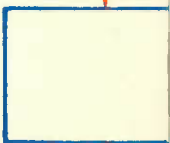
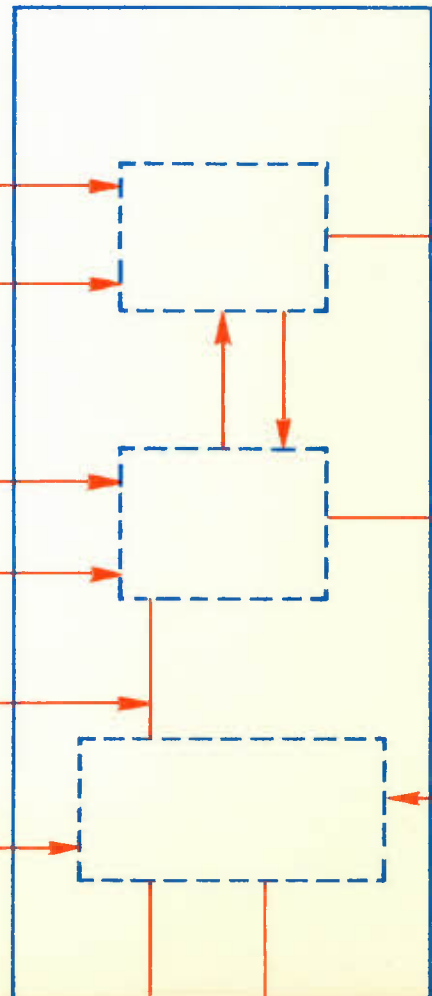
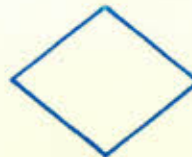
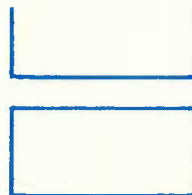
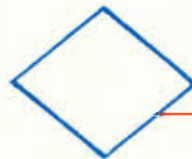
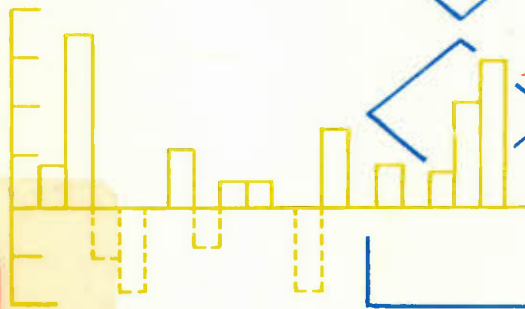




**Economic Council of Canada**  
**Conseil économique du Canada**



HC  
111  
.E28  
n.53

c.1  
tor mai

Post Office 527, Ottawa K1P 5V6  
Case Postale 527, Ottawa K1P 5V6

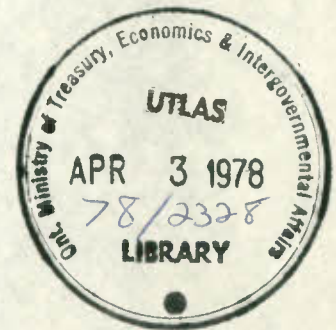
DISCUSSION PAPER No. 53

Public Expenditure Indicators  
in Canada

by Michel Boisvert

Discussion Papers are distributed by the Council so that their authors may benefit from the comments of their colleagues. Any other use of these papers should first be approved by the authors.

March 1976





CAN.  
EC-5-  
53/  
1976



## Résumé

La stabilisation conjoncturelle apparaît déjà depuis plusieurs décennies comme un objectif de premier plan en politique économique. Il existe de fait tout un arsenal d'instruments à court terme pour se rapprocher d'un tel objectif, les plus connus étant la gestion du surplus (ou déficit) budgétaire du gouvernement et le contrôle de la masse monétaire et des conditions de crédit. Certains économistes prétendent cependant que la stag-flation actuelle s'expliquerait davantage par des facteurs de plus long terme tel que l'expansion continue du secteur public dans les économies industrielles. Par ailleurs, l'ensemble du secteur public est habituellement traité comme exogène dans les modèles macroéconomiques d'origine keynésienne tel que CANDIDE.

Le but de ce document est de mettre au point un éventail de règles de gestion publique susceptibles de générer des taux de croissance différents pour les dépenses gouvernementales et d'en mesurer, à l'aide du modèle CANDIDE, les implications sur les variables normalement visées par la stabilisation conjoncturelle. A cause de l'importance du niveau provincial de gouvernement au Canada, chaque règle de gestion est appliquée indépendamment à chacun des gouvernements provinciaux, en plus du gouvernement fédéral. Ces exercices sont d'abord effectués pour la période 1961-1971, avec l'hypothèse d'un surplus ou déficit budgétaire comparable à ce qui a été observé à chaque année, et ensuite pour la période 1972-1977, avec l'hypothèse d'une position budgétaire identique.

La plupart des résultats confirment les expectatives en ce domaine. Ainsi, une même règle de gestion donne lieu à des taux de croissance de dépenses publiques différents d'un gouvernement à l'autre. De même, la relation d'arbitrage de type Phillips entre inflation et chômage se vérifie lorsqu'on compare les résultats obtenus. Par ailleurs, un taux de croissance plus rapide des dépenses publiques entraîne habituellement une augmentation des pressions inflationnistes et une utilisation accrue de la main-d'oeuvre disponible. Par contre l'application d'une même règle de gestion à chacun des onze gouvernements pris isolément entraîne une telle expansion budgétaire chez les gouvernements provinciaux qu'elle provoque un impact plus important sur l'objectif de stabilisation que celui du gouvernement fédéral.

L'objectif plus général du document est ainsi de poser un nouveau jalon dans la recherche de l'harmonisation des politiques économiques à l'intérieur d'un régime fédéral.

\* \* \* \* \*

Ce document a largement bénéficié des travaux préliminaires de M. Gilles Proulx du Conseil économique du Canada et de M. Gilles Desrochers de l'Université de Montréal ainsi que des commentaires judicieux de M.M. Neil Swan et Bert Waslander, respectivement directeur du Groupe d'études régionales et directeur du groupe CANDIDE au Conseil.

## Summary

Macroeconomic stabilization has for many years been one of the major objectives of government economic policy. Many short-term instruments have been designed precisely to achieve this objective; among them, the best known are management of government budget surpluses or deficits and control of the money supply and credit conditions. However, some economists argue that the current stagflation could be more effectively explained by reference to longer-term factors, such as the continuous expansion of the public sector in industrial countries. Moreover, the public sector is usually exogenous in Keynesian macroeconomic models such as CANDIDE.

The purpose of this paper is to develop a range of behavioural patterns that would generate different growth rates for public expenditures and, using the CANDIDE model, to examine their implications for variables usually connected with stabilization policy. Given the importance of the provincial level of government in Canada, each pattern is applied independently to each provincial government, as well as the federal government. This is done first for the 1961-71 period, assuming a budget surplus or deficit position comparable to that observed each year, and then for the 1972-77 period, assuming an identical budgetary position across patterns.

Most of the results support current expectations in this area. For example, the same behavioural pattern yields different growth rates for public expenditures among governments. Similarly, the trade-off between inflation and unemployment, as illustrated by the Phillips curve, gains additional support when the patterns are compared. Also, a higher rate of growth for public expenditures usually implies an increase in inflationary pressures and a decline in unemployment. On the other hand, if the same patterns are applied to each of the eleven governments separately, the budgetary expansion of the provincial governments is such that it has a larger impact on the goal of stabilization than a comparable change in the federal budget.

The broader objective of this paper is to provide another step in the research into the harmonization of economic policies in a federal system.

\* \* \* \* \*

This Discussion Paper largely benefited from the preliminary work of Mr. Gilles Proulx from the Economic Council of Canada and Mr. Gilles Desrochers from the Université de Montréal, in addition to the comments made by Mr. Neil Swan, Director of the Regional Studies Group, and by Mr. Bert Waslander, Director of the CANDIDE Group at the Council.



| Contents  | <u>Page</u> |
|---|-------------|
| 1. Introduction: public expenditures and harmonization        | 5           |
| 2. Development of a range of government behavioural patterns  | 8           |
| 2.1 Identification of various paths of expansion              | 8           |
| 2.2 Application to the 1961-71 period                         | 11          |
| 2.3 Projections for the 1972-77 period                        | 13          |
| 3. Repercussions on the economic indicators of stabilization  | 15          |
| 3.1 Assumptions and rules of operation used in the simulation | 15          |
| 3.2 Analysis of results                                       | 20          |
| 4. Conclusions  | 31          |
| Appendix A: Methods for the calculation of paths of expansion |             |
| Appendix B: Rules for simulation with the CANDIDE model       |             |

1. Introduction: public expenditures and harmonization

Every government, provincial or federal, pursues several distinct objectives simultaneously. In order to do this, governments have at their disposal a very wide range of means. Some of those means, such as government income and expenditures, have a direct effect on the economy, while others, such as regulatory powers, have a more indirect effect.

The objective of stabilization could best be described as the desire of governments to fully utilize all available resources so that corrective measures may be taken as soon as a discrepancy appears between the country's real and potential output. For our present purposes, full employment is understood to mean the complete utilization of all available manpower and plant capacity. It is well known that if overall demand is too high, it leads to inflationary pressures, thus creating a negative impact on output with respect not only to foreign trade but also to internal demand, such as the behaviour of households and firms vis-à-vis inflation. Macroeconomic stabilization is therefore aimed at eliminating unemployment as much as possible, without at the same time stimulating inflationary pressures.

The importance of government action in the pursuit of such objectives is well known. Less well known, however, is the potential effect of the combined action of several governments on the economy. Presumably, an expansionist fiscal policy by the

federal government could be cancelled out if provincial governments were to pursue restrictive policies. This prospect is all the more likely since economic agents affected are the same in both cases. But if two provincial governments were to adopt different stabilizing measures, could we expect repercussions on economic agents other than those directly under the influence of each government? For example, in a situation involving both levels of government, it can be said that the acceleration of public investment facilitates economic growth, but if this acceleration were widespread among all governments, would it not have inflationary repercussions and eventually reduce private investment, a result which would be the opposite of what was originally intended? This could happen without the concertation or harmonization of government policies, especially in view of the greater latitude possible in the planning of public facilities than of industrial installations.

The importance of this "coordination between the federal and provincial levels of government on expenditure policies directed towards the achievement of longer-term stabilization objectives"<sup>1</sup> has led to an explicit recommendation by the Council in its Tenth Annual Review. But what can be really expected from such a coordination or harmonization of policies? In short, a coordination of the policies pursued by each

---

1 Economic Council of Canada, Tenth Annual Review (Ottawa: Information Canada), 1973, pp. 71-72.



government which, while recognizing each other's autonomy, would allow them to eliminate obstacles created by an unsatisfactory combination of policies, and at the same time distribute, through negotiation, the burden of stabilization policy among the various partners.

In an attempt to consider a harmonized stabilization policy, each government is assumed to adopt an isolationist position -- that is an outlook which deliberately ignores the repercussions of its own actions as well as the actions contemplated by other governments -- and to discern the difficulties to which such an outlook or posture might lead. Only public expenditures will be considered here because, besides their important role in macroeconomic policy, recently they have--through their high growth rate--also taken on the dimensions of a serious structural problem.

Therefore, the next section will develop a range of behavioural patterns, considered to be both attainable and desirable,<sup>1</sup> as well as an estimation of the resulting growth rates for the 1961-71 and 1972-77 periods. Later, by treating these patterns of expenditures as exogenous variables, we will attempt

---

1 This is a brief definition of a performance indicator, according to the terminology used by the Economic Council of Canada, ibid., p. 72.

to discern the implications of this behaviour for the economic indicators of stabilization through simulations using the CANDIDE model. We shall observe, among results, that while the growth rate of the public sector has only minor repercussions on price levels, it has a much more significant effect on the rate of manpower utilization. As well, provincial governments tend to react more vigorously to various behavioural patterns and, through their control over their total budgets, they possess a very efficient stabilizing instrument.

## 2. Development of a range of government behavioural patterns

### 2.1 Identification of various paths of expansion

In developing a range of government behavioural patterns, our intention was not to place ourselves in the position of each government, since the choice of a performance indicator is a government prerogative. Rather, we intended to examine the macroeconomic implications of each of these patterns. This approach led to a series of growth paths<sup>1</sup> which we, in turn, applied to each government. These paths are described here briefly<sup>2</sup> and are presented in order of rising importance for the rate of growth in public expenditures.

---

1 The minimum, potential and demand paths were drawn from suggestions made by W. Z. Hirsch, The Economics of State And Local Government, New York, McGraw-Hill, 1970, pp. 277 ff.

2 The method of calculation is described in Appendix A.

The minimum path corresponds to the annual growth rate of public expenditures required for a given constant quantity of public services per capita. Consequently, the total budget will vary only as a function of changes in population and/or price levels.

The parallel path follows a rate of growth which is identical to that of private consumption expenditures. This behavioural pattern implies, therefore, that the observed relationship between private and public consumption should be considered as desirable.<sup>1</sup>

The potential path is arrived at by assuming a constant tax structure and level. Accordingly, an increase in public expenditures is assumed to be the result of an increase in revenues made possible by general growth in the economy and the progressivity of personal income taxation. The volume of transfer payments from the federal to the provincial governments is also determined by calculating the federal government's potential path.<sup>2</sup>

---

1 Due to the lack of information on personal consumption in each province, we suggest that personal disposable income be used instead.

2 Since our analysis differentiates provincial levels from the federal level, the problem of double-counting is eliminated.



The continuity path maintains growth at the rate observed in recent years. When this growth rate has undergone major changes during this period, due for the most part to an increase in the expenditures for social services,<sup>1</sup> the years preceding this break in the long-term path have been excluded from the calculation. This behavioural pattern thus corresponds to a widely held attitude that could be called "deliberate extrapolation", and thus takes into account only relevant past experience, for each government in turn.

The demand path also operates on the basis of extrapolation, since it is defined as the product of the growth rate assuring the minimum path by a demand factor based on the coefficient of elasticity between public expenditures and real personal income per capita as estimated from the recent past.

Finally, the maximum path is derived from a constant level of real disposable income per capita in each province, or in the country as a whole. This path differs from the preceding ones in that it also takes into account expenditures by municipalities and hospitals and assumes the same growth rate for each level of government within a given region.

---

1 In this respect, we believe that the increased government involvement in this field is too often neglected, at least by the general public.

## 2.2 Application to the 1961-71 period

Each path was applied independently to each government for the 1961-71 period to provide a comparison with the expansion observed during those years. With the aid of the results presented in Table 1, a number of useful comments can be made. As expected, the range of behavioural patterns is very wide. For example, in the case of provincial governments, the minimum path implies an annual growth rate in expenditures of 6.0 per cent, while the maximum path yields a growth rate of 26.0 per cent, compared to an actual rate of 15.1 per cent. Moreover, the potential path is generally higher than the parallel path, but it is below the demand path for all provinces except Saskatchewan. The latter, however, is very low, even below the observed path for the federal government and Saskatchewan, since no significant statistical relationship was found for the 1952-60 period between the level of public expenditures of these governments and the changes in real personal income per capita; thus, the demand and minimum paths become identical. In contrast, the coefficient of elasticity used in determining the demand path is 3.47 for Manitoba, leading to a higher growth rate than that obtained under the assumptions made for the maximum path.

In Quebec, Saskatchewan and British Columbia, the continuity path is higher than the demand path. This means that the expansion of the provincial public sector at the end of the 1950s outstripped the usual government reaction to

Table 1

ESTIMATED AND ACTUAL GROWTH PATHS:  
ANNUAL GROWTH RATE OF TOTAL PUBLIC EXPENDITURES, BY GOVERNMENT,  
IN CURRENT DOLLARS, 1961-71

| Growth path<br>Level of Government | Minimum | Paral-<br>lel    | Poten-<br>tial | Conti-<br>nuity | Demand | Maximum           | Observed |                                 |
|------------------------------------|---------|------------------|----------------|-----------------|--------|-------------------|----------|---------------------------------|
|                                    |         |                  |                |                 |        |                   | Total    | Per capita \$ 1961 <sup>2</sup> |
| Federal                            | 5.6     | 8.6              | 11.3           | 6.6             | 5.6    | 26.0              | 10.2     | 2.8                             |
| Provincial                         | 6.0     | 8.6 <sup>1</sup> | 11.2           | 13.3            | 19.0   | 26.0 <sup>1</sup> | 15.1     | 7.3                             |
| Newfoundland                       | 5.6     | 9.8              | 13.3           | 18.8            | 20.0   | 31.0              | 16.2     | 8.7                             |
| Prince Edward Island               | 4.9     | 8.9              | 13.0           | 15.6            | 18.1   | 33.0              | 14.6     | 7.9                             |
| Nova Scotia                        | 4.9     | 7.7              | 12.2           | 17.1            | 22.5   | 27.0              | 14.6     | 7.9                             |
| New Brunswick                      | 4.8     | 8.6              | 13.1           | 14.8            | 19.6   | 29.0              | 14.9     | 8.2                             |
| Quebec                             | 5.8     | 8.2              | 11.3           | 18.9            | 15.8   | 27.0              | 15.9     | 8.5                             |
| Ontario                            | 6.5     | 8.9              | 11.2           | 17.6            | 23.7   | 24.5              | 15.9     | 7.7                             |
| Manitoba                           | 5.0     | 7.3              | 11.3           | 22.6            | 27.0   | 25.0              | 13.4     | 6.8                             |
| Saskatchewan                       | 4.1     | 5.9              | 9.1            | 11.5            | 4.1    | 27.6              | 11.5     | 5.8                             |
| Alberta                            | 5.8     | 9.1              | 10.2           | 11.6            | 15.4   | 27.4              | 14.2     | 6.1                             |
| British Columbia                   | 6.8     | 9.5              | 11.5           | 18.3            | 12.8   | 26.0              | 13.1     | 2.2                             |
| Federal + Provincial               | 5.7     | 8.6              | 11.3           | 9.4             | 14.2   | 26.0              | 11.8     | 4.1                             |

1 Based on Canada as a whole, rather than on a summation of individual provincial estimates.

2 The only price index used was derived from the implicit price deflators provided by the National Accounts for each type of government expenditure.



growth in personal income. This may be explained simply by the fact that these provinces were the last to have accelerated their public expenditures.

On the whole, of all the provinces, Saskatchewan is the most conspicuous because of a weaker growth potential which may be explained by zero population growth and by a smaller increase in personal income per capita. Finally, here one again notes much greater homogeneity among the Atlantic Provinces than among the Prairie Provinces.

### 2.3 Projections for the 1972-77 period

Table 2 shows the growth rates projected for each government for the 1972-77 period on the basis of the same growth paths, with only one change: here the analysis is done by using constant dollars, thus explaining the lower figures. Given the high level of inflation evident for some time in Canada, we decided to present the performance indicators in 1972 dollars and also to introduce the behavioural factors such as personal income in real terms.<sup>1</sup>

---

1 Obviously, in our simulations we will need to reintroduce the inflationary phenomenon. Indeed, it is now treated as a separate phase in our approach, by way of alternative assumptions.

Table 2

GROWTH PATHS: AVERAGE ANNUAL GROWTH RATE OF  
TOTAL PUBLIC EXPENDITURES FOR EACH GOVERNMENT,  
IN CONSTANT DOLLARS, 1972-77

| Level of<br>Government | Growth path      |                  |           |                 |        |                   |
|------------------------|------------------|------------------|-----------|-----------------|--------|-------------------|
|                        | Minimum          | Parallel         | Potential | Conti-<br>nuity | Demand | Maximum           |
| Federal                | 1.2              | 5.1              | 5.83      | 7.5             | 3.7    | 17.1              |
| Provincial             | 1.2 <sup>1</sup> | 5.1 <sup>1</sup> | 5.78      | 9.1             | 7.9    | 17.1 <sup>1</sup> |
| Newfoundland           | 1.0              | 4.8              | 5.05      | 7.4             | 6.4    | 17.0              |
| Prince Edward Island   | 0.35             | 4.8              | 5.05      | 8.9             | 6.2    | 17.4              |
| Nova Scotia            | 0.25             | 4.8              | 5.07      | 10.2            | 8.4    | 17.4              |
| New Brunswick          | 0.45             | 4.8              | 5.07      | 8.4             | 7.6    | 17.8              |
| Quebec                 | 0.50             | 5.5              | 6.71      | 9.2             | 9.0    | 20.1              |
| Ontario                | 1.75             | 4.8              | 5.29      | 11.3            | 7.2    | 15.4              |
| Manitoba               | 0.20             | 5.0              | 5.18      | 7.8             | 7.3    | 19.4              |
| Saskatchewan           | -1.0             | 5.0              | 5.12      | 4.0             | 3.2    | 26.5              |
| Alberta                | 1.70             | 5.0              | 5.14      | 6.7             | 8.8    | 14.8              |
| British Columbia       | 2.50             | 5.4              | 5.96      | 6.8             | 4.9    | 13.6              |
| Federal + Provincial   | 1.2              | 5.1              | 5.80      | 8.25            | 4.75   | 17.1              |

1 Based on Canada as a whole, rather than on a summation of individual provincial estimates.

Most of the results,<sup>1</sup> as presented in Table 2, are comparable to those obtained for 1961-71. It is interesting to note, however, that the demand path implies a lower growth rate than the potential path -- thus making possible a tax reduction -- not only for the federal government and for Saskatchewan, but also for British Columbia. Particularly noteworthy is the fact that, henceforth, the demand path points to slower growth than the continuity path everywhere, except in Alberta, which suggests a general reduction in the growth of the public sector.

3. Repercussions on the economic indicators of stabilization
- 3.1 Assumptions and rules of operation used in the simulation<sup>2</sup>

In the isolationist perspective considered here, we decided to assume that all governments would simultaneously adopt the same behavioural pattern. Thus each simulation corresponds to a different pattern that is common to all governments.

---

1 The assumptions used here are listed in Appendix A. It should also be noted that the simulations lead us to conclude that the growth rates corresponding to the potential path have been slightly underestimated. Since the projection method used is too rudimentary to allow us to make the adjustments required, these estimates are retained for their indicative value.

2 For further methodological details, see Appendix B.



In addition, it is well-known that the simulation using a model as complex as CANDIDE requires sophisticated treatment. Indeed, the system's reaction to an expansion of public expenditures, if not compensated by a comparable adjustment in taxation revenues, is so strong that, starting in 1961, a yearly injection of \$400 million constant dollars in current expenditures on additional goods and services would have succeeded in eliminating unemployment in four years.<sup>1</sup> Fortunately, ours is a long-term outlook, so that we have attempted to obtain an average annual level of budgetary surplus or deficit comparable for all behavioural patterns. To do this, the public expenditures block (#6) in the model was made exogenous, so that the projected expansion could be perfectly reproduced. Finally we know from experience that macroeconomic models of this type usually underestimate the rate of increase in the general price index whenever unusual pressures are felt. Therefore, we recommend that these results be interpreted as minimum estimates.

In order to assess the validity of our simulations

---

1 Canadian Experience with Recent Inflation as Viewed Through CANDIDE, by R. G. Bodkin, F. Chabot-Plante and M. A. Sheikh, 51 pages, paper presented at the Conference on Price Behavior, Bethesda, Maryland, November 1974.

for the 1972-77 period, besides the convergence required in solving the system, we adopted two other basic criteria: first, the average annual growth rate of the GNE implicit deflator obtained as a result of the interdependent relationships in the system must be close to the level assumed a priori for the calculation of the exogenous block of expenditures. Although our approach is based on projected expenditures in constant dollars, some of the items in the CANDIDE model are expressed in current dollars, which means that an initial rate of inflation chosen more or less arbitrarily must be adopted. Consistency therefore explains this first criterion. Second, the combined budgetary position of the public sector must be comparable between simulations, and as close as possible to the position forecast in the control solution described in the Eleventh Annual Review.<sup>1</sup> As for the 1961-71 period, this constraint derives from the need to differentiate short-term fiscal policy from stabilization policy developed for the medium term on the basis of the growth of the public sector.

---

1 Economic Council of Canada, Eleventh Annual Review: Economic Objectives and Social Indicators (Ottawa: Information Canada, 1974).

Table 3

AVERAGE ANNUAL BUDGETARY POSITION CORRESPONDING TO  
EACH BEHAVIOURAL PATTERN, 1961-71 AND 1972-77  
IN MILLIONS OF CURRENT DOLLARS

| Behavioural<br>pattern | Budgetary position |         |                                |         |                     |         |
|------------------------|--------------------|---------|--------------------------------|---------|---------------------|---------|
|                        | Federal government |         | Other governments <sup>1</sup> |         | Total public sector |         |
|                        | 1961-71            | 1972-77 | 1961-71                        | 1972-77 | 1961-71             | 1972-77 |
| Minimum                | +367               | -1,043  | -302                           | + 122   | + 65                | - 920   |
| Parallel               | +158               | - 981   | +109                           | + 101   | +267                | - 880   |
| Potential              |                    | -2,455  |                                | +1,450  |                     | -1,004  |
| Continuity             | + 51               | -1,264  | - 59                           | + 540   | - 8                 | - 724   |
| Demand                 | -221               | -1,066  | +787                           | + 303   | +567                | - 763   |
| Actual or<br>forecast  | +134               | - 775   | +164                           | + 425   | +298                | - 350   |

1 This category comprises provincial and municipal governments, as well as hospitals and public pension plans.



While the first criterion was always satisfied in an acceptable fashion, it was very difficult to obtain a budgetary position identical from one path to another, due to the lack of an endogenous procedure of budgetary management in Canada. The results obtained through several simulations appear in Table 3. We therefore used the linear multiplier approach.<sup>1</sup> Linear multipliers are derived from the various results of the simulation of a given behavioural pattern, and show the impact of a unit variation in the budgetary position on a target variable such as price levels. A budget surplus of \$300 million was chosen for the 1961-71 period, and a deficit of \$750 million for the 1972-77 period.

It can be inferred from Table 3 that simulations of the potential path for the 1961-71 period and the maximum path for both periods were not retained. In the first case, this is because of unsatisfactory results largely due to the length of the simulation period and the approximate nature of the aggregate elasticity coefficient projection method. On the other hand, the results for the annual growth rate of public

---

1 This approach is described briefly in Ronald G. Bodkin and Stephen M. Tanny, CANDIDE Model 1.1, Economic Council of Canada, CANDIDE Project Paper 18, vol. 1 (Ottawa: Information Canada, 1975), pp. 317-326.

expenditures undeniably render the maximum path totally undesirable. As the simulation of this pattern also involves an adjustment of revenue and expenditures of governments other than those examined here, we have simply decided to remove it from the simulation.

### 3.2 Analysis of results

The results obtained for the past period are presented in Table 4. They give support to several hypotheses in this area, such as the Phillips trade-off curve. As Chart 1 clearly illustrates, any policy which generates more inflation is invariably accompanied by a lower level of unemployment. On the other hand, in line with the Keynesian expansionist theory, as well as with the tax-push inflation hypothesis,<sup>1</sup> it can be noted that, except in the case of the continuity path, an increasing share of the economy under public control will result in higher inflation and lower unemployment. The much greater impact on the labour market than on price levels must also be emphasized. Thus, according to our estimates, the adoption of the minimum path during this ten-year period -- which would have led to a 5.7 per cent growth rate rather than the actual 11.8 per cent -- would have reduced the rate of inflation by 27 per cent, while increasing the unemployment rate by 41 per cent. Conversely, the adoption of the demand path -- a 14.2 per cent

---

1 Mentioned in the Ninth Annual Review of the Economic Council Of Canada, among others.

Table 4

RESULTS<sup>1</sup> OF SIMULATIONS CARRIED OUT WITH  
CANDIDE MODEL 1.1, VARIOUS PATHS OF EXPANSION, 1961-71

| Target variable \ Path of expansion                                | Minimum | Parallel | Continuity | Demand | Observed |
|--|---------|----------|------------|--------|----------|
| Average annual growth rate in GNP, in \$K                          | 4.53    | 4.52     | 5.43       | 5.42   | 5.50     |
| Average annual rate of unemployment                                | 7.45    | 6.25     | 4.03       | 4.25   | 5.28     |
| Average annual rate of increase in the Consumer Price Index        | 2.6     | 2.8      | 3.4        | 3.2    | 2.9      |
| Average annual rate of increase in the implicit price index of GNE | 2.4     | 2.7      | 3.6        | 3.5    | 3.3      |

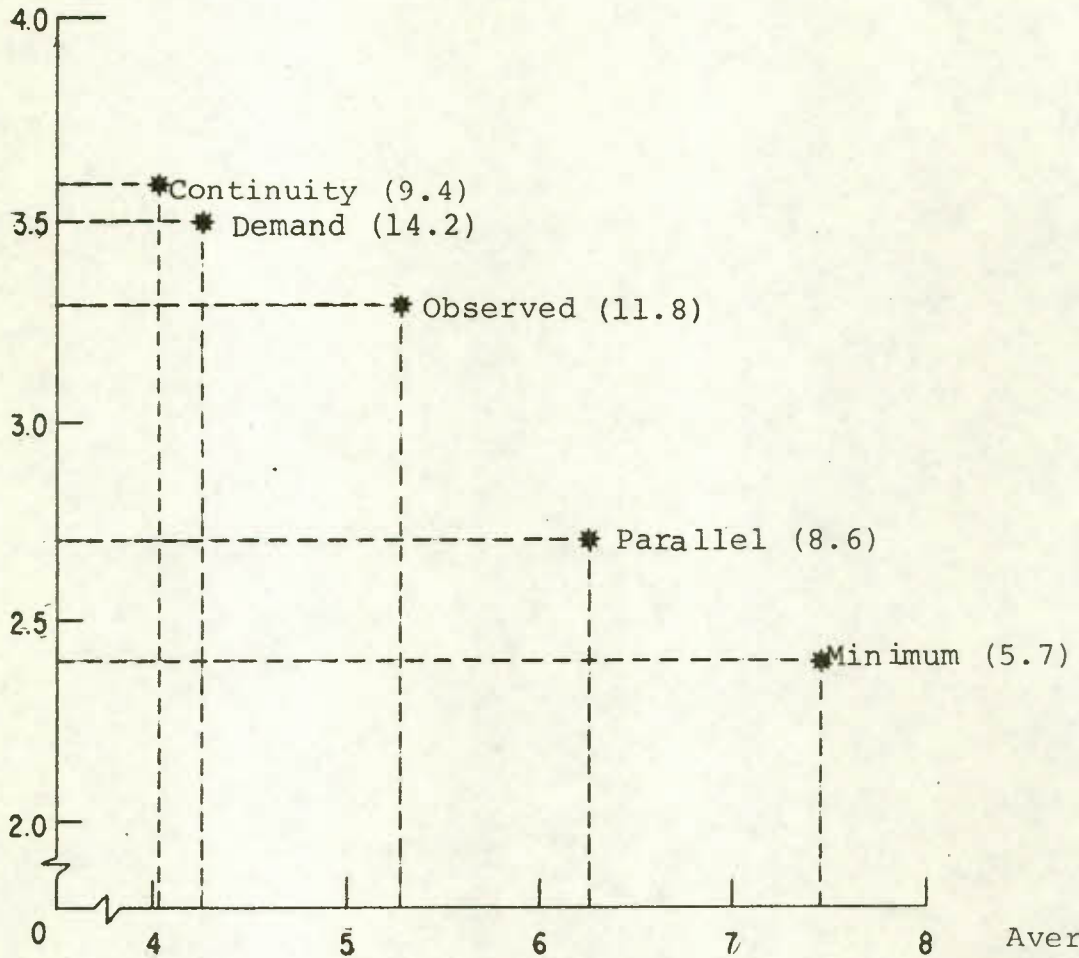
1 Adjusted to obtain an average yearly budget surplus of \$300 million in all paths.



Chart 1

INFLATION AND UNEMPLOYMENT RATES ASSOCIATED  
WITH EACH BEHAVIOURAL PATTERN, 1961-71<sup>1</sup>

Average  
annual  
rate of  
inflation



Average annual  
rate of  
unemployment

<sup>1</sup> Figures in parentheses indicate the average annual growth rates of federal and provincial government expenditures.

growth rate -- would have led to a 10 per cent increase in the inflation rate, but also to a 19.5 per cent reduction in the unemployment rate.<sup>1</sup> It should finally be noted that real GNP grows at a rate of about 4.5 per cent in the two less expansionary paths, and 5.5 per cent under the alternate assumptions.

1 Obviously it is difficult to propose a repulsion equation for inflation and unemployment which would be accepted unanimously. By way of example, we have proceeded with an estimation of the following frequently used quadratic equation.

$$(1) \text{ Min. } Z = \sum_{t=1}^T \eta_t (\alpha(x_t - x_t^*)^2 + \beta(y_t - y_t^*)^2)$$

where  $T = 11$

$$\eta_t \leq 1$$

$x_t$  = Canadian unemployment rate,  
year  $t$

$y_t$  = annual variation rate in the  
Canadian Consumer Price  
Index, year  $t$ ;

if we adopt the following  
simplifying assumptions:

$$\eta_t = 1 \quad \text{for any } t$$

$$\alpha = \beta = 1$$

$$x_t^* = y_t^* = 0$$

we obtain:

$$(1') \text{ Min. } Z' = \sum_{t=1}^T (x_t^2 + y_t^2).$$

As a result, the optimal path of expansion for stabilization purposes in the 1961-71 period would have been the continuity path. Note, however, that the potential path was not available for this evaluation procedure.

Table 5 shows the simulation results for the 1972-77 period. First, it should be noted that here again the Consumer Price Index is less sensitive to changes in the size of the public sector than the GNE price deflator. The unemployment rate shows a smaller dispersion than in previous simulations but, as before, an acceleration of public expenditures facilitates a reduction in unemployment while stimulating inflation. A look at Chart 2 shows the irregular position of the demand path within a well-defined Phillips trade-off. As in the case of the continuity path for 1961-71, the demand path for 1972-77 is characterized by a very low growth rate of federal expenditures, relative to provincial expenditures, which may imply a stronger inflationary potential at the provincial level.



Table 5

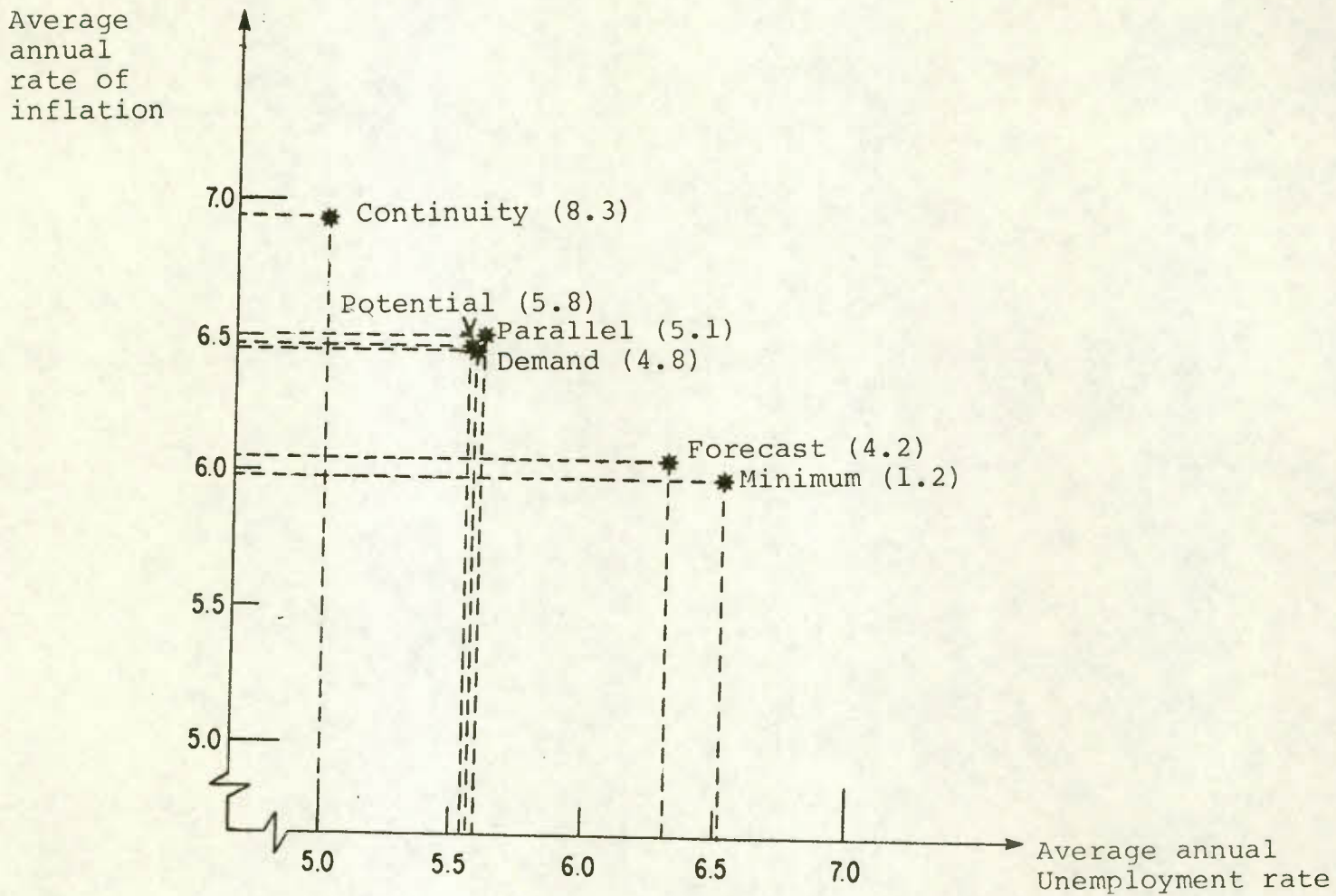
RESULTS<sup>1</sup> OF SIMULATIONS CARRIED OUT WITH CANDIDE MODEL 1.1,  
VARIOUS PATHS OF EXPANSION, 1972-77

| Target variable   | Path of expansion | Forecast 11th Review Scenario B | Minimum | Parallel | Potential | Continuity | Demand |
|---|-------------------|---------------------------------|---------|----------|-----------|------------|--------|
| Average annual growth rate of GNP \$K                           |                   | 6.18                            | 5.99    | 6.54     | 6.67      | 7.02       | 6.64   |
| Average annual rate of unemployment                             |                   | 6.32                            | 6.52    | 5.60     | 5.56      | 5.00       | 5.58   |
| Average annual rate of increase in the Consumer Price Index     |                   | 5.64                            | 5.64    | 5.80     | 5.73      | 5.92       | 5.80   |
| Average annual rate of increase in the GNE Implicit Price Index |                   | 6.03                            | 5.98    | 6.50     | 6.48      | 6.92       | 6.47   |

1 Adjusted to obtain an average annual budget deficit of \$750 million in each path.

Chart 2

INFLATION AND UNEMPLOYMENT RATES ASSOCIATED  
WITH EACH BEHAVIOURAL PATTERN, 1972-77<sup>1</sup>



1 Figures in parentheses indicate the average annual growth rate of federal and provincial public expenditures in constant dollars (Table 3 and Scenario B, Eleventh Annual Review).

In order to verify this assertion statistically, we performed a multiple regression analysis based on the results obtained through our simulation exercise. This was done by differentiating the past period from the projected period with the help of a dummy variable.<sup>1</sup> The definition of each variable and the data are given in Table 6. The results were as follows.<sup>2</sup>

$$(1) \quad u = 7.926 + 0.0592r_f - 0.227r_p$$
$$(12.159)^* (1.238) \quad (4.556)^*$$
$$\bar{R}^2 = .658 \quad F = 10.6 \quad n = 11;$$

$$(2) \quad u = 8.00 + 0.0133r_f - 0.213r_p + 0.397a$$
$$(11.49)^* (0.135) \quad (3.637)^* (0.544)$$
$$\bar{R}^2 = .625 \quad F = 6.6 \quad n = 11;$$

$$(3) \quad \dot{p} = 1.319 + 0.380r_f - 0.028r_p$$
$$(1.289) (5.063)^* (0.359)$$
$$\bar{R}^2 = .731 \quad F = 14.6 \quad n = 11;^3$$

$$(4) \quad \dot{p} = 1.881 - 0.033r_f + 0.081r_p + 3.006a$$
$$(7.620)^* (0.937) \quad (3.893)^* (11.656)^*$$
$$\bar{R}^2 = .980 \quad F = 219.3 \quad n = 11.^3$$

---

1 Remember that the average annual budgetary position differs between the two periods since a \$300 million surplus is assumed for 1961-71 and a \$750 million deficit is assumed for 1972-77.

2 The numbers in parentheses give the value for "t" which is used for the Student test in the verification of a significantly non-null coefficient. An asterisk (\*) indicates a result which is at least 95 per cent conclusive.

3 It should be noted that the substitution of the Consumer Price Index for the GNE Price Deflator yields very similar results.



Table 6

VARIABLES USED IN THE MULTIPLE REGRESSION ANALYSES  
ON THE DESTABILIZING EFFECT OF PUBLIC EXPENDITURES  
FOR EACH LEVEL OF GOVERNMENT

|                       | Average<br>annual<br>unemployment<br>level<br>u | Annual growth<br>rate of GNE<br>price<br>deflator<br>p | Annual growth rate<br>of federal expenditures<br>in current dollars<br>obtained <sup>1</sup><br>r <sub>f</sub> | Annual growth rate<br>of provincial expenditures<br>in current dollars<br>imputed <sup>1</sup><br>r <sub>p</sub> | Dummy<br>variable<br>a |
|-----------------------|---|--|--|--|------------------------|
| <u>1961-71 period</u> |   |  |  |  |                        |
| Minimum               | 7.45  | 2.4  | 4.2  | 6.0  | 0                      |
| Parallel              | 6.25  | 2.7  | 7.9  | 8.6  | 0                      |
| Continuity            | 4.03  | 3.6  | 6.5  | 13.3   | 0                      |
| Demand                | 4.25  | 3.5  | 5.9  | 19.0   | 0                      |
| Observed              | 5.28  | 3.3  | 9.1  | 15.1   | 0                      |
| <u>1972-77 period</u> |   |  |  |  |                        |
| Forecast              | 6.32  | 6.03   | 11.5   | 12.1   | 1                      |
| Minimum               | 6.52  | 5.98   | 8.9  | 7.8  | 1                      |
| Parallel              | 5.60  | 6.50   | 13.9   | 12.7   | 1                      |
| Potential             | 5.56  | 6.48   | 15.4   | 13.4   | 1                      |
| Continuity            | 5.00  | 6.92   | 17.4   | 17.6   | 1                      |
| Demand                | 5.58  | 6.47   | 13.2   | 15.7   | 1                      |

1 The difference between imputed and obtained rates derives partly from expenditures excluded from the calculations, especially the unemployment insurance benefits which can thus play their role of automatic stabilizer, and partly from the lack of identity between imputed and obtained inflation rates. Note, however, that for the federal government the coefficient of correlation between the two series for the eleven observations is +0.974.

Source: Tables 1, 3, and 4, and other simulation results.

It can be shown from the first equation that the change in unemployment rate between the various expansion paths for the public sector -- from 4.03 per cent to 7.45 per cent -- results significantly from the provincial level of government only. Since the dummy variable in equation (2) seems to be of no use, it must be concluded that in the framework of CANDIDE Model 1.1, the budgetary position of governments and/or the different context of the 1970s do not have a significant impact on unemployment in Canada. As for the impact on the inflation rate, the federal government's responsibility seems to appear clearly with the results of equation (3). The correlation coefficient between the inflation rate and the federal expenditures growth rate is 0.88, whereas it is only 0.31 in the case of provincial governments. The introduction of the dummy variable into equation (4) makes it possible to change this verdict. Multicollinearity is found between the independent variables since the correlation coefficient between  $r_f$  and  $a$  is 0.82. Consequently, it can be stated that once the effect of the dummy is removed, in particular that of the budgetary position, the rate of increase in federal expenditures loses any significant impact on the inflation rate. This is not the case for the expenditures of provincial governments, however, since their increases statistically contribute to inflation.

Given that the total volume of provincial expenditures is roughly equal to that of the federal government, it is not surprising that the actions of these governments significantly influence the stabilization variables. This influence is stronger here because the application of the same behavioural pattern provokes a stronger reaction, on balance, on the part of provincial governments than of the federal government ( $\bar{r}_f = 12.8$  per cent  $>$   $\bar{r}_p = 10.4$  per cent). Although differences in the structure of expenditures, in their spatial distribution or in a government's propensity to import might imply a differentiating impact between the two levels of government, we believe that the general level of our analysis does not allow us to form such conclusions. However, it would be interesting to pursue investigations in this direction.

The statistical results presented above also allow us to delineate more clearly the stabilizing role of public expenditures. Thus, the elasticity coefficient between the inflation rate and the forecast average annual rate of increase in provincial expenditures is 0.162, as derived from equation (4), so that, ceteris paribus, the adoption of a behavioural pattern leading to the minimum path could represent a reduction of 0.7 percentage points in the annual rate of inflation. On the other hand, to reduce the unemployment rate by 1 percentage point, ceteris paribus, provincial expenditures would have to increase from 12.1 per cent to 14.4 per cent, because of the elasticity coefficient of - 0.434 derived from equation (1).



#### 4. Conclusions

Let us now summarize the observations made during these simulation exercises. First, a given behavioural pattern with respect to public expenditures tends to produce different results between governments. Second, each behavioural pattern leads to a different growth rate for the public sector as a whole, in spite of the fact that three paths of expansion -- the potential, continuity, and demand paths -- generally yield results approximating those actually observed. Moreover, by using the system of economic interrelations contained in the CANDIDE Model, we were able to verify that in general a policy involving a decrease in the rate of unemployment usually means an additional inflationary pressure, but of lower intensity than usually anticipated. Further, there is a positive correlation between the growth rate of the public sector on one hand, and the level of manpower utilization and the rate of inflation on the other hand. Finally, in the isolationist context examined here, where all governments simultaneously adopt a common behavioural pattern, the provincial level of government would have greater impact on stabilization objectives than the federal level, especially since 1972.

What, then, are the conclusions that can be drawn from these results? Determining the desired progression of public expenditures is a task which belongs to each government. They alone know how much weight to give to stabilization objectives in their economic policies. Nevertheless, the objective of

5 per cent for the average annual growth of current public expenditures in constant dollars, as proposed in the Economic Council's Eleventh Annual Review, corresponds more closely to the parallel and demand paths than to the potential and continuity paths. On the other hand, if the fight against inflation is to involve public expenditures, the alternatives are then restricted to the forecast and minimum paths, since our estimates show that any other pattern, including the potential path, would contribute to inflationary pressures. Consequently, it would be useful for each government to examine these various alternatives in order to measure in a more detailed manner their implications with respect to objectives other than stabilization. Furthermore, the results obtained thus far should suffice to convince provincial governments of the major role which they must play in this domain relative to the federal government.

At the methodological level, it would certainly be interesting to carry out new simulations combining different behavioural patterns for the various governments or introducing into the behavioural rules explicit consideration of decisions taken by neighbouring governments. In our opinion, these simulations should make full use of a regionalized macroeconomic model such as CANDIDE-R,<sup>1</sup> so that they could not be undertaken

---

1 Vue d'ensemble du modèle CANDIDE-R, G. Fortin, G. Simard and A. D'Amour, Analysis and Liaison Branch, Department of Regional Economic Expansion, Ottawa, May 1964 (mimeo), 50 pages.

until the public sector itself has been regionalized in the model. In any event, this approach would benefit from being integrated into a more diversified stabilization policy, which has already received some attention<sup>1</sup> and which continues to be one of the main concerns of the Regional Studies Group at the Economic Council of Canada.

---

1 For example, in the excellent article by Y. Rabeau, "Un modèle de stabilisation régionale", L'Actualité économique, Vol. 47, No. 3, October-December 1971, pp. 399-417.



## Appendix A

### METHODS FOR THE CALCULATION OF PATHS OF EXPANSION AND DATA SOURCES

Each path of expansion is equal to an average annual growth rate which is obtained by applying a well-defined behavioural rule to each government. Since we have used the end points method to determine these growth rates, the aim is to determine the level of total expenditures for each government at the end of the simulation period. The formulas used were the following:

#### Minimum path:

$$(1) \quad {}^1\hat{D}_f^{72} = D_f^{61} \{(1 + \dot{C}_f)(1 + \dot{p}_f)\}^{11}$$

$$(2) \quad {}^1\hat{D}_j^{72} = {}^1D_j^{61} \{(1 + \dot{S}_j)(1 + \dot{p}_j)\}^{11} + {}^2D_j^{61} \{(1 + \dot{C}_j)(1 + \dot{p}_j)\}^{11}$$

$$(3) \quad {}^1\hat{D}_i^{77} = D_i^{72} (1 + \dot{C}_i^*)^5$$

#### Parallel path:

$$(4) \quad {}^2\hat{D}_i^{72} = D_i^{61} (1 + \dot{d}_i^Y)^{11}$$

$$(5) \quad {}^2\hat{D}_i^{77} = D_i^{72} (1 + g_i^*)^5$$

#### Potential path:

$$(6) \quad {}^3\hat{D}_i^{72} = {}^1\hat{R}_i^{72} = I_i^{62} (1 + \dot{X}_i)^{10\lambda} + T_i^{62} (1 + \dot{X}_i)^{10\lambda} \\ + A_i^{62} (1 + \dot{A}_i)^{10}$$

$$(7) \quad 3\hat{D}_i^{77} = 1\hat{R}_i^{77} = I_i^{72} (1 + \gamma_i^*)^{5Z'_i} + T_i^{72} (1 + \kappa_i^*)^{5Z''_i} \\ + A_i^{72} (1 + \alpha_i^*)^5$$

Continuity path:

$$(8) \quad 4\hat{D}_i^{72} = 1\hat{D}_i^{72} (1 + d_i^*)^{11}$$

$$(9) \quad 4\hat{D}_i^{72} = 1\hat{D}_i^{77} (1 + \delta_i^*)^5$$

Demand path:

$$(10) \quad 5\hat{D}_i^{72} = 1\hat{D}_i^{72} (1 + \dot{y}_i)^{11^v}_i$$

$$(11) \quad 5\hat{D}_i^{77} = 1\hat{D}_i^{77} (1 + \dot{y}_i^*)^{5^\mu}_i$$

Maximum path:

$$(12) \quad 6\hat{D}_i^{72} = 2\hat{R}_i^{72} = d_{Y_i}^{61} \{(1 + \dot{p}_i)(1 + \dot{c}_i)\}^{11}$$

$$(13) \quad 6\hat{D}_i^{77} = 2\hat{R}_i^{77} = (\hat{Y}_i / \hat{P}_i) - d_{\hat{Y}_i}^{77} (1 + \dot{c}_i^*)^5$$

The precise definition of each variable as well as the source of information used are the following:<sup>1</sup>

$A_i^t$  = transfer payments originating from other levels of government, in year t, and region i;

Source: federal 68-211, vol. 1; provincial 68-207, vol. 1.

---

1 The concept of region is used both for each province and for the whole of Canada. When the index k takes on the value f it indicates the federal government, when it takes on the value j it indicates a provincial government.

$\dot{A}_i$  = actual average annual growth rate of transfer payments originating from other levels of government during the 1962-72 period, in region  $i$ ;  
Source: 68-211, vol. 1 and 68-207, vol. 1.

$\dot{C}_k$  = actual average annual growth rate of total population between 1961 and 1972, in region  $k$ ;  
Source: Canada Yearbook.

$\dot{C}_i^*$  = expected average annual growth rate of total population between 1972 and 1977, according to projection B by Statistics Canada, based on a birth rate of 2.20, an annual volume of net international immigration of 60,000 and a gross volume of interprovincial migration of 435,000;  
Source: 91-514.

$\dot{d}_i^*$  = average annual growth rate of gross per capita expenditures by government  $i$ , estimated through a temporal logarithmic function for the period between  $t_i^*$  and 1960, where  $t_i^*$  ( $\geq 1952$ ) corresponds to the year showing an acceleration in gross per capita expenditures, located graphically. Table A-1 gives  $t_i^*$  for each government;  
Source: personal calculations based on 68-211, vol. 1, 68-207, vol. 1 and Canada Yearbook.



$D_k^t$  = gross expenditures, in current dollars, for government k, in year t;  
 Source: 68-211, vol. 1, 68-207, vol. 1.

$D_j^{m,t}$  = gross expenditures, in current dollars, for provincial government i, in sector m where  $m = 1$  corresponds to education, and  $m=2$  corresponds to budgetary items other than education, in year t;  
 Source: 68-207, vol. 2.

$\hat{n}_k^t$  = total gross expenditures of government k, obtained for year t by applying the formula for expansion path n, in current dollars when  $t = 1972$ , and in constant dollars (1972) when  $t = 1977$ ;  
 Source: calculations by the author.

$g_i^*$  = average annual growth rate in real disposable personal income, for region i;  
 Source: scenario B in the Eleventh Annual Review of the Economic Council of Canada, and regionalization based on indications provided by DREE's CANDIDE-R model. It should

be noted that we assume identical growth rates for the four Atlantic Provinces and another growth rate common to all three Prairie Provinces.

$I_i^t$  = personal income tax, in constant dollars, in year  $t$ , and in region  $i$ ;

Source: 68-211, Vol. 1, and 68-207, Vol. 1.

$\lambda_i'$  = elasticity coefficient between personal income tax and real personal income as reflected in the 1972 tax structure, in region  $i$ ;

Source: derived from a personal estimate of the elasticity coefficient between personal income and gross regional product for 1961-72 and from an estimate of the elasticity coefficient between personal income tax and gross regional product based on the tax structure in effect in 1972 and adapted from B. Hull and L. Leonard, "Indexing the Personal Income Tax: An Ontario Perspective", Canadian Tax Journal, July 1974, Vol. 22, No. 4, pp. 370-380. Coefficients used: 1.3 for federal government, 1.8 for Quebec (due to non-indexing) and 1.2 for all other provinces.

$\lambda_i''$  = elasticity coefficient between the government's general revenues of own source other than personal income tax and the level of gross regional expenditures, for region i;

Source: personal approximation:  $\lambda_i'' = \lambda_i'' = 1.0$

$\dot{p}_k$  = actual average annual growth rate in 1961-72 of the implicit price index for the expenditures of government k;

Source: National Accounts and personal calculations; assumption used:  $\dot{p}_f = \dot{p}_j = \dot{p} = 4.0\%$ .

$\dot{P}_i$  = average annual growth rate in the Consumer Price Index during the 1961-72 period, in region i;

Source: National Accounts and assumption of a rate for the region identical to that of its principal metropolitan region; information derived from 62-002.

$\hat{P}_i$  = level reached by the Consumer Price Index in 1977 (1961 = 100), in region i;

Source: scenario B in the Eleventh Annual Review of the Economic Council of Canada and regionalization based on indications supplied by DREE's CANDIDE-R model.



$R_i^{n,t}$  = gross general revenues for government  $i$ , obtained for year  $t$  through the application of expansion path formula  $n$ , in current dollars when  $t = 1972$  and in constant dollars (1972) when  $t = 1977$ , where  $n = 1$  corresponds to the potential path and  $n = 2$  corresponds to the maximum path;  
Source: calculations by the author.

$\dot{S}_i$  = actual average annual growth rate in 1961-71 in the school population, in province  $i$ ;  
Source: 1961 Census, c. 91-550, Vol. 13 and 1971 Census, c. 92-742, Vol. 1.

$T_i^t$  = gross general revenue of own source other than personal income tax, for year  $t$ , in region  $i$ ;  
Source: 68-211, Vol. 1 and 68-207, Vol. 1.

$\dot{X}_i$  = actual average annual growth rate in the gross regional expenditure, for the 1962-72 period, in region  $i$ ;  
Source: National Accounts and estimates by the Consultative Section (Provinces) of Statistics Canada.

$\dot{Y}_i$  = actual average annual growth rate in real per capita personal income in 1961-72, in region i;  
Source: calculations by the author, based on component variables.

$\dot{Y}_i^*$  = average annual growth rate expected during 1972-77 in real per capita personal income, in region i;  
Source: estimates by the author.

$\hat{Y}_i$  = regional income expected for 1977, in current dollars, in region i;  
Source: scenario B in the Eleventh Annual Review of the Economic Council of Canada and regionalization based on indications supplied by DREE's CANDIDE-R model.

$d_{Y_i}^{61}$  = actual disposable personal income in 1961 in current dollars, in region i;  
Source: 13-201, Vol. 37 and geographic distribution according to Statistics Canada (September 1974).

$d_{Y_i}$  = actual average annual growth rate in disposable personal income in 1961-72, in current dollars, in region i;  
Source: 13-201, Vol. 37 and geographic distribution according to Statistics Canada (September 1974).

$d_{i,77}$   
 $Y_i$  = disposable personal income, in current dollars,  
expected for 1977, in region  $i$ ;

Source: scenario B in the Eleventh Annual Review of the Economic Council of Canada and regionalization based on indications supplied by DREE's CANDIDE-R model.

$\alpha_i^*$  = expected average annual growth rate in intergovernmental transfer payments, in 1972 dollars, for 1972-77, in region  $i$ ;

Source: ibid.

$\gamma_i^k$  = average annual growth rate expected in real personal income during 1972-77, in region  $i$ ;

Source: ibid.

$\delta_i^*$  = average annual growth rate in gross per capita expenditures in real terms for government  $i$ , estimated through a temporal logarithmic function for the period between  $t_i^{**}$  and 1972, where  $t_i^{**}$  ( $\geq 1961$ ) corresponds to the year showing an acceleration in real gross per capita expenditures, plotted graphically. Table A-1 gives the value of  $t_i^{**}$  for each government.

Source: calculations by the author, based on 68-211, Vol. 1, 68-207, Vol. 1 and Canada Yearbook.



$\kappa_i^*$  = expected average annual growth rate in real gross regional expenditures in 1972-77, in region i;  
Source: cf.  $\gamma_i^*$ .

$\lambda_i'$  = elasticity coefficient between personal income tax and gross regional expenditures, according to the tax structure in force in 1962, in region i;  
Source: based on D. J. Daly, Federal Tax Revenue at Potential Output, 1960 and 1970, Ottawa, Economic Council of Canada, study no. 9, December 1974.  
We assumed:  $\lambda_f' = 1.70$  and  $\lambda_j' = \lambda' = 1.80$ .

$\lambda_i''$  = elasticity coefficient of self-generated gross general revenues, other than personal income tax, according to the tax structure in effect in 1962, in region i;  
Source: approximation by the author:  $\lambda_i'' = \lambda'' = 1.0$ .

$\mu_i$  = elasticity coefficient between gross per capita expenditures in constant dollars and the real per capita personal income, estimated for 1961-72, in region i;  
Source: estimate by the author through single regression analysis (the results are given in Table A-2).

$v_i$  = elasticity coefficient between per capita gross expenditures in constant dollars and per capita real personal income, estimated for 1952-60, in region i;

Source: ibid.

Table A-1

BREAKPOINT IN THE EVOLUTION OF GROSS PER CAPITA EXPENDITURES  
OF EACH GOVERNMENT IN CURRENT DOLLARS FOR 1952-60 ( $t_i^*$ ) AND IN  
CONSTANT DOLLARS FOR 1961-72 ( $t_i^{**}$ )

|                      | $t_i^*$ | $t_i^{**}$ |
|----------------------|---------|------------|
| Federal              | *       | 1969       |
| Provincial           | 1954    | *          |
| Newfoundland         | 1957    | 1965       |
| Prince Edward Island | 1953    | 1964       |
| Nova Scotia          | 1957    | 1964       |
| New Brunswick        | 1957    | 1966       |
| Quebec               | 1958    | 1969       |
| Ontario              | 1956    | 1964       |
| Manitoba             | 1955    | *          |
| Saskatchewan         | 1956    | *          |
| Alberta              | *       | 1966       |
| British Columbia     | 1959    | 1965       |

\* No significant change in the growth rate was experienced during the whole period (1952-60 or 1961-72).



Table A-2

Estimates of elasticity coefficients between per capita gross expenditures in constant dollars and per capita real personal income for each government, for 1952-60 ( $v_i$ ) and for 1961-72 ( $\mu_i$ )

| Level                | 1952-1960   |           |             | 1961-1972     |           |             |
|----------------------|-------------|-----------|-------------|---------------|-----------|-------------|
|                      | $\hat{v}_i$ | Student t | $\bar{R}^2$ | $\hat{\mu}_i$ | Student t | $\bar{R}^2$ |
| Federal              | 3.484*      | 1.374*    | .100*       | 0.655         | 9.020     | .880        |
| Provincial           | 2.339       | 5.696     | .797        | 1.708         | 28.736    | .987        |
| Newfoundland         | 1.827       | 4.054     | .659        | 1.178         | 9.473     | .890        |
| Prince Edward Island | 1.734       | 2.654     | .430        | 1.263         | 15.469    | .956        |
| Nova Scotia          | 2.654       | 7.718     | .880        | 1.712         | 16.531    | .961        |
| New Brunswick        | 1.958       | 6.310     | .829        | 1.532         | 12,855    | .937        |
| Quebec               | 1.548       | 3.831     | .631        | 1.657         | 14,955    | .953        |
| Ontario              | 3.013       | 5.230     | .767        | 1.747         | 19.957    | .973        |
| Manitoba             | 3.473       | 6.569     | .840        | 1.527         | 13.222    | .940        |
| Saskatchewan         | -0.072*     | -0.162*   | -0.139*     | 0.937         | 7.171     | .821        |
| Alberta              | 1.466       | 2.317     | .353        | 1.492         | 13.922    | .946        |
| British Columbia     | 1.582       | 4.726     | .727        | 1.057         | 10.355    | .906        |

\* Nonsignificant at 90 per cent level.

## Appendix B

### RULES FOR SIMULATION WITH THE CANDIDE MODEL

This appendix is a succinct description of the steps in the procedure followed during the simulation exercises for each path of expansion.

#### 1961-71 period

##### Expenditures

1) Determination of the volume of expenditures forecast by the path of expansion ( $\hat{D}_i^\tau$ ) for each year in the simulation period.

a) For the federal government:

$$\hat{D}_f^\tau = D_f^{61} \cdot (1 + \hat{r}_f)^\tau$$

b) For the provincial governments:

$$\hat{D}_p^\tau = \sum_{j=1}^{10} D_j^{61} (1 + \hat{r}_j)^\tau$$

where  $\hat{r}_i$  = the estimated growth rate for a path of expansion using the formulas given in Appendix A, region  $i^1$ .

---

1 The index  $i$  is used both for each province and for the whole of Canada (in the case of the federal government).

Since the provincial level of government is not always isolated in the CANDIDE model, but is included in the so-called group of "junior" governments, the volume of the forecast expenditures for the latter becomes:

$$\hat{D}_J^T = \hat{D}_p^T + D_{J-p}^T$$

where  $D_{J-p}^T$  in this case is an exogenous variable, corresponding to hospitals and municipal governments.

- 2) Distribution of the volume of expenditures among the various budgetary items.
  - a) First, some items ( $\bar{D}_i^T$ ) have been excluded from this operation because they were considered to be independent of the behavioural pattern adopted. This was the case with expenditures for capital depreciation, contributions to the federal unemployment insurance program and the participation of provincial governments in health insurance programs.<sup>1</sup> Therefore, the total new volume

---

1 In this case we assumed budgetary autonomy, through specific contributions by taxpayers that were not adjusted in the simulations.



of expenditures becomes:

$$\hat{D}_i^\tau = \hat{D}_i^\tau - \bar{D}_i^\tau$$

- b) Second, given the length of the period studied and the availability of data, we decided to distribute the total in proportion to the actual distribution for each year rather than on the basis of a pre-determined average distribution. This procedure yielded the following:

$$k \hat{D}_i^\tau = \left( \frac{k D_i^\tau}{D_i^\tau - \bar{D}_i^\tau} \right) \hat{D}_i^\tau \quad k = 1, K .$$

where k represents an adjusted budgetary item.

- c) Some budgetary items thus modified are exogenous in the model, so that the new value was merely substituted for the old value according to the SOLUTION procedure in Informetrica's SYMSYS program. The other items are determined by the model by means of a behavioural equation. Our initial results were obtained through simulations which for these variables were based on the constant term adjustment method. We then decided to exogenize the whole public expenditures block (#6) so that these endogenous variables could

be treated as exogenous and the values assigned before and after the simulation would be identical.

### Revenues

- 1) Determination of the level of revenues expected for each path of expansion and for each year in the simulation period. As we emphasized in the text, we maintain that the use of the budgetary surplus or deficit is an efficient stabilizing instrument over the short term. This is why in order to test the assumption of an inflationary bias in a medium-term behaviour of the government, we have attempted in each simulation to replicate a total surplus (deficit) level for the 10 years identical to the one observed during this period, that is + \$1,017.9 millions for the federal government (GBALF) and + \$1,089.6 millions for the other levels of government (GBALJ). Consequently, we proceeded on the basis of the following annual relationships:

$$\hat{R}_f^T = \hat{D}_f^T + \text{GBALF}^T$$

and

$$\hat{R}_J^T = \hat{D}_J^T + \text{GBALJ}^T$$

2) Contrary to what has been the rule with respect to expenditures, we decided to modify only a limited number of Revenue items appearing in block 19 of the CANDIDE model, because the behavioural context which we attempted to reproduce seemed to deal only with a number of specific taxes. Therefore, only the following taxes were treated as control variables: personal income taxes (TIPF and TIPP), taxes on corporate profits (TCAF and TCAP) and sales taxes (FSALES and TRS). Moreover, federal transfer payments to other levels of government (FTRJG) were made compatible, within the framework of each expansion path, with the evolution of federal expenditures.

As in the case of expenditures, the amount allocated to each of these different items is equal to the difference between the total revenue assigned by the path, adjusted to take into account the surplus (deficit) for the year in question and the yield of unadjusted sources of revenue, that is:

$$\hat{R}_i^T = R_i^T - \bar{R}_i^T$$



Similarly, the distribution among the various items was made in terms of the actual distribution observed each year.

$$\lambda \hat{R}_i^T = \left( \frac{\lambda R_i^T}{R_i^T - \bar{R}_i^T} \right) \hat{R}_i^T \quad \lambda = 1, 3$$

where  $\lambda$  stands for an adjusted source of income.

The constant term adjustment method was used in all cases except FSALES where the RSC, RSIM and RSIR rates were changed because of their role elsewhere in the system of equations. Moreover, even if the relationship is not explicit, any changes in the provincial sales tax (TRS) must be reflected in the consumption functions developed on the basis of the various categories of goods. Therefore, we changed the exogenous variables TNFIOR to TSP40R (that is from 352 to 378) in the same proportion as the TRS, in each year and for each expansion path.

#### 1972-77 period

Some changes had to be made in the procedure followed for the 1972-77 period.

With respect to expenditures, distribution among the various budgetary items was made on the basis of the average distribution observed from 1969 to 1973. Moreover, the non-provincial portion of the expenditure items of the so-called "junior" governments was estimated in the same manner. The average distribution observed from 1969 to 1973 was also used in distributing adjusted income. On the other hand, we eliminated the various sales taxes from the income adjustment procedure.

The rate of inflation raised some problems since we decided to define the paths of expansion for the 1972-77 period in constant terms. For each inflationary assumption -- based on GNE Implicit Price Deflator -- the procedure followed is based on the following iterations:

- a) determination of the rate of inflation in government expenditures, based on a temporal logarithmic function as estimated for 1955-71;
- b) adjustment of the variables used in the model into current dollars;

- REFERENCE COPY
- c) simulation;
  - d) calculation of the composite implicit price index for government expenditures, and comparison with the evolution imputed in (b);
  - e) reiteration, if necessary.



JUL 27 1990

HC/111/.E28/n.53

Boisvert, Michel

Public expenditure

indicators in Canada dibo

c.1 tor mai

Y