Session 1

INDICATORS OF FISCAL IMPACT

FISCAL POLICY AND THE BUSINESS CYCLE: A NEW APPROACH TO IDENTIFYING THE INTERACTION

Stephen Murchison[*] *and Janine Robbins*[**]

1. Introduction

As economic data released late last year pointed towards an economic slowdown, policy makers were interested in the extent to which fiscal policy might mitigate the slowdown of the Canadian economy and to what extent the ensuing slowdown may have a negative impact on the budget balance. The former refers to the impact of fiscal policy on the economy (referred to in this paper as an indicator of fiscal impact), while the latter is concerned with the budgetary position over the business cycle. Although the cyclically-adjusted budget balance (CABB) is widely used for both purposes, its use as an indicator of the economic impact of fiscal policy is inappropriate for several reasons discussed in this paper. This paper introduces a new indicator of fiscal impact, called the indicator of Fiscal Policy Stance (or FiPS), which is jointly estimated with an indicator of budgetary position (i.e.: CABB).

Changes in the budgetary balance can be decomposed into two components: one that is directly caused by the business cycle and one that is independent of the cycle. The former includes automatic stabilizers, such as the EI program, while the latter, referred to as the CABB, includes structural changes and discretionary policies that are independent of the business cycle. The intended purpose of the CABB is to isolate the discretionary and/or structural component of the budgetary balance; however, it has also been used inappropriately to infer the effects of fiscal policy on the economy.

For instance, the year-over-year change in the CABB has been used as a proxy for the impact of fiscal policy on the economy. However, using the

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[*] Bank of Canada / Banque du Canada.

[**] Department of Finance / Département de Finance – Canada.

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CABB in this way introduces many assumptions that are problematic. First, the CABB imposes the same demand elasticities for revenues as expenditures. Second, the CABB omits cyclically-induced changes in the budget balance, which also affect aggregate demand. Lastly, if the measurement is subject to simultaneity bias, the structural budget component will be overstated, and thus, inaccurate.

The technique commonly used to identify the CABB is flawed in that it fails to address the issue of "simultaneity", whereby changes in fiscal policy affect the business cycle and vice versa. Neglecting this problem yields estimates of the coefficients of the fiscal equations that are biased towards zero, and consequently, the cyclical component of the budget balance is underestimated.[1] Previous works by Blanchard (1990) and van den Noord (2000), for example, have warned of the potentially serious problem of neglecting the simultaneity in estimating the CABB.

Numerous studies, using a wide variety of estimation techniques, have attempted to identify the impact of fiscal policy on the economy. It is generally acknowledged, however, that simple indicators cannot adequately capture the full interaction between budgetary revenues and expenditures and the business cycle and that this can only be achieved through simulations of a macroeconomic model.

In this paper, we distinguish between indicators of budgetary position and indicators of fiscal impact and pay particular attention to the terminology used to describe the CABB. In previous work, the year-over-year change in the CABB has been referred to as an indicator of fiscal stance; however, this implies that it is able to provide some sort of measure of the expansionary or contractionary effect of fiscal policy. For the reasons described in the preceding paragraphs, it is apparent that this is not an appropriate use of the CABB. Rather, we refer to the CABB as a measure of budgetary position, since the CABB is able to show from where changes in the budgetary balance arise. Therefore, we refrain from using the terms "expansionary" or "contractionary" when describing the year-over-year change in the CABB, and instead, we use only the terms "improvement" or "deterioration". Furthermore,

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[1] An explanation of this bias towards zero is provided later in the paper.

we refer to the FiPS as a measure of fiscal impact, since it is designed with the intent to measure the effect of fiscal policy on the economy and we reserve the terms "expansionary" or "contractionary" for interpreting the FiPS.

This being said, the purpose and interpretation of the FiPS indicator is also limited. We refer to the FiPS as an indicator of fiscal impact, as it aims to capture the very short-term direct impact of fiscal policy on the economy. As a simple indicator, the FiPS is not capable of determining the long-run, general equilibrium effects of changes in the budgetary components on economic activity, nor the transitional effects. The FiPS model considers only the aggregate demand effects and does not incorporate the supply side dynamics.

The purpose of this project is to develop an *unbiased*[2] indicator of the first round impact of fiscal policy on the economy (the FiPS). In doing so, an unbiased measure of the CABB is produced as a residual, which is therefore, model-consistent with the FiPS indicator. This procedure yields:

- An unbiased measure of the cyclically-adjusted budget balance that
  - is accompanied by an explicit measure of the uncertainty surrounding the estimate (i.e. confidence bands).
- An unbiased measure of the degree of fiscal stimulus in the economy that
  - incorporates the effect of both the cyclical and cyclically- adjusted components of the budget balance
  - allows for heterogeneous demand elasticities across the components of the budget balance
  - is accompanied by an explicit measure of the uncertainty surrounding the degree of stimulus (i.e. confidence bands).

Section two reviews previous research pertaining to indicators of budgetary position and fiscal impact. Section three describes the model and discusses the motivation for using Generalized Method of Moments to estimate the FiPS. Section four presents the empirical results of the model, while the

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[2] In this paper, we use the term unbiased as it is more widely recognized. Strictly speaking, our methodology yields a consistent estimate. There is no guarantee of unbiasedness in small sample.

following section graphically compares the different indicators of budgetary position and fiscal impact. The sixth section discusses the advantage of confidence intervals surrounding the indicators and the last section concludes with some remarks regarding the limitations of the FiPS methodology.

2. Review of the Previous Studies

2.1 Indicator of budgetary position

The budgetary balance can be thought of as having two components: one cyclical and one cyclically-adjusted. The cyclical component reflects the state of the business cycle (i.e.: whether actual output is above or below potential output), while the cyclically-adjusted balance attempts to measure what the budgetary balance would be if the economy were operating at potential. The cyclical component represents the automatic stabilizers, which by definition, cause government receipts and spending to react to output shocks without the need for active government intervention. Automatic stabilizers work to dampen the fluctuations in the business cycle by increasing revenues (decreasing expenditures) during an economic expansion and by decreasing revenues (increasing expenditures) during an economic contraction. In this way, automatic stabilizers have the effect of at least partially offsetting, without any government intervention, swings in the business cycle. Fluctuations in the cyclical component originate solely from fluctuations in the business cycle, defined as the change in the output gap (actual output minus potential output as a per cent of potential output). The cyclically-adjusted component changes in response to structural changes in the economy and discretionary changes to fiscal policy.

Policy makers are particularly interested in separating the cyclically-adjusted component from the cyclical component in order to assess the budgetary position over the business cycle. This differentiation is important because cyclical balances are expected to reverse themselves over the business cycle, whereas, cyclically-adjusted balances may require government action in order to reverse. Understanding the source of changes in the budgetary balance will help guide policy makers in setting effective policies. For instance, permanent programs should not be implemented based on cyclical changes in

the budgetary position. Moreover, it may be inappropriate to take fiscal measures to reverse a deficit as it may already be in the course of reversing itself as economic conditions improve. Conversely, government action may be required to reverse a widening structural deficit in order to restore financial integrity. Several different approaches have been employed to separate the different influences on budgetary balances; we discuss some of the methodologies here.

The Organisation for Economic Cooperation and Development (see Giorno *et al.*, 1995), the International Monetary Fund (see Hagemann, 1999) and Finance Canada regularly report and publish estimates of the CABB for the total Canadian government sector. The methods employed by the IMF, OECD and the Department of Finance produce relatively comparable results, despite the idiosyncrasies of their methodologies. There are essentially two steps involved in estimating cyclically-adjusted budget balances: 1) estimate an output gap and 2) obtain elasticities of the revenue and expenditure components to output. These elasticities are then applied to the output gap in order to obtain an estimate of the cyclically-adjusted component. The cyclical component, or the effect of automatic stabilizers, is the difference between the actual and cyclically-adjusted balances.

Despite its widespread use as an indicator of discretionary changes in the budgetary balance, Blanchard (1990) criticizes the CABB as being needlessly controversial as it relies on potential output, which is unobserved. Blanchard maintains that any benchmark, be it inflation, interest rates or unemployment, would be sufficient to distinguish between cyclical and discretionary changes in the budget components and suggests a new indicator of the impact of discretionary fiscal policy. Blanchard suggests a simple, arbitrary benchmark, such as the previous year's unemployment rate. This indicator answers the question, "What would the primary surplus have been had the unemployment rate remained the same as the previous year?".

Chouraqui, Hagemann and Sartor (1990) also review the use of the cyclically-adjusted balance as an indicator of discretionary changes in fiscal policy. Their paper compares the estimates of the cyclically-adjusted balances when using potential output as a benchmark to using a moving benchmark, such as the level of output consistent with the previous year's unemployment rate. The results for ten OECD countries show that, for most countries, the

choice of the benchmark makes little difference to the orientation of fiscal policy. Moreover, the results appear consistent with general perceptions of the direction of fiscal policy in most countries over the estimation period.

Alesina and Perotti (1995) employed Blanchard's approach to twenty OECD countries, including Canada, and in general, found that the year-over-year change in the CABB estimated by the Blanchard and OECD methodologies produced similar results. Moreover, deflating nominal tax and expenditure variables by potential GDP, instead of actual GDP in order to purge the cyclical component of government expenditures, resulted in only a minimal difference. Kneebone and McKenzie (1999) applied Blanchard's approach to Canadian federal and provincial data covering the period from 1962 to 1996. The authors found that their estimate of the federal government year-over-year change in the CABB was comparable to the estimates published by Finance Canada.

Bouthevillain and Quinet (1999) use a structural bivariate VAR model to decompose the budgetary balance into its structural and cyclical components. Following an approach developed in Blanchard and Quah (1989), the authors impose a restriction that for every increase of one percentage point in economic activity, the budgetary balance as a share of GDP improves by 0.6 percentage points. The authors further assume that the cyclical and structural components of the deficit are not correlated. Compared to the standard two-step method described earlier, the structural VAR method provides a smoother and smaller structural deficit, which implies a larger cyclical component. The difference between the structural VAR and two-step methodologies can be attributed in part to a different interpretation of the resulting cyclically-adjusted budget balances: the two-step cyclically-adjusted budget balance corrects for the impact of the output gap, while the structural VAR cyclically-adjusted budget balance corrects for cyclical fluctuations in GDP that are not induced by fiscal policy.

Cohen and Follette (1999) analyse the cyclical component of the budgetary balance in the United States by employing two approaches: spectral analysis[3] and standard time series. The conclusions from the empirical

[3] A discussion of spectral analysis can be found in Granger and Newbold (1977).

techniques are compared to the results simulated in a macroeconomic model, FRB/US. The authors use spectral analysis to identify the cyclical component of budgetary revenues and expenditures and find a very strong relationship between taxes and unemployment-related expenditures to the tax base and the unemployment rate, respectively, over the business cycle, lending evidence to the automatic stabilizing effect of taxes and employment-related spending. While spectral analysis highlights the cyclical properties of a budget component, it cannot differentiate between the automatic and structural changes. The authors then calculate a high-employment budget balance, which is conceptually similar to the cyclically-adjusted budget balance. The authors find that additional GDP growth of 1 per cent would increase revenues by approximately 0.3 per cent of GDP. Moreover, almost half of the variation in revenues stems from changes in personal income taxes, with another third of the variation explained by corporate income taxes. The findings of the spectral analysis and standard time series are partially confirmed by simulations of the macroeconomic model, FRB/US: automatic stabilizers are found to dampen the short-run effect of aggregate demand shocks on GDP by reducing the multiplier by about 10 per cent; however, very little stabilization is found in response to an aggregate supply shock.

Mélitz (2000) explores the interaction between fiscal and monetary policy regimes, the response of fiscal authorities to debt-to-output ratios and the reaction of fiscal authorities to the business cycle. The study pools annual data from the European Union countries, excluding Luxembourg, plus Australia, Canada, Japan, Norway and the United States. Using two-stage and three-stage least squares to simultaneously model the reaction functions of the monetary and fiscal authorities, Mélitz concludes that deficits provide only weak automatic stabilization, as a result of stabilizing taxes that slightly more than offset destabilizing expenditures. Expenditures first react in a destabilizing manner initially to an economic shock, before providing stabilization mainly through unemployment compensation in the following year. Mélitz explains this phenomenon by postulating that some government spending could be pro-cyclical (e.g.: health services, legal entitlements and public service promotions), while unemployment insurance payments are counter-cyclical, but react with a lag.

Bouthevillian *et al*. (2001) present a new approach to estimating cyclically-adjusted budgetary balances. This paper is innovative in that it captures the effect of compositional changes in aggregate demand and national income on various components of government revenues and unemployment-related expenditures. The authors attribute compositional effects to the fact that tax rates differ across tax bases and the revenue and expenditure bases may be in different phases of the business cycle or exhibit fluctuations of different magnitudes during the business cycle. While the compositional effect was found to be fairly small for the Euro area as a whole during the 1990s, this was not the case on a country-by-country basis.

2.2 Limitations and interpretations of the CABB

The CABB has been criticized for being misused and misinterpreted.[4] It is important to understand the definition of the cyclical and cyclically-adjusted balances and the purpose for which the CABB was designed. Regardless, caution must be used when interpreting the CABB, even when it is being used for its intended purpose.

In theory, the budget balance can be divided into its cyclical and cyclically-adjusted components. However, in practice, the distinction between the two is less obvious. For instance, tax and spending systems include an automatic stabilizing component, whereby revenues (expenditures) tend to increase (decrease) during an economic expansion and decrease (increase) during an economic contraction. Income taxes and Employment Insurance benefits are examples of such. It is interesting to note that even a flat tax can provide some automatic stabilization; however, the amount of stabilization increases when the tax rate increases or the progressivity of the tax system increases. Although these budgetary components are legislated to respond in this way to the business cycle, this may not be the only component included in the cyclical component. For instance, if policy makers take discretionary decisions in reaction to the business cycle, this may also be captured in the measurement of the cyclical component. However, we would expect that since

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[4] Several studies, including Buiter (1985), Blanchard (1990), Chouraqui, Hagemann and Sartor (1990) and Gramlich (1990) provide insightful discussions of the uses and abuses of the CABB.

it often takes longer than one quarter to develop and implement fiscal policies, this affect would likely be minimal in estimation.

Chalk (2002) differentiates between structural[5] and discretionary components. Since measurement techniques of the cyclically-adjusted balance cannot purge structural, or exogenous, shocks such as oil prices, inflation and exchange rates, the cyclically-adjusted budget balance may contain more than just discretionary policies.

The interpretation is further clouded when the cyclically-adjusted budget balance is decomposed into the central and state levels by the presence of intergovernmental transfers. For instance, when a central government unilaterally increases transfers to the state level, the budgetary balance of the central government is reduced, while the budgetary balance of the state level is increased (unless the increased funding is immediately used to increase expenditures or reduce revenues). While the central government did make a policy decision that led to a deterioration of its budgetary balance, the state level of government did not make a policy decision to improve its fiscal position, yet it would appear this way.

The year-over-year change in the CABB, when expressed as a percent of GDP, should not be used in a normative sense to determine what revenues or expenditures "should be", and in the same way, cannot be used to isolate the intent of government interventions. For instance, decomposing the year-over-year change in the CABB into its revenue and expenditure components can only show the source of the change in the budgetary balance as a per cent of GDP. It makes little sense to use this measure to determine if government actions intended to produce a stimulative or contractionary effect on the economy. A simple example demonstrates this argument. Some revenues and expenditures are assumed to have no cyclical component. In this case, any change in the actual variable as a per cent of GDP would be considered a structural change, implying that any non-adjusted variable growing at a rate different than GDP must be changing as a result of government direct intervention. This interpretation is problematic. First, there is no reason to believe that non-adjusted expenditures should grow with GDP. It is more likely

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[5] The structural balance is defined as the fiscal position that would result if the economy were operating at potential.

that expenditures would grow in line with population, inflation and the cost of technological advancement in some sectors (e.g.: health). Even without any additional discretionary measures, most non-unemployment related expenditure programs tend to increase over time; some at a faster rate than GDP, some at a slower rate. Therefore, the year-over-year change in the CABB cannot be used to identify the intent of government policy; it can only infer whether the change in the CABB is attributed to revenues or expenditures. Just as the CABB should not be used as a normative index, the decomposition of the CABB should not be used to determine an optimal level for revenues and expenditures.

Chalk (2002) warns that even if the structural balance is accurately measured, it will never be a good proxy for the demand impact of fiscal policy. He suggests that the change in budgetary components multiplied by their respective multipliers would provide a better indicator of demand impact.

Understanding what the CABB cannot do enables us to talk about the purposes for which the CABB can be used. The CABB is designed to determine what the budgetary balance would be in the absence of fluctuations in the economy. It is able to show where changes in the cyclically-adjusted balance originate from: revenues or expenditures. With GDP as a common denominator, the relative impacts of changes in spending and revenues on the budget balance (i.e.: the so-called structural budgetary balance) can be determined. However, the CABB should not be used to determine the impact of fiscal policy on the economy or to interpret the intent of government policies.

2.3 Measuring the impact of fiscal policy on the economy

It is generally accepted that discretionary fiscal policy actions can have "Keynesian" effects in the short run. This occurs because changes in fiscal policy can directly affect aggregate demand through increased government spending and private consumption. In the longer term, output is affected by interest rates, exchange rates, labour allocation and investment decisions, which could work to offset the Keynesian effects on the economy.

Ricardian Equivalence, at the other end of the spectrum, postulates that deficit-financed tax cuts and/or increased government spending will have no important effects on consumption, capital accumulation or economic growth. The neutrality of government debt occurs because economic agents have sufficient foresight to realize that deficits today mean higher taxes tomorrow and will adjust their savings in such a way that national savings remains unchanged. Elmendorf and Mankiw (1998) provide a comprehensive literature survey of the macroeconomic impact of government debt on the economy from a conventional "Keynesian" view to the standpoint of Ricardian Equivalence. While empirical evidence is mixed concerning the existence of Ricardian Equivalence, the most widely-held view is that fiscal policy can have real affects on the economy in the short run.

Constructing an indictor to measure the impact of fiscal policy on economic growth is no new task. The OECD Monetary and Fiscal Policy Division (1978) identified four techniques that were in use by various OECD countries to estimate budget impact measures: 1) large-scale macro-econometric models, 2) weighted budget balances, 3) derivations from the full-employment balance and 4) a "mixed" approach that combines the impact of actual and/or discretionary changes. The study suggests a new indicator, the net real fiscal impulse, which weights real tax and expenditure flows. This indicator considers the first-round impact on the economy and is not intended to capture the longer-run multiplier effects. The overall impact is attained by summing the changes in real taxes and expenditures, multiplied by their respective weights, expressed as a per cent of the previous years' real GDP.

Feldstein (1982) uses instrumental variables estimation to test the impact of changes in government spending and taxation on aggregate demand. While limiting his analysis to the direct demand effects, Feldstein acknowledges that fiscal policy actions are partially offset indirectly by higher interest rates, reduced money supply balances and changes in portfolio composition in the general equilibrium. Using instrumental variable techniques, the author rejects the notion of Ricardian Equivalence, where government deficits have no impact on aggregate demand. Feldstein concludes that changes in government policies regarding taxation and expenditure can have a substantial impact on

aggregate demand; however, monetary policy may limit the net effect on output.

Aschauer (1985) and Katsaitis (1987) examine the degree to which government spending on goods and services is a substitute for private consumption in the United States and Canada, respectively. Both studies find evidence that government spending is a poor substitute for private consumption, implying that an increase in government spending will tend to increase output nearly one-for-one.

Bernheim (1987) explores the theoretical underpinnings of Ricardian Equivalence and concludes that deficits could have large effects on current consumption. Reviewing several studies, the author finds that an additional dollar of deficit stimulates between 20 and 50 cents of current consumer spending. Bernheim uses these results to dispute the existence of Ricardian Equivalence.

Blanchard (1985) develops an index of fiscal policy impact whereby aggregate demand is affected by fiscal policy in three ways: the marginal propensity to consume out of debt (or wealth); the marginal propensity to consume out of labour income, which is determined by the present value of current and anticipated taxes; and directly through government spending. Blanchard (1990) develops another similar indicator in an attempt to answer the question, "What is the effect of fiscal policy on aggregate demand, while disregarding distortions induced by the tax/benefit system". However, the objective is to develop a *simple* indicator that does not rely upon forecasts, so he instead proposes three simple indicators of fiscal impact: 1) the inflation-adjusted deficit, 2) an "adjusted" deficit, defined as program spending plus debt charges minus the average of tax revenues for the current and following two years and 3) an indicator, while not developed in the paper, that could capture the effects of retirement programs on current consumption. Admitting that these measures are not as complete as the more complex index of fiscal policy impact, they do offer simplicity and ease of construction.

Following the work of Blanchard (1985), Chouraqui, Hagemann and Sartor (1990) construct two indexes to measure the impact of fiscal policy on the economy: one that assumes that individuals are myopic and another that allows for some consumer foresight. The authors also compute the deficit

counterparts to the two indexes: the actual deficit and an adjusted deficit, which takes in to account potential future taxes, respectively. Overall, the results show that the indexes and deficit counterparts display similar patterns in an absolute sense; however, the myopic index and its deficit counterpart tend to overstate the impact of fiscal policy on the economy. This implies that expectations of future taxes can dampen the impact of fiscal policy.

Chand (1992) assesses the measure of fiscal impulse, which estimates the initial contribution of budgets to aggregate demand. Simply put, the fiscal impulse measure is considered expansionary when government spending increases by more than the increase in potential output multiplied by a base-year spending-to-potential output ratio or when revenue increases by less than the increase in actual output multiplied by a base-year revenue-to-output ratio. While appealing due to its simplicity, it places the same multiplier (unity) on revenues and expenditures.

Romer and Romer (1994) question the role of monetary and fiscal policy in ending the recessions that occurred in the United States since 1950. The authors measure the impact of fiscal policy on output using three methods: ordinary least squares (OLS), instrumental variables (IV) and Data Resources Incorporated (DRI) macroeconomic model. Overall, monetary policy provides the most important source of economic stimulus in the first year of recovery, followed by moderate stimulus from automatic fiscal stabilizers and weak stimulus from discretionary fiscal policies. The OLS results show that monetary policy, automatic fiscal stabilizers and discretionary fiscal policies contributed an additional 1.6, 0.6 and 0.3 percentage points, respectively, to GDP growth in the first year of recovery. This compares to 1.5, 0.9 and 0.5 percentage points, respectively, based on the DRI estimates. Due to large standard errors, the results from the IV estimation are considered to be unreliable. The authors attribute the limited role of discretionary actions in economic recovery to the fact that only small or temporary actions were taken, since Congressional approval could be circumvented or easily attained for smaller actions. Furthermore, most discretionary policies were implemented with the goal of increasing long-term growth during economically healthy periods and not with the goal of mitigating short-term fluctuations.

Blanchard and Perotti (1999) use a mixed structural VAR/event study to consider the economic impact of changes in government consumption and

investment spending and taxes net of transfers. This study is an improvement over previous studies as it takes into account the contemporaneous relationship between tax, spending and output shocks. As expected, they find that a positive tax shock exerts a negative effect on output, whereas a positive expenditure shock increases output. Using a deterministic trend, a one-dollar increase in taxes net of transfers causes output to fall by an estimated 70 cents on impact, peaking with a multiplier of 0.78 in the fifth quarter after the initial shock. Conversely, a unit spending shock increases output on impact by 0.84, reaching a peak effect of 1.29 after fifteen quarters. The results are similar for stochastic trends. Furthermore, private consumption, investment, exports and imports all react negatively to a net tax increase, whereas for a spending increase, private consumption, exports and imports exhibit a positive correlation, while private investment exhibits a negative correlation.

Auerbach and Feenberg (2000) assess the effectiveness of federal taxes as automatic stabilizers in the United States between 1962 and 1995. Automatic stabilizers are measured in two steps: estimate the sensitivity of after-tax income to before-tax income and then estimate the sensitivity of consumption to changes in disposable income. Accordingly, the lower the sensitivity of after-tax income to changes in before-tax income increases the effectiveness of automatic stabilizers. Moreover, theory predicts that changes to disposable income would have a larger impact on consumption of middle- and lower-income earners who face liquidity constraints than of high-income earners as a result of a higher marginal propensity to consume at the lower income levels. The authors use individual tax returns from the NBER TAXSIM Model, which has the ability to calculate the tax impact of legislated tax changes. The authors conclude that tax-induced consumption offsets approximately 8 per cent of the initial shock to output and thereby provides some degree of automatic stabilization of aggregate demand.

James, Robidoux and Wong (2000) develop the Fiscal Conditions Index (FCI) to estimate the first-round impact of fiscal instruments on aggregate demand. The goal of this study is to propose an alternative to the use of the CABB as a proxy for the economic impact of fiscal policy, allowing for heterogeneous effects of different revenue and expenditure components on output. It also does not exclude the impact of the automatic stabilizers on output, as does the CABB. According to the FCI, a decline in taxes of 1.0

percentage point provides an additional 0.5 percentage point increase in output. Furthermore, an extra dollar of government spending provides an additional dollar of output. However, some of the multipliers are imposed rather than freely estimated and the estimated multipliers likely suffer from simultaneity bias.

This paper attempts to bridge the gap between the indicators of budgetary position and indicators of fiscal impact firstly by clarifying the appropriate role and interpretation of each indicator and secondly by employing a technique that captures the interaction between the budgetary components and business cycle. The FiPS methodology focuses upon the short-run, direct impacts of fiscal policy on aggregate demand[6], and is not able to infer any longer-run relationships between fiscal policy and output. The methodology is discussed in detail in the next section.

3. Model and Estimation

3.1 Background

The methodology employed in this paper consists of two equations: a fiscal equation (which is a set of equations represented by several budgetary components) and an output equation (which is actually an aggregate demand function). The fiscal and output equations are estimated simultaneously to capture the interaction between the fiscal and economic variables. Consider the following simple static model of the interaction between output relative to potential and the components of the government's budget balance;

Fiscal equation:

$$\Delta \mathbf{x}_t = \Delta \tilde{y}_t \, \mathbf{C} + \mathbf{v}_t \qquad \mathbf{v}_t \sim (\mathbf{0}, \Sigma) \qquad (3.1)$$

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[6] Blanchard (1990) offers an insightful discussion on the distinction between impact effects, or the impact of fiscal policy given income, interest rates and exchange rates, and final, or general equilibrium, effects.

Output equation:

$$\Delta\tilde{y}_t = \mathbf{A}'\Delta\mathbf{x_t} + \mathbf{B}'\Delta\mathbf{z_t} + u_t \qquad u_t \sim (0, \sigma^2) \qquad (3.2)$$

where $\mathbf{x_t}$ is an n×1 vector of the components of the budget balance divided by potential output, $\tilde{y}_t$ is the output gap, $\mathbf{z_t}$ is an m×1 vector of strictly exogenous determinants of output growth and u_t is a random term that captures the effects of pure demand shocks. The n elements of $\mathbf{v_t}$ represent discretionary changes in the components of the budget balance relative to potential output that are strictly exogenous by assumption to the business cycle.

The elements of the n×1 vector **C** measure the responsiveness of the components of the budget balance to changes in output relative to potential. Those components of revenues (expenditures) with an automatic stabiliser component will have a positive (negative) correlation. This means that when output relative to potential increases, revenues will tend to increase and expenditures will tend to fall. Since some budgetary components do not vary with the business cycle, it is possible that some elements of **C** are equal to zero.

The elements of the n×1 vector **A** measure the responsiveness of output growth to the elements of the budget balance. We expect that output will decrease (increase) as revenues increase (decrease) or expenditures decrease (increase), since more resources are being withdrawn from (injected into) the economy. Therefore, we expect that the revenue components of **A** will have a negative coefficient, while the coefficients for the expenditure components will be positive. However, it is plausible that some of the elements of **A** may be indistinguishable from zero. We further expect that the expenditure coefficients will be larger, in absolute terms, than the revenue coefficients.

If the first k elements of $\mathbf{x_t}$ represent revenues and the remaining m-k elements represent expenditures, we can then define the change in the budget balance as:

$$\Delta BB_t \equiv \sum_{i=1}^{k} \Delta x_{i,t} - \sum_{j=k+1}^{m} \Delta x_{j,t} \qquad (3.3)$$

The change in the cyclically-adjusted budget balance is then defined simply as:

$$\Delta CABB_t \equiv \sum_{i=1}^{k} v_{i,t} - \sum_{j=k+1}^{m} v_{j,t} \tag{3.4}$$

In the context of this model, the CABB is defined to be the component of the budget balance that is strictly exogenous to the output gap. As discussed below, however, this should not be taken to mean that it is uncorrelated with the output gap.

The difference between the budget balance and the CABB is simply the cyclical component of the budget balance, given as;

$$\Delta CBB_t = C^* \Delta \tilde{y}_t \qquad \text{with} \qquad C^* = \left(\sum_{i=1}^{k} c_i - \sum_{j=k+1}^{m} c_j \right) \tag{3.5}$$

where c_i is the i^{th} component of C. The cyclical component literally measures the change in the budget balance that is due to movements in the output gap. This could stem from automatic stabilizers or a shift in policy that is in response to, or is at least correlated with, the business cycle. Thus, any attempt to actively conduct counter-cyclical fiscal policy will be included in this component of the budget balance.

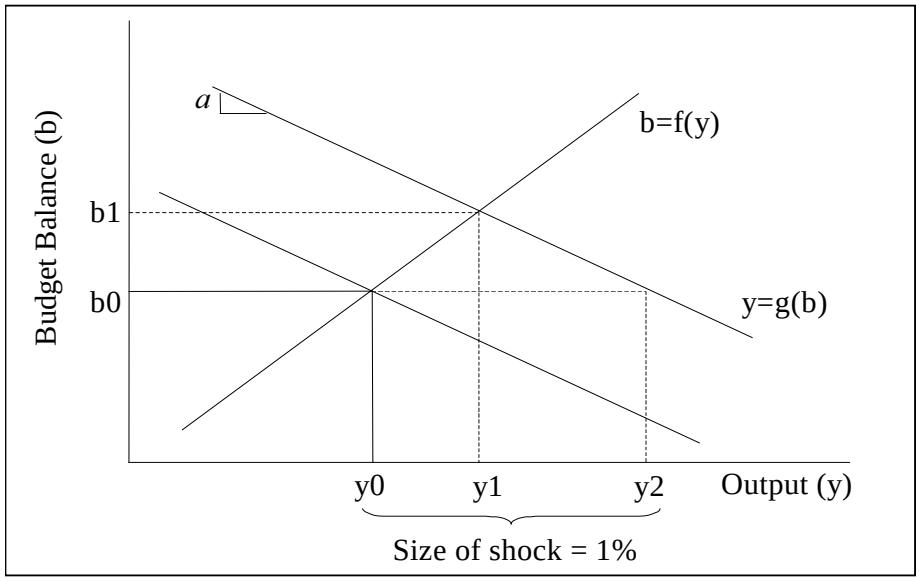
Equation 3.6 is simply the change in the indicator of fiscal impact (the FiPS), which measures the percentage point contribution of fiscal policy to output growth.

$$FiPS_t = A' \Delta x_t \tag{3.6}$$

Here we have provided a simple model, whereby output growth relative to potential is determined by fiscal policy and a set of predetermined or strictly exogenous variables, such as the real interest rate, the real exchange rate and US output. However, the impact of a demand shock is complicated by the interaction between fiscal and economic variables. The following illustration maps out the effects of a unit shock to equation 3.2. We will assume, for the sake of simplicity, that each element of **A** equals a (Fig. 1).

Fig. 1

Effect of a demand shock on output and the budget balance



We begin in equilibrium at point {y0, b0}. The upward sloping function represents equation 3.1 (with slope equal to C*), whereas the negatively sloped function represents equation 3.2 (with slope a). A positive demand shock of 1 per cent, in the first instance, would raise output by one percent to y2. However, since the increase in income has the effect of raising tax revenues and lowering expenditures, the net impact on output is somewhat lower, at say, y1. Similarly, the net increase in the budget balance (point b0 to b1) is somewhat smaller than implied by the original shock because the balance improvement acts to lower output. The new equilibrium at {y1, b1} is a function of the relative slopes of the two functions. In the case of the preceding demand shock, a larger C* or smaller a reduces the impact of a demand shock on output.

In general, the reduced-form multipliers are given as:

$$\Delta\tilde{y}_t = \left(\frac{a}{1 - aC^*}\right)\Delta CABB_t + \left(\frac{1}{1 - aC^*}\right)u_t \tag{3.7}$$

$$\Delta BB_t = \left(\frac{1}{1 - aC^*}\right)\Delta CABB_t + \left(\frac{C}{1 - aC^*}\right)u_t \tag{3.8}$$

The principal distinction between $\mathbf{x_t}$ and $\mathbf{z_t}$ is that $\mathbf{x_t}$ is assumed to be endogenous to $\tilde{y}_t$ in our model, unlike $\mathbf{z_t}$, which is exogenous. This stems from the fact that output and the elements of the budget balance are assumed contemporaneously related in equations 3.1 and 3.2 (and $\sigma^2 \neq 0$). This assumption is predicated on the fact that the relationship between output and the budget balance is at least partly one of accounting, whereby the national accounts output identity includes government expenditures. Furthermore, personal income tax revenues at a given point in time are, for the most part, a function of personal income at that point in time.

This illustrates an important difference between fiscal policy and, for instance, monetary policy, which is generally assumed to affect output with a lag. The real interest rate typically enters a demand function with several lags, particularly at a quarterly frequency or higher. This distinction considerably complicates the task of estimating either equation 3.1 or 3.2. To see why, consider again equations 3.7 and 3.8. Equation 3.8 posits a linear relationship between (the change in) the budget balance, the two structural shocks and the two structural parameters. Thus movements in the budget balance and demand shocks are correlated. Similarly, equation 3.7 indicates that output growth is correlated with movements in the CABB. These correlations invalidate OLS estimates of **A** and **C** since OLS assumes that the regressors and the residual are orthogonal, and therefore, OLS imposes a correlation of zero between the regressors and the residual.

More intuitively, consider the interpretation of the coefficient in an OLS regression of the output gap on the budget balance (divided by potential). This coefficient measures the amount by which the output gap changes when the budget balance changes. However, this depends strongly on whether the underlying source of budget balance movement is a demand shock or a shock

to the CABB. In the former case, the coefficient is positive, while in the latter it is negative.

In practice, the estimated reduced-form parameter will be a weighted-average of the two structural parameters. The relative weights will depend on the relative average magnitudes of the shocks (i.e.: σ^2, Σ). However, since the theoretical values of the elements of **A** and **C** always have the opposite sign, the OLS estimates of **A** and **C** will invariably be biased towards zero. Consequently, the size of the cyclical component of the budget balance and the fiscal component of output would be underestimated using OLS. It is worth noting that this problem exists independent of sample size. Thus, OLS is not only biased under these circumstances, it is inconsistent.[7]

3.2 Proposed Estimation Approach

This research project is innovative in the way Generalized Method of Moments (GMM) estimation is used to identify the fiscal and output equations and to provide consistent estimates of the coefficients in equations 3.1 and 3.2. Previous studies have employed instrumental variables estimation to eliminate the problem of inconsistency associated with OLS. As such, this section reviews instrumental variables, provides background information for those not familiar with GMM estimation and explains the motivation of GMM for this work.

An instrument is a variable that is uncorrelated with the error term, but correlated with the variable that is correlated with the error term (known as the endogenous regressor). For instance, in order to identify a in the previous example, we need a variable that causes shifts in the budget balance function that is also uncorrelated with demand shocks. Given shifts in f(y) and the resulting equilibrium levels of y and b, holding the output curve fixed, we could trace the output curve and obtain a consistent estimate of a. In this simple model, the only valid instrument is the CABB. However, knowledge of

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[7] As the sample size approach infinity, the distribution of a *consistently* estimated parameter converges to a point equal to the true value.

C* is required to calculate the (unobserved) CABB. Of course, identifying C* introduces precisely the same problem as identifying a.

One set of variables that fulfil these two requirements in terms of output is $\mathbf{z}_t$. The elements of $\mathbf{z}_t$ are clearly correlated with output through equation 3.2, but will not, in general, be correlated with movements in the CABB. Consequently, it is possible to consistently estimate the n elements of **C**. Equation 3.1 can, in fact, be regarded as a system of n equations, each containing one unknown coefficient. Thus, a necessary condition for identification is the existence of at least one predetermined or strictly exogenous variable in the output function, that is m>0, but generally m>1. Thus an interesting question arises: since each variable in $\mathbf{z}_t$ represents a valid instrument, in that it will yield a consistent estimate of C, which variable should be used? In finite samples, the estimate of **C**, denoted $\tilde{\mathbf{C}}$, will depend on which instrument is selected. For instance, using US output growth as the instrument will, in general, yield a different $\tilde{\mathbf{C}}$ than real interest rates or the real exchange rate. In fact, the demand function from the NAOMI model, as described in Murchison (2001), yields up to 10 possible instruments, including lags. Ideally, one would like to somehow incorporate the information from all m instruments in the estimation of $\tilde{\mathbf{C}}$. Incorporating this entire set of information in the most efficient way possible is a fundamental principal underlying the Generalized Method of Moments (GMM) (see Hansen, 1982).

In order to explain what GMM really means, it is instructive to return to the definition of what defines an instrument. In order to be valid, an instrument for the output function cannot be correlated with demand shocks (the error term), otherwise the estimated coefficient will reflect both the effect of the independent variable on output (the desired component) and the effect of demand shocks (the bias). If the instrument is assumed valid, this information can be used to actually estimate the parameter of interest. Stated otherwise, one can choose the coefficient in the output function so as to minimise the resulting sample correlation between the instrument and the error term. Theory often suggests certain population "moment conditions"; the most notable being expectations models, whereby the assumption of rationality implies orthogonality between agents' information sets and expectational errors. GMM uses these population moment conditions to identify the parameters of the

model. Moreover, the resulting parameters are consistent regardless of the distribution of the error term and regardless of whether those errors are serially correlated or heteroskedastic.

Having more instruments than parameters amounts to having more moment conditions than parameters in the GMM framework since each instrument implies exactly one moment condition. In order to address the question of what to do with this 'extra' information, it is instructive to revisit the second requirement of an instrument: i.e. it must be correlated with the endogenous regressor. In fact, a higher correlation with that variable implies a more efficient, and thus better, instrument. Therefore, a higher correlation produces a more precisely estimated parameter (a lower variance).

In this instance, there is one parameter per equation and m instruments. Instead of choosing the instrument with the highest correlation with the output gap, GMM constructs a (linear) combination of the m instruments that maximises this correlation and uses this composite instrument. In fact, in the context of a single equation model with spherical errors, it corresponds to two-stage least squares (2SLS). This illustrates another interesting point: many common estimators including instrumental variable regression (IV), non-linear IV, 2SLS, 3SLS and even OLS can simply be regarded as special cases of GMM. For instance, the OLS moment conditions require zero correlation between the regressors and the error term. Minimising the sum of squared residuals is equivalent to setting these sample correlations to zero.

Using GMM in conjunction with the set of instruments $\mathbf{z}_t$ will yield consistent and (asymptotically) efficient estimates of $\mathbf{C}$, which can then be used to solve for $\mathbf{v}_t$, the elements of the CABB. These components have the properties of being correlated with the corresponding components of the actual budget balance $\mathbf{x}_t$, but uncorrelated with u_t.

Hence the components of the CABB are suitable as instruments in equation 3.2, the output function. Thus, using this two-stage approach, it is possible to identify both the indicator of budgetary position (CABB) and the indicator of fiscal policy impact (FiPS). Indeed it possible to set this up as a particular GMM problem, whereby a subset of the instruments is a function of the estimated parameters, thereby solving for both simultaneously. Finally, it is also possible to construct an asymptotically valid measure of the uncertainty

surrounding the CABB and FCI. This uncertainty stems directly from the uncertainty associated with the GMM parameter estimates (i.e. the parameter covariance matrix).

4. Constructing and Estimating the Model

In this section, we use quarterly National Income and Expenditure Accounts data from 1973Q1 to 2001Q2 to estimate the system of fiscal equations (equation 3.1) and construct the cyclical and cyclically-adjusted budget balances using the GMM approach (referred to as the FiPS-based estimates). We consider only primary balances, which exclude interest income and debt charges, in this analysis to adjust for changes in the budgetary balance induced by changes in interest rates. Next, we estimate the same fiscal equations individually using OLS estimation, which are then compared to the results from the GMM estimation. We find that the cyclical component under the GMM methodology is more than twice as large as that OLS methodology, thereby lending support to the assertion of simultaneity bias inherent in the OLS parameter estimates. Lastly, we present the estimation results from the FiPS indicator and compare them to the multipliers obtained from an OLS estimation of the output equation.

4.1 Cyclical and Cyclically-Adjusted Budget Balances

We begin by decomposing the budgetary balance into its various revenue and expenditure components following the convention of the National Income and Expenditure Accounts and arrive at a model consisting of nine categories of revenues and expenditures (Table 1). As Mackenzie (1989) points out, the decomposition of revenue and expenditure components may be important if multipliers are sufficiently different from each other and if the composition of revenue and expenditure components differs substantially from year to year. Moreover, even if the weights for the various revenue and expenditures are similar, they may not move in tandem with economic fluctuations. For this reason, we start with a relatively disaggregated model, and after a series of hypothesis tests, we accept a more aggregated model.

We begin by running a model that includes all nine budgetary components and use Hansen's D-statistic[8] to test the restrictions imposed on the fiscal equations. The D-statistic compares the criterion functions of the restricted and unrestricted regressions, similar to an LM test statistic, using the chi-squared distribution with the degrees of freedom equal to the number of restrictions. As the difference between the restricted and unrestricted models widens, it is less likely that the restrictions are valid. Therefore, a test statistic larger than the critical value would lead to a rejection of the null hypothesis that the restrictions are valid.

Table 1

Variable mnemonics and definitions

Mnemonic	Definition
PIT	Personal income taxes plus non-residents' withholding tax
CIT	Corporate income taxes
IND	All indirect taxes, excluding property taxes.
OREV	Other revenues comprised of natural resource revenues, transfers from persons and profits of government business enterprises
WAGE	Government spending on wages, including military
NWGS	Government spending on non-wage goods and services, net of proceeds from the sale of goods and services
SUB	Government subsidies to businesses
TOTR	Transfers to persons, net of contributions to Employment Insurance, Workers' Compensation Board, Canada Pension Plan and Quebec Pension Plan
OEXP	All other expenditures, mainly comprised of gross capital formation and military goods and services

[8] See Newey and West (1987).

For the fiscal equation, we first test the restriction that WAGE and SUB are equal to OEXP, given that there is relatively weak evidence suggesting that the coefficients are statistically significant from zero. Given that the test statistic is 0.58 against a critical value of $\chi^2(2) = 5.991$ at the 5 per cent level of significance, we cannot reject the null hypothesis that the restrictions are valid. We next test the joint restrictions that CIT is equal to IND and that WAGE and SUB are equal to OEXP. Given a test statistic of 0.80 against a critical value of $\chi^2(3) = 7.815$ at the 5 per cent significance level, we again fail to reject the null hypothesis that the restrictions are valid.

Next, we impose the restrictions on the fiscal equations and re-estimate the resulting six-variable model, whereby β_i represents the effect of the business cycle on the fiscal variables, $\tilde{y}_t$ is the output gap and ν_{it} is the cyclically-adjusted component. Here, TAX is the combination of corporate and indirect taxes and GOV represents the sum of spending on wages and salaries, subsidies to businesses and other expenditures. As we are ultimately interested in isolating the effect of the business cycle on these components, the budgetary components are expressed a proportion of potential output. We also take first differences to eliminate drifts from some of the fiscal ratios and ensure consistency between the fiscal and output equations. These transformations yield the following set of equations (expressed in matrix form):

$$\Delta\begin{bmatrix} pit/y^p \\ tax/y^p \\ orev/y^p \\ nwgs/y^p \\ gov/y^p \\ totr/y^p \end{bmatrix} = \Delta\tilde{y}_t \begin{bmatrix} \beta_1 \\ \beta_3 \\ \beta_3 \\ \beta_4 \\ \beta_5 \\ \beta_6 \end{bmatrix} + \Delta_t \begin{bmatrix} \nu_1 \\ \nu_2 \\ \nu_3 \\ \nu_4 \\ \nu_5 \\ \nu_6 \end{bmatrix}; \qquad \nu_i = \Delta\left[\frac{e_{it}}{y^p}\right] \tag{4.1}$$

Looking at the GMM estimates, we find that for every one-dollar increase in output, the budgetary balance improves by 85 cents (Table 2). As expected, revenues exhibit a positive correlation with the output gap, while expenditures exhibit a negative correlation.

For a positive economic shock, most of the improvement in the budgetary balance stems from the revenue side. The fact that revenues vary

with the business cycle to a larger extent than expenditures is not surprising since government expenditures are largely discretionary in nature, and are therefore, not as highly correlated with the state of the economy. Overall, revenues have a combined GMM estimated coefficient of 0.53, implying an average elasticity of the fiscal variables with respect to output of about 1.7. This suggests that the revenue share of output is pro-cyclical, stemming almost entirely from personal and corporate income and indirect taxes.

Table 2

Model estimates of the fiscal equations

	GMM			OLS		
	Coefficient	Elasticity	t-statistic	Coefficient	Elasticity	t-statistic
β_1 (pit)	0.20	1.65	2.80	0.06	0.46	0.79
β_2 (tax)	0.27	2.03	4.18	0.20	1.51	4.22
β_3 (orev)	0.06	1.07	2.47	0.04	0.68	1.91
β_4 (nwgs)	–0.06	–0.95	–2.65	0.00	–0.07	–0.19
β_5 (gov)	–0.14	–0.86	–1.85	–0.06	–0.35	–0.86
β_6 (totr)	–0.12	–1.94	–4.34	–0.06	–1.01	–2.31
	0.85			0.31		

Personal income taxes have a coefficient of 0.20 and an estimated elasticity of 1.65. An elasticity of greater than unity is due largely to the progressivity of the tax system and the only partial inflation indexation from the latter half of the 1980s to the close of the 1990s. With the re-introduction of full inflation indexation beginning with the 2001 taxation year in most Canadian jurisdictions, the elasticity is expected to be lower in future years.

The coefficient on corporate income and indirect taxes (TAX) is slightly larger than that of personal income taxes, implying that corporate income and indirect taxes are more cyclically sensitive than personal income taxes. In addition, the high elasticity indicates that these taxes are highly pro-cyclical.

Other revenues exhibit only a weak cyclical component. This is not surprising given that this revenue component is mainly composed of natural resource revenues and property taxes. Prices for natural resources are determined on the world market and do not necessarily fluctuate with Canada's business cycle.

As implied by a combined GMM coefficient of –0.32, government expenditures have historically behaved counter-cyclically in Canada. Most government spending components exhibit only a weak cyclical component, reflecting the fact that most government spending is largely discretionary. We would expect to see a significant cyclical component for transfers to persons, which include employment insurance benefits and social assistance, as they are more closely tied to the state of the economy.

In the preceding section, we argued that if the simultaneity between output and the budget balance were ignored, the coefficient estimates would be biased toward zero. In order to get an idea of the magnitude of this bias we re-estimate the FiPS model using OLS.[9] Both the GMM and OLS estimates suggest that the budget balance has a counter-cyclical component: revenues are positively correlated with the output gap, whereas expenditures are negatively correlated. Although this is true for both the GMM and OLS estimates, the absolute size and statistical significance[10] of each coefficient is larger using GMM, particularly for personal income tax revenues and all government expenditures. Thus, the direction of the simultaneous equation bias is consistent in every case with that predicted in the previous section.

Moreover, the GMM estimate of the budgetary balance multiplier, 0.85, is more than double that of the OLS multipliers. Consequently, the GMM-based cyclical component of the budget balance is, at any point in time, double that under the OLS model. This would suggest, for instance, that the responsiveness of automatic stabilizers to the business cycle have previously been underestimated by a considerable amount.

Our estimate of an 85-cent improvement in the primary balance for a one-dollar increase in output is high by most standards, which estimate a

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[9] Technically, we use SUR on the fiscal equations.

[10] While t-values have been included it should be noted that they are only asymptotically valid.

budgetary improvement closer to 50 per cent of the size of the output shock.[11] If, in our measurement of the cyclical component, we only adjust personal and corporate income taxes, indirect taxes and transfers to persons (more consistent with other standard measures), the automatic stabilizers would cause an improvement of 60 per cent of the size of the output shock, rather than 85 per cent. Not only is this measure more consistent with the standard measures, it continues to support the assertion that when the issue of simultaneity between fiscal and economic variables is not addressed, the estimate of the cyclical component is biased toward zero.

4.2 The Output Equation Specification

Turning now to the output equation, the baseline aggregate demand function is taken from the NAOMI model, a small reduced-form model of the Canadian economy (see Murchison, 2001). Output growth in NAOMI is determined primarily by some exogenous economic variables, $\mathbf{z}_t$, such as potential output growth (Δly^p), U.S. output growth (Δly^{US}) and the change in the slope of the yield curve ($\Delta slope$). A somewhat smaller role is played by the (change in the) real exchange rate (Δlz) and real non-energy commodity prices ($\Delta lpcne$). Formally, the equation can be written in terms of the change in the output gap:

$$\Delta\tilde{y} = \alpha_1\Delta\tilde{y}_{-1} + \alpha_2\left(\Delta ly^{US} - \Delta ly^{p}\right) + \alpha_3\sum_{i=3}^{4}\frac{\Delta slope_{-i}}{2} + \alpha_4\sum_{i=3}^{4}\frac{\Delta lz_{-i}}{2} + \alpha_5\sum_{i=3}^{6}\frac{\Delta lpcne_{-i}}{4} \qquad (4.2)$$

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[11] Across 20 OECD countries, van den Noord (2000) found that, on average, net lending changes by 0.52 per cent for a 1 per cent change in GDP, with a low of 0.37 in Ireland and a high of 0.76 in Sweden. Mélitz (2000) estimated the response of fiscal policy to the business cycle to be in the range of 0.31 to 0.37.

or in terms of output growth as:

$$\Delta ly = \alpha_2 \Delta ly^{US} + (1-\alpha_2)\Delta ly^{p} + \alpha_1\left(\Delta ly_{-1} - \Delta ly_{-1}^{p}\right) + \\ + \alpha_3 \sum_{i=3}^{4} \frac{\Delta slope_{-i}}{2} + \alpha_4 \sum_{i=3}^{4} \frac{\Delta lz_{-i}}{2} + \alpha_5 \sum_{i=3}^{6} \frac{\Delta lpcne_{-i}}{4} \qquad (4.3)$$

NAOMI's output function can be written in terms of output growth that includes a single lag of the dependent variable. As such, the long-run impact of a shock to fiscal policy will be larger than the immediate or contemporaneous impact. For the purposes of this paper, we will refer to this as a multiplier effect. It is not clear exactly what the lagged variable is picking up. It could, for instance, be a proxy for one or more omitted variables. On the other hand it could represent an approximation to a longer partial-adjustment process in one or more of the explanatory variables or a *Leontief* output multiplier.

Since the fiscal variables enter into the output function contemporaneously and given the relatively small sample size (about 110 observations), a single lagged dependent variable may simply represent a parsimonious approximation to a longer distributed lag representation in each fiscal variable. Nevertheless, the approximation is likely crude since the specification imposes the same adjustment process for every argument in the demand function. Furthermore, since there is no notion of stock equilibria in this model whatsoever, discussions of the long run impacts are somewhat inappropriate. It should also be noted that the estimated multiplier is biased down in finite samples due to its correlation with lagged residuals.[12] While we report the results of the long-run fiscal multiplier, caution is warranted in both its structural interpretation and the precision with which it has been estimated.

The value of the lagged dependent variable in NAOMI's output function, α_1, is 0.39 when written in terms of equation 4.2. Consequently, the long-run multiplier is $1/(1 - \alpha_1) = 1.64$. Since the value of α_1 is quite low, much of the adjustment takes place within a short period of time. For instance,

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[12] However, this downward bias should be small given that estimated value is considerably less than one. It is well known that the bias is an increasing function of the true root.

the multiplier after one year is about 1.60. Our aim is to use a fairly traditional demand specification thereby reducing the possibility of contaminating the results of interest with model misspecification.

In order to complete the model, it is necessary to augment equation 4.3 with the fiscal variables, which are also divided by potential output and first differenced. We estimate equation 4.4, where $f(Z)_t$ represents the exogenous economic determinants listed previously and x/y^p represents components of the budgetary balance expressed as a proportion of potential output.

$$\tilde{y}_t = \delta_1 \tilde{y}_{t-1} + \delta_1 \tilde{y}_{t-2} + f(Z)_t + [a_1\ a_2\ a_3]\,\Delta[x/y^p]_t + u_t \qquad (4.4)$$

Note that this specification assumes that fiscal policy does not affect potential output. Given that potential output is exogenous in NAOMI, this restriction represents a simplifying assumption. To the extent that tax rates affect long-run labour supply or the share of government spending affects the capital stock, our model represents only an approximation of the true interaction between fiscal policy and output.

Equation 4.4 forms the output equation that is estimated using quarterly data from 1973Q1 to 2001Q2. Five specifications are tested, with the results are shown in Table 3. We again employed Hansen's D-statistic to test the different specifications for the output equation. The first specification includes all nine fiscal variables separately, and hence, this is the unrestricted model against which the other specifications are tested. Interestingly, the exogenous economic determinants are largely invariant to the specification chosen. From this regression, we find that IND, OREV, WAGE and OEXP are not significantly different from zero and TOTR is not significantly different from 1.0. Not all revenues impact aggregate demand to the same degree. Only PIT and CIT are significant at the 10 per cent level, and surprisingly, the coefficient on CIT would imply that investment is more sensitive than consumption. While this is a peculiar result, plotting the coefficient on CIT over time shows that it is quite unstable, which renders the point estimate less reliable.[13] In the short term, we would expect that individuals could change their consumption patterns in response to a personal income tax cut faster than businesses could

[13] For instance, when the start of the sample is arbitrarily set to after the 1981-1982 recession, we find that the coefficient on corporate income taxes is near zero.

change their investment plans in response to a corporate income tax cut. For this reason, we would expect that a change in personal income taxes would have a larger impact on the economy than a change in corporate income taxes in the short run.

On the expenditure side, spending on transfers to persons and non-wage goods and services adds more stimulus to the economy than any other category of government spending. Although government spending enters the aggregate demand equation directly, its impact on aggregate demand can be less than one if it is offset by lower private consumption, investment or net exports. Although the coefficient on transfers to persons is greater than one, it is not found to be statistically different from one. The results further show that wages have no significant impact on the economy. This could be the case if government employment is a substitute for private sector employment and therefore, government spending on wages could increase without any additional stimulus to the economy. However, this is not a full explanation as government spending on wages enters the aggregate demand function directly.

Interestingly, other expenditures, which include capital, non-wage defence spending and transfers to non-residents, are also not statistically significant.

In the second regression, we impose several restrictions setting IND, OREV, WAGE and OEXP to zero and TOTR to 1.0, and re-estimate. Obtaining a D-statistic of 1.63, we fail to reject the null hypothesis that the restrictions are valid against a critical value of $\chi^2(4) = 9.488$ at the 5 per cent level of significance. It is interesting to note that most of the coefficients on the variables, except SUB, remain largely invariant to the change in the specification.

The third regression is the same as the second specification, except CIT is restricted to equal PIT. This restriction is tested because despite the fact that CIT is statistically significant, it has a relatively large standard error and a rather unstable coefficient. It is interesting to note that the joint coefficient on PIT and CIT is similar to the one for PIT alone. Again using the D-statistic, the null hypothesis that the restrictions are true cannot be rejected at the five per cent level of significance.

Table 3

Output equation specifications

Variable	(1)	(2)	(3)	(4)	(5)
$\Delta \tilde{y}_{-1}$	1.39	1.28	1.27	1.40	1.38
	(10.41)	(12.94)	(13.06)	(14.90)	(14.07)
$\Delta \tilde{y}_{-2}$	–0.39	–0.28	–0.27	–0.39	–0.37
	(–2.93)	(–2.79)	(–2.74)	(–4.08)	(–3.80)
$\Delta ly^{US} - \Delta ly^{P}$	0.68	0.64	0.62	0.57	0.60
	(6.30)	(6.95)	(7.02)	(6.89)	(6.97)
Δslope	–0.32	–0.33	–0.33	–0.36	–0.36
	(–2.30)	(–2.72)	(–2.76)	(–3.02)	(–2.86)
Δlz	0.15	0.13	0.13	0.14	0.17
	(2.94)	(3.15)	(3.21)	(3.30)	(3.64)
Δlpcne	0.11	0.10	0.10	0.10	0.11
	(3.31)	(3.43)	(3.54)	(3.75)	(3.87)
PIT	–0.39	–0.35			
	(–2.77)	(–2.83)	–0.36		
CIT	–0.67	–0.62	(–2.98)		
	(–1.85)	(–2.06)		–0.30	–0.36
IND	–0.19	-	-	(–2.99)	(–3.28)
	(–0.71)				
OREV	–0.56	-	-		
	(–1.15)				
NWGS	0.78	0.76	0.80		
	(2.02)	(2.27)	(2.48)		
WAGE	0.29	-	-		0.53
	(0.82)			0.22	(2.67)
SUB	0.68	0.55	0.49	(2.20)	
	(1.64)	(1.75)	(1.65)		
OEXP	0.06	-	-		-
	(0.44)				
TOTR[1]	1.41	1.00	1.00	1.00	1.00
	(3.69)				

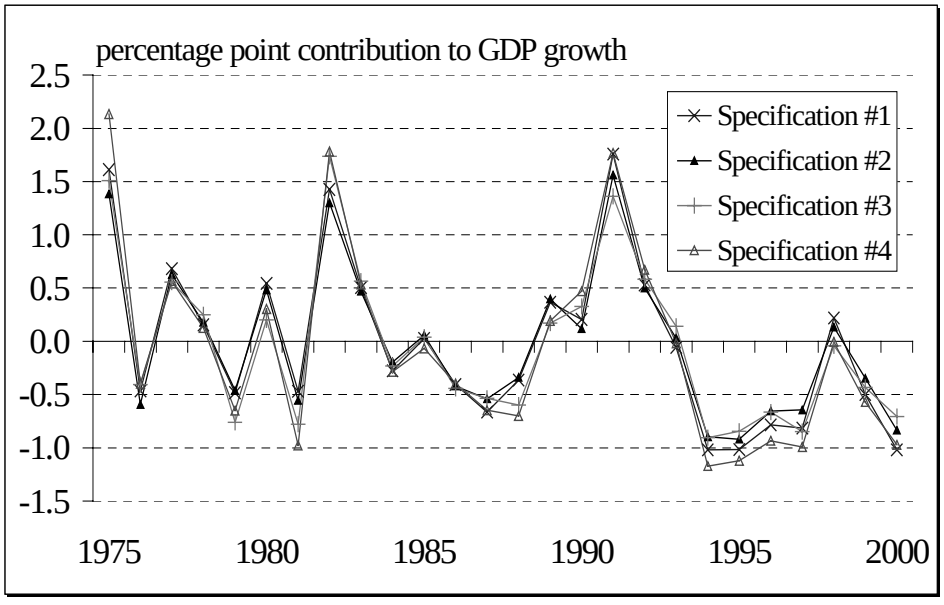
Note: t-statistics in brackets.

(1) In all specifications, the unrestricted multiplier is greater than, but not statistically different from 1.

It is possible that some of the odd findings or lack of statistical significance may result of noisy data. We test the restriction that all revenues share the same multiplier and that all expenditures, except TOTR, exert the same impulse on output. The results are summarized in the fourth estimation. Again, with a D-statistic of 4.66, we cannot reject that the restrictions are valid, given a critical value of $\chi^2(6) = 12.59$ at a 5 per cent level of significance. Surprisingly, this specification implies that a reduction in revenues would have a larger stimulative impact on the economy than an increase in expenditures. Also of interest, adding IND and OREV does not change the multiplier on joint PIT/CIT variable. Even though these restrictions cannot be rejected at the 5 per cent level of significance, these results are puzzling and are somewhat the opposite of what is expected.

Fig. 2

Comparison of FiPS indicators



Finally, the last specification shows that the deterioration in the stimulus provided by expenditures is attributable to the OEXP variable, which is mainly comprised of spending on gross capital formation, non-wage defence and transfers to non-residents. Excluding this category from total expenditures results in a multiplier of 0.53, higher than that of revenues in absolute terms. These restrictions (PIT, CIT, IND and OREV have the same multiplier; NWGS, WAGE and SUB have the same multiplier and OEXP is zero) cannot be rejected at a 10-per cent level of significance. Irrespective of which specification is chosen, the resulting FiPS indicators are roughly similar (Fig. 2).

4.3 Results of the Indicator of Fiscal Policy Impact on the economy

For illustration purposes, we compare the results from specification #3 to the OLS estimated coefficients and observe an even greater difference between the GMM and OLS estimated coefficients (Table 4). All three OLS estimated multipliers $\{\alpha_1 \quad \alpha_2 \quad \alpha_3\}$ are close to zero and none is significantly different from zero, suggesting substantial simultaneity bias.

Table 4

Model estimates of the output equation

		GMM			**OLS**	
	Multiplier	Elasticity	t-statistic	Multiplier	Elasticity	t-statistic
α_1 (pit/cit)	–0.36	–0.06	–2.98	0.00	0.00	0.00
α_2 (nwgs)	0.80	0.05	2.48	0.31	0.02	1.02
α_3 (sub)	0.49	0.01	1.65	0.21	0.00	0.74
(totr)	1.00	0.09	-	0.20	0.02	0.67

The GMM estimates show that the marginal propensity to consume out of a personal income tax cut is roughly one-third, suggesting that a considerable proportion of such a tax cut is saved. This could be interpreted as suggesting that Canadians are at least partly Ricardian in their savings behaviour.

With the GMM estimation, all revenues other than personal and corporate income tax were not found to be significantly different from zero. This implies that a reduction in indirect taxes[14] or other revenues have no short-term affect on output through the demand channel. While this result is difficult to explain, indirect taxes and other revenues show multipliers of about –0.19 and –0.56, respectively; however, the standard errors are of almost the same magnitude.

Turning to the expenditure side, the baseline GMM model suggests a high degree of substitutability for spending on items other than non-wage goods and services and transfers to persons. Specifically, a one-dollar increase in non-wage goods and services and business subsidies causes private consumption and investment to fall by 20 and 51 cents, respectively.

The GMM model finds evidence to suggest that the marginal propensity to consume out of transfers is about 1.0. While our point estimate is 1.4, 1.0 is less than one standard deviation from the point estimate. Moreover, restricting the coefficient to unity only changes the other coefficients by a small amount at the second decimal place.

As expected, the multipliers from the OLS estimation are much smaller in absolute terms than the corresponding GMM estimates, illustrating the impact of the simultaneity bias.

5. Implications for the indicators

In comparing the GMM- and OLS-based measures of the cyclical and cyclically-adjusted balances, we find that for most years, the two indicators

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[14] Retail sales taxes were isolated from indirect taxes, but were not found to be significantly different from zero.

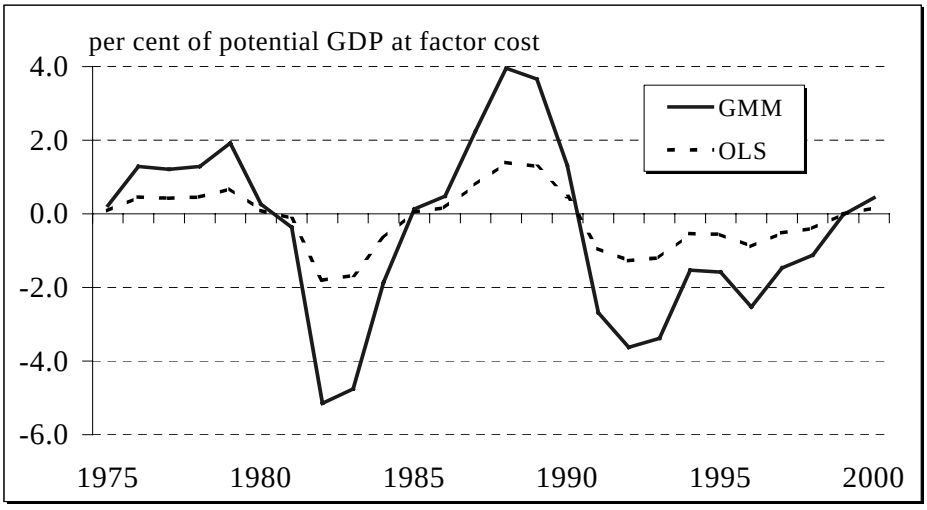
move in the same direction. However, the indicators diverge in years when the output gap is large. This is not surprising because when the output gap is near zero, actual output is almost equal to potential output and therefore, the cyclical component is near zero. Since it is the cyclical component that we are measuring, both models will show similar and small cyclical components. In years when the output gap is large, the cyclical component will be larger and deviations between the two models will emerge.

Our results support the assertion that the coefficients of the OLS estimation are biased towards zero. In every year, the cyclical component is closer to zero under the OLS-based methodology than the GMM methodology (Fig. 3).

The fact that the cyclical component is systematically larger in absolute terms under the GMM methodology than the OLS estimation sometimes causes the two measurements of the primary CABB to be of opposite signs. For instance, when the output gap is greater than zero, the cyclical component

Fig. 3

Comparison of cyclical components



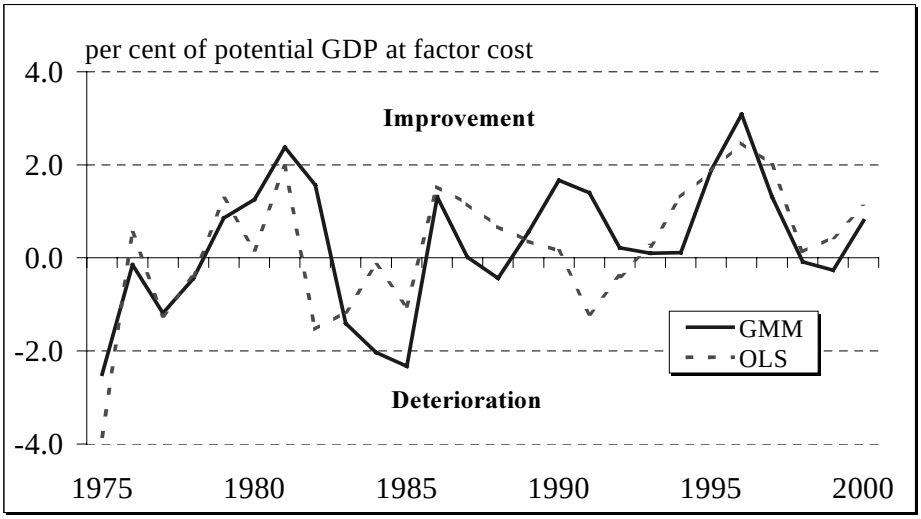
will also be greater than zero. A larger positive cyclical component implies a larger negative (smaller positive) cyclically-adjusted balance when the actual balance is negative (positive). Conversely, when the output gap is less than zero, the cyclical component is a larger negative under the GMM estimation. A larger negative cyclical balance implies a smaller negative (larger positive) cyclically-adjusted balance when the actual balance is negative (positive). This explains the divergences when comparing the year-over-year change in the primary CABB (Fig. 4).

Comparing the GMM and OLS estimates, we, not surprisingly, find that the two indicators are similar; however, there are wide divergences when the change in the output gap is larger, such as in the early- to mid-Eighties and early-Nineties.

In terms of the Indicator of Fiscal Policy Stance, we find that the estimate based on the OLS estimation is substantially more muted than the

Fig. 4

Comparison of year-over-year change in the primary CABB



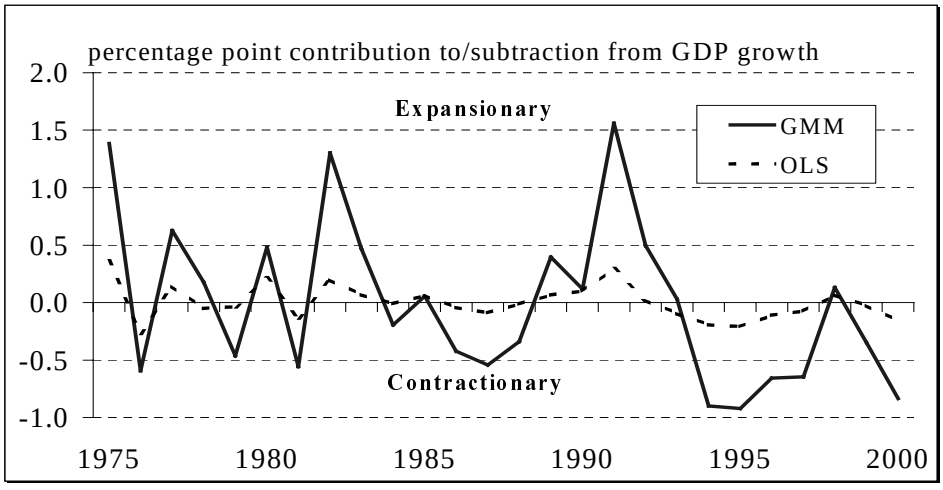
GMM-based estimate, providing further evidence that the OLS coefficients were indeed biased towards zero (Fig. 5). In fact, the OLS estimate produces an indicator that appears largely neutral in most years. This is expected since the coefficients from the OLS estimation are much closer to zero.

6. Constructing confidence intervals

So far we have argued that our measure of the impact of fiscal policy and structural budget balance are unique in that they take seriously the issue of simultaneity between output and fiscal policy. As with any statistical model, however, the point estimates are really only half the story. While our methodology yields estimates of the parameters of interest that are consistent, they remain subject to sampling error. Consequently, it is somewhat misleading to discuss results based on the point estimates only while ignoring this potentially influential additional piece of information.

Fig. 5

Comparison of the FiPS indicators



Alesina and Perotti (1995) calculate the degree of fiscal adjustment, whereby fiscal policy is considered to have a neutral impact on the budget if the adjustment (negative or positive) is within one-half a standard deviation away from the mean adjustment. A small fiscal adjustment is between one-half and one standard deviation away from the mean. A strong fiscal adjustment is defined as an adjustment that is larger than one standard deviation away from the mean. However, a true confidence band will vary significantly in size through time depending on the relative magnitudes of the components of the budget balance. In general, the size of the confidence band will tend to be smaller when the budget balance is close to neutral and larger when it is large in absolute value, but this need not be the case.[15]

By using the estimated parameter covariance from the GMM estimation, it is possible to construct asymptotically valid confidence intervals, both over history and the forecast periods. These confidence intervals can then be used to determine whether the government's fiscal stance is statistically distinguishable from neutral. For example, where the confidence intervals encompass zero, fluctuations in output have no significant impact on the budgetary balance (Fig. 6).

The same conclusion can be reached for the confidence bands surrounding the FiPS. For most years the confidence intervals would imply mainly neutral policy (Fig. 7). The exceptions are years surrounding recessions, such as 1982 and 1991, where policy has been stimulative. In contrast, policy was contractionary for some years during the period of fiscal consolidation (1994 to 1997).

The purpose of this project is to build on past work that has attempted to identify the direct impact of fiscal policy on the business cycle and vice-versa by addressing one particular weakness inherent in other models, i.e. the failure to properly account for simultaneity. Generally speaking, the results suggest that the FiPS has been largely successful in this endeavour.

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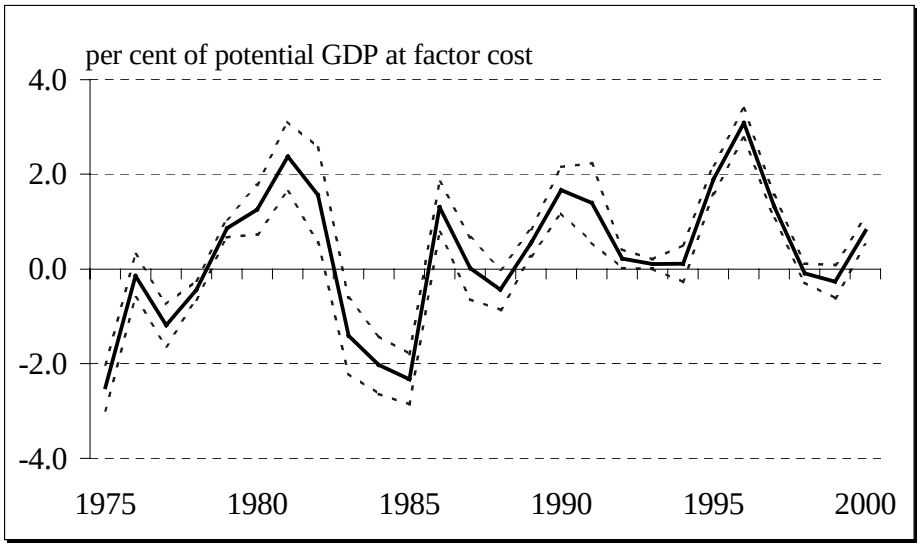
[15] Only in the case of the GMM-based CABB will the size of the confidence band be a constant function of the size of the output gap. This stems from the fact that the output gap is the only determinant of the CABB (for a given budget balance).

Fig. 6

Confidence bands surrounding the change in the primary CABB



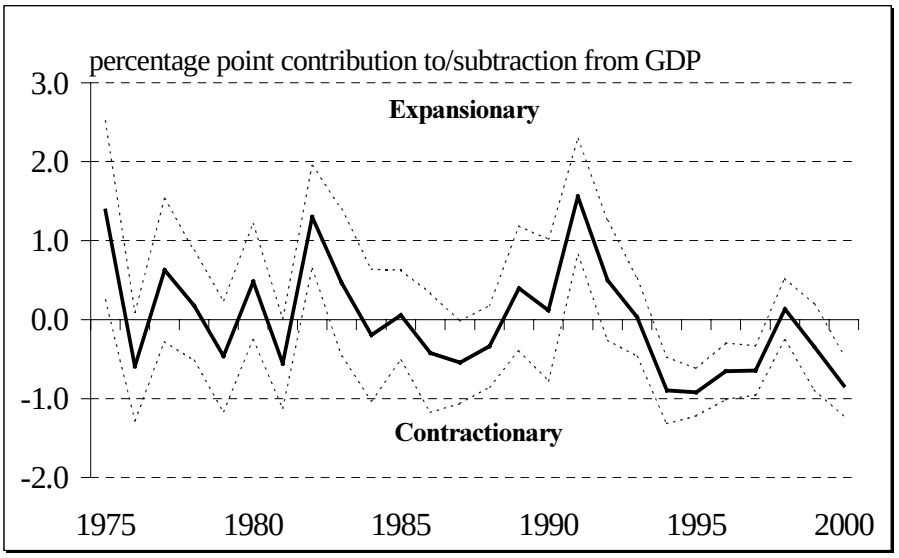
7. Conclusion

This work further clarifies the role of the cyclically-adjusted budget balance as an indicator of budgetary position and why it should not be used to measure the impact of fiscal policy on the economy. In its place, the FiPS is proposed as a measure of the impact of fiscal policy on economic activity. While the FiPS is a clear improvement, it has some limitations that need to be acknowledged.

For instance, as a model of economic behaviour, the FiPS is a vastly simplified approximation and the results should be considered with this in mind. Moreover, no account has been taken for stocks, such as level of government debt or permanent income, nor have agents' expectations of the future been modeled in a reasonable fashion.

Fig. 7

Confidence bands surrounding the FiPS



As a simplifying assumption, the FiPS treats potential output as fully exogenous, thus precluding the possibility that fiscal policy initiatives influence growth at frequencies lower than that of the business cycle. We implicitly assume, for example, that long-run labour supply is invariant to the level and type of taxation in the Canadian economy.

Finally, there could exist important non-linearities in the reduced-form relationship between fiscal policy and output not captured by our model. A highly progressive tax system should give rise to parameter non-constancy in the tax coefficients, both at business cycle frequencies and lower (resulting from long-run upward-trends in tax revenues). Thus the coefficient linking the output gap to tax revenues should be regarded more as an historical average rather than a reflection of recent behaviour.

Despite these limitations, the FiPS is a useful tool in furthering the understanding of the interaction between output and government revenues and expenditures. In addition, this work produces an unbiased measure of the CABB.

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ON THE MACROECONOMIC IMPACT OF FISCAL POLICY IN GERMANY: PRELIMINARY RESULTS OF A SVAR APPROACH

Matthias Mohr[*]

1. Introduction

Although the effects of fiscal policy belong to the most extensively discussed issues in theoretical macroeconomics, not much is known about the actual impact of changes in government revenue or expenditure on the economy (the reader is referred to Perotti (2000) for a – somewhat disillusioning – overview on this issue). Against the background of debates on stabilisation policy dating back to the sixties, this seems to be surprising. In the traditional Keynesian approach to macroeconomic analysis, active fiscal policy was assigned a powerful and beneficial role as a potential macroeconomic stabiliser. Practical problems with the conduct of active stabilisation policy and new theoretical advances however, have led to a markedly more modest assessment of the potential and the benefits of active fiscal stabilisation policy. Practically, active fiscal stabilisation policy often turned out to be pro cyclical – and hence destabilising – rather than stabilising. Operational time lags in the conduct of fiscal policy and policy co-ordination failures between central government and local authorities – which may control a substantial amount of general government resources – are the perhaps most prominent hindrances to a successful active fiscal stabilisation policy.

New classical macroeconomics claimed that fiscal (and monetary) stabilisation policy is effective only if it surprises economic agents. According to this paradigm, *systematic* responses to macroeconomic shocks would be ineffective since by definition they can be expected and reactions by economic agents would in fact counteract discretionary policy. Additionally, real business cycle theorists interpreted macroeconomic shocks mainly as technology shocks and business cycles as consequences of welfare maximising choices of optimising economic agents adapting to such shocks. In this

[*] Deutsche Bundesbank.

theoretical view, too, macroeconomic fine-tuning through fiscal policy is not advised since it potentially decreases welfare by interfering with the optimal choices of economic agents. In addition, a more recent challenge to the standard Keynesian view has emerged from the detection of so called Non-Keynesian effects of fiscal policy. If public debt has already reached high levels, economic agents would not have much trust in the sustainability of increases in expenditures. These may rather nurture expectations that government has to cut spending in the near future in order to observe the long run budget constraint. It is even possible that expenditure cuts have short-run expansionary effects by stabilising expectations and confidence.

Today, the view that discretionary fiscal policy should be concentrated on the provision of public goods and the continuos improvement of favourable supply side conditions rather than on reactive responses to cyclical fluctuations seems to constitute a widely accepted view among economists. Neo-Keynesians would advocate monetary rather than fiscal policy as the more flexible and hence more appropriate tool for active macroeconomic stabilisation[1] and New Classical economists remain generally sceptical against any discretionary stabilisation policy.

However, it could nevertheless be premature to declare fiscal stabilisation policy dead in view of the economic policy experience and the theoretical insights of the last two decades. A more prominent role for active fiscal stabilisation policy has recently been demanded especially for EMU in which monetary policy is centralised under the control of the ECB. The course of European monetary policy must necessarily be aimed at the macroeconomic conditions of the Euro area as a whole and may thus be inappropriate for individual countries hit by an asymmetric macroeconomic shock. Since the ECB would probably not adjust monetary policy in order to respond upon such idiosyncratic shocks, fiscal policy – so the argument goes – remains as the only tool which can should be used for active economic stabilisation. The demand for active fiscal policy has became more audible in the political arena, especially during and after the most recent economic slowdown in 2001. To conclude, it appears that the issue of active fiscal stabilisation remains on the agenda, especially under the conditions of EMU.

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[1] See, e.g., Taylor (2000).

In this paper, short run impacts of fiscal policy in Germany on the macroeconomic environment in a small structural vector auto-regressive (SVAR) model are investigated. The results presented so far in this paper are preliminary and need to be validated and qualified further. Furthermore, the views and results presented here reflect the opinion of the author and not the opinion of the institution the author belongs to.

Vector auto-regressive models have been used for the analysis of monetary policy since about 20 years now. It is only recently that their potential for the analysis of fiscal policy has been investigated. Blanchard and Perotti (2002) represents one of the early examples of a VAR analysis of fiscal policy.[2] Recent contributions to VAR analysis of fiscal policy shocks, on which this paper draws very much, are Mihov and Fatas (2000), Bruneau and De Bandt (1999) and Hoeppner (2001).

2. Data

The four series included in the analysis are GDP (Y), private consumption (CP), total government receipts (BR) and total government expenditure (BE). All variables are in real terms. The series were deflated with the respective price indices, except total government receipts which was deflated with the GDP deflator, and all series were seasonally adjusted. The data are based on semi-annual German national accounts[3] from 1970:1 to 2000:2. Total expenditures were adjusted for proceeds from UMTS licences.

Due to German unification the series exhibit a structural break in 1991:1. The series were adjusted for this break by applying an extended HP-Filter which allows for an endogenous estimation of deterministic structural breaks, given the period in which the break supposedly occurs. It is assumed thereby that the break is reflected in levels and not in trends.[4] The adjusted series was obtained by subtracting the estimated deterministic shifts in levels from the original series. Finally, all series were transformed into

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2 The working paper version of Blanchard and Perotti (2002) dates back to 1999.

3 Quarterly series of total government receipts and expenditure are not yet available.

4 See Appendix A.2 for the derivation of the extended HP-Filter.

logarithms. Following standard tests, the adjusted and transformed series can be regarded as integrated of order 1.

Let Z_t be the 4x1 vector of the four endogenous variables Y, CP, BR and BE at time t. The VAR in reduced form is given by the equation:

$$Z_t = A(L)Z_{t-1} + u_t, \tag{2.1}$$

A(L) denotes a matrix polynomial in the lag operator L ($A(L) = A_0 + A_1L^1 + A_2L^2 + ... + A_pL^p$) and ε_t denotes a vector of white noise residuals with zero mean and covariance $E(u_t u_t') = \Sigma_u^2$. Hence, the residuals are assumed not to be auto-correlated but can and will in most cases be contemporaneously cross-correlated. The auto-regressive model in Equation (2.1) can be estimated by OLS, since the right hand side of the equation is predetermined and thus exogenous with respect to the vector Y_t. Hence, the ε_τ are in fact vectors of correlated one step prediction errors.

As a next step, the co-integrating relationships of the time series are to be analysed. As is well known, the reduced form in Equation (2.1) can be transformed into the error correction form:

$$\Delta Z_t = A_0 + \sum_{i=1}^{p} \pi_i \Delta Z_{t-i} + \Pi Z_{t-p} + u_t \tag{2.2}$$

If co-integrating relationships between the variables in Z exist, the n×n matrix Π can be decomposed as $\Pi = \alpha\beta'$, with α and β as n×r matrices, $0 < r < n$. In this way, the vector of the endogenous variables, Z, can be described by r long run (or: co-integrating) relationships as specified by the vectors of β. The vectors in α and β can be estimated by rank regression and the number of co-integrating vectors in the β-matrix, r, can be tested using Johansen's trace test.[5]

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[5] The was estimated with a lag of 2 periods. The lag length has been determined by information criteria. The Hannan-Quinn criterion was decisive in the choice of the maximum lag here. See Reimers (1993) for a discussion of information criteria in VARs.

Table 2.1

Trace Tests for the co-integration rank (r)

r	Statistic	50%	80%	90%	95%	97.5%	99%
0	72.72	38.84	45.65	49.65	53.12	56.06	60.16
1	38.26	23.28	28.75	32.00	34.91	37.61	41.07
2	10.29	11.25	15.25	17.85	19.96	22.05	24.60
3	3.86	3.40	5.91	7.52	9.24	10.80	12.97

The test depicts two co-integrating vectors at the 5% significance level.[6] Possible candidates for co-integrating vectors would be revenue and expenditure on the one hand and real private consumption and real GDP on the other. This can be tested by imposing identifying restrictions on the co-integrating vectors. With the ordering of the variables as Y, CP, BR, BE and C, (C denotes the constant in the co-integration space), the restrictions can be specified as zero restrictions on the 5×r Matrix β (with co-integration rank r = 2): $\beta_1^{'} = [1, \beta_{21}, 0, 0, \beta_{51}]$ and $\beta_2^{'} = [0, 0, 1, \beta_{42}, \beta_{52}]$. Furthermore, the co-integration vectors are normalised for Y and BR, respectively. The restrictions imply a stable long run relationship between private consumption and GDP, $Y + \beta_{21} CP + \beta_{51} C = 0$, and a stable long run relationship between expenditure and revenue, $BR + b_{42} BE + b_{52} C = 0$, respectively. The latter can be justified by the long run government budget constraint: For the long run budget constraint to hold, expenditure and revenues should not follow different trends.[7] The parameters b_{ij} are estimated freely. We would expect that

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[6] The test has been performed under the assumption that both, the I(1) and the I(0) model contain constants and no trends, i.e. the deterministic component has been restricted to a non zero means in the cointegrating equations. This implies that $A_0 = \alpha \beta_0^{'}$, with β_0 as an n×r vector.

[7] Trehan and Walsh (1988) show that the inter-temporal budget constraints implies that the deficit be stationary. Actually, they employ this implication for a test of sustainability of the deficit.

$\beta_{21}, \beta_{42} < 0$ and, more specifically, $\beta_{21}, \beta_{42} \approx -1$.[8] The co-integration vectors are actually estimated as $\beta_1^{'} = [1, \underset{(0.070)}{-1.30}, 0, 0, \underset{(0.450)}{1.63}]$ and $\beta_2^{'} = [0,0,1, \underset{(0.123)}{-0.60}, \underset{(0.770)}{-2.92}]$, with associated standard errors in parentheses. Due to the restrictions imposed, the co-integration vectors are overidentified and the restrictions can thus be tested.

Table 2.2

Test of overidentifying restrictions on the co-integrating vectors (weakly restricted)

LOG-LIKELIHOOD UNDER H0	1273.44104
LOG-LIKELIHOOD UNDER HA	1274.41926
NUMBER OF DEGREES OF FREEDOM	2
CHI SQUARE TEST	1.95646
SIGNIFICANCE LEVEL	0.38

If the restrictions are correct, the log-likelihood of the restricted model should not differ much from that of the unrestricted model. This is the case as can be inferred seen from Table 2.2. The log-likelihood is χ_2^2-distributed and the restrictions imposed cannot be rejected. (The significance level against the H0 is about 38%).

Although the signs of the freely estimated parameters come out as expected, the absolute estimated values, however, are largely different from unity. Thus, an additional test was performed with a more binding restriction on the second co-integrating vector such that the long run budget restriction of

[8] Note that the variables are in logarithms.

government is now explicitly enforced by imposing $\beta_2^{'} = [0,0,1,-1,\beta_{52}]$. The co-integrating vectors are estimated as $\beta_1^{'} = [1,\underset{(0.011)}{-1.05},0,0,\underset{(0.073)}{-0.13}]$ and $\beta_2^{'} = [0,0,1,-1,\underset{(0.02)}{-0.16}]$ under the stronger restriction. Furthermore, the estimated relationship between consumption and GDP turns out as almost proportional.[9]

Table 2.3

Test of overidentifying restrictions on the co-integrating vectors (strongly restricted)

LOG-LIKELIHOOD UNDER H0	1272.00356
LOG-LIKELIHOOD UNDER HA	1274.41926
NUMBER OF DEGREES OF FREEDOM	3
CHI SQUARE TEST	4.83142
SIGNIFICANCE LEVEL	0.18457

3. Results of the SVAR Analysis

Since all variables belong to the co-integration space, the VAR model can be estimated in levels (i.e.: as in Equation 2.1) rather than in first differences. The latter approach would be appropriate if no co-integration existed among the variables. Alternatively, the VAR could also be estimated in VEC-form (as in Equation 2.2). In this paper, only the results for the VAR in

[9] Likewise, the first co-integrating vector could be restricted thereby enforcing the stable CP/Y relationship. In this way, the inter-temporal budget restriction can be tested. As a result not reported here, the restriction cannot be rejected and the parameter β_{24} turns to be close to –1 in this case.

levels are presented. They are qualitatively comparable to those derived from the VEC-form albeit actual figures differ somewhat.

Estimating Equation (2.1) by OLS yields estimates of the one step prediction errors, u_t. However, the prediction errors do not constitute independent shocks which can be interpreted economically since they are mutually correlated. Rather, the "pure" shocks which can be exclusively assigned to certain variables, have to be derived from the estimated prediction errors. Let the pure structural shocks, ε_t, be implicitly defined by the VAR in structural form:

$$B\,Y_t = \Gamma_0 + \Gamma(L)Y_{t-1} + \varepsilon_t \tag{3.3}$$

such that $A_0 = B^{-1}\Gamma_0$, $A(L) = B^{-1}\Gamma(L)$, and:

$$u_t = B^{-1}\varepsilon_t \tag{3.4}$$

B is a Matrix with ones on the main diagonal. Note that the structural shocks are by definition mutually uncorrelated. Without loss of generality, the equation system (3.3) can be normalised such that the variances of the structural shocks are equal to one. Thus, the ε_t are assumed to be distributed as $N(0, I_4)$ whereby I_4 denotes the 4×4 identity matrix. It follows that:

$$B\Sigma_u^2 B' = I_4 \tag{3.5}$$

If the 4×4 matrix B could somehow be derived from the covariance matrix Σ_u^2, which can be estimated from the reduced form, the structural shocks ε_t can be identified. Unfortunately, this is not possible without additional assumptions, since the estimated covariance matrix Σ_u^2 delivers $n(n+1)/2$ parameters whereas the n^2 entries of B are to be derived. Thus, it is necessary to impose at least $n(n-1)/2$ – in this case: 6 – additional restrictions on the matrix B. Actually, in this case it turns out that 7 restrictions are

necessary.[10] The set of restrictions imposed on the contemporaneous responses (i.e.: the responses in the same period) of the endogenous variables upon structural shocks are described by Equation (3.6):

$$\begin{bmatrix} 1 & b_{12} & b_{13} & b_{14} \\ 0 & 1 & b_{23} & b_{24} \\ -0.85 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_Y \\ u_{CP} \\ u_{BR} \\ u_{BE} \end{bmatrix} = \begin{bmatrix} \varepsilon_Y \\ \varepsilon_{CP} \\ \varepsilon_{BR} \\ \varepsilon_{BE} \end{bmatrix} \tag{3.6}$$

The set of restrictions is very similar to the identification schemes in Blanchard and Perotti (1999) and Hoeppner (2001). The response of Y to any shock – the first line in (3.6) – is unrestricted. The second line implies that private consumption does not react contemporaneously to a GDP shock,[11] ε_Y. In the third line, the elasticity of total government revenue with respect to output is fixed to 0.85. This value has been taken from Bouthevillain *et al.* (2001). In addition, it is assumed that government revenue are not contemporaneously affected by government expenditure. The last line copies the identification scheme in Blanchard and Perotti (2002): First, government expenditure are assumed not to react immediately upon revenue shocks and, second, government is assumed not to react upon a macroeconomic shock by adjusting expenditure in the same period. By Equations (3.6) and (3.5), the B matrix and thus the structural shocks are now identified.

After estimating the VAR in reduced form (Equation (2.1)) the B matrix can be estimated and an impulse-response analysis can be performed. The complete set of impulse-response graphs is shown in the appendix. The responses of Y and CP to revenue and expenditure shocks – normalised to one standard deviation – are shown in Figure 3.1.

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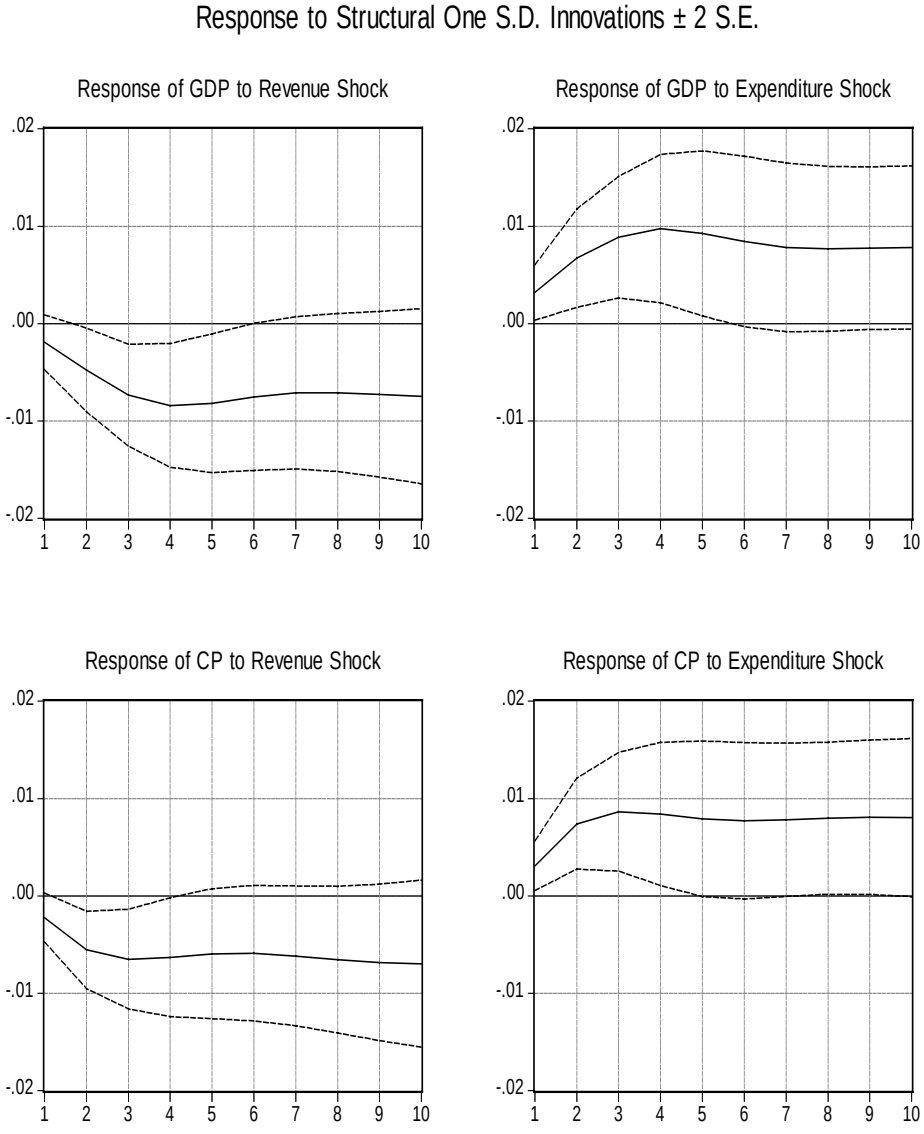
[10] Note that Equation (3.5) defines non-linear relationships between the entries in B. Thus, by pure counting of equations and unknown parameters only a necessary, not a sufficient condition for exact identification can be derived.

[11] Fixing the immediate response of CP to GDP to 0.5 – which comes close to 0.85×CP/Y, i.e.: setting $b_{21} = -0.5$, does not change the results below significantly.

Fig. 3.1

Response of Y and CP to a revenue and an expenditure shock



Since the VAR has been estimated in levels, the response variables do not necessarily return to the zero line (which represents the state of the system in the absence of shocks). They rather adjust to new equilibrium levels induced by the impulses. As to be expected, a positive expenditure (revenue) shock causes GDP and private consumption to increase (decrease). The graphs exhibit the responses to a shock normalised to one standard deviation (together with the 5% confidence band). As all series are in logarithms, the results can easily be translated into elasticities by dividing the responses through the estimated standard deviations of the shocks. It follows that private consumption decreases by about 0.4% after two years following a one percent revenue shock and increases by about 0.35% after one year and a half following a one percent expenditure shock. GDP reacts with a decline of about –0.5% (0.4%) within two years after a one percent revenue (expenditure) shock. However, these results are preliminary and have to be interpreted with caution. The identification scheme, which is still arbitrary, has to be validated better in theoretical and methodological respect.

APPENDIX

A.1 THE EXTENDED HP-FILTER

Define a trend series with a deterministic break as:

$$x_t^* = a_t + s_t . \tag{A1}$$

Here, a denotes the smooth trend without break. The break occurs at an exogenously given period τ so that the series s is defined as follows:

$$s_t = \begin{cases} 0, & t < \tau \\ \bar{s}, & t \geq \tau \end{cases} \tag{A2}$$

Denote the original series to be filtered by x. The break, i.e. the parameter $\bar{s}$, can be determined endogenously by solving

$$\underset{s_t, a_t^*}{\text{Min}} \sum_{t=1}^{T} (x_t - s_t - a_t)^2 + \lambda \sum_{t=3}^{T} \left(\Delta^2 a_t\right)^2 \tag{A3}$$

with **s** restricted by (A1). The simple HP Filter is implied by the condition $\bar{s} = 0$. For the general case, the solution of (A3) gives the following first order conditions:

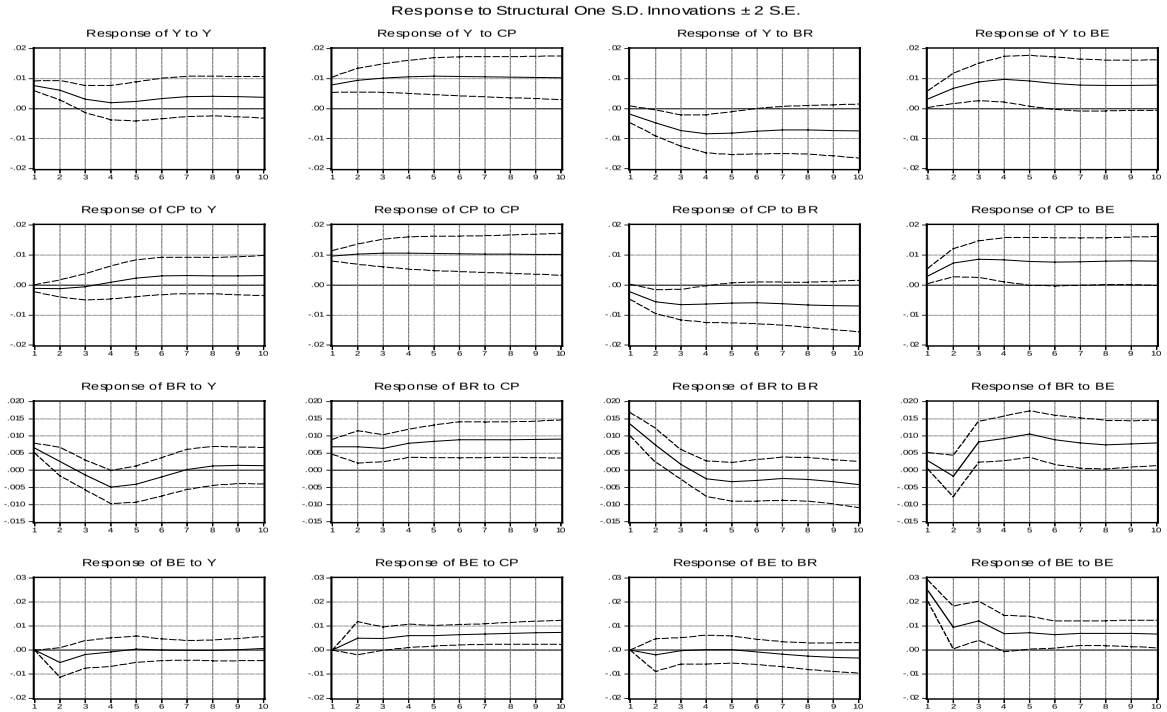
$$\begin{aligned}
&t = 1: && x_1 - s_1 = a_1 + \lambda(a_1 - 2a_2 + a_3) \\
&t = 2: && x_2 - s_2 = a_2 + \lambda(-2a_1 + 5a_2 - 4a_3 + a_4) \\
&2 < t < T-1: && x_t - s_t = a_t + \lambda(a_{t-2} - 4a_{t-1} + 6a_t - 4a_{t+1} + a_{t+2}) \\
&t = T-1: && x_{T-1} - s_{T-1} = a_{T-1} + \lambda(a_T - 4a_{T-2} + 5a_{T-1} - 2a_T) \\
&t = T: && x_1 - s_T = a_T + \lambda(a_{T-2} - 2a_{T-1} + a_T) \\
&s_t = && \begin{cases} \dfrac{1}{T-\tau+1} \displaystyle\sum_{t=\tau}^{T} (x_t - a_t) = \bar{s}, & t \geq \tau \\ 0, & t < \tau \end{cases}
\end{aligned} \tag{A4}$$

The intuition beyond (A4) is straightforward. The first 5 lines define the well-known first order conditions of the simple HP filter applied on the break-adjusted series, $x_t - s_t$. The last line, finally, determines the structural break endogenously as the average deviation of the smooth trend *a* from the original series being filtered after period τ. It must be kept in mind, however, that *a* and *s* are determined simultaneously by the equation system (A4).

A.2 IMPULSE-RESPONSE GRAPHS OF THE SVAR APPROACH

Fig. A.1

Set of Impulse-Response Graphs



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APPRAISING THE EFFECTS OF THE BUDGET ON THE ECONOMY WITH AN ECONOMETRIC MODEL: THE ITALIAN FISCAL ADJUSTMENT IN THE NINETIES

Sandro Momigliano[*] *and Stefano Siviero*[*]

1. Introduction and summary conclusions

Recent years have witnessed a renewal of interest in the stabilisation role of fiscal policy,[1] for a number of reasons. In Japan, the textbook limits of monetary policy have long emerged. In the US, the achievement of substantial budget surpluses and the recession that started in March 2001 have stimulated a debate, both in the academic and political arena, on how fiscal stimulus should be wielded to contrast the downturn.[2] In the euro area, a more activist role of fiscal policy is being considered, given that national policymakers can no longer rely on monetary and exchange rate policies to cope with macroeconomic shocks which affect their individual countries.

In short, in all major economic areas of the world fiscal policy has returned to centre stage in the political and academic debate; its effects on output growth and other aspects of the macroeconomy are being heatedly discussed, after years of relative neglect.

Two approaches are generally used to evaluate the budget's impact on the economy.[3] One is based on synthetic indicators. They include the extremely crude reference to the change in the primary balance-to-GDP

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[*] Research Department, Banca d'Italia.

The opinions expressed are those of the authors and do not reflect those of the Banca d'Italia. Any errors contained in the paper are the sole responsibility of the authors.

[1] Measuring the effects of the government budget on economic activity was the main focus of public policy studies from the fifties to the seventies (see e.g. Brown (1956), Oakland (1969), and Blinder and Solow (1974)). This reflected the importance of the objective of cyclical stabilisation that was assigned to fiscal policy and a theoretical framework that tended to focus on the short run. In the following decades the focus of most fiscal studies shifted to medium and long-term considerations, owing to changes in the theoretical frame of reference and to the empirical context, characterised by unsustainable fiscal positions in many of the major industrialised economies.

[2] See e.g. Seidman (2001) and *The Economist* (2002).

[3] A review of the theoretical and applied literature on the subject is beyond the scope of this work. See e.g. IMF (2000) and the review of fiscal policy indicators in Bosi *et al.* (1990).

ratio, sometimes cyclically-adjusted, and slightly more sophisticated indicators, constructed by weighting the various components of the budget according to their estimated impact on aggregate demand. The second is based on simulation of an econometric model.[4] [5]

This paper describes a procedure belonging to the latter approach and focused on evaluating the short-term impact of the budget[6] on economic activity. In a nutshell, the appraisal is based on a comparison between the historical macroeconomic outcome and the result of a counterfactual simulation of the model in which, for each year under investigation, it is imposed that the ratio of each budget item to GDP remain unchanged from the preceding year.

Being based on using an econometric model, the proposed procedure allows one to take into account the interaction of the economic variables over time and, in general, a larger number of relationships between the budget and the economy than more synthetic indicators. It provides not only a measure of the effect of the budget on output, but also of its impact on prices and other macroeconomic variables. Finally, it can be used to attribute these effects to different budgetary features, including year-on-year changes in the level and composition of the balance and the quarterly performance of revenue and expenditure during the year.

The methodology proposed is then used to appraise the impact of the budget on the Italian economy in each of the ten years of the period 1991-2000, using the Bank of Italy's Quarterly Econometric Model (BIQM).[7] It should be underscored that the procedure described here does not make a distinction between budgetary changes deliberately sought by the public sector through the active use of economic policy instruments

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4 A standard reference is Blinder and Goldfeld (1972).

5 In recent years, a number of analyses of the effects of fiscal policy have used a structural vector autoregression (SVAR) approach (see, e.g., Blanchard and Perotti (1999)), and hence are meant to evaluate the impact on the economy of exogenous shocks in fiscal policy. Thus, they are not strictly comparable with the two approaches mentioned here, which aim at assessing the overall effects of the budget on economic activity.

6 In this paper the term "public sector", which is often used in this context, is generally replaced by "budget", which is intended to indicate that the analysis does not cover all the possible effects generated by the wide-ranging and complex activities of the Government but is limited to those that can be traced to the budget, i.e. to the items on the income statement and balance sheet.

7 The procedure described here has been regularly used as the basis for the comments on the impact of the budget on output traditionally contained (in the Section on Public Finances) in the Bank of Italy's Annual Report, starting with the Report for the year 1995.

available to it and changes otherwise induced, including automatic changes in budget items due to macroeconomic developments, particularly the phase of the cycle. In other words, the indicator points to the overall consequences of the government's active and induced conduct, but cannot attribute those consequences to automatic or discretionary mechanisms. A number of methodologies have been developed to evaluate the effects of discretionary policies alone, some of which are based, like the approach presented here, on econometric models (see Artis and Green (1982), Bosi (1986), Bosi, Golinelli, Mantovani and Stagni (1990) and Sartor (1998)). However, the identification of discretionary policies calls for the adoption of numerous hypotheses, which heavily influence the results.[8]

It should also be noted that while on the one hand an econometric model can clearly define an ample range of effects on output generated by the budget, on the other it is unlikely that it can provide indications regarding some potentially significant channels for the transmission of budgetary policy to the economy. This is particularly true in the case of the effects of the behaviour of the public sector or of its announcements on operators' expectations regarding interest and exchange rates.

Given the very considerable difficulties involved in defining these relationships, in applying the proposed methodology to the Italian economy in the 1990s we deemed it preferable to consider only the channels of influence explicitly codified in the BIQM. However, we investigated the sensitivity of the results to changes in the basic structure of the model, which is largely backward-looking, aiming at making some of its key components forward-looking. In particular, the experiments were re-run after replacing the main private consumption equation in the basic version of the BIQM with a new specification, in which consumer spending reacts to current as well as to future expected disposable income. Moreover, in some additional experiments we formulated a different assumption regarding the reaction of monetary policy to the counterfactual changes in fiscal policy (for this purpose, the monetary policymaker was

[8] The variety of institutional authorities (the government, parliament, regional and local authorities) which can influence the general government budget, as well as the complexity and interaction of the decision-making processes in which they are involved, make it difficult even to identify all the categories of action to be classified as budgetary policies in a given year. Additional problems arise when dealing with actions that do not have an immediate impact on the public finances and with rules which are formally temporary but in fact are extended every year in a semi-automatic way.

assumed to behave according to an estimated forward-looking Taylor-type rule).

It should be emphasised that our analysis focuses on the impact of the fiscal policy of *year t* on the economy *in the same year.* Hence, the lagged effects of the public budget on the economy are largely ignored. It is the counterfactual nature of the experiments that suggested that we confine ourselves only to the short-term effects of the budget, as counterfactual simulations become increasingly meaningless as the simulation period is extended. One should think, for instance, of the difficulties inherent in running a counterfactual simulation that assumes no fiscal adjustment at all for the whole decade 1991-2000. To formulate the scenario that might have stemmed from such an assumption (in terms of its likely repercussions on monetary policy, the exchange rate, the expectations and behaviours of consumers and firms) is virtually impossible. In other words, if the question "What would have happened if the adjustment process had been suspended for any given year?" seems to be a sensible one, the question "What if there had not been any adjustment at all in Italy in the Nineties?" appears to be almost meaningless. A counter-history stretched to cover too long a span of time is exposed to the criticisms amusingly exemplified in Preston McAfee (1983).[9]

Section 2 discusses the main characteristics of the BIQM, focusing on general government and the mechanisms that determine its linkages with the level of output. Section 3 outlines the assumptions used in constructing the counterfactual baseline simulation meant to identify the macroeconomic context that would have resulted, given the behavioural relations embodied in the model, had the public budget balance been "neutral". Specifically, Section 3.1 concentrates on the definition of "neutrality" used in the present paper, while Section 3.2 sets out several *ceteris paribus* assumptions referring to such hard-to-quantify phenomena as expectations and risk premia in the financial and foreign exchange markets.

In Appendix 1 a full description of the variant simulations that have been carried out to attribute the overall effect to a number of features of the public budget is given. Appendix 2 presents how some of the main assumptions underlying the basic results have been relaxed in a set of

[9] Regarding the strengths and weaknesses of counterfactual simulations see also the remarks in Locarno and Rossi (1995).

alternative simulations. Appendix 3 describes three synthetic indicators of the budget's impact on economic activity, referred to in the discussion of the method adopted here and its results.

The key results obtained when this procedure is applied to the period 1991-2000 are described in detail in Section 4. They may be summarised as follows.

1. The adjustment effort of the period 1991-97, which eventually resulted in the Italian participation in the EMU, was unsurprisingly very restrictive, implying a reduction of the rate of growth of output of about 0.6 percentage points in each of the 7 years. The impact of the budget was greatest in 1995 (–1.4 percentage points) while it was almost neutral in 1991 and 1996. As fiscal policy relaxed after 1997, the budget's effects became positive in 1998 and in 1999, neutral in the year 2000.
2. While retaining its basically restrictive impact throughout the decade, the effect of the budget on economic activity was mildly counter-cyclical, confirming the results of earlier studies for the 1970s and 1980s. Indeed, the largest negative effects were recorded in 1994 and 1995, when GDP growth was relatively high.
3. The impact of the budget is attributed to four different factors: a) changes in the balance, in the absence of any change in its composition and in the number of public employees; b) changes in the composition of the budget; c) changes in public sector employment; d) the quarterly pattern of accounts. Overall, the first three factors were, on average, restrictive, while the fourth had a negligible impact on the results. Focusing on the consolidation period 1991-97, about 6 tenths of the overall restrictive impulse is to be attributed to the first factor. Interestingly, almost 3 tenths of the overall restrictive effects in the period 1991-97 came from the second factor (composition of the budget) and the remaining tenth from the third (dynamics of public employment). The changes in the composition of the budget exerted large effects on economic activity in several years: in 1991, they nearly offset the restriction determined by the improvement in the primary balance; in 1994, they more than offset the deterioration of the balance; in 1995, more than half of the large negative contribution of the budget to economic activity reflected changes in the composition of the primary budget.

4. The results show that, according to the relationships included in the BIQM, an improvement (worsening) of the primary balance of 1 per cent of GDP, distributing the change proportionately among all the items of the budget, results in a reduction (increase) in the rate of growth of output of about 0.3 percentage points.
5. The assessment of the effects of the budget on economic activity in the Nineties appear significantly different, both quantitatively and qualitatively, from those obtained using the synthetic budget indicators commonly used to assess the fiscal stance.
6. The average impact of the budget on inflation was basically nil in the decade, being slightly negative in the years 1992-96 and positive afterwards.
7. Finally, the results seem to be robust with respect to changes in some of the key assumptions embodied in the basic structure of the BIQM, regarding in particular the process of expectations formation and the conduct of monetary policy.

2. An indicator based on the BIQM

The BIQM provides considerable detail on government budget items and their interaction with the rest of the economy. In particular, it takes more complete account of economic agents' behaviour patterns than do more synthetic indicators: the latter by and large neglect the multiplier and accelerator effects of variations in budget items, because they only take into account the direct impact on the various components of demand.[10] The model also permits evaluation of the consequences of the changes induced in prices and stocks. For example, higher indirect taxation leading to an acceleration in domestic price inflation may harm competitiveness, reducing net export demand. This in turn alters the country's net external position, hence the wealth of the private sector, resulting in a contraction

[10] In constructing summary indicators the impact of the public sector on demand components is generally calculated according to an estimate of their long-term elasticities (an exception is the weighted, lagged budget balance suggested by Ceriani and Di Mauro (1986)). A reliable quantification of the multiplier and accelerator effects, however, requires a detailed description (like that of the quarterly model) of the lags with which consumption and investment respond to changes in net public transfers. It is possible that in some circumstances the multiplier and accelerator mechanisms do no more than modify the results in scale (see Ceriani and Di Mauro (1986), p. 13), without affecting the analytical conclusions in qualitative terms. When there are significant non-linearities within the model, however, this is no longer the case.

of consumption. These mechanisms may only be captured if a fully-fledged econometric model is used in assessing the impact of the budget on the macroeconomy.

In addition to remedying some of the shortcomings of summary indicators, a BIQM-based indicator helps meet a significant requirement, namely strong internal consistency with the cyclical and forecasting analysis of the Bank of Italy Research Department, which relies on that model.

2.1 Main features of the model

The new version of the BIQM shares many of the characteristics of the previous one, released in 1986 (see Banca d'Italia (1986)). Its long-term properties are consistent with a neoclassical model postulating exogenous growth, in which full employment of factors is accompanied by a constant rate of inflation, hence constant relative prices. The levels of output and of the employment of capital and labour are consistent with the parameters of the aggregate production function and with relative factor costs. The steady-state growth path of the model, stemming from technical progress and the accumulation of real and financial wealth, interacts with the dynamics of the adjustment process to determine short-term characteristics. The adjustment processes essentially reflect three factors: the stickiness of prices and wages, which prevents their instantaneous adaptation to the situation of full resource utilisation; the non-malleability of installed physical capital, which limits the short-term modifiability of the relative composition of productive factors; and the possibility that expectations and outcomes may not coincide. In the short run, therefore, given these rigidities, the characteristics of the model fit the Keynesian framework in which the level of output is determined by the trend in aggregate demand, in a situation of oversupply in both the goods and the labour market.[11]

[11] The coexistence of a neoclassical macroeconomic equilibrium framework with Keynesian short-to-medium-term adjustment processes is a feature shared by most existing macroeconometric models (see, e.g., Church, Sault, Sgherri and Wallis (2000)).

A detailed description of the relations incorporated into the BIQM lies beyond the scope of the present paper.[12] To facilitate the interpretation of the results discussed in Section 4, however, it is helpful to examine the principal mechanisms whereby the level of economic activity and price dynamics react to changes in the public budget.

2.2 The role of the budget in determining the level of economic activity and prices

In describing the mechanisms whereby changes in the aggregates of the public finances affect the level of economic activity, it is appropriate to distinguish (as in some synthetic indicators, see e.g. Ceriani and Di Mauro (1986)) between the consequences attributable to the impact of net transfers on the behaviour of households and enterprises and those due to variations in expenditure on goods and services, investment and wages and salaries.

Changes in any one of the latter items are directly reflected in the identity that determines GDP at current prices; however, the impact on real GDP also depends on any effects such changes may have on relative prices.[13] The demand of the public sector triggers the multiplier and accelerator mechanisms associated with the consumption and investment functions. In part, moreover, it is directed abroad, but general government expenditure on goods and services has a smaller impact on imports than the average of the other components of demand, so that the leakage effects are relatively limited. This feature is shared, to a smaller extent, by public investment.

As regards the net transfers of the public sector, their main influence is on households' consumption, which, in accordance with the classic life-cycle model, is a function of permanent income and wealth. In addition to these two variables, the equation also contains the real interest

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[12] For a more detailed description of the main properties of the model, see Banca d'Italia (1986), Galli, Terlizzese and Visco (1989), and Terlizzese (1994). A discussion of the latest versions of some of the principal equations is in Siviero and Terlizzese (1997). An up-to-date description of some of the main equations in the supply block of the model can be found in Parigi and Siviero (2001). Extensive simulation experiments may be found in Altissimo and Siviero (2002).

[13] In particular, it is necessary to specify, for the stimulus associated with changes in wages and salaries, whether such changes are the result of changes in unit earnings or in the number of public employees. For more details, see Section 3.2.1.

rate, which plays the dual role of capturing intertemporal substitution effects and correcting, albeit approximately, the error caused by measuring wealth at replacement cost instead of market prices. In the standard version of the model, consumers' behaviour is backward-looking. A forward-looking consumption function is specified and estimated in Appendix 2.

The disposable income underlying households' consumption decisions is defined with reference to the entire private sector (hence without distinguishing between general government net transfers to households and enterprises) and includes only the current items of the general government accounts. This is consistent with the classification adopted for the national accounts, which exclude net capital transfers from the income account. This exclusion has a particularly pronounced effect on the results presented in Section 4.1 owing to the substantial recourse made in the period in question to one-off revenue measures, the proceeds of which are counted as capital revenue.

Given the presence of the private sector's total wealth in the consumption function, households' expenditure also varies with changes in the stock of public debt.

Enterprises' demand for factors of production is modelled as the result of a cost-minimisation process in a putty-clay context: hence, only the marginal vintage reflects the behaviour of relative factor prices.[14] The latter are a function both of the direct tax rate applicable to enterprises, which contributes to the cost of capital (with a series of adjustments to take account of tax measures designed to encourage investment) and of employers' social security contribution rate. The tax component of the behaviour of general government thus has a direct influence on enterprises' investment choices.

The indirect effects produced by the operation of the accelerator mechanism in the wake of a change in aggregate demand depend on the dynamic structure of the investment equation. The latter, in fact, is not exclusively a function of current variables. The existence of delivery lags

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[14] The theoretical approach referred to in the text is applied only to investment in machinery, equipment and transport equipment. For the components relative to residential and non-residential construction, the model uses a simplified approach that is less constrained by restrictions imposed by theory.

means that the flow of investment includes plant and machinery belonging to earlier vintages, corresponding to different values of relative factor prices and hence of the optimal relationship between capital and output. Also, the desired changes in production capacity, which in principle reflect the expected development of demand, are proxied by a distributed lag of the level of value added.

One further aspect of enterprises' behaviour that is directly affected by changes in the budget is the demand for credit, since an increase in investment subsidies reduces their financing needs.[15]

In contrast with what generally happens in the simplified models underlying the synthetic indicators discussed above, the quarterly model takes account of the reactions of the components of aggregate demand to changes in prices produced by a fiscal stimulus, both directly through changes in indirect tax rates and indirectly insofar as an acceleration in aggregate demand as a result of increases in public expenditure causes a short run gap between capacity and the actual level of economic activity, with potentially inflationary consequences.[16] An increase in prices, regardless of the cause, reduces competitiveness and accordingly net exports. There is also a negative effect on consumption decisions owing to the reduction in disposable income necessary to take account of the diminished purchasing power of financial wealth.

As will be seen from the results presented in Section 4, prices often diverge significantly from the values observed in the counterfactual simulations underlying the indicator presented here. It is thus possible that considering the interrelationships between quantities and prices may give rise to significant differences from the results obtained with indicators that ignore them.

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15 The policy adopted for financing the Treasury's borrowing requirement also affects the financial, monetary and credit variables. These effects are not considered here because their role in determining the short-term effects of the budget on economic activity is almost negligible.

16 For an evaluation of the effects of the capacity utilisation rate on prices in the quarterly model, see Gavosto and Siviero (1995). In addition to the influence of the mechanisms described in that work, the inflation rate is affected by public sector employment policies, insofar as these influence the unemployment rate and hence, via the Phillips curve, the rate of increase in wages.

3. The design of the counterfactual benchmark simulation

Using the econometric model to measure the impact of the budget on economic activity in a given period involves comparing the historical values with those given by a counterfactual benchmark simulation serving to identify the macroeconomic scenario that would have been produced by a "neutral" budget.[17] In order to define the counterfactual simulation, it was necessary to make a series of methodological and operational choices. The most important decision, on the definition of a "neutral" budget, is examined in Section 3.1. The hypotheses on the main exogenous and policy variables are discussed in Section 3.2.

Before moving on to describe the experimental design, it is necessary to discuss a potential weakness: as is inevitably the case with all analyses that require appraising the effects of a change in policy, our results are affected by the well-known difficulties associated with the evaluation of policy measures on the basis of behavioural relationships found to hold under a different policy set-up (Lucas (1976)).

There are, however, several reasons to believe that in practice the Lucas Critique may be less disruptive than one may tend to think. First, the behaviour of economic agents may be backward-looking rather than forward-looking, and forward-looking behaviour is a key ingredient in Lucas-type non-structurality. It is thus possible to test empirically which of the two behavioural schemes is appropriate (Hendry (1988), Favero and Hendry (1992)).[18] Second, even if the agents' expectation formation process is assumed to be forward-looking, the possibility exists that, because of the indeterminacy of the equilibrium, one may still specify rational and "Lucas-proof" decisional rules (Farmer (1991)). Third, the institutional changes or policy measures in question may not be the "regime shifts" necessary for the Lucas Critique to apply (Sims (1982)). Finally, even if each individual agent were to modify her/his decisional

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[17] The classic reference for this methodology, based on counterfactual simulations of an econometric model, is Artis and Green (1982), which sets out to measure the impact on growth of discretionary fiscal policy measures.

[18] As the sample used in the estimation of the BIQM (from mid-1970s to end-1990s) arguably embeds numerous changes in both the policy stance and the institutional set-up (for a detailed description of the operational and institutional changes in monetary policy see Passacantando (1996)), and given that no clear signs of coefficient instability can be found (see Siviero and Terlizzese (1997)), one might feel somewhat re-assured, in this respect, about the reliability of the results presented below.

rule as a consequence of a policy regime shift, the aggregation of heterogeneous reactions may result in an aggregate response that is much less pronounced than each of the underlying individual reactions, so that the actual, aggregate macroeconomic effects of a policy change may be better approximated by an approach that disregards the inherent non-structurality (Altissimo, Siviero and Terlizzese (1999)).

Nevertheless, in an attempt to alleviate the potential impact of the Lucas Critique on our results, we also investigated how the conclusions are likely to be affected if the assumption that consumers do not take future expected policy into account when forming current decisions is relaxed (see Section 3.2 and Appendix 2).

3.1 The definition of a "neutral" budget

In order to construct a counterfactual benchmark simulation it is necessary to have an *a priori* definition of public sector behaviour patterns that are "neutral" with regard to changes in the level of economic activity. The adoption of a definition of "neutrality" is not simply a technical "operational" choice but reflects a particular view of the working of the economy.

The criterion adopted in this paper is similar to that underlying a number of other works on this issue: *the activity of the public sector is neutral if all the items of the general government budget, excluding interest payments, remain unchanged in relation to GDP from one year to the next*.[19]

Defining $y_{t,q}$ as the ratio of any budget item in the qth quarter of year t to GDP at current prices in the same period, the following constraint was imposed in the simulation for the construction of the benchmark for the year t:

$$y_{t,q} = \bar{y}_{t-1}$$

where $\bar{y}_{t-1}$ is the average value of the variable in the previous year.

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[19] As noted in the Introduction, the results produced with the concept of "neutrality" adopted here do not coincide with those that would be obtained by assuming unchanged legislation. In the case of excise taxes, for instance, the yield would remain unchanged in relation to GDP from one year to the next only in the event of changes in the law, except in special circumstances.

Synthetic indicators of the budget's impact on aggregate demand (see Appendix 3) face a basically analogous problem. A different definition of neutrality is proposed in Ceriani and Di Mauro (1986), namely the absence of change in the different items of the budget in real terms.[20] In other words, the budget is deemed "neutral" if the quantities of resources levied and distributed remain unchanged. By contrast, Blanchard (1990) and the IMF's *Fiscal Impulse* define neutrality as the absence of change in relation to GDP.

The reference to unchanged quantities in real terms is hardly compatible with the models of balanced growth determined by technological progress and the availability of productive factors. In fact, in a situation of long-term equilibrium the demand of each institutional sector (which is "neutral" by definition with respect to growth) remains unchanged in relation to GDP, whereas the definition of "neutrality" based on unchanged real quantities implies a progressive decline in the public sector's importance in the economy.[21]

The choice of the definition of neutrality to be used is also constrained by institutional factors. The reference to GDP, in particular, is justified by the tendency for the size of the public sector in each country to be related to the level of economic activity. This tendency is a consequence of the operation of automatic fiscal mechanisms and of the fact that the number and scale of the activities performed by the public sector tend to be a function of the size of the economy.

A different criterion was adopted for interest payments; these are not determined on the basis of a definition of neutrality but kept endogenous as a function of interest rates and the size of the public debt.[22] Consequently, the counterfactual simulation takes account, via the channel of interest payments, of the indirect effects associated with the divergence of other items of the budget from their historical values.

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[20] In the literature on Italy, the same criterion was adopted by Morcaldo and Violi (1989), who assess the effects of the budget on the basis of counterfactual simulations of a simplified income-determination model.

[21] The criterion of constancy in real terms also has operational drawbacks. In particular, where both revenue and expenditure are rising, it results in counterfactual simulations marked by a composition of the budget that is systematically different from that actually recorded (with lower levels of both revenue and expenditure). This in turn risks making the results less reliable.

[22] For the treatment of interest rates in the counterfactual benchmark simulation, see Section 3.2.

3.2 The ceteris paribus *hypotheses*

In order to complete the description of the design of the benchmark simulations, it is necessary to explain the assumptions made with respect to the exchange rate of the lira, interest rates and the mechanisms involved in the formation of expectations.

As regards interest rates, in a first set of experiments (which we designate as "standard" or "basic") the choice was made to keep the monetary policy stance unchanged with respect to history; thus, the real *ex post* interest rate on Italian Treasury bills (the average of 3, 6 and 12-month maturities) is set equal to the value historically observed. The other interest rates react to the movement in the Treasury bill rate in accordance with the relationships built into the quarterly model.

It might be argued, however, that a better approximation of the counterfactual behaviour of the monetary policymaker could be attained if a sensible policy rule could be used for this purpose, rather than simply imposing a "normative" constraint such as the one underlying the standard simulations. In order to meet this criticism of the basic simulation results, the experiments were repeated with a slightly modified version of the BIQM, in which the monetary policy authority reacts to inflation and output developments according to an estimated Taylor-type reaction function of the forward-looking kind. Hence, this modification of the basic model structure also pulls forward-looking elements into the picture. A detailed description of the Taylor rule specification and estimation is given in Appendix 2; further information may be found in Altissimo and Siviero (2002).

As regards the (nominal) exchange rate, the technically simple hypothesis of unchanged values with respect to those observed was adopted. Incidentally, this is consistent with the exchange rate policy pursued for most of the period in question, with the exception of the period between September 1992 (when Italy abandoned the ERM) and end-1996 (when it rejoined).[23] Any assumption that required postulating a different exchange rate policy would have taken us onto very slippery ground.

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[23] The simulations were also repeated keeping the real exchange rate unchanged with respect to its historical values. The results obtained in this exercise are briefly discussed in Section 4; in short, this robustness check does not signal any significant sensitivity of the results with respect to this modification in the exchange rate assumption.

Instead of the foregoing hypotheses it would have been possible, in theory, to try and take account of the effects of the public finances on the risk premium associated with the issuer and expectations concerning inflation and the exchange rate.[24] However, it was felt that following such a course would have necessarily required the adoption of criteria characterised by a wide margin of discretion, given the well-known difficulties of finding sensible and empirically robust explanations of risk premia dynamics. The only alternative exchange rate assumption that was experimented with (unchanged PPP with respect to history) did not alter the main conclusions.

As regards the treatment of economic agents' expectations, the latter are by and large assumed to be of the adaptive type in the BIQM, with the exception of inflation expectations, which are generated by an equation modelling expectations data taken from the Isco-Mondo Economico survey; see Nicoletti Altimari (1997).[25]

It should be noted, however, that some phenomena that may play an important role in determining the effect of fiscal policy on the economy cannot be easily taken into account. Consider, for example, the effect of announcements of future tightening or of measures perceived by economic agents as indicating a turning point in the orientation of budgetary policy. Obviously, however, constructing counterfactual indicators for the effects of announcements or perceived changes in fiscal policy orientation would be a hopeless task.

Nevertheless, a modification of the basic version of the BIQM that allows consumers to behave in a forward-looking manner was tested: specifically, a consumption function was estimated that assumes consumer spending to be affected by future as well as current disposable income. The specification and estimation details are discussed in Appendix 2. In the experiments that rest on the BIQM modified as described just above, the simulations cannot be run only for period *t* (the year under investigation), but must embrace a longer time span, so as to provide an estimate of the current effects of future (expected) changes in the budget balance and composition. Specifically, it was imposed that all items of the

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[24] As described below, the basic BIQM structure allows for macroeconomic policy to affect inflation expectations.

[25] The model can also be simulated under the assumption of rational expectations; see, e.g., Nicoletti Altimari, Rinaldi, Siviero and Terlizzese (1995).

public sector balance (as a share of GDP) remain constant at the average value of year *t*–1 for years *t*, *t*+1, *t*+2 (as a terminal condition, it was assumed that public items as a ratio to GDP go back to their historical values starting in the first quarter of year *t*+3; sensitivity analyses showed that, if the terminal condition is moved further forward, and the simulation period is accordingly extended, the results remain basically unaffected).[26] Thus, the experimental set-up presents elements of similarity with the forward-looking synthetic indicator proposed in Blanchard (1990), which assumes consumption to depend on current as well as future transfers. There are, however, important differences with respect to that indicator, in that:

- propensity to consume is not assumed to be equal to 1, but is determined according to the estimated parameters presented in Appendix 2;
- if relative future transfers are assumed to be different from what they were in history, this implies that future output, real wage payments, etc., should also be expected to differ from their historical values; implicitly, the forward-looking indicator in Blanchard (1990) ignores these second-round effects, whereas, by simulating a full macroeconomic model, these effects are also taken into account.

4. The results

Before starting to examine the results, it should be stressed again that they refer strictly to the short-term impact of fiscal policies. More precisely, they refer to the impact of the fiscal policy of *year t* on the economy *in the same year*. Model simulation in general and the method we propose could in theory be used to assess the impact of fiscal policy over the medium term. However, results become less and less reliable the longer the period of simulation. This loss of reliability is mainly connected with the large number of *ceteris paribus* assumptions that are implicitly needed to run the simulations: as the simulation period extends, upholding these assumptions become less and less reasonable, undermining the significance of results.

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[26] It should be recalled that, as full historical figures are only available up to 2000, the forward-looking experiments rest on projected values for the years 2001 onwards; this suggests some caution in interpreting the results for the last 3 years in the sample.

This problem is particularly evident in the decade examined in this period, which witnessed a dramatic improvement of Italian public finances. As they were clearly on an unsustainable course at the beginning of the decade, in the absence of fiscal adjustment a dramatic financial crisis was inevitable, with strong negative implications for economic activity and growth. While extremely difficult to quantify, these implications could not be overlooked in an overall assessment of the costs of the fiscal adjustment, covering the cumulated effects of the budgetary policies of *years t to t+n*. The results we are presenting, on the contrary, only require assuming that no financial crisis would have been immediately triggered by a yearly pause in the adjustment process. This sounder basis clearly comes at a price. In particular, the sum of the results for the individual years cannot be interpreted as the overall cost, in terms of growth, of the fiscal policies adopted over the period.

4.1 The impact of the budget on the Italian economy in the period 1991-2000 [27]

The decade examined in this paper can be divided into two sub-periods: 1) the run-up to the European Monetary Union (1991-97); 2) the years following (1998-2000).

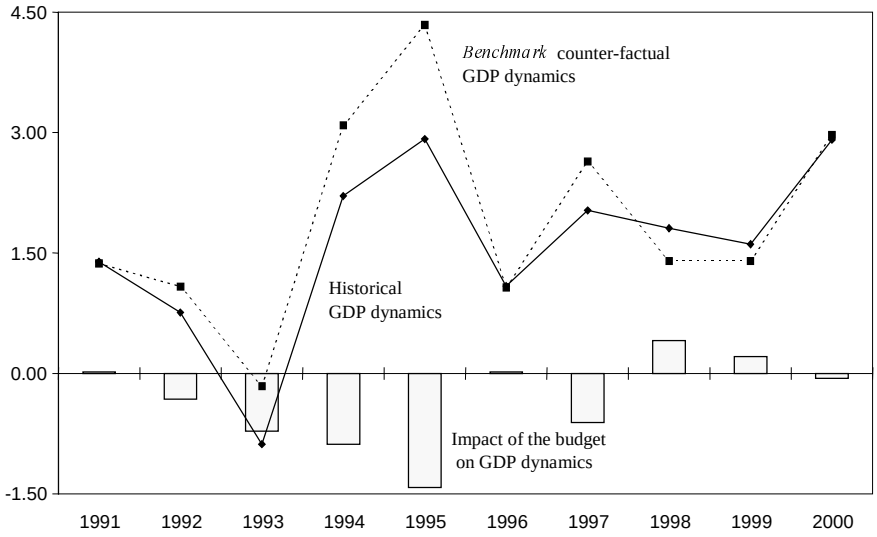
In the first period, the primary balance shifted from a deficit of 1.3 per cent of GDP to a surplus of about 6.7 per cent, as fiscal policy focused on the objective of bringing the overall deficit ratio below the 3 per cent Maastricht threshold. Over the period, the short-term impact of the budget on output was restrictive by almost 0.6 percentage points each year on average. If we compare the average yearly growth registered in the period (1.4 per cent) with that of the previous decade (2.3 per cent), close to 70 per cent of the decline could be attributed to the budget. The size of the overall impact on growth varied from year to year; it was greatest in 1995 (–1.4 percentage points) and close to zero in 1991 and 1996.

In the three years following the inception of the Third Stage of EMU, fiscal policy could relax, taking advantage of the lagged effect on interest payments of the fall in the market rates registered in 1996 and in

[27] The results for the last part of the period examined here must be interpreted with care, as they are based on provisional national accounts data which will presumably be revised.

Fig. 4.1.1

GDP growth rates, actual and in the benchmark simulations and budget impact



1997. The primary surplus fell significantly in 1998 and then stabilised at around 5 per cent of GDP. The effects of the budget on economic activity were positive in 1998 and in 1999, neutral in 2000.

Figure 4.1.1 shows the historical rates of change of GDP between 1991 and 2000, together with those produced by the benchmark simulation; the difference between the two provides an estimate of the impact of the budget on GDP.

The correlation between this estimated impact and the rates of growth of GDP of the benchmark simulation (i.e. excluding the effects of the budget) is negative (–0.5 per cent), thus suggesting that the effect of the budget was mildly counter-cyclical. These results confirm those obtained by Ceriani and Di Mauro (1986, pp. 15-21 and 43-52) for the period from 1971 to 1984.

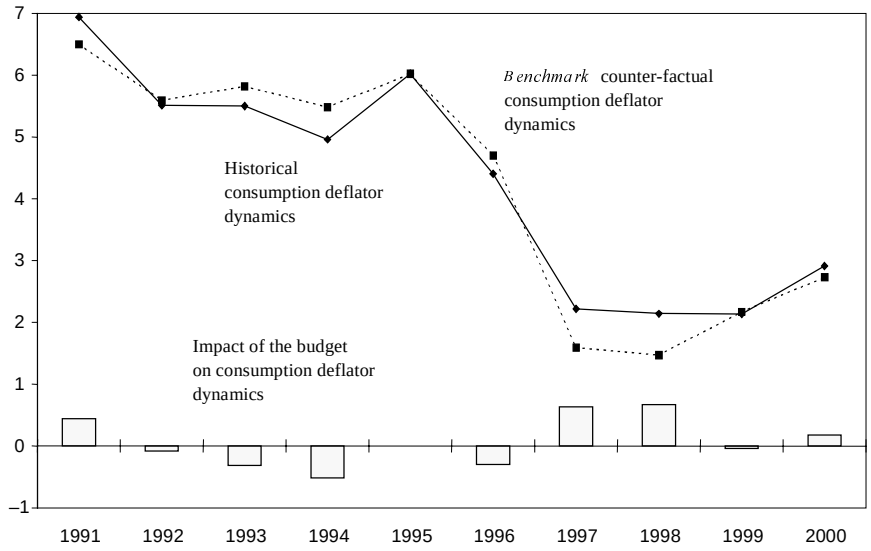
The effects of the budget on a number of macroeconomic variables are shown in Table 4.1.1. On average, the budget made a slightly positive

contribution to inflation (as measured by the private consumption deflator). Negative contributions to price dynamics are concentrated in the period from 1992 to 1996, when external inflationary pressures likely prevented the adoption of potentially inflationary measures (Figure 4.1.2). It is worth noting that the contribution of indirect taxation to price dynamics, especially if assessed on the basis of the changes in total indirect taxes, differs substantially from the figures shown in Table 4.1.1 for two sets of reasons.

Firstly, the BIQM distinguishes between the various components of indirect taxes, both in terms of timing of impact on prices and of deflators involved. In 1993, for instance, the significant increase in the indirect tax ratio, being due to the introduction of a tax levied on the estimated value of buildings (ICI), implied almost no immediate impact on prices, on the basis of the links codified in the model. In 1998, an even larger increase, being related to a new tax mainly levied on wages (IRAP) was not transposed onto prices, as it compensated for a reduction in social contribution rates. Secondly, changes in indirect taxation are not the only source of inflationary or deflationary impulses in the BIQM. Price

Fig. 4.1.2

Percentage change in the consumption deflator, actual and in the benchmark simulations, and budget impact



Tav. 4.1.1

Effects of the public budget on some macroeconomic variables

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
GDP, 1990 prices	(1)	0.02	-0.32	-0.72	-0.88	-1.42	0.02	-0.61	0.41	0.21	-0.06
Public consumption, 1990 prices	(1)	1.11	-0.72	-0.94	-3.18	-4.73	-1.31	-1.30	0.83	1.09	0.35
Balance of current accounts / GDP	(2)	0.08	0.14	0.17	0.40	0.74	-0.10	0.36	-0.34	-0.07	0.03
Total employment	(1)	0.13	-0.12	-0.27	-0.38	-0.49	-0.14	-0.49	0.00	-0.05	-0.14
Unemployment rate	(2)	-0.11	-0.09	0.13	0.20	0.36	0.08	0.21	0.01	-0.02	0.15
GDP deflator	(1)	0.65	-0.49	-0.76	-1.34	-0.85	-0.15	0.96	0.22	0.03	0.03
Private consumption deflator	(1)	0.44	-0.08	-0.32	-0.52	0.00	-0.30	0.63	0.67	-0.04	0.18
Gross fixed investment deflator	(1)	0.36	0.18	-0.03	-0.45	-0.20	-0.30	-0.13	-0.05	-0.27	-0.19
Exports deflator	(1)	0.35	0.14	-0.07	-0.49	-0.24	-0.28	-0.13	-0.03	-0.25	-0.21
Public consumption deflator	(1)	-0.46	-2.39	-1.42	-4.15	-4.67	1.13	1.26	-2.12	-0.14	-0.54
Wage rate, private sector	(1)	0.27	-0.28	-0.31	-0.75	-0.97	0.01	-0.53	0.70	-0.04	-0.06
Labor cost per employee, private sector	(1)	0.48	-0.29	-0.89	-1.85	-1.32	0.05	0.36	1.42	-0.06	0.01
Cost of labor per unit of output, private sector (trend productivity)	(1)	0.47	-0.20	-0.82	-1.63	-1.00	0.02	0.54	1.27	-0.06	0.04
Mark-up, private sector (trend productivity)	(1)	-0.36	0.08	0.63	1.21	0.69	-0.02	-0.49	-1.00	0.04	-0.04

(1) Percentage differences between the historical data and the results of the benchmark simulation.

(2) Differences between the historical data and the results of the benchmark simulation.

dynamics also reflects changes in social contributions and the wage rate in the public sector; moreover, it reacts to pressures exerted by the dynamics of aggregate demand (this effect being proxied by the degree of capacity utilisation). In 1995, for instance, the contribution of indirect taxation to inflation can be estimated to have been positive, whereas the overall effect of the public budget was neutral.

The results for the other deflators differ somewhat from those found for the private consumption deflator; for the GDP deflator the differences stem from the fact that it is directly affected by changes in per capita compensation in the public sector.

The general government budget had a significant negative effect on employment over the period (in particular, in 1995 the budget raised the unemployment rate by almost 0.4 percentage points). As a result of the impact of the budget on domestic demand being significantly restrictive on average, the balance on current account improved more than it would have done otherwise throughout the whole period; this is particularly true for 1995, when 0.7 percentage points of the increase in the current account surplus can be attributed to the budget. Thus, a non-trivial portion of the extraordinary improvement in the external balance in the period 1993-97 was due to the effects of the budget on demand and output (see also the results reported for the period 1992-93 in Locarno and Rossi, 1995).

4.2 Decomposing the effect of the budget on GDP

In addition to the counterfactual benchmark simulation, additional simulations have been produced to assess the role played by a number of features of the general government budget in determining the overall results. In particular, the following factors have been assessed separately: changes in the level (but not in the composition) of the primary balance (it is worth recalling that the estimates presented in this paper are based on the assumption that interest payments react to changes in the monetary policy stance; see Section 3.2); changes in the composition of the budget; public employment policies; modifications in the quarterly profile of revenues and expenditures. The results show that the first three factors played an important role in determining the size of the effects of the budget in the years examined, the first two being predominant. Focusing on the adjustment period 1991-97, about 60 per cent of the average overall

restrictive impact of the budget is to be attributed to the first factor; almost 30 per cent to the second and 10 per cent to the third. These results indicate that the restrictive impulses to the economy stemming from the need to reduce the deficit could have been reduced by choosing a different set of measures. The effects of changes in the quarterly profile are, by contrast, generally negligible (Figure 4.2.1).

In the years 1991-97, the impact of the primary balance, keeping all the other characteristics of the budget unchanged, was generally restrictive (the only exception being the expansionary impact in 1994).[28] Over the period, the effects were close to –0.3 percentage points per year on average (with a spike of –0.6 points in 1997); they were close to zero, on average, in the following years. *Ceteris paribus*, changes in the primary balance have had a fairly stable impact on GDP: if the balance improved by 1 per cent of GDP, growth was reduced by about 0.3 percentage points.[29]

The portion of the overall impact accounted for by changes in the composition of the budget from one year to the next[30] was often significant. In 1991, together with the increase in public employment this factor offset the restriction associated with the improvement in the balance. In 1994, it more than compensated for the deterioration of the balance. In 1995, it accounted for more than half of the large negative impulse coming from the budget. Over the fiscal adjustment period, this factor exerted, on average, a negative impulse close to –0.2 percentage points (with a spike of –0.9 points in 1994); in the following years the impulse was on average of the same magnitude, but positive.

These results are mainly determined by two features of the fiscal policies followed in the period: the relatively large reliance on measures reducing direct expenditure and the frequent adoption of one-off measures. The first element explains the average restrictive impulse exerted by

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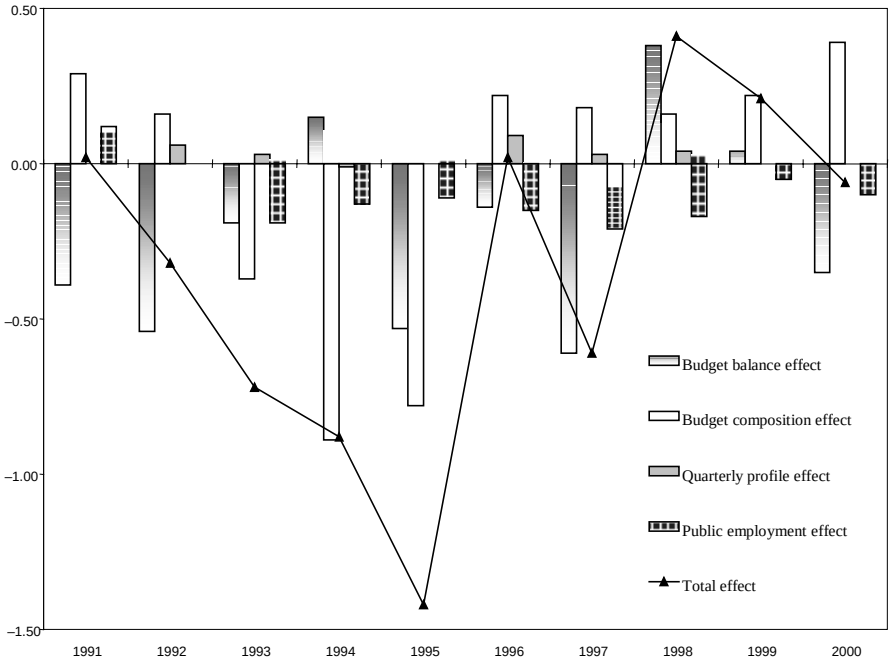
28 These effects have been computed by comparing. for each year, two counterfactual simulations that differ only in the ratio of the budget to GDP, equal to the historical level in the first simulation and to that of the previous year in the second (see Appendix 1).

29 By construction, this multiplier equals the weighted average of the multipliers associated with the different items on the revenue and the expenditure sides of the general government balance sheet (excluding interest payments).

30 To identify these effects, for each of the years examined in this paper a counterfactual simulation has been produced in which the level of the balance (as a ratio to GDP) is constrained to be at its historical figure, but the composition of the balance reflects that of the preceding year (see Appendix 1).

Fig. 4.2.1

Decomposition of the budget impact on GDP growth



changes in the composition of the budget in the fiscal adjustment period and the reverse impact in the following years. The sum of purchases of goods and services (net of sales on the market) and public investment declined significantly as a share of GDP from 1990 to 1997; and then rose from 1998 to 2000. As pointed out in Section 2.2, these components have a direct effect on demand and thus on output, whereas the impulses stemming from a change in net transfers have only an indirect and relatively limited impact on aggregate demand (through disposable income and consumption).[31] The second element helps to explain the large impact of composition effects in specific years. One-off measures are recorded as capital account revenue/expenditure in the general government budget.

[31] The focus on the first year effects of the budget is likely to amplify the difference in the impact of the budget components on the economy: in particular, that between transfers and direct expenditures.

According to the national accounts, which provide the framework for the quarterly model, these items do not affect private sector disposable income, so that the main channel through which they would exert an effect on demand and output is not activated. Their impact is consequently very limited.

The introduction of one-off measures is relatively important in explaining the positive sign of composition effects in 1992, 1997 and 2000 and the size of the negative effects in 1993-94 (when the 1992 one-off measures declined to zero).[32] A relatively large shift in the composition of the budget is also registered in 1995 and, with the opposite sign, in 1996. It comes from the attribution to capital expenditures in 1995 of a one-off payment to pensioners (close to 1 per cent of GDP and, in cash terms, spread over a few years) determined by a sentence of the Constitutional Court. For the same reasons given for the one-off measures, the shift in the composition of the budget determined by this payment in 1995 exerts, *ceteris paribus*, a negative impulse on growth; the undoing of this shift in the following year had a positive impact.

4.3 Sensitivity analyses

As mentioned in Section 3, the results above hinge on a set of key assumptions, in particular regarding the reaction of monetary policy to the counterfactual fiscal policy shocks. Moreover, they rest on the backward-looking specification of consumers' behaviour embedded in the basic BIQM structure. In this section we investigate how sensitive the results are to changes in those assumptions.

First, the experiments were repeated after augmenting the model structure with an estimated forward-looking Taylor-type monetary policy reaction rule (see section 3.2.2 and Appendix 2 for details). The model was simulated under the perfect-foresight assumption, for two years (the year under investigation, *t*, and the following one, t+1), assuming that the policy-controlled nominal interest rate reverts to the historical values in

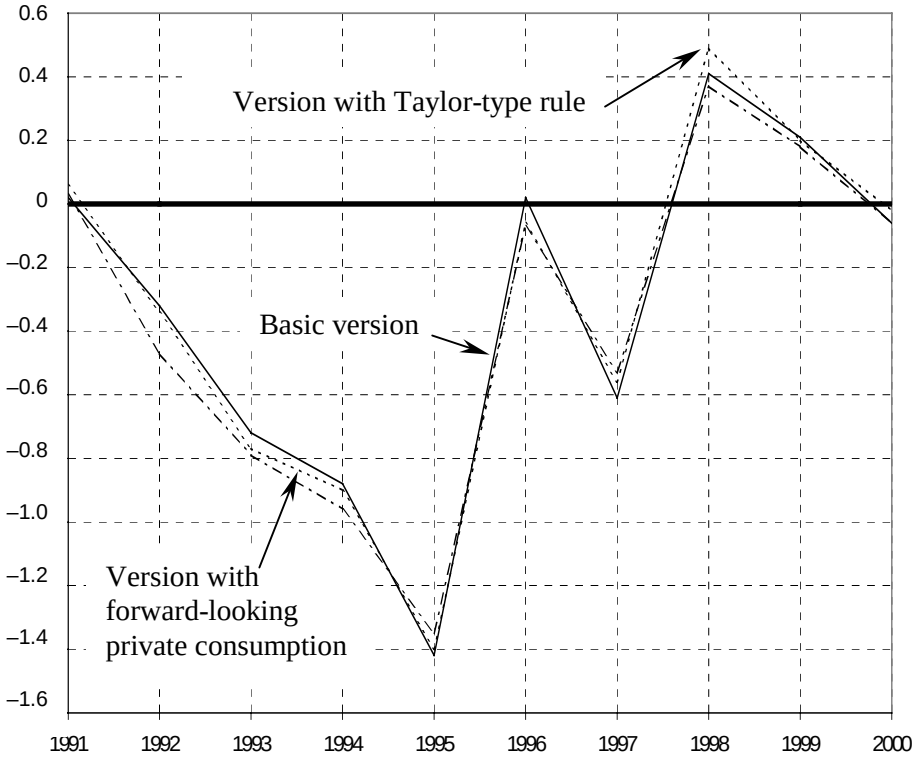
[32] The 1992 episode is a particularly clear example of the role of one-off measures. In that year, capital account revenue increased from 0.3 to 2.2 per cent of GDP, which entirely accounts for the increase in the overall surplus of 1.9 per cent of GDP. It is worth noting that one-off measures were adopted precisely with the aim of minimising the impact of the fiscal consolidation effort on demand and output.

the first quarter of year *t*+2 (moving the terminal condition further forward did not change the results significantly).

While in some years the policy-controlled rate is visibly different from that obtained under the assumption of unchanged short-term real interest rate (as in the standard simulations), the conclusions regarding the impact of the budget on the macroeconomy are hardly affected: for instance, the effects of the budget on GDP are very close to those under the standard assumptions (see Figure 4.3.1), with the largest discrepancy (in 1996) being less than 0.1 percentage points. Clearly, the overall picture is unaffected, and the results may thus be deemed reasonably robust with respect to changes in the assumption regarding the reaction of the monetary policy authority to the fiscal policy shock.

Fig. 4.3.1

Budget impact on GDP: Sensitivity analysis



In a second set of alternative experiments, a forward-looking consumption function was used, so that consumer spending reacts both to current and future (expected) changes in the budget.[33] While the impact of this modification is somewhat larger than in the previous case (the largest discrepancy with respect to the standard simulations amounts to 0.15 percentage points in 1992), the assessment of the budget's impact remains remarkably close to the standard version (the average discrepancy over the decade is virtually nil).

To conclude, the main results of the analysis would appear to be satisfactorily robust with respect to a range of substantial changes in some key assumptions.

4.4 A comparison with other budget indicators

As mentioned above, the model simulation-based approach adopted in this paper has the advantage, with respect to synthetic indicators, of taking a larger number of relationships into account. However, it is more complicated to manage and less transparent. In this section we compare our results (with the standard version of our procedure) with those of a limited set of synthetic indicators, some of which are frequently used to assess the fiscal stance, to check whether the recourse to our more complex approach is warranted.

We consider six synthetic indicators. The first two, which are entirely based on accounting rules, are the changes in the ratios to GDP of: 1) the overall and 2) the primary balance. The others are only slightly more complex: 3) the indicator proposed in Blanchard (1990) in the version which employs only the current values of fiscal variables; 4) an indicator derived from that proposed in Ceriani e Di Mauro (1986) in which the changes in the ratio to GDP of fiscal variables are used as benchmark, instead of the changes in real terms (for the reasons given in chapter 3.1); 5) the *Fiscal Impulse* measure proposed by the IMF; 6) the change in the structural balance estimated by the OECD.[34]

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[33] The relevance of persistent changes in fiscal policy to explain Italian private consumption in the 1990's is particularly emphasised in Rodano and Saltari (2001).

[34] The latter inclusion is justified by the fact that, at least in recent years, in the OECD *Economic Outlook* the fiscal stance is generally measured in terms of the changes of the structural balance

(continues)

We find a significant dispersion in the results, both qualitative and quantitative (Table 4.4.1), suggesting that the choice of one method or another is not irrelevant. The correlation between indicators is generally positive, but usually not very high (Table 4.4.2). The only exceptions are the correlations between the IMF *Fiscal Impulse* and the OECD structural balance, on one side, and the overall balance, on the other. The high correlations reflect the simplifications used to construct these indicators, which drastically reduce the differences from the original accounting balance. Overall, the correlation matrix of our results and the six indicators shows that there no indicator is particularly "out of line" with respect to the others.

A relatively strong correlation exists between the results of the procedure presented in this paper and the indicator derived from that proposed by Ceriani and Di Mauro (1986). They share the feature of assigning different weights to the various budget items, though they do not apply the same weighting scheme.

(see e.g. OECD *Economic Outlook* n. 69, page 5). The structural balance is computed by adjusting the overall balance for the impact of the cycle; it also excludes one-off revenue from the sale of mobile telephone licences (relevant for Italy in 2000).

Table 4.4.1

Budget impact on economic activity: results of different indicators
(percent of GDP)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
BIQM results	0.0	–0.3	–0.7	–0.9	–1.4	0.0	–0.6	0.4	0.2	–0.1
Balance (1)	–0.1	–1.0	–0.4	–1.0	–1.7	–0.5	–4.4	0.1	–1.1	0.8
Primary Balance (2)	–1.4	–1.8	–0.8	0.6	–1.8	–0.5	–2.3	1.5	0.2	0.6
Blanchard (1990) (3)	–0.1	–0.5	–0.1	–0.8	–3.1	0.8	–2.1	0.2	–0.7	0.2
Ceriani e Di Mauro (1986) (4)	–0.1	0.2	–0.6	–1.3	–2.2	0.8	–0.7	–1.0	0.1	–0.2
Fiscal impulse (FMI) (5)	–0.5	–1.8	1.8	–1.5	–2.6	–0.1	–4.4	0.3	–0.8	0.5
Structural balance OECD (6)	–1.4	–1.2	–1.4	0.1	–0.7	–0.8	–4.4	0.0	–1.2	1.0

(1) Changes in the ratio to GDP of the overall balance of the General Government (multiplied by –1).
(2) Changes in the ratio to GDP of the primary balance of the General Government (multiplied by –1).
(3) Version with only the current values of the fiscal aggregates.
(4) Version with partial monetary illusion. Neutrality is defined as no change in the GDP ratio of fiscal variables.
(5) Based on OECD estimates of potential output (*Economic Outlook* n. 69).
(6) Changes in the ratio to GDP of the overall structural balance of the General Government (multiplied by –1).

Tav. 4.4.2

Correlations among indicators

	BIQM result	Balance	Primary Balance	Blanchard (1990)	Ceriani e Di Mauro (1986)	*Fiscal impulse* (FMI)	Structural balance OECD
BIQM Results	1	0.4	0.4	0.6	0.7	0.4	0.3
Balance (1)		1	0.6	0.7	0.2	0.9	0.8
Primary balance (2)			1	0.5	0.0	0.6	0.6
Blanchard (1990) (3)				1	0.7	0.7	0.2
Ceriani e Di Mauro (1986) (4)					1	0.3	–0.1
Fiscal impulse (FMI) (5)						1	0.4
Structural balance OECD (6)							1

(1) Changes in the ratio to GDP of the overall balance of the General Government (multiplied by –1).
(2) Changes in the ratio to GDP of the primary balance of the General Government (multiplied by –1).
(3) Version with only the current values of the fiscal aggregates.
(4) Version with partial monetary illusion. Neutrality is defined as no change in the GDP ratio of fiscal variables.
(5) Based on OECD estimates of potential output (*Economic Outlook* n. 69).
(6) Changes in the ratio to GDP of the overall structural balance of the General Government (multiplied by –1).

APPENDIX 1

THE SIMULATION DESIGN IN DETAIL

The general criterion adopted to define the neutrality of the public sector does not fully describe the procedure followed in this paper in the construction of the budget in the counterfactual scenarios. A few important additional choices that had to be made, and the resulting simulation designs, are briefly described below.

The use of a quarterly model makes it necessary to define the profiles of the different items of the budget during the year. In the construction of the neutral budget a "flat" profile was assumed, with each item remaining unchanged in relation to GDP at the average value of the previous year. In order to evaluate the consequences of this assumption, a variant of the benchmark simulation was performed (variant 2 in Table A.1.1), in which the profile of each item of the budget was made similar to the actual profile recorded in the year in question while keeping the average for the year at the level of the previous year.

Table A.1.1

Design of the simulations underlying the benchmark and its variants

Simulations	$y_{t,q}$	$DIPAPD_{t,q}$, $q=1,...,4$
Benchmark	$\overline{y}_{t-1}$	$\overline{DIPAPD}_{t-1}$
Variant 1	$\overline{y}_{t-1}$	$DIPAPD_{t,q}$
Variant 2	$y_{t,q} + (\overline{y}_{t-1} - \overline{y}_t)$	$DIPAPD_{t,q}$
Variant 3	$[y_{t,q} + (\overline{y}_{t-1} - \overline{y}_t)]f(.)$	$DIPAPD_{t,q}$

For the revenue items, the function *f(.)* is defined as:

$$f(.) = 1 + (BALANCE_t - BALANCE_{t-1}) / (REVENUE_{t-1} + EXPENDITURE_{t-1})$$

For the expenditure items, the function *f(.)* is defined as:

$$f(.) = 1 - (BALANCE_t - BALANCE_{t-1}) / (REVENUE_{t-1} + EXPENDITURE_{t-1})$$

DIPAPD = General Government employment

As regards expenditure on public employees, it should be noted that this item can be kept unchanged in relation to GDP by modifying either the number of employees or the rate of increase in earnings. The effects on the level of economic activity are likely to be more pronounced in the first case, the effects on prices in the second. In the benchmark simulation the number of public employees was kept unchanged at the average level of the previous year. Consequently, unit earnings were constrained to increase at the same rate as GDP at current prices (in order to maintain the ratio of total earnings to GDP unchanged).

By contrast, variant 1 of the counterfactual simulation is based on a different criterion, whereby the number of public employees is set equal to the actual number (while the ratio of total earnings to GDP is again kept unchanged).

Lastly, in variant 3 the ratio of the budget balance to GDP was set equal to the value actually observed for each of the years considered, but the composition of the budget kept unchanged with respect to that of the previous year. In the simulation the change in the balance is proportionally distributed among the different items of the budget, with the same sign as recorded by the balance for revenue and the opposite sign for expenditure (see the note to Table A.1.1).

Table A.1.2 shows how the benchmark and the three variants described above are used to decompose the total effect of the budget on economic activity.

Needless to say, static simulation residuals were added to all counterfactual experiments, so as to make the latter fully comparable with the historical outcomes.

Table A.1.2

Breakdown of the total effect

Effect	Measurement method
Total effect	History – *Benchmark*
Employee effect	Variant 1 – *Benchmark*
Profile effect	Variant 2 – Variant 1
Balance effect	Variant 3 – Variant 2
Composition effect	History – Variant 3

APPENDIX 2

CHECKS OF THE ROBUSTNESS OF RESULTS

As noted in the main text, the standard simulations were run on the assumption that the monetary policy stance in the counterfactual experiments was the same as the historically observed; that is, the real *ex post* average interest rate on T-Bills was required to take the values actually recorded (the rest of the interest rates react to changes in the policy instruments according to the term structure embedded in the model).[35] Also, the standard simulations rest on a backward-looking specification of consumers' behaviour.

In order to check the robustness of our results, we departed from the benchmark assumptions in a variety of ways. Two such departures are described below (other, less significant modifications to the basic experimental set-up are referred to in the main text).

A forward-looking Taylor-type rule

A first departure consisted in enriching the basic structure of the BIQM with a monetary policy reaction function.

Following Altissimo and Siviero (2002), we repeated the counterfactual experiments using a version of the BIQM that includes a Taylor-type monetary policy rule, whereby the policy-controlled interest rate is a (positive) function of the (current) inflation rate and output gap (with parameters equal to 1.5 and 0.5, respectively). The original formulation of the rule is found in Taylor (1993), where it is shown that such a simple rule may provide an adequate description of the policy followed by the Federal Reserve during Volcker's time, despite the fact that it ignores a number of variables that constitute the information set upon which the setting of the monetary policy instrument is based. Subsequent research showed that the same rule satisfactorily describes the conduct of monetary policy in a variety of countries and for a variety of time periods.

[35] For the last few years of our sample (1999-2000), as Italy was already part of EMU, the simulations were also run under the assumption of nominal interest rates unchanged with respect to history, as one cannot assume that monetary policy reacts so as to leave the Italian short-term real interest rates unchanged. The results so obtained do not differ significantly from the benchmark.

Various authors have proposed variants to Taylor's original formulation. On the one hand, it has been shown that Taylor's formulation may be seen as an optimal monetary policy reaction function within an inflation targeting strategy (see, e.g., Rudebusch and Svensson (1997)); in this context, it is usually found that the optimal reactions to both the inflation rate and the output gap are likely to be considerably larger than the values postulated in Taylor (1993). On the other hand, several authors have tried to enrich the original framework in several ways: for instance, in some works current inflation has been replaced by future expected inflation (which, in turn, has raised the issue of the optimal degree of forward-lookingness of the monetary policy authority: on this point see, e.g., Batini and Haldane (1999)). Forward-looking behaviour is obviously justified by the considerable lags with which changes in the policy-controlled instrument affect the economy: see, on this issue, the recent results reported by van Els, Locarno, Morgan and Villetelle (2001), as well as earlier evidence in BIS (1995)); furthermore, in a number of papers the interest rate has been allowed to react smoothly to the changes in inflation and in the output gap.[36]

Altissimo and Siviero (2002) present estimates of a forward-looking Taylor-type rule for the Italian economy in the 1990s:

$$i_t = \gamma_0 + \gamma_1 \times i_{t-1} + \gamma_2 \times \pi_{t+1} + \gamma_3 \times gap_t$$

where i_t is the short-term (policy-controlled) interest rate (taken to be the rate on overnight deposits), π_{t+1} is future expected inflation (log changes in annual CPI) and gap_t is the output gap (given by a 4-term moving average of the degree of capacity utilisation in the private non-farm and non-energy sector).

The equation was estimated using data from 1991.Q1 to 1997.Q4, using a GIVE approach (the instruments being current and past values of inflation, a 4-quarter moving average of capacity, and the annual change in the effective exchange rate). While the horizon is admittedly short, one should recall the caveats spelled out above regarding the intrinsic instability of estimated policy reaction functions (in the Italian case,

[36] See, e.g., Clarida and Gertler (1996) and Clarida, Gali and Gertler (1998), and Angeloni and Dedola (1998) for estimates of Taylor-type specifications showing both features just described. A common feature of the Taylor-type rules estimated in these papers is that, although the same specification is roughly adequate to describe the behaviour of monetary policy in a number of countries and for a variety of time periods, there are signs of a change in policy behaviour around the early 1980s.

moreover, the institutional and operating framework of monetary policy changed considerably between the 1980s and the early 1990s: see, e.g., Passacantando (1996)).

The empirical specification selected by Altissimo and Siviero (2002) is the following (Newey-West adjusted t-.statistics in parentheses):

$$i_t = \underset{(4.263)}{1.215} + \underset{(10.909)}{0.598} i_{t-1} + \underset{(4.989)}{0.528} \pi_{t+1} + \underset{(4.409)}{0.152} gap_t$$

$$R^2 = 0.949; \quad GR^2 = 0.626; \quad DW = 1.935; \quad \sigma = 0.619;$$

$$\text{Sargan's test (p - value)} = 0.735; \ \text{Serial correlation test (p - value)} = 0.418;$$

$$\text{Functional form test (p - value)} = 1.126$$

The implied long-run coefficients for inflation and the output gap are 1.31 and 0.38, respectively, thus in line with the average finding in the empirical literature, as well as with those found for the Italian economy by Angeloni and Dedola (1998) using monthly data.

Further details (including a comparison with a more standard specification that does not assume forward-looking behaviour) can be found in Altissimo and Siviero (2002).

A forward-looking consumption function

As described in the main text, the standard BIQM presents very slight forward-looking elements.

However, one may argue that the anticipation of future changes in the public budget is a key factor when it comes to assessing the effects of the budget on the economy. For instance, one of the indicators presented in Blanchard (1990) requires evaluating the impact of public transfers on consumers' behaviour by building an average measure of net transfers that includes both the current year's values and the historical figures for the following few years.

In order to build an indicator similar to the forward-looking ones of Blanchard (1990), we chose to replace the main consumption function in the BIQM with a forward-looking formulation. It should be emphasised that, in the BIQM, economic consumption (i.e. the sum of consumer non-durables, services and the flow of services from the stock of durable goods) depends on current and lagged private sector disposable income

and wealth; the demand for durable goods, on the contrary, is modelled under the assumption that consumers aim at reaching a desired level of the stock of durables, as a ratio to non-durables. The latter equation was not modified, on the ground of two considerations: first, durable goods represent only about 10 per cent of total consumer spending; second, once the economic consumption equation is forward-looking, the demand for durables itself becomes forward-looking, although only indirectly.

The forward-looking specification chosen is the same as that estimated in Taylor (1993) for a number of countries. The estimation results for the period 1980.Q1 to 1998.Q4 are the following (Newey-West adjusted t-statistics in parentheses):

$$C_t = \underset{(0.990)}{-966.94} + \underset{(91.270)}{0.950}\, C_{t-1} + \underset{(4.879)}{0.054}\, PY_t - \underset{(4.584)}{129.664}\, r_t$$

$$R^2 = 0.999;\ DW = 1.258;\ \sigma\,(\text{ratio to mean of dependent variable}) = 0.004;$$

where C_t is economic consumption, PY_t is a measure of permanent income and r_t is a forward-looking measure of the real interest rate.

Specifically, we constructed permanent income and the real interest rate as in Taylor (1993):

$$PY_t = \frac{\sum_{j=0}^{8} 0.9^j\ Y_{t+j}}{\sum_{j=0}^{8} 0.9^j}$$

where Y_t is private sector disposable income; thus, our measure of permanent income includes both current and future net transfers.

As to the real interest rate, it is given by the difference between the current period nominal interest rate on bonds and future inflation (average inflation expected to prevail 4 to 7 quarters ahead). As in Taylor (1993), the real interest rate term is multiplied by an exponential trend, growing at the same pace as potential output, to prevent the effects of the real interest rate on consumption from vanishing as the economy grows.

As instruments we used, as in Taylor (1993), lagged values of consumption, disposable income, nominal long-term interest rates and the price level, as well as a linear trend.

The estimation results are similar to those found by Taylor (1993) for some of the countries he investigated. While the estimation results are not fully satisfactory, it should be considered that the purpose of this forward-looking consumption function is only to test the sensitivity of the results with respect to a rather dramatic modification in the behavioural assumptions underlying the basic BIQM and hence the standard counterfactual simulations.

With respect to Blanchard (1990), our indicator not only assumes that consumers react to future (expected) transfers, but are also able to assess how the future overall macroeconomic picture would be affected by a persistent change in the fiscal policy stance.

APPENDIX 3

SYNTHETIC INDICATORS OF THE IMPACT OF THE BUDGET ON ECONOMIC ACTIVITY

This Appendix examines three synthetic indicators that have been used to assess the impact of the budget on economic activity: the fiscal impulse measure published by the International Monetary Fund until 1997, the proposals of Blanchard (1990), and the weighted budget balance devised by Ceriani and Di Mauro (1986).

The IMF's Fiscal Impulse (FI) measure

From the mid-Seventies until 1997, the IMF published, in *World Economic Outlook,* an indicator of the impulse exerted by fiscal policy on aggregate demand in the principal OECD countries. The indicator, described in Heller, Mansur and Haas (1986), was calculated by comparing the budget balance as a proportion of GDP for a given fiscal year with the proportion that would have been recorded if the ratio of revenue to actual GDP and that of expenditure to potential GDP had remained unchanged with respect to a base year:

$$FI = (g_t - r_t) - ((g_0 Y_t / YP_t) - r_0)$$

where g and r are respectively public expenditure and revenue in relation to GDP, YP is potential output, Y is actual GDP and the indices 0 and t refer respectively to a base year in which potential and actual output were roughly equivalent and the year in question. The impulse in a given year is equal to the change in FI relative to the preceding year.

This method of measurement did not weight the various components of the budget according to their potential impact on aggregate demand and did not consider the loss of purchasing power on the public debt, in contrast with the other indicators described below. It had the advantage of being very simple to calculate, except for the estimate of potential GDP, which was based on the assessments of the IMF's area experts. This simplicity involved limits in using the indicator, which the IMF's experts prudently presented as a "first step", designed to gauge the size of the initial stimulus exerted on demand, in analysing a country's fiscal policy.

Yet it is not clear whether the IMF indicator should be classified as a criterion for measuring the overall impact of the budget or a method for

isolating the effects of discretionary policies on the budget balance. The use of different reference criteria for expenditure and revenue in constructing the "neutral" budget balance (potential GDP for the former, actual GDP for the latter) is intended as a rough-and-ready cyclical adjustment of the balance; the indicator would therefore appear to identify, as a residual, the effects of discretionary policies. But this objective is explicitly excluded by Heller, Mansur and Haas (1986),[37] who emphasise that the point of adjusting for cyclical effects is to arrive at a measure of the "non-transitory" effects of the budget on aggregate demand.

The indicators proposed by Blanchard

The indicator of the budget's impact on aggregate demand proposed by Blanchard (1990) in an advisory paper for the OECD is characterised primarily by the importance it attributes to agents' expectations regarding net future taxes. The indicator is based on the following consumption function:

$$C = \alpha(D + K) + \beta\left[\varphi\int\left(Y(s) - T(s)\right)\exp(-\varphi s)ds\right]$$

where consumption expenditure C depends on wealth (D=public debt, K=other private wealth) and present and future disposable income (Y=income from labour, T=total taxes net of transfer payments other than interest payments); future disposable income is discounted on the basis of a coefficient φ that reflects the relevant time horizon for the consumer (determined by the combined effect of his forecasting capacity and liquidity constraints).

Excluding the components that are directly attributable to government and taking account of its demand for goods and services G, the contribution of the public finances to aggregate demand is thus given by the following expression:

$$I = \alpha D - \beta\left[\varphi\int T(s)\exp(-\varphi s)ds\right] + G$$

[37] In a more recent work, Chand (1993) justifies the indicator on the basis of a simplified Keynesian model and attributes a twofold value to it. In his view, the indicator makes it possible to identify both discretionary policies and the overall impact of the budget, and is superior to the criterion proposed by Blanchard (1990), examined below, since it identifies the government's "active contribution".

Blanchard proposes three indicators in which drastic simplifications are made for practical reasons. In the first, which assumes that consumers' time horizon does not extend beyond the current year (or, equivalently, that their expectations *T* remain constant) and that the propensity to consume is equal to unity both for income from labour and for property income (the latter is measured net of the loss of purchasing power on wealth), the above formula is reduced to:

$$I = iD - T + G$$

where *i* is the real interest rate on the debt. The indicator coincides with the current budget balance owing to the loss of purchasing power on the debt. For comparisons between different years, Blanchard suggests relying the indicator to GDP. In the other indicators, consumers' time horizon is lengthened. In the second, *T* is replaced by an average of the value of taxes net of transfer payments in the year examined and of those forecast for the two subsequent years. In the third, Blanchard suggests adopting the values of *T* expected by each cohort of the population over its life expectancy.

Ceriani and Di Mauro's weighted budget balance

Ceriani and Di Mauro (1986) propose an indicator conceptually analogous to that of *net real fiscal impulse* used by the OECD up to 1982. The impact on aggregate demand is calculated by aggregating the appropriately weighted changes in the following budget items, expressed in real terms:[38] direct expenditure (collective consumption and investment), net transfers to households (net of direct taxes payable by them and of part of the loss of purchasing power on their holdings of public debt[39]); net transfers to enterprises; indirect taxes net of production subsidies (including those granted to autonomous government agencies, which are assumed to influence the price level via public service charges). From the solution of a simple Keynesian income-expenditure model and of several synthetic national accounts identities, the authors derive the appropriate weights to assign to the changes of the various components: 1 for direct expenditure and indirect taxes (with a negative sign for the latter); 0.8 (estimated coefficient of the propensity to consume out of

[38] For net transfers and indirect taxes, an index of consumer prices net of indirect taxes is used. For the other items, the corresponding national accounts deflators are used.

[39] The authors use a money illusion coefficient of 0.5 derived from the estimates of Lecaldano, Marotta and Masera (1984).

disposable income) for net transfer payments to households; 0.1 for net transfer payments to enterprises.

In a second version of the indicator the authors replace the current value of net transfers to households with a moving average whose weights correspond to the lagged coefficients derived from an estimate of the consumption function. This specification is intended to make the indicator consistent with a "permanent income" specification of the consumption function in which the explanatory variable is expected income approximated with a lagged structure.

An overview

Though they share an underlying Keynesian rationale, the methodologies examined differ in a number of respects.

First of all, there is a lack of uniformity in the criteria used to define the "neutrality" of the fiscal impulse (on this see Section 3.1). Ceriani and Di Mauro (1986) refer to the constancy of budget components in real terms, whereas Blanchard (1990) and the IMF's *Fiscal Impulse* work use constancy with respect to GDP.

Moreover, one finds notable simplifications in the *Fiscal Impulse* and in Blanchard's criteria. These simplifications reflect the international organisations' need for the simplest, most transparent indicators in order to survey so many countries. Carried too far, however, such simplifications drastically reduce the indicators' value added with respect to balances computed on the basis of purely accounting rules.

One of the characteristic features of the methodologies developed by Ceriani and Di Mauro (1986) is differential weighting of budget items. As the authors show, this feature has an important impact on results.

Finally, all the indicators considered attempt, using a variety of instruments, to take account of the impact of market expectations in determining the effects of the government budget on economic activity.

The IMF's *Fiscal Impulse* indicator, in estimating the economic effects, excludes changes in the public accounts due to the business cycle during the year. Being transitory, these changes are held not to have significant effects on the behaviour of economic agents, who are engaged in optimising their spending plans over a rather ample time horizon. Even accepting these premises, however, the cyclical adjustment of the IMF indicator is quite crude. It may differ considerably from that adopted by

economic agents themselves. Moreover other, non-cyclical factors can produce transitory variations in the public accounts whose impact may be greater than that of the business cycle itself or more readily perceived and assessed by agents.

A more direct way to take expectations into account is incorporated in Blanchard's second indicator, in which the figure for taxes net of transfer payments is an average of current value and forecasts for the next two years. This approach presumes that transitory factors continue to exert some effects on economic activity. However, Blanchard's solution is not problem-free. In particular, it is open to the earlier objection to the IMF's *Fiscal Impulse*, namely the lack of assurance that the forecasts used in constructing the indicator correspond to those of economic agents.

A methodology that is consistent with adaptive mechanisms of expectation determination, finally, is the lagged-coefficient version of Ceriani and Di Mauro's indicator, which uses moving averages of lagged net transfers to households and firms.

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PUBLIC LIABILITIES UNDER UNCERTAINTY

Reijo Vanne[*]

1. Introduction

The development of the Finnish economy has been the most fluctuating among the present EU countries in terms of real growth and employment during the last 15 years. Foreign and domestic demand and technological change have been the underlying driving forces. In the late 1980s inflation and real income expectations maintained domestic demand and private agents were running into debt. Due to, e.g., the policy of the Bank of Finland, the inflation expectations were never met, and the inconsistency of the plans turned out in the early 1990s. The debt crisis was strengthened by declining foreign demand. On the other hand, technological restructuring was rapid, and due to high unemployment, wages have risen slower than productivity since the mid 1990s.

The minimum of annual real economic growth rate was –6.3 per cent in 1991. The maximum, 6.3 per cent, was reached in 1997. The maximum of unemployment, 16 per cent, was reached in 1994, and the minimum of 3 per cent is from the year 1989. In a Nordic type welfare economy with high tax rates and large transfer schemes the high unemployment rate variation resulted in a roller coaster pattern also in public sector revenue and expenditure aggregates. The minimum of primary balance, –8 per cent of the GDP, was reached in 1993. The recent maximum was 6.7 per cent in 2000.

In addition to small open economy and Nordic welfare state properties, there are some other institutional features which complicate assessing the state of current policy and public economy in the long run in Finland. The Finnish public pension system includes also the so called second pillar of pension scheme categories. Thus, the main part of public pension benefits is earnings-related and there are no ceilings for the

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[*] The author is Chief Economist at the Central Pension Security Institute in Finland.

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Corresponding address: Central Pension Security Institute, 00065 Eläketurvakeskus, Finland, Phone: +3589 151 22 86, fax: +3589 151 25 80, email: reijo.vanne@kolumbus.fi

benefits. The national pension benefits are means-tested against the earnings-related pensions and the scheme is of the pay-as-you-go type.

The earnings-related pensions are partly pre-funded, the funding rate being approximately 25 per cent (Risku, 2001). The schemes for private sector employees and self-employed persons are run by private mutual pension insurance companies, industry-wide or company pension funds. The total value of their assets is above 50 per cent of the annual GDP. Domestic and foreign government bonds form 40 per cent and shares quoted on the exchange 30 per cent of the market value of the assets. The rest is invested in real estates, loans and money market instruments. All pension institutions as well as contributions and benefits are included in the general government sector in the national accounts.

The Finnish central government owns quoted stocks as well. However, the gross debt of the central government is approximately of the same size as the value of its financial assets, and the net financial wealth of the general government is almost equal to the wealth of pension institutions. Volatility of assets prices is another important point when assessing the state of the Finnish public economy.

The first generational accounts were presented in Auerbach *et al.* (1991). In an EU-wide project a research group produced generational accounts and related indicators for the EU member countries (EU, 1999 and Raffelhüschen, 1999a). The indicators showed a large intergenerational imbalance in Finland. The base-year of the report was 1995, and as the above stylized facts indicate, the Finnish economy has changed a lot since then. Policy changes have taken place as well. The former standard of national accounts has been replaced with the European System of Accounts (ESA95). Nowadays it is also a common view that continuously increasing longevity should be assumed.

In addition to the uncertainty of public net wealth and deficit based on business cycles and financial market, we could look at the future productivity uncertainty and the uncertainty of population forecasts as well. In the short and medium terms, population and its age-structure do not play any role, i.e. variables are constant or they are easy to forecast accurately. In the long term things are different, and population projections underlie every empirical intertemporal approach. The uncertainty of Finnish population projections is analysed in Alho (1998).

The first aim of this paper is to show how sensitive to business cycles intertemporal fiscal balance is, and discuss whether this could be catched by the sensitivity analysis typically presented in association with baseline generational accounts. Business cycle and other sensitivity results are based on Feist *et al.* (1999) and Vanne (2002).

The second aim is to describe, how risky the implicit net liabilities figures are in the Finnish case. We present results of intertemporal public budget simulations when population, productivity, interest rate and returns on stocks are stochastic. The results are presented in Alho and Vanne (2002).

In Chapter 2 we outline the rather well-known approach of generational accounts with an extension to stochastic population, productivity and interest rate paths. In Chapter 3 we present the data. The results are presented and discussed in Chapter 4. Conclusions are drawn in Chapter 5.

2. Generational accounting

2.1 Deterministic accounts

We follow generational accounting as presented in Raffelhüschen (1999b), and begin to determine generational accounts for current and future generations by calculating a set of figures as follows:

$$N_{t,k} = \sum_{s=\max(t,k)}^{k+D} T_{s,k} P_{s,k} (1+r)^{t-s} \qquad (1)$$

In equation (1) $N_{t,k}$ denotes the net present value (NPV) of all the future net taxes paid by the generation born in year *k* under the policy considered and discounted to the beginning of the base-year *t*. Net tax is defined as taxes paid minus transfers received and the value of public services consumed. *r* is the assumed annual discount rate. In equation (1) NPVs for the future generations, i.e. generations born after the year t, are also discounted to the year t, and not to the birth-year of the generation. NPVs are calculated separately for both genders, though this is not denoted in the equations. For generations born in year *t* or later, the result is the NPV of their lifetime net taxes, and for generations born before *t,* the result is the NPV of the net taxes of the remaining lifespan.

$P_{s,k}$ stands for the number of members of a generation born in year *k* who survive until the year *s*. *D* represents the assumed maximum length of lifetime, typically and also here 100 years. In practice, $P_{s,k}$ is drawn from population projections, which are typically produced by the so called cohort component method. We pass the explicit presentation and discussion of the method and assume increasing longevity until the year 2050. The assumption is implemented by decreasing mortality rates, i.e. increasing survival probabilities, for ages below 100 years, and assuming a certain death at the age of 100 years. Decreasing mortality has a significant impact on the length of retirement days, and thus on the NPV of the lifetime net taxes, *ceteris paribus*. In a more general case, we could also consider probability changes of "softer" transitions. We could, e.g., model transitions between labour market positions. One of the most remarkable cases is a rising effective retirement age. However, increasing longevity is the only type of transition we have assumed in this study.

$T_{s,k}$ denotes the average net tax paid in the year *s* by a representative member of the generation born in the year *k*, and all types of taxes, transfers and services are taken into account. $T_{s,k}$ includes, among other variables, also the collective public services, and in this study the depreciation of the fixed capital as part of the value of public services. In the original version of generational accounting neither individual nor collective public services were included in generational accounts. Public services were taken into account as a stream which should only be financed intertemporally by taxes (Auerbach, Gokhale and Kotlikoff, 1991).

It is assumed that current policy is prevailing indefinitely. $T_{s,k}$ is a sum of various types of taxes, transfers and services:

$$T_{s,k} = \sum_i h_{s,k,i} \tag{2}$$

where *i* denotes the type of tax, transfer of service. If $h_{s,k,i}$ >0, it is a tax, and if it is negative, it is a transfer of service. The difference *s–k* refers to the age of the generation in the year *s*. The future streams are first projected by age. Generally, projections based on sophisticated methods or expert knowledge may be available, but especially if that is not the case, projections are based on the assumed annual rate of productivity growth, *g:*

$$h_{s,k,i} = z_{s,k,i} h_{t,t-(s-k),i} (1+g)^{s-t} \tag{3}$$

Equation (3) assigns to each agent of age *s–k* in year s the same payment observed for agents of the same age in the year *t*, adjusted for productivity. The coefficients *z* are policy parameters to capture the changes that have taken place or are assumed to take place. Parameters may also be used as endogenous variables, which are solved in order to find an intertemporal balance.

The generational account in the year *t* of the cohort born in the year $k \leq t$, is:

$$A_{t,k} = \frac{N_{t,k}}{P_{t,k}} \tag{4}$$

The generational accounts for the future generations are defined as follows:

$$A_{k,k} = \frac{N_{k,k}}{P_{k,k}} \tag{5}$$

$P_{k,k}$ is the number of children born in the year *k* and who are alive at the end of the year. According to equation (5) the generational accounts for future generations are NPVs of lifetime net taxes in the birth-year.

If we compare the accounts of future generations to each other or to the account of the newly-born generation, we have to do the corresponding productivity adjustment, and when operating at the level of public economy, as in equation (1), we have to calculate the NPVs at the same moment.

We now define the basic indicator of generational imbalance or unsustainability of the policy. The uncovered intertemporal public liabilities (IPL) of the base-year *t*, L_t, are defined as:

$$L_t = B_t - \sum_{k=t-D}^{\infty} N_{t,k} \tag{6}$$

B_t is the net public debt at the beginning of the year t, and the N-values are defined in equation (1). Due to comparability across countries or the same

country at different points of time, L_t should be related to, e.g., the GDP of the year t. If L_t is unequal to zero, the policy considered is not sustainable. In case L_t is positive, taxes should be raised or transfers and services cut. In case L_t is negative, taxes are allowed to be lowered or benefits raised. L_t is an indicator of the imbalance.

The variables $z_{i,t,,k}$ (equation (3)) are used to balance the intertemporal budget, i.e., to set L_t zero. The balancing could be done by choosing the values of *z* at any of its sub-index combination points. A typical solution is to choose net taxes of future generations to balance the budget (k>t). Another common solution is to adjust all gross taxes of current and future generations.

Balancing of the budget generates more indicators of imbalance, in addition to the fundamental indicator L_t. We could, e.g., compare the generational accounts (equations (4) and (5)) of the youngest current and the first future generation, if future generations balance the budget. If all generations balance the budget by a uniform proportional annual tax change, we are able to solve the sustainable tax rate.

The only indicators we consider here are L_t and a uniform annual tax change for all future periods.

2.2 Stochastic accounts

We handle explicitly the debt and the gross asset parts of the public portfolio in stochastic simulations. We rewrite the IPL definition of equation (6) in a form where the stochastic variables are denoted:

$$L_t(r, y, f, m, l, g) = B_{bond,t}(r) - B_{stock,t}(r, y) - \\ - \sum_{k=t-D}^{\infty} N_{t,k}(f, m, l, g, r) \qquad (7)$$

In definition (7) interest rate (*r*), return rate on risky assets (*y*), fertility rates (*f*), mortality rates (*m*), net migration (*l*) and growth rate of productivity (*g*) are stochastic processes. Fertility and mortality rates at every age are presented as stochastic time series, mortality rates also by

gender. In the current application covariances between fertility rates at different ages as well as the corresponding covariances among mortality rates were also taken into account.

The stochastic properties of the variables are estimated from historical data. All the stochastic variables are assumed to be mutually independent, and in this particular case 1500 stochastic paths were drawn from the distributions. A value of L_t is calculated for and attached to every path. The properties of the distribution of L_t over paths are considered. The mean, median and deviation indicators are calculated. The deviation is an indicator for the risk embedded in the intertemporal fiscal stance.

In the empirical case, simulations were continued only until the year 2100. For deterministic generational accounts, assumptions are chosen so that the resulting series are converging and their sums are finite. In stochastic simulations nothing guarantees the convergence of the infinite series resulting from the random path.

3. Data

3.1 Population

The deterministic population projection starting from the base-year 1995 was reported in Feist *et al.* (1999). The deterministic population forecast starting from the year 2000 is here basically that of Eurostat published in 1997. We have slightly modified the Eurostat baseline projection, and also continued the projections until the year 2100. Eurostat has published a new revision in 2000 (EU, 2000), but the differences between the new and old versions are not remarkable. We assumed a total fertility rate of 1.75, net immigration of 5000 persons annually and an increasing life expectancy until the year 2050, and constant mortality thereafter. The increase of life expectancy was approximately one year in a decade. The assumed annual net immigration figure is relatively small compared to the original population, only 0.1 per cent, which has been a typical figure for Finland during the last 20 years. We didn't apply any separate immigrant population modelling (Bonin, Raffelhüschen and Walliser, 1999).

The stochastic population projections are reported in Alho (1998). The method is based on a baseline projection and error distributions. The

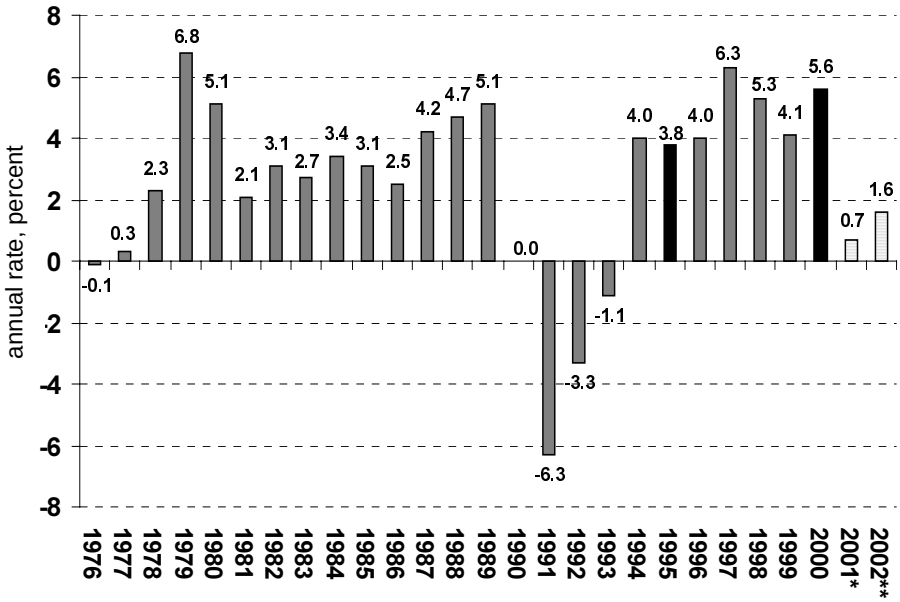
error distributions of age-specific fertility and mortality rates were estimated by first simulating past baseline (naïve) forecasts. The total fertility rate data was from the period 1776-1996, and age specific figures from the period 1955-1995. Age-specific mortality rates by 5-year age-groups were available from the period 1900-1994. Total migration data was from the years 1945-1995.

3.2 Growth and primary balances

The growth rate of the Finnish economy has varied a lot during the last 25 years, as is shown in Figure 1.

Fig. 1

Annual real growth rates of GDP in 1976-2002 in Finland**
(percent)



Sources: Statistics Finland, Ministry of Finance.

The real output was contracting for three years, in 1991-1993, and the record decline was 6.3 per cent in 1991. On the other hand, the growth rates observed since 1994 have also been exceptionally high. The nominal value of GDP was 95 billion euro in 1995 and 132 billion euro in 2000. The preliminary statistics in Figure 1 indicates that after the year 2000 the Finnish economy is again driven into a slow growth regime.

One of the key parameters of generational accounting is the rate of productivity change. For the stochastic simulations we defined it as a relative change of real GDP per capita. The variable includes both the effects of input and total factor productivity changes. Input changes are due to, e.g., the changes of population age-structure and the changes of employment rates as well as investment development. The estimation of the time series properties of the variable was based on the data from the period 1860-2000 (Alho and Vanne, 2002).

Growth fluctuations reflect in fluctuations of unemployment rates and returns on assets and further in fluctuations of tax revenues and social transfers.

Unemployment rates were rising rapidly in 1991-1994, but the decline was rather slow since then, despite the rapid real growth. This is due to both rising participation rates and high productivity growth. The unemployment rate was 15.4 per cent in 1995, in the base-year of the EU study, and in 2000 the rate was 9.8 per cent of the labour force. In 2001 the average unemployment rate was 9.1, and it is supposed to rise in 2002.

High variations of the real growth and unemployment rates have resulted in high variation of primary surpluses and deficits as shown in Figure 2. In a Nordic type welfare state the automatic stabilizer effects are rather strong. Primary balance is calculated here without taking into account either the returns on public financial capital or public interest expenditures. Depreciation of the public fixed capital is included in the expenditure, and thus net formation of fixed capital is not taken into account.

Mainly due to the partially pre-funded public pension system, Finland has a tradition of positive primary balances. The recession years of the 1990s and a few years after them were a dramatic exception to this. The final primary balance surplus was 6.7 per cent of GDP in 2000. In Vanne (2002) the preliminary figure of 6.4 per cent was used.

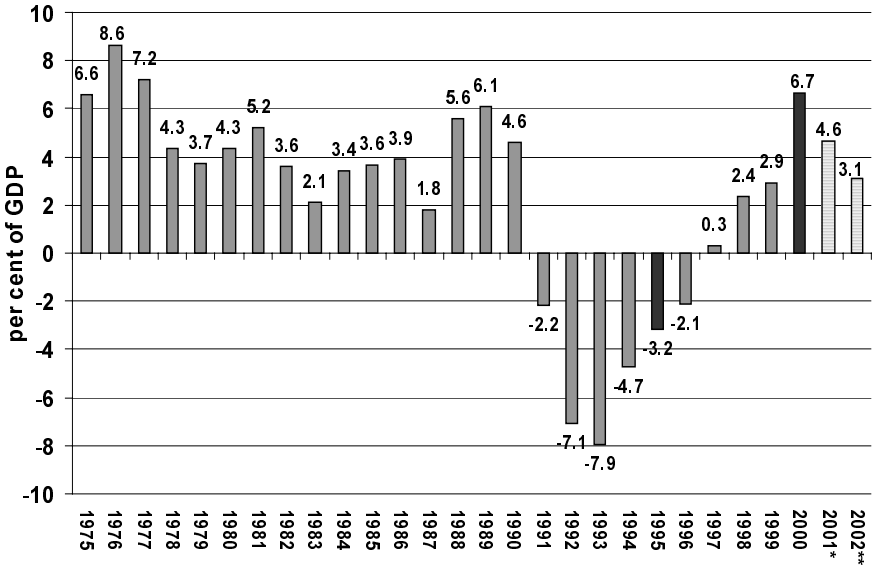
3.3 Public wealth

Public net financial wealth is one of the key variables when calculating the IPLs in equations (6) and (7). Primary balances accumulate or decrease net wealth, but as can be seen by comparing Figures 2 and 3, the primary balance has not been the key variable underlying the changes of public net wealth in Finland during recent years.

There are two exceptional features in the Finnish public economy compared to the majority of the European countries. The pension institutions running the statutory earnings-related pension schemes own stocks and other financial assets. Also the central government owns a remarkably high amount of financial assets in addition to gross debt. The volatility of stock prices strengthens the business cycle effects on the IPLs.

Fig. 2

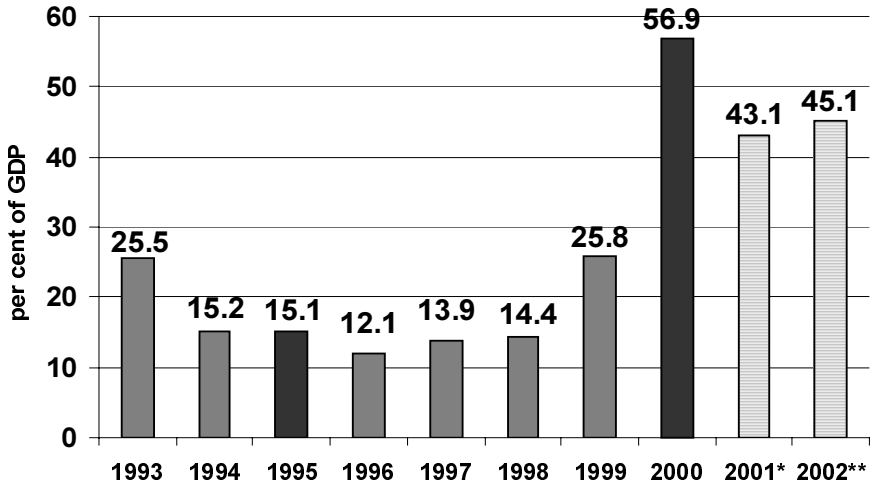
Primary balances in 1975-2002 in Finland**
(percent of GDP)



Sources: Statistics Finland, Ministry of Finance.

Fig. 3

Net financial wealth of the general government in 1993-2002 (1 Jan) in Finland**
(percent of GDP)



Sources: Statistics Finland, Ministry of Finance, Finnish Pension Alliance.

In the beginning of 1995 the net wealth was 15 per cent of GDP according to the present financial statistics standard. The share was 8 per cent in the end of the year according to the former standard, and that value was used in the EU study. The preliminary ratio of net assets to the GDP of the year 2000 was 59 per cent, which figure was used as the initial net wealth in Vanne (2002). The updated statistics is 57 per cent. We notice that the market value of public net assets has decreased again since the beginning of 2000 according to preliminary statistics, despite primary balance surpluses.

The main part of public assets is covering the liabilities of the statutory earnings-related pension schemes, which are mainly run by private mutual insurance companies. The portfolios are managed as private investors manage their portfolios, but there are rather sophisticated rules for the part of total liabilities, which should be covered, as well as for a proper risk management. The pension funds ran surpluses also during the recession, and the gross debt was accumulated with the central government.

For the stochastic simulations, we processed bonds and public assets separately (equation (7)). From a sophisticated portfolio point of view, a more detailed partition would be necessary. Bonds are a rather homogenous category, but in the Finnish case it should be remembered that the value of bonds is a net variable. Part of the bonds issued by the Finnish central government is in the possession of the Finnish pension funds. The pension funds hold also bonds of foreign central governments and companies, and their share is increasing. Naturally, risk properties of company bonds are different from those of governments, but we didn't take this into account.

On 1 January the net value of bonds was –32.3 per cent of GDP in 2000. The properties of the real interest rate time series were estimated from the German government bond observations in 1955-2000 (Alho and Vanne, 2002). The surpluses or deficits of primary balances generated by the corresponding paths were not explicitly cumulated to the debt stock, in order to consider their stochastic properties separately.

The value of assets, excluding bonds, was 91.3 per cent of GDP on 1 January 2000 (Statistics Finland, 2001). Assets include very heterogeneous investments, namely stocks, loans, shares of real estate companies, money market instruments and cash. The stocks owned by the pension funds are mainly foreign. Stocks owned by the central government are Finnish, though they are quoted on the market, part of them also in foreign stock exchanges and many of the companies operate internationally. We decided to base the estimation on the Dow-Jones index series from 1950-2000 (Alho and Vanne, 2002).

We didn't try to find any results related to optimal portfolio management. The modest target was to include the stochastic properties of the asset term in the intertemporal budget. Having this in mind, we assumed that the value of assets would be kept constant over time by selling and buying. The risk premium (over the bond rate) streams formed on average an additional part of positive wealth.

3.4 Revenues, expenditures and age-profiles

In Table 1 we disaggregate public revenues and expenditures in 1995 and in 2000. The statistics standard has changed also here. We follow the new standard also as to the year 1995, and the aggregates are slightly

Table 1

Public revenue and expenditure aggregates in 1995 and 2000 in Finland
(percent of GDP)

	1995	2000
Revenues		
Income taxes	17.4	21.0
VAT and other indirect taxes	13.7	13.3
Employers' social insurance contributions	10.1	8.8
Insured persons' social insurance contributions	4.5	3.3
Total = tax rate	45.7	46.4
Expenditures		
Pensions	13.1	10.8
Unemployment benefits	3.7	2.0
Family policy (transfers related to children)	2.6	1.7
Other social transfers	2.8	2.0
Subsidies	2.8	1.5
Individual public services	14.5	12.9
Collective public services	8.3	7.6
Other expenditures minus other revenues	1.1	1.5
Total	48.9	40.0
Primary surplus (+) or deficit (–)	**–3.2**	**6.4**

Source: Statistics Finland, National Accounts.

different from those used in the EU study. The main statistical improvement from the point of generational accounting is that collective public services are separated from the individual public services.

Revenues and expenditures are here organized so that the revenue side includes only taxes, and the rest of income is deducted from the residual of expenditures. The tax-rate rose slightly from 1995 to 2000, due to higher employment, higher profits and thus higher income taxes. The preliminary statistics was the above mentioned 46.4 per cent for 2000. The final statistics was even higher, 47.1 per cent.

In fact, the nominal tax rates have been lowered. Lowering of taxes is also the expressed policy of the present cabinet which took office in spring in 1999. Social insurance contributions have declined, because the unemployment benefits can be financed by lower rates.

The policy of the present government is that the expenditure of the central government, including interest payments, should be kept constant in nominal terms. The policy has not completely succeeded, but it is reflected in the above expenditure figures. It should be noted that only one fifth of the total pension expenditure is in the books of the central government. On the other hand, unemployment benefit expenditure has declined remarkably since 1995, and has made the cutting job easier for the government. The total pension expenditure was 10.9 per cent of GDP in 2000, compared to 13.1 per cent in 1995.

We use the profiles of the EU study as age-profiles of the base-year taxes, transfers and services. However, for pensions we use a profile from the year 1999 (Central Pension Security Institute, 2000), as well as for health insurance benefits (Social Insurance Institution, 2000). For social and health services we use a profile from the year 1998 (Ministry of Social Affairs and Health, 2001). All the profiles are adjusted for the year 2000 so that the corresponding aggregates of national accounts are fulfilled. In Figures 4 and 5 we present the age-profiles of net taxes in 1995 and in 2000 for both genders.

The profiles in Figures 4 and 5 are non-deflated. Increasing prices, wages and indexed transfers have a positive impact on the net taxes, if they are originally positive and a negative impact if net taxes are originally negative. However, the higher age where net taxes are equal to zero, has shifted 3 years forward for both genders. The crucial age was 59 years for

Fig. 4

Age profiles of net taxes of males in 1995 and 2000 in Finland

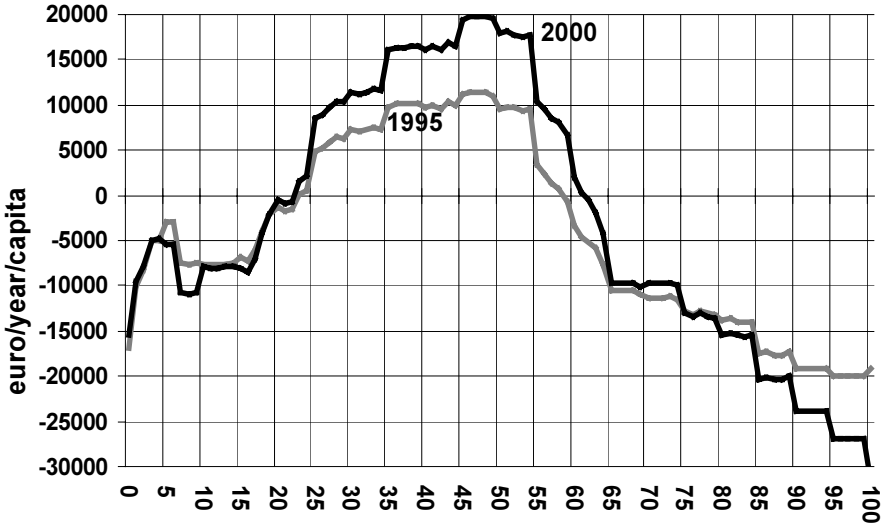


Fig. 5

Age profiles of net taxes of females in 1995 and 2000 in Finland

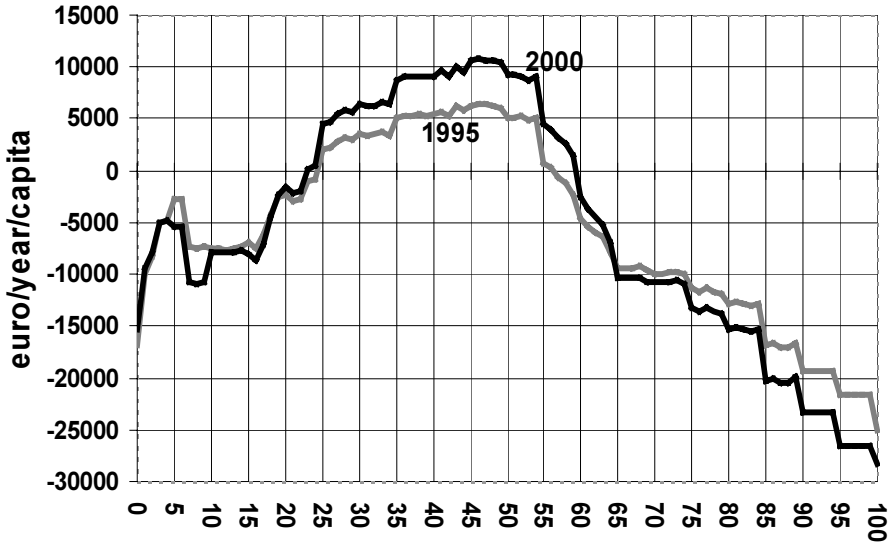
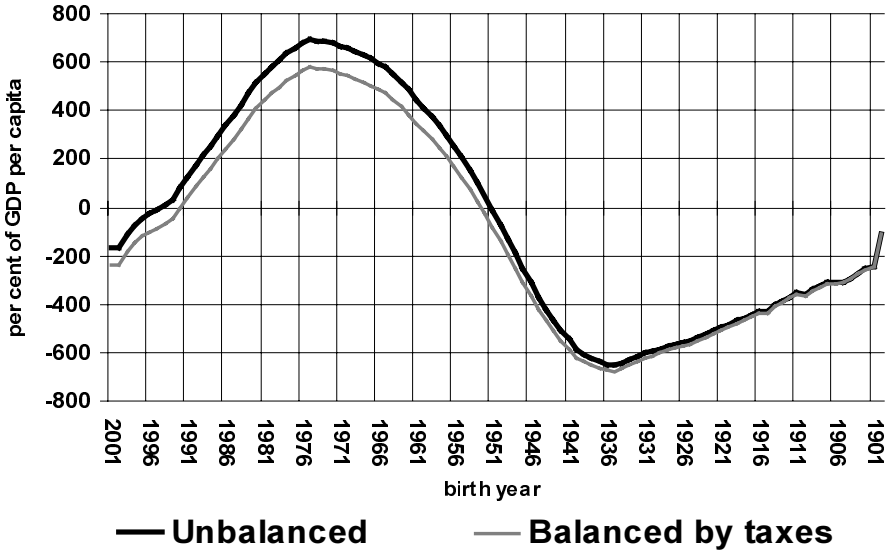


Fig. 6

Generational accounts of the year 2000
for the generations born in 1900-2001
(percent of GDP per capita)



women and 61 years for men. Also positive net taxes have changed more than negative net taxes, especially at the prime ages from 30 to 55 years. Rising employment rates are the underlying reason. Naturally, these changes are no surprise given the aggregate changes reported in Table 1. Rising employment rates are observed also at higher ages of labour force, and in fact, the effective retirement age has risen since 1995.

4. Results

4.1 Deterministic accounting

The generational accounts of current generations defined in equation (4) are presented in Figure 6. Also the account for the generation to be born in 2001 is presented as defined in equation (5). The other curve in the

figure describes the accounts given that the IPLs are reset to zero by a sustainable tax rate change assumed to have come in force in 2001.

The two ages where the value of the generational account is zero, are 6 and 49 years in the unbalanced current policy path. Positive accounts, denoting positive NPVs of net taxes, appear in a 12 year wider age range than in 1995. The lower age has declined and the higher age has risen by 6 years since 1995.

In Table 2 we present the IPLs and the respective required aggregate tax rate change to reset the IPL to zero at the baseline of this study and a comparison to the EU study baseline.

Table 2

Intertemporal public liabilities (IPLs) with its components and balanced tax rate changes required at the baseline in 1995 and 2000 in Finland
(percent of GDP)

Item	1995 g=0.015 r=0.05	2000 g=0.015 r=0.05
Intertemporal public liabilities, total	253	–90
Ageing	114	159
Explicit net debt	–8	–59
Macroeconomy and fiscal policy	147	–191
Balancing change of tax rate	8.8	–3.2

The generational balance has improved dramatically from 1995 to 2000. The IPL-indicator was 253 per cent of GDP in 1995 and with the same productivity growth and interest rate assumptions it is –90 per cent of GDP in 2000. In terms of sustainable tax rates, instead of a requirement of raising the tax rate path 8.8 percentages of GDP above the current policy path, the sustainable tax rate path is now 3.2 percentages below the current policy path.

It should be noticed that the overall tax rate (ratio of all taxes collected to GDP) is not constant in time, though all tax rates that agents meet are kept constant in time. Especially, when pensions are taxable income, the overall tax rate rises when population is ageing. Pension expenditures as well as taxes paid by pensioners are rising in relation to GDP, though all the tax rates are kept constant. Current policy should not be regarded as maintaining the current overall tax rate.

Following the approach of the EU study (growth of 1.5 per cent, interest rate at 5 per cent), we have separated the effect of population ageing on the IPLs. In 1995 it appeared to be 114 per cent of GDP, and until the year 2000 it has increased to 159 per cent of GDP. One reason is that the main part of the burden of ageing will materialise in the future also in 2000, but the burden will be met in a nearer future. Another reason is that life-expectancy was assumed to stop in 2010 and in 2050 when the base-years were 1995 and 2000 respectively.

Table 3

Sensitivity of intertemporal public liabilities and balanced tax rate changes to productivity growth rate and interest rate, base-year 2000
(percent of GDP)

	g=0.015 r=0.03	g=0.02 r=0.03	g=0.01 r=0.03	g=0.02 r=0.05	g=0.01 r=0.05
Intertemporal public liabilities	–19	49	–53	–83	–95
Balanced change of tax rate	–0.3	0.6	–1.2	–2.5	–3.9

However, in terms of primary surplus or deficit, population ageing started in 1995 in Finland. In order to find this out, we calculated the resulting primary deficit year by year in the 1990s using the 1995 age-profiles and the age structures of the particular years. It appeared that the pure ageing effect on the annual deficit started to rise in 1995. The difference between the 2000 and 1995 deficits was approximately 0.5 per cent of GDP.

Table 3 includes a sensitivity analysis with respect to productivity growth and interest rate. The sensitivity results are organised in a rising order by the difference between the interest rate and productivity growth rate.

The IPLs are in the range of +49 and –95 per cent of GDP. The sustainable tax rate changes vary between 0.6 and –3.9 percentages of GDP. In Finnish long-run projections the annual productivity growth rate is typically assumed to be 1.5 and the real interest rate is assumed to be 3 per cent (Klaavo *et al.*, 1999). If this turns out to be the case, the IPLs are currently –19 per cent of GDP, and the sustainable tax rate change would be –0.3 per cent of GDP. If productivity would grow 2 per cent annually, taxes should be increased by 0.6 percentages of GDP for the balance. The conclusion is that the public economy is now quite near an intertemporal and intergenerational balance in Finland.

In the following we discuss whether the current situation was captured by the sensitivity analysis scenarios of the EU study. A combined macroeconomic and fiscal policy scenario was presented in the EU study where IPLs appeared to be slightly negative as seems to be the case in the light of the 2000 data. The combined policy included the following elements: 1) halving the unemployment rate from the 1995 level until the year 2005, 2) raising the effective retirement age by five years until 2015, 3) raising the social insurance contribution rates as high as 1.5 times the current value until 2035, and 4) cutting all the public services by 20 per cent until 2010.

The unemployment rate has not yet been halved from the 1995 level, but it has declined more rapidly than in the halving path. The effective retirement age has probably not increased at sufficiently high rate in the passed five years according to preliminary data. In practice, a five-year increase in twenty years is a very ambitious target, and it cannot be reached by current policy. Ceteris paribus, the assumed rise of contribution rates would result in a 6 percentage rise of tax rate in 40 years, i.e. a 0.15

percentage rise annually. In table 1 we find that the tax rate has risen at the required pace in the passed five years. The final statistics indicate that the tax rate has risen more rapidly. We find as well that public services have been cut approximately by 10 per cent compared to the 1995 level in terms of GDP percentages.

Broadly speaking, the Finnish economy and fiscal policy have followed the best path from the point of view of intergenerational balance outlined in the EU study. However, the assumed phasing-in periods of the policy have not finished yet, and the assumed target values of the policy parameters have not yet been reached either, but it seems that intergenerational balance has already been achieved.

In fact, in addition to the policy outlined in the EU study, two other instruments have been used. First, social transfers and production subsidies have been cut. The decrease of social transfers is partly due to diminished unemployment, but especially transfers related to children or family policy have been decreased in relative terms. They are typically non-indexed, and adjustment decisions have not been made. Pension cuts have also been made, but combined with earlier decisions and long transition periods, the overall result is that average pension benefits follow the productivity growth rate (Klaavo *et al.*, 1999) as was assumed in the EU study. Another issue is that the GDP share of the pension expenditure has decreased due to the fact that factor income distribution has changed in favour of capital income.

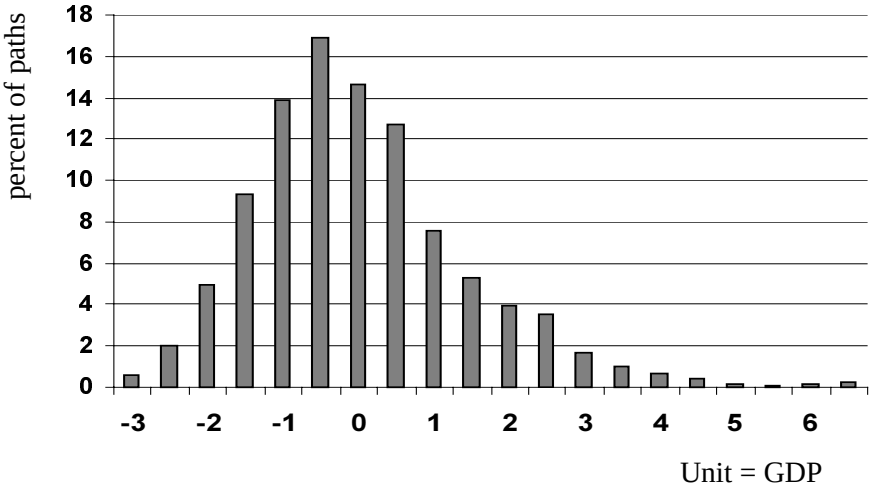
The development of capital income leads us to the other reason underlying the favourable intertemporal public debt position of the Finnish economy compared to the most favourable scenario of the EU study. Both capital income tax revenues and the value of public wealth react to changes in the market values of stocks and real estates. Capital income tax revenues are partly dependent on capital gains and partly on profits. Both are heavily dependent on business cycles, and the assumption of productivity growth rate cannot capture these effects, even though a variable rate was assumed.

4.2 Stochastic accounting

The observed rapid change of intertemporal fiscal stance during a short period and the rather obvious factors behind the change were the reasons for applying a stochastic approach. The deviation of the IPL

Fig. 7

Distribution of IPLs in 1500 simulations
(IPLs as shares of GDP in 2000)



outcomes provides a good base to assess how certainly we are able to talk about the fiscal stance. In Figure 7 we describe the distribution of public net liabilities based on the net wealth on 1 January 2000 and the first 101 (2000-2100) future primary balances.

Approximately 16 per cent of the outcomes are between –75 and –25 percentages of GDP, nearly 15 per cent of outcomes are in the range (–25.25) and 13 per cent in the range (25.75). The median is –18 percentages and the quartile range from –95 to 75 percentages (last column of table 4). The probability that the "true" value of uncovered public liabilities is in this range is 50 per cent. The distribution is skew to the right, indicating that large net liabilities are relatively more likely than corresponding levels of positive implicit wealth.

The four first columns of Table 4 also demonstrate the movement of the distribution of discounted net benefits, when the time horizon is lengthened. The movement indicates that the population is ageing on the median path. Though the median of IPL is still negative (–18) after including 101 primary balances (years 2000-2100), we could expect that

Table 4

Distribution of intertemporal public liabilities (IPL) and components
(percent of GDP)

	Time horizon, years					
	25	50	75	100	100	100
Net benefits (net of taxes)		Net debt	IPL			
Lower quartile	–80	–51	–19	8	–136	–95
Median	–69	–22	28	70	–95	–18
Higher quartile	–59	12	93	159	53	75

it would become positive when including, let's say, 10-15 additional years. Sustainability would prevail, if the median of IPLs would stabilise at zero (or nearly zero), when time horizon is lengthened. As discussed in Alho and Vanne (2002), we are not yet able to say a lot about the convergence or divergence of the median.

5. Conclusions

The intergenerational balance has improved dramatically in five years from 1995 to 2000 in Finland. The economy has grown rapidly due to reallocated resources and product innovations as well as the favourable international economic development. Fiscal policy has aimed at decreasing public gross debt, and the pension institutions have taken measures in order to raise the actual funding rate of the earnings-related pension schemes. The mainstream has been to improve the return on the investments of the funds.

In 1995 the Finnish public economy showed a severe unsustainability and intergenerational imbalance. In 2000 it is near balance,

and probably, depending on the assumptions about the future, on the positive side.

When comparing the generational accounting results of the year 2000 to the results in the EU study 1995 as the base-year, we find that the development has been even better than the most favourable scenario presented in the 1995 study. The comparisons also raise the methodological question of dealing with the variables that are the most dependent on business cycles, capital income tax revenues being a good example. There is a large public financial wealth in Finland. The wealth includes also risky assets, whose value is determined on the financial markets and the value is highly dependent on the business cycles.

Stochastic simulations with the year 2000 as a starting point show that the median of net liabilities is not as favourable as the deterministic baseline path. The median of intertemporal net liabilities starts at a negative value and gets positive when the time horizon of the simulations is shifted forward. The median path is not sustainable, but it takes over 100 years before the additional primary balances convert the median positive.

Stochastic simulations presented here are based on very simple assumptions. In the future the interdependence of the stochastic economic variables should be investigated and taken into account. The model of the public portfolio should also be more realistic and include more categories of assets than the present first version includes. Putting effort on these issues would develop the approach into the direction of asset-liability management applied in the insurance industry.

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THE COMPARATIVE EFFECTS OF FISCAL POLICY IN SMALL AND LARGE EUROPEAN COUNTRIES

Xavier Denis[*] *and Alain Quinet*[**]

1. Introduction

Given the loss of national monetary policy in EMU, fiscal policy needs to play a more significant role in smoothing the impact of country-specific shocks. To this end, the norm for budgetary behaviour, as enshrined in the Stability and Growth Pact, is to let the automatic stabilisers operate freely. However, the need for discretionary fiscal stabilisation cannot be ruled out. Small open economies, more specifically, may need a pro-active fiscal policy, for at least two reasons: they exhibit greater variance of output as they are more vulnerable to fluctuations in world market growth and terms of trade; the monetary stance is unlikely to be tailored to their specific needs, as they represent only a small share of the euro area. In this context, the effectiveness of fiscal policy in small open economies deserves particular attention.

Most large-scale macroeconomic models assume that fiscal policy essentially operates through its direct impact on the current income of households. Under the assumptions of sticky prices and liquidity-constrained households, a deterioration in the public balance can stimulate aggregate demand. However, both theory and empirical evidence point to possible non-Keynesian effects. Evidence of Ricardian effects (i.e. a zero fiscal multiplier) have been found in some high debt countries such as Belgium and Italy (Nicoletti, 1988). Moreover, several highly publicised episodes of fiscal contraction, including Denmark (1983-87) and Ireland (1987-89), suggest that anti-Keynesian effects (i.e. a negative fiscal multiplier) are possible, as those countries registered both a decline in debt-to-GDP ratios and an improvement in economic performance.

The aim of this paper is to investigate these non-Keynesian effects using a panel data approach. When interpreting the results, we pay

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[*] Banque de France.

[**] Ministère de l'Economie, des Finances et de l'Industrie.

The views expressed in the paper are those of the authors, and do not necessarily represent those of the institutions with which they are affiliated.

particular attention to the size of the country, as episodes of non-Keynesian fiscal policy have mainly been found in small open economies.

Although it is difficult to disentangle the complex relationships between fiscal developments and economic growth, a few lessons do seem to emerge from our empirical work :

- the effects of fiscal policy seem to be non-linear. Unfavourable fiscal conditions initial, namely a rapidly growing debt/GDP ratio, affect the effectiveness of fiscal policy.;
- non-Keynesian effects affect the size of the fiscal multiplier but do not change its sign. our findings are in line with the Keynesian thinking as regards to the sign of the fiscal multiplier. They contradict in this respect the results of Alesina and Perotti (1997) and Alesina and Ardagna (1998);
- non-keynesian effects can be found between the mid-Eighties and the late Nineties in small open economies and Italy. However, non-linear effects seem to be the result of specific conditions and do not necessarily reflect the intrinsic impotency of fiscal policy in small open economies. We find no evidence that fiscal policy in small open economies should be less effective that in the main economies of the euro area. The sensitivity of the budget balance to the cycle, and thus the size of automatic stabilisers, seem to be higher in small open economies. A higher penetration ratio reflects a deeper trade integration, but not necessarily a higher propensity of local consumers to import foreign products.

Overall, while non-Keynesian effects may appear if the long-run sustainability of public finances is in doubt, traditional Keynesian effects can be expected in normal (non crisis) conditions. Thus, we remain confident that if the objectives of the SGP are met, fiscal policy remains an adequate instrument to accommodate cyclical divergences. Section II reviews the literature on non-Keynesian effects, highlighting the importance of initial fiscal conditions. Section III presents new evidence of non-linear effects of fiscal policy variables on national saving. Section IV concludes.

2. The case for non-Keynesian effects

It is generally accepted that plans aiming to reduce government debt and deficit have positive supply-side effects in the long term, since they are

associated with lower interest rates and, possibly, a lower tax burden According to the standard Keynesian view, however, a fiscal contraction creates a downturn in the short run. This standard view has been challenged by various economists providing evidence of Ricardian effects, or, more surprisingly, of successful fiscal adjustments, with positive GDP effects occurring almost immediately after the implementation of fiscal consolidation programs. These episodes question the effectiveness of fiscal policy in small open economies.

2.1 Review of previous work on non-Keynesian effects

Over the past three decades, the Keynesian view of fiscal policy, still incorporated in most macro-econometric models, has been challenged by the revival of the so-called "Ricardian equivalence" theorem (Barro, 1974). According to this theorem, private agents fully discount the reduction (increase) in future tax rates that will result from a permanent reduction (increase) in government spending. Ricardian equivalence rests on a number of strong assumptions, including full certainty about future taxation and government spending, identical planning horizons in the private and the public sector, and full access of households to capital markets. Empirical estimates of consumption functions, taking into account the government deficit as an explanatory variable, suggest that full Ricardian equivalence is generally not relevant, i.e. general private consumption responds negatively to fiscal tightening. However, Ricardian equivalence holds as a close approximation in countries with extremely high public debt/GDP ratios, such as Belgium and Italy in the Eighties (Nicoletti, 1988).

Going one step further, three non-mutually exclusive views explain why fiscal policy can have non-linear effects:

- the first one emphasises the role of expectations of future tax liabilities. In the model of Bertola and Drazen (1993), households are rational and Ricardian equivalence holds, but government expenditures are effected by a positive drift. As long as the expenditure to GDP ratio remains low, a rise in government spending is almost completely offset by a decrease in household consumption, since private agents are Ricardian. But when government expenditures reach a higher level, any further increase in government spending raises the probability that an adjustment will occur (in Bertola and Drazen terminology, expenditures approach a "trigger point" at which an adjustment has some probability

of occurring). An interesting implication of their model is that consumption behaviour exhibits a Keynesian pattern before a stabilisation occurs, and a Ricardian when it occurs, as seems to have been the case in the Danish and Irish experiences. The model proposed by Sutherland (1997) exhibit Keynesian behaviour in "normal times" and anti-Keynesian behaviour in "bad times". When the public debt-to-GDP ratio approaches a critical point, agents realise that they will not be able to shift the tax burden onto the next generation. Therefore, they behave in a Keynesian way as long as public debt is low, and become increasingly anti-Keynesian as the probability of their being taxed increases. As in the model of Bertola and Drazen, non-linearities are related to the initial level of debt as a percentage of GDP;

- the second source of expansionary effects is the credibility argument on interest rates. At high (or rapidly increasing) levels, public debt may face an interest rate premium due to the inflation or default risks. A vigorous fiscal adjustment can reduce risk premia and improve investors' expectations. Investment may be stimulated immediately if firms expect an increase in the net return of their capital stock associated with a decline in the rate of return for financial assets that would offset, or even more than offset, the fall in aggregate demand due to the reduction in government spending and the increase in taxation;
- the third view, developed by Alesina and Perotti (1997) and Giavazzi and Pagano (1990), emphasises the composition effect of the adjustment on labour market institutions and labour costs. The analysis of the stabilization role of fiscal policy traditionally focuses on its demand-side effects, while supply-side effects are seen as more important over the longer term. However, supply-side effects of fiscal policy can have short-term demand-side consequences because of expectations that longer-term growth will be affected. Alesina and Perotti identify two main ingredients of successful fiscal adjustments: the adjustment must be expenditure based and should be accompanied by agreements with the unions (guaranteeing wage moderation) and/or currency devaluation. By contrast, tax increases (particularly labour and social security taxes) lead to a rise in the cost of labour and a fall in competitiveness, as wage demands increase. Giavazzi and Pagano argue that a large adjustment, by inducing a permanent change of fiscal regime, can be expansionary because expectations are less likely to be affected by smaller adjustments.

2.2 Does the size of the country matter?

Two cases which are often quoted as clear demonstrations of non-Keynesian effects of fiscal consolidation are Denmark and Ireland in the 1980s (Alesina and Ardagna, 1998; Giavazzi and Pagano, 1990). This finding questions the role and effectiveness of fiscal policy in small open economies. Do the anti-Keynesian effects stem from temporary unfavourable initial fiscal conditions or from some specific features of small open countries?

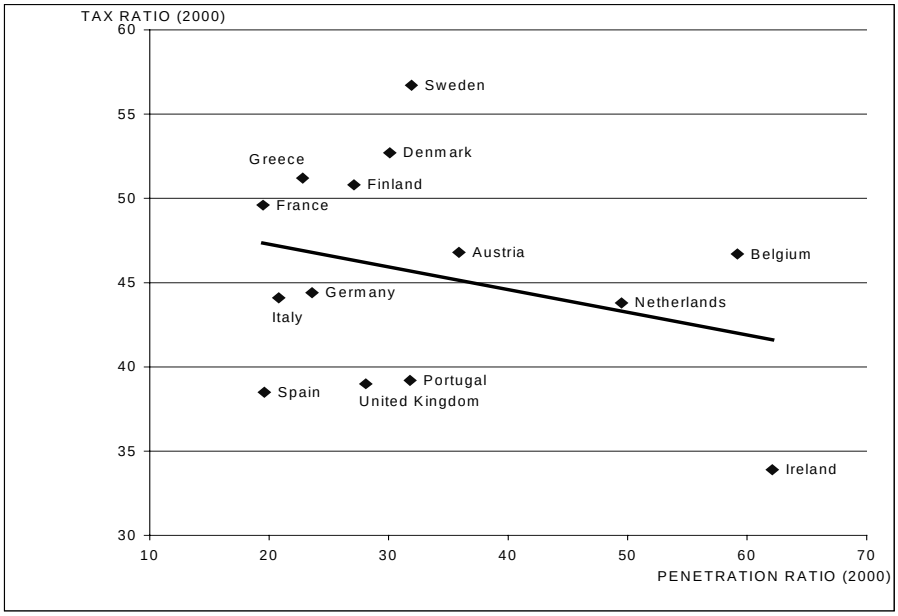
The effectiveness of fiscal policy as a stabilisation tool depends on two main elements: the size of the automatic stabilisers (defined as the semi-elasticity of the public balance *vis-à-vis* GDP fluctuations) and the sign and size of the fiscal multiplier. Small open economies display some specific characteristics as regards these two elements: on the one hand, they have some of the world's largest automatic stabilisers; on the other hand the fiscal multiplier is presumed to be lower as a large proportion of a fiscal stimulus leaks abroad *via* higher imports.

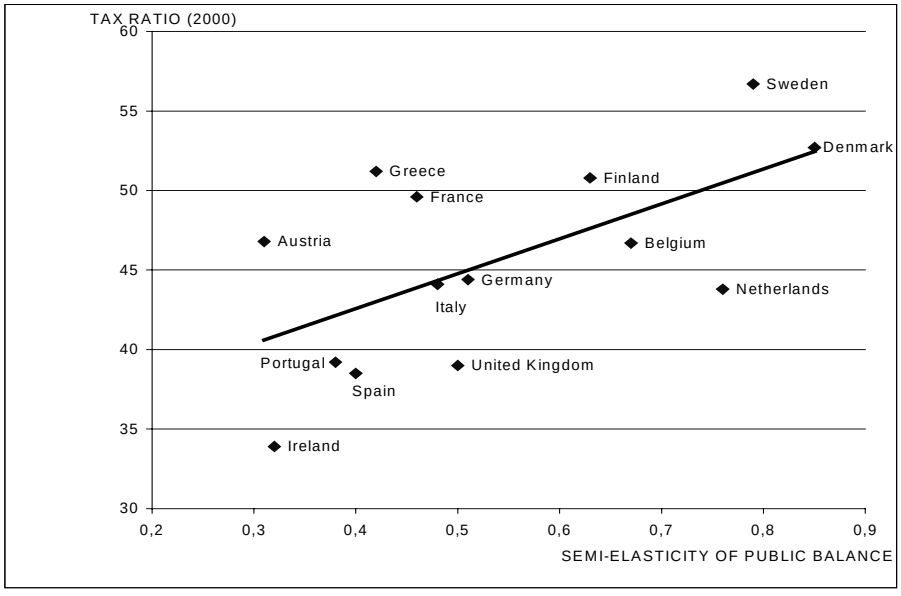
Small, highly open economies have some of the world's largest governments (Figure 1). Two reasons may explain this robust association between an economy's exposure to foreign trade and the size of the tax burden. First, government expenditures are used to provide social insurance against external risk (Cameron, 1978 and Rodrick, 1988). This in turn results in larger demand for government transfers in small open economies. Second, Alesina and Wacziarg (1997) underscore the country size effect on government consumption. To the extent that there are fixed costs and economies of scale linked to the supply of public goods, the cost of public goods can be spread over a larger pool of taxpayers in larger countries. By contrast, *per capita* expenditures should be higher in smaller countries, leading to a larger share of government in GDP.

The sensitivity of the public balance to GDP variations and hence the size of automatic stabilisers is strongly correlated with the size of the tax ratio. It also depends on the sensitivity of budget items to fluctuations in output. There is evidence that, across countries, government size and cyclical sensitivities of taxes and transfers are correlated. For example, van den Noord (2000) documents that, in a sample of OECD countries, larger governments are associated to larger elasticities, especially on the expenditure side. Overall, the size of automatic stabilisers is comparatively larger in small open economies, with the exception of Ireland.

Figure 1

Openness and the size of automatic stabilisers





Source: van den Noord (2000); OECD (2001).

Although small open economies have larger automatic stabilisers, the fiscal multiplier is presumed to be lower. According to the literature, fiscal multipliers are more likely to be positive and large when the economy is close or when the exchange rate is fixed. By contrast, it is widely presumed that the effectiveness of government intervention is lower in economies that are highly integrated in the world economy, for two reasons. First, their propensity to import should be higher, as they are more open to foreign trade. Second, when capital mobility is high, a flexible exchange rate acts as a brake on the multiplier: the exchange rate appreciates in response to fiscal expansion, especially if expectations are rational and if the expansion is perceived to be permanent. The smaller the country, the higher the crowding out effect.

3. An empirical analysis of fiscal adjustment in European countries

The economic impact of a fiscal contraction depends on a number of factors, some of which are mutually offsetting. The question of whether deficit reduction will raise or lower output, and especially how long it will take before positive effects materialise, is in the end an empirical question. A large variety of empirical strategies have been carried out to test the existence of non-Keynesian effects. Three main lessons can be drawn from available studies : the size of the fiscal multipliers tends to be smaller than traditionally estimated in standard Keynesian macroeconomic models (Cour *et al*., 1996); they seem to have decreased over time as a consequence of more forward-looking behaviours assumed for economic agents in the most recent macro-models (Hemming *et al.,* 2000); there is little evidence of non-linear effects of fiscal policy. This can be explained, among other things, by the very limited variance of fiscal variables such as debt and tax burden over time. By contrast, the panel data methodology seems more promising as it uses the variance of fiscal variables across countries.

3.1 Searching for non-linear effects of fiscal policy

To investigate the interplay between fiscal changes and economic performance, we study the economic effects of fiscal variables across 15 European Union countries over the 1970-2001 period. The panel data methodology we use seems well suited to assess the impact of fiscal

variables (such as the debt and the tax burden) which exhibit a high degree of inertia over time at the country level.

Among the array of variables highlighted in the empirical literature on the determinants of the gross national saving rate, this paper takes into account the cyclical position of the economy – as measured by the output gap – the real interest rate, the ratios of government revenues and expenditures to potential GDP, the interest payments on public debt (as a share of GDP) and the variation in the debt-to-GDP ratio. Assuming that automatic stabilisers are perfectly reversible, cyclical balance components of government balance sum up to 0 over the business cycle and private agents should only react to structural deterioration in general government balance. Following Giavazzi *et al.* (2000), we try to detect the occurrence of non-Keynesian effects trough the national saving channel stemming from the expenditure side, the revenue side or a fast growing debt when the primary cyclically-adjusted balance varies significantly (in table 3, we display different fiscal episodes where primary cyclically-adjusted balance changes by more than one percentage point of GDP).

According to these criteria, two groups of countries can be considered. A group of low performer countries includes countries that display large fiscal deficits and high debt to GDP ratios on average across the period under review: this group includes small open economies (Belgium, Denmark, Greece, Ireland, Sweden) and Italy. The other group covers countries that did better on average even if they may have faced some substantial deterioration of their public finances in some circumstances (Austria, France, Germany, the Netherlands, Portugal, Spain, United Kingdom).[1]

To test the existence of non-linear effects, a set of dummies variables has been attached to different explanatory variables, namely public spending, taxes and debt as a share of GDP (Table 4). The main challenge of this type of estimation is to correct for the endogeneity bias of fiscal variables. This endogeneity bias essentially stems from the existence of automatic stabilisers built into tax revenues and expenditure variables, which tend to fluctuate with the business cycle and are affected by the same shocks as the national saving ratio. To address this issue, we instrument the net taxes by the primary cyclically-adjusted budget balance, the real interest rate by its lagged value, and public spending by public

[1] Because data lack for Luxemburg and Greece, only 13 countries are covered in the estimates.

consumption, excluding, by definition, interest payments, capital expenditures and public transfers. For a similar purpose, potential GDP was substituted for actual GDP as a denominator, except for interest payments and changes in debt to GDP ratios.

$$\frac{S_t}{Y_t^*}=\alpha_0+\alpha_1\frac{S_{t-1}}{Y_{t-1}^*}+\alpha_2\frac{Y_t-Y_t^*}{Y_t^*}+\alpha_3 r_t+\alpha_4\frac{T_t}{Y_t^*}+\alpha_5 d_t\frac{T_t}{Y_t^*}+\alpha_6\frac{G_t}{Y_t^*}+\alpha_7 d_t\frac{G_t}{Y_t^*}+\beta_1\frac{I_t}{Y_t}+\gamma_1 d_t\Delta\frac{D_t}{Y_t}$$

Long-run parameters from pooled country regressions are presented in table 6 annex 2, where significant results are bold-faced written. The main findings are the following:

- our results are in line with the Keynesian thinking as regards to the sign of the multiplier. Non-Keynesian effects can be found between the mid-Eighties and the late Nineties in small open economies and in Italy. However, these non-linear effects affect the magnitude of the fiscal multiplier but do not change its sign;
- the response of national saving to fiscal policy may indeed be non-linear for countries experiencing a deterioration in their fiscal position. Those countries are typically small open economies, with the exception of Italy;
- in particular, these non-linearities may be characterised as anti-Keynesian effects in two cases: in the case of a substantial deterioration in the primary cyclically-adjusted budget balance, a decrease in cyclically adjusted tax receipts leads to a rise in national saving, meaning that the private saving ratio more than offsets a fall in public saving (i.e. pools 3 and 6); in the case of a substantial increase in debt to GDP ratio, an increase in public spending results in an increase in national saving for the same reason (i.e. pool 6);
- this result holds when we introduce a precautionary motive in the saving ratio (i.e. the impact of the unemployment rate on saving behaviour) and when we correct for the cyclical position (proxied by the output gap);
- some non-Keynesian effects can also be found in several European countries, irrespective of their size or their past performance in public finances, during the run-up to EMU. These effects can be labelled as 'policy-induced' Ricardian equivalence (Cotis *et al*., 1998). Rather than supporting the tax-discounting hypothesis *per se* this evidence suggests

that consumers could easily anticipate coming fiscal retrenchments in the mid-Nineties.

In order to corroborate these conclusions, we have run a regression to explain private consumption for both sets of countries (results are reported in Table 7 annex 3). Besides traditional explanatory variables such as lagged dependent variables, real disposable income, private consumption deflator, we include public finance variables (the ratio of general government balance to disposable income) and future debt-to-GDP ratio.[2] Public finance variables improve the estimate. But the future debt ratio is a statistically significant explanatory variable for "low performer" countries only.

3.2 Is fiscal policy intrinsically less effective in small open economies?

It is difficult to argue from our results that fiscal policy should be intrinsically less effective in small open economies. The non-linear effects are found only from the mid-Eighties, at a time of rapidly deteriorating fiscal positions. In normal times (i.e. before the mid-Eighties) no "non-Keynesian" effects can be found. To investigate this issue further, we look at both international macro-econometric models and foreign trade equations.

The size of fiscal multipliers is model dependant. However, the important point to make here, is that in each international macro-model, the fiscal multipliers are of comparable size across European countries. In the Quest model used by the European commission, for example, the value of the public expenditure multiplier does not seem to be inversely correlated with the size of the country (see Table 1 below). When exchange rate are fixed, as it is the case now in EMU, fiscal policy is not hindered by interest rate rise and exchange rate movements as long as monetary policy can accommodate the new fiscal stance. Interest rate and exchange rate remain stable and the crowding out effect tend to be small or even null whereas spill over effects are important.

The small discrepancy between the multipliers stems from the fact that a fiscal impulse given by a same country will trigger a much smaller

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[2] This variable may be interpreted as follows: assuming that the effective debt level at period t+1 is the forecast made at period t, a perceived deterioration of government solvency leads households to anticipate a fiscal policy adjustment trough tax increases at some point.

reaction from the central bank than a fiscal impulse coming from a larger size country. In a fixed exchange rate framework and obviously so in a currency union such as the euro zone, this leads to rather similar public expenditure multipliers across Euro area countries, as the higher expected impact for large countries is offset by interest rate hike. It brings a rather different picture from other macro models that display a much wider range of estimates when no monetary policy reaction is assumed.

Table 1

Short-term public expenditure multipliers
(assuming fixed exchange rate)

AUSTRIA	0.5
BELGIUM	0.5
FINLAND	0.4
FRANCE	0.5
GERMANY	0.4
GREECE	0.5
IRELAND	0.4
ITALY	0.5
NETHERLANDS	0.4
PORTUGAL	0.7
SPAIN	0.5

Source: EC (2001).

We also run some simple regressions on foreign trade to investigate whether a higher penetration ratio in small open economies reflects a deeper integration in world trade or a higher propensity of local consumers to import foreign products. Since the time-horizon to assess the impact of fiscal policy on the economy is commonly acknowledged to be between

one or two years, we only take the short term elasticities into consideration. Our results (Table 2)[3] are the following:

- the short-run elasticity of imports to domestic demand is similar across countries;
- the responsiveness of imports to exports is higher in small open economies (with Portugal being an iutlier). This suggests that the higher penetration ratio is associated with the higher import content of export rather than the higher marginal propensity to import of final domestic demand.

Some interesting policy implications emerge from our findings as regards the effectiveness of fiscal policy in EMU:

- the small open economies are well equiped as the size of automatic stabilisers is large. Ireland stands as an outlier as the tax burden is significantly below EU average;
- moreover, monetary Union should reinforce the role of fiscal policy in small open economies, as the effects of a fiscal stimulus (contraction) on aggregate demand is not reduced by a endogenous decline (increase) in interest rate or exchange rate. Moreover, a smaller economy will have a smaller effect on the average variables of the euro area and thus on the decision making of the ECB;
- the effectiveness of discretionary fiscal policy is not hampered by a higher propensity to import. However, even non-altruistic households may interiorise a policy reaction function of the fiscal authorities if if a government is bound by a fiscal rule. For example, if the public deficit approaches the 3 per cent of GDP benchmark in a future recession, then even individuals who do not have very long time horizons may adjust their saving behaviour to at least partially prepare for higher future taxes.

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[3] The results given in Table 4 are derived from an error correction model. We work on annual data for the period 1978-1999 and follow a standard Engle and Granger two-stage strategy:

Long-term equation:
Log(imports) = c(1) × Log(Domestic Demand) +c(2) × Log(Exports) + c(3) × Log (Competitiveness)+c(4)

Short term equation:
dlog (Imports) = c(5) × dlog(Domestic Demand) +c(6) × dlog(Exports) +c(7) × Residual(–1) +c(8)

We present in Table 4 the value of c(6) – column 1 – and c(5) – column 2 – for a number of European countries.

Table 2

Foreign trade (1978-2001)

(t-stat values are reported below coefficient estimates)

	SHORT-TERM ELASTICITY OF IMPORTS TO EXPORTS	SHORT-TERM INCOME ELASTICITY OF IMPORTS
GERMANY	0.57 (9.9)	0.95 (10.9)
FRANCE	0.48 (7.6)	1.91 (10.6)
ITALY	0.56 (7.6)	2.11 (10.0)
SPAIN	0.20 (1.2)	2.47 (9.2)
UNITED KINGDOM	0.39 (2.8)	1.35 (7.7)
AUSTRIA	0.97 (9.5)	0.52 (1.9)
BELGIUM	0.86 (13.5)	0.78 (7.1)
DENMARK	0.59 (5,1)	1.40 (10.0)
IRELAND	0.58 (5.9)	1.24 (8.3)
NETHERLANDS	0.80 (9.7)	0.88 (8.5)
FINLAND	0,55 (5.1)	1,43 (6.3)
PORTUGAL	0.25 (3.8)	1.82 (14.1)
SWEDEN	0.64 (7.2)	1.38 (9.4)

(1) Source: OECD data base.

4. Conclusion

The adoption of a common monetary policy in Europe has eliminated the possibility of using monetary policy for the stabilisation of country-specific shocks. The main remaining instrument in the hands of national authorities to stabilise local macroeconomic conditions, is fiscal policy.

In this paper we have searched systematically for the circumstances in which national saving responds non-linearly to fiscal policy impulses. Given the complexity of the interactions among economic growth, interest rate movements, and reductions in debt ratios, no study can definitively establish clear lines of causality. However, the evidence confirms some previous findings and supplements them with a few new ones. There is no reason to believe that fiscal policy should be less effective in small open economies. First the automatic stabilisers seem to be more important in those countries, as highlighted by a higher semi-elasticity of the public balance *vis-à-vis* GDP. Second, the effectiveness of discretionary fiscal policy can be hampered by a high level of public debt, not by a higher propensity to import.

One way of reconciling the correlation between country size and the fragility of public finances over the past decades is to argue that small open economies are more subject to external shocks. When an external shock occurs, the automatic stabilisers are powerful, as small open economies exhibit a high sensitivity of the public balance to GDP swings. Moreover, fiscal stimulus may be needed if the shock is substantial or country-specific. Consequently, the position of the budget balance may deteriorate rapidly, making small open economies more prone to episodes of fiscal crises.

ANNEX 1

Table 3

Fiscal episodes
(1970-2001 period)

Fiscal contraction or expansion respectively corresponds to a positive / negative variation of the primary cyclically-adjusted budget balance superior to 1 percentage point in absolute value

COUNTRIES	FISCAL CONTRACTION	FISCAL EXPANSION
FRANCE	1979, 1983, 1996, 2001	1978, 1981, 1988, 1992
GERMANY	1982-83, 1989, 1992-93, 1997	1975, 1979, 1990-91
AUSTRIA	1977, 1984, 1992, 1996-97, 2001	1973, 1975-76, 1982, 1986, 1993-94
BELGIUM	1977, 1982, 1984-85, 1987, 1990, 1993	1972, 1976, 1979-81, 1988, 1991
UNITED KINGDOM	1980-82, 1995-98, 2001	1983, 1990, 1992-93
GREECE	1982, 1986-87, 1991-94, 1996, 1998	1981, 1985, 1988-89, 1995
IRELAND	1982-84, 1987-89, 1996, 2000	1978, 1979, 1990, 1995
ITALY	1970-77, 1980, 1982-83, 1986, 1989, 1991-93, 1995, 1997	1972, 1975, 1978-79, 1981, 1985, 1994, 1998
SPAIN	1975, 1979, 1983, 1986-87, 1992, 1996	1974, 1982, 1988
PORTUGAL	1977, 1982, 1984, 1992, 1995	1972, 1974, 1976, 1978, 1981, 1987, 1990, 1993
THE NETHERLANDS	1977, 1981-83, 1985, 1988, 1991, 1993, 1996, 1999	1974, 1976, 1978, 1986, 1989, 1990, 1994, 2000
SWEDEN	1971, 1976, 1983, 1987, 1995, 1998	1973, 1974, 1978, 1979, 1988, 1990-92, 1999
FINLAND	1971, 1975, 1976, 1981, 1984, 1993, 1998, 2000	1971, 1974, 1978-80, 1982, 1987, 1991
DENMARK	1983, 1984, 1986, 1993-99	1972, 1975, 1976, 1979, 1982, 1994

Table 4

Dummies variables showing anti-keynesian effects
Fast growing debt ratio interacting with expenditure ratio in case of fiscal expansion (d6)

Countries	Years during which d6 = 1
France	1982, 1984 and 1985, 1992 to 1998
Germany	1975, 1982, 1983, 1990 to 1993, 1995, 1996, 1998
Austria	1975, 1982 to 1988, 1990, 1991, 1993 to 1995, 1999
Belgium	1975 to 1994, 1996
United Kingdom	1980, 1984, 1990, 1992, 1993, 1995 to 1998
Ireland	1975, 1976, 1978 to 1988, 1993
Italy	1981 to 1998
Spain	1982 to 1986, 1989 to 1998
Portugal	1995, 1999, 2000
The Netherlands	1979 to 1986, 1988 to 1993, 1995
Sweden	1979 to 1984, 1986, 1991 to 1995
Finland	1991 to 1995
Denmark	1981 to 1984, 1990 to 1993

Table 5

Tax receipts to GDP ratio interacting with a fiscal expansion

Countries	Years during which d33 = 1
France	1978, 1981, 1988, 1992
Germany	1975, 1979, 1990, 1991
Austria	1973, 1975, 1976, 1982, 1986, 1993, 1994
Belgium	1972, 1976, 1979 to 1981, 1988, 1991
United Kingdom	1983, 1990, 1992, 1993, 2000
Ireland	1978, 1979, 1990, 1995
Italy	1972, 1975, 1978, 1979, 1981, 1985, 1994, 1998
Spain	1974, 1982, 1988
Portugal	1972 to 1974, 1976, 1978, 1981, 1987, 1990, 1993
The Netherlands	1974, 1976, 1978, 1986, 1989, 1990, 1994, 2000
Sweden	1973, 1974, 1978, 1979, 1988, 1990 to 1992, 1999
Finland	1972, 1974, 1978 to 1980, 1982, 1987, 1991
Denmark	1972, 1975, 1976, 1979, 1982, 1994

ANNEX 2

Table 6

«Low performer» countries (1970-2002)
Panel data estimation with fixed effect
Dependent variable: National Saving to GDP Ratio[4]

1970-2002	Pool 1	Pool 2	Pool 3	Pool 4	Pool 5	Pool 6
National saving ratio (–1)	0.745 (0)	0.734 (0)	0.764 (0)	0.636 (0)	0.755 (0)	0.657 (0)
Output gap	0.217 (0)	0.221 (0)	0.219 (0)	0.254 (0)	0.167 (0)	0.247 (0)
Real interest rate	–0.076 (0)	–0.067 (0.001)	–0.061 (0.002)	–0.037 (0.074)	–0.089 (0)	–0.058 (0.027)
Tax receipts	0.225 (0)	0.252 (0)	0.236 (0)	0.262 (0)	0.266 (0)	0.379 (0)
-and large change in primary CAB (d1)		–0.036 (0.281)				
-and large increase in primary CAB (d3)			–0.007 (0.849)			–0.028 (0.525)
-and large decrease in primary CAB (d33)			**–0.076** (0.037)			**–0.083** (0.052)
-and rapid debt growth (d5)					–0.021 (0.646)	–0.076 (0.121)
Government consumption	0.014 (0.043)	0.012 (0.101)	0.001 (0.148)	0.037 (0)	0 (0.976)	0.008 (0.476)
-and large change in primary CAB (d2)		–0.002 (0.561)				
-and large decrease in primary CAB (d4)			0.002 (0.625)			0.005 (0.344)
-and large increase in primary CAB (d44)			–0.012 (0.018)			–0.009 (0.102)
-and rapid debt growth (d6)					–0.002 (0.72)	**0.018** (0.041)
Interest payment on public debt				–0.201 (0)		–0.218 (0)

(The p-values are reported between parentheses).
Adjusted R2: 0.95 SE: 0.896 DW: 2.06 SSR: 100.46

[4] In OECD database we used, national saving figures are not reported. We proxied this variable by adding up public saving and household saving.

ANNEX 3

Table 7

«Low performer» countries (1970-2002 period)
Panel data estimation with fixed effect
Dependent variable: Private Consumption

Included observations: 32 after adjusting endpoints Number of cross-sections used: 6 Total panel (unbalanced) observations: 156				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Consumption (–1)	1.152380	0.075	15.3	0.0000
Consumption (–2)	–0.209576	0.069	–3.0	0.0030
Real disposable Income	0.382682	0.055	7.0	0.0000
Real disposable Inc. (–1)	–0.317822	0.061	–5.2	0.0000
Deflator (–1)	–0.226356	0.046	–4.9	0.0000
GG balance to Disposable income ratio (–1)	–0.001456	0.000	–4.5	0.0000
Public debt to GDP ratio (+1)	–0.030251	0.007	–4.3	0.0000
Fixed Effects ITA--C BEL--C DNK--C FIN--C SWE--C IRE--C	 –0.285524 –0.245466 –0.225918 –0.237534 –0.231757 –0.194602			
R-squared	0.999977	Mean dependent var		10
Adjusted R-squared	0.999976	S.D. dependent var		3.43
S.E. of regression	0.016956	Sum squared resid		0.04
Durbin-Watson stat	1.959224			

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DEVELOPING AN INDICATOR OF FISCAL STANCE FOR NEW ZEALAND

Renee Philip[*] *and John Janssen*[**]

1. Introduction

Assessments of short-term fiscal policy often use terminology such as a "tight (or loose) fiscal stance" or "contractionary (or expansionary) fiscal policy".[1] The aim of this essay is to investigate an indicator of fiscal stance for New Zealand. Simple indicators of fiscal stance can form a useful part of a fiscal analysis toolkit – alongside measures of the structural fiscal position, analysis of tax and spending trends and drivers, and longer-term fiscal projections. Simple indicators of stance may enhance the *ex post* interpretation of fiscal policy as well as helping to identify relatively large *ex ante* forecast changes in fiscal policy. However, we do not see an indicator of fiscal stance as some sort of "stop" or "go" trigger for fiscal policy initiatives. Policy initiatives should also be assessed with reference to underlying micro-economic and public finance analysis. Ideally, fiscal stance indicators would be augmented with assessments derived from macroeconomic and time series models. Although assessments of fiscal stance may play an information role, our analysis constitutes a significant health warning to their unqualified use.

This essay is set out as follows. Section 2 gives a brief summary of fiscal policy in New Zealand in the 1990s. Section 3 sets out definitions of fiscal stance and discusses some of the limitations of simple indicators. Section 4 outlines issues that arise in calculating an indicator of fiscal stance. Section 5 provides estimates and sensitivity analysis of the fiscal stance for New Zealand. Finally, Section 6 provides concluding remarks.

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[*] Currently on secondment from the New Zealand Treasury to the Reserve Bank of New Zealand (PO Box 2498, Wellington, New Zealand. PhilipR@rbnz.govt.nz).

[**] New Zealand Treasury (PO Box 3724, Wellington, New Zealand. john.janssen@treasury.govt.nz).

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[1] Two typical examples include the Economist's assessment of UK fiscal policy ("The fiscal arithmetic: Luck and judgment", *The Economist*, March 25, 2000, p. 66) and the International Monetary Fund (IMF) assessment of Irish fiscal policy (IMF, 2001a).

2. Fiscal policy in New Zealand

Because of the limited availability of fiscal information on a consistent basis, we start our estimates of fiscal stance in the early 1990s.[2] Key points of New Zealand fiscal policy relevant for analysis of fiscal stance are:

- A swing from consecutive operating deficits to consecutive operating surpluses from 1994 and a significant reduction in debt.
- Fiscal projections in the mid 1990s suggested scope for a fiscal adjustment, and the then Government announced tax reductions and additional spending.
- Looking forward, the current Government is aiming to run operating surpluses.

One of the requirements of the Fiscal Responsibility Act 1994 is for the Government to set long-term fiscal objectives. The current Government's approach is to run operating surpluses sufficient to make contributions to the partial pre-funding of future pension costs (New Zealand Superannuation), while meeting capital spending demands and keeping debt at prudent levels. In setting its fiscal policy plans the Government aims to make progress toward its long-term fiscal objectives, while letting the automatic fiscal stabilisers operate in the short-term.

The Government formulates its budget to ensure that aggregate levels of taxation and spending (including forecast new operating and capital spending) are consistent with progress toward its long-term fiscal objectives. Adjustment towards fiscal objectives will result in changes to the fiscal balance over time, and therefore possible changes in the fiscal stance. These changes in the fiscal stance are not necessarily a deliberate attempt to influence aggregate demand, but are the consequence of a number of individual budget decisions and progression towards the long-term fiscal objectives.

Governments may also be concerned about macroeconomic stability and therefore the potential short-term impact of fiscal policy on aggregate demand. For example, strongly pro-cyclical fiscal policy could place additional pressure on monetary policy and lead to undesirable swings in

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[2] The Crown Financial Statements are based on Generally Accepted Accounting Practice (GAAP) and were first published in the early 1990s.

interest rates and the exchange rate. Because large changes in the fiscal stance may have an impact on aggregate demand in the economy, they will need to be taken into account by the Reserve Bank of New Zealand (RBNZ), which operates to achieve an inflation target.

In New Zealand, co-ordination between monetary and fiscal authorities does not take the form of the authorities acting to pursue joint policy objectives. Rather, the fiscal policy and monetary policy frameworks emphasise transparency. In the case of the mid-1990s tax reductions there was active consultation between New Zealand's monetary and fiscal authorities. A fiscal stance indicator would complement existing fiscal indicators used by the New Zealand Treasury, such as the estimated structural fiscal balance (see Tam and Kirkham, 2001). A key task of this indicator is to assess the trend in the structural fiscal position (see the New Zealand Treasury's Briefing to the Incoming Government, 1996 and 1999). The fiscal balance currently used in this calculation is the OBERAC (Operating Balance Excluding Revaluations and Accounting policy Changes), which is discussed in Section 4.1.

3. Definitions, limitations and other approaches

3.1 Definitions

There is no standard definition of fiscal stance, although some measure of the fiscal balance is typically involved. In this context, changes in fiscal stance are often defined as the change in the fiscal balance, where this change is typically described as the fiscal impulse. The change measure indicates that even though the fiscal balance may be in deficit, fiscal policy can be tighter (looser) than the previous period if the deficit is smaller (larger). An increase (decrease) in the deficit (surplus) therefore represents an expansionary fiscal impulse. Wells (1995) notes two drawbacks in using the change in the fiscal balance as an indicator of fiscal policy effects:

- Both changes in private-sector demand and fiscal instruments (tax rates and spending plans) can influence the actual fiscal balance. The most common approach to this drawback is to estimate a cyclically-adjusted or structural fiscal balance.
- Because of inherent differences in each of the fiscal instruments, they should be weighted to reflect their initial impact on aggregate demand.

This leads to the use of what is sometimes termed the "weighted budget balance".

In this essay, fiscal stance and fiscal impulse are generally defined in terms of discretionary policy that has an impact on aggregate demand. This excludes cyclical effects, which are considered non-discretionary. This definition is similar to that used by the UK Treasury (see HM Treasury, 1999). For example, consider the case of unemployment expenditure. Changes in unemployment expenditure occur through changes in unemployment numbers and/or changes in benefit rates. The effect of cyclical changes in unemployment numbers is considered non-discretionary and would be excluded from the measure of fiscal stance. The effect of changes in benefit rates is discretionary and would change the fiscal stance.

Although fiscal stance is defined in terms of discretionary fiscal policy, not all of the changes involved in the calculation will be straightforward. For example, an exogenous and non-cyclical increase in the number of hospital patients can require increased spending on healthcare. Although such exogenous factors are largely non-discretionary (for given health policy), a government will need to take them into account when making decisions. A government has the discretion over whether to accommodate non-discretionary changes, or to offset them with discretionary policy changes elsewhere in the budget.

Fiscal stance is attempting to measure whether the government's decisions are adding to, or subtracting from, demand pressures in the economy. We focus on the non-cyclical, or structural component given the potential role of automatic fiscal stabilisers.[3] For example, consider the case where forecasts indicate a significant deterioration in the overall fiscal balance. If this is due in large part to a forecast cyclical downturn, then although the change appears expansionary, it is reflecting the role of automatic stabilisers. The onset of the downturn may result in a fiscal deficit under policies that would otherwise have generated a balance or surplus.

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[3] Automatic stabilisers are those aspects of tax and spending systems that tend to smooth output over the economic cycle. For example, during an upswing, incomes tend to rise, resulting in higher tax receipts, while falling unemployment lowers unemployment expenditure. The strength of these stabilisers will depend on the specific features of the tax and spending systems. Often these features are the result of various policy decisions rather than any conscious decision to optimise the stabilising features of taxes and spending.

If the downturn does not eventuate then the extent of automatic fiscal stabilisation will have been less. The change in the actual fiscal balance would *ex post* appear less expansionary. Since we are interested in the stance of fiscal policy then it is important to distinguish between a loosening that arises from cyclical effects versus one that arises from discretionary changes. As discussed in the next section, the separation of cyclical and discretionary effects can be difficult. Reliance on automatic fiscal stabilisers needs to allow for their operation during both downturns and upturns, together with a reference to the medium-term fiscal position (for an assessment in the New Zealand context see Fowlie, 1999).

3.2 Limitations

Blanchard (1993) provides an important survey of the limitations to short-term fiscal indicators. First, the original purpose of the structural, or cyclically-adjusted balance (CAB) is to assess what the budget balance would be if the economy were at full employment. Changes in the CAB have subsequently been used to assess the effect of fiscal policy (e.g., an increase in the structural deficit is seen as expansionary).

However, Blanchard questions whether the CAB is well suited to this task. For example, fiscal policy operates through two main channels, the distortions created by the tax/incentive structure and the effect of fiscal policy on aggregate demand. He argues that the CAB is only aimed at this latter channel. Second, Blanchard draws a distinction between the impact effect of fiscal policy and the final effect, where the latter requires consideration of general equilibrium effects on interest rates, exchange rates and output. In Blanchard's view an indicator can only measure impact effects and even then he is doubtful about the use of the CAB. For example, a measure of fiscal impact will also depend on assumptions about the future because consumption does not depend only on current income.

A more detailed analysis along weighted budget balance lines would introduce significantly more judgement than the simple indicator of fiscal stance developed here. One of the relevant factors to consider when assessing whether a "tighter" fiscal stance will actually have a contractionary impact on the economy is the composition of the change in fiscal policy (e.g., between changes in taxes, transfer payments, investment or public sector wages).

To address some of the limitations with using a simple indicator, work in Treasury in the mid 1990s focused on developing an *Economic and Fiscal Indicator* (see Treasury's Briefing to the Incoming Government 1996, p.61). A summary of the EFI is given in the Annex. Even the EFI could not provide a complete assessment of the impact of fiscal policy on the economy because it is only a partial model. For example, it does not contain a supply side, or a monetary policy reaction function.

Finally, it is not clear from a theoretical or empirical perspective what the short-term effects of fiscal policy are. Makin (1998) provides a summary of some of the key considerations in an open-economy setting. During the 1990s a series of papers examined the effect of large fiscal consolidations, often finding that these can be expansionary. This was in contrast to the predictions of standard Keynesian-type models where a fiscal contraction reduces aggregate demand and output through multiplier effects. For example, Giavazzi and Pagano (1990) considered fiscal contractions in Denmark and Ireland during the 1980s, finding that large reductions in cyclically-adjusted fiscal deficits were associated with increases in private sector consumption. Alesina and Perotti (1996) examine seven consolidations (in Denmark, Ireland, Belgium, Canada, Italy, Portugal and Sweden), also finding positive effects on the growth of private consumption. Perotti (1999) investigates the role of initial fiscal conditions in determining the effects of changes in fiscal policy.

3.3 Other approaches

An indicator of fiscal stance will only ever be, at best, a guide to the initial impact of fiscal policy. For example, an increase in government spending could add to demand pressures in the first instance. However, as firms and households react to this increase in government spending, they may change their investment and consumption behaviour. A simple indicator of fiscal stance does not capture these second-round effects. The final effect of fiscal policy on aggregate demand needs to take account of the dynamic effects through time. As Blanchard (1993) argues, to make a more complete assessment of the effects of fiscal policy on aggregate demand requires a full-scale macroeconomic model.

There are a number of papers that use macroeconomic models to examine the effect of fiscal policy on the economy. For example, Hall and Rae (1998) examine the effect of a fiscal expansion in New Zealand using

the NBNZ-DEMONZ model. They consider how the results are dependent on the financial market response and the monetary policy reaction, and the difference between a fiscal expansion achieved through tax cuts and increased spending. Modelling the effect of fiscal policy using the New Zealand Treasury Model (NZTM) is an area for further work.[4]

As a complement to macroeconomic models, which through their assumptions can pre-determine the effect of fiscal policy (see Blanchard, 2000), Blanchard and Perotti (1999) use a structural vector-autoregression (VAR) approach to estimate the dynamic effect of fiscal policy on US economic activity. This approach takes into account not just the initial impact on the economy, but how the impact changes through time. Blanchard and Perotti use the observation that within a quarter, there is little or no discretionary response of fiscal policy to unexpected movements in economic activity. Combining this with institutional information about the tax and transfer systems as well as the timing of tax collections allows Blanchard and Perotti to construct estimates of the automatic effects of unexpected movements in activity on fiscal variables, and, by implication, obtain estimates of exogenous fiscal policy shocks. Having identified these shocks, they then trace their dynamic effects on output. The results consistently show that positive government spending shocks have a positive effect on output, and positive tax shocks have a negative effect. The multipliers for both spending and tax shocks are typically small, often close to one.

4. Calculating indicators of fiscal stance

Notwithstanding the limitations discussed in Section 3, we consider it useful to investigate estimates of fiscal stance based on an indicator type framework. Even so, there is no generally accepted indicator of fiscal stance. Developing an indicator of fiscal stance involves making a number of judgements, such as:

- The appropriate measure of the fiscal balance – including whether this is based on cash or accrual measures, whether it is based on operating flows or includes capital, whether or not it is calculated before net interest payments (i.e., primary balance), and which data source to use.

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[4] The New Zealand Treasury Model is currently being refined and documented (for example, see Szeto, 2001).

- Adjustments to capital transactions.
- The approach taken to isolating discretionary, or structural fiscal policy – for example, whether to use the two-step method (output gap with elasticities) or an indexed method.

4.1 The appropriate measure of the fiscal balance

The most commonly reported measure of the fiscal balance in New Zealand is the operating balance from the Statement of Financial Performance. The operating balance is an accrual measure based on Generally Accepted Accounting Practice (GAAP) and so reflects accounting standards. It includes non-cash items such as depreciation and the retained surpluses of State-owned enterprises and Crown entities. It also includes revaluation effects on net present valued liabilities of the Accident Compensation Corporation (ACC) and Government Superannuation Fund (GSF), gains or losses on asset sales and accounting policy changes (for example, changes around the recognition of assets and liabilities). These items are less likely to have a direct impact on aggregate demand than other income and spending items, although they may have second round or indirect effects. Two possible alternatives are to:

1. Start with the OBERAC and exclude non-cash items, the key items being depreciation and the retained surpluses of State-owned enterprises and Crown entities.[5]
2. Focus directly on a cash measure of the fiscal balance, for example, net cash flows from operations (NCFFO) from the Statement of Cash Flows.

NCFFO is the difference between cash operating receipts and cash operating expenditures. Although the path of depreciation over time is generally smooth, actual purchases of physical assets can occur in a more lumpy fashion and will include spending that increases the asset base. An indicator of fiscal stance based on NCFFO needs to incorporate capital expenditures directly. The judgements around capital are outlined in Sections 4.2 and 5.

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[5] See the December Economic and Fiscal Update 2001, pp. 60-61 for details on the OBERAC calculation. The materiality limit for OBERAC adjustments is $100 million.

A further point relating to the fiscal balance is the appropriate information source. Internationally, fiscal indicators are calculated from a range of sources, including budgetary accounts, the System of National Accounts (SNA) and Government Finance Statistics (GFS). Both SNA93 and revised GFS (GFS2001, see IMF, 2001b) are accrual frameworks based on statistical standards. The revised GFS framework is harmonised with SNA93 although the coverage of a particular category of transaction may differ slightly. Its primary aim is to provide a comprehensive conceptual and accounting framework for analysing and evaluating fiscal policy, especially the performance of the general government sector with a focus on taxes, spending, borrowing and lending (IMF, 2001b, pp.1-3). The fiscal balance in SNA and GFS that comes closest to our base definition is essentially "net lending/borrowing". In GFS, net lending is the net operating balance less net acquisition of non-financial assets. The GFS net operating balance is an accrual measure of revenues and expenses that includes depreciation as an expense. Depreciation cancels out of the calculation of GFS net lending since the calculation uses net investment. Our base indicator is somewhat wider than net lending as we include selected transactions in financial assets.

It would be useful to compare indicators of fiscal stance based on GAAP with those based on SNA and GFS. Statistics New Zealand (SNZ) prepares government sector accounts on an SNA93 basis for two purposes: the Institutional Sector Accounts (ISA) and the SNZ Crown Accounts. The government sectors (central and local) in the ISA are annual March year experimental series published with a lag (they are currently only available up until 1998).[6] The SNZ Crown Accounts are a narrower subset of the ISA government sector and are annual June year official series published with a lag of four to five months. Publication by SNZ of GFS accounts in line with the revised manual is a medium-term project. Overall this means that fiscal stance cannot be easily calculated on an SNA basis for the most recent years, or for the forecast period. Due to these data limitations, we restrict calculations to GAAP-based indicators.[7]

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[6] The central government sector (3.1) comprises government departments, offices of Parliament and most Crown entities. It excludes the RBNZ, which is included in sector 2.1 (financial intermediaries). State-owned enterprises are part of sector 1 (producer enterprises). The concept of core Crown in the GAAP financial statements excludes both State-owned enterprises and Crown entities (but includes the RBNZ).

[7] The New Zealand Treasury is currently involved in a project with SNZ that involves a reconciliation of GAAP and SNA fiscal information.

4.2 The appropriate measure of capital transactions

Ideally, the indicator of fiscal stance would include capital transactions that have an impact on aggregate demand. However, it is not always clear which transactions will affect aggregate demand, and it is likely that there are varying degrees of economic impact.

It is useful to examine how other countries adjust for capital. The UK Treasury uses public sector net borrowing as an indicator of the short-term impact of fiscal policy on the economy, so as to include investment decisions. Public sector net borrowing is defined as net investment less the surplus on current budget. The capital transactions included in public sector net borrowing are capital formation (acquisition of fixed assets, stocks and valuables net of any sales), plus net acquisition of land, and net payments of investment grants. The Australian Treasury (1997, 1999) uses net lending, which is the net operating balance less net capital investment.

The impact on aggregate demand will depend on the nature of the capital transaction. For example, sales of existing assets represent a transfer of resources and are unlikely to have a significant effect on demand. In addition, for a small open economy like New Zealand, many large government capital items are imported, for example defence assets, and therefore will not impact on domestic demand.

4.3 Approaches to identifying discretionary fiscal policy

There are a number of approaches that can be used to remove the effect of the economic cycle and so estimate the structural fiscal balance (see Giorno, Richardson, Roseveare and van den Noord, 1995; Bank of Italy, 1999; van den Noord, 2000). Most approaches use a two-step methodology that uses estimates of the output gap together with a set of elasticities of tax and spending to output. The New Zealand Treasury calculates a structural fiscal balance based on this two-step method (see Annex).

Tam and Kirkham (2001) find that the calculation of the structural balance for New Zealand using the two-step method is very sensitive to the output gap calculation, although trends in the balance appear more robust. An advantage of using the Treasury's approach to identify discretionary fiscal policy is that it is widely understood, and is already a published fiscal

indicator. There are a number of disadvantages in using Treasury's approach as a basis for measuring fiscal stance:

- The current methodology used by the Treasury does not make any adjustment for cyclical variations in interest rates and inflation (see, for example, Bouthevillain and Quinet, 1999). However, this problem has become less important as inflation rates have declined and become more stable. Furthermore, an adjustment can be made by excluding net interest payments and focusing on the primary balance (Blanchard, 1993).
- It is sensitive to estimates of potential output, which are uncertain, especially toward the end of the sample period and into the forecast horizon – the periods where discretionary policy and stance may be of most interest. Blanchard (1993) points out that the CAB was not designed as an indicator of changes in discretionary fiscal policy, and it relies needlessly on the uncertain calculation of potential output.

Instead, Blanchard suggests the use of an indexed approach. His suggested indicator of discretionary fiscal policy has become known as the Blanchard Fiscal Impulse (BFI) (see for example, Alesina and Perotti, 1995, 1997; and various papers in Bank of Italy, 1999). The BFI is defined as the value of the primary surplus which would have prevailed, were unemployment at the same value as in the previous year, minus the value of the primary surplus in the previous year, both as a ratio to GDP in each year (see Blanchard, 1993). Blanchard removes net interest payments as a simple way of adjusting the balance for changes in inflation and real interest rates. Fluctuations in net interest payments are also considered non-discretionary. The BFI is essentially a cyclical adjustment that eliminates from the fiscal balance changes in taxes and transfers due to changes in the unemployment rate (Alesina and Perotti, 1997).

Although the BFI approach avoids the need to estimate potential output, Kearney, McCoy, Duffy, McMahon and Smyth (2000) note that it assumes a stable relationship between changes in unemployment and economic activity, which may not be appropriate (especially during periods of structural change).

Another approach is to use a structural VAR that takes into account any feedback between fiscal policy and the economic cycle (see Bouthevillain and Quinet, 1999; Kearney *et al.*, 2000). The structural balance estimated via the two-step method attempts to remove the effect of the economic cycle on the fiscal balance, but ignores the fact that the fiscal

balance also may affect the economic cycle. Bouthevillain and Quinet (1999) and Kearney *et al*. (2000) estimate a two-variable structural VAR model that decomposes fluctuations in the deficit-to-GDP ratio into those arising from shocks to output (assumed to have permanent effects) and changes in the deficit itself (assumed to have transitory effects).[8]

However, Kearney *et al.* have shown that the structural VAR method can be unreliable in the presence of structural change. Other disadvantages of this method are that the identifying procedure is subjective so that the estimates are sensitive to small changes in the restrictions. In addition, the structural VAR method is not simple to update when additional data becomes available, making it difficult to monitor an indicator based on a structural VAR approach on a regular basis.

5. Estimates of the fiscal stance for New Zealand

This section estimates the fiscal stance for New Zealand from 1992 until the end of the current forecast horizon (year ended June 2006). This section tests sensitivities of a base indicator to some of the key judgements outlined in the previous section. The key judgements made in calculating the base indicator are:

- Net cash flows from operations before net interest payments (i.e., finance costs less interest, profits and dividends) is used as the measure of the primary fiscal balance.
- The capital adjustment is reasonably detailed and attempts to capture the capital transactions that impact on aggregate demand.
- Treasury's two-step structural adjustment method is used to remove the effect of the economic cycle on the fiscal balance because it is already a method used by the Treasury, and it is reasonably simple to update. The adjustment is applied only to the operating part of the primary fiscal balance. The capital component is not cyclically adjusted.

Table 1 lists the five key capital items, along with a judgement about whether these are likely to impact on aggregate demand. Deciding which

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[8] Buckle, Kim and Tam (2001) use a structural VAR to explicitly model the interaction between a set of economic variables and the budget balance in New Zealand. However, their focus is not on the structural fiscal position *per se*, but rather the *ex ante* fiscal balance required to achieve, with a given probability, a desired *ex post* budget balance for alternative short-term fiscal planning horizons.

capital transaction should be included in the adjustment involves a trade-off between simplicity and completeness. A simple indicator would make an approximate estimate of capital that affects demand. A more complete indicator would look at each item and make adjustments for capital expenditure that affects demand. For example, it could remove defence capital expenditure from purchases of physical assets, and refinancing of hospital loans from advances to hospitals. Based on Table 1, capital in our base indicator includes:

- Net purchase of physical assets, excluding defence.
- Increases in student loans.
- Advances to hospitals, excluding refinancing of existing loans.
- Net purchase of investments, excluding the sale of Contact Energy, Auckland and Wellington airports, Forestry Corporation, "At work" insurance, Radio spectrum sales, and excluding the purchase of Air New Zealand.[9]
- The forecast of future new capital spending excluding expected defence capital spending.

5.1 Base indicators

Table 2 sets out the calculation of the base indicators of the fiscal balance and fiscal impulse (using information from the December Economic and Fiscal Update, 2001). It begins with net cash flows from operations (NCFFO) and shows the adjustments made to arrive at the fiscal balance. The change in this fiscal balance gives the indicator of fiscal impulse. The calculations are effectively for the core Crown (as distinct from Total Crown where the core is consolidated with State-owned enterprises and Crown entities on a line-by-line basis).[10] It is worth noting that because of the various adjustments, the level of the fiscal balance does not match the more frequently cited structural OBERAC. The base indicator of fiscal balance, relative to nominal GDP, is plotted in Figure 1.

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[9] Proceeds from sales of State-owned entities are excluded, because they make the series volatile and distort the indicator of fiscal impulse. They are also unlikely to impact directly on aggregate demand compared to other capital transactions.

[10] Advances and net purchases of investments (excluding asset sales/purchases) are included in the capital adjustment as a proxy for new investment spending by Crown entities. Extending the indicator to better capture the role of Crown entities is an area for further investigation.

Table 1

Capital transactions

Capital transaction	*Likely impact on aggregate demand*	*Reason*
Net purchases of physical assets (net of sales).	Yes for most except defence purchases.	Defence assets are largely imported.
Net increases in advances (this is largely loans to students and hospitals).	Yes for student loans. Yes for loans to hospitals (excluding refinancing of existing loans). No for other advances.	Student loans mostly spent on consumption goods. Loans to hospitals are largely spent on investment.
Net purchases of investments (this includes capital injections to State-owned enterprises and Crown entities, purchase and sale of existing entities).	Yes for investment. No for purchase/sale of existing entities.	Most capital injections are likely to be spent on investment. Purchases and sales of existing entities represent a transfer of resources.
Forecast for future new capital spending – an amount for capital spending included in forecasts.	Yes for most. No for defence.	Some will be spent on purchases of physical assets. Some will also be spent on defence, which is mostly imported.
Contributions to New Zealand Superannuation Fund (involves investing in financial assets).	Unlikely.	Likely to have little direct effect. A large portion will be invested offshore.

Fig. 1

Base indicator of fiscal balance
(years ended June, percent of GDP)

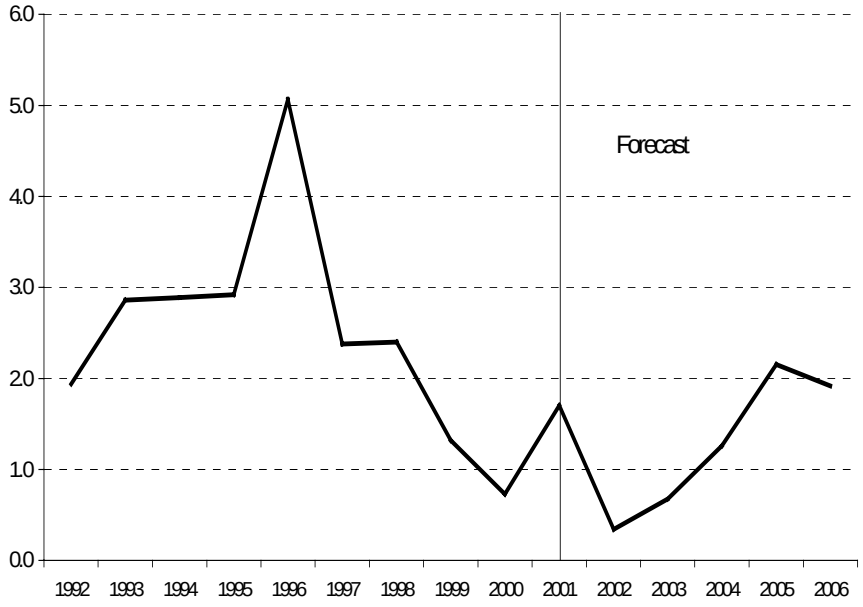

Figure 1 suggests a tightening of fiscal policy in the early 1990s, followed by a loosening until the late-1990s. This reflects the 1996 and 1998 tax cuts (which occurred in the 1997 and 1999 fiscal years) and increases in primary expenditure.[11] Under our definitions, a positive fiscal impulse indicates a tightening relative to the previous year (note that 1992 is lost because fiscal impulse is calculated as a change). Figure 2 plots the fiscal impulses.

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[11] New Zealand's fiscal consolidation was concentrated in the early to mid-1990s, whereas OECD countries generally consolidated in the latter half of the decade. Analysis by the OECD (1999, Figure I.9, p. 21) indicates that over the period 1995 to 1999, only two out of 20 OECD countries experienced a fall in their estimated structural fiscal balance, New Zealand and Japan. (In order to facilitate the cross-country comparison, the OECD use different fiscal information to that used here. But the general point of an easing still holds).

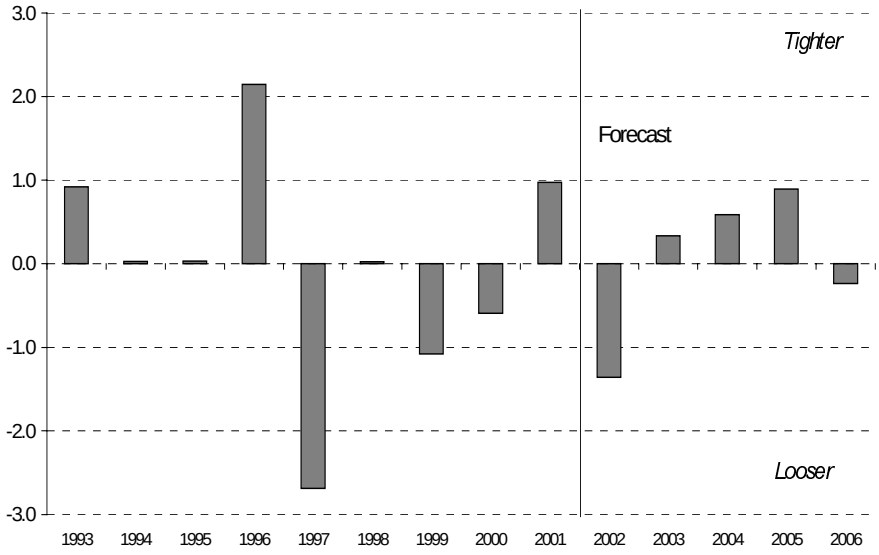
Table 2

Base indicators

Year ended June	2001	2002	2003	2004
$ million	Actual	Forecast	Forecast	Forecast
Total cash from operations	38,471	39,891	41,094	43,713
Total cash to operations	36,549	38,238	39,307	40,963
Net cash flows from operations (NCFFO)	1,922	1,653	1,787	2,750
Cyclically-adjusted NCFFO	1,864	1,718	1,984	2,614
Net interest payments	1,607	1,294	1,467	1,520
Cyclically-adjusted primary NCFFO (a)	3,471	3,012	3,451	4,134
Capital adjustment				
Net purchase of physical assets (excluding defence)	842	1,172	926	872
Net increase in advances to students	668	727	771	791
Net increase in advances to DHBs (excluding refinancing)	0	33	100	100
Net purchase of investments, including health and other (excluding sale of Contact Energy, AKLD and WGN airports, Forestry Corporation, NZS Fund)	16	440	233	220
Capital contingency provision (excluding expected defence and investment in Air New Zealand)	0	234	590	518
Total capital adjustment (b)	1,526	2,606	2,620	2,501
Fiscal balance (= a - b)	1,945	406	831	1,633
Fiscal balance (% GDP)	1.7	0.3	0.7	1.3
Fiscal impulse (% GDP)	1.0	–1.4	0.3	0.6
Memorandum items				
Depreciation	925	965	1,000	1,002
Nominal GDP	114,275	118,980	123,271	129,725

Fig. 2

Base indicator of fiscal impulse
(years ended June, percent of GDP)



Whether a particular fiscal impulse actually has an expansionary or contractionary effect depends on some of the issues and limitations raised in Section 3 (i.e., levels of government debt, expectations surrounding the permanence of the change, the stance of monetary policy and the mix of tax and spending changes behind the impulse). For these reasons it is inappropriate to compare fiscal impulses of approximately equal magnitude (e.g., 1993 and 2001 in Figure 2) as having equal effects on aggregate demand.

Alesina and Perotti (1995) use a classification system to identify significant fiscal expansions and contractions.[12] Re-writing the Alesina and Perotti definition for the budget balance instead of the budget deficit, the fiscal stance, as measured by the fiscal impulse is:

[12] The classification system uses the Blanchard Fiscal Impulse (BFI) measure as the relevant fiscal indicator.

…when the fiscal indicator is:	
Neutral	between –0.5 and 0.5% of GDP
Loose	between –0.5 and –1.5% of GDP
Very loose	less than –1.5% of GDP
Tight	between 0.5 and 1.5% of GDP
Very tight	more than 1.5% of GDP

Using this system, historical fiscal impulses from the base indicator in Figure 2 were reasonably "tight" in 1993, 1996, and 2001 and "loose" in 1997, 1999 and 2000. Only two of the historical impulses, in 1996 and 1997, exceed the very tight/loose boundaries. In the case of 1996, there was a relatively large capital adjustment in 1995, followed by a smaller adjustment in 1996. Although most components of the capital adjustment evolve relatively smoothly through time, net purchases of investments are reasonably volatile, with a large positive value of around 1% of GDP in 1995. The year ending June 2001, which is the last actual observation, shows a tightening compared to 2000. The change in the capital adjustment between these two years is modest and the tightening reflects an increase in the primary structural (cash) surplus. Looking forward, the base indicator fiscal impulses are on average closer to neutral as the impulses are broadly in the –0.5 to +0.5 range (Figure 2).

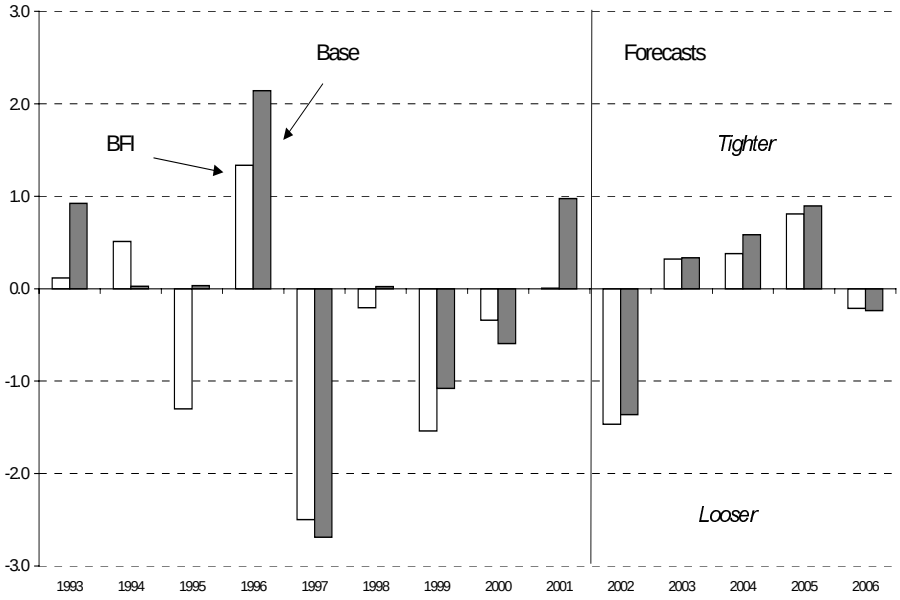
5.2 Approach to identifying discretionary policy

This section compares the two-step method of cyclical adjustment with the Blanchard Fiscal Impulse (see Annex for detail). Note that the same capital component is included in each method.

According to Figure 3, the BFI tells a broadly similar story to the base indicator. However, the magnitude of fiscal impulses according to the Alesina and Perotti classification system can differ. For example, in 2001 the BFI suggests a neutral fiscal impulse, whereas the base indicator suggests a tightening. Both indicators tell a very similar story over the forecast period. This is reassuring, because forecasts of potential output used in the calculation of the base indicator are uncertain. However, it is likely that the similarity of the indicators reflects the relatively small economic cycle and stable unemployment rates over the forecast period compared to history, so that there is less difference between the different methods of adjusting for the cycle.

Fig. 3

Comparisons of discretionary measures
(years ended June, percent of GDP)



5.3 Capital adjustments

The capital adjustment complicates the calculation of fiscal impulse because it requires judgements to be made around which capital items should be adjusted for. Figure 4 looks at the sensitivity to different capital adjustments. The base indicator of fiscal impulse is compared with two measures that use alternative capital definitions:

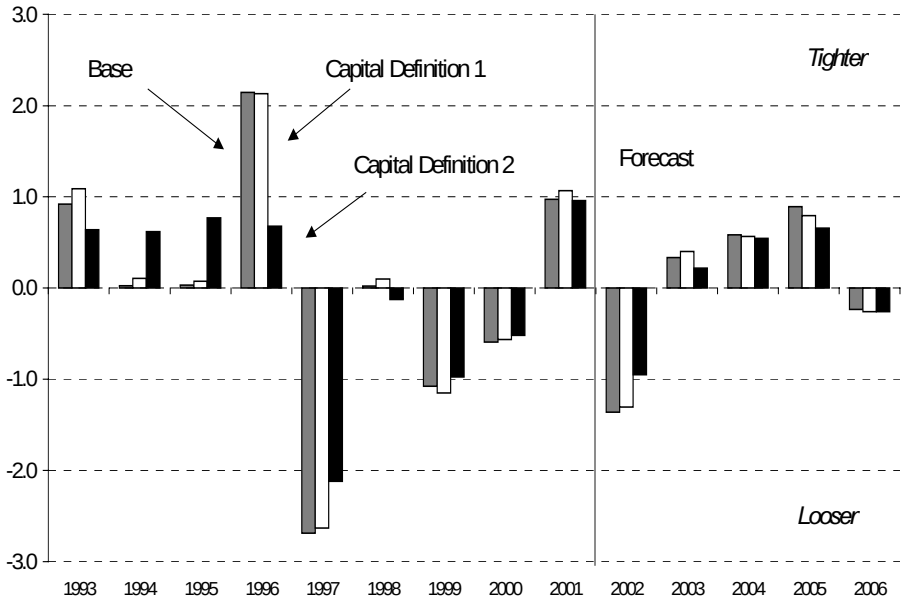
1. The first definition adjusts only for net purchases of physical assets (excluding defence), net purchases of investments (excluding asset sales and purchases) and forecast future new capital spending (excluding defence and Air New Zealand). Advances are excluded.
2. The second definition adjusts only for net purchases of physical assets and forecast future new capital spending (excluding defence). Advances and net purchases of investments are excluded. This measure is arguably a better proxy of direct resource claims and brings the balance closer to a net lending concept.

The alternative capital definitions result in changes to the level of the fiscal balances and the indicators of fiscal impulse. Because it excludes net purchases of investments, capital definition 2 is less volatile and the associated fiscal impulses are generally somewhat smaller than the other two indicators. In particular, the 1996 fiscal impulse "spike" apparent in Figure 2 is reduced.

Factors that would cause the base indicator to diverge from an indicator with a narrower capital adjustment include large changes in student loans, net purchases of investments and advances. Overall, this suggests that although making a capital adjustment has not made much difference in the past, it is important to consider a broader capital adjustment to ensure that the indicator is robust to changes in capital spending.

Fig. 4

Fiscal impulse – alternative capital adjustments
(years ended June, percent of GDP)



6. Concluding remarks

This essay has outlined the conceptual issues around thinking about changes in fiscal stance, and developed an indicator for New Zealand. Although the general approach of governments has been to allow automatic fiscal stabilisers to operate, for macroeconomic stability reasons government may be interested in the impact of fiscal policies on aggregate demand. It is useful to have an indicator of changes in fiscal stance as a first approximation of fiscal impact. We have outlined some key decisions that need to be made in calculating an indicator of fiscal stance. The base indicator calculated reflects intuitive judgements about the changes in the stance of fiscal policy in New Zealand over the last decade and looking forward.

It appears that the indicator is not very sensitive to the key judgements. However, these results could be a function of the relative stability of the time period considered. The magnitude and lumpy nature of capital transactions mean that the adjustments could be important in the future, and the more complex base indicator is more likely to be robust.

As with any indicator, the indicator of fiscal stance has limitations. At best it provides only an indication of the first round impact of fiscal policy on demand. There are other factors that need to be taken into account when assessing the full impact of fiscal policy on the economy, for example, the composition of the change in fiscal policy. Only a full-scale macroeconomic model, complemented with time series analysis can provide a complete assessment of the impact of fiscal policy on the economy.

ANNEX

THE NEW ZEALAND TREASURY APPROACH TO ESTIMATING THE STRUCTURAL FISCAL BALANCE

The Treasury's approach utilises an estimated output gap and the sensitivity of tax receipts and unemployment expenditure to output. The output gap is measured as:

$$gap_t = (Y_t - Y_t^*) / Y_t^* \tag{A.1}$$

where: Y_t = actual real GDP in year t
Y_t^* = potential real GDP in year t.

A positive (negative) value for gap_t indicates that actual real GDP is above (below) potential real GDP. The method currently used by the Treasury in estimating the output gap for the purpose of the structural balance is the Hodrick-Prescott (HP) filter.[13]

The structural balance is calculated using cyclically adjusted receipts, cyclically adjusted expenditure on unemployment, and other operating expenditure components.

The responsiveness of receipts to output depends on two effects, the responsiveness of the tax type to a change in its base ($e_{T,B}$) and the responsiveness of the tax base to a change in output ($e_{B,Y}$). Cyclically-adjusted receipts are calculated as:

$$R_{i,t}^* = R_{i,t}(1 + e_{i,T,Y} \times (-gap_t)) \tag{A.2}$$

where: $R_{i,t}^*$ = cyclically adjusted nominal receipt item i in year t
$R_{i,t}$ = actual nominal receipt item i in year t
gap_t = output gap in year t
$e_{i,T,Y} = e_{i,T,B} \times e_{i,B,Y}$ for each receipt item i.

The elasticities for different receipt items, with respect to output, are as follows:

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[13] Tam and Kirkham (2001) use a structural time series model (STAMP) to estimate potential output. They examine the sensitivity of the estimated structural balance to alternative methods of calculating potential output.

Receipt item	Elasticity
Individual income tax	1.12
Company tax	1.10
Withholding tax/Other direct tax	1.10
GST	1.10
Excise duties	1.00
Other indirect tax	1.00
Interest, profits and dividends	0.00
Other receipts	1.00

The cyclically adjusted unemployment rate is derived using the output gap and an Okun coefficient β, which is assumed to be 0.5.

$$U_t^* = U_t - \beta(-gap_t) \tag{A.3}$$

where: U_t = actual unemployment rate in year t
U_t^* = benchmark unemployment rate in year t.

Cyclically adjusted unemployment expenditure is assumed to move proportionally to the ratio of unemployment to benchmark unemployment.

$$UE_t^* = average\ benefit_t \times beneficiaries_t \times (\frac{U_t^*}{U_t}) \times 52 \tag{A.4}$$

where: UE_t^* = cyclically adjusted unemployment expenditure in year t
$average\ benefit_t$ = average weekly benefit in year t
$beneficiaries_t$ = unemployment beneficiaries in year t.

The Blanchard Fiscal Impulse indicator

The Blanchard Fiscal Impulse (BFI) is an indictor of discretionary fiscal policy, and is defined as the value of the primary surplus which would have prevailed, were unemployment at the same value as in the

previous year, minus the value of the primary surplus in the previous year, both as a ratio to GDP in each year.

$$BFI_t = \left(r_t(U_{t-1}) - g_t(U_{t-1})\right) - \left(r_{t-1} - g_{t-1}\right) \quad \text{(A.5)}$$

where: r = primary government receipts (% GDP)
g = primary government operating expenditure (% GDP)
U = unemployment rate.

The BFI has been calculated using the equations, elasticities and Okun coefficient from the Treasury's structural adjustment approach. The Okun relationship provides the link from output to unemployment and is specified as:

$$\frac{Y_t - Y_{t-1}}{Y_{t-1}} = \frac{1}{\beta}(U_{t-1} - U_t) \quad \text{(A.6)}$$

Now convert (A.2) into changes in output from the previous year, rather than deviation in output from potential:

$$R_{i,t}(Y_{t-1}) = R_{i,t}\left(1 + e_{i,T,Y}\frac{Y_{t-1} - Y_t}{Y_{t-1}}\right) \quad \text{(A.7)}$$

Convert (A.7) into changes in unemployment from the previous year by substituting in the Okun relationship (A.6) above. Convert (A.4) into the relationship between current and lagged unemployment, rather than current and benchmark unemployment. This gives an equation for each receipt item, and an equation for unemployment expenditure:

$$R_{i,t}(U_{t-1}) = R_{i,t}\left[1 + e_{i,T,Y}\frac{1}{\beta}(U_t - U_{t-1})\right] \quad \text{(A.8)}$$

$$UE_t(U_{t-1}) = average\ benefit_t \times beneficiaries_t \times \left(\frac{U_{t-1}}{U_t}\right) \times 52 \quad \text{(A.9)}$$

$R_{i,t}\ (U_{t-1})$ is a measure of a receipt item in year t had the unemployment rate of the previous period prevailed. Similarly, $UE_t\ (U_{t-1})$ is unemployment expenditure in year t had the unemployment rate of the previous period prevailed. $R_t(U_{t-1})$ is total receipts in year t at the previous years unemployment rate, and is derived by aggregating the adjusted receipt items. $G_t(U_{t-1})$ is derived by combining adjusted unemployment

expenditure with other operating expenditures. The BFI can be calculated by substituting $R_t(U_{t-1})$ and $G_t(U_{t-1})$ into the equation for the BFI (A.5) above, and converting to % of GDP.

The New Zealand Treasury Economic and Fiscal Indicator

The *Economic and Fiscal Indicator* (see Treasury's Briefing to the Incoming Government 1996, p.61) indicates whether fiscal policy is tighter or looser in one year relative to another year. The key difference between the EFI and other indicators of fiscal stance is that the EFI attempts to take into account the composition of government expenditure and taxes.

The approach taken was to consider how a change in fiscal policy affects the components of aggregate demand (consumption, investment, government spending, and net exports), including the feed through parameters and elasticities. The indicator is the sum of the effect of the change in fiscal policy on each of these components. The key benefit of the EFI is that it takes into account the composition of fiscal policy, so that it may provide additional information in the case of a balanced budget change in fiscal policy. It also accounts for different reactions by different households, by assuming that some households are liquidity constrained while others are not.

The key disadvantages of the EFI are that the calculation is subjective and relies on judgements around economic theory and parameters such as elasticities, it is not cyclically adjusted and it is not internationally comparable. In addition, changes in the operating balance were found to proxy reasonably well any changes in the EFI under a variety of scenarios.

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COMMENTS ON SESSION I: INDICATORS OF FISCAL IMPACT

Mike Artis[*]

The five papers in this section provide a sample of the wide range of empirical work that is excited by the concerns of fiscal policy today.

The paper by *Momigliano and Siviero* uses the methodology introduced by Blinder and Goldfield (1976) to measure the effects of fiscal policy using a large macroeconometric model. That methodology has a number of advantages when compared to the widely-used "summary indicators" of fiscal policy. In particular, it renders measures of fiscal policy on a wide range of variables and is precise about timing. The methodology can be adapted to cope with forward-looking elements, when the measures of fiscal impact obtained can be further characterized as representing "unanticipated" and "anticipated" policy effects (Artis *et al.*, 1994) though this is not done here. The methodology necessarily suffers from all the drawbacks alleged of large macroeconometric models, although there are no obvious alternatives usable at present. In addition, it is clear that the counterfactual description of the fiscal action, which engages the model's dynamic multipliers is a source of concern especially taken the horizon is a long one. The mechanical application of these methods provides a geology of fiscal actions in which (say) the fiscal actions of Italy's First World War governments would still today provide a distinct layer! Thus the authors are right to be cautious about the horizon they examine; yet at the same time they may be missing much of the action: the effects of this year's fiscal actions are quite likely to bulk large next year. The kind of work embodied in this paper is detailed and exhaustive; yet it would have been nice also to have seen an extension demonstrating that the model is worthy of this investment. What kind of tracking performance does it possess?

The paper by *Mohr* demonstrates the potential of one of the main alternatives to the macroeconometric model for the analysis of policy – the SVAR. Relatively new in application to fiscal policy (perhaps though lack of high frequency data?), SVARs have long been popular in attempts to measure the effects of monetary policy. They remain controversial in many

[*] European University Institute and CEPR.

respects. SVARs are bound to be "small", as it is hard to handle more than five or so equations in this framework. They are far from the ideal of unrestricted measurement for this reason. The modeller has to make drastic simplifications. The record in monetary policy application also features sustained efforts to resolve various "puzzles" – wrong signs on variables – which indicate considerable compromise with the unrestricted ideal. Nevertheless, this paper is to be welcomed in view of the very small experience we have with fiscal SVARs so far.

The paper by *Denis and Quinet* displays yet another methodology, that of panel data analysis. Here, the authors' interest is in tracking episodes of "anti-Keynesian effects", named for the observation of "expansionary contraction" in periods of fiscal consolidation. There are some misgivings one can have about the strength of inference in panel data estimates. The method treats the experience of an economy through time as equivalent to that of a comparison of economies at a point of time. It is important to deploy a battery of controls to render the method reliable and it is never entirely clear that this can be done. In the case in point, large fiscal consolidations are often accompanied by a package of other measures and by a strong rhetoric on the part of government ministers and others. Is it then the fiscal action that produces the observed anti-Keynesian effect, or the other things? Despite misgivings like these, this paper is obviously a workmanlike exploration of the issues.

The paper by *Murchison and Robbins* attacks the estimation of the built-in stabilizers from a fresh standpoint. There is an established procedure for estimating the "built-in stabilizers", one which is practised in all the main international policy-making bodies – the IMF, OECD and EC. The procedure identifies *a priori* the elements of expenditure (only one: unemployment compensation) and tax revenues which are assumed to be cyclically sensitive. Then appropriate elasticities are estimated and a measure of the output gap is generated. These steps involve minor variations as between the organizations that estimate the built-in stabilizers. The resultant estimates of the cyclically-adjusted budget balance differ considerably from estimates generated by (say) applying the Hodrick-Prescott methodology to the data, or – so far as one see – the estimates generated in this paper. (It would be helpful to have a direct comparison). The reason is that the IMF-OECD-EC method specifies cyclically-sensitive budget components as those that, for *given tax and expenditure schedules,* generate cyclically-sensitive expenditure or revenue flows. By construction, they take no account of cyclically-sensitive

changes in these schedules. Melitz (2000), in a paper first written some time ago, showed these changes to be significant in size. The Murchison-Robbins paper takes all this into account in what is a constructive and carefully executed estimation exercise. It would be instructive to apply a similar methodology to other countries.

Finally there is the paper by *Vanne* which demonstrates an issue arising in the generational accounting literature. This issue concerns the correct valuation of assets held by governments, perhaps to find pension payments. Since asset prices can reflect the effects of "irrational exuberance" these will be imported into the generational eccounting framework where the government holds such assets, as in the case the author examines. What should be done about this? There are broadly two possibilities : one is to ensure that any decision rules dependent on these data take into account their volatility: or, a valuation principle which incorporates some dampening factor might be used. Either way, the important point is to establish the transparency of the procedure.

The five papers reviewed here reflect well the range of empirical work on fiscal issues; just as important, they reflect well on the research agenda and competence of the authorities concerned.

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COMMENTS ON SESSION I: INDICATORS OF FISCAL IMPACT

Jacob Braude[*]

Most of the papers in this session are concerned with the construction or assessment of indicators of fiscal policy in the short run. The indicators relate either to measuring the policy itself or to evaluating its effects on economic activity over the business cycle.

My comments are organized along three major themes, which I shall discuss in turn.

1. Level versus composition in the choice of policy instruments

An important point the papers raise is that when one examines fiscal policy over the business cycle, reference to levels (of expenditures, revenues, deficits) is not enough. One should also look at the composition, given any level.

In terms of composition two major distinctions arise from the papers:

1. The item – composition: the spending mix such as public consumption versus transfer payments; the composition of revenues, e.g., the distinction between direct and indirect taxes; the structure of the budget balance in terms of expenditures versus revenues.
2. The composition of fiscal policy over the business cycle regarding discretionary policy versus automatic stabilizers. That is, what part of the change in the budget balance comes from explicit government decisions as opposed to the effect of the business cycle given existing tax rates, unemployment benefits, etc.

I would like to emphasize several points as to why these distinctions are important and potentially fruitful for policy making:

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[*] Research Department, Bank of Israel.

1. Countries are losing or giving up their ability to use the deficit level as a policy instrument. EU members have not only conceded monetary policy. To some extent they have also given up fiscal policy. Agreements such as the Maastricht Treaty and the Stability and Growth Pact limit members' ability to respond to the business cycle by large changes in their overall budget balance. Therefore they are largely left just with the ability to affect activity through the *composition* of the balance. Hence it is becoming more important in today's Europe to choose the optimal composition of the budget balance (in both dimensions that I have just mentioned), rather than its level. This is increasingly true also outside the EU as more countries unilaterally commit themselves to budget-balance targets.
2. While acknowledging the issue, the papers do not yet provide separate estimates of the effect on economic activity of automatic stabilizers compared to discretionary policy. Such estimates could help policy-makers decide on the optimal mix of automatic and discretionary measures. Moreover, the choice of this mix may have implications for the levels of the automatic stabilizers themselves.

An example may clarify this point. Are high marginal income tax rates, which induce an automatic stabilizer (but have other costs), preferable to discretionary changes in tax rates when the cycle changes? More specifically, Philip and Janssen mention in their paper that in New Zealand there is a general approach of relying almost solely on automatic stabilizers, rather than discretion, in responding to the business cycle. That, I think, could lead to a sub-optimal choice of tax rates.

2. The composition of policy objectives

Murchison and Robbins emphasize the important distinction, apparently often neglected in the literature, between the impact of fiscal policy on the economy (FiPS) and the budgetary position over the business cycle (CABB).

A potential application is that their estimation of both indicators allows an assessment of the trade-off between two conflicting objectives (high activity, low deficit). It could also help in deriving a deficit-target that reflects policy-makers' preferences regarding these objectives. The explicit consideration of both objectives may enhance the transparency of the decision making process and the credibility of the chosen target.

3. Issues that arise from comparing the papers

3.1 Are findings comparable?

One might think that three of the papers (Murchison and Robbins, Momigliano and Siviero, Philip and Janssen) examine roughly the same phenomenon in their respective countries: they all look at data over a certain time period to estimate the effect of fiscal policy. It is however important to note that the circumstances are quite different, hence comparing their results requires caution. In Italy and New Zealand there is a change of regime during the sample period – a shift to a more disciplined fiscal policy, which is probably not the case in Canada. As the authors acknowledge, and bearing in mind the Lucas critique, the effect of fiscal policy at a time of structural change could differ substantially from its effect during a normal business cycle, in which the regime is stable.

3.2 A word on methodology

The three papers just mentioned employ a time series framework, testing the effects of fiscal policy within a single country over time. In contrast, Denis and Quinet use pooled data for several countries over time. However, the value added relative to country-specific studies is not fully exploited. They present only fixed-effects estimation, which utilizes just the time variation within each country, but neglects the cross-country variation. Supplementing the results with random-effects (GLS) estimation, which makes use of both variations, could be instructive.

3.3 Openness

Denis and Quinet emphasize the potential significance of a country's openness for the effect of fiscal policy. This point might merit consideration in the single country studies, to the extent that these countries had gone through significant trade liberalizations or capital market reforms during the period in question.

3.4 Inequality

The papers offer a careful analysis of fiscal policy over the business cycle. Extending the analysis to additional aspects that are likely influenced by this policy could be useful. Inequality is a case in point. The composition of policy instruments discussed earlier may have a considerable effect on the cyclical behavior of inequality. Specifically, high income tax rates are potentially important automatic stabilizers and could also mitigate after-tax inequality over the cycle. The same may apply for the choice of different taxes or taxes versus subsidies.

3.5 Generational accounting

Vanne's paper shifts the discussion from the very short run to the very long run. Yet, generational accounting may alter the impact of fiscal policy even in the short run. For example, suppose a country realizes that its social security system is unsustainable and therefore decides to start accumulating budget surpluses. This could constitute a shift in the fiscal regime, thereby changing the manner in which fiscal policy is perceived by the public, hence the way it affects the economy even in the short run. In fact, such a change in regime designed to pre-fund the public pension system seems to have taken place in New Zealand (see Philip and Janssen's paper). To a lesser degree this may also be the case in the US, regarding the allocation of some budget surpluses to Social Security.

COMMENTS ON SESSION I: INDICATORS OF FISCAL IMPACT

Nicola Sartor[*]

Until the mid-80s, the general attitude in the field of fiscal indicators was to develop "the Indicator", which could be used for almost any purpose, depending on the way it was analysed (levels, first differences, cross-country comparisons, etc.). In the late 80s, Olivier Blanchard, acting as a consultant for the OECD Secretariat, dismissed the possibility of using one indicator as a "jack-of-all-trades" (Blanchard, 1990, p. 5) and raised the following simple preliminary question: "Indicators of what?". From his analysis it clearly emerged that it was impossible to set up an all-purpose indicator. Instead, each fiscal policy issue would require a specific analytical tool. The main difficulty would lie in finding indicators that make as little use of economic theory as possible. As a matter of fact, fiscal indicators are mostly used by government officials who need simple and robust ways of deriving basic policy statements. Indicators which would heavily rely on a specific piece of economic theory may become vulnerable to criticism by those people who, for any reason, reject that particular theory. International organisations, such as the OECD, the IMF or the EC Commission, would first of all avoid such a risk.

Indicators are designed for supporting the analysis of the following four issues: 1. fiscal impact and/or impulse, namely the short-run stimulus of budgetary policy to economic activity, via its effects on aggregate demand; 2. fiscal stance, or the issue of separating the discretionary component of the policy from the effect of built-in stabilisers; 3. financial sustainability of budgetary policy; 4. fiscal policy effects through distorsions, or the effects of tax and spending policies on supply. While it is possible to derive simple indicators for the first three aims, the analysis of fiscal policy effects on the supply side requires a large and articulated set of indicators, heavily dependant on economic theory.

The papers presented in the first session of the workshop cover the first three issues. Apart from providing interesting and accurate analyses,

[*] Department of Economic Law, University of Verona.
Correspondence address: via dell'Artigliere n. 19, 37129 Verona (Italy).
E-mail: nicola.sartor@univr.it

they – as a whole, allow to derive some comments on the sensitivity of empirical results to the different methodologies.[1]

With respect to the measurement of fiscal impact and fiscal stance, the most controversial issues in the literature are:

1. Do we need the notion of cycle?
2. Can an indicator of fiscal impact be model-free?

As for the first issue, an indicator does not require the identification of a cycle. Information about fiscal stance and impact is usually obtained by analysing first differences of budget balances, purged of the effects of any change in the macroeconomic scenario occurred during the period under scrutiny. As originally pointed out by Blanchard (1990), any arbitrary benchmark suits this need. According to my interpretation, the persistence of the use of the "cyclically-adjusted budget balance" (henceforth cabb) is partly explained by the inertia that large organisations display in changing consolidated methodologies. In recent years, the resurgence of cyclical corrections can be attributable to the introduction of the "stability and growth pact" and the subsequent need to identify the budget balance which would prevent Countries to run a deficit larger than 3 percent of GDP even during recessions. When compared to the "arbitrary benchmark" technique, the main disadvantage of cabb is represented by the need to estimate potential output and its implicit (and often unnecessary) suggestion that cabb can be expected to prevail in the long run – a very ambitious and uncertain statement.[2]

While Murchison and Robbins apply a new estimating technique to the conventional cabb approach, an application of the "arbitrary benchmark" approach is provided by Philip and Janssen. Their paper includes an interesting comparison of the results derived from their indicator and other ones. The paper by Murchison and Robbins underlines the importance of the estimation techniques to identify the interactions

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1 Obviously, rigorous conclusions would require the application of the different methodologies to a common dataset, which is beyond the scope of the workshop.

2 For example, Blanchard *et al.* (1990, p. 33) argue that "the cyclical adjustment is justified only if the economy is going to return to its mid-point fairly quickly; the cyclical adjustment is irrelevant *if the economy is expected to remain depressed for a long time to come*" (italics added). In the light of the long spell of sustained growth of the U.S. economy, it could be added "or if the economy is expected to grow for a long time to come". As an additional argument against cyclical adjustment, the Authors claim that "cyclical adjustments are not needed when forecasts are available. [...] even for the long-term indicator, a mechanical estension of the forecasts beyond 5 years is likely to dominate any mechanical cyclical adjustment".

between fiscal policy and the economic cycle. The Authors conclude that when the output gap is large, judgment on policy stance may be biassed if the interaction between the business cycle and fiscal policy is not correctly measured.

As for the second issue (can an indicator be model-free), Momogliano and Siviero remind us that fiscal indicators may diverge from econometric simulations. Moreover, model simulations allow to estimate the impact of fiscal policy on several variables (such as prices, balance of payments, employment) and not just output. In the final paragraph, the Authors compare their results with the one obtained by some budget indicators. Their conclusion – based on correlation coefficients among empirical estimates, that "the results appear significantly different, *both quantitatively and qualitatively*, from those obtained using the syntetic budget indicators commonly used to assess the fiscal stance" (p. 1, italics added) is fully warranted. For example, if the definition of fiscal stance proposed by Alesina and Perotti (1995) is adopted,[3] model simulations provide a measure of the stance which is different from the one obtained by the Blanchard (1990) and the Ceriani and Di Mauro (1986) methodology respectively 5 and 3 times out of 10. If the comparison is made according to sign consistency, different policy judgements emerge respectively in 1 and 3 cases out of 10. Some discrepancies (4 out of 10, according to the Alesina and Perotti definition) emerge also when comparison is made between the two synthetic indicators. The highest correlation between model simulations and indicators is displayed by the Ceriani and Di Mauro indicator, likely because their methodology attributes different weights to different budget items. On the basis of model simulations, Momigliano and Siviero estimate that 30 percent of the overall effect can be attributed to the changes in budget composition. Thus indicators that ignore any change in the budgetary mix is likely to miss a significant part of the impact.

Denis and Quinet, as well as Mohr, address the highly debated question of the effects of fiscal policy on output. The issue is particularly relevant in EMU-Countries, where a policy instrument different from monetary policy to be used against asymmetric shocks is needed. Denis and Quinet reminds us that the issue is still quite controversial, as proved by the expansionary effects of an apparently restrictive budgetary policy

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[3] Fiscal stance is neutral if the effect of fiscal policy on GDP lies between –0.5 and 0.5 percent, loose (tight) between –(+)0.6 and –(+)1.5, very loose (tight) if it is greater than –(+)1.5.

enacted by countries with unsustainable debt.[4] More generally, the analysis seems to suggest that, while simple indicators can be of some use for assessing fiscal impact (but the issue then becomes: are first round effects of great importance for assessing the appropriateness of fiscal policy?), the estimation of the long-run effects requires not only econometric model simulations (as suggested by Momigliano and Siviero), but also judgements on country-specific qualitative aspects, such as announcement effects. Qualitative judgements appear unavoidable as long as the economy is affected by structural reforms.

Last, but by far not least, Vanne as well as Murchison and Robbins (in the second part of their paper) address the issue of the correct interpretation of point estimates. Because of the uncertainty that always surrounds empirical results – due to sampling errors (Murchison and Robbins) or to the sensitivity of the methodology (Vanne on Generational Accounting), full reliance on point estimates may lead to an incorrect assessment of fiscal policy. I find the innovation of applying stochastic simulations to indicators very useful: this is particularly the case with Generational Accounting, as its empirical results are known to be quite sensitive to the assumptions concerning the long run macroeconomic scenario (see, for example, Banca d'Italia, 2000).

Summing up, the papers seem to suggest that indicators aimed at assessing relatively simple economic fenomena can be developed. However, results may be substantially different according to the methodology that is used or when compared with model simulations, even when the analysis is limited to fiscal impact. As long as an econometric model is available, counterfactual simulations seem to be preferable to any syntetic measure derived from indicators. A delicate issue araises when an econometric model is not available: should policy conclusions heavily depend on indicators? In any case, detailed analysis based on economic theory remains unescapable when judgments on more complex fenomena have to be derived.

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[4] On this point see, for example, Perotti (1999).

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