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The Effectiveness of Fiscal Policy in a Keynesian-Monetarist Model of Canada[1])

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Abstract: This paper presents a simple macroeconomic model that includes all of the main channels of transmission for fiscal policy and that can generate either Keynesian or monetarist results for the impact of fiscal policy depending on the values assumed for particular parameters. The structure of this model, called KEMO for KEynesian-MOnetarist, was kept very simple and schematic. The objective of this paper is to examine through simulations of the model the degree of sensitivity of the fiscal multiplier to certain hypotheses concerning the way the economy functions and the value of certain parameters, as well as the dynamic process of adjustment of the economy to a fiscal shock.

1. Introduction

For many years one of the most controversial stabilization policy questions has been whether or not discretionary changes in fiscal policy can have a significant and lasting effect on the level of economic activity during periods when unemployed resources are available. Economists are extremely divided on this question. On the one hand, there are the Keynesians, who believe that fiscal policy is an effective instrument of stabilization. On the other, there are the monetarists, who believe in the predominant role of the money supply in the determination of national income and who argue

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that fiscal policy action, not accompanied by an accomodating monetary policy, can only have a temporary and insignificant impact on output.[3])

To support their case, the Keynesians point to the results of simulations with large macro-econometric models which show that fiscal policy initiatives have a significant and lasting impact on the *level* of activity.[4])[5]) The monetarists, for their part, do not regard the results of these simulations as very convincing evidence. According to them, the simulations only reflect the nature of the models, which, being Keynesian in structure, ignore too many links which exist among the different sectors of the economy and which work to reduce the impact of fiscal policy on the economy even in the short-run.[6])

To measure the real effect of fiscal policy, the monetarists propose, as an alternative, a simple reduced form model in which the determination of national income is explained in terms of a distributed lag on the money supply and government expenditures.

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[3]) A corresponding issue of disagreement is the degree of effectiveness of monetary policy. While neo-keynesians would not deny that monetary policy is important, they hold the view that it is not the only effective stabilization tool. Econometric models in the keynesian tradition generally produce the result that monetary changes and changes in nominal GNP do not have a one to one relationship [see, for example, Bank of Canada and Department of Finance]. On the other hand, the reduced-form monetarist models do indicate a one to one relationship between changes in money and GNP [see, for example, *Carlson*, 1978]. One of the authors, *Sheikh*, 1982, has used the KEMO model presented in this paper to study the effectiveness of monetary policy. The model generates monetarist results of homogeneity under a specified set of assumptions.

[4]) In all of the large macro-econometric models of the Canadian economy, the real multiplier for expenditures on government goods and services is positive. It is even greater than one for the first four years in most of them, notably in RDX2, RDXF, QFS, TIM, CANDIDE, TRACE, QFM and DRI [see *Helliwell/Maxwell/Waslander;* Department of Finance; Bank of Canada and Department of Finance]. In the long run, there is a progressive decline in the real multiplier in these models, but in no case is there a decline in the nominal multiplier. In this context it is worth noting that the monetarist hypothesis of no impact of fiscal policy on nominal output is, under certain conditions, inconsistent with the stability of the system. This has led such authors as *Blinder/Solow* [1973] and *Tobin/Buiter* [1976] to conclude that fiscal policy is even effective in the long-run.

[5]) A number of econometric models produce the result that real fiscal multipliers tend towards zero in the long run. However, zero multipliers in the long run still represent non-zero cumulative impacts of fiscal policy on real output. For example, for the relevant period of analysis, say five years after the shock, all Canadian econometric models produce positive multipliers. These models include QFS (of the Department of Finance), RDXF (of the Bank of Canada), CHASE (of Chase Econometric), DRI (of Data Resources Inc.), FOCUS (of the University of Toronto), TIM (of the Informetrica Ltd.), CANDIDE (of the Economic Council of Canada) and MACE (of the University of British Columbia) [see Bank of Canada and Department of Finance for details]. Even after 10 years, all these models produce positive multipliers, with the exception of CHASE, which produces zero multipliers, and FOCUS and MACE which produce slightly negative multipliers not large enough to offset the positive impacts in earlier years.

[6]) The monetarists stress, among other things, the interaction between the financial and real sectors. The influence of financial variables in Keynesian models is, according to them, both too restrictive and too indirect: too restrictive because they do not take into account substitution between money and financial assets; and too indirect because they are limited to a transmission through interest rates and do not allow for wealth effects [see *Carlson*, 1974; *Carlson/Spencer*].

The reduced form model, according to the monetarists, implicitly takes into account all of the complexity of the transmission mechanism of fiscal and monetary policy, which would be difficult if not impossible, to portray adequately in a structural model. This thus permits an empirical test of the relative impacts of these two types of policy. The first estimations of this model seemed to support the monetarists. The results attributed the key role to monetary policy and an insignificant impact to fiscal policy [*Andersen/Jordan;* also see *Andersen/Carlson*]. A reestimation of this model, using more recent data, produced very different results. They showed a significant effect for fiscal policy [*Friedman,* 1977.][7])

The estimation of reduced form models, as proposed by the monetarists, raises a number of statistical problems, which Keynesians have not been hesitant to point out.[8]) There is the extreme sensitivity of the results to the period of estimation chosen and to the particular variables selected to represent fiscal and monetary policy [*Gramlich*]. The reduced-form model, which was presented as a convenient short curt to facilitate the direct measurement of the real impact of fiscal policy on national output, without having to estimate the parameters of a structural model, is in reality unable to provide much information on the relative impacts of fiscal and monetary policy [*Modigliani/Ando*]. The reduced form model does not really constitute an alternative to the specification of a structural model which integrates all of the elements of the monetarist approach.

Even though efforts have been made over the course of recent years to develop models integrating certain aspects of the monetarist approach, a monetarist structural model, which could be contrasted to the existing Keynesian models, does not exist. Moreover, as *Rasche* [1973] had already noted in 1973, there does not exist a general model, which can reproduce alternatively Keynesian or monetarist results as special cases, and which can, in shedding light on the distinctive elements of these two approaches, permit the empirical verification of which of these two competing hypotheses better explains the functioning of the economy.[9])

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[7]) For a critique of Friedman's study see *Carlson* [1978]. The estimation of a similar reduced from model for Canada by *Duguay* [1979] also contradicted the monetarist hypothesis on the ineffectiveness of fiscal policy. Recently one of the authors [*Sheikh*, 1979] reestimated the Duguay model using revised national accounts data and a somewhat different fiscal policy variable, the cyclically-adjusted budget balance of the Department of Finance [1978] rather then the full employment surplus of the Bank of Canada. The results suggested an even greater impact for fiscal policy and a smaller impact for monetary policy than those of Duguay.

[8]) Among the most important problems posed for an evaluation of the impact of fiscal and monetary policy by the estimation of a reduced form model are those relating to the endogeneity of the money supply, as well as those stemming from the correlation between monetary and fiscal variables on the one hand and certain omitted variables on the other which also are important in the determination of national income. *Goldfeld/Blinder* [1972] have also demonstrated that, if fiscal policy actions were often used in the past as an instrument of stabilization in an effective manner, then the reduced form model would underestimate the real influence of fiscal policy and overestimate the influence of monetary policy. In this event the weaker the coefficient associated with fiscal policy in the reduced form model, the larger, not smaller, would have been the impact of the fiscal instrument in the past.

[9]) The only real effort in this direction is due to *Stein* [1976].

This paper reports on the work which we have undertaken along the lines suggested by Rasche. We have developed a simple macroeconomic model that includes all of the *main* channels of transmission for fiscal policy and that can generate either Keynesian or monetarist results for the impact of fiscal policy depending on the values assumed for particular parameters. The structure of this model, called KEMO for KEynesian-MOnetarist, was kept very simple and schematic. The objective of the exercise was not to measure the degree of effectiveness of fiscal policy in Canada, or to determine which of the two competing hypotheses better describes the functioning of the Canadian economy. It was much more modest than that. The objective was to examine through simulations of the model the degree of sensitivity of the fiscal multiplier to certain hypotheses concerning the way the economy functions and the value of certain parameters, as well as the dynamic process of adjustment of the economy to a fiscal shock. This exercise seemed useful to us, not only from a pedagogical point of view, but equally from an analytical point of view, because it permits the identification of the most important parameters that condition the effectiveness of fiscal policy.

The main advantage of this type of approach in relation to the traditional technique of comparative static analysis is that the latter, which consists of developing a theoretical model and of using it to calculate the sign of the multiplier from the signs of the various coefficients, can only produce ambiguous results when the model utilized becomes very complex. In the case which concerns us, the magnitude (absolute and relative) of certain parameters has an equal, if not greater, importance than their sign. In this circumstance, our approach is much more fruitful. Another advantage of our approach over that of comparative statics is that it enables us to observe the dynamic adjustment process of our theoretical economy following a fiscal shock. The relatively small size of our model enables us to do this much more easily than with a larger econometric model.

The paper has four sections in addition to the introduction. Section 2 provides a brief account of the main factors involved in the process of adjustment of the economy to a fiscal shock, and of how some of these factors can appreciably reduce the impact of the shock. Section 3 contains a brief description of the KEMO model and of its characteristics. Section 4 presents the results of several simulations of a representative fiscal shock (taken to be an increase in government expenditures on goods and services). These simulations are performed making different hypotheses about the way the economy operates with respect to, notably, the degree of sensitivity of the demand for money and investment expenditures to variations in the interest rate, the flexibility of wages and salaries, and effect of inflationary expectations and their formation mechanism.

Section 5 provides our concluding comments. To summarize, we demonstrate that macromodels can easily produce results which can either support the keynesian or the monetarist position on the effectiveness of fiscal policy. These results depend crucially on certain key relationships in the economy which include: sensitivity of investment to real interest rates, substitutability of assets in individual portofolios, wage-price determination process, and inflation expectation and interest rate relationships.

2. The Transmission Mechanism for Fiscal Policy

In the traditional Keynesian model, the impact of an expansionary fiscal policy results from three types of effects: the direct impact of the increase in government expenditures (or the first round increase in consumer expenditures if the expansionary fiscal policy takes the form of a tax cut); an indirect effect stemming from the increase in consumer expenditures resulting from the second round increase in income; and an accelerator effect produced by the increase in investment expenditures stimulated by the increase in aggregate demand.

Several factors intervene, however, in the process of adjustment of the economy to an increase in government expenditures which might either reduce the positive indirect effects of the increase (i.e. the induced increase in consumption and investment), or cause a compensatory reduction in private sector demand that would offset initial positive effect of an increase in demand in the public sector.

Thus, for example, the increase in government spending can be accompanied by an immediate reduction in private sector spending, either because the new spending made by the government in certain areas would come in direct competition with spending that had previously been done by the private sector,[10]) or because the resulting increase in the public debt produces a negative reaction from enterpreneurs and consumers, which triggers a decline in investment and consumer expenditures.[11]) In the extreme case where the increase in government spending is exactly offset by a reduction in private sector investment and consumer expenditures, fiscal policy would be totally ineffective. This situation could be portrayed in the framework of the IS-LM diagram by the absence of even a temporary rightward shift in the IS curve resulting from the increase in government spending. This case is not thought to be of interest and is not pursued in the present study.

Other factors having a less direct influence can also significantly affect the fiscal multiplier in the short and medium terms. They include:

2.1 The Relative Elasticity of the Demand for Money and Investment Expenditures with Respect to the Interest Rate

If the demand for money was completely independent of the level of the interest rate, as postulated in the quantity theory for money, fiscal policy would be totally ineffective. The increase in government spending would exert pressure in financial

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[10]) Certain types of current expenditures in the area of education, health, or infrastructure investment are possible examples.

[11]) Some authors, in line with the famous Ricardian "neutrality doctrine", have suggested that taxpayers might have enough foresight to anticipate the increase in their future tax bill (or of their descendents) stemming from the government deficit being run to stimulate the economy, and that they would consequently be induced to reduce their consumer expenditures as a result. If this were the case, an increase in government spending would not have any larger impact on economic activity if it was financed by borrowing or by taxation [see, for example, *David/Scadding; Buiter/Tobin; Tobin/Buiter,* 1980; *Buiter; Stevens*]. For an examination of the negative psychological impact of an increase in the government deficit on entrepreneurs see *Cepula* [1973].

markets, thus raising interest rates until investment (or other investment-sensitive) expenditures declined sufficiently to offset the initial increase. On the other hand, if investment expenditures were perfectly elastic with respect to the interest rate (i.e. the IS curve is horizontal), an increase in government expenditures would absorb savings thus reducing investment expenditures by an equivalent amount, and rendering fiscal policy ineffective.

Even though the question of the slopes of the IS and LM curves is no longer at the centre of the Keynesian-monetarist debate on the respective roles of monetary and fiscal policy,[12]) the degree of relative sensitivity of investment and money demand to the interest rate remains important for the effectiveness of fiscal policy. Between the two extreme cases described in the preceding paragraph, where the effectiveness of fiscal policy is compromised either because the LM curve is vertical or because the IS curve is perfectly horizontal, there is an intermediate case wehre the combination of an LM curve with a very steep slope and an IS curve with a shallow slope could make fiscal policy largely ineffective.

2.2 The Effect of an Increase in Wealth on the Demand for Money and the Interest Rate

The increase in the public debt and in the real capital stock, resulting from the increase in the deficit and the accelerator effect on investment, could cause an increase in the demand for money and accentuate even more the restraining impact of financial market pressures on the multiplier.[13]) The negative effect exercised by the increase in wealth via the demand for money (shifting the LM curve to the left) is however counteracted by the fact that the same increase in wealth also stimulates consumption (shifting the IS curve to the right). On balance then the overall impact of wealth itself is even uncertain since an increase in the interest rate can cause wealth to decline more than it would be increased by the accumulation of public debt and capital stock.[14])

2.3 Portfolio Adjustments Associated with the Financing of the Deficit and the Relative Substitutability of Government Bonds, Money and Real Assets

The increase in public debt resulting from the pursuit of an expansionary fiscal policy would generate a disequilibrium in financial markets. In the process of restoring portfolio equilibrium, the relative prices and rates of return of different types of assets

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[12]) To the extent that the adjustment process to a fiscal shock involves movement in the IS and LM curves resulting from price effects, wealth effects or shifts in the composition of portfolios, the slope of the LM curve no longer has the determining impact on the real multiplier. The slope of the LM curve remains relevant, however, for determining the value of the nominal multiplier [see *Carlson,* 1978; *Gordon; Purvis*].

[13]) According to *Silber* [1970], the effectiveness of fiscal policy in Keynesian models would be attributable to the fact that they do not include wealth variables in their demand for money equations.

[14]) In the KEMO model, however, the impact of interest rate changes on wealth is not taken into account.

would change, causing in turn a disequilibrium in the goods market. The portfolio adjustment, stemming from the increase in government borrowing, could have either a positive or negative impact on fiscal policy, depending on whether government bonds were better substitutes for money or real assets (represented by corporate securities) in the portfolios of assets held by economic agents.[15]) The absorption of the growing volume of government securities in portfolios can bring about, in effect, either a decline in the interest rate and, as a consequence, an increase in the price of existing real assets, if government securities are perceived as good substitutes for money, or, conversely, a rise in the interest rate and a reduction in the price of existing real assets, if government securities tend to replace corporate securities in portfolios. Under the first hypothesis, the increase in the value of existing real assets would stimulate investment expenditures to produce new real assets, thus serving to enhance the effectiveness of fiscal policy. If, on the other hand, government securities were to take the place of corporate securities, as the monetarists from Friedman[16]) on down hold, the effectiveness of fiscal policy would be impaired. The impact of an increase in government spending would be partly annulled by a reduction in private investment.[17])

2.4 The Increase in Wages and Salaries

In the traditional Keynesian model, nominal wages rates and prices are postulated to be constant, and the adjustment to disequilibrium between supply and demand is made entirely by quantities, with aggregate supply being taken as perfectly elastic. If we relax this assumption and postulate instead that wages are determined by a Phillips curve relation as a function of labour market tightness, an expansionary fiscal policy would give rise to a tightening of labour markets and thus push up wages and prices. The hypothesis of wage and price flexibility has at least two implications for the fiscal multiplier. The increase in the price level would first reduce the real supply of money (shifting the LM curve leftwards), thus raising the interest rate. The increase in the price level would also imply a decline in the real value of wealth held

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[15]) The monetarists make much of this portfolio composition effect as the principal channel of transmission of monetary shocks to the real sector and as the reason for the ineffectiveness of fiscal policy even in the short-term [see *Brunner/Meltzer*, 1976; *Friedman*, 1970; *Stein*].

[16]) *Friedman* [1970] cites as evidence the fact that in the Unites States government deficits do not result in an equivalent increase in the sum total of public and private debt.

[17]) *Stein* [1970] contends that the whole controversy between the Keynesians and the monetarists hinges on the question of the degree of substitutability among money, government securities and real assets. Empirical tests, according to him, confirm the monetarist view that government bonds are better substitutes for real assets than for money. In the same vein, several authors have suggested that debt management policy can have an important impact on the effectiveness of fiscal policy. An expansionary fiscal policy would be more effective, according to these authors, if financed by the issuance of short term securities, which are more close substitutes for money that long-term bonds [see *Hendershott; Cohen/McMenamin; Friedman*, 1978].

in the form of currency or government debt, which would reduce consumer expenditures (shifting the IS curve leftwards).[18]) This is the Pigou-Patinkin effect. In an open economy the increase in the price level would also have the additional effect of weakening the country's competitive position, which would curtail even more the fiscal multiplier.[19])

2.5 The Role of Inflationary Expectations and Their Formation Mechanism

The effectiveness of fiscal policy as an instrument of stabilization is, in a large measure, affected by the role of inflationary expectations in wage determination and by their formation mechanism.

According to the rational expectations school, economic agents are in a position to exploit all of the available information to predict the impact of an increase in the public spending on the evolution of wages and prices.[20]) Workers can thus correctly anticipate the future rates of inflation when they go to sit down at the bargaining table. This would rule out even a temporary unanticipated erosion in the real wage, which is an important condition for an increase in production and employment in the short-run. With rational expectations there is no trade-off between inflation and the unemployment rate even in the short-term. Thus fiscal policy can not have an impact on the real level of economic activity.

Contrary to the notion of rational expectations, the adaptive expectations hypothesis admits the possibility of systematic errors in inflation forecasts. Under this hypothesis, economic agents base their forecasts on the past inflation rates, and, in contrast to rational expectations, ignore the impact that past and future fiscal policy can have on the inflation rate. The impact of fiscal policy, in this case, would be affected by the forecast errors of economic agents and the speed with which they correct these errors. The speed of adjustment of expectations of different economic agents constitutes one of the main elements at issue in the debate between Keynesians and monetarists on the effectiveness of fiscal policy.

In addition to the several factors discussed, which to different degrees affect the impact of fiscal policy on real output and are at issue in the debate between Keynesians and monetarists, the effectiveness of fiscal policy is also determined by the degree of openness of the economy (the propensity to import), the exchange rate regime (fixed or flexible), and the relative importance of the nation in international trade, which determines the way in which export prices are set.

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[18]) The increase in the price level would also imply that a reduction in the real value of wealth would lower the deomand for money (producing an offsetting shift of the LM curve to the right).

[19]) As will be discussed later in the paper, the value of the fiscal multiplier in an open economy depends critically on the exchange rate regime in place, the degree of integration of international capital markets, and the way in which export prices are determined.

[20]) The concept of rational expectations rules out the possibility of persistent errors in forecasting inflation. Rational expectations are formed, not only on the basis of past inflation as are adaptive expectations, but also take into account the current economic situation and the adjustment of the economy to the likely setting of policy. Given the quality of the information possessed, economic agents are assumed to be capable of making an unbiased forecast of the rate of inflation.

With a floating exchange rate, the increase in imports stemming from an expansionary fiscal policy initiative would cause a depreciation of the currency, which would tend to limit the increase in imports and to stimulate exports. In this way, a floating exchange rate can, all other things being equal, increase the effectiveness of fiscal policy in an open economy. The exchange rate, however, in a country such as Canada where there is a high degree of integration with international financial markets, is also sensitive to the gap between domestic and foreign interest rates. Depending on the relative strength of changes in the interest rate and in the current account balance, an expansionary fiscal policy can lead, not to a depreciation of the currency, but to an appreciation, which would dampen even further any impact on real activity.

The way in which export prices are determined can also have an important impact on the effectiveness of fiscal policy in a country, such as Canada, where more than a quarter of GNP is destined for foreign markets. If the prices of exports are determined on international markets (the small country hypothesis), fluctuations in the exchange rate would have no impact on export prices, in which case export demand would remain the same and the impact of fluctuations in the exchange rate would be limited to the profit margins of exporters. If, on the other hand, the price of Canadian exports were determined in domestic markets (the large country assumption), any variation in the exchange rate would be translated directly into equivalent variations in the price to consumers in foreign markets and would thus cause changes in export volumes. The large country assumption does not guarantee the effectiveness of fiscal policy in an open economy. It all depends on the impact of the increase in government expenditures on the exchange rate, on the one hand, and on the domestic inflation rate, on the other.

3. The Structure of the KEMO Model

The KEMO model is relatively simple in comparison to the large existing macroeconometric models. It only has 53 equations, of which 17 are definitions. Because of the important statistical biases that the estimation of such a small aggregated model with many omitted variables would involve, the parameters of the model were not estimated empirically. Instead the coefficients of the equations were taken from existing Canadian econometric models such as CANDIDE and RDX2, or were specified *a priori* to reflect the different hypotheses concerning the functioning of the economy (Keynesian or monetarist) being explored.[21]) A brief description of the main features of the model, starting with the main components of aggregate demand, is provided below. We will then present the supply side of the model, and finally the wage and price sector.[22])

[21]) It must be acknowledged that the model has a certain Keynesian bias to it because most of its coefficients were taken from Keynesian models. These pro-Keynesian biases are, however, compensated for by the introduction of other pro-monetarist biases into the model for purposes of the simulations.

[22]) A complete list of the equations of the model with variable definitions is provided in Appendix II.

Starting with the *demand* side, the consumption function is based on a mixture of the permanent income and life cycle hypotheses. Current real consumer expenditures depend on current real personal disposable income, a wealth variable and lagged real consumer expenditures. Real personal disposable income is defined as the sum of wages, salaries and supplementary labour income, non-incorporated business income, investment income, and government transfer payments to residents less direct taxes. Government transfer payments include interest on the public debt held by residents. As for the wealth variable, it is comprised of the capital stock, the part of the public debt held by residents and the real value of outside money less private sector foreign debt. The public debt held by residents is assumed to be a constant proportion of the total public debt which itself changes in response to changes in the government decifit. In the simulations reported here, the rate of increase in the monetary base is exogenous, so an increase in the deficit translates into an equivalent increase in the public debt.

The investment equation is one of partial adjustment of the capital stock to its desired level. The desired stock of capital, expressed in relation to permanent expected output, depends on the gap between the actual real interest rate, which is defined to be the nominal interest rate minus expected inflation, and the average real interest rate. Permanent expected output is defined as a weighted average of the predicted level of potential output and the level of output that would result if average rate of growth of output in the current and preceeding period were to be maintained. The level of potential output is estimated in accordance with the methodology of Statistics Canada by dividing the existing stock of capital by the historical minimum value of the capital to output ratio (calculated to be 2.3914). The nominal interest rate is a reduced form equation derived by solving the supply and demand for money functions. The important arguments in the interest rate equation are the money supply, the ratio between the public debt held by residents and the money supply, output, real wealth, and the expected rate of inflation.[23]).

Government expenditures are exogenous in the model and grow at a fixed rate. The export and import equations are very simple, containing an activity variable (real GNP for the import equation and U.S. real GNP for the export equation) and a relative price variable specified to be the ratio between foreign and domestic prices, both specified in Canadian dollars. In the simulations reported here, two different equations for exports are utilized. The first is based on the hypothesis that our export prices are determined on the domestic market (the large country assumption) as a function of the general price level. The second, conversely, supposes that Canadian export prices are established on international markets in foreign currency (the small country assumption). In the first equation, the volume of exports depends on the ratio of international prices to domestic prices expressed in foreign currency. In the second, the relative price term does not vary and exports only depend on foreign real activity levels, with

[23]) An important variable possibly omitted from the interest rate configuration is U.S. interest rates. However, this omission does not affect a simulation model of the type presented here since, in a shock minus control sense, the influence of all exogenous variables, such as foreign interest rates, will be exactly zero.

variations in the exchange rate only affecting the profit margin of exporters. As for prices of Canadian imports, we assume that they are determined abroad.[24])

On the *supply* side real national product at factor cost depends on the number of people employed and the utilized stock of capital, based on a Cobb-Douglas production function. GNP at market prices is obtained by adding indirect taxes less subsidies. The utilization rate can either be exogenous, or estimated by the ration between actual GNP (adjusted for unintended inventory accumulation) and potential GNP. Employment demand is a function of the real wage rate in efficiency units and the utilized capital stock. The growth rate of productivity is taken to be exogenous. The supply of labour, also exogenous, is used along with labour demand to calculate the unemployment rate.

Concerning *wages and prices,* the percentage change in the nominal wage rate is a function of the growth rate of productivity, the reciprocal of the unemployment rate (a measure of the tightness of the labour market), the expected rate of inflation, the increase in tax burden, variations in the exchange rate, and a catch-up variable reflecting past errors in anticipating inflation. In the simulations reported here, we have not taken into account the last three variables, limiting our analysis to the expectations-augmented Phillips curve specification.

The inflation rate (represented by the rate of increase of the GNP deflator)[25]) depends on variations in unit labour costs, changes in the rate of capacity utilization, foreign inflation in domestic currency, changes in indirect taxes, and unintended inventory accumulation, a measure of excess demand in the goods market.

The expected inflation rate follows a simple adaptive scheme and depends on expected inflation in the preceeding period and actual inflation in the current period.

The exchange rate is a function of the current account balance, the gap between domestic and foreign interest rates, the gap between expected domestic inflation and foreign inflation, and the value of the exchange rate in the previous period. The expected exchange rate depends on its own value in the preceeding period as well as its current value.

Definitional equations complete the model. The structure of the model, even though kept relatively simple, incorporates the main channels of transmission of fiscal policy noted by both the Keynesians and monetarists. The model can be made to reproduce the results consistent with alternatively either the orthodox Keynesian analysis of the determination of national income, or the monetarist approach, by just changing the coefficients in some of the equations. The model thus permits us to examine several hypotheses concerning the adjustment process of the economy to a fiscal shock and to identify the most important parameters in the present controversy over the effectiveness of fiscal policy.

[24]) An alternative formulation of the export equation could be where the effect of market power in exports is measured by putting in an export demand function and varying its elasticity.

[25]) To keep our model simple and the number of equations manageable, the model contains only one price variable. There is, therefore, no distinction between prices facing producers and those facing wage earners, a distinction which can be particularly important for a small open economy [see, for example, *Sachs*]. However, this distinction between different prices only has a secondary relevance for the main argument made in this paper which is that models can be developed including important elements of both keynesian and monetarist theories.

4. The Simulation Results

We have run a number of simulations with the KEMO model, each time using a different version of the model made by modifying values of particular parameters. For each version of the model, we have first created a control solution for the 1977 to 1985 period and have then simulated a fiscal shock, which took the form of a permanent $400 million increase in real government expenditures on goods and services in 1971 dollars, starting in 1977.[26])[27])[28]) The real fiscal multipliers for GNP, investment and consumer expenditures are shown in tables 1, 2 and 3 respectively. A complete list of the simulations performed preceeds the tables (see Appendix I).

The simulations were run, for the most part, assuming that the price of Canadian exports were determined on international markets. Some simulations were also done assuming that the price of exports was determined on the domestic market.

Using as a starting point the extreme version of the model based on the traditional Keynesian model with the interest rate and wage rate fixed in nominal terms, the model is modified to take into account the changes in the interest rate resulting from increase in the value of transactions, from the impact of real wealth on the demand for money, and also from portfolio composition effects. We then introduce the hypothesis that consumers behave rationally in responding to the public debt as a component of wealth and as a source of interest income, as well the hypothesis of wage and price flexibility as affected by different assumptions concerning the formation of expectations. We finally examine the impact of the assumption that the price of Canadian exports is determined on domestic markets rather than international.

4.1 The Traditional Keynesian Model

The first two simulations illustrate the impact of fiscal policy in the short and medium terms in a simple Keynesian model. The present version of the KEMO model differs a little from the traditional Keynesian model in that the consumption function includes a wealth variable. Simulation 1 shows the polar case of an effective fiscal policy: the LM curve is stable and horizontal (i.e. the demand for money is perfectly elastic with respect to the interest rate so that the interest rate remains unchanged); the aggregate supply curve is also horizontal (i.e. the nominal wage rate is fixed). The fiscal multiplier, as can be seen, is very high: the impact multiplier is 2.2; it reaches 2.7 in the second year and stabilizes at 2.5 from the sixth year on. Fiscal policy actions thus have a significant and lasting impact on the level of economic activity in this kind of a world. The government deficit increases, however, and persists for the whole period.

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[26]) Except in simulations 15, 16 and 17, we make the assumption that the stock of capital is not fully utilized at any time during the simulation period.

[27]) The objective of this exercise is not to evaluate the relative effectiveness of different types of fiscal policy instruments. Only one type of fiscal policy initiative was simulated.

[28]) Fiscal multipliers would be zero or negative if the economy was already operating at full capacity. Even Keynesians accept this. Therefore, for the simulations reported here, the control solutions were prepared such that unemployed resources always did exist.

Simulation 2 is the same as simulation 1, except for the increase in the interest rate caused by the increase in the transaction demand for money. As expected, the fiscal multiplier is weakened. This is true, however, only for the first three years. Following that, the depressing effect of the increase in interest rates on investment is offset by a stronger increase in consumer spending. The somewhat higher budgetary deficit in this scenario is translated into a much greater increase in public debt, one of the components of wealth. The growth of the debt and the increase in the interest rate raises interest income, which explains the greater increase in consumer expenditures by the end of the period.[29])

4.2 Wealth and Portfolio Composition Effects

Simulations 3, 4 and 5 assume that an expansionary fiscal policy has an impact on the interest rate, not only on account of the increase in the transaction demand for money, but also because of wealth and portfolio composition effects which either shift the LM curve left or right depending on the importance and direction of the portfolio composition effect. Simulation 3 assumes that government securities are not substitutes for money and that instead they replace other types of assets in the portfolio of economic agents, so that the issuance of new government securities raises the interest rate. The joint effect of wealth and portfolio composition effects on the interest rate results in a weakening of investment spending, thus temporarily reducing the value of the multiplier. As previously, however, the increase in real wealth, resulting from the cumulative government deficit and the increase in interest income, stimulates consumer expenditures and offsets over time the fall in investment, resulting in a substantial increase in the multiplier by the end of the period.[30]) Therefore, taking into account wealth and portfolio composition effects does not necessarily lower private spending and can even increase the fiscal multiplier in the long-run.[31])

These results would be quite different if we were to assume a higher degree of sensitivity of investment expenditures to variations in the interest rate. The elasticity of investment spending with respect to the expected real interest rate is raised from 0.1 in simulation 3, to 0.4 in simulation 4. The higher elasticity of investment markedly decreases the fiscal multiplier; the multiplier is less than one in the third year and becomes negative by the end of the period. The accelerator effect of the increase in aggregate demand on investment is nullified by the depressing effect of the increase in the interest rate resulting from financial market pressure from as early as the first year. Consumer expenditures grow by less, due to the smaller increase in income associated with the lesser increase in the interest rate and public debt, and also due to the weaker increase in real wealth resulting from the decline in investment and reduced government deficits stemming from lower public debt charges.

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[29]) The growth of interest income is even stronger since the interest rates themselves increase.

[30]) This situation is similar to that discussed in *Blinder/Solow* [1973].

[31]) It should be recalled that the KEMO model does not take into account capital losses on fixed income securities resulting from an increase in the interest rate. Wealth effects are thus overestimated in the model.

In the debate between the monetarists and Keynesians, much attention has focussed on portfolio composition effects and on the relative substitutability of different types of assets as the critical factor for the effectiveness of fiscal policy. Simulation 5 shows the importance of portfolio composition effects in the KEMO model. To do this, we have redone simulation 4, changing the sign of the portfolio composition variable in the interest rate equation. We made the hypothesis that government bonds were good substitutes for money. This considerably raises the fiscal multiplier, which goes from 1.6 in the first year to 2.7 by the end of the period. These results are quite different from those of simulation 4 where the multiplier gradually declines, even turning negative in the last year. The great sensitivity of the results to portfolio composition effects can be explained by the very high elasticity of investment with respect to the interest rate. Investment increases in simulation 5, rather than declines as in simulation 4, because the positive accelerator effect overpowers the negative impact of a higher interest rate.

4.3 The Rational Behaviour of Economic Agents

The following six simulations (6, 7, 8, 9, 10 and 11) examine different forms of the rational expectations hypothesis as applied to consumers. According to one variant of this hypothesis, government securities should not be counted as a component of wealth. The reason for this is that financial assets held in the form of liabilities of the government do not have a counterpart in the form of real capital, and will thus eventually require an increase in taxation. In this case, an increase in government securities held by consumers would not have an expansionary impact on their spending. The hypothesis of rational expectations could be taken even further to imply that consumers do not include interest on the public debt in their income.[32])

In simulation 6, the wealth variable in the consumption function excludes the part of the public debt held by residents. Interest on the debt, however, is included in disposable income and wealth and portfolio composition effects are taken into account in the demand for money. The elasticity of investment with respect to the interest rate is, as before, 0.4. The exclusion of government bonds as a component of wealth in the consumption function reduces the multiplier as expected. It becomes negative after the seventh year. However, the effect is fairly small because of the great sensitivity of investment to the interest rate. Thus the depressing effect on investment of higher interest rates exerts a dominating influence on the multiplier with the wealth effect on consumer expenditures being much weaker in comparison.

In simulation 7 we have excluded interest paid on government securities held by residents in the calculation of disposable income as well as excluding public debt from real wealth in the consumption function. The results of this simulation can be compared with simulations 5 and 6. The exclusion of interest income from disposable income substantially diminishes the multiplier. The multiplier becomes negative in the

[32]) The extreme variant of this hypothesis, as has already been noted, requires that an increase in government expenditures should produce an equivalent reduction in consumer expenditures.

fifth year and continues to deteriorate subsequently. Contrary to the previous scenarios, there is a growing diminution of consumer expenditures from the fourth year, which adds to the decline in investment resulting from the increase in the interest rate and reduction in aggregate demand.

Simulation 8 is similar to simulation 7, except that government bonds have been excluded as a component of wealth in the interest rate equation. This change implies a smaller increase in the interest rate which has the effect of raising the multiplier. The effect is relatively small at the beginning but it becomes progressively more and more important. A comparison of these results with those of simulation 4 shows that this particular variation of the rational expectations hypothesis has important implications for the effectiveness of fiscal policy, particularly in the medium-term. In the short-term, however, the sensitivity of investment expenditures to variations in the interest rate appears to be more important for the effectiveness of fiscal policy than this variant of the rational expectations hypothesis, as is shown by the results of simulation 9. This simulation is the same as simulation 8, except for the utilization of a coefficient for the elasticity of investment with respect to the interest rate of .1 instead of .4.

In simulations 10 and 11 we have examined the portfolio composition effect, this time in the context of the rational expectations hypothesis. Simulation 10 excludes wealth and portfolio composition variables from the interest rate equation. In simulation 11 the portfolio composition variable is reintroduced in the interest rate equation, but with a negative sign which signifies that government bonds are substitutes for money. A comparison of the results of these two simulations with those of simulation 8 confirms once more the determining influence of the relative degree of substitutability of government debt for money on the degree of effectiveness of fiscal policy. The value of the multiplier increases appreciably in comparison with simulation 8. In simulation 11 the hypothesis that government securities are substitutes for money implies a continual outward shift in the LM curve and is equivalent, to some extent, to the case where fiscal policy is accompanied by an accommodating monetary policy. The nominal interest rate remains practically constant in this simulation, only increasing by 0.1 percentage points at the beginning of the period and returning to its initial level by the fourth year. It should not be surprising, consequently, that the value of the fiscal multiplier increases gradually rather than declining as before.

4.4 Flexibility of Wages and Inflationary Expectations

Up until this point we have assumed that the nominal wage rate was not sensitive to either demand pressures in labour markets or price inflation and was thus exogenous. We now relax this assumption and suppose for the first time in simulation 12 that the change in the nominal wage rate depends not only on the exogenously specified productivity growth, but also on the unemployment rate and anticipated inflation. As can be seen by comparing the results of this simulation with those of simulation 3, this change diminishes the effectiveness of fiscal policy in the short-run, but increases it in the longer run. In the short-term the increase in the wage rate leads to an increase in the price level and interest rates, given a fixed supply of money, and

therefore discourages investment. Investment increases just the same over the first two years on account of the accelerator. Little by little, however, the acceleration of inflationary expectations, which here are assumed to be adaptive, combined with a smaller increase in the nominal interest rate brings about a reduction in the real interest rate, which offsets the impact of the increase in the wage rate and stimulates investment. The erosion of the increase in the nominal interest rate can be explained by the reduction in real wealth due to the price increase, which is more important than the increase resulting from the enhanced deficit. The smaller increase in the nominal interest rate than in inflation can be attributed to the absence of inflationary expectations from the interest rate equation. Allowing for inflationary expectations in the interest rate equation has a dramatic effect on the multiplier as is shown in simulation 13. In this simulation we made the Fisherian assumption that price expectations are fully reflected in nominal interest rates. The value of the multiplier is not affected very much initially, but it starts to diminish little by little from the third year, becoming less than 1 by the fifth year. In simulation 12 there was a slight erosion of the multiplier in the early years, that was reversed by the fifth year, after which the multiplier increased rapidly. In simulation 13, on the other hand, the multiplier declines monotonically.

In simulation 14 we have redone simulation 13 raising the elasticity of investment with respect to the interest rate. As predicted the multiplier is appreciably reduced. It is less than one starting in the first year and becomes negative from the third year. Because of inflation, however, the multiplier remains positive in nominal terms.

In the KEMO model gross national product can not be increased in real terms without an equivalent increase in the level of production, which depends on employment and the utilized capital stock. An increase in production requires either a reduction in the real wage, an expansion of the capital stock, or an increase in utilization of existing capital. In the short-run, variations in the capacity utilization rate constitute an important factor in the adjustment of production to demand. To better evaluate the effect of adjustments in the intensity of capacity utilization on the multiplier, we have done simulation 15 which is the same as simulation 13 except that the capacity utilization rate is held constant. In this simulation the value of the multiplier is much weaker in the short-run, particularly in the first two years. Even though the absence of excess capacity reduces the effectiveness of fiscal policy in the short and medium-terms, in the long-run it produces the opposite effect. The relatively weak increase in national product over the first few years causes a much larger increase in the government deficit, which in turn raises the public debt and debt interest thus stimulating consumption by the end of the period.

Variations in the real wage rate as well as adjustments in the utilization of existing capital exercise a determining influence on production. In simulation 15 we made the assumption that the nominal wage rate was determined on the basis of an expectations-augmented Phillips curve with expectation formation being adaptive. The evolution of the real wage rate is in this context strictly tied to errors in forecasting inflation and to the speed with which any errors are corrected. Simulation 16 is similar to simulation 15 except that the correction speed is much quicker. The coefficient of current inflation in the price expectations equation is increased from .5 to .8 with

a corresponding reduction in lagged inflation. As can be seen in Table 1, the more rapid adjustment of inflationary expectations reduces the multiplier considerably. The multiplier is reduced by one-half on impact and becomes negative from the third year. These results can be attributed principally to the marked decline in investment. This decline, together with the assumption of a constant rate of capacity utilization, implies a reduction in potential output. It is worth noting that in spite of a strong diminution in real gross national product, the multiplier remains positive because of the increase in price.

In simulation 17 we made the assumption that economic agents were able to correctly predict the inflation rate, and that the real wage rate and real interest rate were not affected by the rate of inflation. This is the extreme version of the rational expectations hypothesis. The multiplier is negative from the first year. As before, the preverse effect of fiscal policy can be traced to an induced decline in investment. Consumer expenditures increase slightly, in spite of a reduction in real wealth, on account of an increase in income from interest on the public debt.

For simulation 18 we have redone simulation 17, reintroducing this time a variable rate of capacity utilization. Even though the increase in government expenditures still has a negative impact on gross national product resulting from the assumption of ultra-rationality in the formation of inflationary expectations, the perverse impact of fiscal policy is somewhat weaker. This stems from two sources. The first is that the erosion in the capital stock is in part offset by an increase in the utilization rate, which cushions the reduction in potential output. The second is the more moderate reduction in inventories which lessens price pressures. The smaller increase in the domestic rate of inflation results in slower growth in imports, and, via the wealth effect, to a less pronounced weakening in consumer expenditures.

4.5 Determination of Export Prices

Until this point, we have made the assumption that prices of Canadian exports are determined on international markets, and that, as a result, the increases in wages and prices in Canada do not have any impact on the competitive position of Canadian exporters, instead only affecting their profit margins. Even though this assumption as to the determination of export prices is that which is most often utilized in econometric models, we have done several simulations making the alternative assumption that Canadian export prices were determined entirely as a function of domestic economic conditions.

Simulation 19 is similar to simulation 1. This means that the nominal interest rate as well as the nominal wage rate are exogenous. The only difference is that export prices are determined in Canada. The implication of this latter assumption is that the depreciation of the Canadian dollar resulting from the expansionary shock reduces the price of Canadian exports, and thus raises the volume of exports. This is why the multiplier is slightly higher in this simulation.

While in simulation 19 the interest rate, the wage rate, and inflation are held constant, simulation 20 is similar to simulation 14 and thus allows the interest rate and

wages and prices all to vary. The assumption of domestically determined export prices this time implies a reduction in the effectiveness of fiscal policy. The multiplier becomes negative in the third year, due to the pick up in inflation which outweighs the impact of the depreciation and makes exports less competitive on international markets.

Simulation 21 follows on simulation 20 with a modification to the interest rate equation to include the wealth and portfolio variables. This has a small effect on the multiplier. There is a less pronounced reduction in investment, which tends to accentuate inflationary pressures and to further reduce exports.

In simulation 22 the interest elasticity of investment was reduced from .4 to .1. This has the effect of increasing the value of the multiplier by dampening the decline in investment. In the longer run, however, the competitive position deteriorates and the multiplier declines with the fall off in exports.

5. Conclusions

It has been more than ten years since the term "monetarist" appeared in the literature and the debate on the relative effectiveness of monetary and fiscal policy as instruments of stabilization policy has not yet been resolved. Even though the controversy first looked like it was over empirical questions, there is still not agreement concerning what would constitute a valid empirical test of the role of the two instruments. The Keynesians for their part have estimated structural models which indicate, in contrast to the monetarists' claims, that purely fiscal measures have significant and lasting effects on economic activity. The monetarists in turn regard these models to be inadequate to gauge the effectiveness of fiscal policy because they are based on too limited a view of the adjustment process of the various sectors of the economy to a fiscal shock. The monetarists, however, have not developed their own structural model which represents their own perceptions of the adjustment mechanisms in question and which clearly demonstrates the negligible influence of fiscal policy on output.

Within the framework of this controversy on the effectiveness of fiscal policy, we have developed a simple model, which highlights the principal points at issue in the debate between monetarists and Keynesians. The numerous simulations we have done with the model suggest that, within the framework of the model at least, the effectiveness of fiscal policy is particularly dependent on the following factors:

(1) The degree of sensitivity of investment expenditures to variations in real expected interest rates;
(2) the degree of relative substitutability between government securities, money and other types of assets, from which comes a direct impact of debt management policy on the effectiveness of fiscal policy;
(3) the degree of flexibility of wages and the impact of inflationary expectations, as well as their formation mechanism (adaptive or rational);

(4) the partial or total adjustment of nominal interest rates to inflationary expectations;
(5) the variations in the interest rate on government securities and the way in which economic agents take into account interest on government securities, which they receive, in calculating their disposable income; and
(6) the way in which export prices are determined.

The results of the simulations show that taking into consideration government liabilities as a component of wealth in the consumption and money demand equations does not have a very significant impact on the multiplier.

The identification of the parameters which have a determining influence on the effectiveness of fiscal policy only constitutes the first step in the resolution of the controversy between Keynesians and monetarists. It is up to the Keynesians and monetarists alike to demonstrate that the empirical magnitude of these parameters confirms their thesis regarding the effectiveness of stabilization policy.

Appendix I

List of Simulations

(The shock in each case is an increase in government expenditures on goods and services of $400 million 1971 dollars).

Simulation No.	Summary Description
1	Export prices determined on international markets; nominal wage rate (WG) and nominal interest rate (RI) fixed.
2	Same as 1 except RI = f (YS, Ml/P) where: YS is real GNP; and Ml/P is real money supply.
3	Same as 1 except RI = f (YS, Ml/P, W, DDK/Ml) where: W is real wealth; and DDK is public debt held by residents.
4	Same as 3 except that the interest elasticity of investment is higher.
5	Same as 4 except that the coefficient of DDK in the RI equation is negative.
6	Same as 4 except that C ≠ f (DDK/P) where C is real consumer expenditures.
7	Same as 6 except that C ≠ f (INTD) where INTD is interest payments on the public debt held by residents.
8	Same as 7 except that DDK/P is not treated as wealth in RI equation.
9	Same as 8 except that interest elasticity of investment is lower.

10	Same as 8 except that RI ≠ f (W, DDK/Ml).
11	Same as 8 except that RI = f (–DDK/Ml).
12	Same as 3 except that WG is flexible.
13	Same as 12 except that RI = f (YS, Ml/P, W, DDK/Ml, PEG).
14	Same as 13 except that interest elasticity of investment is higher.
15	Same as 13 except that the capacity utilization rate is held constant.
16	Same as 15 except that inflationary expectations adjust more quickly.
17	Same as 15 except that inflationary expectations are rational.
18	Same as 17 except that the capacity utilization rate is allowed to vary.
19	Same as 1 except that export prices are determined on domestic markets.
20	Same as 14 except that export prices are determined on domestic markets.
21	Same as 20 except that RI = f (YS, Ml/P, W, DDK/Ml).
22	Same as 21 except that interest elasticity of investment is smaller.

Year	SIMULATION NO. 1	2	3	4	5	6	7	8	9	10	11
1977	2.2	1.9	1.9	1.3	1.6	1.2	1.1	1.2	1.7	1.2	1.5
1978	2.7	2.3	2.3	1.3	1.9	1.2	.9	1.0	1.8	1.3	1.7
1979	2.3	2.2	2.0	.9	1.8	.8	.4	.6	1.3	1.1	1.6
1980	2.2	2.2	2.0	.7	1.9	.6	.0	.3	1.0	1.0	1.6
1981	2.4	2.4	2.3	.6	2.1	.4	-.4	.1	.9	1.0	1.7
1982	2.5	2.6	2.5	.4	2.2	.1	-.8	-.2	.6	.9	1.8
1983	2.5	2.7	2.9	.2	2.2	-.1	-1.3	-.5	.2	.9	1.8
1984	2.5	2.8	3.8	.1	2.3	-.3	-1.8	-.8	-.2	.8	1.8
1985	2.5	3.0	5.6	-.0	2.7	-.5	-2.4	-1.1	-.7	.8	1.9

	SIMULATION NO. 12	13	14	15	16	17	18	19	20	21	22
1977	1.7	1.6	.9	.7	.3	-.1	.6	2.7	1.5	1.5	1.7
1978	1.7	1.7	.5	1.0	.1	-.4	-.3	3.8	1.1	1.1	1.3
1979	1.2	1.2	-.2	.9	-.6	-.8	-1.1	3.4	-.1	-.1	.3
1980	1.2	1.0	-.7	.8	-1.3	-1.2	-1.0	3.1	-.5	-.3	-.2
1981	1.8	.9	-.9	.8	-1.9	-1.6	-.5	3.3	-.6	-.5	-.3
1982	2.7	.7	-1.0	.7	-2.6	-2.1	-.2	3.5	-.9	-.7	-.6
1983	4.1	.6	-.9	.7	-3.3	-2.7	-.1	3.5	-1.0	-1.0	-.9
1984	6.0	.5	-.7	.8	-4.2	-3.6	-.2	3.4	-1.0	-1.0	-1.0
1985	8.0	.4	-.6	1.0	-5.5	-4.8	-.6	3.4	-.8	-.9	-1.0

Tab. 1: Multiplier for Real Gross National Product (for a permanent increase in real government expenditures)

Year	SIMULATION NO. 1	2	3	4	5	6	7	8	9	10	11
1977	.5	.5	.5	.4	.4	.3	.2	.2	.4	.2	.3
1978	.9	1.0	1.0	.5	1.7	.5	.3	.3	.6	.4	.5
1979	1.0	1.2	1.2	.7	.9	.5	.1	.2	.5	.4	.6
1980	1.1	1.3	1.4	.8	1.0	.6	-.1	.1	.4	.3	.6
1981	1.1	1.5	1.8	.9	1.1	.6	-.3	-.1	.2	.3	.7
1982	1.2	1.6	2.4	1.1	1.2	.7	-.6	-.3	.0	.3	.7
1983	1.3	1.8	3.5	1.4	1.2	.9	-.9	-.5	-.2	.2	.7
1984	1.3	2.0	5.6	2.0	1.3	1.2	-1.3	-.8	-.5	.2	.7
1985	1.3	2.3	11.8	3.0	1.4	1.9	-1.8	-1.0	-.9	.1	.8

	SIMULATION NO. 12	13	14	15	16	17	18	19	20	21	22
1977	.5	.5	.3	.3	.4	.5	.5	.6	.5	.5	.5
1978	.9	.9	.4	.7	.7	.7	.6	1.2	.7	.7	.8
1979	1.1	1.0	.3	1.0	.7	.4	.4	1.4	.6	.6	.7
1980	1.3	1.1	.1	1.2	.4	.3	.3	1.4	.4	.5	.6
1981	1.6	1.1	-.0	1.4	.2	.2	.4	1.5	.4	.4	.6
1982	2.0	1.2	-.2	1.5	.0	.1	.7	1.5	.2	.3	.5
1983	2.5	1.2	-.3	1.6	.0	.1	1.2	1.6	.1	.2	.3
1984	2.9	1.2	-.3	1.8	.2	.1	1.9	1.6	.1	.1	.2
1985	3.2	1.2	-.3	2.1	.6	.5	2.5	1.6	.0	.0	.1

Tab. 2: Multiplier for Real Consumer Expenditures (for a permanent increase in real government expenditures)

Year	SIMULATION NO. 1	2	3	4	5	6	7	8	9	10	11
1977	.8	.5	.5	-.0	.3	-.0	-.0	.0	.4	.0	.2
1978	.9	.6	.5	-.3	.3	-.2	-.3	-.2	.4	-.0	.3
1979	.4	.2	.0	-.7	.1	-.7	-.7	-.5	-.1	-.2	.1
1980	.3	.1	-.2	-1.0	.1	-.9	-.8	-.7	-.2	-.3	.1
1981	.4	.2	-.2	-1.2	.1	-1.2	-1.0	-.8	-.2	-.2	.2
1982	.5	.2	-.5	-1.6	.1	-1.5	-1.2	-.9	-.3	-.2	.2
1983	.4	.1	-.9	-2.1	.2	-1.9	-1.3	-1.0	-.5	-.2	.2
1984	.4	.1	-1.8	-2.8	.2	-2.4	-1.5	-1.0	-.6	.2	.2
1985	.4	.1	-4.7	-3.8	.2	-3.3	-1.7	-1.1	-.7	-.2	.2

	SIMULATION NO. 12	13	14	15	16	17	18	19	20	21	22
1977	.5	.4	-.2	.1	-.1	-.4	-.1	.9	.4	.4	.5
1978	.3	.4	-.6	.1	-.7	-1.1	-1.2	1.3	.1	.2	.4
1979	-.3	-.1	-1.3	-.1	-1.5	-1.7	-2.2	.7	-.6	-.5	-.3
1980	-.4	-.3	-1.6	-.3	-2.1	-1.8	-1.8	.4	-.8	-.6	-.4
1981	-.1	-.4	-1.7	-.3	-2.5	-2.1	-1.7	.5	-.7	-.5	-.2
1982	.6	-.4	-1.7	-.3	-3.0	-2.5	-1.8	.6	-.8	-.6	-.3
1983	1.7	-.4	-1.6	-.3	-3.6	-3.2	-1.9	.6	-.9	-.7	-.4
1984	3.1	-.4	-1.5	-.2	-4.5	-4.0	-2.5	.5	-.8	-.7	-.4
1985	4.9	-.4	-1.4	-.1	-6.0	-5.3	-3.6	.5	-.8	-.6	-.3

Tab. 3: Multiplier for Real Investment Expenditures (for a permanent increase in real government expenditures)

LIST OF COEFFICIENTS FOR KEMO MODEL

B20	0.	B21	0.5	B22	0.80582
B23	0.034321	B24	0.	B30	0.1068
B31	2.72	B32	-2.	B33	-0.008
B34	0.049	B35	1.	B36	0.95
B37	1.	B40	0.	B41	0.0241
B42	1.	B43	1.	B50	0.
B51	0.006793	B52	1.3	B53	-1.
B54	0.7311	B60	0.005716	B61	1.
B70	1.	B80	0.799	B81	0.815
B82	0.691	B83	1.	B90	0.5
B91	2.	B92	0.5	B100	4.3
B101	0.72	B102	0.28	B110	0.6639
B111	0.1251	B120	1.	B121	1.
B122	1.	B140	0.	B150	1.11
B170	0.01764	B200	1.46	B220	1.09
B221	1.10281	B222	1.	B223	1.
B250	-1.	B251	1.	B260	0.977
B270	0.2387	B271	-1.	B272	1.
B310	0.02	B320	1.	B321	0.42
B322	0.	B323	0.	B324	0.
B325	0.	B330	1.	B331	1.
B332	1.	B333	1.	B334	-3.
B335	0.	B336	-0.864921	B340	0.5
B341	0.	B342	0.	B343	1.
B344	1.	B345	1.	B346	0.
B347	0.6	B350	0.21779	B370	1.1259
B390	0.811857	B391	0.	B3910	1.
B3911	1000.	B392	1.	B393	-1.
B394	0.5	B395	0.5	B396	1.
B397	0.026	B398	1.	B399	1.
B480	-4.	B481	-0.01	B482	-0.5
B490	0.5	B491	-1.	B492	-0.01
B493	-0.0325	B510	1.	B511	-1.
B520	1.	B521	0.	B522	0.
B523	1.	B530	1.	GG	0.021
LSG	0.03	TRDOG	0.04	PWG	0.0577
YFG	0.0495	A70	0.	A71	0.
A72	0.	A80	0.	A81	0.156433
A120	0.	A220	0.	A390	0.006073
A391	1.	A392	0.	A510	0.
A520	0.				

Year	SIMULATION NO. 1	2	3	4	5	6	7	8	9	10	11
1977	.8	.5	.5	-.0	.3	-.0	-.0	.0	.4	.0	.2
1978	.9	.6	.5	-.3	.3	-.2	-.3	-.2	.4	-.0	.3
1979	.4	.2	.0	-.7	.1	-.7	-.7	-.5	-.1	-.2	.1
1980	.3	.1	-.2	-1.0	.1	-.9	-.8	-.7	-.2	-.3	.1
1981	.4	.2	-.2	-1.2	.1	-1.2	-1.0	-.8	-.2	-.2	.2
1982	.5	.2	-.5	-1.6	.1	-1.5	-1.2	-.9	-.3	-.2	.2
1983	.4	.1	-.9	-2.1	.2	-1.9	-1.3	-1.0	-.5	-.2	.2
1984	.4	.1	-1.8	-2.8	.2	-2.4	-1.5	-1.0	-.6	.2	.2
1985	.4	.1	-4.7	-3.8	.2	-3.3	-1.7	-1.1	-.7	-.2	.2

	SIMULATION NO. 12	13	14	15	16	17	18	19	20	21	22
1977	.5	.4	-.2	.1	-.1	-.4	-.1	.9	.4	.4	.5
1978	.3	.4	-.6	.1	-.7	-1.1	-1.2	1.3	.1	.2	.4
1979	-.3	-.1	-1.3	-.1	-1.5	-1.7	-2.2	.7	-.6	-.5	-.3
1980	-.4	-.3	-1.6	-.3	-2.1	-1.8	-1.8	.4	-.8	-.6	-.4
1981	-.1	-.4	-1.7	-.3	-2.5	-2.1	-1.7	.5	-.7	-.5	-.2
1982	.6	-.4	-1.7	-.3	-3.0	-2.5	-1.8	.6	-.8	-.6	-.3
1983	1.7	-.4	-1.6	-.3	-3.6	-3.2	-1.9	.6	-.9	-.7	-.4
1984	3.1	-.4	-1.5	-.2	-4.5	-4.0	-2.5	.5	-.8	-.7	-.4
1985	4.9	-.4	-1.4	-.1	-6.0	-5.3	-3.6	.5	-.8	-.6	-.3

Tab. 3: Multiplier for Real Investment Expenditures (for a permanent increase in real government expenditures)

LIST OF COEFFICIENTS FOR KEMO MODEL

B20	0.	B21	0.5	B22	0.80582
B23	0.034321	B24	0.	B30	0.1068
B31	2.72	B32	-2.	B33	-0.008
B34	0.049	B35	1.	B36	0.95
B37	1.	B40	0.	B41	0.0241
B42	1.	B43	1.	B50	0.
B51	0.006793	B52	1.3	B53	-1.
B54	0.7311	B60	0.005716	B61	1.
B70	1.	B80	0.799	B81	0.815
B82	0.691	B83	1.	B90	0.5
B91	2.	B92	0.5	B100	4.3
B101	0.72	B102	0.28	B110	0.6639
B111	0.1251	B120	1.	B121	1.
B122	1.	B140	0.	B150	1.11
B170	0.01764	B200	1.46	B220	1.09
B221	1.10281	B222	1.	B223	1.
B250	-1.	B251	1.	B260	0.977
B270	0.2387	B271	-1.	B272	1.
B310	0.02	B320	1.	B321	0.42
B322	0.	B323	0.	B324	0.
B325	0.	B330	1.	B331	1.
B332	1.	B333	1.	B334	-3.
B335	0.	B336	-0.864921	B340	0.5
B341	0.	B342	0.	B343	1.
B344	1.	B345	1.	B346	0.
B347	0.6	B350	0.21779	B370	1.1259
B390	0.811857	B391	0.	B3910	1.
B3911	1000.	B392	1.	B393	-1.
B394	0.5	B395	0.5	B396	1.
B397	0.026	B398	1.	B399	1.
B480	-4.	B481	-0.01	B482	-0.5
B490	0.5	B491	-1.	B492	-0.01
B493	-0.0325	B510	1.	B511	-1.
B520	1.	B521	0.	B522	0.
B523	1.	B530	1.	GG	0.021
LSG	0.03	TRDOG	0.04	PWG	0.0577
YFG	0.0495	A70	0.	A71	0.
A72	0.	A80	0.	A81	0.156433
A120	0.	A220	0.	A390	0.006073
A391	1.	A392	0.	A510	0.
A520	0.				

Appendix II

The Kemo Model

1. Y = C + I + G + X – M
2. C = B20*(1 – B21) + B22*B21*(YD – B24*INTD/P)
   +B21*C(– 1) + B23*(W – B25*(DDK/P))
   – B23*B21*(W(–1) – B25*(DDK(–1)/P(–1)))
3. I = B30*(YE*(B31 + B32*(RI*0.01 – PEG + B33))
   – (B30 – B34)*K(–1)
4. X = B40 + B41*YF**B42*PR**B43
5. M = B50 + (B51*YS**B52*PR**B53) + (INTF + B54*TRF) / P
6. T = B60 + RATE*YS**B61
7. G = B70*G (–1)*(1 + GG) + A70*G(–1)*(1 + YG*YG*A71)
   + A72*YS
8. YD = A80*(LD*WNR/P + A81*YSF – B81*T + B82*(TRD/P))
9. YE = B90*YP*(1 + LSG + PROD)**B91
   + (1 – B90)*YS*(1 + B92*YG + (1 – B92)*YG(–1))**B91
10. YSF = B100*LD**B101**KU**B102
11. YS = YSF + B110*(RO/P) – B170*YSF
12. D = DEF – H + H(–1)
13. DSTK = DSTK(–1) + D
14. DD = B140 + DDP*D
15. INTD = B150*RI*DDK(–1)/100
16. DDK = DDK(–1) + DD
17. TRD = TRDO + INTD + B170*YSF*P
18. TRDO = TRDO(–1)*(1 + PG + TRDOG)
19. TR = TRD + TRF
20. TRF = B200*RW*(DSTK(–1) – DDK(–1))/100
21. DFST = DFST(–1) – BT
22. BT = B220*P*(B223*XX+B222*(X – XX))
    – B221*(PW*PF*(M – (INTF + B54*TRF)/P)
    + INTF + B54*TRF) + A220*PW*PF((1 – B223)*XX
    + (1 – B222)*(X – XX))
23. INTF = RW*DFST(–1)/100
24. V = YS – Y

25. W = K + B251*(DDK/P) + Ml/P + B250*(DFST/P)
26. K = B260*K(−1) + I
27. LD = B270*WF**B271*KU**B272
28. LS = LS(−1)*(1 + LSG + PROD)
29. U = (LS − LD)LS*100
30. WR = WR(− 1)*(1 + WRG)
31. WRG = WG − PG − PROD
32. WG = PROD + B320*PEG + B321*(1/U)
    + B322*(T/YS − T(−1)/YS(1)) + B323*(PFE − PF)/PF
    + B324*(PF − PF(−1))/PF(−1)
    + B325*(PG(−1) − WG(−1) + PROD(−1))
33. PG = B330* (WG−PROD) + B102*B331*(KU/K
    − B335*KU(−1)/K(−1) + B336) + (B332 − B330)*PWDG
    + B333*((B110*RO − B111*TRDO)/YC
    − (B110*RO − B111*TRDO)/YC(−1)/
    (1 + (B110*RO − B111*TRDO)/YC(−1)))
    + B334*(V/YS)
34. PEG = B343*(B340*PEG(−1) + (1−B340)*PG)
    + B341*(M1G − B344*M1G(−1))
    + B342*(DEF/YC − B345*(DEF(−1)/YC(−1)))
    + B346*(B347*YG + (1 − B347)*YG(−1))
35. RO = B350*YSF*P
36. MlG = (Ml − Ml(−1))/Ml(−1)
37. DEF = P*(B370*G − T) − RO + TR
38. MI = MULT*H
39. RI = B398*(B390*U**B391)*(DDK/M1*B3911))**B392*
    (M1/P*1000))**B393*(YS/B399)**B394*
    (W/B3910)**B395*(PEG + B397)**B396) + A392*
    (A390*U**B391*(DDK/M1*B3911))**B392
    *(M1/(P*1000))**B393*(YS/B399)**B394
    *(W/B3910)**B395 + A391*PEG*100)
40. P = P(−1)*(1 + PG)
41. PW = PW(−1)*(1 + PWG)
42. YF = YF(−1)*(1 + YFG)
43. YG = (YS − YS(−1))/YS(−1)
44. YC = YS*P
45. YCG = (YC−YC(−1)/YC(− 1))
46. PR = PF*PW/P

47. PWDG = ((PF*PW) – PF(–1)*PW(–1))/PF(–1)*PW(–1))

48. PF = PF(–1) + B480*(BT/YC – BT(–1)/YC(–1) + B481* (RI – RW – (RI(–1) – RW(–1))) + B482*(PWG – PEG)

49. PFE = B490*PFE(–1) + (1–B490)*PF

50. YP = K/2.3914

51. KU = B510*(Y/YP*K) + A510*(KUR*K)

52. H = B522*(B520*HX + B521*(DEF – DEFX) + (H(–1) – HX(–1)) + B523*(B520*HX + B521*DEF + (H(–1) – HX(–1))

53. WNR = B530*WNR(–1)*(1 + WG)

Definition of Variables

BT	Current account balance
C	Real consumer expenditures
D	Government deficit financed by borrowing
DD	Government borrowing on domestic markets
DDK	Part of public debt held by residents
DEF	Government deficit
DEFX	Government deficit in the control solution
DFST	Private foreign debt
DSTK	Stock of public debt
G	Real government expenditures
GG	Growth rate of government expenditures
H	Monetary base
HX	Monetary base in control solution
I	Real investment expenditures
INTD	Interest paid by the government on the public debt held by residents
INTF	Interest paid on the private debt held by foreigners
K	Real capital stock
KU	Utilized capital stock
LD	Labour demand
LS	Labour supply
LSG	Growth rate of labour supply

M	Real imports
M1	Money supply in current dollars
M1G	Growth rate of the money supply
MULT	Multiplier for the monetary base
P	Domestic price level
PEG	Expected inflation rate
PF	Exchange rate ($Can/$Us)
PFE	Expected exchange rate
PG	Inflation rate
PR	Ratio of domestic to international prices
PROD	Growth rate of labour productivity
PW	International price level (import price)
PWDG	Growth rate of international prices in domestic currency
PWG	Growth rate of international prices
RATE	Average direct tax rate
RI	Nominal interest rate
RO	Government revenues other than direct taxes
RW	Nominal interest rate abroad
T	Real direct taxes
TR	Nominal transfer payments to persons
TRD	Government transfers to residents
TRDO	Government transfers to residents excluding debt interest but including subsidies
TRDOG	Growth rate of TRDO
TRF	Government transfers to non-residents including debt interest
U	Unemployment rate
V	Unintended changes in inventories
W	Real wealth
WG	Growth rate of nominal wages
WR	Effective real wage rate
WRG	Growth rate of WR
X	Real exports
XX	Real exports in the control solution
Y	Real GNP, net of unintended changes in inventories
YC	Real GNP in current dollars
YCG	Growth rate of nominal GNP
YD	Real disposable income
YE	Expected real output
YF	Foreign real GNP

YFG	Growth rate of foreign real GNP
YG	Growth rate of real GNP
YP	Potential output
YS	Real GNP at market prices
YSF	Real GNP at factor cost

References

Andersen, L.C., and *K.M. Carlson*: A Monetarist Model for Economic Stabilization. Federal Reserve Bank of St. Louis, Review **52** (4), 1970, 7–25.

Andersen, L.C., and *J.L Jordan*: Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization. Federal Reserve Bank of St. Louis, Review (11), 1968, 11–23.

Bank of Canada and Department of Finance: Seminar on Responses of Various Models to Selected Policy Shocks. Ottawa 1982.

Blinder, A.S., and *R.M. Solow*: Does Fiscal Policy Matter?, Journal of Public Economics, 1973 (November), 319–337.

Brunner, K., and *A. Meltzer*: An Aggregative Theory for a Closed Economy. In: Monetarism. Ed. by J.L. Stein. Amsterdam 1976.

–: Friedman's Monetary Theory. In: Milton Friedman's Monetary Framework. Ed. by R.J. Gordon. Chicago 1977, 63–76.

Buiter, W.: Crowding Out and the Effectiveness of Fiscal Policy. Journal of Public Economics, 1977 (June), 309–328.

Buiter, W., and *J. Tobin*: Debt Neutrality: A Brief Review of Doctrine and Evidence. In: Social Security versus Private Spending. Ed. by George M. von Furstenberg. Cambridge, MA, 1979.

Carlson, K.M.: Monetary and Fiscal Actions in Macroeconomic Models. Federal Reserve Bank of St. Louis, Review **60** (1), 1974.

–: Does the St. Louis Equation Now Believe in Fiscal Policy. Federal Reserve Bank of St. Louis Review **60** (2), 1978, 13–19.

Carlson, K.M., and *R.W. Spencer*: Crowding Out and Its Critics. Federal Reserve Bank of St. Louis, Review **57** (12), 1975, 2–17.

Cepula, R.J.: Deficits Spending, Expectations and Fiscal Policy Effectiveness. Public Finance **3** (4), 1973, 362–370.

Cohen, D., and *J.S. McMenamin*: The Role of Fiscal Policy in a Financially Disaggregated Macroeconomic Model. Journal of Money, Credit and Banking **10** (3), 1978, 322–336.

David, R.A., and *J.L. Scadding*: Private Savings: Ultra-rationality, Aggregation and 'Dension's Law'. Journal of Political Economy, 1974, (March/April), 225–249.

Department of Finance: Economic Review. Supply and Services. Ottawa 1978.

–: Comparative Responses of Canadian Econometric Models to Fiscal Policy, Monetary and Exchange Rate Shocks. Fiscal Policy Division, 1979 (June).

Duguay, P.: Une analyse du modèle à former réduite et son application au Canada. Bank of Canada Technical Report **15**, 1979.

Friedman, B.: Even the St. Louis Model Now Believes in Fiscal Policy. Journal of Money, Credit and Banking **9** (2), 1977, 365–367.

–: Crowding-Out or Crowding-In: Economic Consequences of Financing Government Deficits. Brookings Papers on Economic Activity **3**, 1978.

Friedman, M.: A Theoretical Framework for Monetary Analysis. Journal of Political Economy, 1970. Reprinted in: Milton Friedman's Monetary Framework. Ed. by R. Gordon. 1974.

–: Comments on Tobin and Buiter. In: Monetarism. Ed. by J.L. Stein. Amsterdam 1976.

Goldfeld, S.M., and *A.S. Blinder*: Some Implications of Endogenous Stabilization Policies. Brookings Papers on Economic Activity **3**, 1972.

Gordon, R.J.: Perspective on Monetarism. In: Monetarism. Ed. by J.L. Stein. Amsterdam–New York 1976, 52–66.

Gramlich, E.: The Usefulness of Monetary and Fiscal Policy as Discretionary Stabilization Tools. Journal of Money, Credit and Banking **3** (2), 1971, 506–532.

Helliwell, J.F., T. Maxwell and *A.E.L. Waslander*: Comparing the Dynamics of Canadian Macromodels. Canadian Journal of Economics **12** (2), 1979, 181–194.

Hendershott, P.H.: A Tax Cut in a Multiple Security Model – Crowding-Out, Pulling-In and the Term Structure of Interest Rates. Journal of Finance **31** (4), 1976, 1185–1200.

Modigliani, F., and *A. Ando*: Impacts of Fiscal Actions on Aggregate Income and the Monetarist Controversy: Theory and Evidence. In: Monetarism. Ed. by J.L. Stein. Amsterdam–New York 1976, 17–42.

Purvis, D.D.: Monetarism, A Review. Discussion Paper, Queen's University, 1978.

Rasche, R.: A Comparative Static Analysis of Some Monetarist Propositions. Federal Reserve Bank of St. Louis, Review **55** (12), 1973, 15–23.

Sachs, J.D.: The Current Account and Macroeconomic Adjustment in the 1970s. Brookings Papers on Economic Activity 1981.

Sheikh, M.A.: Medium-Term Projections of the Canadian Economy Using Reduced-Form Monetarist Models. Fiscal Policy Division, Department of Finance, 1979.

–: An Analysis of Some Possible Causes for the Absence or Presence of the Homogeneity Property in Large Macroeconomic Models. Fiscal Policy Division, Department of Finance, 1982.

Silber, W.L.: Fiscal Policy in IS-LM Analysis – A Correction. Journal of Money, Credit and Banking **2** (3), 1970, 461–472.

Stein, J.L.: Inside the monetarist black box. In: Monetarism. Ed. by J.L. Stein. Amsterdam–New York 1976, 183–232.

Stevens, N.A.: Government Debt Financing – Its Effects in View of Tax Discounting. Federal Reserve Bank of St. Louis, Review **61** (7), 1979, 11–19.

Tobin, J.: A General Equilibrium Approach to Monetary Theory. Journal of Money, Credit and Banking, 1969.

–: An Essay on the Principles of Debt Management. Cowles Foundation Paper No. 195, 1963.

Tobin, J., and *W. Buiter*: Long Run Effects of Fiscal and Monetary Policy on Aggregate Demand. In: Monetarism. Ed. by J.L. Stein. Amsterdam–New York 1976.

–: Fiscal and Monetary Policies, Capital Formation and Economic Acivity. In: The Government and Capital Formation. Ed. by George M. von Furstenberg. Cambridge, MA, 1980.

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