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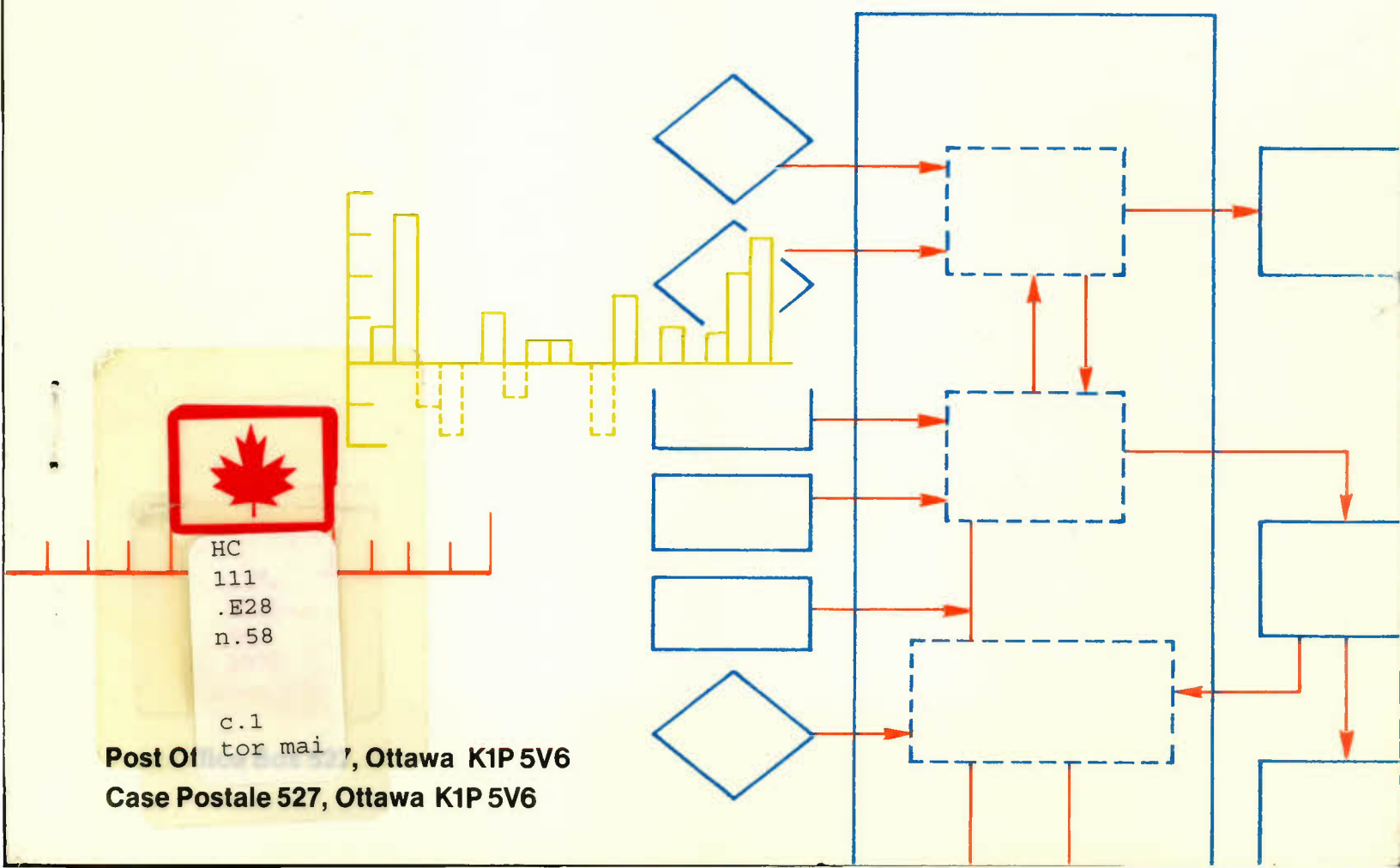

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DISCUSSION PAPER NO. 58

Anti-Inflation Policy and Nonfederal Behaviour: An Econometric Study of the Canadian Case, Using CANDIDE Model 1.2M*

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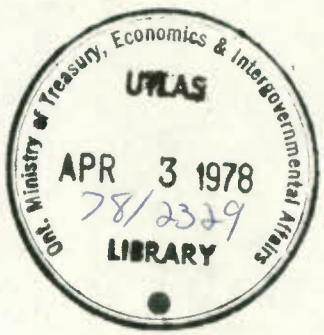

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RÉSUMÉ

Depuis que la Commission royale d'enquête sur la fiscalité a étudié, il y a dix ans, les conséquences macro-économiques de la croissance constante au Canada du secteur non fédéral, des craintes ont été exprimées quant à l'efficacité des politiques fédérales de stabilisation.

Un simple exemple peut aider à concrétiser ces inquiétudes. Dans un état fédéral à économie ouverte comportant un vaste secteur non fédéral et un régime de taux de change fixes, à quoi conduirait une politique fédérale anti-inflationniste préconisant une croissance plus faible des dépenses fédérales et du stock de monnaie ?

Si les déficits des gouvernements non fédéraux augmentent en période de baisse de l'activité économique, les effets de la politique fédérale seront en partie annulés par le comportement des déficits non fédéraux qu'elle provoque. Les raisons sont évidentes. Premièrement, les déficits non fédéraux élevés aident à soutenir la demande globale. Deuxièmement, les gouvernements non fédéraux financent une partie de leurs déficits en vendant des obligations aux non-résidents. Cette émission de créances peut entraîner une entrée continue de capitaux. Si le gouvernement fédéral et la banque centrale ne peuvent neutraliser la croissance des réserves de devises étrangères, ils ne pourront maintenir un taux d'accroissement de la masse monétaire aussi faible que celui qu'ils désirent.

Fait important à noter, la constitution fédérative du Canada, l'Acte de l'Amérique du Nord britannique de 1867, ne mentionne pas le financement des politiques macroéconomiques des paliers inférieurs de gouvernement. De plus, l'A.A.N.B. n'impose à peu près pas de limite aux déficits de ces gouvernements; ces déficits ont été, depuis 1961, plus considérables en moyenne que ceux du gouvernement fédéral ou que les changements de la base monétaire. Enfin, aucune mesure n'assure la coordination des politiques macroéconomiques des divers paliers sauf, peut-être, les conférences fédérales-provinciales.

Les analyses précédentes du rôle macroéconomique des gouvernements non fédéraux sont fragmentaires. Barber en 1967 et Wonnacott en 1972 ont allégué, sans preuves empiriques, que le financement des provinces ou des États est probablement une source de préoccupations politiques dans les régimes fédéraux à économie ouverte, à cause des relations entre ce financement, celui des politiques macroéconomiques du gouvernement fédéral, et la banque centrale. Rafuse aux États-Unis en 1965, Robinson-Courchene en 1969 et Rabeau en 1970 au Canada, entre autres auteurs, ont examiné le comportement cyclique des déficits des paliers inférieurs de gouvernement.

Le présent document a pour objet de combiner les deux aspects dans une évaluation économétrique de l'importance du comportement des gouvernements non fédéraux au Canada quant aux résultats d'une politique anti-inflationniste fédérale.

On suppose qu'une telle politique se ramène à une réduction du déficit fédéral, ainsi que d'une baisse correspondante de la base monétaire.

Les résultats que nous a fournis le modèle CANDIDE de l'économie canadienne touchent aux problèmes que soulève la coordination des politiques macroéconomiques dans un État fédéral. Ils ne confirment pas l'opinion courante selon laquelle, pour être efficace, une politique fédérale de ce genre doit avoir l'appui actif des gouvernements non fédéraux. Notre conclusion principale est plutôt que l'échec d'une telle politique ne peut être facilement imputé au comportement des gouvernements non fédéraux. Plus particulièrement, nous avons constaté que :

1. Si les gouvernements non fédéraux maintiennent leur attitude passée, reflétée dans les équations du modèle CANDIDE (1.2M), leurs déficits sont effectivement contracycliques, mais augmentent à un taux inférieur de 10 % à la réduction des dépenses fédérales. Cette faible augmentation des déficits non fédéraux, même si elle est financée à l'étranger, n'a presque aucun effet sur l'efficacité de la politique anti-inflationniste fédérale.

2. Si les gouvernements non fédéraux modifient leur comportement en réaction à la politique fédérale proprement dite et augmentent leurs dépenses de façon autonome, l'efficacité de la politique fédérale pour abaisser le taux d'inflation

s'en trouve réduite. Toutefois, même si l'on choisit un cas restrictif raisonnable de non collaboration discrétionnaire des paliers inférieurs de gouvernement (comme une augmentation des dépenses non fédérales autonomes, financées par la vente d'obligations à l'étranger et correspondant à une réduction équivalente des dépenses fédérales), la politique fédérale conserve son utilité pour ralentir l'inflation. Environ les deux tiers de la baisse du taux d'inflation attribuable à la politique fédérale subsiste même si ces gouvernements augmentent leurs dépenses d'un montant correspondant à la baisse des dépenses fédérales.

3. Même si ces expériences se fondent sur l'hypothèse d'un taux de change fixe et sur l'absence d'une neutralisation de la croissance des réserves de dévises, le relâchement de l'une ou l'autre de ces hypothèses ne modifie pas nos conclusions. En fait, il aide à rompre le lien entre le financement à l'étranger des gouvernements non fédéraux et la base monétaire canadienne, lien qui est en lui-même inflationniste.

4. La réduction du taux d'inflation occasionne des coûts en ce sens qu'elle accroît le chômage. En réduisant l'efficacité de la politique fédérale dans la lutte contre l'inflation, les mesures prises par les gouvernements non fédéraux peuvent aussi en réduire le coût en termes de chômage. Nous avons établi des courbes d'arbitrage entre l'inflation et le chômage pour la politique fédérale examinée, et pour

diverses hypothéses concernant le comportement des gouvernements non fédéraux. Quelle est la combinaison de taux d'inflation et de chômage qui serait souhaitable pour le bien-être de la société ? Nous l'ignorons. Toutefois, étant donné l'existence de la politique fédérale, on peut trouver de très bons arguments en faveur d'une certaine forme de non collaboration discrétionnaire des paliers inférieurs de gouvernement.

ABSTRACT

Ever since the Royal Commission on Taxation, ten years ago, examined the macroeconomic consequences of the continuing growth in Canada of the nonfederal government sector, fears have been expressed for the efficacy of centrally directed stabilization policies.

A simple example can help to solidify these fears. In the context of an open federal state with a large nonfederal sector, under fixed exchange rates, consider the outcome of a federal anti-inflation policy consisting of lower rates of growth of federal expenditures and of the stock of money.

If the deficits of nonfederal governments increase with the fall in economic activity, the federal policy will in part be offset by the response of nonfederal deficits that it induces. The reasons are straightforward. First, the larger nonfederal deficits help to maintain aggregate demand. Second, nonfederal governments finance part of their deficits by selling bonds to nonresidents. Such a new issue of debt may cause a persistent net capital inflow. If the federal government allied with the central bank cannot sterilize the increase in foreign exchange reserves, it will not be able to maintain as low a rate of monetary growth as it desired.

It is important to note that the Canadian federal constitution, the "British North-America Act" of 1867, is mute on the question of the financing of junior governments' macropolicies.

Nor does the BNA act seriously restrict the size of nonfederal deficits; these deficits in Canada have been since 1961 larger on average than either changes in the monetary base or the deficits of the federal government. There are no provisions, furthermore, for the co-ordination of macropolicies of different jurisdictions in Canada except, possibly, the federal-provincial conferences.

Previous evidence on the macroeconomic role of non-federal governments is fragmented. Both Barber (1967) and Wonnacott (1972) have argued, without empirical corroboration, that the financing of provinces or states is likely to be a source of political concern within open federal systems because of a relationship between this financing, the financing of macropolicies of the central government, and the central bank. Rafuse (1965) in the U.S., Robinson-Courchene (1969) and Rabeau (1970) in Canada, amongst others, have been concerned with the cyclical behaviour of junior governments' deficits.

The purpose of this paper is to combine both aspects in an econometric assessment of the importance of nonfederal behaviour in Canada to the outcome of centrally directed anti-inflation policy; the federal policy is assumed to be a cut in the federal deficit and a corresponding reduction in the monetary base.

Our results, using the CANDIDE Model of the Canadian economy, bear on the problem of the co-ordination of macropolicies in a federal state. They do not confirm the popular view that a successful federal policy of this kind requires active nonfederal

co-operation. Rather, our principal conclusion is that the failure of such policy cannot easily be blamed on the behaviour of the nonfederal governments. Specifically;

1. If nonfederal governments continue their past behaviour, as captured by the CANDIDE 1.2M equations, nonfederal deficits do behave countercyclically, but increase by less than 10 per cent of the original reduction in federal expenditures. This small increase in nonfederal deficits, even if financed abroad, has almost no bearing on the effectiveness of federal anti-inflation policy.

2. If nonfederal governments alter their behaviour in response to the federal policy per se, and autonomously increase their expenditures, the effectiveness of federal policy with respect to the rate of inflation is reduced. However, even for a reasonable limiting case of nonfederal discretionary nonco-operation (such as an increase in autonomous nonfederal expenditures by one dollar for each dollar reduction at the federal level, all financed by selling bonds abroad) the federal policy still remains effective in reducing the rate of inflation. Approximately two-thirds of the reduction in the rate of inflation due to the federal policy remains if these governments increase their expenditures dollar for dollar.

3. Although these experiments are carried out under the assumptions of fixed exchange rate and in the absence of sterilization, relaxing any of these assumptions does not affect our conclusions. Relaxing these assumptions actually helps to break the link between nonfederal foreign financing and the domestic monetary base, which link in itself, is inflationary.

4. Reducing the rate of inflation has its cost in terms of increased unemployment. Nonfederal actions, by reducing the effectiveness of federal policy in terms of inflation, may also reduce the cost in terms of unemployment. We have derived inflation-unemployment trade-off curves, for the given federal policy and a variety of assumptions about nonfederal behaviour. Which of the inflation-unemployment rate combinations is desirable from the social welfare point of view, we do not know. However, given the existence of the federal policy, a case can be made for the desirability of some form of discretionary nonco-operation by nonfederal governments.

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I. Introduction

One of the central tenets of modern stabilization policy in a federal state is the idea that the central government allied with the central bank, by judicious manipulation of its expenditures and revenues, its outstanding stock of bonds, and the stock of money, can and should offset fluctuations in national private demand. In Canada, the rapid growth of the nonfederal governments has stimulated concern, expressed most notably by the Royal Commission on Taxation,[1] for the ability of the federal government to conduct such policies without the explicit co-operation of the other government levels.

A simple example can help to solidify this concern. Consider a cut in the federal deficit and a corresponding reduction in the monetary base intended to reduce aggregate demand and therefore the rate of inflation.[2] Assume a fixed exchange rate and the absence of sterilization of changes in reserves. If the deficits of nonfederal governments increase with the fall in economic activity,[3] this federal policy will in part be offset by the response of nonfederal deficits that it induces. The reasons are straightforward. First, the larger nonfederal deficits help to maintain aggregate demand. Second, nonfederal governments

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1 See, for example, the second volume of the Royal Commission on Taxation (1966), pp. 91-105.

2 Such a policy was announced as the intention of the federal government in the last quarter of 1975, as part of an overall anti-inflation program.

3 As Perry (1968), p. 48, notes in percentage terms some nonfederal expenditures (especially on fixed capital formation) would not have to increase very much to offset the effect, on total government expenditure, of a sizeable percentage reduction in federal expenditures.

finance part of their deficits by selling bonds abroad. Such a new issue of debt may cause a persistent net capital inflow leading to an increase in the monetary base. Thus, the federal authorities may not be able to maintain as low a rate of monetary growth as desired.

In analogous fashion, a reduction in the nonfederal deficits would complement the federal budget cut by reducing aggregate demand directly, and indirectly by allowing a greater reduction in the money supply than would be possible if the federal government acted alone.

Tables 1 and 2 emphasize the potential importance of nonfederal deficits in Canada and the means by which these deficits are financed.

Table 1

Foreign Borrowing by Provincial and Municipal Governments and Their Enterprises, and Changes in the Monetary Base, 1961-71

	(1)	(2)	(3)	(4)
	Foreign Pay Bonds	Total Borrowing	(1)/(2) * 100	Change in Monetary Base
	(Millions of dollars)		(Per cent)	(Millions of dollars)
1961	- 12	1,250	- 1.0	134
1962	117	963	12.1	113
1963	285	1,397	20.4	123
1964	472	1,413	33.4	162
1965	268	1,289	20.7	316
1966	424	2,257	18.8	257
1967	799	2,831	28.2	150
1968	905	2,559	35.4	237
1969	1,020	2,448	41.7	305
1970	362	2,533	14.3	250
1971	278	3,326	8.4	767

Source Rows (1), (2); Bank of Canada Review (October 1972), Table II, page 12. Row (4); CANDIDE Databank.

The plausibility of large changes in the way non-federal deficits are financed is at least partly established by Table. 1 Of total provincial-municipal borrowing in 1961, -1 per cent was abroad. Yet in 1969, 42 per cent of new issues were payable in foreign currencies while after only two years this fell to 8 per cent. Moreover, Table 1 indicates that nonfederal borrowings abroad have been since 1961 larger on average than changes in the monetary base.

It is important to note that most federal constitutions, including the Canadian "British North-America Act" of 1867, are mute on the question of the financing of junior governments' macro-policies. Nor do they seriously restrict the size of the deficits to be financed.

Table 2 presents a perspective on the relative size of federal and nonfederal deficits. It is clear that nonfederal purchases of goods and services have always been significant in the composition of aggregate demand, and are becoming more so; the ratio of nonfederal purchases of goods and services not related to conditional grants to federal purchases has increased from roughly 1.3 in 1961 to 1.7 in 1973. If conditional grants for purchases and transfers to persons are included at the nonfederal level, the shift becomes much more dramatic, from 1.7 to 2.8. And as Parizeau (1970) has pointed out, this later shift has been based primarily on a system of open-ended grants which allows provincial governments to control the magnitude of both federal and their own contributions to these shared-cost programs.

Table 2

A Partial View of the Relative Importance of Provincial and Municipal Governments in the Canadian Federation

		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
		(Per cent)												
(1)	G_{NF}/Y	9	9	9	9	9	10	10	10	10	10	10	10	10
(2)	G_F/Y	7	7	6	6	6	6	6	6	6	6	6	6	6
(3)	$(G_{NF} + T^C)/Y$	12	13	13	13	14	14	15	16	16	18	18	18	17
(4)	T^{NC}/G_F	9	9	10	11	13	14	16	14	16	18	20	21	20
(5)	CPP/G_F	-	-	-	-	-	14	16	17	17	17	17	16	15

Notation CPP = surplus of Canada Pension Plan, National Accounts basis; CPP/Y can be calculated as Row (2) * Row (5).

G_{NF} = nonfederal purchases of goods and services not related to conditional grants, including gross capital formation, and excluding capital consumption allowances.

G_F = federal purchases of goods and services including defence purchases and gross fixed capital formation, and excluding capital consumption allowances.

T^C = conditional grants to nonfederal governments plus nonfederal matching expenditures.

T^{NC} = unconditional grants to nonfederal governments. T^{NC} excludes transfers of tax revenue collected by the federal government; T^{NC}/Y can be calculated as Row (2) * Row (4)

Y = GNP in current dollars.

Source Winer (1975), Appendix; and CANDIDE databank. Entries are approximate because of rounding.

It is also apparent that there has been a doubling in unconditional grants from the federal to provincial governments since 1961, both relative to the size of federal purchases and relative to GNP. By 1973 the federal government was transmitting to the nonfederal level, without strings attached, an amount approximately equal to 20 per cent of the value of its purchases, or 1.2 per cent of money income, in order to equalize per capita tax yields across provinces. In addition, since 1966 the provincial governments have been able to borrow the surplus of the Canada Pension Plan at relatively low interest rates. In 1973 this source provided provincial governments an additional amount equal to 15 per cent of federal purchases.

When all factors are combined -- swings in nonfederal sources of financing, Pension Plan surpluses, unconditional transfers, open-ended conditional grants, and relative size -- one reaches the present situation of Canada: one of considerable decentralization where the possible effectiveness of federal policy, independent of nonfederal behaviour, must be questioned.[4]

Previous evidence on the macroeconomic role of nonfederal governments is fragmented. Both Barber (1967) and Wonnacott (1972) have argued, without empirical corroboration, that the financing of macropolicies of nonfederal governments is likely to be a source of political concern within open federal systems because of a relationship between this financing and the financing of macropolicies of the central government allied with the central bank. Rafuse (1965) in the U.S.,

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4 Parizeau (1970), p. 88.

Robinson-Courchene (1969) and Rabeau (1970) in Canada, amongst others, have been concerned with the cyclical behaviour of junior governments' deficits.[5]

The purpose of this paper is to combine both aspects (the magnitude of nonfederal deficits and the means of their financing) in an econometric assessment of the importance of nonfederal behaviour in Canada to the outcome of centrally directed demand management policy. In Section II, we outline the essential ingredients of the model and the taxonomy used to study the importance of nonfederal behaviour, followed by our results in Section III.

The conclusions of this study are presented in Section IV. In view of the obvious importance of the nonfederal presence in the Canadian macroeconomy, one might be tempted to conclude that federal policy will not succeed if the nonfederal levels of government do not actively co-operate. However, our results, as recorded below, do not confirm this popular view. At least in the particular case of a federal policy intended to reduce aggregate demand and thereby the rate of inflation, we find that even active nonco-operation of an extreme, and unrealistic, nature not completely offset the effects of the federal policy. Indeed, in one reasonable sense discussed below, such nonco-operation may even be desirable. Thus the failure of such policy cannot easily be blamed on the behaviour of the nonfederal governments.

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5 In Canada see also the Royal Commission on Taxation, Vol. 2 (1966), Barber (1967), and Poddar (1972). Barber's work comes closer than the others to a recognition of the importance of both channels of nonfederal influence.

II. Elements of an Econometric Model of an Open Federal State, and a Taxonomy of Nonfederal Responses

We employ CANDIDE 1.2M as a tool for studying the importance of nonfederal behaviour in the Canadian context. Ours is a large scale model of a national economy, fited to annual data, generally for the period 1955-73, using ordinary least squares as the method of parameter estimation.

Several striking features of CANDIDE are worth mentioning.[6] The model is disaggregated in a number of directions, which accounts for its large size. It has more than 625 behavioural equations and 427 input-output identities in a total of slightly more than 2,100 equations. It thus integrates input-output submodels with conventional econometric modeling. There are approximately 500 exogenous variables and 1,050 other identities. The model also has some particular features regarding its treatment of government. These features, as a whole, distinguish it from other Canadian models and make it related to the behaviour of government.

The following are the main elements of the modeling of government in CANDIDE. First, the mdoel disaggregates government into two levels, a consolidated federal government and central bank and all other nonfederal governments. Second, the existence of

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6 For a complete description of the model, see ECC (1976), and Bodkin, et. al. (1974).

government budget restraints assures that sources and uses of funds at both levels of government are balanced in a manner specified by the model user. Third, expenditures, as well as revenues, of the two levels of government are endogenous. Fourth, sources of revenues and types of expenditures are highly disaggregated at both levels.

Below we detail some salient aspects of the CANDIDE model relevant to the government sector in setting the stage for our experiments. All variables are endogenous and are in nominal terms, unless otherwise stated. It is assumed that all federal deficits are monetized, the exchange rate is fixed and there is an absence of any sterilization of the change in foreign exchange reserves.[7]

The consolidated balance sheet of the government of Canada and the Bank of Canada is represented by[8]

$$(1) \quad \Delta H = \eta D_F + \mu \Delta R$$

that is, the changes in the monetary base ΔH consists of a fraction η of the federal deficit on a national accounts basis D_F (the

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7 These assumptions are relaxed below. However, there are good reasons for believing that with the current system of managed floating, the federal government will not allow any important exchange rate fluctuation following a major budget change. See Kaliski and Prachowny (1975), p. 20.

8 Time subscripts (and error items where applicable) are omitted for convenience throughout this analysis. The specification of government budget restraints follows Winer (1975), Chapter 3.

change in the domestic component of the monetary base) and a fraction μ of the change in foreign exchange reserves ΔR.[9] $1-\eta$ is the degree to which federal deficits are financed by the domestic sale of debt, $1-\mu$ is the degree of sterilization, where the values of η and μ lie between 0 and 1 and are exogenously specified. Our assumptions imply that η and μ are equal to 1 in all periods.

$$(2) \quad D_F = D_F(y, P, y_{-1}, P_{-1}, \ldots y_{-j}, P_{-k}; X_F) \; ; \; D_{X_F} > 0$$

where y is real output, P is a price index and X_F is a shift vector of exogenous parameters and variables, some of which are in real terms. Since most endogenous purchases are denominated in real terms and are in part a function of real output, a change in y will in general have a different effect on government expenditures than the equivalent change in $P \cdot y$ with y constant. On the other hand, tax revenue depends primarily on nominal income. Thus P and y enter D_F separately.[10]

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9 In any experiment with CANDIDE, only deviations of D_F and ΔR from the reference solution values of these variables result in a change in the monetary base, using equation (1). The federal budget restraint, and the nonfederal restraint given below, are imposed on the model only when an exogenous shock to the model causes endogenous variables to deviate from their reference solution values.

10 Since our experiments will be conducted within the sample period of the CANDIDE model, 1955-73, federal income tax revenues are not indexed to the rate of inflation.

In this study we introduce the federal budget cut into the model using a step decrease in X_F. The consequent decrease in D_F, given ΔR unchanged, is assumed to result in an equally smaller monetary base.

Nonfederal (provincial and municipal) deficits on a national accounts basis are given by

$$(3) \quad D_{NF} = D_{NF}(y, P, y_{-1}, P_{-1}, \ldots\ldots, y_{-\ell}, P_{-m}; X_{NF}) \; ; \; D_{X_{NF}} > 0$$

where X_{NF} is analogous to X_F and y and P enter separately for the same reason here as in (2). Thus, nonfederal deficits in CANDIDE vary endogenously with the level of economic activity. This may be the result of automatic changes in nonfederal deficits that occur in the absence of discretionary budget changes, or of discretionary budget changes not related to the introduction of the federal policy per se, but rather to changes in prices and output. Virtually every federal policy that influences economic activity induces a change in the provincial-municipal deficits if only because their tax revenues are altered.[11] Provincial deficits may also vary with economic activity as a result of attempts at stabilization of the provincial economy.

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11 Certain regional stabilization funds have been proposed which would insulate nonfederal deficits in Canada from year to year changes in economic activity. See, for example, the Royal Commission on Taxation (1966), p. 109. None of these schemes have been implemented.

With X_{NF} held constant, an increase in D_{NF} when X_F is reduced will be called nondiscretionary nonco-operation.[12] Conversely, $\Delta D_{NF}/\Delta X_F > 0$ refers to nondiscretionary co-operation by the nonfederal governments at a particular point in time.

Moreover, it is possible that the introduction of important federal stabilization policies will result in autonomous changes in the size of the nonfederal deficits. Such changes may be situations of discretionary nonco-operation, $\Delta X_{NF}/\Delta X_F < 0$ or discretionary co-operation, $\Delta X_{NF}/\Delta X_F > 0$.

We define discretionary actions on the basis of changes in the exogenous component of nonfederal deficits because we wish to distinguish reactions to the federal policy per se from all other reasons for changes in D_{NF}. The reactions are to the autonomous federal budget cut because subsequent induced changes in the endogenous components of D_F are not immediately known by the nonfederal governments.

But could there be an incentive for nonfederal governments to increase the exogenous component of their expenditures when the federal government is reducing its

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12 In the literature (Rafuse (1965), Barber (1967), Robinson-Courchene (1969), Rabeau (1970)) this would be considered evidence of the countercyclical behaviour of nonfederal deficits with respect to the general level of economic activity. The difference in terminology helps to bring out the mixed blessing of this stabilizing influence of nonfederal deficits. Such behaviour helps to mitigate (but would never eliminate) the effect of shocks to the economy, but therefore tends to offset the desired effects of federal stabilization policies. Our terminology follows from a desire to concentrate on the effectiveness of federal stabilization policies.

expenditures? The answer is, yes. Nonfederal governments, like the federal government, are interested in maintaining high employment, stable prices and providing adequate social services. Once they see that the federal government is taking responsibility for the control of inflation, since such action may be considered a public good (they can't be excluded from enjoying the benefits), they may feel less constrained compared to the situation in which federal anti-inflation policy does not exist. They may thus support the federal actions verbally on the one hand, while nevertheless taking actions that increase their deficits.[13]

A specification of the behaviour of nonfederal deficits is not sufficient for our purposes, however. It is necessary to consider the other key element which determines, together with this behaviour, the nonfederal influence on federal macropolicy. This concerns the means by which these deficits are financed.

The budget restraint of the nonfederal sector is represented by

$$(4) \quad \Delta B^{*}_{NF} = \gamma D_{NF}$$

where ΔB^{*}_{NF} is the value of the net change in the stock of provincial and local debt held by nonresidents (assumed to be sold at par) which is assumed to equal a fraction γ of the nonfederal deficits. $(1-\gamma)D_F$ is thus the value of nonfederal debt sold domestically each year.

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13 N. Swan suggested this argument.

To expose the relationship between nonfederal financing, nonfederal deficits and the success of federal policy, we also require the balance of payments identity

$$(5) \quad \Delta R = TC + (X-M)$$

where TC is total capital inflow, X-M is the current account surplus, as well as total capital inflow, given by

$$(6) \quad TC = f(r-r^{*}, I, X-M) + \Theta \cdot \Delta B^{*}_{NF} .$$

TC depends on the domestic-foreign interest rate differential, domestic investment, X-M, and a shift variable, a fraction Θ of ΔB^{*}_{NF} where $0 \leq \Theta \leq 1$. Θ is a shift parameter which represents the degree to which a new issue of nonfederal debt abroad results in a simultaneous capital inflow at the same interest rate differential. Hereafter Θ will be assumed to be 1.[14]

If, for example, increases in the budget deficits of nonfederal governments are financed by selling debt abroad, $\gamma = 1$, this results in an increase in TC, an increase in ΔR,

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14 Thus we assume ΔB^{*}_{NF} has no direct influence on the existing Canadian component of nonresidents' portfolios. Relaxing this assumption, as we note below, actually helps to strenghten our conclusions.

and an increase in ΔH, since $\mu = 1$ in (2).[15] On the other hand, with $\gamma = 0$, we should expect the effects of nonfederal nonco-operation to be less severe since increases in D_{NF} are financed by selling debt domestically, having no indirect influence on the monetary base through this route. Since the original federal policy includes reducing the monetary base, we shall label a nonfederal switch from domestic to foreign sources of financing when D_{NF} is increasing discretionary nonco-operation, and the opposite switch, discretionary co-operation.

Decreases in nonfederal deficits on the other hand reduce the need for financing. In this case, the larger the value of γ the more nonfederal governments would be retiring foreign debt, thus further reducing the money supply. Switching from domestic to foreign sources of financing when D_{NF} is falling is thus referred to as discretionary co-operation.

But what is the most likely value for γ? We admit that our model does not have, at least at this stage, a complete sector explaining the behaviour of nonfederal financing. Hence what we plan to do is study the extreme cases and see if we can derive any meaningful conclusions.[16]

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15 There is a general principle involved here. Whenever nonfederal (federal) actions influence sources or uses of funds at the federal (nonfederal) level, then the federal (nonfederal) government must alter some other source or use of funds so as to keep them in balance; this response will in general influence economic activity. The consequences of this interdependency in a closed federal state are explored at length in Winer (1976).

16 Some parts of this switching in nonfederal financing which are a function of the interest rate differential may already have been included in the estimation of TC in equation (4) above. We say, some parts, because the nonfederal behaviour may change as a result of the new federal policy, which will not be captured by equation (4). Thus for this reason our estimates of capital inflows are biased upwards. However, the absence of this bias, as discussed below, would actually help to strengthen our conclusions even further.

A Taxonomy of Nonfederal Responses

It is instructive to summarize the discussion at this point in Table 3. We are using English and Greek symbols to refer to the amounts and type of financing of nonfederal deficits respectively, brought about by discretionary nonfederal behaviour. The simulations to be reported in this study exhaust the taxonomy of Table 3.

Table 3

A Taxonomy of Nonfederal Responses When $\Delta X_F < 0$, $\eta = \mu = 1$

Behaviour / Effective Action	Discretionary	Non-Discretionary $X_{NF} = \bar{X}_{NF}$, $\gamma = \bar{\gamma}$
Co-operation	2a: $\Delta X_{NF}/\Delta X_F > 0$ 2α: $\Delta\gamma > 0$	1a: $\Delta D_{NF}/\Delta X_F > 0$
Nonco-operation	2b: $\Delta X_{NF}/\Delta X_F < 0$ 2β: $\Delta\gamma > 0$	1b: $\Delta D_{NF}/\Delta X_F < 0$

So far we have emphasized the reduction in the rate of inflation as a test for the success of federal policy. But, if there does exist a trade-off curve, this success in terms of the reduction of the rate of inflation may be associated with a cost in terms of an increased rate of unemployment. If a different nonfederal behaviour yields a different degree of success for the

federal policy with respect to the rate of inflation, the cost associated with this behaviour in terms of the unemployment rate will also be different. Thus we may be able to draw a standard unemployment- inflation trade-off curve defined over this taxonomy. A policy of complete nonfederal co-operation may be expected to yield point $2a + 2\alpha$, with less inflation and more unemployment. Alternatively, the other extreme case of complete nonfederal nonco-operation may yield a point like $2b + 2\beta$ - with more inflation and less unemployment.[17]

Other responses may be expected to lie in between these extremes as indicated by Figure 1.

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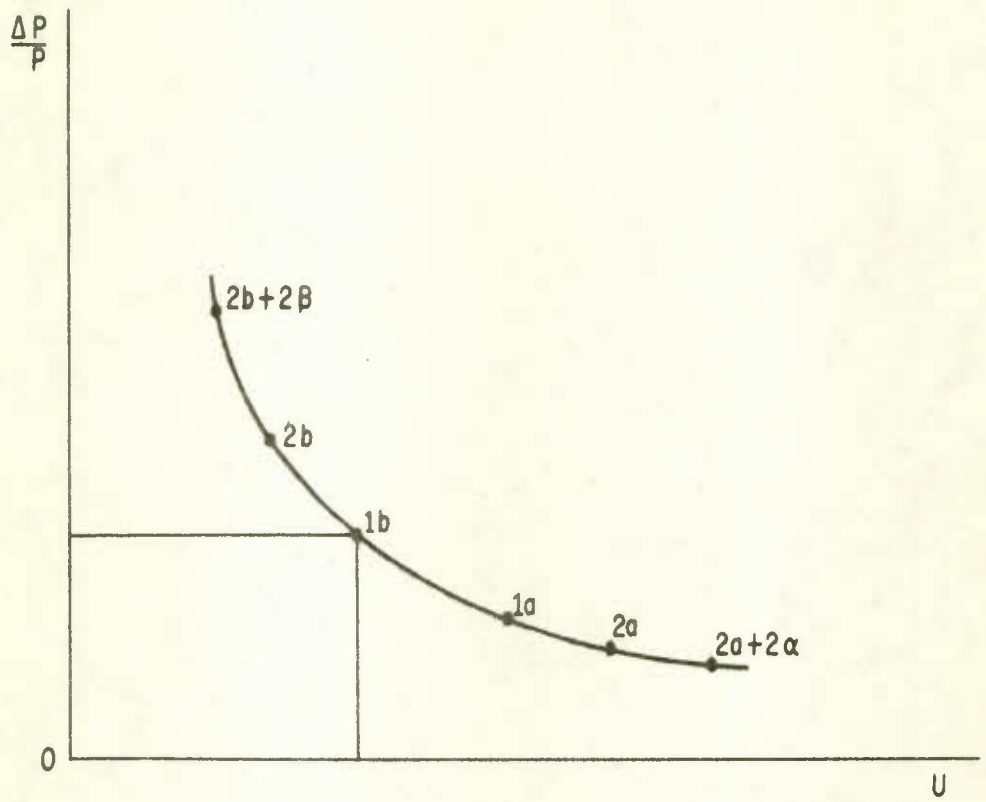
17 No conclusion should, however, be derived above the social desirability of any of these points in the absence of any knowledge about society's welfare function.

Figure 1

A Possible Ranking of the Outcomes of Federal Policy Defined Over a Taxonomy of Nonfederal Responses



III. Results of Simulations

We begin with a situation in which the task of the federal government is a difficult one. We assume:

1. The nonfederal wages are exogenous.[18] Since a federal expenditure cut reduces nonfederal revenues by depressing economic activity, such stickiness of nonfederal wages helps to generate a net increase in nonfederal deficits.

Moreover, our assumptions of $\mu = 1$ and of fixed exchange rates imply:

2. If nonfederal governments finance any increase in their deficits by a sale of bonds abroad, the federal government does not try to offset the effects of such a policy on the monetary base by sterilizing the change in foreign reserves or by allowing the exchange rate to appreciate.

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18 To maintain consistency in our assumptions about government wage behaviour, we also exogenize federal wages in all experiments. Since our interest lies fundamentally in the differential effects of various government jurisdictions, we do not want to make our conclusions dependent upon non-stochastic assumptions which we have imposed on the model.

In this environment we introduce a sustained $500 million cut in federal expenditures for the period 1969-73, below the actual level of these expenditures.

That is, components of the vector X_F are reduced in every year to produce an instantaneous reduction in D_F by $500 million current dollars. The two components of D_F affected are 'federal current expenditures' and 'federal fixed capital formation'. Since it is assumed that $\eta = 1$ in all periods, the instantaneous effect of this budget cut is a reduction in the monetary base below its historical value, equal to the size of the autonomous decrease in the federal deficit. The changes in selected variables are then calculated over reference solution values of these variables.[19]

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19 All the results are, unless otherwise stated, averages of the listed variables for the period 1970-72. The experiments cover the period 1969-73. The case year 1969 is lost since we calculate percentage changes for some variables. We do not include 1973 in our calculations for four reasons.

First, we think that four years following the time of the introduction of a federal policy, is a long enough period to indicate whether this policy is effective or not. Second, the separation of 1973 from our results gives us an idea for the direction in which activity would be changing over a longer run. One year is not a sufficiently long period for that purpose, but we did not want to start earlier than 1969 because we wanted to select the most inflationary period from the sample period of the model. Third, the data for 1973, the last year of the sample period of the model, is still subject to revision and may contain significant errors. Fourth, interest payments on government debt are not specified endogenously in the version of CANDIDE employed in this study -- evidence from a subsequent version suggests 3 or 4 years is the maximum time period over which interest payments may be safely ignored.

A. The Importance of Nonfederal Deficits

Table 4 gives the results for the first set of simulations, where the nonfederal means of financing are kept constant. We use an average historic value for the period 1961-71 of the parameter γ, 0.2.[20]

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20 This average is calculated from Table 1, Column 3. Thus, the remaining $1-\gamma$ or .8 of these deficits are financed by the domestic sale of debt. Tax rates of nonfederal governments are assumed to be constant. Provincial crown corporations and agencies are included in the calculation of γ.

Table 4*

The Importance of Nonfederal Budget Deficits, $\gamma = 0.2$
(Average 1970-72; simulation value less reference solution value)

Simulation		Variables $\Delta P/P_{-1}$	U	D_{NF}	D_F	ΔR	y
		(Per cent)	(Per cent)	(Millions of dollars)			
1.	1b	-13.0	13.9	46.0	-513.6	473.6	-1,198
2.	1bX	-11.6	14.2	0.0	-499.4	481.2	-1,254
3.	2bL	- 8.7	7.9	725.3	-606.3	541.6	- 780
4.	2bP	- .4	6.8	1,177.3	-715.5	634.3	- 416
5.	2bG	-13.0	13.6	253.6	-557.2	512.6	-1,171
6.	2aB	-16.6	23.8	-1,012.7	-302.5	390.8	-2,116
7.	2aP	-23.8	21.5	-1,074.0	-388.0	317.0	-1,975
8.	Reference solution values	2.77	6.42	-1,015.7	-355.0	755.7	67,252

*Average 1970-72.

Notes: 1. All these results are reported as changes from the reference solution of the model given in Row 8; - (+) means the simulation value is below (above) that of the reference solution. Columns 1 and 2 are in terms of per cent change over the reference solution.

2. The variables are;

P Implicit deflator of consumer expenditures.

U The rate of unemployment.

D_{NF} Provincial and Municipal government deficits, millions of current dollars.

D_F Federal Government deficit, millions of current dollars.

ΔR Official settlements balance, millions of current dollars.

y GNE, millions of constant dollars.

3. 1b -- continuation of past behaviour of nonfederal deficits

1bX -- nonfederal deficits exogenous (maintained at reference solution values)

2bG -- nonfederal purchases exogenous, but taxes - less - transfers allowed to vary endogenously

2bL -- autonomous increase in nonfederal deficits equal to the autonomous reduction in the federal deficit

2bP -- autonomous increase in nonfederal deficits of 1.24 times the autonomous federal decrease ($1.24 = G_{NF}/G_F$ in 1969).

2aB -- balanced budget at the nonfederal level (elimination of nonfederal deficits)

2aP -- autonomous decrease in nonfederal deficits of 1.24 times the autonomous federal decrease

Continuation of Past Nonfederal Behaviour

If the nonfederal governments do not undertake any discretionary change in their behaviour in response to the federal anti-inflation program per se, i.e., $X_{NF} = \bar{X}_{NF}$, and continue to react to the change in the macroeconomy, as in the past, then the effects of the federal policy are shown in Row 1 (experiment 1b). Compared to the reference solution of the model, the rate of inflation decreases by 13.0 per cent, over its reference solution value (measured by the percentage change in the implicit deflator of consumer expenditures). The percentage increase in the unemployment rate, over its reference value, is 13.9 per cent.

As federal expenditures are decreased the federal government surplus increases, in this case by $513.6 million, only slightly more than the original decrease of federal expenditures by $500 million. This happens because of secondary influences on various items of federal government expenditures and revenue which are (see equation 2) endogenous variables in the model.

A decrease in federal expenditures has increased the nonfederal deficits, by depressing real economic activity. Thus the nonfederal deficits in CANDIDE, when nonfederal wages and salaries are exogenized, do indeed behave countercyclically.[21] But an autonomous $500 million cut in federal expenditures induces only a $46 million increase in the nonfederal deficits.[22] Thus any decrease in federal expenditures is matched by a less

than 10 per cent increase in nonfederal deficits. This is not a large increase and does not have any substantial effects. To prove this point, we exogenize the nonfederal sector completely in such a way that the nonfederal deficits are the same as in the reference solution of the model. Row 2 of Table 4 records the results of such an experiment, labeled 1bX.

IbX, compared to 1b, shows a higher rate of inflation and a higher rate of unemployment; the inflation rate is 1.4 per cent higher and the unemployment rate .3 per cent higher. Even though these differences are very small, it is interesting to note that both inflation and unemployment rates increase with the elimination of nonfederal deficits. This is because federal and nonfederal deficits, in CANDIDE, have different influences on inflation and real activity. More about this later.

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21 Robinson and Courchene (1969) also find nonfederal deficits to respond countercyclically to economic activity.

22 We have calculated the ratio $\Delta D_{NF}/\Delta Y$, where Y is the current dollar value of GNE. The value of this ratio in the experiment 1b equals -.060, which is very close to that calculated by Robinson-Courchene (-.065; Table 4, p. 177) for the provincial governments only. Our estimate also includes the municipal governments. For the long run, the Robinson-Courchene estimate of this ratio is .009. In the 5th year of our experiments, the year 1973, this ratio is .0001.

Nonfederal Nonco-operation

We have examined three selected cases. These are; nonfederal governments[23]

(1) offset any decrease in federal expenditures by autonomously increasing their expenditures dollar for dollar (case 2bL).

(2) increase their expenditures so as to initially keep the ratio of nonfederal to federal expenditure equal to 1.24, as in the year 1969 (case 2bP).[24]

(3) maintain their expenditures even though their revenues fall due to the federal policy (case 2bG).

The results of these experiments are given in Rows 3 to 5 of Table 4. Compared to 1b, case 2bL shows a higher rate of inflation and lower rate of unemployment. We still, however, witness an 8.7 per cent decrease in the rate of inflation over the reference solution of the model, and a 7.9 per cent increase in the rate of unemployment. It can be seen that after all the effects have worked themselves out, the net budget position of all levels of governments worsens by $119 million, as the federal budget surplus increases by $606.3 million, whereas nonfederal budget deficits grow by $725.3 million. But this increase in total budget deficits still leads to a decrease in real GNE, an increase in the unemployment rate and a lowering of the rate of inflation. This is again symptomatic of the different effects of federal and nonfederal deficits on prices and real activity.

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23 Unless otherwise stated, the components of nonfederal deficits altered to examine nonco-operation correspond to the components of federal deficits altered as a part of the initial federal policy.

24 'Other current (nonfederal) expenditures' was used as the adjusting item here; also in case 2aP below.

The increase in nonfederal expenditures in case 2bP is larger than in 2bL, $620 million versus $500 million. The rate of inflation in 2bP is thus larger than 2bL and the unemployment rate lower. This immense increase in nonfederal expenditures almost completely offsets the effect of federal policy on inflation, as the rate of inflation, compared to the reference solution, decreases by only .4 per cent. The unemployment rate, however, is up by 6.83 per cent over the reference value.

The nonfederal deficits in case 2bG are lower than those in cases 2bL and 2bP. Hence, compared to both these cases, the rate of inflation is lower and unemployment rates higher in case 2bG.

Nonfederal Co-operation

In the three cases studied here we assume that nonfederal governments:

(1) reduce their expenditures so as to maintain the same deficit position as would have existed in the absence of the federal anti-inflation program (case 1bX).

(2) balance their budgets by reducing their expenditures (case 2aB).[25]

(3) reduce their expenditures so as to maintain a constant share in total governments expenditures (case 2aP).

25 Nonfederal deficits for this experiment are $3.0 million rather than zero, which we were trying to achieve. The reason is that these deficits are endogenous and we have to adjust some items in the nonfederal budget ('other current expenditures', in our case) to try to bring it as close to zero as possible. After repeated experiments we left them at 3.0 since the result would hardly change if they were reduced by another 3 million dollars.

We have already discussed the effects of case 1 above. To briefly recapitulate, we found that if nonfederal governments do not alter X_{NF}, the federal policy does not affect D_{NF} significantly. Hence elimination of these new deficits does not entail any substantial change in the rate of inflation.

Elimination of all nonfederal deficits (case 2aB) reduces the rate of inflation over the reference solution by 16.6 per cent, which is better than 13.0 per cent in the case where nonfederal governments are passive (case 1b). The unemployment rate increases by 23.8 per cent over the reference. This is almost 10 per cent higher than that achieved in case 1b. Thus nonfederal co-operation helps to reduce the rate of inflation, as expected.

Nonfederal co-operation in 2aP involves, on average, a larger reduction in expenditures than in 2aB (compare D_{NF} in the two). It thus leads to a greater reduction in the rate of inflation, 23.8 per cent compared to 16.6 per cent in case 2aB. However, we notice that case 2aP leads to a smaller increase in the unemployment rate over reference, compared to case 2aB, 21.5 per cent versus 23.8 per cent. This is a result of the fact that the autonomous reduction in nonfederal expenditures in case 2aP is uniformly equal to $620 million in all years, whereas the amount of the reduction of expenditures in 2aB in any year depends upon the particular budget deficit in

that year. Substantial lags in the model and our use of unweighted averages in reporting results give importance to the resulting difference in distribution over the simulation period of nonfederal deficits.

It is not surprising to find that nonfederal co-operation helps the federal government to reduce the rate of inflation.

B. Importance of the Means of Financing Nonfederal Deficits

In our earlier results, we assumed that nonfederal governments finance 20 per cent of any change in their deficits position by borrowing from abroad.[26] In this section we wish to examine the importance of the changes in the nonfederal means of financing (by using values of γ other than .2) to the success of federal anti-inflation policy.

Consider, first, a case where the only decrease in federal expenditures comes about through a sustained $500 million decrease in the autonomous component of unconditional transfers to nonfederal governments.[27]

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26 As stated earlier this is an historic average for the period 1961-71. We would like to point out here that a different γ would not at all affect the direction of any of our conclusions. This will become apparent below.

27 The constant term of the equation explaining equalization payments was reduced by $500 million in each year.

If nonfederal governments maintain their expenditures, they have to finance this cut in their sources of funds by some means. Consider the following alternatives.

(1) $\gamma = 0.2$, as before.

(2) They finance 100 per cent of these deficits by borrowing from abroad, $\gamma = 1.0$

(3) The finance 100 per cent of these deficits by borrowing in the domestic market, $\gamma = 0.0$

The results of these experiments are given in Table 5 and are denoted by 1T2, 1T1 and 1T0, respectively.

Table 5*

The Importance of Nonfederal Financing of Reductions in Unconditional Transfers from the Federal Government (Average 1970-72; simulation value less reference solution value)

Simulation \ Variable		$\Delta P/P_{-1}$	U	D_{NF}	D_F	ΔR	y
		(Per cent)	(Per cent)	(Millions of dollars)			
1	1T2 (γ=0.2)	- .7	5.1	537.4	-424.0	400.4	-454.0
2	1T1 (γ=1.0)	0.0	0.0	532.6	-525.0	519.6	10.0
3	1T0 (γ=0.0)	- .7	6.4	538.3	-399.0	370.3	-570.0

*See Notes to Table 4.

For the case 1T1, the nonfederal governments, by financing their entire new deficits from abroad, force an equivalent capital inflow and thus an equivalent change in the monetary base. Hence, since unconditional transfers do not enter into any of the behavioural equations in the private sector, the federal policy has no effect at all on inflation or unemployment.

In cases 1T2 and 1T0, however, the extent of nonfederal financing from foreign sources is smaller; thus new capital inflows are less than $500 million leading to smaller surpluses in the balance of payments, a lower stock of high-powered money, a lower level of economic activity, and hence more unemployment -- with slightly less inflation. Hence, a decrease in nonfederal borrowings from abroad helps to reduce the rate of inflation -- though at the cost of a higher unemployment rate.

We have also conducted other experiments for all cases reported in Table 4, using alternative assumptions about γ. These results are reported in Tables 6 and 7.

A comparison of Tables 6 and 7 with Table 4 leads to the same kind of conclusions as reported above. The following additional observations may, however, be made.

1. We noticed earlier that if nonfederal governments continue their past behaviour (case 1b), the increase in their budget deficits is quite small. Hence, changes in the means of financing have no significant effect on any variable.

2. The values for all variables for case 1bX in Tables 4, 6 and 7 are identical. This happens because nonfederal deficits, by definition, are held constant.

3. With non-federal nonco-operation, the success of federal policy is hindered most if nonfederal governments finance all their new deficits abroad. In the case 2bP, $\gamma = 1$, this policy of all foreign financing even reverses the effects of federal policy by increasing the rate of inflation over reference (by 1.1 per cent) and decreasing the rate of unemployment (by .3 per cent).[28]

4. The greatest reduction in the rate of inflation is brought about by nonfederal discretionary co-operation both with respect to the magnitudes of deficits and the means of financing; 2aP, $\gamma = 1$.[29]

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28 Allowing for induced effects, the average ratio D_{NF}/D_F for the sample period is 1.39 in case 2bP, $\gamma = 1$.

29 The absolute reduction in the price level over the period 1969-73 is greater in the case 2aB, with $\gamma = 1$, than with $\gamma = .2$ or 0, as expected. The reason we get a smaller average reduction in the rate of inflation with $\gamma = 1$, for the period 1970-72, is because the errors here corresponding to those mentioned in footnote 23 are not distributed in the same way over the sample period as those when $\gamma = 0$ or $\gamma = .2$. This does not, however, affect our conclusions.

Table 6*

The Importance of Nonfederal Financing, $\gamma = 1.0$
(Average 1970-72; simulation value less reference solution value)

Simulation \ Variable	$\Delta P/P_{-1}$	U	D_{NF}	D_F	ΔR	y
	(Per cent)	(Per cent)	(Millions of dollars)			
1 1b	-13.0	13.4	45.0	-523.7	480.0	-1150.0
2 1bX	-11.6	14.2	0.0	-499.4	481.2	-1254.0
3 2bL	- 7.9	9.5	721.6	-733.7	720.0	- 200.0
4 2bP	1.1	- .3	1174.0	-846.7	800.0	174.0
5 2bG	-13.0	12.0	243.7	-586.7	592.3	-1035.0
6 2aB	-14.8	29.9	-1017.0	-184.0	28.0	-2619.0
7 2aP	-24.5	30.4	-1052.7	-155.0	25.6	-2734.0

*See notes to Table 4.

Table 7*

The Importance of Nonfederal Financing, $\gamma = 0$
(Average 1970-72; simulation value less reference solution value)

Simulation \ Variable		$\Delta P/P_{-1}$	U	D_{NF}	D_F	ΔR	Y
		(Per cent)	(Per cent)	(Millions of dollars)			
1	1b	-13.0	14.0	46.1	-511.0	472.0	-1210.0
2	1bX	-11.6	14.2	0.0	-499.4	481.2	-1254.0
3	2bL	- 9.7	1.6	725.6	-574.7	497.0	- 923.0
4	2bP	- .4	8.7	1178.3	-668.7	553.0	- 626.0
5	2bG	-13.0	13.9	256.0	-549.3	490.6	-1206.0
6	2aB	-16.6	29.9	-1016.5	-332.0	480.6	-1991.0
7	2aP	-23.8	19.3	-1077.7	-365.3	391.0	-1779.0

*See notes to Table 4.

C. The Inflation-Unemployment Trade-Off

Figure 2 gives inflation-unemployment trade-off curves for each value of γ from Tables 4-7. In general,[30] the shape of these trade-off curves supports the conclusions one would expect; higher rates of inflation are associated with lower rates of unemployment.

What this figure does not show is the desirability of any one of these points over others from the point of view of maximizing society's welfare.

Unless we have knowledge of the exact form of the social welfare function, it is not possible to decide whether nonfederal co-operation or nonco-operation is more desirable. For example, a social welfare function represented by an indifference map, of which W_0 and W_1 are part, has the property that nonco-operation, 2bL(1), is preferred. Of course, counter-examples can be easily constructed, but our point is that the desirability of 2bL(1) cannot be ruled out a priori.[31]

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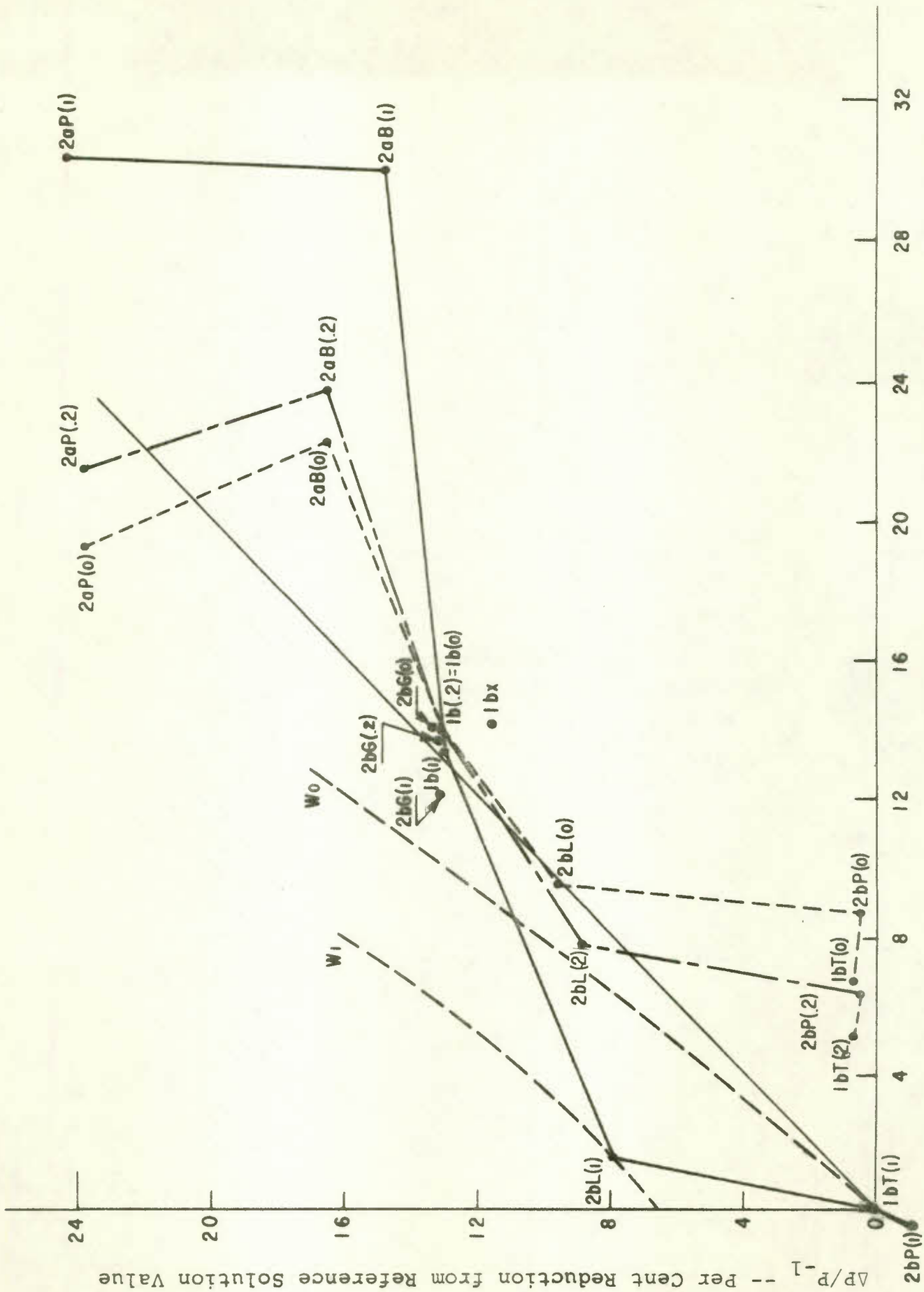
30 Except for a few points which have been explained above.

31 As usual, we implicitly assume that greater reductions in the rate of inflation for a given increase in the unemployment rate are preferred. Thus higher levels of welfare than W_0 are associated with indifference curves like W_1 in Figure 2.

Figure 2*

Tables 4 to 7 Summarized as Unemployment-Inflation Trade-Offs*



*Note:

1. Vertical Axis: (simulation inflation rate - reference solution inflation rate) ÷ reference solution inflation rate, in per cent.

   Horizontal Axis: (simulation unemployment rate - reference solution unemployment rate) ÷ reference solution unemployment rate, in per cent.

2. The bracketed numbers refer to a value of γ of 1.0, 0.2 or 0.0.

3. See notes to Table 4.

Figure 2 also illustrates the differential effects of federal and nonfederal governments on real activity and prices. Herein lies the underlying reason why we cannot reject nonco-operation out of hand. For example, when federal deficits are reduced (with a simultaneous reduction in the monetary base), and the effect of nonfederal governments is completely isolated, we move from the origin to point 1bX; the federal policy has about the same effect on both real activity and prices. However, if nonfederal deficits are now increased dollar for dollar (all financed by increases in the monetary base via foreign borrowings), we do not move back to the origin, but to point 2bL(1). We notice two things. First, the nonfederal policy has a relatively greater effect on real activity than on prices. Second, the effects of a money financed federal dollar, both on real activity and prices, are stronger than those of the nonfederal, foreign financed, dollar.[32]

The reasons for these differential effects are implicit in the outline of CANDIDE given in Section II above. A major cause, clearly illustrated by Figure 2, is the difference in the means by which deficits are financed. Moreover, the two levels of government purchase different commodities and factors thereby influencing different commodity and factor markets. They also

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32 These conclusions do not hold for all levels of government deficits or for all types of financing due to nonlinearities present in the model structure. For example, the first of these conclusions holds strongly when comparing 1bX with 2aB(1), but is less valid when comparing 1bX with 2aP(1).

purchase different amounts of the same commodities and factors. Thus the same total dollar change in government deficits will in general consist of different commodity and factor bundles. Nor do both government sectors levy the same sorts of taxes or make the same type of transfer payments. Induced changes in taxes - less - transfers of each level therefore influence consumption differently. Finally, even if we begin by ensuring that autonomous changes in government deficits are the same dollar amount and consist of exactly the same menu of expenditure or tax changes, differences by level of government in the endogeneity of the various components of these deficits will ensure that such symmetry does not persist. We will end up with either a different total change in deficits, or with a different composition for the same dollar amount, or both.

IV. Conclusions

This paper deals with the claim that explicit non-federal co-operation is essential for the success in Canada of federal aggregate demand policies intended to reduce the rate of inflation. We have introduced such a policy that is well within the capabilities of the federal authorities, and we have done so in the context of an open federal state that allows for all possible nonfederal macro-economic influences.

The summary of our experiments given by Figure 2 clearly indicates that

(1) If the nonfederal governments do not undertake any discretionary actions in response to the federal anti-inflation policy per se, then the effectiveness of that policy in reducing the rate of inflation is not seriously reduced; our case 1b(.2).

As it turns out, the nonfederal deficits do behave countercyclically in this case, but increase only by less than 10 per cent of the decrease in federal deficits. And a comparison of our experiments 1bX (where the deficits of nonfederal governments are maintained at their original level before the introduction of the federal policy) with 1b(.2) suggests that this increase in nonfederal deficits has no significant effect on the success of the federal policy. This is so even when these new nonfederal deficits are financed completely by borrowing from abroad.

This conclusion is strengthened by biases which have been introduced into CANDIDE. The countercyclical behaviour of nonfederal deficits has been artificially strengthened by assuming that nonfederal wages are exogenous. When the increased nonfederal deficit is financed abroad, we assumed that it lead to an equal and instantaneous capital inflow. Moreover, if the federal policy is successful, as shown above that it is, even under the strict assumptions of fixed exchange rates and no sterilization, then it surely would not cease to be successful if any of these assumptions were relaxed. Nonfederal foreign financing tends to generate a surplus in the balance of payments, thus increasing the monetary base under our strict assumptions and hence offseting the effects of federal policy to some extent. The relaxing of any of these strict assumptions actually helps to break the link between foreign financing and the monetary base, and thus increases the effectiveness of federal policy. Of course, the influence of the federal policy would be different under flexible as opposed to fixed exchange rates, but for reasons that do not involve the behaviour of nonfederal governments.

(2) When the junior governments do not co-operate, autonomously increasing their expenditures dollar for dollar for any decrease in federal expenditures, all financed by borrowing abroad (case 2bL(1) in Table 6), federal policy is still effective in reducing the rate of inflation. Approximately two-thirds of the reduction in the rate of inflation observed when nonfederal governments continue their past behaviour remains in spite of this discretionary nonco-operation.

Only when nonfederal expenditures increase considerably more than the decrease in federal expenditures, all financed by borrowing from abroad (case 2bP(1), involving an autonomous nonfederal increase in expenditures of 1.24 times the autonomous federal decrease in expenditures), does the federal policy become completely ineffective. However, we consider such a case only as a theoretical exercise to determine the extent to which nonfederal governments must go to completely offset the effects of the federal policy. This limit, we believe, is not realistic.[33]

(3) Nonfederal co-operation increases the effectiveness of federal policy with respect to controlling inflation, but at significant cost in terms of unemployment.

No conclusions can be drawn from this analysis with respect to the desirability of nonfederal co-operation without knowledge of a social welfare function. This is because co-operation always involves costs in terms of increased unemployment. This cost may be significant since in some cases nonfederal co-operation influences real activity to a greater extent than it influences prices, compared to the relative effects on output and prices of the federal policy.

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33 The cases 1T1, 1T0 and 1T2 involving cuts in federal transfers to the provinces as the only means of federal action are examined merely to study the importance of nonfederal financing. They are not likely to occur, at least as part of federal stabilization policy.

Indeed, if we are only willing to assume that less inflation for any given level of unemployment is socially preferred, we cannot, a priori, rule out every form of discretionary nonco-operation (such as 2bL(1)) as being socially undesirable.

It should be borne in mind that we cannot use these differential effects to argue for a shift in expenditure responsibilities or sources of funds from one level of government to another. To do so would at the same time remove any primary reasons for these differential influences.

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