


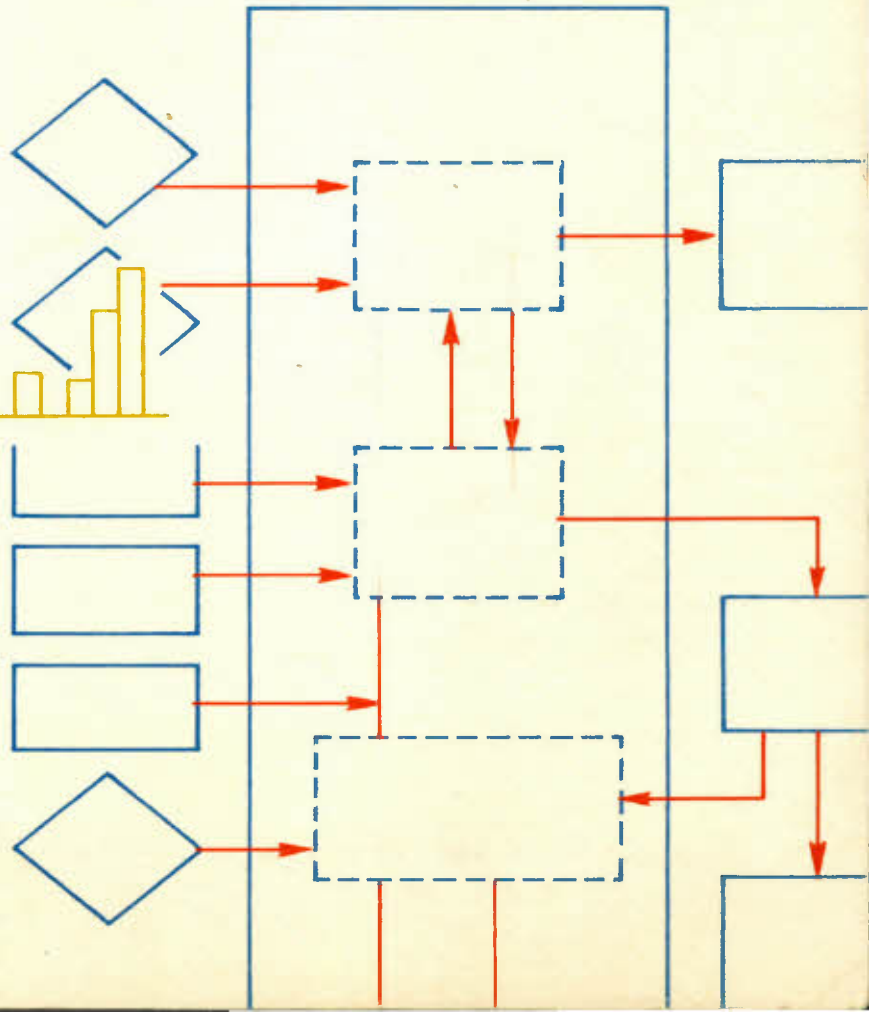
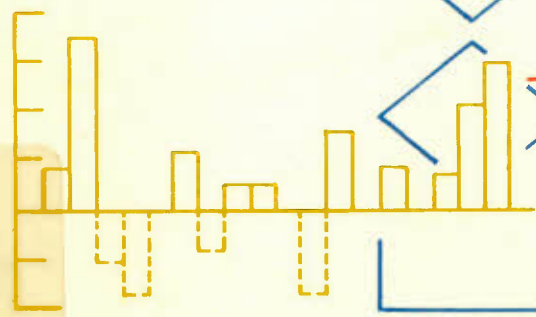
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DISCUSSION PAPER NO. 199

An Essay on Revenue and Spending  
Elasticities by Level of Government

by R. S. Preston, B. L. Eyford,  
H. M. Saiyed

An Analysis using  
CANDIDE Model 2.0

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## Résumé

De nos jours, les économistes, les responsables des politiques, ainsi que le public se heurtent à toutes sortes d'anomalies. Mais à la lumière des principes régissant le fonctionnement des marchés et leur application dans le choix des politiques, les déficits fédéraux persistants et le déséquilibre budgétaire entre les divers paliers de gouvernement ne devraient pas durer encore très longtemps.

Il arrive très souvent que des anomalies soutenues provoquent des crises, lorsque par exemple le cadre de référence établi n'est pas en mesure d'apporter une explication satisfaisante et partant, de donner une orientation souhaitable à la politique. Il nous faut donc alors le remettre en question, mais sans pour autant s'en défaire. En changeant ainsi de point de vue, il est possible que nous comprenions mieux pourquoi les anomalies deviennent cycliques et persistantes. Il devrait en résulter des recommandations en matière de politiques plus susceptibles de corriger ces anomalies chroniques.

On a reproché aux modèles économétriques de n'avoir pas su prévoir un grand nombre d'anomalies qui nous confrontent encore aujourd'hui et de ne pas avoir contribué à l'orientation

des politiques ayant pu les rectifier. Dans le présent Document, nous voulons revenir aux principes fondamentaux et examiner les propriétés dynamiques (à court et à long termes) du modèle CANDIDE 2.0. Nous poursuivons les trois objectifs suivants :

1) mettre ces propriétés nettement en évidence; 2) juger si elles peuvent expliquer les anomalies que nous notons à l'heure actuelle; 3) isoler les domaines où des modifications à la politique pourraient réduire ce que nous qualifions d'anomalies habituelles. Nous espérons, grâce à cette méthode, pouvoir répondre à un certain nombre de questions particulières qui se posent dans le débat en cours sur le fédéralisme fiscal.

Parmi les questions auxquelles nous nous proposons de répondre, certaines des plus importantes sont : 1) Les multiplicateurs des dépenses fédérales sont-ils plus importants ou moindres que ceux des dépenses provinciales ? 2) Quels effets la taille et la tendance dynamique de ces multiplicateurs de dépenses exercent-ils sur la capacité de générer des recettes et sur le volume des dépenses selon les niveaux de gouvernement ? 3) Le rapport entre la capacité de générer des recettes et le volume des dépenses selon les niveaux de gouvernement est-il équilibré ou présente-t-il des différences importantes qui pourraient contribuer aux déficits fédéraux persistants ou au déséquilibre budgétaire ? 4) Ces déficits ont-ils pour résultat de faire obstacle à la formation de capital privé ? 5) La méthode de financement influe-t-elle sur la taille du multiplicateur ?



Dans le modèle CANDIDE 2.0, les équations relatives aux impôts et aux dépenses sont désagrégées selon les niveaux de gouvernement. À l'aide de techniques de simulation explicites, nous tentons de faire connaître la réponse du modèle à un certain nombre de chocs sur les dépenses, les prix et les salaires dans le secteur public. Comme point de départ à l'examen de ces options, nous utilisons une projection de référence pour la période 1980-1990.

Le modèle CANDIDE 2.0 est un système simultané. Pour comprendre la capacité de générer des recettes et le volume de dépenses selon les niveaux de gouvernement, nous examinons les répercussions de ces chocs sur : 1) la composition de la demande finale; 2) la répartition fonctionnelle du revenu; et 3) la composition du revenu personnel. Les effets à court et à long termes de ces chocs sur les recettes et le rythme des dépenses selon les niveaux de gouvernement devraient être fonction, entre autres, de l'influence de ces chocs sur les trois secteurs mentionnés ci-dessus, des effets que les changements qu'ils ont subis exercent sur la base de l'impôt et des transferts selon les niveaux de gouvernement, ce que ces changements laissent prévoir en ce qui concerne les élasticités des impôts et des dépenses selon les niveaux de gouvernement, et enfin, ce que le mouvement des recettes et des dépenses suppose comme effets de deuxième et troisième ordres.

Dans la présentation de mesures sommaires, nous devons dans certains cas diviser arbitrairement un mouvement endogène par un autre lorsqu'ils sont tous deux exprimés en termes de pourcentage de déviation par rapport au scénario de référence. Nous avons adopté cette formule afin de permettre une gradation des diverses simulations lorsqu'elles sont mises en comparaison. Nous ne pouvons caractériser les résultats de ce calcul en les qualifiant "d'élasticité paramétrique", ni donner une interprétation paramétrique à ces "élasticités" qui sont, en fait, des fonctions qui tiennent à l'état du système. Par exemple, nous observons que les "élasticités" des recettes fédérales ainsi calculées sont fonction d'un choc particulier sur le système. Nous donnons ici à ce concept particulier l'appellation "d'élasticité du secteur public".

Le présent Document est divisé en six parties. La première traite des propriétés du multiplicateur général du modèle CANDIDE 2.0. Nous examinons un total de sept chocs de quantité, et nous analysons quatre cas particuliers, deux au niveau fédéral et deux au niveau provincial. Dans l'un de ces cas, celui du choc sur les biens du gouvernement fédéral, nous avons mis au point trois variations, toutes trois comportant un degré différent d'élimination. Dans la deuxième partie, nous indiquons les effets que ces chocs de quantité exercent sur un certain nombre de répartitions importantes (dépenses et revenus). Dans la troisième, nous tentons de déterminer l'influence que ces

chocs ont pu avoir sur la taille des impôts et des dépenses selon les niveaux de gouvernement. Nous soulignons les effets qu'ils ont pu exercer sur la base de l'impôt et des transferts selon les niveaux de gouvernement, pour ensuite examiner en détail le mouvement du système de l'impôt sur le revenu des particuliers. Dans la quatrième, nous analysons les effets que des chocs soigneusement conçus sur les salaires et les prix exercent sur la répartition fonctionnelle du revenu. Nous montrons de quelle façon ces chocs influent sur la composition de la base de l'impôt par leur incidence sur la répartition fonctionnelle du revenu. La cinquième traite des recettes fiscales et des dépenses selon les niveaux de gouvernement face à ces chocs sur les prix et sur les salaires. Dans la dernière partie, nous présentons un résumé de nos résultats et indiquons dans quelle mesure ils répondent aux questions posées au départ.

## ABSTRACT

Anomalies, these days, confront economists, policy makers, and the public alike. Persistent federal deficits and fiscal imbalance between levels of government are not things we would expect to persist for long periods of time, given our understanding of market principles and the application of these principles in policy choice.

The persistence of anomalies many times leads to crises, when the established frame of reference fails to give adequate explanation and thus policy direction. This leads one to question, but not discard, the traditional frame of reference. What should evolve is a better understanding of the process, by which anomalies become recurrent and persistent, perhaps by changing ones' point of view. This should lead to policy recommendations that are better suited to deal with persistent anomalies.

Econometric models have come under attack for not anticipating many anomalies which currently persist and for not contributing to policy direction which might correct them. In this paper we intend to return to first principles and examine the dynamic properties (short and long run) of CANDIDE Model 2.0. We have three purposes in mind: 1) to fully expose these properties; 2) to make a judgment as to whether these properties can explain



the anomalies we currently observe; 3) to isolate areas where changes in policy might reduce what we regard as the continued occurrence of these anomalies. Using this approach we hope to answer a number of questions specific to the debate now in progress concerning fiscal federalism.

Among the questions that we expect to answer, a few of the more important include: 1) Are federal spending multipliers larger or smaller than provincial spending multipliers? 2) What impact does the size and dynamic path of these spending multipliers have on the revenue generating capacity and spending response by level of government? 3) Is the revenue generating capacity and spending response by level of government aligned or do large differences exist between them, which might contribute to persistent federal deficits or to fiscal imbalance? 4) Do persistent government deficits crowd out private capital formation? 5) Does the method of financing influence the size of the multiplier?

The tax and expenditure equations in CANDIDE Model 2.0 are disaggregated by level of government. By using straightforward simulation techniques we intend to reveal the response of CANDIDE Model 2.0 to a number of government spending, price and wage shocks. A standard reference case for the period 1980-1990 will be used as the starting point in the examination of these alternatives.

CANDIDE Model 2.0 is simultaneous system. To understand the revenue generating capacity and spending response by level of government we examine the impact of these shocks on: 1) the composition of final demand; 2) the functional distribution of income; and 3) the composition of personal income. The short- and long-run impact of these shocks on revenue and spending patterns by level of government, should depend, among other things, on how these shocks effect the three previously mentioned distributions, how changes in these distributions influence the tax and transfer base by level of government, what these changes imply for tax and spending elasticities by level of government, and finally what the revenue and spending response implies by way of second and third order effects.

When presenting summary measures, in some instances we will arbitrarily divide one endogenous response by another where both are expressed as per cent deviation from the reference case. This procedure is followed for purposes of scaling when various simulations are compared. We can not characterize the results of this calculation as a "parametric elasticity". We cannot give a parametric interpretation to these "elasticities" as they are, in fact, functions dependent upon the state of the system. For example, federal revenue "elasticities" computed in this manner are shown to depend upon the specific shock imposed upon the system. Hereafter we refer to this particular concept as a "state elasticity".

This paper is divided into six sections. Section 1 deals with the general multiplier properties of CANDIDE Model 2.0. In all, seven quantity shocks are examined. We deal with four specific cases, two federal and two provincial. For one of these cases, the federal government goods shock, we develop three variations, each with a different degree of crowding out. In Section 2 we indicate the impact that these quantity shocks have on a number of important distributions (expenditure and income). In Section 3 we trace the influence that these shocks have on tax and spending response by level of government. We stress the influence that these shocks have on the tax and transfer base by level of government. We examine in detail the response of the personal income tax system. In Section 4 we deal with the impact of four carefully designed wage and price shocks on the functional distribution of income. We show how these wage and price shocks affect the composition of the tax base by way of their impact on the functional distribution of income. Section 5 deals with the response of tax receipts and spending levels to these price and wage shocks by level of government. In Section 6 we summarize our findings and indicate to what extent these results answer the original questions posed.



## INTRODUCTION

Anomalies, these days, confront economists, policy makers, and the public alike. Persistent federal deficits and fiscal imbalance between levels of government are not things we would expect to persist for long periods of time, given our understanding of market principles and the application of these principles in policy choice.

The persistence of anomalies many times leads to crises, when the established frame of reference fails to give adequate explanation and thus policy direction. This leads one to question, but not discard, the traditional frame of reference. What should evolve is a better understanding of the process, by which anomalies become recurrent and persistent, perhaps by changing ones' point of view. This should lead to policy recommendations that are better suited to deal with persistent anomalies.

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the anomalies we currently observe; 3) to isolate areas where changes in policy might reduce what we regard as the continued occurrence of these anomalies. Using this approach we hope to answer a number of questions specific to the debate now in progress concerning fiscal federalism.

Among the questions that we expect to answer, a few of the more important include: 1) Are federal spending multipliers larger or smaller than provincial spending multipliers? 2) What impact does the size and dynamic path of these spending multipliers have on the revenue generating capacity and spending response by level of government? 3) Is the revenue generating capacity and spending response by level of government aligned or do large differences exist between them, which might contribute to persistent federal deficits or to fiscal imbalance? 4) Do persistent government deficits crowd out private capital formation? 5) Does the method of financing influence the size of the multiplier?

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CANDIDE Model 2.0 is simultaneous system. To understand the revenue generating capacity and spending response by level of government we examine the impact of these shocks on: 1) the composition of final demand; 2) the functional distribution of income; and 3) the composition of personal income. The short- and long-run impact of these shocks on revenue and spending patterns by level of government, should depend, among other things, on how these shocks effect the three previously mentioned distributions, how changes in these distributions influence the tax and transfer base by level of government, what these changes imply for tax and spending elasticities by level of government, and finally what the revenue and spending response implies by way of second and third order effects.

When presenting summary measures, in some instances we will arbitrarily divide one endogenous response by another where both are expressed as per cent deviation from the reference case. This procedure is followed for purposes of scaling when various simulations are compared. We can not characterize the results of this calculation as a "parametric elasticity". We cannot give a parametric interpretation to these "elasticities" as they are, in fact, functions dependent upon the state of the system. For example, federal revenue "elasticities" computed in this manner are shown to depend upon the specific shock imposed upon the system. Hereafter we refer to this particular concept as a "state elasticity".

This paper is divided into six sections. Section 1 deals with the general multiplier properties of CANDIDE Model 2.0. In all, seven quantity shocks are examined. We deal with four specific cases, two federal and two provincial. For one of these cases, the federal government goods shock, we develop three variations, each with a different degree of crowding out. In Section 2 we indicate the impact that these quantity shocks have on a number of important distributions (expenditure and income). In Section 3 we trace the influence that these shocks have on tax and spending response by level of government. We stress the influence that these shocks have on the tax and transfer base by level of government. We examine in detail the response of the personal income tax system. In Section 4 we deal with the impact of four carefully designed wage and price shocks on the functional distribution of income. We show how these wage and price shocks affect the composition of the tax base by way of their impact on the functional distribution of income. Section 5 deals with the response of tax receipts and spending levels to these price and wage shocks by level of government. In Section 6 we summarize our findings and indicate to what extent these results answer the original questions posed.

#### GENERAL MULTIPLIER PROPERTIES

The multiplier properties of CANDIDE Model 2.0 are, among other things, dependent on the nature of the shock imposed upon the system, and the values of key parameters associated with wealth effects, price-wage sensitivity, and the sensitivity of interest



rates to bond financed government spending. To demonstrate this we examine four cases, and for one of these cases we examine three variants. The four cases include a \$1.0 billion (1971\$) sustained increase in: 1) federal goods purchases, 2) federal services purchases, 3) provincial goods purchases, and 4) provincial services purchases. For the federal goods case we examine three variants. In each of these variants we modify the mechanisms within CANDIDE Model 2.0 which contribute to crowding out, producing a long-run multiplier which returns to zero after initially taking-on positive values. The four cases associated with a sustained increase in federal (provincial) goods (services) purchases are developed under the assumption of accommodating monetary policy and a flexible exchange rate. Before discussing in detail these results let us indicate the areas within CANDIDE Model 2.0 where plausible changes in structure leads to a reduction in the long-run multiplier.

Consider the data presented in Table 2 - Table 6. For each variant (No Wealth, No Wealth - Price Sensitive, No Wealth - Price & Interest Sensitive) these data are the cause and not the effect, as we have made exogenous adjustments to produce the deviations recorded. For the four cases free of adjustment these data are the effect unaided by adjustment. The no wealth variant strips from the system wealth effects which emanate from higher interest income received in the personal sector induced by bond financing of debt incurred as a result of increased federal purchases of goods. The no-wealth, price sensitive variant



strips the system of these wealth effects and increases the sensitivity of prices to wages by imposing long-run elasticities on the sector price equations. The no-wealth price and interest sensitive variant adds to the changes made in the previous variants, increasing the sensitivity of interest rates (above that which occurs as a natural consequence of the existing structure of CANDIDE Model 2.0) to growth in government debt.

Although these three variants may appear arbitrary in their implementation, their outcome demonstrates that plausible changes in the structure of CANDIDE Model 2.0 will result in a reduced path of the long-run multiplier associated with federal goods purchases. Although we have not developed alternatives for other levels of government or for other types of federal purchases we anticipate that similar results would be obtained under similar conditions. In Table 1 we record the net effect on the general multiplier for each of these seven cases. There are several important comparisons to note.

Compare the goods multiplier with the services multiplier for federal and for provincial governments. The goods multiplier in the initial year of impact is higher than the services multiplier. This is true for both federal and provincial governments. In the long-run, the federal goods multiplier and the federal services multiplier are equal. In the first instance it increases from 1.9 to 2.2. In the second instance it increases from 1.6 to 2.2. For provincial governments the impact

Table 1  
General Multiplier Properties<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	1.9	2.1	2.0	2.2
No Wealth	1.9	2.0	1.7	1.8
No Wealth, Price Sensitive	2.0	1.9	1.1	0.8
No Wealth, Price & Interest Sensitive	2.0	1.8	0.4	0.0
Federal Services	1.6	1.8	2.1	2.2
Provincial Goods	2.0	1.9	2.2	2.4
Provincial Services	1.8	1.7	2.4	2.6

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990. Figures recorded are the increase in GNE resulting from the sustained increase.

and the long run multipliers are both larger than those of the federal government.

By removing incremental wealth effects the federal goods multiplier in the long run is reduced to 1.8 from 2.2. By increasing the price-wage sensitivity of CANDIDE Model 2.0 through imposition of long-run elasticities in the price-wage sector the federal goods multiplier is reduced to 0.8. By increasing the sensitivity of interest rates to bond financed debt the federal goods multiplier is reduced to 0.0 in the long run.

We have performed these variants in a cumulative fashion. Thus the net contribution to the reduction of the multiplier of the wealth effect is .4, the net contribution of increasing price-wage sensitivity is 1.0, and the net contribution of increased interest sensitivity to bond financing is 0.8. The impact of making the system more price and interest rate sensitive in the medium run is also apparent. The average for the 1986-1990 period for the respective multipliers is reduced when compared to the values obtained during the initial year of impact.

The mechanisms which contribute to the outcome of the path of the long-run multiplier in each of these variants are characterized by the data recorded (and referred to previously) in Table 2 - Table 6. Table 2 contains data on the per cent

deviation in the consumer price index from the reference case. As the multiplier declines (across the three variants) the system is characterized as one which is increasingly price sensitive for identical sustained increases in federal purchases.

In Table 3 we record the per cent deviation from the reference case for the real wage. Here there are two interesting observations. The size of the multiplier is related to the deviation of the real wage from the reference case. The larger the deviation in the real wage the larger the multiplier. Likewise, the reduction of the multiplier obtained by making the system more price-wage sensitive is accompanied by real wages that are less sensitive to identical sustained increases in federal purchases.

In Table 4 we record the deviation from the reference case for personal interest income. Apparent here is the constraint imposed on the system to obtain the "no-wealth" results. The deviation from the reference case for personal interest income is zero. Interesting also is the increase in personal interest income that is obtained under a federal goods (services) shock versus a provincial goods (services) shock of identical magnitude.

Table 5 and Table 6 show the sensitivity of government bond rates and long-term industrial bond rates to each shock. Federal shocks put upward pressure, but provincial shocks put downward



Table 2

Percentage Difference From the Reference Case for the Consumer Price Index<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	-0.1	0.8	2.2	2.7
No Wealth	-0.1	0.8	2.1	2.5
No Wealth, Price Sensitive	-0.3	0.9	2.6	3.0
No Wealth, Price & Interest Sensitive	-0.3	1.0	3.4	3.8
Federal Services	0.1	0.9	2.6	3.2
Provincial Goods	-0.2	0.5	1.9	2.3
Provincial Services	0.1	0.9	2.5	3.0

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990.

Table 3  
Percentage Difference From the Reference Case for the Real Wage<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	0.2	1.0	2.5	2.9
No Wealth	0.2	0.9	2.3	2.7
No Wealth, Price Sensitive	0.3	0.7	1.9	2.4
No Wealth, Price & Interest Sensitive	0.3	0.7	1.9	2.5
Federal Services	0.4	1.2	2.6	3.2
Provincial Goods	0.3	1.3	3.3	3.9
Provincial Services	0.5	1.7	4.0	4.8

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990.

Table 4

Difference From the Reference Case for Personal Interest Income<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	0.1	0.6	2.1	2.8
No Wealth	0.0	0.0	0.0	0.0
No Wealth, Price Sensitive	0.0	0.0	0.0	0.0
No Wealth, Price & Interest Sensitive	0.0	0.0	0.0	0.0
Federal Services	0.1	0.6	1.9	2.6
Provincial Goods	0.1	0.3	0.9	1.0
Provincial Services	0.2	0.6	1.1	1.2

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990.

Table 5  
Difference From the Reference Case for Long Term Government Bond Rate<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	0.3	0.14	0.40	0.51
No Wealth	0.3	0.14	0.40	0.51
No Wealth, Price Sensitive	0.3	0.15	0.43	0.54
No Wealth, Price & Interest Sensitive	0.3	0.33	0.94	1.07
Federal Services	0.3	0.14	0.38	0.49
Provincial Goods	-0.05	-0.12	-0.22	-0.30
Provincial Services	-0.04	-0.13	-0.33	-0.47

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990.



Table 6

Difference From the Reference Case for Long Term Industrial Bond Rate<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	0.00	0.07	0.19	0.22
No Wealth	0.00	0.07	0.18	0.21
No Wealth, Price Sensitive	-0.00	0.08	0.21	0.24
No Wealth, Price & Interest Sensitive	-0.00	0.26	0.53	0.56
Federal Services	0.01	0.08	0.20	0.23
Provincial Goods	-0.02	-0.05	-0.07	-0.11
Provincial Services	-0.01	-0.03	-0.12	-0.19

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990.

pressure on bond rates. The reason for these differences, and those mentioned in the previous paragraph, will be shown in a future section to be influenced by the composition and amount of domestic debt issued to finance a sustained increase in spending. Note the extent to which we must increase interest rate sensitivity to obtain complete crowding out. In the long run we must double the response of interest rates to bond financing from what otherwise would have occurred as a natural consequence of the structure of CANDIDE Model 2.0.

The dynamic path of the multiplier in these seven alternatives (four cases, three variants of case one) depends upon: 1) the nature of the shock, (goods versus services), 2) the level of government from which the shock emanates (federal versus provincial), 3) the size of the wealth effect, 4) the price - wage sensitivity of the system, and 5) the interest rate sensitivity of the system. All of these factors influence the components of final demand which aggregate to produce a unique multiplier path. The absence of wealth effects reduces consumption through their impact on income. The price-wage effects influence consumption through their effect on real income. Increased interest rate sensitivity directly influences investment. All of these various effects give rise to degrees of crowding out either through import leakages or direct effects on investment.

We will demonstrate in a later section that the dynamic path of the multiplier, and the differences which exist between each case, have important implications for the size and dynamic path of the state elasticities associated with taxation, both at federal and provincial levels. At that time it will be important to recall the characteristics of the general multiplier as we have pointed them out. In the argument we will not claim causation, we will only indicate that the path of certain state elasticities associated with the system appears to be dependent on the path of the general multiplier.

This overview reveals the variety of response that CANDIDE Model 2.0 is capable of under alternative assumptions related to the nature of the shock itself and the structure of the model. In situations where interest rates and prices are highly sensitive the net effect of any given shock must be interpreted differently than under ideal sets of conditions. We strengthen this point by considering the compositional effects that various shocks and alterations in structure have on the composition of spending, on the functional distribution of income, and on the distribution of personal income. To increase our understanding of the various patterns which emerge under alternative shocks and alternative structures, we present in Table 7 - Table 12 the composition of the multiplier for each of the cases under consideration.

## COMPOSITIONAL EFFECTS ON SPENDING

Let us examine the results contained in Table 7. In Table 7 we record the multiplier associated with a federal goods shock along with its composition. For instance, in 1980 a federal goods shock of \$1.0 billion leads to a \$0.8 billion increase in consumption, a \$0.4 billion increase in fixed investment, a \$0.3 billion increase in inventory change, and a \$0.5 billion increase in imports. This nets to a \$1.9 billion increase in GNE.

During the first half of the period the multiplier increases to 2.1. Consumption has increased by \$1.1 billion, investment by \$0.7 billion and imports by \$0.7 billion. During the later part of the period although the multiplier has stabilized at 2.0, its composition is quite different from that of the first half of the period. Consumption has increased from \$1.1 billion to \$2.0 billion, investment has declined from \$0.7 billion to 0.0 while imports has increased from \$0.7 billion to \$1.0 billion. During the first half of the period investment makes a substantial contribution, during the last half of the period investment makes no contribution, but imports makes a substantial contribution. By the end of the period the composition of the multiplier is dominated by consumption, government and imports. Although the multiplier itself is not reduced we see evidence of crowding out and import leakage.

Let us look at the three variants. Here we successively reduce the value of the total multiplier by cutting links in the



Table 7

Multiplier Composition, Federal Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Gross National Expenditure (1971\$)	1.9	2.1	2.0	2.2
Consumption	0.8	1.0	2.0	2.4
Government Expenditure	1.0	1.0	1.0	1.0
Investment	0.4	0.7	0.0	0.1
Inventory Change	0.3	0.0	0.0	0.0
Exports	-0.0	0.0	0.0	0.0
Imports	0.5	0.7	1.0	1.3

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are deviation from the reference case.

personal interest sector, increasing the sensitivity of prices to wages, or increasing the sensitivity of interest rates to bond financed government spending initiatives. In Table 8 we record the federal goods shock with no wealth effects. The major reason why the long-run multiplier is reduced is due to the absence of wealth influences on consumption. By comparing Table 7 with Table 8 we observe a long-run reduction in the contribution of consumption to the value of the multiplier.

Now compare Table 7 with Table 9. Here we find that increasing the price-wage sensitivity of CANDIDE Model 2.0 puts downward pressure on both the contribution of consumption and investment to the long-run value of the multiplier. By the end of the period the contribution of consumption is reduced from \$2.4 billion to \$1.6 billion and that of investment is reduced from -\$0.1 billion to -\$0.3 billion.

Now compare Table 7 with Table 10. In this case the long-run multiplier approaches 0.0 after taking-on an initial positive value near 2.0. Comparing these results to those in Table 7 we find that the contribution of consumption is reduced from \$2.4 billion to \$1.4 billion and that of investment is reduced from \$0.1 billion to -\$0.6 billion. Note also the increased contribution of imports. In the long run we observe an increase from \$1.3 billion to \$1.7 billion. This represents increased import leakage resulting from higher domestic prices and domestic interest rates. Crowding out from all sources alters the composition of GNE towards a high consumption, high

Table 8

Multiplier Composition, Federal Goods Shock (No Wealth)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Gross National Expenditure (1971\$)	1.9	2.0	1.7	1.8
Consumption	0.8	0.9	1.7	1.9
Government Expenditure	1.0	1.0	1.0	1.0
Investment	0.4	0.7	-0.1	0.0
Inventory Change	0.3	-0.0	0.0	0.0
Exports	-0.0	0.0	0.0	0.0
Imports	0.5	0.7	0.9	1.2

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are deviation from the reference case.

Table 9  
Multiplier Composition, Federal Goods Shock (No Wealth, Price Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Gross National Expenditure (1971\$)	2.0	1.9	1.1	0.8
Consumption	0.9	0.9	1.4	1.6
Government Expenditure	1.0	1.0	1.0	1.0
Investment	0.4	0.6	-0.3	-0.3
Inventory Change	0.3	-0.0	-0.0	0.0
Exports	-0.0	0.0	-0.0	-0.1
Imports	0.6	0.7	1.0	1.5

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are deviation from the reference case.



Table 10

Multiplier Composition, Federal Goods Shock (No Wealth, Price and Interest Rate Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Gross National Expenditure (1971\$)	2.0	1.8	0.4	-0.0
Consumption	0.9	0.8	1.2	1.4
Government Expenditure	1.0	1.0	1.1	1.1
Investment	0.4	0.5	-0.7	-0.6
Inventory Change	0.3	-0.0	-0.0	0.0
Exports	-0.0	0.0	-0.06	-0.2
Imports	0.6	0.6	1.1	1.7

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are deviation from the reference case.

government spending, low investment, high import content economy. This kind of environment, among other things, is not conducive to maintenance of a competitive position or high productivity growth.

Let us now examine the multiplier composition for a federal services shock (Table 11). In the long run the composition of the multiplier appears identical to that associated with a federal goods shock, however, the medium-run composition is different. The contribution from consumption in this case is slightly less in the medium run than in the case of a federal goods shock. The contribution from investment is considerably less when compared to the case of a federal goods shock. In fact, there is little contribution from investment, either initially or in the long run. Once again with a federal services shock we see a high consumption, high government spending, low investment, high import content economy. However, in the case of a federal services shock almost no capital accumulation occurs, even during the initial stages.

Let us now look at Table 12. Here we report the composition of the multiplier for a provincial goods shock. The results are quite dissimilar from those associated with a federal goods shock, in particular the contribution of investment to the total multiplier is much greater in the long run. Rather than falling from a value of \$0.7 billion to 0.0 it remains in the \$0.7 billion range.

Table 11

Multiplier Composition, Federal Services Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Gross National Expenditure (1971\$)	1.6	1.8	2.1	2.2
Consumption	0.8	1.0	2.1	2.5
Government Expenditure	1.0	1.0	1.0	1.0
Investment	0.1	0.2	0.1	0.0
Inventory Change	0.1	0.0	0.0	-0.0
Exports	-0.0	0.0	0.0	0.0
Imports	0.4	0.5	1.1	1.3

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal services of \$1.0 billion during the period 1980-1990. Data are deviation from the reference case.

Table 12  
Multiplier Composition, Provincial Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Gross National Expenditure (1971\$)	2.0	1.9	2.2	2.4
Consumption	1.0	1.0	2.2	2.6
Government Expenditure	1.0	1.0	1.0	1.0
Investment	0.4	0.7	0.5	0.6
Inventory Change	0.2	0.0	0.0	0.0
Exports	-0.0	0.0	0.0	0.0
Imports	0.6	0.8	1.4	1.7

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of provincial goods of \$1.0 billion during the period 1980-1990. Data are deviation from the reference case.



This represents an important difference in outcome between a federal goods shock and a provincial goods shock. In Table 5 - Table 6 of the previous section we reported for all cases the deviation from the reference case for the long-term government bond rate, and the long-term industrial bond rate. One of the more important results we obtained was upward pressure from federal shocks and downward pressure from provincial shocks on these two interest rates. These observations leave the tentative suggestion that we have observed portfolio crowding out when comparing the results contained in Table 7 with those contained in Table 12. A general explanation of this can be traced to the impact that increased government spending levels have on financial requirements and the way these requirements are eventually financed. With this in mind we are closer to linking the magnitude and dynamic path of many state elasticities associated with tax revenues to the dynamic performance of the multiplier and the method of financing.

We have observed in our investigation of the compositional impact of various shocks on the multiplier, a variety of effects. Among these effects are import leakages and portfolio crowding out. Before proceeding to an analysis of the state elasticities associated with taxation let us turn to the analysis of other mechanisms that will influence these state elasticities. Among these are the impact that these shocks have on the functional distribution of income.

COMPOSITIONAL EFFECTS ON THE FUNCTIONAL DISTRIBUTION OF INCOME

The impact on the functional distribution of income for alternative federal (provincial) goods (services) shocks is recorded in Table 13 - Table 18. In these tables we list the categories associated with the functional distribution of income. The functional distribution of income includes, wages, salaries, interest, rents and profits. To scale these results for each income component we arbitrarily divide its per cent deviation from the reference case by the per cent deviation of nominal GNE from the reference case. The resulting calculations are state elasticities for the functional distribution of income under the conditions (states) specifically associated with each of the alternatives.

To further facilitate our presentation we also compute weighted state elasticities and report these in brackets. These are obtained by weighting the component state elasticities by the income component share of total. Let us examine the unweighted and weighted state elasticities for three of these components: wages and salaries; business and government profits; and, interest and miscellaneous income.

Interpretation of these results requires knowledge of the National Accounts concepts as recorded in Table 13 - Table 18,

and how they are modelled in CANDIDE Model 2.0. Within CANDIDE Model 2.0 business and government profits are obtained as the residual in the Net National Income identity. As a result, the impact that a shock has on profits depends upon the impact that such a shock has on each of the components of Net National Income, the most important of which is wages and salaries. Furthermore, interest and miscellaneous income (another component of Net National Income) is itself an identity which is composed, among other things, of interest to persons plus government investment income, less interest on the public debt plus interest on consumer debt. As a result the long-run impact of a shock on interest and miscellaneous income follows from the net effect of these four items on this aggregate. Two of these items associated with this aggregate, interest on the public debt and personal interest income depend on the amount and composition of public debt outstanding. By composition we mean: 1) domestic vs foreign; and 2) the proportion of domestic public debt held in the personal sector.

In tracing the impact of each one of the shocks on the functional distribution of income, these two separate influences on interest and miscellaneous income, and the fact that profits is the residual of the Net National Income identity (in which wages are the most important item) have an important bearing on the interpretation of the state elasticities associated with the functional distribution of income.



Let us examine Table 13. The state elasticity of wages and salaries with respect to GNE is less than 1.0 (.69) initially, but increases in the long run to 1.44. The state elasticity of interest and miscellaneous income is small initially but falls to -2.5 in the long run. The state elasticity of profits with respect to GNE is high initially taking on a value of 4.41, but eventually falls below 1.0, stabilizing in the region of .63. It is clear that the initial high profits state elasticity is due to the low short run wage state elasticity.

This can be verified by comparing the results in Table 13 with those contained in Table 17. The purchases of federal services is more labour intensive than the purchases of federal goods in the short run. Services purchases should therefore lead to a higher state elasticity in the initial year of impact for wages with respect to GNE. This, in fact, is the case. The wage state elasticity for federal services purchases is 1.11, the wage state elasticity for federal goods purchases is .69. Furthermore, as the wage state elasticity increases the profit state elasticity declines.

As mentioned before in Table 13, the business and government profits state elasticity initially increases to 4.41, in Table 17 the same elasticity under conditions of a federal services shock initially increases to only 2.75. In the long run in the case of a federal services shock the wage state elasticity and the profits state elasticity are close to those of the federal goods



Table 13

Functional Distribution of Income, State Elasticities, Federal Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Net National Income	1.15	1.07	1.05	1.06
Total Wages & Salaries	0.69 (0.50)	1.19 (0.84)	1.44 (1.03)	1.44 (1.04)
Business & Government Profits	4.41 (0.70)	1.87 (0.31)	0.58 (0.10)	0.63 (0.11)
Less: Dividend Paid to Non-Resident	1.40 (0.02)	1.44 (0.02)	0.65 (0.01)	1.07 (0.01)
Interest & Misc. Income	-0.01 (-0.00)	-0.61 (-0.05)	-1.87 (-0.12)	-2.50 (-0.14)
Farm Income	1.47 (0.03)	1.16 (0.03)	0.96 (0.03)	0.88 (0.03)
Non-Farm Income	-0.12 (-0.01)	0.36 (0.02)	0.82 (0.04)	0.92 (0.05)
Inventory Valuation Adjustment	0.73 (-0.02)	2.02 (-0.05)	1.53 (-0.03)	1.15 (-0.02)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 14

Functional Distribution of Income, State Elasticities, Federal Goods Shock (No Wealth)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Net National Income	1.15	1.07	1.05	1.06
Total Wages & Salaries	0.70 (0.50)	1.20 (0.85)	1.48 (1.05)	1.48 (1.07)
Business & Government Profits	4.61 (0.73)	2.29 (0.38)	1.25 (0.22)	1.35 (0.23)
Less: Dividend Paid to Non-Resident	1.47 (0.02)	1.75 (0.02)	1.31 (0.01)	1.87 (0.02)
Interest & Misc. Income	-0.31 (-0.03)	-1.53 (-0.14)	-4.03 (-0.25)	-5.05 (-0.28)
Farm Income	1.50 (0.03)	1.17 (0.03)	0.96 (0.03)	0.87 (0.03)
Non-Farm Income	-0.12 (-0.01)	0.37 (0.02)	0.87 (0.04)	0.97 (0.05)
Inventory Valuation Adjustment	0.76 (-0.03)	2.02 (-0.05)	1.47 (-0.02)	1.08 (-0.02)

<sup>1</sup> Source: CANDIDE Model 2.0, December 1980.

<sup>2</sup> Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 15

Functional Distribution of Income, State Elasticities, Federal Goods Shock (No Wealth, Price Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Net National Income	1.16	1.07	1.03	1.04
Total Wages & Salaries	0.73 (0.52)	1.13 (0.78)	1.34 (0.93)	1.38 (0.97)
Business & Government Profits	4.31 (0.70)	2.49 (0.44)	1.45 (0.28)	1.34 (0.25)
Less: Dividend Paid to Non-Resident	1.39 (0.02)	1.78 (0.02)	1.27 (0.01)	1.75 (0.02)
Interest & Misc. Income	-0.33 (-0.04)	-1.44 (-0.12)	-3.58 (-0.23)	-4.50 (-0.26)
Farm Income	1.52 (0.03)	1.12 (0.03)	0.72 (0.02)	0.41 (0.01)
Non-farm Income	-0.17 (-0.01)	0.42 (0.02)	1.18 (0.06)	1.44 (0.08)
Inventory Valuation Adjustment	0.39 (-0.01)	2.06 (-0.05)	0.59 (-0.01)	-1.50 (0.02)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 16

Functional Distribution of Income, State Elasticities, Federal Goods Shock (No Wealth, Price and Interest Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Net National Income	1.16	1.07	1.03	1.04
Total Wages & Salaries	0.73 (0.52)	1.11 (0.77)	1.32 (0.91)	1.36 (0.95)
Business & Government Profits	4.31 (0.70)	2.59 (0.46)	1.42 (0.27)	1.24 (0.23)
Less: Dividend Paid to Non-Resident	1.39 (0.02)	1.80 (0.02)	1.21 (0.01)	1.71 (0.02)
Interest & Misc. Income	-0.33 (-0.04)	-1.56 (-0.14)	-3.53 (-0.23)	-4.30 (-0.25)
Farm Income	1.52 (0.03)	1.28 (0.03)	0.79 (0.02)	0.38 (0.01)
Non-Farm Income	-0.17 (-0.01)	0.50 (0.03)	1.50 (0.08)	1.81 (0.11)
Inventory Valuation Adjustment	0.39 (-0.01)	2.27 (-0.05)	0.48 (-0.01)	-2.22 (0.03)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.



Table 17

Functional Distribution of Income, State Elasticities, Federal Services Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Net National Income	1.17	1.12	1.08	1.07
Total Wages & Salaries	1.11 (0.79)	1.34 (0.95)	1.43 (1.02)	1.46 (1.06)
Business & Government Profits	2.75 (0.44)	1.36 (0.23)	0.62 (0.11)	0.48 (0.08)
Less: Dividend Paid to Non-Resident	0.86 (0.01)	0.97 (0.01)	0.71 (0.01)	0.98 (0.01)
Interest & Misc. Income	-0.06 (-0.01)	-0.56 (-0.05)	-1.40 (-0.09)	-1.90 (-0.11)
Farm Income	0.74 (0.02)	0.82 (0.02)	0.81 (0.03)	0.74 (0.03)
Non-Farm Income	0.08 (0.00)	0.47 (0.02)	0.80 (0.04)	0.89 (0.05)
Inventory Valuation Adjustment	1.25 (-0.04)	1.51 (-0.03)	1.42 (-0.02)	1.04 (-0.02)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal services of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 18

Functional Distribution of Income, State Elasticities, Provincial Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990	
Net National Income	1.17	1.07	1.03	1.03	
Total Wages & Salaries	0.88 (0.63)	1.52 (1.07)	1.71 (1.22)	1.72 (1.24)	1
Business & Government Profits	2.84 (0.45)	-0.95 (-0.17)	-2.13 (-0.37)	-2.33 (-0.40)	35
Less: Dividend Paid to Non-Resident	0.93 (0.01)	-0.53 (-0.01)	-2.15 (-0.02)	-2.17 (-0.02)	1
Interest & Misc. Income	0.78 (0.08)	1.83 (0.16)	1.99 (0.12)	2.19 (0.12)	
Farm Income	1.09 (0.02)	0.97 (0.02)	0.85 (0.03)	0.76 (0.03)	
Non-Farm Income	-0.20 (-0.01)	0.13 (0.01)	0.41 (0.02)	0.46 (0.02)	
Inventory Valuation Adjustment	-0.68 (0.02)	2.11 (-0.05)	1.57 (-0.03)	1.11 (-0.02)	

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of provincial goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

shock. The wage elasticity builds to 1.44 in the federal goods case and to 1.46 in the federal services case. The profits elasticity is similar in the long run, with an average for the latter part of the period of .58 in the federal goods case and of .62 in the federal services case.

If profits is the residual in the Net National Income identity then the major influences on the profits state elasticity are from 1) wages, and 2) interest and miscellaneous income. The interest and miscellaneous income elasticities are zero on impact but drift to values in the neighbourhood of -1.9 to -2.5 for the federal goods and federal services case respectively. This pattern results directly from the net effect of the state elasticity associated with interest on public debt and the state elasticity associated with interest payments to persons.

We can verify this by comparing Table 19 with Table 23. In Table 19 - Table 24 we decompose the state elasticity associated with interest and miscellaneous income into its component parts. By examining the weighted state elasticities in Table 19 and Table 23 associated with 1) interest to persons, and 2) interest on public debt we see clearly what is happening. In response to the shock, the state elasticity associated with interest to persons increases, however, the state elasticity associated with interest on public debt and interest on consumer debt increases at a faster rate. Because of the nature of the interest and

Table 19  
Interest and Miscellaneous Investment Income, State Elasticities, Federal Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Interest & Misc. Investment Income	-0.01 (-0.00)	-0.61 (-0.05)	-1.87 (-0.12)	-2.50 (-0.14)
Add:				
Interest to Persons	0.28 (0.03)	0.79 (0.08)	1.49 (0.11)	1.60 (0.11)
Government Investment	0.24 (0.02)	0.47 (0.04)	0.95 (0.07)	1.15 (0.08)
Unremitted Profits (Govt.)	3.10 (0.01)	0.20 (0.00)	0.27 (0.00)	0.27 (0.00)
Govt. Direct Taxes, Corp. Profits	2.51 (0.00)	0.58 (0.00)	0.33 (0.00)	0.37 (0.00)
Deduct:				
Interest on Public Debt	0.60 (0.05)	1.79 (0.15)	3.70 (0.26)	4.38 (0.29)
Interest on Consumer Debt	0.98 (0.02)	1.35 (0.02)	2.05 (0.03)	2.08 (0.03)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.



Table 20  
Interest and Miscellaneous Investment Income, State Elasticities, Federal Goods Shock (No Wealth)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Interest & Misc. Investment Income	-0.31 (-0.03)	-1.53 (-0.14)	-4.03 (-0.25)	-5.05 (-0.28)
Add:				
Interest to Persons	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Government Investment	0.25 (0.02)	0.49 (0.04)	1.04 (0.08)	1.26 (0.09)
Unremitted Profits (Govt.)	3.24 (0.01)	0.38 (0.0)	0.58 (0.00)	0.61 (0.00)
Govt. Direct Taxes, Corp. Profits	2.61 (0.0)	0.77 (0.0)	0.70 (0.00)	0.79 (0.00)
Deduct:				
Interest on Public Debt	0.60 (0.05)	1.90 (0.16)	4.15 (0.30)	4.97 (0.33)
Interest on Consumer Debt	0.97 (0.02)	1.34 (0.02)	2.07 (0.03)	2.11 (0.04)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 21

Interest and Miscellaneous Investment Income, State Elasticities, Federal Goods Shock (No Wealth, Price Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Interest & Misc. Investment Income	-0.33 (-0.04)	-1.44 (-0.12)	-3.58 (-0.23)	-4.50 (-0.26)
Add:				
Interest to Persons	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Government Investment	0.24 (0.02)	0.49 (0.04)	1.03 (0.07)	1.27 (0.08)
Unremitted Profits (Govt.)	3.13 (0.01)	0.61 (0.00)	0.63 (0.00)	0.40 (0.00)
Govt. Direct Taxes, Corp. Profits	2.51 (0.00)	0.95 (0.00)	0.82 (0.00)	0.73 (0.00)
Deduct:				
Interest on Public Debt	0.60 (0.05)	1.82 (0.15)	3.96 (0.27)	4.85 (0.31)
Interest on Consumer Debt	1.04 (0.02)	1.28 (0.02)	1.98 (0.03)	2.07 (0.04)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 22

Interest and Miscellaneous Investment Income, State Elasticities, Federal Goods Shock (No Wealth, Price and Interest Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Interest & Misc. Investment Income	-0.33 (-0.04)	-1.56 (-0.14)	-3.53 (-0.23)	-4.30 (-0.25)
Add:				
Interest to Persons	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Government Investment	0.24 (0.02)	0.57 (0.05)	1.45 (0.10)	1.79 (0.12)
Unremitted Profits (Govt.)	3.13 (0.01)	0.70 (0.00)	0.58 (0.00)	0.27 (0.00)
Govt. Direct Taxes, Corp. Profits	2.51 (0.00)	1.03 (0.00)	0.80 (0.00)	0.64 (0.00)
Deduct:				
Interest on Public Debt	0.60 (0.05)	2.03 (0.17)	4.35 (0.30)	5.19 (0.33)
Interest on Consumer Debt	1.04 (0.02)	1.25 (0.02)	2.04 (0.04)	2.14 (0.04)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 23

Interest and Miscellaneous Investment Income, State Elasticities, Federal Services Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Interest & Misc. Investment Income	-0.06 (-0.01)	-0.56 (-0.05)	-1.40 (-0.09)	-1.90 (-0.11)
Add:				
Interest to Persons	0.26 (0.03)	0.84 (0.08)	1.23 (0.09)	1.32 (0.09)
Government Investment	0.20 (0.02)	0.54 (0.05)	0.93 (0.07)	1.10 (0.08)
Unremitted Profits (Govt.)	1.94 (0.01)	0.25 (0.00)	0.19 (0.00)	0.11 (0.00)
Govt. Direct Taxes, Corp. Profits	1.57 (0.00)	0.48 (0.00)	0.32 (0.00)	0.26 (0.00)
Deduct:				
Interest on Public Debt	0.52 (0.04)	1.86 (0.15)	3.03 (0.22)	3.58 (0.24)
Interest on Consumer Debt	1.13 (0.02)	1.47 (0.03)	1.92 (0.03)	1.97 (0.03)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of federal services of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.



Table 24  
Interest and Miscellaneous Investment Income, State Elasticities, Provincial Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Interest & Misc. Investment Income	0.78 (0.08)	1.83 (0.16)	1.99 (0.12)	2.19 (0.12)
Add:				
Interest to Persons	0.18 (0.02)	0.54 (0.05)	0.71 (0.05)	0.59 (0.04)
Government Investment	0.12 (0.01)	0.02 (0.0)	-0.03 (-0.00)	-0.05 (-0.00)
Unremitted Profits (Govt.)	2.00 (0.01)	-0.97 (-0.00)	-0.98 (-0.00)	-1.22 (-0.00)
Govt. Direct Taxes, Corp. Profits	1.62 (0.00)	-0.73 (-0.00)	-1.20 (-0.00)	-1.42 (-0.00)
Deduct:				
Interest on Public Debts	-0.82 (-0.06)	-1.50 (-0.13)	-1.27 (-0.09)	-1.48 (-0.10)
Interest on Consumer Debts	0.90 (0.02)	0.61 (0.01)	0.86 (0.01)	0.74 (0.01)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained real increase in the purchase of provincial goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

miscellaneous income identity, as indicated previously the net effect is a declining negative state elasticity associated with this income component in the functional distribution of income. A simple explanation is as follows.

Both the federal goods shock and the federal services shock imply increase purchases, financed by issuing bonds. In a future section we observe that the resulting increased activity levels provide incremental revenues which continually fall short of incremental financing requirements. As a result bond financing continues during the entire period. Evidence of this is found in both Table 19 and Table 23 where we observe a monotonic increase in the state elasticity associated with interest on public debt and the state elasticity associated with interest to persons.

For instance, in Table 19 the state elasticity associated with interest on public debt is initially .60, rising to 4.38 by the end of the period. The state elasticity associated with interest paid to persons is initially .28, rising to 1.60 in the long run. As mentioned previously the concept interest and miscellaneous investment income found in the functional distribution of income recorded in Tables 13 through 17 is primarily the difference between these two concepts, interest received by the personal sector minus interest paid by the public sector. What these results indicate is that an increasing proportion of incremental debt is held in the non personal sector and, in particular, in

the financial sector in the case of a federal goods shock. This keeps the profits state elasticity from falling in the long run as interest on the public debt becomes income to the business sector without a corresponding outflow to the personal sector.

Three of the more important dynamic paths associated with various government spending shocks can now be fully understood. The wage and salaries state elasticity is low initially but builds to high levels. This is directly related to the labor content of the shock. Higher labor content implies higher wage state elasticities in the short run. The high profits state elasticity in the short run results from a shift in the functional distribution of income initially towards profits. What eventually happens to this elasticity in the long run depends in part on the wage state elasticity and in part on the state elasticity associated with interest and miscellaneous income. What transpires for the elasticity associated with interest and miscellaneous income, in part, depends upon the relative magnitudes of the state elasticities associated with interest to persons and interest on the public debt. And this depends on who holds the debt.

One can see this quite clearly by comparing Table 13 and 19 with Tables 18 and 24. Tables 18 and 24 show the functional distribution of income and the compositional effect on interest and miscellaneous income under conditions of a provincial goods

shock. In comparing a federal goods shock with a provincial goods shock we see opposite effects obtained for the state elasticities associated with business and government profits and interest and miscellaneous income (compare Table 13 with Table 18).

In the case of a provincial goods shock the profits elasticity is lower in the short run and the wage elasticity is higher than in the case of a federal goods shock. In the long run the wage state elasticity is higher for the provincial goods shock and the interest and miscellaneous income state elasticity is positive rather than negative. These effects combine to produce a negative state elasticity associated with profits under conditions of a provincial goods shock. The positive interest and miscellaneous income state elasticity under conditions of a provincial goods shock is shown in Table 24 to depend upon a reduced elasticity associated with interest to persons and a negative state elasticity associated with interest on the public debt. It is important to keep in mind the change in sign in the interest on public debt state elasticity in the provincial goods case when compared to the federal goods case. What we are observing here is the net effect on total government financing requirements (who holds the debt) associated with a goods shock emanating from the federal level versus a goods shock emanating from the provincial level. In short, the savings in cost and the increases in revenue which result at the federal level from a provincial goods shock are far greater than the savings in



cost and the increases in revenue that result at the provincial level from a federal goods shock. As a result, debt holdings are markedly different.

Let us summarize our results thus far. The goods shock provides low short-run state elasticities for wages with respect to GNE, but high short-run profits state elasticities. The reverse is true in the long run. In the case of a services shock the wage elasticities are above 1.0 in the short run, but similar to the goods elasticities in the long run. Likewise, for business and government profits the state elasticities are above 2.0 for the service shock, but below that obtained for the goods shock in the short run. In the long run both state elasticities appear to be identical. In the long run the interest and miscellaneous income state elasticities turn negative for federal shocks but remain positive for provincial shocks reflecting important differences in debt holding patterns.

Let us consider the impact of the three variants, each exhibiting various degrees of crowding out. Stripping the system of its wealth effects means reducing interest payments to the personal sector. In reducing interest payments to the personal sector since profits are a residual we find the major outcome of this variant is to increase the profits state elasticity in the long run (all incremental debt is held outside the personal

sector). Rather than drifting below 1.0 we now find the profits state elasticity increases to 1.24 in 1990. This results from the interest and miscellaneous income elasticity increasing in a negative direction.

If we strip the system of its wealth effects and make it more price sensitive we find that this decreases the wage state elasticity and decreases the interest and miscellaneous income state elasticity (in a negative direction). In the third variant, where we have no wealth effects, increased price-wage sensitivity and increased interest rate sensitivity, we find a further reduction in both the wage state elasticity and the profit state elasticity.

Crowding out appears to reduce the wage state elasticity and the profit state elasticity if we first normalize for wealth effects. This has important implications for the revenue elasticities by level of government. Two of the largest income bases upon which taxes are levied are those associated with wages and those associated with profits. If crowding out produces lower state elasticities with respect to GNE for these two income components then we would expect the tax elasticities associated with these components to be similarly reduced.

We have demonstrated that the sensitivity of wage income to a goods versus services shock when scaled by GNE is quite different in the short run. We have demonstrated that the wage-state

elasticity tends to grow over time and peak in the range of 1.4. We have demonstrated that the profit state elasticity is high in the short run but low in the long run. We have indicated that the sensitivity of interest and miscellaneous investment income is bound up in the net cost or benefit of a shock emanating from one level of government to its counterpart and the composition of debt holdings. These results move us one step further to interpreting many of the state elasticities associated with the revenue and expenditure accounts of federal and provincial governments. By observing these simple state elasticities we would anticipate that personal taxation might have low elasticities initially, but high long-run elasticities, while corporate taxation might have high short-run elasticities but low long-run elasticities. Furthermore, the nature of the shock (goods vs. services) also should influence the size of the revenue elasticities. Before leaving this discussion let us examine carefully the sensitivity of personal income to these various shocks.

#### COMPOSITIONAL EFFECTS ON PERSONAL INCOME

The composition of personal income and associated state elasticities are recorded in Table 25 - Table 30. Two important points should be noted. First the size of the state elasticities associated with personal income for federal goods shocks versus a provincial goods shock are very close both in the short run and in the long run. This can be seen by comparing Table 25 with

Table 25

Composition of Personal Income, State Elasticities, Federal Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Personal Income	0.53	0.98	1.33	1.35
Total Wages & Salaries	0.69 (0.47)	1.19 (0.82)	1.44 (1.02)	1.44 (1.03)
Farm Income	1.47 (0.03)	1.16 (0.03)	0.96 (0.03)	0.88 (0.03)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.00)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	-0.12 (-0.01)	0.36 (0.02)	0.82 (0.04)	0.92 (0.05)
Interest, Dividend & Misc.	1.20 (0.15)	1.15 (0.12)	1.40 (0.12)	1.38 (0.11)
Transfer Payment to Persons	-0.94 (-0.12)	-0.11 (-0.01)	0.93 (0.11)	1.04 (0.12)
Capital Assistance to Persons	-0.38 (-0.00)	0.0 (0.00)	0.01 (0.00)	0.00 (0.00)
Transfers from Corporations	2.18 (0.00)	1.05 (0.00)	0.43 (0.00)	0.49 (0.00)
Transfers from Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

<sup>1</sup> Source: CANDIDE Model 2.0, December 1980.

<sup>2</sup> Results reported in this table are derived from a sustained increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case.



Table 26

Composition of Personal Income, State Elasticities, Federal Goods Shock (No Wealth)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Personal Income	0.51	0.93	1.27	1.29
Total Wages & Salaries	0.70 (0.47)	1.20 (0.83)	1.48 (1.05)	1.48 (1.06)
Farm Income	1.50 (0.03)	1.17 (0.03)	0.96 (0.03)	0.87 (0.03)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	-0.12 (-0.01)	0.37 (0.02)	0.87 (0.04)	0.97 (0.05)
Interest, Dividend & Misc.	1.00 (0.13)	0.57 (0.06)	0.35 (0.03)	0.27 (0.02)
Transfer Payment to Persons	-0.93 (-0.12)	-0.09 (-0.01)	1.01 (0.12)	1.11 (0.13)
Capital Assistance to Persons	-0.38 (-0.00)	0.01 (0.00)	0.01 (0.00)	0.0 (0.00)
Transfers from Corporations	2.29 (0.00)	1.34 (0.00)	0.95 (0.00)	1.08 (0.00)
Transfers from Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case.

Table 27

Composition of Personal Income, State Elasticities, Federal Goods Shock (No Wealth, Price Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Personal Income	0.51	0.88	1.19	1.23
Total Wages & Salaries	0.73 (0.49)	1.13 (0.77)	1.34 (0.93)	1.38 (0.97)
Farm Income	1.52 (0.03)	1.12 (0.03)	0.72 (0.02)	0.41 (0.01)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	-0.17 (-0.01)	0.42 (0.02)	1.18 (0.06)	1.44 (0.08)
Interest, Dividend & Misc.	0.96 (0.12)	0.67 (0.08)	0.47 (0.04)	0.26 (0.02)
Transfer Payment to Persons	-1.01 (-0.13)	-0.09 (-0.01)	0.99 (0.12)	1.15 (0.14)
Capital Assistance to Persons	-0.39 (-0.00)	0.00 (0.00)	0.02 (0.00)	0.01 (0.00)
Transfers from Corporations	2.16 (0.00)	1.52 (0.00)	1.14 (0.00)	1.10 (0.00)
Transfers from Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case.

Table 28

Composition of Personal Income, State Elasticities, Federal Goods Shock (No Wealth, Price and Interest Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Personal Income	0.51	0.89	1.21	1.24
Total Wages & Salaries	0.73 (0.49)	1.11 (0.76)	1.32 (0.92)	1.36 (0.96)
Farm Income	1.52 (0.03)	1.28 (0.03)	0.79 (0.02)	0.38 (0.01)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	-0.17 (-0.01)	0.50 (0.02)	1.50 (0.08)	1.81 (0.11)
Interest, Dividend & Misc.	0.96 (0.12)	0.71 (0.08)	0.47 (0.05)	0.21 (0.02)
Transfer Payment to Persons	-1.01 (-0.13)	-0.06 (-0.01)	1.10 (0.13)	1.26 (0.15)
Capital Assistance to Persons	-0.39 (-0.00)	0.01 (0.00)	0.02 (0.00)	0.01 (0.00)
Transfers from Corporations	2.16 (0.00)	1.59 (0.00)	1.13 (0.00)	1.03 (0.00)
Transfers from Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case.

Table 29

Composition of Personal Income, State Elasticities, Federal Services Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Personal Income	0.76	1.10	1.30	1.34
Total Wages & Salaries	1.11 (0.75)	1.34 (0.92)	1.43 (1.02)	1.46 (1.05)
Farm Income	0.74 (0.02)	0.82 (0.02)	0.81 (0.03)	0.74 (0.03)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	0.08 (0.00)	0.47 (0.02)	0.80 (0.04)	0.89 (0.04)
Interest, Dividend & Misc.	0.84 (0.11)	1.09 (0.12)	1.18 (0.10)	1.11 (0.09)
Transfer Payment to Persons	-0.92 (-0.11)	0.13 (0.02)	0.93 (0.11)	1.09 (0.13)
Capital Assistance to Persons	-0.43 (-0.00)	0.02 (0.00)	0.01 (0.00)	0.01 (0.00)
Transfers from Corporations	1.22 (0.00)	0.75 (0.00)	0.44 (0.00)	0.37 (0.00)
Transfers from Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of federal services of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case.



Table 30

Composition of Personal Income, State Elasticities, Provincial Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Personal Income	0.54	1.04	1.35	1.37
Total Wages & Salaries	0.88 (0.59)	1.52 (1.05)	1.71 (1.21)	1.72 (1.23)
Farm Income	1.09 (0.02)	0.97 (0.02)	0.85 (0.03)	0.76 (0.03)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	-0.20 (-0.01)	0.13 (0.01)	0.41 (0.02)	0.46 (0.02)
Interest, Dividend & Misc.	0.76 (0.10)	0.21 (0.03)	-0.0 (0.00)	-0.37 (-0.03)
Transfer Payment to Persons	-1.30 (-0.16)	0.44 (-0.05)	0.82 (0.10)	0.99 (0.11)
Capital Assistance to Persons	-0.50 (-0.00)	0.03 (0.00)	0.01 (0.00)	0.00 (0.00)
Transfers from Corporations	1.22 (0.00)	0.89 (0.00)	1.69 (0.00)	-1.90 (0.00)
Transfers from Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of provincial goods of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case.

Table 30. In the short run the state elasticity associated with a federal goods shock for personal income is .53. For a provincial goods shock it is .54. In the long run a federal goods shock yields an elasticity of 1.35, the provincial goods shock yields an elasticity of 1.37. However, the composition of this elasticity is much different for the federal versus provincial case. Second, in the case of a federal goods shock the elasticity associated with interest and dividends remains in the range of 1.2. That associated with a provincial goods shock is initially is .76 but falls towards zero and eventually turns negative.

These results indicate the following. The compositional impact of federal or provincial shocks on the income bases upon which taxes are levied by both federal and provincial governments is not independent of the nature of the shock imposed upon the system, nor of the level of government from which the shock emanates, nor of the degree of crowding out, nor of the net costs and benefits which accrue to one level of government as a result of its counterpart engaging in discretionary spending action, nor of the composition of debt holdings. It should be clear by now that there is no such thing as "the tax elasticity".

As a digression we could imagine other experiments associated with quantity shocks. We could analyze one emanating from the private sector associated with large energy projects, or we could analyze one emanating from the foreign sector associated with an

export boom in raw materials. By now we know enough from examining the seven cases at hand to initially begin an analysis.

Both of these imaginary experiments should admit wide variation in compositional effects on the tax base and therefore wide variation in tax elasticities. This, in part, is the key to understanding the current dilemma of fiscal policy. The asymmetric effects associated with provincial shocks versus federal shocks on debt servicing state elasticities and the possibility that spending elasticities are systematically higher than revenue elasticities leaves governments little room to manoeuvre without a coordinated approach. This situation is made worse in an environment where the multiplier is low, or in an environment where the long-run multiplier is reduced because of crowding out.

#### TAX AND SPENDING ELASTICITIES BY LEVEL OF GOVERNMENT

Let us now examine carefully the results recorded in Tables 31 through 36. Here we record a revenue and expenditure decomposition of the state elasticities associated with spending and revenues for the various shocks under consideration by level of government. We have decomposed total revenue and total spending elasticities by level of government into their major components, weighting the state elasticities with the share of total to show their relative contribution to the total. Let us consider first the case of a federal goods shock, the results of which are recorded in Table 31.

Table 31

Revenue and Expenditure Decomposition, Weighted State Elasticities, Federal Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
<b>Federal Government</b>				
Total Revenue	1.09	1.20	1.20	1.33
Personal Income Tax	0.20	0.54	0.78	0.81
Corporate Tax	0.52	0.38	0.10	0.12
Manufacturing Sales Tax	0.10	0.11	0.12	0.12
Investment Income	0.07	0.11	0.17	0.19
Other Income	0.21	0.06	0.03	0.09
Total Spending	2.49	2.18	2.54	2.61
<b>Goods &amp; Services</b>				
Transfers to Persons	2.81	1.74	1.14	1.00
Transfers to Provinces	-0.54	-0.24	0.20	0.24
Interest Payments	0.01	0.02	0.03	0.03
Other Expenditures	0.17	0.61	1.14	1.30
	0.03	0.05	0.03	0.04
<b>Provincial Government</b>				
Total Revenue	0.57	0.81	1.05	1.12
Personal Income Tax	0.13	0.33	0.48	0.50
Corporate Tax	0.18	0.14	0.05	0.06
Retail Sales Tax	0.13	0.14	0.18	0.19
Investment Income	0.02	0.06	0.09	0.10
Other Income	0.10	0.16	0.25	0.28
Total Spending	0.07	0.41	0.76	0.84
<b>Goods &amp; Services</b>				
Transfers to Persons	-0.01	0.05	0.14	0.16
Transfers to Other Levels of Govt.	0.07	0.20	0.26	0.28
Interest Payments	-0.00	0.16	0.30	0.33
Other Expenditures	0.00	-0.04	-0.03	-0.02
	0.01	0.04	0.09	0.09

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.



Revenue and Expenditure Decomposition, Weighted State Elasticities, Federal Goods Shock (No Wealth)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
<b>Federal Government</b>				
Total Revenue	1.09	1.22	1.27	1.42
Personal Income Tax	0.17	0.48	0.71	0.73
Corporate Tax	0.55	0.46	0.22	0.26
Manufacturing Sales Tax	0.10	0.11	0.11	0.11
Investment Income	0.07	0.12	0.19	0.21
Other Income	0.21	0.05	0.03	0.10
Total Spending	2.50	2.27	2.78	2.88
Goods & Services	2.82	1.78	1.22	1.08
Transfers to Persons	-0.54	-0.23	0.23	0.27
Transfers to Provinces	0.01	0.02	0.03	0.03
Interest Payments	0.17	0.64	1.27	1.47
Other Expenditures	0.03	0.05	0.03	0.03
<b>Provincial Government</b>				
Total Revenue	0.56	0.81	1.05	1.13
Personal Income Tax	0.12	0.29	0.44	0.46
Corporate Tax	0.19	0.16	0.09	0.11
Retail Sales Tax	0.13	0.13	0.18	0.18
Investment Income	0.02	0.06	0.09	0.10
Other Income	0.10	0.16	0.25	0.28
Total Spending	0.07	0.43	0.81	0.89
Goods & Services	-0.01	0.06	0.16	0.18
Transfers to Persons	0.07	0.20	0.27	0.28
Transfers to Other Levels of Govt.	-0.00	0.17	0.31	0.35
Interest Payments	0.00	-0.04	-0.03	-0.01
Other Expenditures	0.01	0.06	0.10	0.09

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.

Table 33

Revenue and Expenditure Decomposition, Weighted State Elasticities, Federal Goods Shock (No Wealth, Price Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
<b>Federal Government</b>				
Total Revenue	1.08	1.21	1.20	1.30
Personal Income Tax	0.16	0.43	0.59	0.64
Corporate Tax	0.53	0.51	0.29	0.29
Manufacturing Sales Tax	0.10	0.11	0.11	0.11
Investment Income	0.07	0.12	0.19	0.21
Other Income	0.22	0.04	0.00	0.05
Total Spending	2.56	2.17	2.62	2.79
Goods & Services	2.92	1.71	1.13	1.02
Transfers to Persons	-0.57	-0.23	0.25	0.32
Transfers to Provinces	0.01	0.02	0.02	0.03
Interest Payments	0.17	0.61	1.17	1.38
Other Expenditures	0.03	0.06	0.03	0.04
<b>Provincial Government</b>				
Total Revenue	0.56	0.79	0.99	1.06
Personal Income Tax	0.12	0.27	0.38	0.40
Corporate Tax	0.19	0.18	0.12	0.12
Retail Sales Tax	0.14	0.12	0.15	0.15
Investment Income	0.02	0.06	0.09	0.10
Other Income	0.10	0.16	0.24	0.28
Total Spending	0.04	0.45	0.91	1.04
Goods & Services	-0.02	0.06	0.16	0.18
Transfers to Persons	0.06	0.19	0.24	0.25
Transfers to Other Levels of Govt.	-0.00	0.17	0.36	0.42
Interest Payments	0.00	-0.04	0.00	0.03
Other Expenditures	-0.00	0.07	0.15	0.16

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.

Table 34

Revenue and Expenditure Decomposition, Weighted State Elasticities, Federal Goods Shock (No Wealth, Price and Interest Sensitive)<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
<b>Federal Government</b>				
Total Revenue	1.08	1.24	1.29	1.38
Personal Income Tax	0.16	0.43	0.60	0.63
Corporate Tax	0.53	0.52	0.29	0.27
Manufacturing Sales Tax	0.10	0.11	0.11	0.11
Investment Income	0.07	0.13	0.27	0.31
Other Income	0.22	0.04	0.02	0.07
Total Spending	2.56	2.20	2.60	2.73
<b>Goods &amp; Services</b>				
Transfers to Persons	2.92	1.67	1.01	0.90
Transfers to Provinces	-0.57	-0.22	0.30	0.38
Interest Payments	0.01	0.02	0.02	0.03
Other Expenditures	0.17	0.67	1.22	1.38
	0.03	0.06	0.04	0.04
<b>Provincial Government</b>				
Total Revenue	0.56	0.79	0.98	1.03
Personal Income Tax	0.12	0.27	0.38	0.40
Corporate Tax	0.19	0.19	0.12	0.12
Retail Sales Tax	0.14	0.12	0.14	0.14
Investment Income	0.02	0.06	0.09	0.10
Other Income	0.10	0.16	0.25	0.28
Total Spending	0.04	0.47	1.08	1.24
<b>Goods &amp; Services</b>				
Transfers to Persons	-0.02	0.06	0.19	0.22
Transfers to Other Levels of Govt.	0.06	0.19	0.24	0.24
Interest Payments	-0.00	0.17	0.40	0.48
Other Expenditures	0.00	-0.03	0.07	0.12
	-0.00	0.08	0.17	0.18

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a sustained real increase in the purchase of federal goods of \$1.0 billion during the period 1980-1990. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.

Table 35

Revenue and Expenditure Decomposition, Weighted State Elasticities, Federal Services Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
<b>Federal Government</b>				
Total Revenue	1.74	1.60	1.39	1.43
Personal Income Tax	0.42	0.63	0.76	0.79
Corporate Tax	0.33	0.27	0.12	0.09
Manufacturing Sales Tax	0.10	0.10	0.11	0.11
Investment Income	0.05	0.13	0.18	0.19
Other Income	0.85	0.46	0.23	0.24
Total Spending	2.62	2.56	2.39	2.49
Goods & Services	2.99	2.00	1.19	1.10
Transfers to Persons	-0.56	-0.13	0.21	0.26
Transfers to Provinces	0.02	0.02	0.02	0.03
Interest Payments	0.15	0.62	0.94	1.07
Other Expenditures	0.03	0.05	0.03	0.03
<b>Provincial Government</b>				
Total Revenue	0.65	0.83	1.02	1.09
Personal Income Tax	0.25	0.38	0.46	0.49
Corporate Tax	0.11	0.10	0.05	0.04
Retail Sales Tax	0.14	0.14	0.18	0.18
Investment Income	0.02	0.06	0.08	0.09
Other Income	0.13	0.17	0.24	0.28
Total Spending	0.12	0.45	0.73	0.82
Goods & Services	0.01	0.07	0.14	0.16
Transfers to Persons	0.10	0.20	0.26	0.28
Transfers to Other Levels of Govt.	-0.00	0.16	0.28	0.32
Interest Payments	0.00	-0.03	-0.04	-0.03
Other Expenditures	0.01	0.06	0.09	0.09

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a sustained real increase in the purchase of federal services of \$1.0 billion during the period 1980-1990. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.



Table 36

Revenue and Expenditure Decomposition, Weighted State Elasticities, Provincial Goods Shock<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
<b>Federal Government</b>				
Total Revenue	0.89	0.76	0.70	0.77
Personal Income Tax	0.20	0.69	0.90	0.91
Corporate Tax	0.34	-0.13	0.41	-0.43
Manufacturing Sales Tax	0.11	0.13	0.13	0.13
Investment Income	0.03	0.00	-0.02	-0.02
Other Income	0.20	0.07	0.10	0.17
Total Spending	-0.85	-0.67	-0.06	-0.03
Goods & Services	0.06	0.26	0.35	0.36
Transfers to Persons	-0.71	-0.29	0.22	0.28
Transfers to Provinces	0.01	0.02	0.02	0.02
Interest Payments	-0.24	-0.71	-0.68	-0.73
Other Expenditures	0.02	0.05	0.03	0.04
<b>Provincial Government</b>				
Total Revenue	0.53	0.73	0.91	0.95
Personal Income Tax	0.14	0.41	0.55	0.56
Corporate Tax	0.12	-0.04	-0.15	-0.16
Retail Sales Tax	0.15	0.15	0.21	0.21
Investment Income	0.01	0.03	0.04	0.04
Other Income	0.11	0.18	0.26	0.29
Total Spending	3.13	2.69	2.08	1.98
Goods & Services	3.09	2.17	1.16	0.99
Transfers to Persons	0.06	0.07	0.18	0.21
Transfers to Other Levels of Govt.	-0.01	0.17	0.34	0.40
Interest Payments	-0.00	0.24	0.31	0.29
Other Expenditures	-0.02	0.03	0.08	0.08

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a sustained real increase in the purchase of provincial goods of \$1.0 billion during the period 1980-1990. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.

First consider the spending elasticities. Under conditions of a federal goods shock a 2.8 per cent increase in federal purchases of goods and services gives rise to a 1.0 per cent increase in GNE. The immediate effects of this increase in GNE leads to increased employment opportunities, lower unemployment rates, and therefore reduced unemployment compensation payments. We see in Table 31 as a result of this the transfer state elasticity is initially  $-.54$ .

The total spending elasticity in the system is 2.49, considerably less than the revenue elasticity of 1.09, half of which is associated with corporate taxes. We see immediately the influence of income distribution (a shift to corporate profits during the initial stages of the shock) on the composition of the total federal revenue state elasticity. The corporate tax elasticity is high, the personal tax elasticity is low. The total revenue elasticity however is considerably less than the spending elasticity. As a result financing of the deficit increases interest payments, initially by a modest amount, contributing  $.17$  to the total spending elasticity.

What transpires as we move out into the simulation period is interesting. First the spending elasticity associated with goods and services declines. This is the net effect of the increase in the multiplier as the system moves forward. A smaller increase

in goods purchases is needed to obtain the same increase in GNE in the long run as the multiplier increases. If the multiplier were very high (3-4) this elasticity would be very low in the long run. We also see a change in the composition of the total revenue state elasticity. Note the contribution of personal income tax increases and the contribution of corporate tax declines. The total revenue elasticity increase to a range of 1.2 - 1.3.

Rather than seeing a decline in the total spending elasticity, we see a change in its composition. The goods and service elasticity declines but the transfer and debt servicing elasticity increase dramatically. The transfer elasticity increases primarily because of 1) the indexation of transfer payments, and 2) the influence that real wage gains has on labour force participation rates and thus the number of unemployed. The debt servicing elasticity continues to increase because of the persistent short fall of the revenue elasticity from the spending elasticities. In summary the federal government never is able to finance from incremental revenue, its incremental spending during the period. It must continue to finance debt to maintain the increased level of spending. Furthermore an increasing proportion of this debt is not held in the personal sector.

Are there any benefits associated with the accounts of provincial governments? In Table 31 it is clear that provincial governments benefits immediately, although their revenue

elasticities are not as high as the federal governments, they are considerably higher in the short run than their spending elasticities. In the long run the revenue elasticities are still higher than spending elasticities at the provincial level, but the gap narrows.

Let us now consider a provincial goods shock with the associated impact on both levels of government (Table 36). At the federal level we see revenue elasticities which are initially lower than in the case of the federal goods shock. The contribution of personal income taxes is identical at .20, however, the contribution of corporate tax to the total revenue elasticity is much smaller at .34 versus .52. This can be traced directly to the impact that a provincial goods shock has on the functional distribution of income versus the impact that a federal goods shock has on the functional distribution of income. In reviewing these results you should remember that a provincial goods shock produces a lower state elasticity of profits with respect to GNE than a federal goods shock. Therefore, the profits tax elasticity with respect to GNE is lower in the case of a provincial goods shock when compared to a federal goods shock. This is because the reduced stock of federal debt is proportionately higher outside the personal sector.

This is an important observation. It teaches us that compositional impacts on the functional distribution of income can have a bearing on the total tax elasticities associated with



the various levels of government. A second point to note is that the long-run elasticity associated with federal revenues is smaller in the case of a provincial goods shock. This is due to large difference in the corporate tax elasticities in the long run. In the case of the federal shock it is positive, in the case of the provincial goods shock it is negative. This result is related to the impact that bond financing by the federal government has on the spending elasticity associated with debt servicing and the compositional shift of this debt away from the personal sector. It is consistent with the differences in state elasticities we previously observe for personal interest and for public debt interest.

Although a provincial goods shock produces a low federal total revenue elasticity in the long run it produces a zero total spending elasticity. The net effect is a large gain in revenues versus costs for the federal government. Furthermore, under conditions of a provincial goods shock the state elasticity associated with federal interest in the long run is  $-0.7$ . Under conditions of a federal goods shock the state elasticity associated with provincial debt servicing remains close to zero. Thus provincial stimulus leads to considerable savings in interest payments by the federal government with little debt cost to the provinces and a proportional shift of debt holding to the personal sector. Whereas a federal goods shock leads to a large increase in the debt servicing state elasticity associated with the federal government and an increased proportion of debt held outside the personal sector.

The revenue elasticity associated with provincial governments under conditions of a provincial goods shock is not as high as that associated with a federal goods shock. This again is in part due to the corporate tax elasticity. Finally the revenue elasticities at the provincial level never exceed the total spending elasticities, implying a continued need for financing at the provincial level. However, this continued financing at the provincial level, at least within the context of CANDIDE Model 2.0, is not all obtained domestically. This in part explains the reasons why a provincial goods shock leads to downward pressure on long-term interest rates while a federal goods shock leads to upward pressure on long-term interest rates. In the case of a provincial goods shock the excess of federal revenues over federal spending leads to less domestic pressure in financial markets. The domestic financing needed by provinces does not take up all the slack created by the absence of the federal government in domestic financial markets since a proportion of provincial deficits are financed abroad. But increased federal deficit financing leads to an increased concentration of debt outside the personal sector.

How does crowding out impact the tax elasticities associated with a federal goods shock. Although we have recorded the weighted state elasticities for these cases in Table 32 through Table 34 let us consider the unweighted state elasticities

Table 37

Total Government Revenue, State Elasticities<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	0.77	0.96	1.09	1.19
No Wealth	0.77	0.96	1.13	1.24
No Wealth, Price Sensitive	0.76	0.95	1.06	1.14
No Wealth, Price & Interest Sensitive	0.76	0.97	1.13	1.22
Federal Services	1.10	1.15	1.16	1.22
Provincial Goods	0.67	0.70	0.76	0.81
Provincial Services	0.83	0.86	0.85	0.86

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of total government revenue from the reference case by the per cent deviation of GNE from the reference case.

Table 38

Personal Income Tax, State Elasticities with Respect to Assessed Income<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	1.09	1.49	1.49	1.44
No Wealth	1.00	1.41	1.41	1.37
No Wealth, Price Sensitive	0.96	1.37	1.33	1.30
No Wealth, Price & Interest Sensitive	0.96	1.37	1.31	1.27
Federal Services	1.46	1.55	1.48	1.43
Provincial Goods	1.06	1.63	1.58	1.53
Provincial Services	1.46	1.64	1.57	1.52

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of personal income tax collections from the reference case by the per cent deviation of assessed income from the reference case.



Table 39

Assessed Income, State Elasticities with Respect to Nominal GNE<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	0.50	0.97	1.34	1.35
No Wealth	0.47	0.92	1.27	1.29
No Wealth, Price Sensitive	0.48	0.86	1.18	1.22
No Wealth, Price & Interest Sensitive	0.48	0.86	1.19	1.23
Federal Services	0.75	1.10	1.30	1.34
Provincial Goods	0.54	1.12	1.43	1.44
Provincial Services	0.72	1.18	1.37	1.40

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of assessed income from the reference case by the per cent deviation of GNE from the reference case.

Table 40  
 Personal Income Tax, State Elasticities with Respect to Nominal GNE<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	0.54	1.46	1.99	1.95
No Wealth	0.47	1.31	1.80	1.78
No Wealth, Price Sensitive	0.47	1.19	1.57	1.59
No Wealth, Price & Interest Sensitive	0.47	1.19	1.56	1.57
Federal Services	1.10	1.70	1.92	1.92
Provincial Goods	0.57	1.85	2.27	2.21
Provincial Services	1.05	1.94	2.13	2.12

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of personal income tax collections from the reference case by the per cent deviation of GNE from the reference case.

Table 41

Total Government Spending, State Elasticities<sup>1,2</sup>

	1980	Average 1981-85	Average 1986-90	1990
Federal Goods	1.38	1.33	1.68	1.75
No Wealth	1.39	1.39	1.83	1.92
No Wealth, Price Sensitive	1.40	1.33	1.77	1.91
No Wealth, Price & Interest Sensitive	1.40	1.36	1.85	1.99
Federal Services	1.48	1.56	1.59	1.67
Provincial Goods	1.10	0.90	0.95	0.93
Provincial Services	1.40	1.25	1.05	1.01

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a sustained increase in the purchase of federal (provincial) goods (services) of \$1.0 billion during the period 1980-1990. Data are obtained by dividing the per cent deviation of total government spending from the reference case by the per cent deviation of GNE from the reference case.

recorded in Table 37 - Table 41. In Table 37 we record the state elasticities for each of the 7 alternatives for total government revenues. In Tables 38, 39 and 40 we record the state elasticity of personal income tax with respect to assessed income, the state elasticity of assessed income with respect to GNE, and the state elasticity for personal income tax with respect to GNE. In Table 40 we find that the personal income tax state elasticity with respect to nominal GNE is reduced in the long run from 1.95 to 1.57 under conditions of crowding out.

This comes about because of two reasons: 1) the impact that crowding out has on the functional distribution of income; and 2) the impact that crowding out has on the general multiplier in the system. The state elasticity of personal income tax with respect to nominal GNE can be decomposed into the state elasticity of assessed income with respect to GNE and the state elasticity of personal income tax with respect to assessed income. In Table 38 we see that crowding out reduces the sensitivity of personal tax collections to assessed income. In Table 39 we see that crowding out influences the functional distribution of income reducing the sensitivity of assessed income to GNE. Crowding out can cut the state elasticity of personal income tax with respect to nominal GNE by as much as 20 per cent, because of shifts in the functional distribution of income and reduced multiplier effects on the assessed income base.



Crowding out has a tendency to increase the total spending elasticities in the long run. In Table 41 we see an increase in the total government spending elasticity from 1.75 to 1.99 under conditions of crowding out. Furthermore, in examining the spending elasticities and the revenue elasticities for all levels of government combined (Table 37 and Table 41) it is clear that spending elasticities always exceed revenue elasticities. Under conditions of crowding out the spread between revenue elasticities and spending elasticities increases.

If CANDIDE Model 2.0 contains the major structural features of the Canadian economy, including the revenue generating capacity of the federal and provincial governments, these seven simulations suggest that the persistence of federal deficits and the inability of the federal government to provide improvement in this area is in part explained by the structure of the system (low tax elasticities in relation to spending elasticities). Furthermore, the tax elasticities that we have observed in these seven alternatives are those associated with a quantity shock. We would expect the tax elasticities under these conditions to be greater than 1.0. If we subject the system to a number of price and wage shocks we would anticipate low tax elasticities associated with personal income and high spending elasticities associated with transfer payments. To gain some insight into the impact that various price and wage shocks might have on spending and revenue elasticities by level of government, we have designed four such alternatives. Let us now turn our attention to an analysis of these results.

## THE WAGE-PRICE SECTOR

Wage formation within the model is driven by an expectational process. Among other things, two important determinants of expectations are: (1) past movements in prices; and, (2) the conduct of monetary policy as embodied in movements in key monetary aggregates. Inflationary expectations are modelled as a composite index. The index is a weighted average of past rates of change in the CPI and past rates of change in M1. In the current version of CANDIDE Model 2.0 the weighting is .7 for the CPI and .3 for M1. When expectations are formed in this manner, under conditions of a price shock, wage behaviour unaccompanied by accommodating monetary policy will differ from wage behaviour accompanied by accommodating monetary policy. Under accommodation we see full pass through to wages, without accommodation we see only 70 per cent pass through to wages.

The wage equations within the commercial sector are disaggregated by industry. Outside of the commercial sector the disaggregation is by level of government with education and health care treated separately at the provincial and at the local level. Each wage equation has a similar structure, however, the estimated coefficients vary from industry to industry. The equations are expectational Phillips curves. Wage formation depends upon the price expectations variable discussed previously and the reciprocal of the unemployment rate (labour market tightness). In a few formulations, additional variables

including specific U.S. (industry) wage rates and domestic sector productivity indicators influence wage formation. The equations are estimated in change form and the coefficient on the price expectations variable, in most instances, is near 1.0.

Another area where background is needed to understand simulation results is that of price formation. In CANDIDE Model 2.0 there are two classes of prices. These include:

(1) domestic value-added prices disaggregated by industry; and,  
(2) final demand prices disaggregated by spending category. The second category contains the familiar prices associated with consumption, investment, government spending, exports and imports. The export and import prices are disaggregated by commodity groups.

Price formation within CANDIDE Model 2.0 occurs at the industry level. Here domestic value-added prices are related to wage rates, productivity, capital cost, and in some instances export prices. The industry value-added price equations are estimated in per cent change form. The coefficient associated with the percentage change in wages in each of these equations, range from .5 to .6. Industry price formation can be characterized as a mark-up on wage and other costs, tempered by productivity movements.

Once sectoral domestic value added prices are determined, final demand prices are formed. In forming final demand prices the



following factors are accounted for: 1) domestic value added industry prices, 2) import prices, 3) the exchange rate, 4) the import content of total supply, 5) commodity and non-commodity taxes, 6) subsidies, 7) direct and indirect content of industrial commodity supply, and 8) the commodity composition of any given expenditure category.

The industry value-added prices if properly weighted and aggregated average to a price index for gross domestic product. The final demand prices if properly weighted and aggregated average to a price index for gross national expenditure. The difference between these two aggregate price indicators is due to indirect taxation, subsidies and income flows to-and-from abroad. Differences in these two aggregate deflators (gross national expenditure versus gross domestic product) should reflect only these conceptual differences. If one is not careful in designing simulation experiments using CANDIDE Model 2.0, inconsistencies between these two aggregate deflators will appear.

In examining the wage and price sector of CANDIDE Model 2.0 it is important to keep in mind sector specific structure and key parameters at the sector level. These include: 1) the way in which CPI and M1 growth influence expectations, 2) the way expectations influence wage formation, 3) the way in which wage formation influences price formation, and 4) the way in which foreign prices influence domestic prices. These four responses are key to explaining the wage-price dynamics of CANDIDE Model



2.0. To illustrate these responses, in anticipation of tracing their impact on the functional distribution of income and on revenue and spending responses by level of government we have designed a number of alternatives.

#### DESIGNING THE WAGE-PRICE SHOCKS

We have developed four alternatives. These include: 1) a domestic and foreign price shock, 2) a domestic price shock, 3) a foreign price shock, and 4) a domestic wage shock. To reveal the key structural features mentioned previously these alternatives have unique features which we outline at the outset. In each case we have exogenized the reference path for a selected set of wages and/or prices, imposing a 1.0 per cent upward displacement on each path and deriving a solution consistent with this exogenized upward displaced path.

For instance, in the alternative where both domestic and foreign prices are displaced we exogenize all domestic value-added industry deflators and then displace the reference path upward by 1.0 per cent. We also displace upward by 1.0 per cent the path of all export and import deflators. Once this is complete we obtain a solution around this exogenized upward displaced path. The solution around this path cuts the influence of wages on prices focusing our attention on the response of wages to prices. We have also performed two variants of this alternative. These include displacing only domestic prices by

1.0 per cent and obtaining a solution, and displacing only foreign prices by 1.0 per cent and obtaining a solution. As in the previous case when the path of domestic prices is displaced by 1.0 per cent no feedback is permitted from wages to prices thus focusing our attention on the response of wages to prices. However in the case where foreign prices are displaced, feedback is permitted making interpretation more difficult. A similar procedure is followed in developing the wage alternative. The domestic wage equations are exogenized. The path of the reference case is then displaced upward by 1.0 per cent. A solution is then obtained around this displaced path which shows the impact on prices, however, the indirect effect of prices on wages are absent from the simulation.

In summary our price shock simulations are designed to show the direct effects of prices on wages both short and long run, with the indirect effects of wages on prices removed. Our wage shock simulations are designed to show the direct effects of wages on prices both short and long run with the indirect effect of prices on wages removed. These wage and price alternatives may appear arbitrary, since each of them cuts certain key links between wages and prices. In fact, the arbitrary nature of the analysis is a key feature of our procedure. It permits the wage-price dynamics of the system to be observed cleanly without confusion with indirect effects stemming from wage-price interaction.

## AN OVERVIEW OF THE ALTERNATIVE SHOCK

Let us examine the impact on the real wage for each alternative. In Table 42, we record the per cent difference from the reference case for the real wage. Under conditions of a price shock, the real wage initially declines. It recovers from this initial decline, but never returns to reference case levels. The price shock alternatives indicate that wages do not completely adjust to prices. For the domestic wage shock alternative we find initially a large gain in real wages with smaller gains occurring in the medium run. The wage shock alternative suggest incomplete adjustment of prices to wages. Let us examine each of these alternatives in detail.

In Tables 43-46 we record the percentage difference from the reference case for a variety of wage and price aggregates. Consider first the data in Table 43. Here we record the impact on final demand prices, the exchange rate, consumer prices, inflationary expectations, wage rates, and the real domestic product deflator. In this alternative all domestic value-added prices and the U.S. currency value of all export and import prices are subject to an upward displacement in 1980-1986 of 1.0 per cent. These prices are held at this displaced reference path and a new solution is obtained. Important in the interpretation of these results are certain key links between wages and prices which by the nature of the simulation have been cut.

Table 42

Percentage Difference from the Reference Case for the Real Wage<sup>1</sup>

	1980	1981	Average 1982-86
Domestic and Foreign Price Shock <sup>2</sup>	-0.88	-0.27	-0.32
Domestic Price Shock <sup>3</sup>	-0.67	-0.22	-0.30
Foreign Price Shock <sup>4</sup>	-0.36	-0.19	-0.16
Domestic Wage Shock <sup>5</sup>	0.73	0.58	0.54

1 Source: CANDIDE Model 2.0, December 1980.

2 Derived from 1.0 percent sustained upward displacement in Domestic and Foreign Prices.

3 Derived from 1.0 percent sustained upward displacement in Domestic Prices

4 Derived from 1.0 percent sustained upward displacement in Foreign Prices

5 Derived from 1.0 percent sustained upward displacement in Domestic Wages



Table 43

Percentage Difference from the Reference Case, Domestic and Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Gross National Expenditure (Deflator)	0.99	0.95	0.94
Consumption	0.98	0.94	0.92
Government Expenditure	0.91	0.94	0.95
Investment	0.99	0.94	0.96
Exports	0.90	0.70	0.81
Imports	0.96	0.73	0.85
Exchange Rate	-0.10	-0.30	-0.19
Consumer Price Index	0.94	0.90	0.90
Inflation Expectations	0.00	0.72	0.00
Average Hourly Earnings (Wage)	0.05	0.63	0.58
Deflator, Real Domestic Product	1.01	1.00	1.00

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent sustained upward displacement in Domestic and Foreign price used as primary inputs in final demand price conversion.

The deflator for real domestic product is a weighted average of the industry value-added deflators which are subject to the upward displacement of 1.0 per cent. Also, in this alternative, both export and import prices (foreign currency values) are subject to an upward displacement of 1.0 per cent. The exchange rate is endogenous and thus free to vary in response to the shock. Downward pressure from the exchange rate, percentage wise, accounts for the less than 1.0 per cent increase in the Canadian dollar equivalent of the foreign currency valued deflators for exports and imports. As a result the 1.0 per cent upward displacement in foreign currency valued export and import prices translates to a less than 1.0 per cent increase (in domestic currency valued export and import prices) reflecting exchange rate movements (and mix effects).

Aside from exchange rate effects, final demand prices increase in all cases by close to 1.0 per cent. The consumer price index increases by .94 per cent. The difference reflecting movements in the exchange rate, the weighting of its components, and differences in the way imputed rental items are handled when compared to the implicit deflator for consumer purchases, National Accounts basis. Neither inflationary expectations nor average hourly earnings are affected much in the initial year of the shock.

In the second year several important changes occur. Price expectations increase by .72. This is a key response. It

represents the lagged effect which the CPI has on the formation of expectations as indicated earlier. Average hourly earnings increase by .63. This also is a key response. It shows the impact of expectations on wage formation. The relationship of expectations to past movements in the CPI, and the relationship of hourly earnings to price expectations reveals two important parameters of the system. The weight of lagged changes in the consumer price index (in the aggregate) associated with expectations is .76 (.72 divided by .94); the weight of the expectation parameter influencing wage formation (in the aggregate) is approximately .90 (.63 divided by .72). These are the key parameters that relate domestic and foreign price shocks to domestic wage formation.

In Table 43 the price shock is not accompanied by accommodating monetary policy, this accounts for the missing .28 from inflationary expectations in the long run. If .28 (the contribution of an increase in M1 by 1.0 per cent to inflationary expectations) were added to .72 (the effect of the CPI), average hourly earnings would increase by close to a full percentage point in the long run. As a result no long run reduction in the real wage from the reference case would occur. There would be a short run reduction by almost a full percentage point, but lagged adjustments in expectations would restore the level of the real wage to the reference case.

Let us now consider the second alternative. The results are recorded in Table 44. In this case domestic value-added

deflators at the industry level are exogenized and displaced upward by 1.0 per cent. The export and import prices now include only adjustments associated with the endogenous movement of the exchange rate, since the foreign currency values of these prices are held at reference case levels. In this alternative we see the same dynamic patterns evolving. However, because foreign prices are excluded from the shock, we now observe only a .73 per cent increase in the consumer price index. This leads in the following year to a .56 per cent increase in inflation expectations and subsequently to a .49 per cent increase in wage rates. Using these key percentage changes, again we find that on average, price expectations increase .76 for every percentage point increase in the consumer price index and that nominal wages increase .90 per cent for every percentage point increase in price expectations. In this case, as in the previous case we do not see full adjustment of wages to prices. This is again due to the lack of accommodating monetary policy and the impact of this on the formation of price expectations.

Let us now examine the results obtained from the foreign price shock. The direct and indirect effects here are more difficult to trace because all domestic wages and prices are left endogenous within the system. With the foreign price shock, the foreign currency values of the export and import deflators are increased by 1.0 per cent. In 1980 consumer prices increase by .35 per cent. This is due to: 1) higher foreign prices including exchange rate effects; and, 2) higher domestic prices as



Table 44

Percentage Difference from the Reference Case, Domestic Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Gross National Expenditure (Deflator)	0.80	0.77	0.78
Consumption	0.79	0.77	0.77
Government Expenditure	0.87	0.90	0.91
Investment	0.65	0.63	0.67
Exports	-0.07	-0.17	-0.04
Imports	-0.02	-0.15	-0.02
Exchange Rate	-0.07	-0.17	-0.03
Consumer Price Index	0.73	0.71	0.73
Inflation Expectations	0.00	0.56	0.03
Average Hourly Earnings (Wage)	0.06	0.49	0.43
Deflator, Real Domestic Product	1.01	1.00	1.00

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent sustained upward displacement in Domestic industry prices used as primary inputs in final demand price conversion.

characterized by the real domestic product deflator (up by .17, an indirect effect). These effects combine to produce an increase in the consumer price index of .35. The change in the consumer price index leads in the subsequent year to an increase in inflation expectations of .27 which translates to an increase in average hourly earnings of .22 per cent. The increase in average hourly earnings, because domestic prices are now endogenous, contributes to a further increase in the real domestic product deflator (from .17 in the year of impact to .31 in the second year). Under conditions of a foreign price shock even with domestic wage rates and domestic prices fully endogenous, a decline in the real wage is observed. Again this is due to non-accommodating monetary policy. If we had accommodated the foreign price shock by increased money supply growth we would not see a long-run decline in the real wage.

Let us now consider the results obtained in the fourth alternative. In this case we displace by 1.0 per cent the path of domestic wages and subsequently obtain a solution to the model for the new path. In this case it is important to recognize we have cut the link between expectations and wage formation (in the previous cases we cut the link between wage formation and price formation). A 1.0 per cent increase in domestic wages leads to a .48 per cent increase in real domestic product prices (industry level). This is a key response. It represents (in the aggregate) the short-run mark-up in the industry price equations. This variation in domestic value-added prices at the industry

Table 45

Percentage Difference from the Reference Case, Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Gross National Expenditure (Deflator)			
Consumption	0.30	0.38	0.44
Government Expenditure	0.33	0.39	0.44
Investment	0.07	0.19	0.31
Exports	0.44	0.52	0.55
Imports	0.98	0.83	0.84
	1.00	0.85	0.87
Exchange Rate	-0.02	-0.17	-0.17
Consumer Price Index	0.35	0.41	0.45
Inflation Expectations	-0.00	0.27	0.00
Average Hourly Earnings (Wage)	-0.01	0.22	0.29
Deflator, Real Domestic Product	0.17	0.31	0.39

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent sustained upward displacement in Foreign prices used as primary inputs in final demand price conversion.

level produces a .42 per cent increase in the deflator associated with gross national expenditure and a .30 per cent increase in the consumer price index. The .30 per cent increase in the consumer price index leads to a .24 per cent increase in inflation expectations.

Recall that neither import nor export prices were disturbed from reference case levels in this alternative. This causes the aggregate price index associated with expenditure to move less than the aggregate price index associated with industry value-added. As a result of not passing increased domestic costs to export markets, we see a divergence between the two aggregate price deflators in the system. Once again we see the key parameters on the price side of the model at work. An increase in domestic prices given foreign prices exogenous leads to a diluted impact on consumer prices. The increase in consumer prices implies increased inflation expectations, but since monetary policy is not accommodating the percentage effect on wages is again reduced.

In the second and subsequent years additional adjustments occur to real domestic product prices representing the long-run dynamics embodied in the mark-up process. The short-run pass through is .48, the medium- to long-run pass through is in the range of .60 to .64. This, of course, produces an impact on consumer prices, the GNE deflator, and subsequently on inflation expectations.



Table 46

Percentage Difference from the Reference Case, Domestic Wage Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Gross National Expenditure (Deflator)	0.42	0.51	0.54
Consumption	0.31	0.45	0.50
Government Expenditure	0.82	0.85	0.86
Investment	0.34	0.38	0.41
Exports	0.01	0.02	0.07
Imports	0.00	-0.02	0.01
Exchange Rate	0.01	0.02	0.08
Consumer Price Index	0.30	0.44	0.48
Inflation Expectations	0.00	0.24	0.05
Average Hourly Earnings (Wage)	1.03	1.02	1.02
Deflator, Real Domestic Product	0.48	0.60	0.64

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent sustained upward displacement in Domestic wages.

What have we learned about wage-price dynamics within CANDIDE Model 2.0 from these four simulations? For price shocks, initially there are large declines in the real wage, but as the expectations process begins to work recovery of the real wage occurs. However, unless recovery is accommodated by an increased rate of growth of money supply it is never complete. The behaviour of the real wage in the case of price shocks is a consequence of: 1) the expectation process, 2) the impact that expectations have on wage formation, and 3) the import content of total supply. There are other influences that we have not accounted for or mentioned in our discussion, however, the three cited above are the major factors. Wage shocks imply an upward shift in the real wage in the short run, with some reduction in these short run gains in the long run. Incomplete adjustment of prices to wages occurs because we have used mark-up theory in the determination of the industry value-added prices.

It is easy to see the implications that these shocks might have for the composition of spending, the functional distribution of income, and the composition of personal income. A shift of the real wage is telltale evidence that the functional distribution of income has changed. This, of course, implies a different composition for the tax base in each alternative. Furthermore, a rising or falling real wage implies different real activity levels which suggest a different mix of transfer payments for each of the alternatives under consideration. Let us now turn to an analysis of the impact of these four alternatives on the composition of spending.

Table 47

Deviation from the Reference Case, Domestic and Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Gross National Expenditure (1971\$)	-0.31	-0.44	-0.35
Consumption	-0.44	-0.25	-0.26
Government Expenditure	0.02	-0.04	-0.04
Investment	-0.06	-0.14	-0.11
Inventory Change	0.03	-0.16	0.02
Exports	-0.01	-0.02	-0.02
Imports	-0.14	-0.17	-0.08

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent sustained upward displacement in Domestic and Foreign Prices used as primary inputs in final demand price conversion.

## COMPOSITIONAL EFFECTS ON SPENDING

In each case the upward displacement of prices (wages) implies incomplete adjustment of wages (prices) to the imposed shock. In three cases (domestic wage, foreign price and domestic price) we record not only incomplete adjustment of domestic wages and prices but also a changing ratio of foreign to domestic prices. Differences (from the reference case) in these two key ratios, the real wage and the ratio of domestic to foreign prices explains much of the compositional shift in spending recorded in Tables 47-50. Let us examine each case separately.

For the domestic and foreign price shock (Table 47) there is an initial fall in the real wage followed by partial recovery, but no change occurs in foreign-domestic price relatives. Initially we see a substantial drop in consumption accompanied by reduced imports, reduced investment and increased inventory accumulation. This change in consumption reflects the initial reduction in the real wage. In the long run the real wage recovers and thus consumption recovers. We see little evidence of import substitution.

Compare these results with those recorded in Table 48 (the domestic price shock). In this case we record a large short-run reduction in the real wage, a reduced long-run impact and a changed ratio between domestic and foreign prices. As a result the compositional effects on spending differ from those of the



Table 48

Deviation from the Reference Case, Domestic Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Gross National Expenditure (1971\$)	-0.35	-0.50	-0.51
Consumption	-0.38	-0.24	-0.28
Government Expenditure	0.01	-0.04	-0.04
Investment	-0.05	-0.10	-0.10
Inventory Change	0.01	-0.14	0.01
Exports	-0.01	-0.02	-0.03
Imports	-0.06	-0.04	0.05

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent sustained upward displacement in Domestic industry prices used as primary inputs in final demand price conversion.

Table 49

Deviation from the Reference Case, Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Gross National Expenditure (1971\$)	-0.01	-0.08	-0.05
Consumption	-0.11	-0.10	-0.09
Government Expenditure	0.02	-0.00	-0.02
Investment	-0.01	-0.06	-0.06
Inventory Change	0.03	-0.07	0.01
Exports	-0.00	-0.00	-0.00
Imports	-0.08	-0.16	-0.13

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent sustained upward displacement in Foreign prices used as primary inputs in final demand price conversion.

Table 50

Deviation from the Reference Case, Domestic Wage Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Gross National Expenditure (1971\$)	0.15	0.14	0.11
Consumption	0.11	0.17	0.23
Government Expenditure	0.04	0.03	0.02
Investment	0.03	0.08	0.05
Inventory Change	0.04	-0.01	0.00
Exports	0.00	-0.00	-0.00
Imports	0.06	0.13	0.18

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent sustained upward displacement in Domestic wages.

first alternative. In particular the impact on imports is opposite in sign. This indicates that relative price effects in the import equations outweigh income effects resulting in substantial import substitution. This is clear if we compare the long-run impact on gross national expenditure. In the first alternative, where both domestic and foreign prices are increased, GNE declines by .35; in the second alternative GNE declines by .51. The second alternative implies not only reduced levels of activity but also a change in the domestic-foreign composition of total supply.

The opposite effect is present in the third alternative reported in Table 49. Here the income effect and the substitution effect reinforce each other. Higher foreign prices depress the real wage (wages do not fully adjust to increased foreign prices) and higher foreign prices, relative to domestic prices imply substitution away from imports. The decline in imports is large relative to the decline in consumption and gross national expenditure.

In the fourth alternative real wage gains initially occur with some erosion in the long run. These gains in the real wage imply incomplete adjustment in domestic prices. However, partial adjustment does imply increased domestic prices relative to foreign prices. In this alternative the income effect far outweighs the substitution effect. The results show large gains in consumption and in imports.



In summary each alternative shows a different compositional shift in spending. In particular the alternatives which include changes in the ratio of domestic wages to domestic prices, and changes in the ratio of domestic prices to foreign prices show different expenditure compositions than alternatives which include only one of these two changes. Each alternative has a different impact on the composition of total supply (foreign versus domestic). These compositional effects imply changes in the base upon which transfers depend (in particular the number of unemployed). In a future section we indicate that domestic price shocks unaccompanied by foreign price shocks have a substantial impact on the transfer elasticity.

#### COMPOSITIONAL EFFECTS ON THE FUNCTIONAL DISTRIBUTION OF INCOME

We indicated previously the structural features of CANDIDE Model 2.0 which influence the outcome of quantity shocks on the functional distribution of income. These same structural features also influence the outcome resulting from price and wage shocks. Before proceeding let us review these elements. They include the following: (1) profits are the residual in the net national income identity, (2) interest and miscellaneous income is an identity determined, among other things, by the difference between interest received in the personal sector and interest paid by the government sector, (3) the sensitivity of interest received by the personal sector and interest paid by the government sector to an imposed shock depends upon the

Table 51

Functional Distribution of Income, State Elasticities, Domestic and Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Net National Income	1.05	1.02	1.02
Total Wages & Salaries	0.20 (0.14)	0.77 (0.55)	0.67 (0.48)
Business & Government Profits	7.04 (1.11)	1.85 (0.30)	2.25 (0.39)
Less: Dividend Paid to Non-Resident	1.93 (0.02)	2.10 (0.02)	2.14 (0.03)
Interest & Misc. Income	0.86 (0.09)	0.75 (0.08)	0.95 (0.08)
Farm Income	2.20 (0.05)	1.84 (0.04)	1.91 (0.05)
Non-Farm Income	1.21 (0.06)	1.49 (0.08)	1.25 (0.06)
Inventory Valuation Adjustment	10.31 (-0.35)	0.39 (-0.01)	0.61 (-0.01)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Domestic and Foreign prices used as primary inputs in final demand price conversion. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighing component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 52

Functional Distribution of Income, State Elasticities, Domestic Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Net National Income	1.10	1.04	1.02
Total Wages & Salaries	0.19 (0.14)	0.83 (0.59)	0.62 (0.44)
Business & Government Profits	6.61 (1.05)	1.52 (0.24)	2.49 (0.43)
Less: Dividend Paid to Non-Resident	1.83 (0.02)	2.05 (0.02)	2.09 (0.02)
Interest & Misc. Income	0.85 (0.09)	0.78 (0.08)	0.47 (0.04)
Farm Income	2.62 (0.06)	1.86 (0.04)	1.80 (0.05)
Non-Farm Income	1.56 (0.08)	2.16 (0.11)	1.97 (0.10)
Inventory Valuation Adjustment	7.56 (-0.26)	0.80 (-0.02)	0.29 (-0.01)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Domestic prices used as primary inputs in final demand price conversion. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighing component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 53

Functional Distribution of Income, State Elasticities, Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Net National Income	0.95	0.99	1.01
Total Wages & Salaries	0.22 (0.16)	0.62 (0.44)	0.67 (0.47)
Business & Government Profits	7.79 (1.23)	2.58 (0.41)	2.07 (0.36)
Less: Dividend Paid to Non-Resident	2.11 (0.03)	1.98 (0.02)	1.97 (0.02)
Interest & Misc. Income	0.85 (0.09)	0.75 (0.08)	1.20 (0.10)
Farm Income	5.58 (0.13)	4.31 (0.10)	3.20 (0.09)
Non-Farm Income	0.42 (0.02)	0.63 (0.03)	0.82 (0.04)
Inventory Valuation Adjustment	18.03 (-0.61)	1.93 (-0.06)	0.91 (-0.02)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Foreign prices used as primary inputs in final demand price conversion. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighing component state elasticities by the income components share of total. These weighted state elasticities add to the total.



Table 54

Functional Distribution of Income, State Elasticities, Domestic Wage Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Net National Income	1.12	1.08	1.04
Total Wages & Salaries	1.75 (1.25)	1.57 (1.12)	1.57 (1.11)
Business & Government Profits	-0.88 (-0.14)	-0.64 (-0.10)	-1.08 (-0.19)
Less: Dividend Paid to Non-Resident	-0.47 (-0.01)	-0.76 (-0.01)	-1.30 (-0.02)
Interest & Misc. Income	0.30 (0.03)	0.38 (0.04)	0.50 (0.04)
Farm Income	0.97 (0.02)	0.95 (0.02)	0.84 (0.02)
Non-Farm Income	0.49 (0.03)	0.69 (0.04)	0.96 (0.05)
Inventory Valuation Adjustment	2.50 (-0.08)	1.56 (-0.04)	0.71 (-0.02)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Domestic wages. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighing component state elasticities by the income components share of total. These weighted state elasticities add to the total.

composition of incremental debt issued (repaid). If a high proportion of incremental debt is held outside the personal sector, this would imply different elasticities for the two items mentioned in (2). (4) The need to issue incremental debt and its composition depends upon the alignment of revenue and spending elasticities by level of government.

Under conditions of wage and price shocks, we indicate, in a future section, that provincial spending elasticities are greater than provincial revenue elasticities. Furthermore, we indicate that federal spending elasticities, abstracting from the problem of established program financing, are less than federal revenue elasticities except in the case of a domestic price shock. Here spending elasticities approach revenue elasticities. With these points in mind, let us examine the results recorded in Tables 51 - 54.

The impact that wage and price shocks have on the functional distribution of income contains few surprises. The shift in the real wage associated with price shocks implies a shift in the functional distribution of income toward profits. Initially, the profit state elasticity is high and the wage state elasticity is less than 1.0. Although the wage state elasticity increases as the real wage recovers, it never reaches 1.0, implying a permanent shift in the income distribution towards profits. For the wage shock we see the opposite effect. A high state elasticity associated with wage income and a negative state

elasticity associated with profits, implying a shift in the income distribution towards wages. These shifts in the income distribution between wages and profits have important effects on the revenue base upon which both federal and provincial taxes are levied.

There are also important effects on interest and miscellaneous investment income from these price and wage shocks. The most tell-tale impact is observed by comparing Table 55 with Table 56. For a domestic and foreign price shock, the interest and miscellaneous investment income state elasticity in the long run is .95. When a domestic price shock is imposed upon the system the long run elasticity is .47. The major reasons for differences between these two alternatives is associated with the magnitude and composition of the incremental debt issued to finance any imbalance that might occur between revenue and spending by level of government.

For example, in the case of a domestic price shock federal spending elasticities in some instances exceed federal revenue elasticities. This results in increased federal debt which is primarily bond financed. A high proportion of this debt is held outside the personal sector. In the case of a domestic and foreign price shock, revenue elasticities exceed spending elasticities at the federal level. This is primarily due to the fall in the value of the state elasticity associated with transfer payments (less unemployment compensation). In both



alternatives the revenue elasticities at the provincial level are less than the spending elasticities. As a result differences in the composition of incremental debt stem primarily from federal bond financing activities. In the first case bond financing occurs. In the second case, debt repayment occurs. This is the major reason why the interest and miscellaneous income state elasticities differ between these alternatives. A similar argument can be made for the other alternatives.

#### COMPOSITIONAL EFFECTS ON PERSONAL INCOME

The impact that these wage and price shocks have on the composition of personal income clarify some of the points made in previous sections. We record the results for the composition of personal income in Table 59-62. Briefly, price shocks shift the composition of personal income away from wages. This represents nothing new given our previous discussion, however, there are a number of other compositional affects which should be noted.

In the long run the price shocks have similar state elasticities with respect to wages. They range from .62 to .67, however, there is wide variation in the state elasticities associated with interest dividends and miscellaneous income and transfer payments. This variation is explained by: 1) the different effect that each of these price shocks has on revenue and spending elasticities by level of government, which leads to secondary effects on the composition of debt holdings, and 2) the



Table 55

Interest and Miscellaneous Investment Income, State Elasticities, Domestic and Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Interest & Misc. Investment Income	0.86 (0.09)	0.75 (0.08)	0.95 (0.08)
Add:			
Interest to Persons	0.53 (0.06)	1.11 (0.13)	0.42 (0.04)
Government Investment Income	0.36 (0.03)	0.32 (0.03)	0.59 (0.05)
Unremitted Profits (Govt.)	4.93 (0.02)	-2.68 (-0.01)	0.51 (0.00)
Govt. Direct Taxes, Corp. Profits	4.01 (0.00)	-1.14 (-0.00)	0.97 (0.00)
Deduct:			
Interest on Public Debt	0.14 (0.01)	0.42 (0.03)	-0.12 (-0.01)
Interest on Consumer Debt	0.39 (0.01)	1.88 (0.04)	1.44 (0.02)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent sustained upward displacement in Domestic and Foreign prices used as primary inputs in final demand price conversion. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighing component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 56

Interest and Miscellaneous Investment Income, State Elasticities, Domestic Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Interest & Misc. Investment Income	0.85 (0.09)	0.78 (0.08)	0.47 (0.04)
Add:			
Interest to Persons	0.63 (0.08)	1.60 (0.19)	1.20 (0.12)
Government Investment Income	0.36 (0.03)	0.36 (0.03)	0.77 (0.07)
Unremitted Profits (Govt.)	4.62 (0.02)	-3.06 (-0.01)	0.74 (0.00)
Govt. Direct Taxes, Corp. Profits	3.76 (0.00)	-1.41 (-0.00)	1.17 (0.00)
Deduct:			
Interest on Public Debt	0.30 (0.02)	1.03 (0.09)	1.34 (0.11)
Interest on Consumer Debt	0.33 (0.01)	2.18 (0.04)	1.95 (0.04)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Domestic industry prices used as primary inputs in final demand price conversion. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighing component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 57

Interest and Miscellaneous Investment Income, State Elasticities, Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Interest & Misc. Investment Income	0.85 (0.09)	0.75 (0.08)	1.20 (0.10)
Add:			
Interest to Persons	0.33 (0.04)	0.52 (0.06)	-0.06 (-0.00)
Government Investment Income	0.38 (0.03)	0.27 (0.02)	0.44 (0.04)
Unremitted Profits (Govt.)	5.48 (0.02)	-1.42 (-0.00)	0.34 (0.00)
Govt. Direct Taxes, Corp. Profits	4.44 (0.00)	-0.33 (-0.00)	0.81 (0.00)
Deduct:			
Interest on Public Debt	-0.15 (-0.01)	-0.29 (-0.02)	-1.02 (-0.08)
Interest on Consumer Debt	0.55 (0.01)	1.33 (0.03)	1.17 (0.02)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Foreign prices used as primary inputs in final demand price conversion. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighing component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 58

Interest and Miscellaneous Investment Income, State Elasticities, Domestic Wage Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Interest & Misc. Investment Income	0.30 (0.03)	0.38 (0.04)	0.50 (0.04)
Add:			
Interest to Persons	0.46 (0.05)	0.68 (0.08)	0.56 (0.05)
Government Investment Income	0.10 (0.01)	0.25 (0.02)	0.55 (0.05)
Unremitted Profits (Govt.)	-0.62 (-0.00)	-0.12 (-0.00)	-0.40 (-0.00)
Govt. Direct Taxes, Corp. Profits	-0.51 (-0.00)	-0.18 (-0.00)	0.51 (-0.00)
Deduct:			
Interest on Public Debt	0.13 (0.01)	0.36 (0.03)	0.38 (0.03)
Interest on Consumer Debt	0.97 (0.02)	1.63 (0.03)	1.57 (0.03)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Domestic wages. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighing component state elasticities by the income components share of total. These weighted state elasticities add to the total.



Table 59

Composition of Personal Income, State Elasticities, Domestic and Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Personal Income	0.56	1.00	0.82
Total Wages & Salaries	0.20 (0.13)	0.77 (0.52)	0.67 (0.47)
Farm Income	2.20 (0.05)	1.84 (0.04)	1.91 (0.05)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	1.21 (0.06)	1.49 (0.07)	1.25 (0.06)
Interest, Divident & Misc.	2.07 (0.26)	1.53 (0.19)	0.89 (0.10)
Transfer Payment to Persons	0.42 (0.05)	1.36 (0.17)	1.15 (0.14)
Capital Assistance to Persons	-0.06 (-0.00)	0.14 (0.00)	-0.00 (-0.00)
Transfers From Corporations	3.87 (0.01)	1.24 (0.00)	1.62 (0.00)
Transfers From Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Domestic and Foreign prices used as primary inputs in final demand price conversion. Data are obtained by dividing the per cent deviation of the income component from the refered case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 60

Composition of Personal Income, State Elasticities, Domestic Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Personal Income	0.60	1.19	0.98
Total Wages & Salaries	0.19 (0.13)	0.83 (0.56)	0.62 (0.43)
Farm Income	2.62 (0.06)	1.86 (0.04)	1.80 (0.05)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	1.56 (0.08)	2.16 (0.11)	1.97 (0.10)
Interest, Divident & Misc.	2.05 (0.26)	1.89 (0.24)	1.67 (0.18)
Transfer Payment to Persons	0.56 (0.07)	1.87 (0.23)	1.74 (0.21)
Capital Assistance to Persons	-0.02 (-0.00)	0.18 (0.00)	-0.00 (-0.00)
Transfers From Corporations	3.65 (0.01)	1.11 (0.00)	1.88 (0.00)
Transfers From Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Domestic prices used as primary inputs in final demand price conversion. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 61

Composition of Personal Income, State Elasticities, Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Personal Income	0.58	0.80	0.74
Total Wages & Salaries	0.22 (0.15)	0.62 (0.42)	0.67 (0.46)
Farm Income	5.58 (0.12)	4.31 (0.10)	3.20 (0.08)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	0.42 (0.02)	0.63 (0.03)	0.82 (0.04)
Interest, Divident & Misc.	2.07 (0.26)	1.18 (0.15)	0.44 (0.05)
Transfer Payment to Persons	0.18 (0.02)	0.85 (0.11)	0.85 (0.11)
Capital Assistance to Persons	-0.14 (-0.00)	0.10 (0.00)	0.00 (0.00)
Transfers From Corporations	4.23 (0.01)	1.60 (0.00)	1.43 (0.00)
Transfers From Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Foreign prices used as primary inputs in final demand price conversion. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.

Table 62

Composition of Personal Income, State Elasticities, Domestic Wage Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Personal Income	1.37	1.34	1.35
Total Wages & Salaries	1.75 (1.18)	1.57 (1.06)	1.57 (1.09)
Farm Income	0.97 (0.02)	0.95 (0.02)	0.84 (0.02)
Value Adjustment Grain	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Non-Farm Income	0.49 (0.02)	0.69 (0.03)	0.96 (0.05)
Interest, Divident & Misc.	0.27 (0.03)	0.53 (0.07)	0.23 (0.03)
Transfer Payment to Persons	0.88 (0.11)	1.23 (0.15)	1.31 (0.16)
Capital Assistance to Persons	0.11 (0.0)	0.00 (0.0)	0.00 (0.00)
Transfers From Corporations	-0.42 (-0.00)	-0.32 (-0.00)	-0.71 (-0.00)
Transfers From Non-Resident	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

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1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are derived from a 1.0 per cent substained upward displacement in Domestic wages. Data are obtained by dividing the per cent deviation of the income component from the reference case by the per cent deviation of GNE from the reference case. Results reported in brackets are obtained by weighting component state elasticities by the income components share of total. These weighted state elasticities add to the total.



loss of competitiveness associated with domestic price shocks unaccompanied by a foreign price shock, which leads to a high state elasticity with respect to transfer payments. For a domestic and foreign price shock the transfer elasticity is 1.15, for a domestic price shock the transfer elasticity is 1.74, for a foreign price shock the transfer elasticity is .85. The impact on the transfer elasticity in the long run is directly related to the composition of final demand (import substitution).

We see a number of subtle links in examining these results. Price shocks can shift the composition of personal income towards transfer payments and in some instances towards interest and dividend type income. The magnitude of the latter shift depends on the magnitude of the former shift. The transfer elasticity is influenced by the impact of the shock on the composition of final demand, and in particular on its domestic versus foreign content. The size of the interest and dividend elasticity is influenced indirectly by the composition of supply by way of its impact on transfer payments.

#### TAX AND SPENDING ELASTICITIES BY LEVEL OF GOVERNMENT

The response indicated for, (1) the composition of spending, (2) the functional distribution of income, (3) interest received by persons, (4) interest paid by governments, and (5) the composition of personal income all have a bearing on the tax base upon which provincial and federal revenues are levied. These

responses also influence spending at federal and provincial levels. In our discussion of quantity shocks we obtained a number of interesting results, each of which depended on the general characteristics of the multiplier and in some instances, on the alignment (or misalignment) of spending and revenue elasticities by level of government. The results obtained from the price and wage alternatives show the same patterns and some additional effects.

We must be careful in interpreting these results for the following reasons. Established program financing is a large expenditure of the federal government and a large receipt of provincial governments. In formulating the alternatives we did not, because of the complexity of the task, model these transfer payments in response to each price and wage shock. As a result, the estimates of federal spending elasticities and provincial revenue elasticities are less than what would occur if these items were properly modelled.

We indicated that major differences between the wage and price alternatives could be traced to differences in the equilibrium real wage and differences in the equilibrium domestic-foreign price relatives. These differences cause shifts in the income distribution and in the composition of final demand. This account for the differences in spending and revenue elasticities by level of government. Before tracing these effects in detail let us examine the general results recorded in Table 63-66.

In three cases (the domestic and foreign price shock, the foreign price shock and the wage shock) federal revenue elasticities in the short and long run are greater than federal spending elasticities (remember the transfer elasticity, federal government to provinces in each case is arbitrarily low). In one case (domestic price shock) the federal revenue elasticities in the long run are similar to the federal expenditure elasticities, both approaching the range of 1.2 to 1.25. For provincial governments, revenue elasticities are always lower than spending elasticities. In particular the gap is widest for the case of a domestic price shock.

Let us compare the results for a domestic and foreign price shock with that of a domestic price shock. First compare the transfer elasticity (Table 63) with the transfer elasticity (Table 64) associated with federal government expenditures. For a domestic and foreign price shock, in the long run, it is .39. For a domestic price shock in the long run it is .66. The interest payments elasticity for a domestic and foreign price shock is negative in the long run, but for a domestic price shock it is positive in the long run. This accounts for the increase in the federal government expenditure elasticity from .47 in the first case to 1.19 in the second case. In the short run there is not much difference between the expenditure elasticities.

What we have here is the net result of a change in relative prices (domestic versus foreign) on federal expenditure



Table 63

Revenue and Expenditure Decomposition, Weighted State Elasticities, Domestic and Foreign Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Federal Government Revenue	1.41	1.10	1.09
Personal Income Tax	0.28	0.23	0.18
Corporation Tax	0.84	0.65	0.45
Manufacturing Sales Tax	0.06	0.09	0.09
Investment Income	0.10	0.04	0.14
Other Income	0.13	0.09	0.23
Federal Government Expenditure	0.43	0.78	0.47
Goods & Services	0.30	0.25	0.23
Transfers to Persons	0.04	0.42	0.39
Transfers to Provinces	0.02	0.02	0.02
Interest Payments	0.04	0.06	-0.18
Other Expenditures	0.03	0.03	0.02
Provincial Government Revenue	0.62	0.70	0.64
Personal Income Tax	0.16	0.17	0.13
Corporation Tax	0.29	0.23	0.17
Retail Sales Tax	0.04	0.10	0.10
Investment Income	0.02	0.06	0.08
Other Income	0.11	0.14	0.16
Provincial Government Expenditure	0.97	1.30	1.13
Goods & Services	0.45	0.24	0.22
Transfers to Persons	0.18	0.22	0.15
Transfers to Inter-Government	0.20	0.60	0.55
Interest Payments	0.00	0.02	0.10
Other Expenditures	0.15	0.21	0.12

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a 1.0 per cent sustained upward displacement in Domestic and Foreign prices used as primary inputs in final demand price conversion. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.



Table 64

Revenue and Expenditure Decomposition, Weighted State Elasticities, Domestic Price Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Federal Government Revenue	1.32	1.10	1.25
Personal Income Tax	0.33	0.31	0.21
Corporation Tax	0.79	0.63	0.49
Manufacturing Sales Tax	0.06	0.10	0.09
Investment Income	0.10	0.04	0.18
Other Income	0.04	0.02	0.28
Federal Government Expenditure	0.59	1.22	1.19
Goods & Services	0.35	0.35	0.33
Transfers to Persons	0.10	0.62	0.66
Transfers to Provinces	0.02	0.02	0.02
Interest Payments	0.08	0.21	0.17
Other Expenditures	0.03	0.01	0.00
Provincial Government Revenue	0.62	0.77	0.70
Personal Income Tax	0.18	0.22	0.15
Corporation Tax	0.28	0.22	0.19
Retail Sales Tax	0.02	0.10	0.09
Investment Income	0.03	0.07	0.10
Other Income	0.12	0.16	0.18
Provincial Government Expenditure	1.18	1.80	1.68
Goods & Services	0.58	0.40	0.41
Transfers to Persons	0.19	0.27	0.14
Transfers to Inter-Government	0.24	0.84	0.77
Interest Payments	0.00	0.04	0.20
Other Expenditures	0.16	0.25	0.14

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a 1.0 per cent sustained upward displacement in Domestic prices used as primary inputs in final demand price conversion. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.

elasticities. A loss of competitiveness in the long run can increase federal spending elasticities, while leaving federal revenue elasticities unchanged. The same result is obtained for provincial revenues and provincial expenditures. Expenditure elasticities vary widely while revenue elasticities are subject to narrow variation. This is also apparent when comparing the federal expenditure elasticities across the three price shock cases. For a foreign price shock, the expenditure elasticity is .10; for a foreign and domestic price shock it is .47; and for a domestic price shock it is 1.19. A loss of competitiveness eventually shows up in the government accounts as an imbalance between revenue and expenditures.

Let us take a closer look at the composition of federal revenues. The three price shock alternatives, are all cases in which there is a permanent loss in the real wage. In each case the personal income tax makes only a small contribution to the increase in total federal revenues. Most of the contribution comes from corporate taxation. However, in the case of a domestic wage shock, there is a permanent increase in the real wage. As a result the bulk of the increase in the revenue elasticity stems from personal taxation. Real wage growth carries with it a high personal tax elasticity, and a stagnant real wage carries with it a low personal tax elasticity. In simple terms price inflation without wage inflation produces a shift in the income distribution away from wages (towards profits) and, given an indexed tax system, produces a low

elasticity of personal tax collections with respect to assessed income. As a result the elasticity of the personal tax system with respect to GNE is doubly cursed.

In the above we have abstracted from the impact of established program financing. Let us deal with this issue indirectly by examining the results in Table 64 (domestic price shock). In this case federal expenditure and federal revenue elasticities in the long run are near balance, but provincial revenue and expenditure elasticities are out of balance. Part of the imbalance at the provincial level could be corrected in our calculations if we properly modelled transfers to provinces. If this item were properly modelled, it would increase the imbalance between federal spending and revenue elasticities and at the same time reduce the imbalance at provincial levels. Remembering the indirect influence that revenue and spending elasticities have on the interest payments elasticity (in the long run), the federal imbalance would increase by an amount greater than the correction associated with transfer payments.

An inflationary environments impact on federal financing depends upon two items, (1) what the long-run impact is on the real wage and (2) what the long-run impact is on the ratio of domestic to foreign prices. During the period 1978-1980 we have had: (1) a falling real wage and (2) large downward adjustments in the exchange rate. The first would imply a set of elasticities that would be opposite to what we have recorded in



Table 66 or much like what we have recorded in Table 64.

Federal government revenue elasticities that are marginally less in the long run than federal government spending elasticities, and provincial government spending elasticities which were much higher than provincial government revenue elasticities. Common to both simulations reported in Table 64 are, (1) the level of established program financing and (2) the level of the oil price subsidy. The same oil price regimes and transfers, were assumed in both the reference and alternatives. If the domestic price shock was heavily weighted toward energy prices, we would see a completely different result. If the domestic price shock were accompanied by a foreign price shock both of which were heavily weighted towards energy prices, we would again see a much different result. In any event the results recorded in Table 64 characterize in general what happens when Canada experiences rapid rates of inflation relative to both domestic (labour) and foreign costs.

Suppose Canada were to restore through a set of unspecified policies rapid growth in the real wage (high growth in productivity). This would imply revenue elasticities substantially higher than spending elasticities with large contributions from the personal income tax system to incremental revenues. This can be varified by examining the results in Table 66. However, it is more informative to examine the results in Table 68-70. Here we record the state elasticity of personal income tax with respect to nominal GNE, the state elasticity of



Table 65

Revenue and Expenditure Decomposition, Weighted State Elasticities, Foreign Price Shock<sup>1,2</sup>

	1980	1981	<u>Average</u> 1982-86
Federal Government Revenue	1.65	1.09	0.95
Personal Income Tax	0.24	0.17	0.16
Corporation Tax	0.93	0.67	0.42
Manufacturing Sales Tax	0.09	0.10	0.09
Investment Income	0.11	0.04	0.11
Other Income	0.28	0.12	0.17
Federal Government Expenditure	0.16	0.32	0.10
Goods & Services	0.22	0.14	0.16
Transfers to Persons	-0.08	0.22	0.22
Transfers to Provinces	0.02	0.02	0.02
Interest Payments	-0.04	-0.10	-0.34
Other Expenditures	0.04	0.04	0.03
Provincial Government Revenue	0.69	0.64	0.60
Personal Income Tax	0.14	0.13	0.11
Corporation Tax	0.32	0.24	0.16
Retail Sales Tax	0.09	0.11	0.11
Investment Income	0.02	0.05	0.07
Other Income	0.11	0.12	0.14
Provincial Government Expenditure	0.55	0.74	0.68
Goods & Services	0.15	0.13	0.08
Transfers to Persons	0.18	0.19	0.17
Transfers to Inter-Government	0.10	0.23	0.32
Interest Payments	0.00	-0.01	0.00
Other Expenditures	0.12	0.19	0.11

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a 1.0 per cent sustained upward displacement in Foreign prices used as primary inputs in final demand price conversion. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.

Table 66

Revenue and Expenditure Decomposition, Weighted State Elasticities, Domestic Wage Shock<sup>1,2</sup>

	1980	1981	Average 1982-86
Federal Government Revenue	1.29	1.22	1.14
Personal Income Tax	1.19	0.95	0.79
Corporation Tax	-0.11	-0.12	-0.21
Manufacturing Sales Tax	0.08	0.10	0.11
Investment Income	0.00	0.04	0.11
Other Income	0.12	0.25	0.34
Federal Government Expenditure	0.79	0.87	0.81
Goods & Services	0.42	0.34	0.32
Transfers to Persons	0.26	0.42	0.46
Transfers to Provinces	0.03	0.02	0.02
Interest Payments	0.04	0.06	-0.04
Other Expenditures	0.04	0.04	0.05
Provincial Government Revenue	0.95	0.88	0.87
Personal Income Tax	0.65	0.53	0.47
Corporation Tax	-0.03	-0.03	-0.07
Retail Sales Tax	0.11	0.14	0.16
Investment Income	0.03	0.05	0.08
Other Income	0.19	0.19	0.23
Provincial Government Expenditure	1.16	1.32	1.42
Goods & Services	0.70	0.50	0.44
Transfers to Persons	0.19	0.19	0.17
Transfers to Inter-Government	0.18	0.52	0.65
Interest Payments	0.00	0.01	0.09
Other Expenditures	0.10	0.11	0.07

1 Source: CANDIDE Model 2.0, December 1980.

2 Results reported in this table are weighted state elasticities. Data is derived from a 1.0 per cent sustained upward displacement in Domestic wages. Data are obtained by weighting each state elasticity with respect to GNE for each revenue (expenditure) component by the share of total. These weighted state elasticities add to the total for each federal (provincial) revenue (expenditure) category.

Table 67

Total Government Revenue, State Elasticities<sup>1</sup>

	1980	1981	Average 1982-86
Domestic and Foreign Price Shock <sup>2</sup>	0.97	0.91	0.86
Domestic Price Shock <sup>3</sup>	0.94	0.97	1.02
Foreign Price Shock <sup>4</sup>	1.07	0.81	0.72
Domestic Wage Shock <sup>5</sup>	1.11	1.07	1.04

1 Source: CANDIDE Model 2.0, December 1980.

2 Derived from 1.0 percent sustained upward displacement in Domestic and Foreign Prices.

3 Derived from 1.0 percent sustained upward displacement in Domestic Prices

4 Derived from 1.0 percent sustained upward displacement in Foreign Prices

5 Derived from 1.0 percent sustained upward displacement in Domestic Wages

Table 68

Personal Income Tax, State Elasticities with Respect to Nominal GNE<sup>1</sup>

	1980	1981	Average 1982-86
Domestic and Foreign Price Shock <sup>2</sup>	0.71	0.67	0.52
Domestic Price Shock <sup>3</sup>	0.85	0.87	0.60
Foreign Price Shock <sup>4</sup>	0.63	0.49	0.45
Domestic Wage Shock <sup>5</sup>	3.02	2.44	2.12

1 Source: CANDIDE Model 2.0, December 1980.

2 Derived from 1.0 percent sustained upward displacement in Domestic and Foreign Prices.

3 Derived from 1.0 percent sustained upward displacement in Domestic Prices

4 Derived from 1.0 percent sustained upward displacement in Foreign Prices

5 Derived from 1.0 percent sustained upward displacement in Domestic Wages



Table 69

Personal Income Tax, State Elasticities with Respect to Assessed Income<sup>1</sup>

	1980	1981	Average 1982-86
Domestic and Foreign Price Shock <sup>2</sup>	1.74	0.72	0.68
Domestic Price Shock <sup>3</sup>	1.91	0.80	0.66
Foreign Price Shock <sup>4</sup>	1.51	0.69	0.66
Domestic Wage Shock <sup>5</sup>	2.11	1.77	1.52

1 Source: CANDIDE Model 2.0, December 1980.

2 Derived from 1.0 percent sustained upward displacement in Domestic and Foreign Prices.

3 Derived from 1.0 percent sustained upward displacement in Domestic Prices

4 Derived from 1.0 percent sustained upward displacement in Foreign Prices

5 Derived from 1.0 percent sustained upward displacement in Domestic Wages

Table 70

Assessed Income, State Elasticities with Respect to Nominal GNE<sup>1</sup>

	1980	1981	Average 1982-86
Domestic and Foreign Price Shock <sup>2</sup>	0.41	0.92	0.77
Domestic Price Shock <sup>3</sup>	0.44	1.09	0.90
Foreign Price Shock <sup>4</sup>	0.41	0.71	0.69
Domestic Wage Shock <sup>5</sup>	1.43	1.38	1.40

1 Source: CANDIDE Model 2.0, December 1980.

2 Derived from 1.0 percent sustained upward displacement in Domestic and Foreign Prices.

3 Derived from 1.0 percent sustained upward displacement in Domestic Prices

4 Derived from 1.0 percent sustained upward displacement in Foreign Prices

5 Derived from 1.0 percent sustained upward displacement in Domestic Wages

Table 71

Total Government Spending, State Elasticities<sup>1</sup>

	1980	1981	Average 1982-86
Domestic and Foreign Price Shock <sup>2</sup>	0.86	1.09	0.85
Domestic Price Shock <sup>3</sup>	1.12	1.63	1.58
Foreign Price Shock <sup>4</sup>	0.33	0.50	0.37
Domestic Wage Shock <sup>5</sup>	1.23	1.21	1.18

1 Source: CANDIDE Model 2.0, December 1980.

2 Derived from 1.0 percent sustained upward displacement in Domestic and Foreign Prices.

3 Derived from 1.0 percent sustained upward displacement in Domestic Prices

4 Derived from 1.0 percent sustained upward displacement in Foreign Prices

5 Derived from 1.0 percent sustained upward displacement in Domestic Wages

personal income tax with respect to assessed income, and the state elasticity of assessed income with respect to nominal GNE. The most important result is contained in Table 66.

Note that for domestic and foreign price shocks, domestic price shocks and foreign price shocks this elasticity is much less than 1.0. In the long run it ranges from .45 to .60. However, in the case of a domestic wage shock which implies real wage gains, the elasticity is extremely high, in the range of 2.0. It might be instructive to compare these results with those reported in Table 40. Under conditions of a quantity shock emanating from either the federal or provincial government the state elasticity of personal income tax with respect to GNE in the long run is in the range 1.9 to 2.0. Under conditions of a price shock this elasticity is in the range of .45 to .60. However, under conditions of a wage shock it is in the range of 2.0.

Let us look at total government revenue and total government spending state elasticities. These results are contained in Table 67 and Table 71. They are for all governments combined, federal, provincial, municipal, local, hospital and the pension plans. Under a domestic and foreign price shock in the long run the revenue elasticity is about equal to the spending elasticity; under condition of a domestic price shock, the revenue elasticity is far less than the spending elasticity; under conditions of a foreign price shock the revenue elasticity exceeds the spending elasticity; under conditions of a domestic wage shock, in the



long run revenue elasticities are slightly less than spending elasticities. As a complete system we obtain results which are consistent with our priors. Higher domestic and foreign prices do not distort revenue and spending elasticities. Higher domestic prices, however, do distort these elasticities as do higher foreign prices. However, when the accounts are disaggregated and one looks at the impacts by level of government a completely different picture emerges. Once again I remind the reader that this picture excludes the impact on revenue elasticities at the provincial level and spending elasticities at the federal level associated with established program financing. It also excludes the shifts that occur when domestic oil prices or foreign oil prices change.

#### SUMMARY OF THE ANALYSIS

What lessons can we learn from the quantity shocks?

(1) Federal spending multipliers are in general lower than provincial spending multipliers, (2) the size and dynamic path of these spending multipliers influences the revenue generating capacity and spending response of both federal and provincial governments, (3) changes in the functional distribution of income have an important bearing on the dynamic path of the revenue elasticities due to the way these changes influence the composition of the income base upon which taxes are levied, (4) the revenue generating capacity as characterized by tax elasticities, and spending response as characterized by spending

elasticities, are not aligned; as a result of these differences, persistent federal deficits and fiscal imbalance might ensue if the federal government initiates spending initiatives without raising tax rates, (5) bond financed spending initiatives at the federal level appears to shift the distribution of debt holdings away from the personal sector, (6) major differences are apparent in the debt servicing elasticity associated with a federal goods shock and the debt servicing elasticity associated with a provincial goods shock, thus bond financing at the federal level shifts income out of the personal sector, (7) the federal government benefits more from provincial shocks than provincial governments benefit from a federal shock, (8) there is some evidence (the influence that debt financing has on long-term interest rates) that persistent government deficits crowd out private capital formation, (9) due to the difference that we observe between the provincial goods shock and the federal goods shock there is evidence that the method of financing influences the size of the multiplier, and (10) crowding out increases spending elasticities and reduces the tax elasticity associated with personal income.

What lessons can we learn from the wage and price shocks?

(1) under conditions of price shocks provincial revenue elasticities are far less than spending elasticities, (2) federal revenue elasticities appear to be higher than federal spending elasticities except in cases where a loss of competitiveness results from a change in domestic foreign price relatives,

(3) the personal income tax elasticity falls well below 1.0 under conditions of a price shock, whether it be domestic or foreign, (4) under conditions of a wage shock the personal tax elasticity with respect to assessed income or with respect to GNE appears similar to that obtained under conditions of a quantity shock emanating from either level of government, (5) the personal tax system of Canada will only respond with a high elasticity when there are gains in real wages (high growth in productivity), and (6) we have verified that the lack of alignment between spending and revenue elasticities by level of government eventually leads to bond financing by the federal government shifting incremental debt away from the personal sector producing compositional shifts in the distribution of personal income and the functional distribution of income.

#### CONCLUSIONS

We began this paper by stating that existing econometric models had come under attack because they fail to explain, in particular, imbalances that are currently visible in the Canadian system. In particular the imbalance between federal and provincial revenues and expenditures was cited. In this paper we have examined 11 different environments. Seven associated with quantity shocks and four associated with price shocks. None of these environments replicate the current Canadian experience. However, combining the domestic price shock case with the quantity shock case (no wealth, price and interest sensitive) is not unlike the current Canadian situation.



What are the things that we learned about revenue and spending elasticities in these two cases? We learned the multipliers are in general low, therefore, Keynesian type fiscal policy initiatives (increased spending) is an impotent route. We learned under these conditions, tax elasticities are low, impacts on real wages are low, and that the compositional shift in income was, in fact, away from the personal sector for certain items. Under conditions of a domestic price shock we learned that tax elasticities are low, that transfer elasticities are high, and that the incremental pressures on provincial revenues from provincial spending is high. This is not inconsistent with the way the world is currently working.

In the worst of all possible cases we could view a world constantly wracked by inflationary shocks, high interest rates and low real growth. This would have a tendency to put downward pressure on revenue elasticities, eventually causing wide gaps between revenue and expenditure at the federal level. This, coupled with an oil subsidy program (which is now a large expenditure item) where price shocks directly influence subsidy payments, could in a very short period of time produce an intolerable situation for federal government finances. Oil price shocks result in higher subsidy payments which require financing, but this subsidy only indirectly provides stimulus to the system through holding a subsidized price low. The danger here is that bond financing of oil subsidy payments may shift the composition of debt away from the personal sector.



What is the solution? In the Seventeenth Annual Review we indicated "top priority must now be given to achieving a better rate of growth in the real incomes of Canadians". The results obtained in this analysis support without doubt this one simple statement. It would appear to me that rearranging fiscal relationships between levels of government will not in fact, improve growth in Canada. It may shift the deficit from one level of government to another, and rightly so make the financing of the deficit the responsibility of those who incurred the cost originally. This, of course, is an improvement. However, it appears to me that attention must also be given to rearranging the relationship between government and the private sector. We will not achieve higher growth through a new set of fiscal arrangements. We will achieve higher growth by rearranging the overall tax structure, including private sector incentives. We appear to be fascinated and possibly almost hypnotized by arguments over revenue sharing, resource distribution, resource ownership, the financing of education, the financing of health care, etc. It would be unfortunate if we thought that solving the problems of revenue sharing, established program financing and the like would itself automatically lead to growth. It will only set the stage for growth.

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