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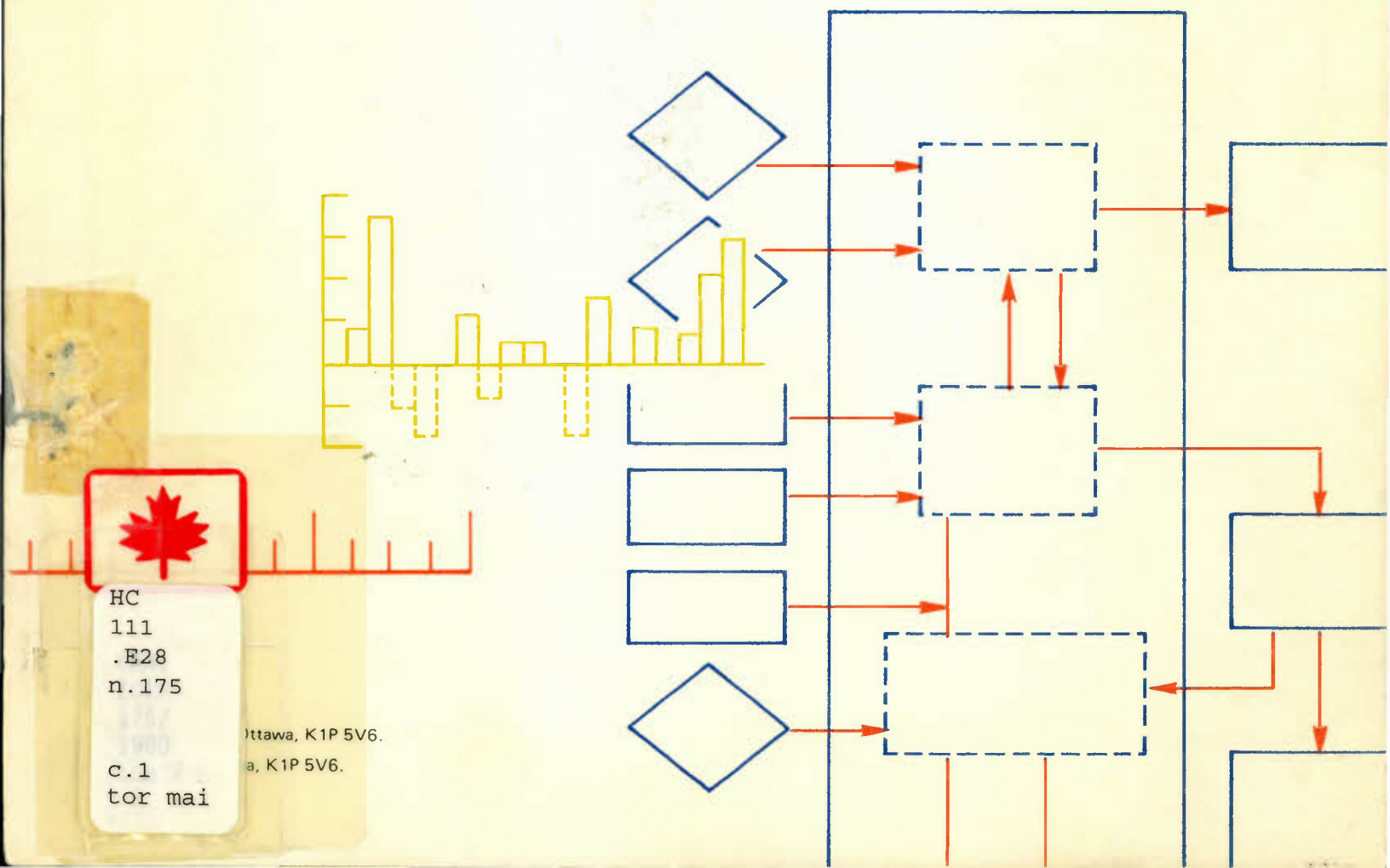

DISCUSSION PAPER NO. 175

Price Formation in an Open Economy and the Relative Efficiency of Fiscal and Monetary Stabilization Policies: The Case of Canada

by

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Résumé

Le présent document a comme premier objet d'examiner les divers aspects de la formation des prix dans une économie ouverte, comme celle du Canada, et d'évaluer dans ce contexte l'efficacité relative des politiques de stabilisation budgétaires et monétaires à l'aide du nouveau modèle CANDIDE 2.0. La question de l'inflation de source étrangère et le problème de la rigidité traditionnelle des prix intérieurs, par rapport aux coûts intérieurs, sont analysés à court et à moyen termes.

Voici les principales constatations de l'auteur :

1. Les prix sont moins élastiques à court terme qu'à moyen terme, par rapport aux coûts intérieurs. L'élasticité à court terme des prix intérieurs en fonction du taux de rémunération horaire est d'environ 0,35, et à moyen terme, de 0,65.

2. L'équation de prix macro-économique, qui est habituellement estimée à partir de variables de même nature, semble être faussée. Une erreur d'agrégation peut entraîner de graves problèmes dans l'établissement des politiques budgétaires ou monétaires.

3. Les prix sont inélastiques surtout parce qu'il se fait

peu de substitution entre les produits canadiens et les produits importés, même dans une économie ouverte. En outre, dans ce genre d'économie, le comportement des prix à l'importation contribue aux pressions globales des prix, particulièrement sur l'I.P.C.

4. Les politiques de stabilisation budgétaires et monétaires ont leur rôle à jouer, dans une certaine mesure, à cause de la rigidité des prix. Ainsi, une plus grande flexibilité des prix en fonction des salaires contribue effectivement à réduire les effets des multiplicateurs budgétaires et monétaires. Les politiques monétaires expansionnistes prennent du temps à se faire sentir sur les prix. Toutefois, les politiques de stabilisation contribuent à accroître les déficits du secteur public et de la balance des paiements.

5. Étant donné la détérioration du contexte extérieur, les politiques de stabilisation (budgétaires) peuvent compenser en partie les dommages subis par l'économie, en accroissant la production, mais au prix, toutefois, d'une aggravation de l'inflation, ainsi que des déficits de la balance des paiements et du secteur public.

ABSTRACT

The main objective of this paper is to examine the various aspects of price formation in an open economy like Canada and to evaluate the relative efficiency of fiscal and monetary stabilization policies in that context, using the new CANDIDE Model 2.0. Imported inflation and the problems of traditional domestic price inflexibility with respect to domestic costs are analyzed in the short-run and in the medium-run.

The following are the major findings of our study:

1. Prices are more sticky in the short-run than in the medium-run with respect to domestic costs. The short-run elasticity of domestic price with respect to hourly money wage rate is roughly .35 and the medium-run is .65.

2. Macro-price equation traditionally estimated from macro variables appears to be biased. Aggregation bias can lead to serious problems in policy making -- fiscal or monetary.

3. Prices are sticky largely because of limited import substitution between domestic and imported goods even in an open economy. Behaviourally also import prices do play a part in the overall price pressures in an open economy, particularly for CPI.

4. Fiscal and monetary stabilization policies do have some significance due to price inflexibility. Greater price

flexibility, i.e., price-wage flexibility does reduce the fiscal and monetary multipliers. Monetary expansionist policies take a long time to filter through prices. However, stabilization policies lead to increasing government and balance of payments deficits.

5. Stabilization (fiscal) policies in the context of the deteriorating external environment can repair some of the damage done to the economy by increasing output, but these policies have to pay the price of higher inflation and worsening balance of payments and government deficits.

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INTRODUCTION

Recent macro-models for stabilization policies in an open economy, where international prices make major incursions into domestic price formation (for both tradables and nontradables), have concentrated on the Mundellian efficient market classification, i.e., monetary policies for external balance and fiscal policies for internal balance (Turnovsky and Kaspura 1974). Many factors have been isolated to show that such a dichotomy may not hold good, namely the existence of managed floating exchange rate regime (as in Canada and U.S.A. very recently), the traditional domestic price inflexibility (short-run) with respect to domestic costs (Modigliani 1977), the level of aggregation of goods and services in the working model, et cetera. Most research in this field, both theoretical and empirical, is carried out in an amorphous homogeneous one-sector model with occasional split between tradables and nontradables. The ensuing result is still far from being unanimous, i.e., neutrality of money may not be maintained and fiscal policy mutliplier may still be operative. Since the basic thrust of stabilization policies has been put into cold storage due to rational expectations, an empirical assessment of these issues seems utterly relevant. As stabilization policies are primarily geared at the most to the medium-term (due to increasing uncertainty with regard

to parameters of a long-run model), an empirical model capable of price and output changes in an international environment in the medium term offers an interesting framework. It also releases the underlying empirical parameters which demonstrate the model results of inflation, unemployment and output changes under particular fiscal and monetary policies.

This paper intends to unfold the empirical content of an open economy like Canada in a largely disaggregated econometric model[1] called "CANDIDE Model 2.0" in the context of specific fiscal and monetary shocks. The model incorporates government budget constraint, an input-output system (with 44 industrial sectors), an integrated financial/monetary sector using asset-debt portfolio model, a particular subsystem of 44 industry-specific price equations involving role of import competitiveness and domestic costs, and other blocks determining final demand items like consumption, investment, government expenditure, et cetera. The present paper intends to examine questions such as:

a) How far are prices sticky (both short-run and medium-run) at the disaggregated level?
b) Do macro-price equations traditionally estimated in open economy models suffer from aggregation bias?

c) Why are prices sticky? Do import prices constrain domestic price formation? If so, by how much?

d) Is price inflexibility largely responsible for the fiscal and monetary multipliers that yield positive results which are traditionally paraphrased as Keynesian paradigms?

e) What happens to stabilization polices (both fiscal and monetary) when confronted with external shocks like depressed incomes of trading partners or rising foreign prices?

The present paper is now organized along the following lines:

a) Section I describes briefly the price determination process of CANDIDE 2.0 which includes the domestic industry price formation, commodity price determination and final demand price formation by detailed categories.

b) Section II derives the macro-prices from individual sector specific prices and examines the quantitative part of price inflexibility which have important impacts on real variables.

c) Section III analyzes the impact of specific fiscal and monetary shocks on the price formation in the model in terms of deviations of shocks from a given control solution. Here the literature on monetary-fiscal stabilization policies including the usual multiplier

properties is discussed. All shocks are carried out in context of a managed-floating exchange regime. This section also considers the possibilities of improved price adjustment mechanisms in the context of simulation experiments.

d) Section IV examines the role of alternative fiscal and monetary policies for stabilization in the presence of foreign inflation. The efficiency of fiscal-monetary stabilization policies under flexible floating exchange rate in the presence of a perturbed external inflationary scenario is the issue of main concern in this section.

e) Section V summaries the important findings of the study.

I Price Formation in CANDIDE

The process of price determination in CANDIDE 2.0 is briefly composed of the following elements:

a) industry-specific domestic price formation (44 industries called PX's);

b) commodity price formation (48 commodities in the first stage (called PQ's) via matrix manipulations involving industry prices (PX's), import content of commodities (u), and import prices (PM's);

c) commodity price formation (48 commodities) in the second stage involving special taxes applicable to manufacturing, i.e., manufacturing sales taxes, and noncommodity taxes;

d) pseudo-final demand prices (89 items) formed in first stage through a final demand bridge matrix before special provincial tax rates are applied;

e) pseudo-final demand prices (89 items) in the second stage after special provincial taxes are applied, (called PF's); and

f) actual-final demand prices with respect to consumption investment, and government expenditures are then explained in terms of pseudo-final demand prices (PF's) which are called adjustment equations. Export and import prices are exogenous in the model except for the exchange rate correction.

The system of commodity price formation given the PX's is explained in terms of simple matrix algebra in Appendix A together with the necessary dimensions. The essential principle to note in this context is that once PX's are determined, final demand prices are weighted averages of PX's and PM's (import prices) where weights are given by the Canadian 1971 Input-Output technology matrix (called use matrix), market share matrix (called make matrix), final demand matrix (called bridge matrix) and the import content vector subject to various tax rates and adjustment equations. The latter in particular is presumed to (1) incorporate some of the temporal changes in the coefficients of the various matrices and (2) make room for adjustments to prices that otherwise an instantaneous cost-push I/O model would have given rise to.

I.1 Industry (Sector) Price Determination

Industry aggregation levels in CANDIDE 2.0 are given in Table 1.0. Of the 48 categories we shall here discuss, the first 44 industry prices as the remaining 4 prices namely, noncompeting import prices, commodity indirect taxes, noncommodity indirect taxes, and subsidies are basically derived as identities (current dollar/ constant dollar) from the final demand categories. Industry prices (PX's) are basically value-added prices obtained by

Table 1.0

Aggregation levels for production, wages, wagebill, industry prices, investment, user cost, capital stock, manhours, hours and employment

Industry	Item
1	Agriculture, fishing and trapping
2	Forestry
3	Metal Mining
4	Coal Mining
5	Crude Petroleum, Natural Gas & Ser Incid to Mining
6	Nonmetal Mining (except coal)
7	Food and Beverages
8	Tobacco Products
9	Rubber and Plastics Products
10	Leather
11	Textile
12	Knitting Mills and Clothing
13	Wood
14	Furniture and Fixtures
15	Paper and Allied
16	Printing, Publising and Allied
17	Iron and Steel
18	Nonferrous Metal
19	Metal Fabricating
20	Machinery (ex Electrical Machinery)
21	Motor Vehicle (ex parts and accessories)
22	Motor Vehicle Parts and Accessories
23	Nonauto Transport Equipment
24	Electrical Products
25	Nonmetallic Mineral Products
26	Petroleum and Coal Products
27	Chemical and Chemical Products
28	Miscellaneous Manufacturing
29	Construction
30	Transportation
31	Communications
32	Utility
33	Wholesale and Retail Trade
34	Owner Occupied Dwellings
35	Finance, Insurance and Real Estate
36	Commercial Services
37	Other Noncommercial Services
38	College and University Education
39	Hospitals
40	Primary, Secondary and Non University Post Sec. Educ
41	Federal Defence
42	Federal Nondefence
43	Local Government
44	Provincial Government
45	Noncompeting Imports
46	Indirect Taxes, Commodities
47	Indirect Taxes, Noncommodities
48	Subsidies

dividing current dollar GDP at factor cost by constant dollar (1971) GDP at factor cost. The latter is is derived by double deflation method[2] where gross outputs and intermediate inputs are deflated by appropriate deflators. Both current dollar and constant dollar GDP's are estimated in a way that nets out indirect taxes, subsidies, trade, and transportation margins.[3] A question that is often raised regarding the appropriateness of the use of value-added prices is that is assumes a fixed proportion between gross output and value-added by industry. This assumption is questionable when elasticity of substitution between material inputs (including energy inputs) and value-added (contributions due to capital and labour) inputs is not zero when relative prices of various inputs change. Recent literature, however, points to the existence of nonzero substitution between capital (K) and energy (E), between capital (K) and labour (L) and even between labour (L) and energy (E).[4] These findings suggest that one should work along gross output price formation by industry instead of value-added prices. However, there are two primary considerations that one must keep in mind to follow this approach: (a) substitution possibilities are worth taking care of in the presence of sharp increases in particular input prices like the recent energy prices and when these price increases are not temporary or purely cyclical and (b) the time series data set for all inputs and

have a sufficiently long series of observations with rapid changes in input prices for industry-specific production function (or cost function) analysis. Whereas it seems that (a) deserves attention specifically with respect to energy price, it is the lack of (b) that forces many analysts to pursue the determination of value-added prices. It is conceded that for long-term projections relative prices of factor inputs (including E and M) may have significant impact on factor shares, and therefore, value-added prices may not be the correct route to gross output prices, i.e., the price movements may be far out of line. CANDIDE 2.0 is primarily intended to cover medium term projections of prices and outputs and given the data limitations of a full-blown gross output production function, the approach of value-added prices may be taken as an admissible second best solution.

1.2 Theory and Practice of Value-Added Industry Specific Price Determination

Value-added by industry generally consists of the following primary factor input contributions:

a) labour income, i.e., wages and salaries and supplementary labour income;

b) capital consumption allowances;

c) net income of unincorporated business; and

d) operating surplus which is composed principally of profits.

Value-added price by definition is the weighted sum of prices of the above four items, where weights pertain to their real constant dollar counterparts. It is possible to approximate (a) and (b) both in terms of quantities and prices by industry over time, but approximations of (c) and (d) in quantities and prices are hazardous. For example, how does one approach profits when nominal profits are not always available by industry? Even when one does have nominal profits from taxation data of company statistics, there is no way to approximate profit deflators by industry by resorting to nominal rate of return to capital since real rate of return by industry is that which is required to arrive at profit deflators. Given all these limitations, the double-deflation approach is the only practical approach to estimation of value-added prices as a residual rather than a weighted sum. In CANDIDE 2.0, the value-added prices then are explained as a function of labour and capital costs, subject to productivity (manhours productivity), import prices and pressure on output or capacity. The following preliminary versions of price determination are first tested.

Model 1 PX = f(ULC)

Model 2 PX = f(W,PR)

Model 3 PX = f(ULC,IUC)

Model 4 PX = f(W,PR,IUC)

Model 5 PX = f(UC)

where

ULC = unit labour cost

W = hourly wage rate

PR = manhour productivity

IUC = user cost of capital

UC = unit total cost of wages and salaries and capital costs

These variants are first tried over a period of 1954-74 in absolute levels, double log forms, percentage change forms and then also tried in various distributed lag forms to maximize explanatory power without sacrificing the usual sign and maximum coefficients restrictions. This applies to all industries 1 through 36 (see Table 1) except 34 (owner-occupied dwellings). Prices of industry 37 through 44 are wage rate equations since outputs in these industry are all labour determined. Models 1 through 5 are all attempts to capture the conventional mark-up pricing models. Preliminary investigations for a large number of

industries revealed that the elasticity of PX with respect to cost variables hardly sum up to unity even in the long run which called for alternative specifications. (Under competitive conditions in the product market, unit elasticity of PX with respect to cost items is a desideratum.)[5] This anomaly led us to recognize the possibilities of (a) product heterogeneity, (b) imperfect sellers' or producers' market, i.e., industries may be concentrated, (c) demand curve for the product may be inelastic or a shifting demand curve, (d) excess demand or capacity utilization rate, and (e) a combination of (a), (b), (c), and (d). To incorporate these missing links as endogenous variables in CANDIDE 2.0 and thereafter explain prices as functions of these and the previous cost items seemed to be a horrendous task although empirical industry-specific price cost equations do exist when all the right-hand side variables are given exogenously.

An attempt to get around these difficulties is then made to incorporate two particular explanatory variables, namely, change (or percentage change) in output (value-added) and import competing prices (or percentage change). It would be useful to explain the rationale for that. To begin with import prices first, assume

$$PX^* = A(UC)^{\alpha} \quad \ldots \quad 0 \leq \alpha \leq 1 \qquad (1)$$

where

PX^* = ideal normal (long-run) value-added price in the absence of foreign competition

UC = unit total cost = $\frac{\text{wage salaries \& capital cost}}{\text{constant dollar output}}$

A = constant term (mark-up factor)

when

α = 1, under competitive conditions

It is well-known[6] that if domestic goods are perfect substitutes of import goods and the latter has no quota restrictions, import competing price (PM) determines the equilibrium-domestic price (PX) in the presence of import competition.[7] This one price rule or the small country assumption will not be valid if (a) quota restrictions in imports are present, (b), domestic goods and import goods are not substitutes, (c) aggregation levels of domestic industries and imported goods are such that product homogeneity cannot be maintained, i.e., some commodities for both domestic and imported are homogenous but others are not. The upshot of this is that a certain percentage increase in unit cost of input may not result in similar

percentage change increase in domestic price even in the long run, i.e., long-run elasticity of domestic price with respect to unit cost in the presence of semi-perfect substitutes of imported goods is less than unity. The conseqence of this on the standard mark-up theory of prices will be explained shortly.

Taking the above argument we may now postulate the following:

$$PX^{**}_t \;/\; PX^{*}_t = (PM_t \;/\; PX^{*}_t)^{\beta}\ ; \quad 0 < \beta < 1 \tag{2}$$

$$PX_t \;/\; PX_{t-1} = (PX^{**}_t \;/\; PX_{t-1})^{\lambda} \quad 0 < \lambda < 1 \tag{3}$$

where

PX^{**}_t = strategic price for domestic producers

and equation 3 is the Nerlove partial adjustment model where actual price, PX_t, adjusts to the strategic price, PX^{**}_t, with a lag. The implications of equation 2 are mainly that (a) if $\beta = 0$, then $PX^{**}_t = PX^{*}_t$, i.e., import price does not have any impact on standard mark-up, and (b) if $\beta = 1$, then $PX^{**}_t = PM_t$ which shows that mark-up pricing of domestic goods is ruled over by PM_t. In reality, neither of them actually holds in the traded-goods sector where domestic and import goods put claims on market share, resulting in any intermediate zone between the two polar cases with a combined constraint of both domestic cost pressures and import penetration.

Combining equations 1,2, and 3, one then obtains:

$$PX_t = A^{\lambda} \; PM_t^{\beta\lambda} \; UC_t^{\alpha\lambda(1-\beta)} \; PX_{t-1}^{(1-\lambda)} \qquad (4)$$

$$\ln PX_t = A' + \beta\lambda \ln PM_t + \alpha\lambda(1-\beta) \ln UC_t + (1-\lambda) \cdot PX_{t-1}$$

$$= A' + a_1 \ln PM_t + a_2 \ln UC_t + a_3 \ln PX_{t-1} \qquad (4a)$$

where

$$a_1 = \beta\lambda \tag{5a}$$

$$a_2 = \alpha\lambda\ (1-\beta) \tag{5b}$$

$$a_3 = (1-\lambda) \tag{5c}$$

a_1 and a_2 are the short-run elasticities of PX with respect to PM and UC whereas β and $\alpha\ (1-\beta)$ are long-run elasticities respectively. The sum of the two long-run elasticities becomes equal to unity if $\alpha = 1$, which holds good under competitive assumptions in the domestic market.

Equation 4 is applied with the following variants:

1. Level forms (apart from logarithmic forms) and percentage forms;
2. Decomposition of UC in terms of wage rate, productivity and capital cost (user cost) with different distributed lags;
3. Distributed lag on PM;
4. Substitution of export price for import price for Canada's two important export industries, agriculture and paper products;
5. Percentage change in output as capacity pressure; and

6. Change in weekly hours as a surrogate for demand pressure.

In the above experiments attempts to capture domestic cost pressures on prices are first pursued, failing which import (or export) prices are introduced to improve explanatory power. No restrictions are imposed on the sum of elasticities to equal unity in the long-run. When equations are specified in the free form, the sum of elasticities in the long-run tends to approach unity in a large number of cases, except for mining,[8] where it appeared that the prices were proverbially sticky at least for the sample period, 1955-74. The equations are estimated by OLS method and the results of some selected value-added price equations are reported in Table 2 for illustrative purposes.[9] This table shows, in general, two specific issues over which traditional cost-push or demand-pull domestic price models generally gloss over. These are: a) cost of capital or related issues like user cost of capital, and b) influence of foreign prices. As Nordhaus (1972) has noted, long-run price determination must take into account the cost of capital for industries which use a substantial input of capital goods in the production process or where the capital share in value-added is significant. It is possible that short-run elasticity of PX with respect to

Table 2

Selected Estimated Value Added Price (PX) Equation by Industry: CANDIDE 2.0

Industry No/Name	Equation Form	Sample Period	Constant	ULC	W	PR	IUC	UC	PM	PTE	X ⁄.	X	DUMMY	PX(-1)	Long-Run Elasticity e_{ULC}	e_W	e_{UC}	e_{PM}	e_{PTE}	e	$\bar{R}^2$	DW
1. Agriculture & Fishing	Level	1954-74	-.07	--	--	--	--	.51	--	.55	.015 ℓ	--	.33	--	--	--	.42	--	.59	1.01	.991	2.01
			(2.29)					(10.68)		(16.01)	(3.34)		(8.25)									
2. Forestry	Log	1949-74	.93	.96	--	--	--	--	--	--	--	-.13	--	--	1.0*	--	--	--	--	1.0	.854	1.81
			(3.87)	(12.06)								(3.29)										
5. Petroleum, Gas (Mining)	Percentage	1958-74	--	--	--	--	.31 ℓ	--	.54 ℓ	--	--	--	--	--	--	--	.31	.54	--	.85	.919	2.33
							(1.54)		(3.23)													
7. Food and Beverage	Log	1959-74	.037	.27 ℓ	--	--	--	--	--	--	20.23⊕ ℓ	--	--	.75	1.08	--	--	--	--	1.08	.982	2.34
			(1.03)	(1.55)							(2.03)			(3.46)								
11. Textile	Percentage	1960-74	--	--	.74	-.89 ℓ	--	--	.69 ℓ	--	--	--	--	--	.70	.74	--	.69	--	1.39	.800	2.15
					(5.15)	(5.25)			(3.31)													
15. Paper Products	Percentage	1961-74	--	--	.21	-.30	--	--	--	.76	--	--	--	--	.20	.21	--	--	.76	.96	.960	1.36
					(1.29)	(1.34)				(13.18)												
22. Motor Vehicle Parts	Log	1957-74	.41	.25	--	--	.25	--	--	--	--	--	--	.61	.64	--	1.28	--	--	1.28	.934	1.60
			(2.34)	(1.43)			(2.16)							(3.74)								
29. Construction	Percentage	1956-74	--	--	.75	-.54	.25	--	--	--	--	--	--	--	.75	.75	1.00	--	--	1.00	.826	2.05
					(5.27)	(4.99)	(3.20)															
32. Utility	Log	1962-74	-.33	--	--	-.67 ℓ**	.55	--	--	--	--	--	--	--	--	--	.55	--	--	.5*	.954	2.24
			(.52)			(1.68)	(4.23)															
33. Trade	Percentage	--	1.02 ℓ	--	--	--	--	--	--	--	-.03 ℓ	--	-1.80	--	1.02	--	--	--	--	1.02	.884	1.88
				(8.28)							(.19)		(3.06)									
35. Finance, Insurance & Real Estate	Log	1951-74	.32	.75 ℓ	--	--	.20 ℓ	--	--	--	--	--	--	--	.75	--	.95	--	--	.95	.995	1.84
			(3.34)	(13.52)			(4.07)															
36. Commercial Services	Level	1952-74	.16	.84 ℓ	--	--	--	--	--	--	.01	--	--	--	.98	--	--	--	--	.98	.972	.23
			(3.53)	(11.79)							(2.43)											

Glossary of Variables

ULC	=	unit labour cost
W	=	hourly wage rate
PR	=	manhour productivity
IUC	=	user cost of capital
UC	=	cost per unit output (includes wage bill plus new cost of capital)
PM	=	import competing price
PTE	=	export price
X ⁄.	=	percentage change in output
X	=	output
PX(-1)	=	lagged value added price
e_{ULC}	=	long-run elasticity of PX w.r. to ULC
e_W	=	" " " " " " W
e_{UC}	=	" " " " " " IUC
e_{PM}	=	" " " " " " PM
e_{PTE}	=	" " " " " " PTE
e	=	sum of " " " " " cost and external prices

Notes: (a) Superscript 'ℓ' denotes Almon log distribution (1st or 2nd order).
(b) * takes care of the negative coefficient on output (-.13) in Forestry to account for economics of Scale.
(c) ** denotes productivity of capital in Utility.
(d) Values in brackets denote 't' statistics.
(e) ⊕ is not X ⁄. , but changes in average weekly hours.

capital costs may be low or even zero as variable costs may matter in short-run price determination.

As regards foreign prices, the literature on domestic price determination takes import prices only insofar as imported goods are inputs in the production process. This approach to imported goods as an input in the production technology followed by an explanation of domestic prices in terms of import prices has a large number of followers, Bardhan and Lewis (1970), Lipsey and Parkin (1970), Ball and Duffy (1972), Goldstein (1974), Ellison (1979) to mention a few. All these studies emphasize only direct cost effects of imported inputs and ignore the presence of "entry limit pricing" policy of domestic producers in the event of possible import penetration. This latter aspect is very important for an open economy like Canada as recognized by Taylor, Turnovsky and Wilson (1973). Domestic value-added prices in such a case are likely to be constrained by import competing prices and the mark-up factor will itself be affected by the conditions of foreign entry, i.e., the cost conditons of entrants in relation to cost conditions of domestic producers and the price elasticity of industry demand. If constant mark-up has to hold, one has then to assume that importers are willing to share the same changes in their prices as domestic prices change with domestic costs. If this premise is wrong, then

it means that Canadian prices for domestically tradable goods cannot rise, by the same amount as domestic costs rise, when import prices remain unchanged. There is no evidence to suggest the behaviour of importers follows that of domestic producers whereas the converse seems to hold to a limited degree, i.e., Canadian producers tend to set their prices somewhat in line with import competing prices. Applebaum and Kohli (1979) corroborates this view and subtantiates the small open-economy assumption we have observed in this study with respect to imports. This does not mean that the "law of one price" holds true but that domestic competition with imported goods somewhat limits the price flexibility of domestically tradable goods.

The number of cases where import prices enter as an argument for PX is 12, of which two are mining (industry 4 and 5) and the remaining ten are in manufacturing.[10] There are only two industries in which export prices appear[11] as arguments in PX (industry 1 and 15, see Table 1). We have separated the influence of import prices for twelve industries on the total GDP deflator of the economy (PXRDP) in a static framework and it turns out that elasticity of PXRDP with respect to PM is somewhat of the order of .08 to .10.

Finally some further comments on the influence of import prices on mark-up theory seem justified. These are:

1. Falling import prices leading to falling domestic prices mean profit squeeze and rising import prices leading to rising domestic prices mean profit bulge. In the case of falling import prices one should then expect that some domestic producers may have to pull down their production as lower prices may not cover costs of production in the long run. Under competitive conditions in the domestic producers' market, this has to hold when domestic goods and imported goods are substitutes. In CANDIDE 2.0 we however get a limited degree of import penetration, i.e., substituting for domestic goods, when import prices fall relative to domestic prices. This effect takes place via final demand and domestic output conversion, i.e., greater imports leading to lesser domestic production. It seems that under conditions of limited product homogeneity the elasticity of imports with respect to relative prices (imports prices relative to domestic prices) should be low when real incomes are held constant. The elasticity of imports with respect to relative prices in CANDIDE 2.0 under various shock experiments, where real incomes are virtually unchanged, work out[12] to be in the range of

-0.21 to -0.25 which appears to be low for an open economy like Canada.

Yadav (1975) reports an aggregate import elasticity with respect to relative price (import price/domestic price) for Canada to be of the order of -1.60, when this aggregate elasticity is made up from disaggregated import demand functions. The difference between this and CANDIDE 2.0 could be attributed to four essential factors: a) Yadav's sample period refers to 1956-72 whereas CANDIDE extends to 1975; b) Yadav has only seven items of imported goods where CANDIDE aggregate elasticity is composed of both goods and services where the total number of behavioural import demand functions is 32 (28 for goods and 4 for services); c) the more disaggregated the levels of imports are, the lower becomes the aggregate price elasticity of imports - a point well verified by Yadav; and d) CANDIDE elasticity is the result of the solution of the whole model and is not the partial elasticity of imports with respect to relative price.[13]

2. As for rising import prices and its impact on domestic prices, the following mechanism works. An increase in import prices leads to an increase demand for domestic goods and in the short-run since output cannot be easily

adjusted, domestic prices rise yielding an increase in mark-up or profit bulge. In time, domestic output increase does take place through import substitution via the same mechanism of reduced imports and increased multiplier.

3. To distinguish between short-run and long-run import substitution, CANDIDE 2.0 has lag distributions of import prices in the estimated domestic price equations and lag distributions of relative prices in the import demand functions. By nature of these distributions, short-run elasticities are always less than long-run elasticities.

4. The empirical literature regarding the effects of import prices on the domestic rate of inflation and correspondingly on the mark-up factor has been recorded by Goldstein (1977) for five industrialized countries, namely, the U.S.A., West Germany, the U.K., Japan, and Italy. Goldstein's results are mixed, i.e., for certain countries the influence of falling import prices is not captured by any decline in GDP deflators, whereas that of rising import prices is captured by some increase in GDP deflators. However, this asymmetry property is far from being settled because of aggregation bias[14] of macro GDP deflator and limitations of data, if not of theory. Goldstein's pooled-time series analysis, for example, of

the same five countries eliminates the existence of 'asymmetry' and brings out the elasticity of GDP deflator to import prices roughly of the order of .20. In any case this elasticity is not a partial elasticity but appears as an implicit total elasticity including the feedbacks of money supply, CPI, wage rate, imports, et cetera, without these relations being at all spelled out.[15] It has been mentioned earlier that our partial elasticity is of the order of 0.10 whereas the direct and indirect effects of import prices on GDP deflator (PXRDP) through the final demand prices like CPI, money supply, wage rate, et cetera is much higher in the long run. This and other related issues will be discussed in the fiscal and monetary simulations covered in the later part of this paper.

I.3 Noncommercial Value-Added Prices

There are seven noncommercial industries (industries 38 through 44, Table 1) which pertain to public sector, and two noncommercial industries (industries 34, and 37, Table 1) which pertain to private sector. Of these, eight[16] industry prices are basically money wage rate equations explained as a function of price expectations (.CPIE) or distributed lag on CPI, and/or inverse of unemployment rate (mostly male, 25-54). The rationale for these equations has been that these industries have their

output determined by labour alone and therefore price movements should coincide with money wage rate movements with the implicit assumption that changes in productivity are taken to be nil. Some of these equations have a strong Phillips Curve effect where the coefficient of the inverse of unemployment rate are a little large, viz, 17.7 for industry 41 (federal defence) and 19.3 for industry 42 (federal nondefence). Most of these equations have the coefficients of price expectations of CPI falling in the range of .75 and 1.0 except for industry 39 (hospital) where the coefficient of price expectations has been constrained to unity.

Value-added deflator equation for industry 34 (owner-occupied dwelling) has been expressed as a function of user cost of capital (weighted average of singles and multiples) and total housing stock (both having distributed lags). The equations has been estimated in percentage form and the long-run coefficient of the user cost turns out to be equal to 1.0 and that of total housing stock equal to -0.72. It would be apparent that price in this industry in the long run is dominated by the supply side. It is worth mentioning that the data series of value-added deflator for this industry has been a little troublesome as the gross output in this industry is only imputed rent on owner-occupied dwellings and specific deductions like repair,

construction, finance and insurance fees, indirect taxes have to be made before a GDP concept can be arrived at.[17]

I.4 Some Additional Deflators Relating To Indirect Taxes And Subsidies

There is an additional class of sector deflators, namely, commodity indirect taxes, noncommodity indirect taxes and subsidies which correspond to industries 46, 47 and 48 of Table 1. These sector deflators are equivalent to commodity prices as they have a one-to-one correspondence in the market-shared matrix, DA. Commodity indirect taxes are paid by the producers as a cost item and it includes[18] federal sales taxes, excise taxes, gasoline taxes, et cetera. Noncommodity indirect taxes include licenses, fees and permits and property taxes. Subsidies represent amounts contributed by governments toward current costs of production. The price indices of these commodities are formed by three identities where the denominator for each is obtained from output conversion and the numerator is the nominal value of each resulting from price, quantity, and tax rate changes. It may be noted that these three price indices are global in nature and are applied to all industries (from industry 1 through industry 44) across the board to arrive at purchaser's prices of industry gross output. Later on we shall see how these purchasers' prices

of gross output are translated into commodity prices at the final demand level by applying specific tax rates to commodities.

I.5 Domestic Price (PX) Sensitivity to Wage and Capital Costs

In the preceding discussions, we have outlined the theoretical and empirical content of import (export) prices in the GDP deflators by industry. At this stage it is appropriate to examine the role of wage and capital costs in domestic price (PX) formation, and to evaluate the extent of price flexibility both in the short and long-run. Empirical literature on price flexibility as regards the behaviour of aggregate GDP deflator with respect to wage rate, productivity and cost of capital is at best a compendium of conflicting results. Theoretical literature maintains that price flexibility with respect to factor input costs (when these costs and their changes are treated as permanent) is essential for a "proper" macro-economic model and that the relative price inflexibility has been a sine qua non of the Keynesian macro-economic paradigm (see Tobin (1975), Sahling (1977)). On the empirical side, Nordhaus (1972) reports the vagaries of estimates of aggregate domestic price elasticity with respect to wage or unit labour cost for the U.S.A. and also the speed of adjustment of price to change in wage

costs. The U.S. empirical studies show the long-run elasticities tend to vary between .37 to 1.85 for labour costs when price is taken to be the wholesale price index which is the gross output concept. Nordhaus claims that empirical results are based on wrong theories particularly because (1) capital costs are not taken into account and because (2) capacity utilization rates are confounded with productivity effect or simultaneity bias. There is also some indications (empirical) that the response of price to wage rate changes is faster than that to productivity changes partly because producers are a little hesitant to accept productivity changes as being permanent, whereas for wage change this hesitancy is almost absent.[19] Given this background at the macro-level, what types of price response to factor input costs by industy may one obtain empirically and what theoretical considerations may one bring to bear upon empirical results that make sense?

Table 2 (page 18) offers a synopsis of selected industries with reference to long-run elasticities of relevant cost items. Table 3 presents the short-run and long-run elasticities of 36 industries (8 industries are excluded as these are wage rate equations; see Table 1) which only point to the cost items in the price equations

excluding the influence of external prices and other variables like change in output.

Table 3 shows industries which suffer from very low long-run total elasticities, namely 4,5,6,17,20, and 27. Except for industry 6, all these industries have import prices as additional arguments which dampen domestic cost - price passthrough. It is also apparent that for certain industries there are some significant differences between short-run and long-run elasticities. The candidates for these are: 5,7,8,25,30,31,32,34, and 35. This is due to the presence of a large lag dependent variable and/or lag distributions on cost items. Some of the differences between short-run and long-run elasticities arise out of a larger capital intensity of these industries, viz, 5,30,31, and 32 and similar results are reported in other studies. As capital costs are fixed cost items, it takes longer time to pass them on to price changes. Comparisons with some studies in Canadian price behaviour with respect to factor input costs (particularly labour costs) show that the industry-specific differences between short-run and long-run elasticities are significant. It is conceded that Table 3 probably reveals larger differences between long-run and short-run elasticities than those reported in these studies.[20] The presence of large coefficients for lagged dependent variables in both of these studies which

TABLE 3

Short Run (S) and Long-Run Elasticities (L) of Domestic Price (PX) to Unit Labour Cost (ULC), Wage Rate (W), Capital Cost (IUC), Unit Total Cost (UC) of CANDIDE 2.0 by INDUSTRY:
Period: 1955-74 (average)

Industry No.	ULC	W	IUC	UC
1. Agriculture				.51(S), .51(L)
2. Forestry	1.0(S), 1.0(L)			1.0(S), 1.0(L)
3. Metal Mining			.97(S), .97(L)	.97(S), .97(L)
4. Coal	.10(S), .10(L)		.26(S), .26(L)	.36(S), .36(L)
5. Petro & Gas			.16(S), .32(L)	.16(S), .32(L)
6. Non-Metal		.14(S), .14(L)		.14(S), .14(L)
7. Food & Bev.	.39(S), 1.08(L)			.39(S), 1.08(L
8. Tobacco	.27(S), .74(L)			.27(S), .74(L)
9. Rubber	.56(S), .63(L)		.26(S), .21(L)	.82(S), .84(L)
10. Leather	.71(S), .90(L)			.71(S), .90(L)
11. Textile		.74(S), .74(L)		.74(S), .74(L)
12. Knitting	.67(S), 1.0(L)			.67(S), 1.0(L)
13. Wood Products	.69(S), 1.04(L)			.69(S), 1.04(L
14. Furniture	.62(S), 1.05(L)			.62(S), 1.05(L
15. Paper Products		.21(S), .21(L)		.21(S), .21(L)
16. Printing & Pub.	.65(S), 1.01(L)			.65(S), 1.0(L)
17. Iron & Steel		.37(S), .37(L)		.37(S), .37(L)
18. Primary Non-Ferrous		.55(S), .55(L)		.55(S), .55(L)
19. Metal Fabricating		.49(S), .49(L)		.49(S), .49(L)
20. Machinery	.17(S), .27(L)			.17(S), .27(L)
21. Motor Vehicles	.33(S), .76(L)			.33(S), .76(L)
22. Motor Veh. Parts and Acc.	.25(S), .25(L)		.25(S), .25(L)	.50(S), .50(L)
23. Other Transp. Equip.	.54(S), .54(L)			.54(S), .54(L)
24. Electrical	.60(S), .84(L)			.60(S), .84(L)
25. Non-Metal Mining Products	.08(S), .56(L)		.20(S), .23(L)	.28(S), .79(L)
26. Petro & Coal Products		.53(S), .53(L)		.53(S), .53(L)
27. Chemical & Allied		.34(S), .34(L)		.34(S), .34(L)
28. Miscellaneous	.37(S), .37(L)		.18(S), .18(L)	.55(S), .55(L)
29. Construction		.75(S), .75(L)	.25(S), .25(L)	1.0(S), 1.0(L)
30. Transportation	.38(S), .71(L)		.08(S), .22(L)	.46(S), .93(L)
31. Communication	0.0(S), .67(L)		.11(S), .32(L)	.11(S), .99(L)
32. Utility			.15(S), .55(L)	.15(S), .55(L)
33. Trade	.74(S), 1.01(L)			.74(S), 1.01(L
34. Owner Occupied Dwelling			.21(S), 1.00(L)	.21(S), 1.0(L)
35. Finance Insurance	.57(S), .75(L)		0.0(S), .20(L)	.57(S), .95(L)
36. Commercial Services	.70(S), .70(L)			.70(S), .70(L)

Note: The column for UC stands for an aggregation elasticity of PX with respect to all domestic costs. Here it is the sum of elasticities for columns of ULC, W and IUC.

survey Canadian industries (2 or 3 digit level) shows that instantaneous price flexibility with respect to domestic factor costs is perhaps an academic desideratum only. Similar results are also reported for U.S. where at least short-run price flexibility is very small.[21] This latter property is often attributed, at least theoretically, to how exactly "demand may enter" (Barro (1972), Iwai (1974)). These authors relate price inflexibility to the sellers' market perception of expected demands. If demand changes or shifts are unexpected, it is maintained that prices may not move while quantities are adjusted (Marshallian) contrary to Walrasian approach of prices adjusting to excess demand. This output-adjusted price inflexibility, however, becomes more so in the case of markets where producers are oligopolistic or command some degree of monopoly.[22]

II Numerical Dimensions of Aggregate Price Flexibility

This section analyses the passthrough problems of domestic prices (PX's) as well as those of final demand prices (PF's). Since PX's have been already discussed in the previous section we shall briefly set out the PF's (89 items) which are generated by the following recursive process.

A) Commodity Price : Vector Before Indirect taxes

$$PQ = F(PX, PM, u, B, B^*, DA) \quad (6)$$

where

PM = import prices by commodity

u = vector of coefficients of import intensity (import/domestic use) by commodity

B = technology (use matrix)

B* = vector of value-added coefficients by industry

DA = market-share matrix

PX = value-added prices by industry

(This part is explained in Appendix A)

B) Commodity Price : Vector After Commodity taxes

$$PQ^* = P(PQ, T) \quad (7)$$

where

T = vector of commodity taxes (manufacturing sales taxes and noncommodity taxes)

C) Final Demand : $PF^{**} = f(PQ^{*}, E)$ (8)

where

PF^{**}= price vector before special taxes are levied

E = final demand bridge matrix

D) Final Demand : $PF^{*} = F(PF^{**}, g)$ (9)

where

PF^{*} = price vector after special provincial taxes are levied

g = vector of special provincial taxes levied on commodity

E) Error modeling of final demand price equations : by item i, i = 1,2, ... 89

$$PF_{it} - PF^{*}_{it} = a_i + \sum_{m=1}^{m} b_{im} (PF_{i,t-m} - PF^{*}_{i,t-m}) + C_i \text{ TIME} \quad ; \quad m \leq 3 \qquad (10)$$

where

$$|b_{im}| \leq 1, \quad \left| \sum_{m=1}^{m} b_{im} \right| \leq 1 \qquad (10a)$$

PF_{it} = actual final demand price by item i in time t

TIME = time variable

Each of the above stages except operation (8) brings in some sort of price inflexibility. Now in equation (6) when P and other matrices/vectors remain unchanged, only a part of PX gets into PQ. Similarly by equation (7) only a part of PQ gets transferred to PQ* due to T and finally PF gets filtered by g (equation 9) and autoregressive error adjustment equations (equation 10). As mentioned earlier PM (import prices) and PTE (export prices) are exogenous in CANDIDE 2.0 except for exchange rate adjustment, i.e., CANDIDE 2.0 determines exchange rate endogenously so that PM and PTE fluctuate as exchange rate fluctuates. At this stage it seems important to ask to what extent is the passthrough of PX into PF actually implemented by the underlying structure of the model. In order to answer that question, we have run a variety of simulations (holding real variable constant) and obtained the following aggregate equations in decomposable forms.[23] Aggregation here implies the aggregation over individual prices of components when the real quantities are held constant.

Aggregate Price Deflators (Bottom-up Version); Long-run

Aggregate GDP Deflator

$$\dot{PX} \simeq .65\dot{W} - .52\dot{PR} + .10\dot{PM} + .03\dot{PTE} + .15\ \dot{IUC} \qquad (11)$$

Aggregate GNE Deflator

$$\dot{PFGNE} \simeq .8069\dot{PX} + .1797\dot{PM} + .0449\dot{PT} - .0136\dot{ADJ} + .249\dot{PTE} - .280\dot{PM} \qquad (12)$$

Aggregate GNE Deflator

$$\dot{PFGNE} \simeq .679\dot{PXRDP(D)} + .045\dot{PT} + .279\dot{PTE} - .0136\dot{ADJ} \qquad (12a)$$

[Eqn 12a is the result of substitution of $\dot{PXRDP(D)} = \dot{PX} - .10\dot{PM}$ in eqn (12) where $\dot{PXRDP(D)}$ is the GDP deflator changes caused only by domestic costs i.e. free from import prices (PM)].

CPI

$$\dot{CPI} \simeq .659\dot{PX} + .157\dot{PM} + .108\dot{PT} + .075\dot{FRMC} \qquad (13)$$

Aggregate Consumption Deflator

$$\dot{PFC} \simeq .787\dot{PX} + .163\dot{PM} + .050\dot{PT} \qquad (14)$$

Aggregate Government Expenditure Deflator

$$\dot{PFGE.CGS} \simeq .956\dot{PX} + .044\dot{PM} - .080\dot{ADJ} \qquad (15)$$

Aggregate Investment Deflator

$$\dot{PFGFC} \simeq .653\dot{PX} + .280\dot{PM} + .057\dot{PT} \qquad (16)$$

Aggregate Inventory Deflator

$$\dot{PFINV} \simeq .549\dot{PX} + .451\dot{PM} - .180\dot{ADJ} \qquad (17)$$

DOT on the variable represents percentage change.

where

W = hourly money wage

PR = manhour productivity

PM = import price expressed in domestic currency

PTE = export price expressed in domestic currency

IUC = user cost of capital

PT = implicit price of indirect taxes (commodity and noncommodity)

ADJ = adjustment equation bias

FRMC = average mortgage rate

PXRDP(D) = aggregate GDP deflator dictated by domestic cost factors only, i.e., when the contribution of PM and PTE to PXRDP in equation (11) are netted out.

A brief description of the equations (11) through (17) may be called for an examination of price flexibility noting in particular that the coefficients in these equations represent partial elasticities demonstrating underlying structural parameters rather than reduced form versions. Equation (11) says that the percentage change in aggregate GDP deflator is influenced by 65 per cent due to money wage rate (W), 15 per cent due to foreign prices and 15 per cent due to capital costs and hence domestic costs account for 80 per cent of GDP deflator. Therefore, the degree of inflexibility of domestic price formation is about 20 per cent. Now by the time we take to explain GNE deflator (equation 12a) the degree of inflexibility amounts to roughly 32 per cent, i.e., 32 per cent of GNE deflator is largely explained by export prices (PTE) and indirect taxes (PT). Similarly other prices show different degrees of inflexibility. Thus, CPI (equation 13) reflects domestic price impact of only 66 per cent, the remaining being explained largely by import prices (16 per cent) and indirect taxes (11 per cent). In CANDIDE 2.0, CPI is an important variable in the determination of money wage (W) (via price expectation) and real wage (W/CPI) which also have implications for labour supply (via participation rates), labour demand as well as aggregate activity. The impact of import prices (PM) is maximum for inventory deflator (equation 17) followed by aggregate investment deflator (equation 16) and aggregate consumption deflator (equation 14).

Overall, the system of equations 11 through 17 brings out the numerical dimensions of imported inflation (from both export and import prices), tax inflexibility, capital, wage and productivity influences on the various aggregate prices. This gives an easy handle to pursue the impact on the real variables of CANDIDE once the various facets of price rigidities are clearly understood in the system. To the extent prices are relatively rigid, real variables (endogenous) may remain relatively unaffected except for exogenous real shocks.

III Analysis of Fiscal Policy Multipliers

In this section, we shall analyse the impact of increased government expenditures (in real terms) on the economy in terms of growth, inflation, fiscal balance of governments, and other macro-economic variables of interest, and shall highlight the contributions of price inflexibility towards the multiplier results. It is well known that the traditional Keynesian multipliers of the fiscal variety rest on (a) the assumption of price rigidities, (b) the assumption as to which monetary policies are pursued, and (c) the assumptions regarding the response of economic agents like households and business to particular fiscal shocks. Thus even when assumption (a) is taken for granted, assumptions (b) and (c) can be construed in such a way as to

reduce the multiplier to zero. However such an exercise would be trivial and it is in the best interests of an analyst to use a method of successive approximation regarding the reasonableness of assumptions (a) and (b) while perhaps leaving (c) as dictated[24] by the model's structural equations. In CANDIDE 2.0 price formation is not guided by rational expectations hypothesis but wage formation is strongly motivated by inflation expectation. In a sense the model as a whole can be characterized as having "semi-rational" properties and to some extent this may be more realistic judging a vast array of institutional rigidites (especially taxes, subsidies, government regulation, et cetera) that any economy is generally confronted with. In this section we shall concentrate primarily on the effects of price flexibility (or inflexibility) on the fiscal multiplier under accommodating and nonaccommodating monetary policies. Results show that greater price flexibility and restricted money supply do reduce the multiplier by some margin in the long-run (although it is not a considerable margin), but short-run multipliers are not that much different when we compare them with those based on assumption of limited price flexibility and accommodating money supply. These results hold even under the federal government's budget constraint which is embedded in CANDIDE 2.0.

III.1 Design of Fiscal Simulations

Fiscal simulations are carried out in the context of both accommodating and nonaccommodating monetary policy. In doing so the distinction between accommodating and nonaccommodating monetary policies should be first clarified. An expansionary fiscal policy which results in short-run budget deficits requires financing by issuance of increased government securities. This puts upward pressure on market interest rates. An accommodating monetary policy implies releasing this pressure by purchases of outstanding government securities on the part of the monetary authority, thereby monetizing, at least in part, the debt issued to finance the deficit. The monetary authority may also be induced to increase the money supply to keep the Canada-U.S. interest rate differential preserved for exchange rate considerations whenever expansionary fiscal policy tends to increase the domestic interest rate. A nonaccommodating monetary policy implies that the monetary authority is unwilling to release the interest rate pressure due to considerations of other goals such as inflation rate (see McMillin and Beard, 1980). Such a policy follows a steady monetary growth rule.

In the context of this interpretation of monetary policy, the following are the essentials of fiscal simulations conducted:

1. A control solution (FORECANDI7885) that provides a scenario of the economy from 1978 to 1985 is first invoked and a fiscal shock of federal government (nondefence) expenditure (in constant dollars) on goods and services to the tune of $493 billion is added each year on the control solution, keeping all government expenditures (in constant dollars) in goods and services (for different levels of government) at the control solution. Money supply is allowed to be endogenously determined and the fiscal shock is labelled INCR.NONWAGE.MF. The shock of $493 million in constant dollars amounts to $1 million in current dollars in 1980. For the sake of brevity we shall call this solution FA.

2. Solution FA revealed an increased money supply growth compared to 8 per cent growth in money supply in the control solution (FORECANDI7885), necessitated primarily by increased GNE. In CANDIDE to control money supply it is necessary to adjust the interest rate (short-rate) and, therefore, to have a nonaccommodating monetary policy it is incumbent that the short-term interest rate (FRATE.PFPAPER3M) is adjusted upwards by the amount the money supply growth in solution FA has exceeded the control solution. The assumption implicit here is the unitary elasticity of money supply growth with respect

to short-term interest rate. Solution FA also showed that the exchange rate (REXCAN) depreciates when compared to that of the control solution. A nonaccommodating monetary policy calls for an additional upward adjustment to exchange rate since interest rate adjustment in CANDIDE 2.0 does not push exchange rate well enough. Thus we have designed a fiscal shock under nonaccommodating monetary policy with adjustments to both short-term interest rate and exchange rate, while keeping the money supply at the level of the control solution. The fiscal shock is the same as in the solution FA for government nondefence expenditure on goods and services. This solution is labelled INCR.NONWAGE.MX and is abbreviated as FB.

3. Solution FB enables us to have a look at the individual sector-specific domestic price response to money wage rate and it appeared that for about 14 industries the model's domestic price equations exhibit relatively low elasticity. We have been then motivated to inquire if these price responses were a little stronger, what could be the changes in the outcome of fiscal multipliers. Accordingly, we adjusted the price equations for 14 industries upward keeping in mind that none of the elasticities of price with respect to money wage rate for these industries can exceed unity. In general, no constraint of unit elasticity was imposed on the model;

also it was difficult to fulfill unit elasticity by continuous adjustments on prices due to the existence of wage-price spiral in the model.[25] The solution thus obtained together with the same assumptions of solution FB regarding fiscal shock, nonaccommodating monetary policy, interest-rate and exchange rate adjustments, is labelled INC.NONWAGE.FLEX and abbreviated as FC. For our analysis of multiplier it is the contrast between solutions FB and FC which would be of interest to examine the net effects of modified price flexibility under nonaccommodating monetary policy.

4. A new control solution (labelled CONTROL.PXFLEX1) is created around the major exogenous assumptions of the original control solution (FORE.CANDI7885) but for changes in coefficients attached to unit labour cost, money wage rate and productivity in selected domestic price equations (PX's) is allowed for increased price flexibility. This solution (abbreviated as FD) reduces GNE but increases both PFGNE and CPI considerably, relative to the original control solution. It also generates a new path of money supply and interest rates, both generally higher than the orignal control solution throughout the most part of the eighties. Basically the primary motivation behind this exercise is to repeat the fiscal shock without necessarily having to artificially adjust prices upward as in solution FC. We are,

therefore, operating now on a changed version of the domestic price block of the model.

5. We then repeated the same fiscal shock throughout 1980-1985 on the new control solution (FD) both under accommodating monetary policy (with no adjustments to short-term interest rate and exchange rate) and nonaccommodating monetary policy (money supply held constant at levels of solution FD with appropriate adjustments to short-term interest rate and exchange rate). These two solutions are labelled PXFLEX.NONWAGE1 (abbreviated as FE) and PXFLEX.NONWAGE2 (abbreviated as FF).

All simulation results in terms of deviations from the control solutions are reported in the appendix.

III.2 Results and Analysis of Fiscal Multipliers

CANDIDE 2.0 represents an extended IS-LM model where mutual consistency in the markets for goods, labour and foreign exchange is preserved by partial equilibrium in these markets. Lag structures in each of these markets prevent us from having a comparative static approach applicable in textbook IS-LM framework, therefore, the dynamic properties of the model cannot have easy analogies with the textbook variety. Keeping this in mind, the

results of fiscal simulations FA through FF are summarized in compact tables 3A to 3F in the appendix for selected macro-economic variables with their deviations from the respective control solutions. A summary chart 1 also presents the time profile of fiscal mutlipliers under various simulations. The major findings of the simulations and a brief analysis of the mechanisms which lead to the results are reported below.

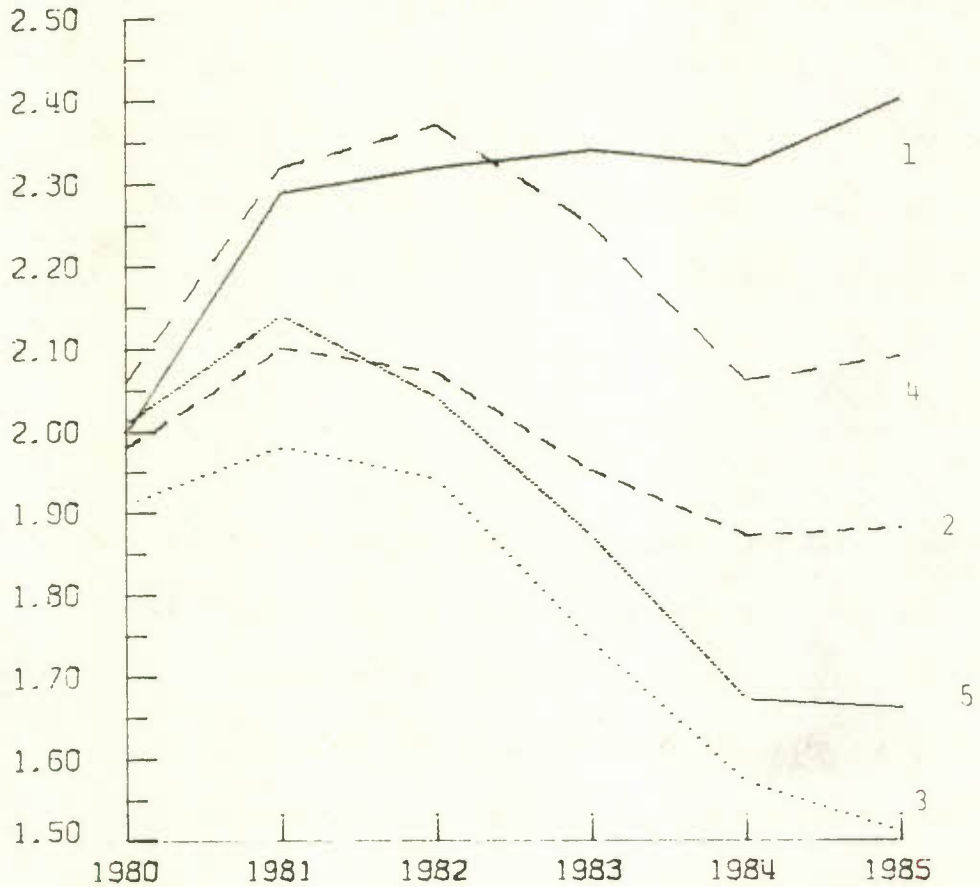
Major Findings

a. Fiscal shock with accommodating monetary policy produces greater multiplier values than with nonaccommodating monetary policy. This is what may be expected accordingly to conventional multiplier results (simulation 1 versus simulation 2, and simulation 4 versus simulation 5 of Chart 1).

b. Simulation 2 versus simulation 3 and simulation 1 versus simulation 4 exhibit the role of increased price flexibility (particularly in the long run). In comparing simulation 2 vis-a-vis simulation 3, one notices the widening gap between multipliers over time as greater price flexibility generates more pressures on output (GNE) decline. However, a comparison of simulation 1 and simulation 4 (both under accommodating monetary policy) shows a similar pattern only from 1983

CHART 1

FEDERAL GOVERNMENT EXPENDITURE OF $493 MILLION (CONSTANT $) ON NON-DEFENCE GOODS & SERVICES: FISCAL MULTIPLIERS IN CANDIDE 2.0 : 1980-1985 (SHOCK SUSTAINED DURING 1980-1985)



Legend:

1. Fiscal shock on control solution (FORECANDI7885) under accomodating monetary policy: labelled INCR.NONWAGE.MF (abbreviated as FA).
2. Fiscal shock on control solution (FORECANDI7885) under non-accomodating monetary policy: labelled INCR.NONWAGE.MX (abbreviated as FB).
3. Fiscal shock on control solution (FORECANDI7885) under non-accomodating monetary policy but with increased (adjusted) domestic price flexibility: labelled INC.NONWAGE.FLEX (abbreviated as FC).
4. Fiscal shock on a new control solution (CONTROL.PXFLEX1) allowing for increased price flexibility under accomodating monetary policy labelled PXFLEX.NONWAGE1 (abbreviated as FE).
5. Fiscal shock on the new control solution (CONTROL.PXFLEX1) under non-accomodating monetary policy: labelled PXFLEX. NONWAGE2 (abbreviated as FF).

to 1985. Note that here we are comparing against two different control solutions and hence other intervening variables do affect the results.

c. In terms of price-wage relationship (i.e., elasticity of PXRDP with respect to W) long-run elasticities are higher as prices adjust to wages with lags, but negative elasticities in the beginning point to the short-run productivity gains under fiscal shocks thereby depressing prices instead of increasing them. The upshot of this is that short-run fiscal multipliers are always higher than long-run ones because of dampening influence of productivity on prices,[26] no matter how seriously one may tamper with price flexibility without imposing restrictions on productivity.

d. The movements of GDP deflator (PXRDP) and GNE deflator (PFGNE, see Tables in the appendix) are parallel but as noted earlier the elasticity of GNE deflator with respect to GDP deflator is always less than one. If we were in a situation that the increasd GDP deflator could have fully passed through in GNE deflator with an elasticity equal to unity, more price pressures could have resulted in lower GNE and, therefore, lesser multipliers. Estimates made by the author show that the multiplier in simulation 3 by 1985 could have fallen to 1.19 had we had a passthrough of GDP deflator onto GNE

deflator by only allowing for complete export price flexibility (but excluding the role of tax inflexibility). A similar calculation for simulation 2 results in multiplier for 1985 to be 1.68 instead of actual 1.88.

e. Output increments by fiscal policy in the short-run raise interest rate (short-rate) and this appreciates exchange rate. However, this appreciation of exchange rate is only temporary as trade balance deteriorates gradually and impinges adversely on the exchange rate, i.e., exchange rate depreciates although not substantially. Trade balance deterioration is caused by increased imports with rising outputs, with rising import prices not being able to sufficiently choke off demand due to a low import elasticity of demand with respect to import price.

f. Fiscal policy by increased government expenditure shocks are successful in generating more output in the long-run but at the cost of greater price level, depreciating exchange rate and continuous federal deficits. Somehow in the medium-run there is a trade-off between inflation (with rising federal deficits) and greater aggregate output and lower uneployment rate.

g. Fiscal shocks create a real wage rate that remains higher than the control because inflation as measured by the CPI does not rise fast enough. This is because of the import content of CPI basket: with import prices not flexible enough to move up (as exchange rate does not depreciated that fast), CPI moves slowly. Although most of the directions of changes generated by the model are quite consistent, various speeds of response inhibit price flexibility especially with respect to CPI that allows output to grow a little too rapidly.

h. Investment responses of certain industries, particularly utility when outputs increase, are much too strong. This causes the multiplier to be high in the short-run and medium-run. Multiplier values seem, therefore, to be biased upwards due to overreaction of investment with respect to output.

i. Even when the domestic price flexibility with respect to domestic costs like money wage rate, capital costs, et cetera, is fully assured, the two essential elements of final demand price inflexibility still remain. These are the import and export prices that do not change much because exchange rate does not move fast enough under managed floating exchange rate regime although the directions of the variables are consistent with received theory. Thus final demand price inflexibility arrests the fall in final demand items like consumption, for

example, and also keeps the real wage rate high, resulting in multipliers that would have been otherwise much lower. Fiscal stabilization policies under managed floating regimes, therefore, do not ensure complete crowding out in an open economy.

III.3 Impact of Monetary Stabilization Policies

Monetary policies geared to stabilization of economic activity have recently generated a sharp split between "monetarism" and "keynesianism" primarily hinging on the validity of rational expectations hypothesis. The latter, if accepted, destroys the effeciency of both monetary and fiscal policies with a view to stabilizing output and employment in the long-run. Modigliani (1977) maintains that an essential difference between two schools primarily lies in the nature of supply curve of the aggregate economy, i.e., whether prices rise fast enough when output is increased. He maintains that there are institutional barriers to price increase by the nature of producers'market power (oligopology) in view of entry limit conditions and lags in adjustments of prices to costs. This may happen even when the long-term nature of wage contracts disappears by short-term contracts to allow for expectational errors in the wage rate equation to enable the wage earners to reach a full-expectation augmented Phillips Curve. Thus the controversy finally boils down to the

empirical validity of vertical supply curve of the economy in the long-run and therefore the existence of neutrality of money.

Another particular offshoot of the monetarist controversy is the Friedman-type recommendation of a permanent stable money supply growth rule to avoid expectational errors and instability caused by gyrations of output that short-run monetary policies may lead to. In this context, the influence of foreign sector through balance of payments surplus or deficit has particular influences on monetary reserves (and, therefore, money stock): money supply grows when balance of payments is in surplus and shrinks when it is in deficit. Thus there is an automatic link between money supply and balance of payments. In the absence of official intervention regarding sterilization of foreign exchange reserves through open market operations, external balance (balance of payments equilibrium) is automatically preserved by not tinkering with money supply and exchange rate. This monetary approach to the balance of payments alleges the persistence of balance of payments disequilibrium to be the result of much too high money supply that monetary authorities pursue in order to obtain short-term results.

Given the above monetarist thrust with respect to stabilization policy, it is important to consider two

essential tenets that pervade the controversy. First, what are the short-run consequences of monetary policy? Secondly, how does the adjustment process work in terms of prices choking off demand and output growth with some considerations given to institutional barriers like taxes, prices, exchange rate and interest rate policy? Evidently, it is not difficult to build a model that has at least the long-run features of vertical supply curve (or money neutrality) but then it is perhaps a little artificial to suit a model to particular desired ends. Having said so it is considered more reasonable to pursue the workings of a given model and sort out what particular linkages in the in the model finally inhibit or exhibit price flexibility.

III.4 Monetary Simulations

Monetary simulations using CANDIDE 2.0 are carried out by increasing the money supply to a target annual growth rate of 10 per cent vis-a-vis the control solution's annual growth rate of 8 per cent.

However, to do so one has also to introduce certain adjustments to Canadian short-term interest rate (FRATE.PFPAPER3M) and exchange rate (REXCAN). In CANDIDE 2.0 short-term interest rate is assumed to be partly determined in reaction to U.S. short-rate (ZUSFRMCP4M) and, therefore, increased money supply does not automatically

reduce the Canadian short rate by an appropriate amount. Similarly a reduction in short-rate should bring about capital outflows eventually resulting in exchange rate depreciation. This latter result does not also follow in CANDIDE 2.0 to an appropriate degree. Hence both short-term and interest rate and exchange rate need to be adjusted to accommodate these influences. The adjustments are: a 2 per cent increase in money supply growth is matched by a 2 per cent decrease in short-term interest rate (level) at a 0.3 (level) increase in exchange rate every year the monetary shock is recorded. Here, the shock is carried out over the period 1980-85. This shock is labelled INCR.MONEY.

After having solved the monetary shock it transpired quite similar to fiscal shock experiments that certain industry-specific prices are not very sensitive to money wage rates and some prices have a tendeny to fall as interest rates fall. Thus a selected group of industry prices has been adjusted upwards relative to their money wage rates to allow for increased price flexibility. This particular innovation is introduced to isolate specific impact of price flexibility and to find out how far we may still be away from final money neutrality. We then applied to the control solution the same monetary shcok of 10 per cent money supply growth with usual adjustments to short-term interest rate and exchange rate (as in INCR.MONEY) plus increased price adjustments to selected

industries particularly over the period 1981-1985. This solution is labelled INCR.MONEY.A2.

III.5 Results and Interpretations of Monetary Simulations

Results of the two monetary simulations are summarized in Tables 4A (INCR.MONEY) and 4B (INCR.MONEY.A2) and deviations of these simulations from the control solution (FORE.CANDI7885) for selected variables of interest are presented. Analysis of these simulations are conducted for the period 1980-1985 over which shocks are registered.

Short-Run Impacts

1. Monetary expansion policies do increase output (GNE) as the conventional IS-LM framework warrants.

2. The output increase is triggered by (a) increased investment (particularly housing starts (RTS)) due to the lowering of interest rates, (b) reduced imports due to depreciating exchange rate resulting from lowering of short-term interest rate, and (c) improvement in exports (due to depreciating exchange rate) and inventories. However some of the benefits of lowering interest rates which cause depreciation of the exchange rate are lost as consumption falls with the fall in real personal disposable income (PDY$/CPI). The latter happens

because CPI rises as import prices rise due to depreciating exchange rate. There is, therefore, a a shift in the composition of the final demand items from consumption and imports to investment and exports.

3. Both aggregate GDP deflator (PXRDP) and GNE deflator (PFGNE) rise because in the short-run a fall in interest rate cannot pass through in domestic deflators, whereas both import and export prices do. Note also the increase in CPI, aggregate consumption deflator (PFC) and aggregate investment deflator (PFGDC) due to the influence of rise in import prices.

4. An increase in CPI has pulled down the real wage (W/CPI) in 1980 which is primarily responsible for a fall in real disposable income. This fall in real wage also results in larger withdrawals of persons from labour force than new entrants in employment yielding a lower unemployment rate in 1980. Money wage rate (W) picks up in 1981 as lower unemployment rate in 1980 acts with a lag on money wage rate.

5. Both output and price increases help to improve the federal government's deficit position to the detriment of provincial and local governments' budgetary stance. Federal fiscal stance improves primarily because of lower unemployment insurance payments as unemployment

rate falls. Provincial budgetary deficits worsen because of a fall in revenues due to a fall in consumption and personal incomes.

6. Improvement in the current account balance of payments results primarily from a fall in imports and a rise in exports as exchange rate depreciates. This shows (particularly for imports) that price effect on imports is much more dominant than income effects.

All these short-run consequences of monetary expansion in both simulations are mostly consistent with the extended IS-LM framework of an open economy under flexible exchange rate. A particular point worth noting is that in the monetary simulation (INCR.MONEY.A2) we have not increased the short-run price flexibility sufficiently to register major changes in the results. Hence the differences in the two simulations are marginal in the short-run.

Long-Run Impact

The primary channel by which output increase from monetary expansion gradually wears itself out in the long run is through increasing the interest rates back to the control. This is achieved if prices rise fast enough to do the job, thereby moving the LM curve to the left. The

various adjustment processes in the economy may delay this shift and, to that extent, the length of time over which monetary shocks are registered is an important factor. As our time period of shock-minus-control responses is restricted only to a period of six years (1980 though 1985) we can only point to the directions in which various adjustments are taking place.

Our findings can be summarized as follows:

1. Output (GNE) has a monotonic growth in both simulations with greater price flexibility yielding a smaller growth (INCR.MONEY.A2) than the one without improved price flexibility (INCR.MONEY).

2. Interest rates in both simulations offer no signs of reverting back to the control levels and they remain sufficiently lower than the control; this allows the exchange rate to depreciate. As we move in time the rate of depreciation continues to cut imports until 1984 (although at a diminishing rate) whereas exports grow by a more or less humped cycle. This has multiplier effects on output.

3. There are increasing price pressures being felt on the domestic front over time. PXRDP, PFGNE, and CPI all rise more or less monotonically. Greater price

pressures are felt in solution INCR.MONEY.A2 compared to solution INCR.MONEY. However, increased GNE deflator (PFGNE) has not succeeded in pulling up the short-term interest rate (FRATE.PFPAPER3M) sufficiently as federal government debt (FGD.TSEC) diminishes and more credit is now available, both of which have negative impacts on the short-rate.

4. The fall in federal government debt is occasioned by a better budget balance situation because revenues rise with increased corporate profits (Y.PROFBT.CORP$) from greater output and because lesser unemployment insurance payments are now necessary as unemployment rate falls (up to 1984). The provincial and local governments' budgetary position worsens with concommitant increase in their debt situation (GVP+L.B.STOCK). This result is partly due to a shift in the composition of output from consumption to investment, in a relative sense, which does not enable provincial governments to raise sufficient revenues to match their increased expenditures. Monetary expansion policies, therefore, tend to favour the federal government's budgetary position and worsen the budgetary stance of provincial and local governments. However, because of lower interest rates aggregate interest payments on debt for all levels of government decline (GE.INTS).

5. Current account balance of payments worsens ultimately in 1985 as output effects dominate the price effects (exchange rate depreciation) on imports.

6. Unemployment rate rises up in 1985 as more entrants into labour force (due to increasing real wage (W/CPI)) swamp the increased employment due to increased output. Real wage rate (W/CPI) shows parallel movements with output increases in both simulations, with lesser increase in the case of solution INCR.MONEY.A2 (greater price flexibility) than in solution INCR.MONEY (unchanged price flexibility).

Given the above, what are the implications of monetary policy in the long-run? Definitely we do not claim that money neutrality is feasible within the time span of the simulations. However, one particular upshot seems clear; most of the major macro-indicators seem to move in the direction implied by the received theory. Also increased price flexibility (INCR.MONEY.A2) has some dampening influence on the growth of output and helps to keep the interest rate a little higher than it would be otherwise. It is further evident that price pressures do mount gradually as the economy appears to grow with eventual turn-around of current account balance of payments when the rate of depreciation of exchange rate wears off. Monetary impacts have traditional gestation lags and CANDIDE 2.0 is

no exception. Had we had the monetary simulations carried out for a longer period of time, say 10 to 15 years, it is quite conceivable that we may approach money neutrality. Nevertheless, it would be reasonable to say that both in the short- and medium-run money does matter in an open economy under managed floating exchange rates.

IV Fiscal Stabilization Policy In An Environment of Rising External Prices and Interest Rates Under Nonaccommodating Monetary Policies

It is often maintained that under a purely flexible exchange rate system a country can pursue its independent monetary policy to stabilize the economy and insulate itself from price and interest rate pressures from its trading partners. This monetary independence criterion is hardly pursued in the real world as the industrial nations in particular are following a synchronized band of highly-managed floating regimes. However even under puristic assumptions of flexible exchange rate system, monetary authorities may not be able to control the terms of trade and wage-price spiral channels that result from the exchange rate changes which bear the brunt of all adjustments.

In this section we shall examine a fiscal stabilization policy in an external environment given by the U.S. economy which faces an increased inflation rate

accompanied by an increased interest rate. This fiscal stance is accompanied by a nonaccommodating monetary policy; under accommodating monetary policy increased traded-good prices, through foreign inflation, would have been otherwise absorbed. In a study bearing on this topic which employs two separate simulations of accommodating and non-accommodating monetary policy under increased U.S. inflation and interest rate, the results show that accommodating monetary policy creates more inflation and less of output than nonaccommodating monetary policy.[28] As nonaccommodating monetary policy puts a lesser degree of stagflation in the economy in the presence of rising external inflationary and interest rate conditions, we picked this as a test case for repair by a fiscal stabilization policy. Note that nonaccommodating monetary policy here implies that the Bank of Canada does not follow the interest rate policy of the U.S. to keep the traditional interest rate differential between the two countries and it sticks to a monetary growth rule without being affected by foreign inflation. This implies that the exchange rate absorbs all external disturbances. The simulation of nonaccommodating policy in the context of foreign inflation and rising interest rates is presented in INT.PlRl.SHK (Table 5A). It shows that over the period 1978-85 there is some sizeable loss of output together with increased inflation (PFGNE).

In order to implement a fiscal policy that makes up for loss of output in INT.PIRI.SHK, we took up an easy increased federal government expenditure shock (GEF.CGS.NDOGS) on nondefence goods and services rather than a tax policy. The amount of shock each year is a varying amount that does not completely eliminate loss of GNE year by year but roughly approximates some sort of redress. This solution is called INT.PIRIADJ and the result is presented in Table 5B.

IV.1 Results and Interpretation

Although fiscal policy can succeed in arresting the fall in output (GNE) caused by nonaccommodating monetary policy in the presence increased foreign prices, it yields the following other long-run effects when the two solutions are compared (see Tables 5A and 5B).

1. Fiscal policy increases PFGNE, CPI, short-term interest rate (FRATE.FCPAPER3M) as well as long-term interest rate (FRATE.IBOND.10Y). However these increases are not very large;

2. Increased short-term interest rate arrests the fall in the depreciation of exchange rate and therefore induces more imports although exports are not very much affected;

3. Output expansion has been first triggerred by expansionary fiscal stance in the first round and investment increases (GFC) in the second round, the accelerator affect. The role of interest rate (long-term), which has only slightly increased, has done practically nothing to pull down investment. Increased consumption is the result of multiplier effects of government expenditure and investment;

4. Overall current account balance of payments which was showing substantial improvement under stagflation is now being eroded by stimulative fiscal policy as output grows with increased imports.

5. Federal government's budgetary situation worsens whereas provincial governments' bugdetary stance improves as expected. This is because output growth is made at the expense of increased federal government expenditure whereas increased activity helps the provinces.

6. Worsening federal deficit has resulted in a massive increase in federal debt (FGD.TSEC) which because of increased interest rates has further effects on federal expenditures on interest payments and, therefore, its own deficit.

7. Real wage rate (W/CPI) has marginally increased with increased activity and there is some improvements in the unemployment rate.

At this stage it is appropriate to ask what fiscal stabilization policy under nonaccommodating monetary policy has done to the economy with respect to the control solution (Table 5B). There is no question fiscal policy has ultimately brought us back to the control solution for output with some improvement in unemployment rate, and federal deficit and the current account balance of payments. The salient features of combined monetary-fiscal stabilization can be summarized (Table 5B) as follows:

a. Combined monetary-fiscal policies can bring the level of GNE back to the control solution. i.e., level of GNE before the external shocks are registered. GNE revival from stagnation is caused by a fall in imports due to a rise in import prices and increased government expenditures.

b. Prices remain much above the control solution but as U.S. prices remain much higher than Canadian prices, exchange rate appreciates. However as external prices (in foreign currency) rise by the nature of shocks, this exchange rate appreciation is not sufficient to pull down the foreign prices (exchange rate appreciates by

2.5 per cent while foreign prices (in U.S. currency)) rise by 8 per cent in 1985 resulting in rising effective import and export prices (in Canadian currency) by about 5.5 per cent in 1985.

c. There is a steady fall in real wage over 1978-1985 and wages share in national income falls to the gain of profit share.

d. Due to increased import prices, the price effect cuts through imports and current account balance of payments improves; also a federal government budgetary position improves due to a rapid rise in corporate profits which is primarily the result of increased inflation.

e. Unemployment falls because of more withdrawals of labour force from the supply side rather than change in employment due to demand factors. Provincial governments' budgetary stance deteriorates.

f. Long-term interest rate moves up as it is primarily guided by increased U.S. long rate but short-rate does not move much because of independent Canadian interest rate policy.

V Conclusions

Stabilization policies, fiscal and monetary, have been of late a matter of major concern for open economies where a large bulk of goods and services is open to trade. One of the most important ingredients in the analysis of open economies is the determination of the speed at which domestic prices are formed. It is often maintained that under independent monetary policy the impact of foreign prices on domestic price formation can be cushioned effectively if a flexible exchange rate regime is followed through. Recently among industrial nations there is actually a synchronized band of managed-floating exchange rates which has resulted in the convergence of international price transmission. Another aspect of the debate has focussed on the issue of short-run and long-run domestic price flexibility arising out of purely domestic cost factors. In this respect one of the key issues is the wage-price flexibility.

This paper first attempts to uncover the domestic price flexibility problem as embedded in CANDIDE 2.0 from both domestic and external sources. It examines the major sources of short-run and long-run price inflexibility that ultimately determines the supply curve of the Canadian economy. In this respect CANDIDE 2.0 industry prices (44 industries) show up different degrees of price flexibility depending on domestic cost factors as well as import or

export prices. Overall price inflexibility in the system then is decomposed into the following sources:

1. Export prices are exogenous but for the exchange rate an hence the GNE deflator remains partly inflexible;

2. Indirect taxes and subsidies imply an additional dose of inflexibility;

3. Some domestic industry prices are governed by import prices due to the nature of (limited) substitution possibilities between domestic and imported goods; import prices are exogenous but for the exchange rate and so when the latter does not change, domestic prices are to a certain extent not flexible;

4. In final demand prices, particularly CPI and prices of investment goods, import prices dominate their movements due to the weight of import content in CPI and investment goods; this makes both these prices relatively inflexible with respect to domestic costs;

5. The overall domestic GDP deflator sensitivity with respect to money-wage rate in the short-run is low (elasticity is equal to .35) and in the long-run moderate (elasticity is equal to .65); in simulation some attention is paid to increase particularly the long-run elasticity to examine specific impacts; and

6. Exchange rate movements crucially determine the movements of import and export prices; under managed floating regimes some relative stickness of exchange rate adds to price inflexibility.

After having examined the sources of price inflexibility, fiscal and monetary stabilization policies are then studied in terms of their impacts.

Fiscal Stabilization Policies

Fiscal policies with increased government expenditures (federal nondefence goods and services) under both accommodating and nonaccommodating monetary policy reveal the following:

a. Fiscal mutlipliers under the nonaccommodating monetary policy are lower than those under accommodating monetary policy; multipliers remain considerably above unity over the period of shock, 1980-1985;

b. Greater wage-price flexibility in nonaccommodating monetary policy with selective price adjustments helps to get the multiplier down to 1.50 in 1985 starting with 1.91 in 1980; similar changes in coefficients in industry-specific price equations also help to get the

multiplier down to 1.66 in 1985 starting with 2.00 in 1980;

c. Both prices and interest rates rise with fiscal shocks; however, the increases are not sufficient to choke off demand and bring about the typical "Crowding Out" phenomenon;

d. Investment in certain industries, particularly utility, has a tendency to show much too strong short-term elasticity with respect to output; this had a tendency to keep the multiplier high; and

e. Both current account balance of payments and federal budgetary situation worsen as output increases; deteriorating trade balance causes the exchange rate to depreciate although not substantially.

To sum up, long-run impact of fiscal shocks in CANDIDE 2.0 even under nonaccommodating monetary policy remains positive.

Monetary Simulations

A monetary shock is registered to the model by changing the money supply growth rule from 8 per cent per annum to 10 per cent per annum for the period 1980 through

1985 with appropriate adjustments to short-term interest rate (reduced) and exchange rate (depreciated). An alternative monetary simulation is also run that incorporates an increased price flexibility with respect to money wage rate under the same 10 per cent money supply growth rule. The major findings can be summarized below:

a. GNE shows a monotonic increase in both simulations; simulation with greater price flexibility shows a lower growth than without;

b. Short-term interest rates in both simulations remain lower than the control solution and show no clear signs of reverting back to the control levels by 1985; this makes the exchange rate to depreciate;

c. There are increasing price pressures (more with greater price flexibility) generated over time but the increase in GNE deflator does not succeed in pulling up the short-term interest rate sufficiently as improved federal debt situation and domestic credit availability both act to pull it down;

d. Most of the GNE increase in monetary simulations is triggered by reduced imports due to depreciating exchange rate and increased investment partly due to lower interest rate but largely due to increase in

output (accelerator effect); initially there is also a switch of final demand from consumption to investment; and

e. Federal fiscal stance improves as increased activity creates more revenues both from increased nominal wage incomes as well as corporate profits with a corresponding decline in current federal expenditures due to fall in unemployment rate; provincial governments face just the reverse situation.

In summary, most of the directions of macro variables seem to be consistent with the received theory of monetary dynamics. However, as our simulations are restricted only to a six year period, monetary dynamics may still be requiring a longer time span to work itself out as it traditionally does. However, there is no denying the fact that in the short- and medium-run monetary stabilization (output) policies are successful, and the issue of money neutrality can only be a very long term possibility.

Combined Fiscal and Monetary Policies in an External Environment with Increased Foreign Inflation and Interest Rates

Can fiscal and monetary measures be effectively utilized to prevent a stagflation imposed by rising external

prices and interest rates for a small open economy? Our final simulation analyses such a scenario where we pose an external environment (U.S. in particular) with exogenous price and interest rate increased and ask for Canada to pursue a combined fiscal-monetary policy to combat the damaging consequences of such external shocks. It is well-known that monetary policies can be geared to insulate domestic inflation from foreign inflation by following a floating exchange rate. This is what we first set out to do by renouncing the managed floating regime and by making the Bank of Canda not pursue parallel increase in the short-term interest rate to keep traditional U.S.-Canada interest rate differential. The exchange rate bears the full burden of all external disturbances.

Next, we develop two monetary simulations under flexible exchange rate: accommodating monetary policy and nonaccommodating (money supply unchanged) monetary policy facing the given external shocks. These simulations show that nonaccommodating monetary policy offers a much milder form of stagflation than accommodating monetary policy. We, therefore, accept the nonaccommodating monetary policy as much more desirable and then superimpose on it a fiscal policy involving government (federal) expenditure shock (nondefence goods and services) to repair the loss of output that nonaccommodating monetary policy generates. The external scenario implies 1 per cent increase in all foreign

prices starting in 1978 and ending by an 8 per cent increase in 1985. The results from this fiscal simulation show the following interesting features:

a. Combined monetary-fiscal policies can bring the level of GNE back to the control solution. i.e., level of GNE before the external shocks are registered. GNE revival from stagnation is caused by a fall in imports due to rise in import prices and increased government expenditures;

b. Prices remain much above the control solution but as U.S. prices remain much higher than Canadian price, exchange rate appreciates. However, as external prices (in foreign currency) rise by the nature of shocks, this exchange rate appreciation is not sufficient to pull down the foreign prices (exchange rate appreciates by 2.5 per cent while foreign prices (in U.S. currency) rise by 8 per cent in 1985 resulting in rising effective import and export prices (in Canadian currency) by about 5.5 per cent in 1985;

c. There is a steady fall in real wage rate over 1978-1985 and wages share in national income falls to the gain of profits share;

d. Due to increased import prices, price effects cut through imports and current account balance of payments improves; also a federal government budgetary position improves due to a rapid rise in corporate profits which is primarily the result of increased inflation;

e. Unemployment falls because of more withdrawals of labour force from the supply side rather than change in employment due to demand factors. Provincial governments' budgetary stance deteriorates; and

f. Long-term interest rate moves up as it is primarily guided by increased U.S. long rate but short-rate does not move much because of independent Canadian interest rate policy.

It can, therefore, be maintained that in the presence of rapid increases in foreign inflation and interest rates, the monetary authorities do have some access to independent decisions regarding both interest rate and exchange rate policy, i.e., not to tie Canadian interest rate to U.S. interest rate and follow a flexible exchange rate, whereas fiscal policies can be geared to pure output stabilization. Hence both monetary and fiscal policies can be utilized to obtain the best of both worlds. However, price stabilization is not feasible because of limited response of exchange rate to relative prices (U.S. versus Canada) and the wage-price spiral.

FOOTNOTES

1 The model in its detail of structure and estimation is fully documented in "CANDIDE 2.0": Model Description", Volume 1 & 2, Economic Council of Canada, October 1979.

2 This is applied primarily to the manufacturing industries even at the three digit SIC level. See Cat.61-505, 61-506, Indexes of Real Domestic Product, Various Issues, Cat.15-509E (Occasional), the Input-Output Structure of Canadian Economy in Constant Prices, 1961-74, Statistics Canada.

3 For estimation of value-added prices over the sample period 1956-74, see the documentation CANDIDE 2.0 , Economic Council of Canada, October 1979.

4 See Ozataly, Griebaugh, and Long (1979) using the cross-section data for 9 countries.

5 Nordhaus (1972) was the first to integrate the neoclassical price theory with mark-up pricing theory and found that unit elasticities holds good only under competitive conditions, with the neoclassical price theory giving the same result as the mark-up price theory. Incidentally, Nordhaus maintains that capital costs should enter in the price equation in the long run and debunks the assumption of the unit elasticity of PX with respect to unit labour cost which empirical studies mechanically follow.

6 See Corden (1971)

7 This holds good when the equilibrium domestic price in the absence of import competition is greater than the competing price in domestic currency (including tariffs).

8 Value-added prices in mining are subject to errors especially for metal and nonmetal mining and less so for coal.

9 Results of estimted value-added prices of all industries are reported in the documentation of CANDIDE 2.0., Economic Council of Canada, October 1979.

10 These are: 11,17,18,19,20, 21,23,26, 27 and 28. Most of these industries happen to have large import shares in domestic supply. Appendix 2.

11 There are some dissenting opinions with respect to the treatment of export prices. Applebaum and Kohli (1979)

maintain that Canada has some edge in determining export prices.

12 Sometimes relative price impinge only up to 1974 in the estimated import demand functions.

13 Note that in the full solution of the model the following additional feedbacks occur: 1. changing import prices feed into domestic prices (PX) and 2. changing import prices change final demand prices including CPI which affects wage rate that feeds into domestic prices. The latter in turn affects the real side and impinge on the imports.

14 Beath (1978) maintains the aggregation bias of macro GDP deflator could be quite serious and he recommends that the priniciple of reaching the macro from industry-specific price models. This parallels Yadav's (1975) comments on aggregate import functions.

15 Otani's (1975) model of Philippines renders a partial elasticity of GDP deflator with respect to import prices to be of the order of .62 in the context of a fully simultaneous model having money/supply demand, domestic price, general price level, import demand and excess demand as gap between actual output and potential output. When the full model is solved the elasticity of domestic price with respect to imported inflation works out to be .50. In a recent article Sheehey (1979) reports Otani's partial elasticity to be biased upward. Import price contributes according to him only 33 per cent to GDP deflator.

16 These eight prices refer to industry 37 and industry 38 through industry 44. All these equations are estimated in percentage change form.

17 See Statistics Canada Cat 15-509E, I/O Table 1961-74, Page 19.

18 Construction industry is the only industry which pays provincial sales taxes in I/O definition to arrive at producers' price.

19 Nordhaus points out that very often empirical estimates are biased in favour of instantaneous wage rate price passthrough rather than being based on an examination of all possible lag structures of price adjustments to wage rates.

20 See Taylor, Turnovsky and Wilson (1973) and Scarfe (1972). These studies represent quarterly gross output price equations and it seems that on an annual basis the lag works out to be 4 quarters or one year. Ours is two years for some industries.

21 Gordon (1975), McCallum (1974,1977), Modigliani (1977), Bruno (1977), Sahling (19777.

22 See Bruno (1979).

23 The calculations underlying the procedure and the results therefrom can be obtained from the author on request.

24 Lucas (1972) has suggested parametric changes in the reaction functions of economic agents in a way consistent with rational expectations hypothesis such that it would frustrate the effectiveness of fiscal policies for stabilization purposes. A critique of this position can be found in Fair (1979), Buiter (1980).

25 Unit elasticity could have been preserved by constraining relevant price equations to PX = W but that would have called for model code changes.

26 Multiplier cycles are very common in both theoretical and empirical literature, i.e., Samuelson (1939) and Beaver, Kohli & Maxwell (1978) due to the existence of time lags.

27 This result is not shown in the tables (appendix) but may be obtained from the author on request.

28 See Rao and Whillans.

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APPENDIX

APPENDIX A: PRICE CONVERSION FORMULA

EI(48,150)	THE FINAL DEMAND BRIDGE MATRIX
BDIMUR(48,48)	DOMESTIC MATRIX WEIGHTING USED TO DETERMINE PQ(COMMODITY PRICES)
UR(48,48)	IMPORT MATRIX WEIGHTING USED TO DETERMINE PQ(COMMODITY PRICES)
DA(48,48)	THE MAKE MATRIX
B(48,48)	THE USE MATRIX
BSTAR(48,48)	DIAGONAL MATRIX WITH (1 - SUM(I=1,48),B(I,J), J=1,48) ON MAIN DIAGONAL (VALUE ADDED SHARE)
U(48,48)	DIAGONAL MATRIX WITH (M(I) / ((Q(I) + M(I) - X(I)), I=1...48) ON MAIN DIAGONAL (IMPORT CONTENT)
M(48)	IMPORT BY COMMODITY, 1971
Q(48)	COMMODITY GROSS OUTPUT, 1971
X(48)	EXPORTS BY COMMODITY 1971
PG(48)	INDUSTRY PRICES
PQ(48)	COMMODITY PRICES
PQD(48)	COMMODITY PRICES (DOMESTICALLY PRODUCED)
PF(89)	FINAL DEMAND PRICES (PSEUDO)
PY(48)	VALUE ADDED PRICES BY INDUSTRY (ASSIGNED)
PM(48)	IMPORT PRICES BY COMMODITY (ASSIGNED)

PQ(I), I=1...48 DERIVED AS FOLLOWS:

$$PG = PQ * B + PY * BSTAR$$
$$PQD = PG * DA$$
$$PQ = PM * U + PQD * (I - U)$$

USING (1), (2), AND (3) WE DERIVE PQ AS A WEIGHTED SUM OF PM AND PY

$$PQ = PM * U * (I - B * DA * (I - U))(INVERSE) + PY * BSTAR * DA * (I - U) * (I - B * DA * (I - U))(INVERSE)$$

NOTE: $UR = U * (I - B * DA * (I - U))(INVERSE)$

$$BDIMUR = BSTAR * DA * (I - U) * (I - B * DA * (I - U))(INVERSE)$$

(PY's here are referred to as PX's in the text)

Response of Fiscal Shock under Accommodating Monetary Policy in CANDIDE 2.0: Simulation 1 (FA)
($493 million (1971$) sustained 1980 through 1985;
Shock-Control Differences and Percentage Differences)

TABLE 3-A

Variable	Name	1979	1980	1981	1982	1983	1984	1985
	PRICES AND WAGES (% DIFFERENCE)							
PXRDP	Aggregate GDP Deflator	-	-.12	-.07	.19	.42	.12	.77
W	Average Hourly Earnings	-	.03	.14	.46	.91	1.29	1.61
PXMF	Manufacturing GDP Deflator	-	-.08	-.03	.19	.45	.68	.86
WMF	Average Hrly Earnings-Manufacturing	-	0.0	.11	.47	.97	1.39	1.76
PFGNE/100	GNE Deflator	-	-.09	-.05	.16	.34	.51	.63
CPI	Consumer Price Index	-	-.07	-.02	.19	.37	.51	.60
PFC	Consumer Expenditure Deflator	-	-.11	-.06	.17	.34	.48	.57
PFGFC	Fixed Investment Deflator	-	0.0	-.02	.12	.27	.46	.63
PTE.CA.G+SW	Exports Deflator	-	.25	.26	.20	.15	.16	.16
PTM.CA.G+SW	Imports Deflator	-	.22	.23	.15	.09	.07	.04
REXCAN	Exchange Rate	-	.26	.27	.20	.16	.17	.16
	COMPONENTS OF GNE (DIFF IN $1971 MILL)							
GNE	Gross National Expenditure	-	985	1127	1146	1156	1145	1181
C	Consumption	-	448	411	489	590	728	904
GFC	Gross Fixed Capital Formation	-	207	485	519	489	375	278
GE.CGS	Government Goods and Services	-	492	492	493	492	491	490
TEG+SNAW	Exports	-	-5	8.5	10.9	12.5	16.4	16.3
TMG+SNAW	Imports	-	295	385	390	402	433	487
	LABOUR, SUPPLY AND DEMAND, REAL WAGE (DIFF)							
DTOTLF	Labour Force (thousands)	-	3.1	6.9	10.6	13.8	22.7	32.9
NE	Employment (thousands)	-	38.7	51.9	57.4	55.6	54.8	52.6
DURATE	Unemployment Rate	-	-.33	-.40	-.41	-.37	-.26	-.18
W/CPI	Real Wage Rate	-	0.0	.01	.01	.02	.04	.05
	GOVERNMENT BUDGET BALANCE (DIFF)							
GDF$	Federal Govt Deficit	-	-520	-485	-510	-681	-1026	-1395
GDP$	Provincial Govt Deficit	-	171	253	291	334	326	334
GD$	Government Deficit	-	-361	-246	-226	-359	-720	-1026
GE.INT$	Interest Payments	-	469	121	197	297	442	631.64
	MONEY, INTEREST RATES AND OTHER (DIFF)							
FMONEYSUPPLY	Money Supply ($ millions)	-	114	224	322	441	631	894
FRATE.FCPAPER3M	Finance Company Paper	-	-.01	0.0	.04	.09	.13	.15
FRATE.GBOND.10Y	Government 10 yr bonds	-	.01	.02	.03	.05	.07	.08
FRATE.IBOND.10Y	Industrial 10 yr bonds	-	0.0	0.0	.01	.02	.04	.05
FFINASSET.PUB	Financial Assets of Public ($ millions)	-	1277	1964	2796	3919	5868	8320
FGD.TSEC	G of C Direct & Guar Securities ($ millions)	-	688	1167	1726	2461	3576	5092
RTS	Housing Starts (thousands)	-	1.17	2.06	2.0	1.8	2.0	2.4
TBC.BAL.CAW$	Current Account Balance ($ millions)	-	-635	-854	-869	-930	-1022	-1198
Y.PROFBT.CORP$	Corporate Profits ($ millions)	-	891	910	821	498	103	218
PDY$/CPI	Real Disposable Income ($ millions)	-	391	495	566	717	905	1111

Diff = Shock - Control
% Diff = [(Shock - Control)/Control] X 100

Table 3B

Response of Fiscal Shock under Non-Accommodating Monetary Policy in
CANDIDE 2.0: Simulation 2 (FB)
($493 million (1971$) sustained 1980 through 1985;
Shock-Control Differences and Percentage Differences)

Variable	Name	1979	1980	1981	1982	1983	1984	1985
	PRICES AND WAGES (% DIFFERENCE)							
PXRDP	Aggregate GDP Deflator	-	-.12	-.07	.17	.37	.53	.65
W	Average Hourly Earnings	-	.04	.09	.33	.70	.99	1.21
PXMF	Manufacturing GDP Deflator	-	-.14	-.07	.13	.35	.54	.68
WMF	Average Hrly Earnings-Manufacturing	-	.01	.07	.35	.78	1.10	1.39
PFGNE/100	GNE Deflator	-	-.13	-.07	.13	.28	.41	.51
CPI	Consumer Price Index	-	-.13	-.05	.17	.32	.42	.50
PFC	Consumer Expenditure Deflator	-	-.0	-.0	0.0	.01	.01	.01
PFGFC	Fixed Investment Deflator	-	-.05	-.06	.08	.21	.38	.53
PTE.CA.G+SW	Exports Deflator	-	-.05	.13	.10	.02	.06	.07
PTM.CA.G+SW	Imports Deflator	-	-.10	.08	.04	-.06	-.05	-.06
REXCAN	Exchange Rate	-	-.05	.13	.10	.02	.07	.08
	COMPONENTS OF GNE (DIFF IN $1971 MILL)							
GNE	Gross National Expenditure	-	975	1037	1019	963	922	930
C	Consumption	-	516	422	498	552	673	818
GFC	Gross Fixed Capital Formation	-	200.49	442.45	436	364	224	111
GE.CGS	Government Goods and Services	-	491	492	494	494	495	494
TEG+SNAW	Exports	-	-11.5	-.26	2.96	3.93	8.16	8.74
TMG+SNAW	Imports	-	343	443	416	407	440	485
	LABOUR, SUPPLY AND DEMAND, REAL WAGE (DIFF)							
DTOTLF	Labour Force (thousands)	-	4.3	7.3	9.4	10.6	17.3	25.1
NE	Employment (thousands)	-	39.3	51.4	56.2	52.0	50.9	47.8
DURATE	Unemployment Rate	-	-.32	-.40	-.41	-.36	-.29	-.19
W/CPI	Real Wage Rate	-	.01	.01	.01	.02	.03	.03
	GOVERNMENT BUDGET BALANCE (DIFF)							
GDF$	Federal Govt Deficit	-	-677	-612	-713	-966	-1394	-1859
GDP$	Provincial Govt Deficit	-	201	273	315	351	383	422
GDS	Government Deficit	-	-484	-344	-385	-594	-988	-1348
GE.INT$	Interest Payments	-	217	256	409	568	877	1203
	MONEY, INTEREST RATES AND OTHER (DIFF)							
FMONEYSUPPLY	Money Supply ($ millions)	-	0.0	0.0	0.0	0.0	0.0	0.0
FRATE.FCPAPER3M	Finance Company Paper	-	.43	.18	.25	.30	.52	.59
FRATE.GBOND.10Y	Government 10 yr bonds	-	.09	.07	.08	.13	.16	.20
FRATE.IBOND.10Y	Industrial 10 yr bonds	-	.08	.08	.09	.11	.15	.19
FFINASSET.PUB	Financial Assets of Public ($ millions)	-	1205	1241	2043	3129	4866	7249
FGD.TSEC	G of C Direct & Guar Securities ($ millions)	-	749	1412	2152	3173	4580	6530
RTS	Housing Starts (thousands)	-	.57	.81	1.01	.80	.85	1.27
TBC.BAL.CAW$	Current Account Balance ($ millions)	-	-712	-965	-919	-918	-1011	-1166
Y.PROFBT.CORP$	Corporate Profits ($ millions)	-	590	762	686	285	-105	-346
PDY$/CPI	Real Disposable Income ($ millions)	-	541	538	575	695	898	1087

Diff = Shock - Control
% Diff = [(Shock - Control)/Control] X 100

TABLE 3-C

Response of Fiscal Shock under Non-Accommodating Monetary Policy
with Increased Price Flexibility in
CANDIDE 2.0: Simulation 3 (FC)
($493 million (1971$) sustained 1980 through 1985;
Shock-Control Differences and Percentage Differences)

Variable	Name	1979	1980	1981	1982	1983	1984	1985
	PRICES AND WAGES (% DIFFERENCE)							
PXRDP	Aggregate GDP Deflator	-	-0.07	0.04	0.31	0.54	0.76	0.93
W	Average Hourly Earnings	-	.04	.12	.38	.76	1.05	1.29
PXMF	Manufacturing GDP Deflator	-	-.11	-.01	.25	.53	.75	.94
WMF	Average Hrly Earnings-Manufacturing	-	.01	.10	.40	.84	1.17	1.47
PFGNE/100	GNE Deflator	-	-.09	.01	.24	.41	.58	.72
CPI	Consumer Price Index	-	-.08	.05	.29	.46	.61	.73
PFC	Consumer Expenditure Deflator	-	-.11	.02	.28	.45	.60	.71
PFGFC	Fixed Investment Deflator	-	-.02	-.01	.16	.32	.52	.72
PTE.CA.G+SW	Exports Deflator	-	-.06	.11	.09	-.00	.02	.02
PTM.CA.G+SW	Imports Deflator	-	-.10	.06	.03	-.08	-.09	-.11
REXCAN	Exchange Rate	-	-.05	.11	.09	-.00	.03	.03
	COMPONENTS OF GNE (DIFF IN $1971 MILL)							
GNE	Gross National Expenditure	-	943	978	953	858	774	744
C	Consumption	-	477	369	444	472	571	691
GFC	Gross Fixed Capital Formation	-	196	434	430	345	187	61
GE.CGS	Government Goods and Services	-	492	492	495	495	496	495
TEG+SNAW	Exports	-	-12.0	-2.2	-0.7	-1.4	.51	-1.3
TMG+SNAW	Imports	-	331	431	418	403	432	478
	LABOUR, SUPPLY AND DEMAND, REAL WAGE (DIFF)							
DTOTLF	Labour Force (thousands)	-	3.36	5.55	7.02	7.91	13.89	20.64
NE	Employment (thousands)	-	38.0	48.6	53.3	47.9	45.5	41.2
DURATE	Unemployment Rate	-	-.31	-.39	-.41	-.35	-.27	-.17
W/CPI	Real Wage Rate	-	.01	.00	.00	.01	.02	.03
	GOVERNMENT BUDGET BALANCE (DIFF)							
GDF$	Federal Govt Deficit	-	-675	-620	-714	-982	-1427	-1899
GDP$	Provincial Govt Deficit	-	199	262	298	323	339	363
GD$	Government Deficit	-	-485	-366	-408	-643	-1071	-1456
GE.INT$	Interest Payments	-	219	263	423	589	906	1245
	MONEY, INTEREST RATES AND OTHER (DIFF)							
FMONEYSUPPLY	Money Supply ($ millions)	-	0.0	0.0	0.0	0.0	0.0	0.0
FRATE.FCPAPER3M	Finance Company Paper	-	.44	.20	.27	.32	.54	.61
FRATE.GBOND.10Y	Government 10 yr bonds	-	.10	.07	.08	.13	.17	.21
FRATE.IBOND.10Y	Industrial 10 yr bonds	-	.08	.08	.10	.11	.16	.20
FFINASSET.PUB	Financial Assets of Public ($ millions)	-	1209	1263	2068	3194	5014	7506
FGD.TSEC	G of C Direct & Guar Securities ($ millions)	-	748	1421	2161	3202	4647	6641
RTS	Housing Starts (thousands)	-	.53	.69	.81	.55	.56	.94
TBC.BAL.CAW$	Current Account Balance ($ millions)	-	-691	-943	-933	-921	-1007	-1168
Y.PROFBT.CORP$	Corporate Profits ($ millions)	-	653	845	796	396	46	-135
PDY$/CPI	Real Disposable Income ($ millions)	-	500	481	516	615	783	942

Diff = Shock - Control
% Diff = [(Shock - Control)/Control] X 100

Table 3E

Response of Fiscal Shock under Accommodating Monetary Policy
with Increased Price Flexibility in
CANDIDE 2.0: Simulation 4 (FE) [Coefficient Change Model]
($493 million (1971$) sustained 1980 through 1985;
Shock-Control Differences and Percentage Differences)

Variable	Name	1979	1980	1981	1982	1983	1984	1985
	PRICES AND WAGES (% DIFFERENCE)							
PXRDP	Aggregate GDP Deflator	-	-.18	-.12	.11	.32	.52	.64
W	Average Hourly Earnings	-	.05	.08	.34	.68	.97	1.21
PXMF	Manufacturing GDP Deflator	-	-.13	-.08	.14	.41	.67	.84
WMF	Average Hrly Earnings-Manufacturing	-	.01	.05	.35	.73	1.06	1.32
PFGNE/100	GNE Deflator	-	-.13	-.08	.10	.26	.43	.54
CPI	Consumer Price Index	-	-.13	-.06	.13	.29	.43	.50
PFC	Consumer Expenditure Deflator	-	-.18	-.10	.10	.27	.41	.48
PFGFC	Fixed Investment Deflator	-	-.0	-.0	.0	.01	.01	.02
PTE.CA.G+SW	Exports Deflator	-	.25	.28	.20	.12	.10	.11
PTM.CA.G+SW	Imports Deflator	-	.22	.24	.14	.06	.02	.01
REXCAN	Exchange Rate	-	.26	.29	.20	.13	.10	.11
	COMPONENTS OF GNE (DIFF IN $1971 MILL)							
GNE	Gross National Expenditure	-	1018	1143	1166	1109	1018	1033
C	Consumption	-	487	412	500	534	597	749
GFC	Gross Fixed Capital Formation	-	214	497	536	485	338	219
GE.CGS	Government Goods and Services	-	491	492	494	493	492	491
TEG+SNAW	Exports	-	-.01	.03	.03	.03	.03	.03
TMG+SNAW	Imports	-	306	390	398	373	367	410
	LABOUR, SUPPLY AND DEMAND, REAL WAGE (DIFF)							
DTOTLF	Labour Force (thousands)	-	4.2	6.9	9.9	10.3	17.1	24.9
NE	Employment (thousands)	-	39.9	53.9	60.4	58.0	53.6	51.5
DURATE	Unemployment Rate	-	-.33	-.43	-.46	-.42	-.32	-.24
W/CPI	Real Wage Rate	-	.01	.01	.01	.02	.02	.03
	GOVERNMENT BUDGET BALANCE (DIFF)							
GDFS	Federal Govt Deficit	-	-536	-469	-472	-641	-1018	-1365
GDPS	Provincial Govt Deficit	-	183	268	295	305	263	234
GDS	Government Deficit	-	-365	-215	-183	-349	-777	-1099
GE.INTS	Interest Payments	-	46.1	121.3	188.6	284.8	430.1	614.7
	MONEY, INTEREST RATES AND OTHER (DIFF)							
FMONEYSUPPLY	Money Supply ($ millions)	-	115	222	339	438	619	920
FRATE.FCPAPER3M	Finance Company Paper	-	-.01	-.01	.02	.07	.12	.13
FRATE.GBOND.10Y	Government 10 yr bonds	-	.01	.02	.03	.04	.06	.08
FRATE.IBOND.10Y	Industrial 10 yr bonds	-	-.00	-.00	.00	.01	.03	.04
FFINASSET.PUB	Financial Assets of Public ($ millions)	-	1266	1909	2902	3773	5784	8574
FGD.TSEC	G of C Direct & Guar Securities ($ millions)	-	700	1158	1675	2361	3467	4941
RTS	Housing Starts (thousands)	-	1.03	2.06	2.35	1.95	2.03	2.80
TBC.BAL.CAWS	Current Account Balance ($ millions)	-	-646	-854	-869	-842	-834	-987
Y.PROFBT.CORPS	Corporate Profits ($ millions)	-	880	1011	969	728	438	263
PDYS/CPI	Real Disposable Income ($ millions)	-	435	486	545	634	752	917

Diff = Shock - Control
% Diff = [(Shock - Control)/Control] X 100

Response of Fiscal Shock under Non-Accommodating Monetary Policy TABLE 3F
with Increased Price Flexibility in
CANDIDE 2.0: Simulation 5 (FF) [Coefficient Change Model]
($493 million (1971$) sustained 1980 through 1985;
Shock-Control Differences and Percentage Differences)

Variable	Name	1979	1980	1981	1982	1983	1984	1985
	PRICES AND WAGES (% DIFFERENCE)							
PXRDP	Aggregate GDP Deflator	-	-0.19	-0.12	0.09	.27	.41	.49
W	Average Hourly Earnings	-	.05	.03	.21	.46	.68	.83
PXMF	Manufacturing GDP Deflator	-	-.18	-.12	.08	.31	.49	.61
WMF	Average Hrly Earnings-Manufacturing	-	.01	.00	.23	.52	.78	.96
PFGNE/100	GNE Deflator	-	-.17	-.10	.07	.22	.33	.40
CPI	Consumer Price Index	-	-.18	-.09	.11	.25	.33	.37
PFC	Consumer Expenditure Deflator	-	-.23	-.12	.09	.24	.33	.38
PFGFC	Fixed Investment Deflator	-	-.08	-.09	.02	.15	.29	.43
PTE.CA.G+SW	Exports Deflator	-	-.04	0.15	.09	.10	.03	.11
PTM.CA.G+SW	Imports Deflator	-	-.09	.09	.02	.03	-.07	-.00
REXCAN	Exchange Rate	-	-.04	.15	.09	.10	.03	.11
	COMPONENTS OF GNE (DIFF IN $1971 MILL)							
GNE	Gross National Expenditure	-	991	1056	1008	923	824	820
C	Consumption	-	534	427	485	485	551	656
GFC	Gross Fixed Capital Formation	-	201	451	440	356	196	76
GE.CGS	Government Goods and Services	-	491	492	495	496	497	496
TEG+SNAW	Exports	-	-11.4	-.55	2.4	3.8	8.2	8.0
TMG+SNAW	Imports	-	344	447	411	367	367	397
	LABOUR, SUPPLY AND DEMAND, REAL WAGE (DIFF)							
DTOTLF	Labour Force (thousands)	-	5.1	7.0	8.5	6.5	11.4	17.7
NE	Employment (thousands)	-	39.5	52.9	57.6	54.1	49.4	47.6
DURATE	Unemployment Rate	-	-.32	-.42	-.44	-.42	-.33	-.26
W/CPI	Real Wage Rate	-	.01	.00	.00	.01	.02	.02
	GOVERNMENT BUDGET BALANCE (DIFF)							
GDFS	Federal Govt Deficit	-	-693	-618	-713	-885	-1396	-1736
GDPS	Provincial Govt Deficit	-	205	295	316	320	328	316
GDS	Government Deficit	-	-495	-328	-383	-542	-1048	-1337
GE.INTS	Interest Payments	-	204	284	420	529	877	1080
	MONEY, INTEREST RATES AND OTHER (DIFF)							
FMONEYSUPPLY	Money Supply ($ millions)	-	0.0	0.0	0.0	0.0	0.0	0.0
FRATE.FCPAPER3M	Finance Company Paper	-	.39	.23	.24	.21	.50	.41
FRATE.GBOND.10Y	Government 10 yr bonds	-	.09	.08	.08	.10	.16	.16
FRATE.IBOND.10Y	Industrial 10 yr bonds	-	.07	.09	.09	.09	.14	.15
FFINASSET.PUB	Financial Assets of Public ($ millions)	-	1245	1274	2085	3022	4950	7335
FGD.TSEC	G of C Direct & Guar Securities ($ millions)	-	783	1424	2177	3120	4505	6375
RTS	Housing Starts (thousands)	-	.62	.88	1.10	1.01	1.07	1.77
TBC.BAL.CAWS	Current Account Balance ($ millions)	-	-708	-966	-886	-813	-802	-920
Y.PROFBT.CORPS	Corporate Profits ($ millions)	-	594	862	797	606	189	152
PDYS/CPI	Real Disposable Income ($ millions)	-	559	536	552	579	757	879

Diff = Shock - Control
% Diff = [(Shock - Control)/Control] X 100

Table 4A

Response of Fiscal Shock (From 8 % Money Supply (M1) Growth Rule to 10 %) in CANDIDE 2.0: Simulation 6 (INCR. MONEY)
Shock-Control Differences and Percentage Differences)

Variable	Name	1979	1980	1981	1982	1983	1984	1985
	PRICES AND WAGES (% DIFFERENCE)							
PXRDP	Aggregate GDP Deflator	-	.22	.21	.28	.39	.60	.84
W	Average Hourly Earnings	-	-.01	.52	.82	1.40	1.89	2.53
PXMF	Manufacturing GDP Deflator	-	.72	.61	.73	.85	1.00	1.18
WMF	Average Hrly Earnings-Manufacturing	-	.00	.54	.77	1.31	1.76	2.36
PFGNE/100	GNE Deflator	-	.54	.34	.46	.49	.68	.89
CPI	Consumer Price Index	-	.69	.38	.50	.45	.65	.80
PFC	Consumer Expenditure Deflator	-	.67	.34	.43	.39	.54	.68
PFGFC	Fixed Investment Deflator	-	.76	.50	.64	.54	.74	.87
PTE.CA.G+SW	Exports Deflator	-	2.75	1.36	1.98	1.62	1.64	1.48
PTM.CA.G+SW	Imports Deflator	-	2.86	1.42	2.09	1.66	1.69	1.48
REXCAN	Exchange Rate	-	2.78	1.37	1.98	1.62	1.64	1.48
	COMPONENTS OF GNE (DIFF IN $1971 MILL)							
GNE	Gross National Expenditure	-	99.81	414	885	1287	1604	1755
C	Consumption	-	-425	-55.6	-93.4	259	444	599
GFC	Gross Fixed Capital Formation	-	74.4	127.0	458	719	936	1030
GE.CGS	Government Goods and Services	-	.68	-61.4	-30.1	-24.6	-11.5	7.5
TEG+SNAW	Exports	-	62.5	93.0	98.3	114.4	109.9	108.3
TMG+SNAW	Imports	-	-322	-418	-287	-166	-44.7	104
	LABOUR, SUPPLY AND DEMAND, REAL WAGE (DIFF)							
DTOTLF	Labour Force (thousands)	-	-10.1	-1.4	1.9	22.0	31.7	46.9
NE	Employment (thousands)	-	3.03	-1.1	12.0	24.5	35.2	40.9
DURATE	Unemployment Rate	-	-.11	-0.0	-.09	-.03	-.04	.03
W/CPI	Real Wage Rate	-	-.03	.01	.01	.04	.06	.08
	GOVERNMENT BUDGET BALANCE (DIFF)							
GDFS	Federal Govt Deficit	-	1008	731	1540	1760	2118	2420
GDPS	Provincial Govt Deficit	-	-73.5	-40.3	-27.6	-33.5	-141.6	-216.5
GDS	Government Deficit	-	913	644	1390	1534	1714	1877
GE.INTS	Interest Payments	-	-806	-812	-1374	-1719	-2185	-2585
	MONEY, INTEREST RATES AND OTHER (DIFF)							
FMONEYSUPPLY	Money Supply ($ millions)	-	506	1086	1799	2609	3561	4673
FRATE.FCPAPER3M	Finance Company Paper	-	-1.97	-1.14	-1.58	-1.48	-1.63	-1.59
FRATE.GBOND.10Y	Government 10 yr bonds	-	-.37	-.30	-.35	-.49	-.48	-.52
FRATE.IBOND.10Y	Industrial 10 yr bonds	-	-.36	-.43	-.54	-.57	-.59	-.61
FFINASSET.PUB	Financial Assets of Public ($ millions)	-	147	2012	3303	3195	3892	4030
FGD.TSEC	G of C Direct & Guar Securities ($ millions)	-	-727	-1680	-3057	4796	6718	9021
HTS	Housing Starts (thousands)	-	3.36	4.63	5.64	5.74	5.06	4.67
TBC.BAL.CAWS	Current Account Balance ($ millions)	-	547	980	602	423	90.8	-296
Y.PROFBT.CORPS	Corporate Profits ($ millions)	-	2211	802	1878	1444	1531	820
PDYS/CPI	Real Disposable Income ($ millions)	-	-818	-248	-251	139	282	531

Diff = Shock - Control
% Diff = [(Shock - Control)/Control] X 100

Table 4B

Response of Monetary Shock (From 8 % Money Supply (M1) Growth Rule to 10 %) in CANDIDE 2.0 with Increased Price Flexibility: Simulation 7 (INCR. Money.A2) (Shock-Control Differences and Percentage Differences)

Variable	Name	1979	1980	1981	1982	1983	1984	1985
	PRICES AND WAGES (% DIFFERENCE)							
PXRDP	Aggregate GDP Deflator	-	.24	.32	.48	.70	1.01	1.36
W	Average Hourly Earnings	-	-.01	.52	.86	1.48	2.02	2.70
PXMF	Manufacturing GDP Deflator	-	.73	.66	.81	.96	1.13	1.40
WMF	Average Hrly Earnings-Manufacturing	-	.00	.54	.82	1.40	1.91	2.54
PFGNE/100	GNE Deflator	-	.55	.42	.61	.74	1.01	1.31
CPI	Consumer Price Index	-	.70	.46	.64	.69	.96	1.20
PFC	Consumer Expenditure Deflator	-	.68	.41	.57	.62	.84	1.06
PFGFC	Fixed Investment Deflator	-	.77	.63	.90	.98	1.24	1.49
PTE.CA.G+SW	Exports Deflator	-	2.75	1.85	1.95	1.58	1.57	1.38
PTM.CA.G+SW	Imports Deflator	-	2.86	1.42	2.06	1.65	1.62	1.39
REXCAN	Exchange Rate	-	2.78	1.36	1.95	1.58	1.57	1.38
	COMPONENTS OF GNE (DIFF IN $1971 MILL)							
GNE	Gross National Expenditure	-	96.38	371.87	804.37	1132.62	1381.25	1441.06
C	Consumption	-	-428.19	-95.88	-142.25	161.07	322.19	3.12
GFC	Gross Fixed Capital Formation	-	73.29	160.05	434.29	670.10	864.81	923.78
GE.CGS	Government Goods and Services	-	1.17	-57.24	-29.35	-27.01	-15.65	1.42
TEG+SNAW	Exports	-	62.34	91.51	94.63	107.10	98.53	92.61
TMG+SNAW	Imports	-	-321.87	-422.69	-286.49	-168.26	-42.00	101.25
	LABOUR, SUPPLY AND DEMAND, REAL WAGE (DIFF)							
DTOTLF	Labour Force (thousands)	-	-10.21	-2.79	-0.45	17.76	26.71	40.27
NE	Employment (thousands)	-	3.00	-1.82	10.11	20.47	28.46	30.27
DURATE	Unemployment Rate	-	-.11	-0.00	-.09	-.03	-.03	.07
W/CPI	Real Wage Rate	-	-.03	.00	.01	.04	.05	.07
	GOVERNMENT BUDGET BALANCE (DIFF)							
GDF$	Federal Govt Deficit	-	1012.64	753.41	1567.92	1795.95	2129.85	2409.43
GDP$	Provincial Govt Deficit	-	-72.19	-50.55	-48.44	-77.31	-217.51	-337.85
GD$	Government Deficit	-	919.68	651.98	1392.83	1521.37	1644.56	1740.78
GE.INT$	Interest Payments	-	806.15	-809.13	-1366.18	-1701.41	-2154.83	-2539.73
	MONEY, INTEREST RATES AND OTHER (DIFF)							
FMONEYSUPPLY	Money Supply ($ millions)	-	506.09	1085.84	1799.00	2609.27	3561.32	4672.50
FRATE.FCPAPER3M	Finance Company Paper	-	-1.97	-1.13	-1.55	-1.44	-1.58	-1.54
FRATE.GBOND.10Y	Government 10 yr bonds	-	-.37	-.30	-.35	-.49	-.47	-.51
FRATE.IBOND.10Y	Industrial 10 yr bonds	-	-.36	-.43	-.53	-.56	-.58	-.59
FFINASSET.PUB	Financial Assets of Public ($ millions)	-	142.12	1987.75	3232.81	3082.0	3790.19	4016.06
FGD.TSEC	G of C Direct & Guar Securities ($ millions)	-	-7-31.12	-1708.87	-3115.37	-4893.44	-6824.37	9106.87
HTS	Housing Starts (thousands)	-	3.34	4.17	4.63	4.24	3.11	2.34
T&C.BAL.CAW$	Current Account Balance ($ millions)	-	5 46	987	590	411	59.1	-322
Y.PROFBT.CORP$	Corporate Profits ($ millions)	-	2242	937	2058	1713	1830	1267
PDY$/CPI	Real Disposable Income ($ millions)	-	-822	-300	-317	20.3	139	333

Diff = Shock - Control
% Diff = [(Shock - Control)/Control] X 100

Table 5A

Response of CANDIDE 2.0 under Non-Accommodating Monetary Policy to Increased Inflation and Interest Rates in the U.S. (Stock Sustained from 1978 through 1985): Simulation 8 (INT,PIRI)
(Shock-Control Differences and Percentage Differences)

Variable	Name	1979	1980	1981	1982	1983	1984	1985
	PRICES AND WAGES (% DIFFERENCE)							
W	Average Hourly Earnings	.04	.26	.58	.85	1.06	1.25	1.49
PFGNE/100	GNE Deflator	.49	.96	1.37	1.74	2.11	2.48	2.86
CPI	Consumer Price Index	.49	1.03	1.52	1.88	2.22	2.58	2.98
PTE.CA.G+SW	Exports Deflator	.46	1.26	2.03	2.84	3.71	4.46	5.17
PTM.CA.G+SW	Imports Deflator	.46	1.28	2.06	2.93	3.81	4.59	5.33
REXCAN	Exchange Rate	-1.52	-1.70	-1.92	-2.07	-2.21	-2.40	-2.66
	COMPONENTS OF GNE (DIFF IN $1971 MILL)							
GNE	Gross National Expenditure	-201	-662	-892	-864	-818	-742	-850
C	Consumption	-65	-330	-454	-528	-613	-707	-921
GFC	Gross Fixed Capital Formation	-259	-458	-766	-870	-847	-744	-719
GE.CGS	Government Goods and Services	38	30	17	12	0	-16	-22
TEG+SNAW	Exports	-47	-53	-65	-76	-80	-92	-102
TMG+SNAW	Imports	123	-228	-470	-632	-732	-800	-918
	LABOUR, SUPPLY AND DEMAND, REAL WAGE (DIFF)							
DTOTLF	Labour Force (thousands)	-9	-18	-27	-32	-35	-39	-44
NE	Employment (thousands)	-4	-17	-33	-38	-39	-34	-39
DURATE	Unemployment Rate	-.02	.00	.07	.07	.05	-.02	-.02
W/CPI	Real Wage Rate	-.02	-.03	-.04	-.05	-.05	-.06	-.07
	GOVERNMENT BUDGET BALANCE (DIFF)							
GDF$	Federal Govt Deficit	42	118	48	234	309	1018	1455
GDP$	Provincial Govt Deficit	-13	-169	-321	-431	-526	-560	-666
GD$	Government Deficit	54	11	-176	-94	106	617	980
GE.INT$	Interest Payments	247	303	543	679	785	764	687
	MONEY, INTEREST RATES AND OTHER (DIFF)							
FMONEYSUPPLY	Money Supply ($ millions)	0	0	0	0	0	0	0
FRATE.FCPAPER3M	Finance Company Paper	.04	-.15	.04	.00	.01	-.04	-.06
FRATE.IBOND.10Y	Industrial 10 yr bonds	.65	.65	.69	.71	.71	.71	.70
FFINASSET.PUB	Financial Assets of Public ($ millions)	3598	4736	5450	6937	7225	7361	6713
FGD.TSEC	G of C Direct & Guar Securities ($ millions)	-22	-56	-113	-285	-769	-1753	-3169
HTS	Housing Starts (thousands)	3	2	-1	-1	-2	-3	-4
TBC.BAL.CAW$	Current Account Balance ($ millions)	130	300	756	1032	1262	1346	1579
Y.PROFBT.CORP$	Corporate Profits ($ millions)	104	77	368	912	1809	2724	3482

Diff = Shock - Control
% Diff = [(Shock - Control)/Control] X 100

Table 5B

Response of CANDIDE 2.0 under Non-Accommodating Monetary Policy
with Fiscal Stimulus to Increased Inflation and Interest Rates in the U.S.
(Shock Sustain from 1978 through 1985): Simulation 9 (INT. PIRIADJ)
Shock-Control Differences and Percentage Differences)

Variable	Name	1979	1980	1981	1982	1983	1984	1985
	PRICES AND WAGES (% DIFFERENCE)							
W	Average Hourly Earnings	.05	.29	.67	1.09	1.48	1.83	2.20
PFGNE/100	GNE Deflator	.47	.91	1.37	1.82	2.27	2.71	3.13
CPI	Consumer Price Index	.48	1.00	1.53	1.99	2.41	2.82	3.25
PTE.CA.G+SW	Exports Deflator	.50	1.41	2.19	2.96	3.81	4.55	5.33
PTM.CA.G+SW	Imports Deflator	.50	1.41	2.20	3.02	3.86	4.62	5.42
XCAN	Exchange Rate	-1.48	-1.55	-1.76	-1.95	-2.11	-2.31	-2.51
	COMPONENTS OF GNE (DIFF IN $1971 MILL)							
GNE	Gross National Expenditure	-22	-97	-248	-227	-200	-171	-144
C	Consumption	12	-91	-208	-252	-294	-341	-423
GFC	Gross Fixed Capital Formation	-212	-294	-492	-591	-610	-585	-601
GE.CGS	Government Goods and Services	125	303	305	299	285	253	315
TEG+SNAW	Exports	-47	-53	-60	-69	-72	-82	-93
TMG+SNAW	Imports	-66	-47	-250	-416	-519	-592	-654
	LABOUR, SUPPLY AND DEMAND, REAL WAGE (DIFF)							
DTOTLF	Labour Force (thousands)	-8	-16	-23	-27	-28	-28	-29
NE	Employment (thousands)	3	7	-2	-5	-8	-5	-6
DURATE	Unemployment Rate	-.09	-.20	-.18	-.18	-.16	-.18	-.17
W/CPI	Real Wage Rate	-.02	-.03	-.04	-.04	-.04	-.05	-.05
	GOVERNMENT BUDGET BALANCE (DIFF)							
GDF$	Federal Govt Deficit	-56	199	2-281	-125	42	390	539
GDP$	Provincial Govt Deficit	29	-25	-131	-238	-339	-407	-473
GD$	Government Deficit	-6	-172	-333	-271	-181	148	291
GE.INT$	Interest Payments	259	349	639	826	996	1058	1095
	MONEY, INTEREST RATES AND OTHER (DIFF)							
FMONEYSUPPLY	Money Supply ($ millions)	0	0	0	0	0	0	0
FRATE.FCPAPER3M	Finance Company Paper	.04	-.15	.05	.04	.07	.04	.03
FRATE.IBOND.10Y	Industrial 10 yr bonds	.65	.65	.69	.72	.73	.73	.73
FFINASSET.PUB	Financial Assets of Public ($ millions)	3797	5436	6494	8427	9342	10425	11235
FGD.TSEC	G of C Direct & Guar Securities ($ millions)	122	475	756	963	975	654	251
RTS	Housing Starts (thousands)	3	2	0	-0	-1	-2	-3
TBC.BAL.CAW$	Current Account Balance ($ millions)	12	-86	265	543	764	848	889
Y.PROFBT.CORPS	Corporate Profits ($ millions)	250	571	910	1373	2088	2761	3600

Diff = Shock - Control
% Diff = [(Shock - Control)/Control] X 100