

RESEARCH REPORT



Induced Macroeconomic Impacts of the Housing Sector



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Project Summary

This study presents a series of simulations investigating the macroeconomic impacts of a two-year, temporary increase in housing construction activity. The simulations were conducted with the FOCUS macroeconometric model, built and maintained at the Institute for Policy Analysis, University of Toronto.

The central section of the study present simulation results for 16 separate simulations. These simulations consider all the possible combinations of four basic two-way choices of assumptions: new construction versus alterations, high versus low growth in the underlying economy, historically observed versus observed-times-two import propensities in the construction sector, and monetary policy aimed at stabilizing interest rates versus monetary policy aimed at stabilizing exchange rates.

The simulations show that a temporary increase in housing activity can have important induced effects on the economy, and that stimulus of this sort could be used as a tool of countercyclical policy during a slump or recession. Stimulus takes up to a year to gather momentum and can persist for a year or more after the stimulus is removed. The simulations also indicate that a temporary housing stimulus of this kind develops its own contractionary aftershock within 3 to 4 years (or somewhat longer under interest-rate targeting).

The simulations indicate small differences in impacts when new construction is compared to alterations. Doubling import propensities in construction naturally scales down the expansionary impact of construction activity, since expenditure leakages in the form of imported building materials are greater. The choice of interest rate and exchange rate control has little effect impacts of the cases, but do produce more pronounced differences over the longer term. Assumptions about the state of the economy have little impact on the simulation results.

1. INTRODUCTION	1
1.1 PRINCIPAL FINDINGS	2
2. METHODOLOGY.....	2
3. BASE CASE	4
4. SIMULATION RESULTS: INDUCED IMPACTS.....	6
4.1 NEW HOUSING CONSTRUCTION	6
4.1.1 <i>High Growth, Standard Import Propensity, Neutralized Exchange Rate Impacts</i>	6
4.1.2 <i>High Growth, Standard Import Propensity, Neutralized Interest Rate Impacts</i>	7
4.1.3 <i>Low Growth, Standard Import Propensity, Neutralized Exchange Rate Impacts</i>	8
4.1.4 <i>Low Growth, Standard Import Propensity, Neutralized Interest Rates</i>	8
4.1.5 <i>High Growth, Double Import Propensity, Neutralized Exchange Rate Impacts</i>	9
4.1.6 <i>High Growth, Double Import Propensity, Neutralized Interest Rate Impacts</i>	10
4.1.7 <i>Low Growth, Double Import Propensity, Neutralized Exchange Rate Impacts</i>	10
4.1.8 <i>Low Growth, Double Import Propensity, Neutralized Interest Rate Impacts</i>	11
4.2 RESIDENTIAL ALTERATIONS AND IMPROVEMENTS	11
4.2.1 <i>High Growth, Standard Import Propensity, Neutralized Exchange Rate Impacts</i>	12
4.2.2 <i>High Growth, Standard Import Propensity, Neutralized Interest Rate Impacts</i>	12
4.2.3 <i>Low Growth, Standard Import Propensity, Neutralized Exchange Rate Impacts</i>	12
4.2.4 <i>Low Growth, Standard Import Propensity, Neutralized Interest Rate Impacts</i>	13
4.2.5 <i>High Growth, Double Import Propensity, Neutralized Exchange Rate Impacts</i>	13
4.2.6 <i>High Growth, Double Import Propensity, Neutralized Interest Rate Impacts</i>	13
4.2.7 <i>Low Growth, Double Import Propensity, Neutralized Exchange Rate Impacts</i>	14
4.2.8 <i>Low Growth, Double Import Propensity, Neutralized Interest Rate Impacts</i>	14
5. COMPARISON OF RESULTS	16
5.1 EXCHANGE RATE CONTROL VS. INTEREST RATE CONTROL.....	16
5.2 HIGH GROWTH ECONOMY VS. LOW GROWTH ECONOMY	17
5.3 INDUCED EFFECTS OF IMPORT PROPENSITIES	17
5.4 TYPE OF CONSTRUCTION EXPENDITURE.....	18
6. INDUCED EFFECTS ON TAXES	22
6.1 DIRECT TAXES - PERSONAL	22
6.2 DIRECT TAXES - CORPORATIONS.....	23
6.3 INDIRECT TAXES	24
6.4 CPP/QPP AND EI REVENUES	26
7. CONCLUSION.....	27

1. Introduction

Residential investment is a key component of the Canadian economy. Over the first half of the 1990s, real residential investment expenditures were \$31.5 billion at 1986 prices, which represented 5.5% of real GDP. Total residential investment is comprised of new residential construction, alterations and improvements, and residential transfer costs. Real expenditures for these components averaged \$14.9 billion, \$10.4 billion and \$6.2 billion respectively over the first half of the 1990s.

Residential construction has a larger effect on the economy than the direct purchases in the sector. An increase in residential construction expenditures supports industries such as contractors and development brokers, who in turn will increase demand of their own suppliers, and so the chain continues. Increased income and employment in each of these industries in turn prompts a general induced effect, where consumption and demand for a range of services increase as a result of higher personal income.

The impact of residential construction will vary depending on a number of broader economic factors:

- **The Economy's Position in the Business Cycle.** The impact of the housing market will vary depending on the economy's position in the business cycle. This variation is largely a result of the sensitivity of prices to subsequent change in aggregate demand. The Bank of Canada has found that inflation increases in a non-linear manner when the economy is above capacity. In periods of high growth, therefore, an increase in aggregate demand will elicit a larger rise in prices than in a period when the economy is operating below capacity. Subsequently, the larger price rise will result in a greater change in the real money supply, and a more exaggerated movement in interest rates. Interest sensitive sectors of the economy will be affected more, and the total impact of the rise in housing on spending will be increased.
- **Monetary Policy.** In addition, the Canadian economy does not operate in isolation. Elevated interest rates tend to lead to rising demand for Canadian holdings, resulting in an appreciation of the Canadian dollar. Under a higher priced Canadian dollar, exporters lose some of their competitive position and exports tend to diminish. This makes the effect of a change in spending on housing dependent on the monetary goals of the Bank of Canada. If the Bank is focusing on interest rate stability over exchange rate stability, then a change in spending on housing will affect Canadian exporters. Conversely, if exchange rate stability is the principal goal of the Bank, then the effect of larger housing expenditure will be concentrated on the interest sensitive areas of the economy.
- **Import Propensity.** If, under NAFTA, the residential housing market adjusts its propensity to import supplies, the direct, indirect, and induced impacts of a change in construction expenditure will be lessened. The higher percent of expenditures spent on foreign goods reduces the amount of domestic expenditure on which the multiplier effect can work. Changes in the economic environment can affect the amount that additional imports reduces economic growth.

The primary objective of this study is to quantify the **induced** impact of the residential construction sector on the Canadian economy under different macroeconomic conditions. The study completed by Informetrica Limited identified and expressed the direct and indirect impact of a \$1 billion annual increase in housing construction and the impact of a \$1 billion rise in renovation, repair and maintenance expenditures, sustained for two years, under various macroeconomic conditions. The effects of these changes in residential housing expenditures on employment and employment income were then used as inputs to DRI's Model of the Canadian Economy to generate the induced effects. Impacts were measured by the effect on national gross domestic product, employment, and federal and provincial taxes.

Summary tables and brief descriptions of the relevant variables for each simulation are provided in Section 4. This section briefly analyses the time-paths and turning points of these variables in each simulation, with a summary table of turning points at the end of this section. Section 5 compares and analyses the differences between simulation results for each of the different assumptions: monetary policy, economic environment, type of construction expenditure, and import propensity of construction expenditure. Appendix A contains schematic diagrams describing the flow of variables in DRI's Model of the Canadian Economy.

Note: This report summarizes the impacts of the simulations on a limited number of key economic indicators. A Microsoft Access database supplied with this report can be used to determine impacts on other economic variables in DRI's Model of the Canadian Economy.

1.1 Principal Findings

- The initial effect of holding exchange rates fixed produces a larger positive effect on the economy, but the continuation of this policy for the medium-term leads to slower growth in the economy by preventing the expansion of exports.
- Trade policy has a larger effect on the Canadian economy than interest rate policy, both positively and negatively.
- Increased residential construction expenditures in a slow growing economy produces initially stronger growth than a in high growth economy, but this stronger growth decays much faster.
- The induced impact of a higher import propensity in residential construction expenditures is lower than the standard import propensity. A doubled import propensity reduces employment and real GDP by 10% under new construction expenditures.
- An increase in new construction expenditures has a larger induced impact than an equal initial increase in renovations and repair expenditure, because it has more linkages with the rest of the economy. Broader linkages spread the amount of direct and therefore indirect expenditures through a broader range of the economy. Higher direct and indirect effects increase the demand for employment and the amount of employment income in the economy; hence induced effects are stronger as well.

2. Methodology

The study focused on determining the induced impact resulting from the direct and indirect impact of an \$1 billion (constant 1986 dollars) increase in expenditure as estimated by Informetrica Limited in two categories of residential investment: New Residential Construction Expenditure, and Residential Alterations and Improvements Expenditure. Informetrica's results were reported using both the historical propensity of these sectors to import materials and at a level of imports twice the historical propensity.

The results that Informetrica obtained for direct and indirect effects on employment and income terms served as inputs to DRI's Model of the Canadian Economy. Each simulation followed an identical path through the model with the exception of monetary policy assumptions. Informetrica's results are shown in Table 1.

Table 1
Direct and Indirect Effects: Informetrica Results

Economic Environment: Expenditure Category: Import Propensity:	Year	High Growth Base Case				Low Growth Base Case			
		New Construction		Alterations/Improve.		New Construction		Alterations/Improve.	
		Standard	Doubled	Standard	Doubled	Standard	Doubled	Standard	Doubled
Real GDP	1999	663.6	585.8	617.3	521.5	658.5	578.4	611.8	512.9
	2000	663.2	585.5	616.8	521.2	659.2	579.8	612.8	514.8
Employment	1999	17.7	16.1	15.7	13.8	17.4	15.8	15.5	13.5
	2000	17.5	16.0	15.6	13.8	17.2	15.6	15.3	13.4
Nominal GDP	1999	927.5	826.2	895.5	768.5	936.6	833.8	905.0	775.8
	2000	953.0	855.1	921.0	798.1	961.1	863.9	929.8	807.3
Wages, Salaries, & Supp. Income	1999	661.1	595.6	602.4	521.3	660.1	590.9	602.0	516.1
	2000	682.6	615.7	620.6	537.9	673.8	604.5	613.6	527.9
Wages and Salaries <i>calculated by DRI</i>	1999	572.8	516.1	521.9	451.7	571.8	511.8	521.5	447.0
	2000	589.4	531.6	535.8	464.4	581.4	521.6	529.4	455.5
Non-Farm Unincorp. Business Income	1999	126.5	124.8	100.1	98.1	134.1	132.4	105.7	103.8
	2000	127.7	126.0	101.0	99.1	137.1	135.5	108.1	106.2
Other Surplus Income	1999	139.9	105.8	193.0	149.1	142.4	110.5	197.3	155.9
	2000	142.7	113.4	199.4	161.1	150.2	123.9	208.1	173.1

Source: Informetrica

The increase in expenditure was introduced in 1999 and sustained for two years. The simulations were run out to the year 2003 to determine the medium-term impact of the expenditure change. A total of sixteen shocks to the High and the Low Growth Base Cases were produced — eight for each. The shocks were conducted in real terms to remove the effects of inflation that would distort a comparison of the impacts between the High and Low Growth Base simulations. Two different set of assumptions on Bank of Canada policy were analyzed. The first assumption was that the Bank of Canada followed a policy of neutralizing exchange rate impacts. This assumption was modeled by holding the exchange rate at base case levels. The second assumption was that the Bank of Canada followed a policy of neutralizing interest rate impacts. This assumption was modeled by holding interest rates at base case levels. Finally, the impact of a higher propensity to import by the construction industry was examined.

Figure 1 in Appendix A gives a schematic overview of DRI's Quarterly Macroeconomic Model of the Canadian Economy. Four blocks of equations interact to generate forecasts: an income-expenditure and potential GDP block, a financial block, a price-wage block, and a balance of payments and foreign sector block. As the current simulations are intended to measure only the *induced* effect of a change in construction expenditure, only the direct and indirect effects on employment and wages, salaries and supplementary income from Informetrica's eight simulations were used as inputs into DRI's Model. After allowing these effects to run their course through the Canadian economy, the direct effects were removed from these two variables in the simulations to derive only induced impacts for each variable in the model.

Figure 2 in Appendix A illustrates the process by which induced impacts are generated by DRI's Model. The employment, wage and nonwage labour income, and corporate profit impacts are entered as exogenous shocks to DRI's Model. These changes have immediate consequences for consumption and investment spending as well as tax revenue. These changes impact the entire model and affect aggregate supply and demand, wages and prices, interest and exchange rates, the labour market and government taxes and balances.

The effects of the direct and indirect impacts resulting from an increase in residential construction expenditures can be traced through the schematic diagrams to see how these changes influence others economic concepts in DRI's model. A positive shock to construction expenditure has the induced impact

of increasing employment and wages, and hence employment income. As employment income is a major component of personal income, this affects both personal direct taxes, consumption, and imports (see Figure 1 in Appendix A). The increase in consumption and imports increases indirect taxes (sales taxes and import duties). Furthermore, in the case of fixed exchange rates, this expansionary policy will push up interest rates. Figure 3 shows that interest rates changes have a direct effect on business fixed investment. Business investment in turn determines the amount of direct taxes from corporations (Figure 7). Control of exchange rate movements limits changes in the relative price of exports and imports and therefore limits the changes that occur to these sectors (see Figure 4). Net exports are an important component of GDP. A higher level of imports, because of a higher demand and/or an appreciation of the exchange rate, is a leakage to total GDP.

3. Base Case

In order to provide an indication of how impacts depend on prevailing macroeconomic conditions, a High Growth and a Low Growth Base Case simulation were prepared by Informetrica Limited. These simulations were calibrated to mimic the economic conditions for two periods: 1986-89 and 1991-94.

The Base Case simulations constructed by Informetrica Limited were based on historical data available prior to the May 1996 NIEA data revisions. DRI used its March 1996 medium-term control simulation as the starting point for constructing High and Low Growth Base scenarios that matched, as closely as possible, Informetrica's simulations. Particular care was taken in ensuring that the percentage differences between Informetrica's High and Low Growth Base Case were preserved in DRI's simulations for a number of key concepts: real output and its components, wages, prices, interest rates, the unemployment rate and housing starts. Table 1 presents a summary of the High Growth and Low Growth Base Case used by DRI in the study.

The High Growth Base Case averages annual real GDP growth of 2.7% from 1999 to 2003, the years of comparison for this analysis. In the High Growth Base Case, there is a drop in economic activity in 2000 affecting all major sectors of the economy: consumption, business investment, residential construction, and imports. The exchange rate is forecast to appreciate steadily throughout this period, although the rate of appreciation slows by 2003. The interest rate on three-month Treasury bills falls from a high of 6.38% in 1998 to 4.76% by 2003.

The U.S. economy and government expenditures are considered exogenous variables and are held fixed in these model simulations. Thus in both the base cases, the U.S. economy is growing at an annual rate of 2.9% in 1999, but the economy slows to 2.2% in 2002. U.S. interest rates throughout these five years are lower than Canadian interest rates in the High Growth Base Case.

The Low Growth Base Case forecasts a different growth cycle in the Canadian economy. The slowest point of the economy is predicted to occur in 1999, with only 0.8% annual growth in real GDP. This increases to 3.0% in 2002 and 2003. Very high interest rates during this period hold business investment at negative growth levels from 1999-2001, after which interest rates begin to decline and non-residential and residential investment rebound. While the U.S. economy has the same forecast as the previous base case, now in comparison with the Canadian economy it has higher growth over the period and markedly lower interest rates. The exchange rate in the Low Growth Base Case is forecast at the same levels as in the High Growth Base Case.

Table 2
The Macroeconomic Impacts of the Housing Sector

	1996				1997			YEARS							
	I	II	III	IV	I	II	III	1996	1997	1998	1999	2000	2001	2002	2003
HIGH GROWTH BASE CASE															
Real GDP Growth Rates (a)															
Gross Domestic Product.....	1.6	2.0	2.8	3.4	4.5	2.7	3.8	1.6	3.5	3.7	2.7	2.4	2.7	3.0	2.7
Consumption.....	2.9	1.8	3.2	3.3	3.6	3.8	3.7	1.9	3.4	3.3	2.1	1.6	2.1	2.4	2.6
Non-Res. Fixed Investment.....	-0.8	-0.4	1.1	2.7	5.0	6.6	7.6	1.4	4.7	9.4	5.5	3.9	2.4	5.9	4.1
Residential Const.....	13.5	-1.2	16.2	22.3	22.3	20.2	15.3	2.8	17.7	7.5	-1.4	-2.8	4.1	4.5	2.2
Total Government.....	-2.9	-8.0	-5.0	-5.1	-0.5	-9.3	-3.9	-3.9	-4.7	-2.4	0.4	1.3	1.4	1.5	1.5
Exports.....	7.2	8.4	7.2	7.1	7.3	7.6	8.0	8.1	7.5	7.2	5.2	5.4	4.7	4.6	5.0
Imports.....	3.8	5.1	4.8	5.2	6.3	7.0	7.2	4.6	6.1	6.8	4.6	3.7	3.4	4.6	5.0
Implicit G.D.P. Deflator (b).....	1.4	1.0	0.7	0.9	1.4	1.6	1.9	1.0	1.7	2.7	3.2	2.1	1.2	1.5	2.2
Consumer Price Index (b).....	1.4	1.0	1.2	1.3	1.6	1.7	1.9	1.2	1.8	2.3	2.4	2.1	1.7	1.9	2.3
Industry Product Price Index (b).....	1.5	0.4	-0.5	-0.3	1.2	1.5	2.2	0.3	1.9	3.4	3.1	2.3	1.9	2.5	3.0
Avg. Hourly Earnings (Manuf.) (b).....	2.9	2.7	1.9	1.8	2.2	2.6	3.0	2.3	2.8	3.8	4.0	3.2	2.2	2.1	2.9
Unemployment Rate (%).....	9.7	9.5	9.4	9.1	9.0	8.8	8.6	9.4	8.7	7.9	7.9	8.1	8.4	8.5	8.2
Inventory Change (Bill.\$86).....	0.29	2.51	2.51	2.86	3.23	3.39	3.49	2.04	3.49	4.61	6.32	5.26	4.65	4.59	4.88
Housing Starts (Thou.).....	105	125	136	141	153	165	175	127	168	187	170	154	166	185	176
Motor Vehicle Sales (Thou.).....	1,186	1,218	1,262	1,320	1,415	1,494	1,520	1,247	1,491	1,541	1,530	1,509	1,539	1,604	1,642
Exchange Rate (U.S. Cents).....	72.96	73.30	73.70	73.20	73.00	72.70	72.50	73.29	72.55	76.63	80.80	82.05	82.74	83.35	83.95
Merch.Trade Bal. (Bill.\$,BOP).....	34.2	35.8	36.5	37.8	39.2	40.0	40.8	36.1	40.4	47.5	59.7	69.9	72.3	71.7	72.4
Curr. Acct. Bal. (Bill.\$,BOP).....	-4.1	-2.7	-2.4	-1.5	-0.7	-0.1	0.4	-2.7	0.2	5.4	14.4	21.7	22.6	20.3	19.2
Fed. Budget Bal. (Bill.\$,NIEA).....	-23.7	-17.9	-16.9	-15.2	-13.6	-9.0	-7.5	-18.4	-9.2	-1.8	2.9	5.6	9.2	13.8	17.5
3-Month T-Bills Rate (%).....	5.13	5.10	5.00	5.25	5.45	5.65	6.15	5.12	5.94	6.38	6.10	5.45	5.08	4.80	4.76
Govt. 10 Yrs. & Over Bonds (%).....	7.67	7.90	7.75	7.60	7.65	7.75	8.00	7.73	7.93	8.13	7.71	7.11	6.89	6.76	6.76
Real Disposable Inc. (b).....	1.0	1.5	2.6	2.6	2.0	2.5	2.7	1.9	2.6	3.4	3.1	1.7	0.9	1.5	2.2
Corp. Profits (After Tax).....	-7.9	-3.7	-3.4	4.1	21.0	18.4	20.2	-2.8	19.4	16.8	9.6	4.8	7.4	10.8	6.8
U.S. Real GDP (a).....	1.3	1.7	2.5	2.4	2.9	3.1	3.4	2.2	2.8	2.9	2.9	2.8	2.4	2.2	2.5
U.S. CPI (b).....	2.7	2.6	2.8	2.9	2.9	2.8	2.8	2.7	2.8	3.0	3.0	3.1	3.2	3.3	3.4
U.S. 3-Month T-Bills (%).....	4.90	4.80	4.67	4.67	4.67	4.67	4.67	4.76	4.70	4.88	4.88	4.88	4.88	4.57	4.46
U.S. Govt. 10-Year Bonds (%).....	5.78	6.24	6.10	6.06	6.07	5.96	5.87	6.04	5.95	5.83	5.61	5.48	5.44	5.31	5.27
Crude Oil (\$U.S./bbl.).....	14.51	14.38	14.40	14.43	14.59	14.79	14.97	14.43	14.88	15.66	16.62	17.63	18.77	20.14	21.75
LOW GROWTH BASE CASE															
Real GDP Growth Rates (a)															
Gross Domestic Product.....	1.6	2.0	2.8	3.4	3.7	1.8	3.4	1.6	3.0	2.1	0.8	2.5	2.5	3.0	3.0
Consumption.....	2.9	1.8	3.2	3.3	3.3	3.3	3.2	1.9	3.2	2.4	0.8	1.0	1.1	2.6	2.6
Non-Res. Fixed Investment.....	-0.8	-0.4	1.1	2.7	4.7	6.2	7.0	1.4	4.4	6.1	-3.4	-3.8	-1.0	5.8	6.0
Residential Const.....	13.5	-1.2	16.2	22.3	16.1	15.5	12.1	2.8	14.8	1.3	-5.7	-2.9	5.8	4.5	2.5
Total Government.....	-2.9	-8.0	-5.0	-5.1	-0.5	-9.3	-3.9	-3.9	-4.7	-4.4	0.4	1.3	1.4	1.5	1.6
Exports.....	7.2	8.4	7.2	7.1	5.4	7.6	8.0	8.1	7.0	6.3	3.4	6.0	4.8	4.4	4.9
Imports.....	3.8	5.1	4.8	5.2	5.9	6.4	6.5	4.6	5.8	4.9	1.4	1.4	2.2	4.3	5.0
Implicit G.D.P. Deflator (b).....	1.4	1.0	0.7	0.9	1.4	1.6	1.9	1.0	1.7	2.9	3.4	1.8	0.6	0.6	0.9
Consumer Price Index (b).....	1.4	1.0	1.2	1.3	1.6	1.7	1.9	1.2	1.8	2.4	2.3	1.8	1.4	1.4	1.6
Industry Product Price Index (b).....	1.5	0.4	-0.5	-0.3	1.2	1.5	2.2	0.3	1.9	3.4	3.0	2.0	1.6	2.1	2.5
Avg. Hourly Earnings (Manuf.) (b).....	2.9	2.7	1.9	1.8	2.2	2.6	3.0	2.3	2.8	4.1	3.8	2.6	1.6	1.1	1.7
Unemployment Rate (%).....	9.7	9.5	9.4	9.1	9.1	9.0	8.8	9.4	8.8	8.6	9.4	9.6	9.6	9.6	9.1
Inventory Change (Bill.\$86).....	0.29	2.51	2.51	2.86	3.66	2.98	2.93	2.04	3.18	2.59	2.84	2.99	3.40	3.27	3.73
Housing Starts (Thou.).....	105	125	136	141	128	152	160	127	151	146	119	101	109	120	110
Motor Vehicle Sales (Thou.).....	1,186	1,218	1,262	1,320	1,415	1,493	1,519	1,247	1,489	1,530	1,509	1,487	1,519	1,584	1,623
Exchange Rate (U.S. Cents).....	72.96	73.30	73.70	73.20	73.00	72.70	72.50	73.29	72.55	76.63	80.80	82.05	82.74	83.35	83.95
Merch.Trade Bal. (Bill.\$,BOP).....	34.2	35.8	36.5	37.8	38.2	39.4	40.6	36.1	40.0	50.6	67.3	86.5	92.9	91.1	89.3
Curr. Acct. Bal. (Bill.\$,BOP).....	-4.1	-2.7	-2.4	-1.5	-1.9	-0.9	0.1	-2.7	-0.4	8.1	20.8	37.3	42.2	38.1	33.8
Fed. Budget Bal. (Bill.\$,NIEA).....	-23.7	-17.9	-16.9	-15.2	-13.9	-9.7	-8.5	-18.4	-10.0	-10.7	-16.4	-19.8	-19.7	-16.8	-14.0
3-Month T-Bills Rate (%).....	5.13	5.10	5.00	5.25	5.45	5.65	6.14	5.12	5.93	9.45	9.56	9.05	8.46	7.80	7.36
Govt. 10 Yrs. & Over Bonds (%).....	7.67	7.90	7.75	7.60	7.65	7.75	7.99	7.73	7.92	10.02	9.84	9.32	8.96	8.60	8.34
Real Disposable Inc. (b).....	1.0	1.5	2.6	2.6	1.8	2.2	2.4	1.9	2.3	4.3	3.0	2.3	1.0	0.9	1.7
Corp. Profits (After Tax).....	-7.9	-3.7	-3.4	4.1	20.2	15.7	17.5	-2.8	17.2	-1.2	3.1	17.2	16.7	19.9	10.7
U.S. Real GDP (a).....	1.3	1.7	2.5	2.4	2.9	3.1	3.4	2.2	2.8	2.9	2.9	2.8	2.4	2.2	2.5
U.S. CPI (b).....	2.7	2.6	2.8	2.9	2.9	2.8	2.8	2.7	2.8	3.0	3.0	3.1	3.2	3.3	3.4
U.S. 3-Month T-Bills (%).....	4.90	4.80	4.67	4.67	4.67	4.67	4.67	4.76	4.70	4.88	4.88	4.88	4.88	4.57	4.46
U.S. Govt. 10-Year Bonds (%).....	5.78	6.24	6.10	6.06	6.07	5.96	5.87	6.04	5.95	5.83	5.61	5.48	5.44	5.31	5.27
Crude Oil (\$U.S./bbl.).....	14.51	14.38	14.40	14.43	14.59	14.79	14.97	14.43	14.88	15.66	16.62	17.63	18.77	20.14	21.75

(a) Annual rate of change
(b) Four-quarter percent change

4. Simulation Results: Induced Impacts

4.1 New Housing Construction

4.1.1 High Growth, Standard Import Propensity, Neutralized Exchange Rate Impacts

In Simulation 1, the Bank of Canada was assumed to follow a monetary policy of neutralizing any changes in the exchange rate. An induced increase in employment income generated by an increase in construction activity increases real GDP in an economy through an increased demand for goods and services. Initially there is pressure in the economy for the interest rate to increase slightly and the exchange rate to appreciate, which, when neutralized, will lead to an increase in money supply.

The induced effect of the construction increase is to raise employment and real GDP in the years following the changes. Lag effects are visible in employment, wages, and real GDP. Employment and employment income experience approximately a two-quarter lag, which causes them to peak in 2000. In the peak year, nearly 3 500 jobs are added to the economy compared with the base case of high economic growth. Real GDP, with a longer lag, peaks in 2001 with \$95 million higher than the base case. The induced effects of the one-time change in construction expenditures begin to diminish after the peaks. Employment and wages fall and begin to grow slightly slower than the base case. GDP follows this cycle after a longer lag, and grows at a slower pace than the base case by 2003.

The lag structure for GDP and employment exhibited in these results stems from gains in productivity. In the near-term, employment rises to produce the additional goods and services demanded. Over time, the capital stock adjusts and labour productivity rises which leads to employment gains peaking before real GDP does.

Federal and provincial taxes (measured in current dollars), summarized here by federal and provincial revenue, reflect the employment income cycle the most. Personal direct taxes from employment form a significant part of government revenues. The additional stimulus to government revenue also peaks in 2001 and begins to grow at a slower rate than the base case in 2002, following employment income. Induced changes in the unemployment rate reflect the changes in employment levels. The final two rows in Table 1 are an indication of the monetary policy pursued. In this simulation, the exchange rate is held fixed, and therefore no changes from the base case are allowed. The interest rate, however, is free to fluctuate, however, the small induced level of the impact has a very small impact on interest rates.

DRI's induced impacts indicate that after five years, the induced impact on real GDP is about \$0.14 for each dollar resulting from the two year combined direct and indirect impact. Employment is about 0.16 of a person per FTE resulting from the direct and indirect impact while wages, salaries, and supplementary labour income are only about \$0.13 for each dollar of direct and indirect impact. These results are generally lower than those generated using closed or partially closed input-output model solutions. These results indicate that the total income multiplier (measured in the fifth year) resulting from the \$1 billion increase in residential construction expenditure sustained over two years is 0.76 (i.e. economic leakages from higher imports prevent the economy as-a-whole from rising by the full amount of the rise in residential activity).

The difference in magnitude of the results from the DRI Model and input-output based approaches stems from the structure of these two types of models and the type of impact they are each estimating. The DRI Model had an econometrically derived set of equations that characterize the demand for goods and services under a set of economic conditions (relative prices, interest rates, etc.) which differs markedly

from the input-output modelling approach of assuming a marginal propensity to consume, applying that to labour income and examining the resultant rise in demand for household goods and services. The marginal propensity to consume is an endogenous concept in DRI's model and is dependent on interest and unemployment rates. Exports, investment, inventories, and government spending all adjust in the DRI Model based on changes in demand, relative prices, interest and exchange rates. Imports adjust in DRI's Model based on changes in domestic demand and relative prices but this impact, net of the relative price term, is also captured by the leakages matrix in an input-output model.

Table 3 summarizes the results from Simulation #1. All the following changes are shown as the absolute difference from the relevant base case (the High Growth Base Case here). Absolute differences are used to preserve comparability between changes that have different starting points. This definition is important to remember when analyzing these tables. Negative numbers seen for employment and wages do not indicate a decline in these variables, but only a smaller value than the base case. These changes are the result of very small differences in growth rates.

Table 3
Simulation #1

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.6	3.5	1.4	-0.4	-0.5
Real GDP (1986\$ millions)	20	90	95	18	-34
Federal Government Revenue	20	58	36	-2	-13
Provincial Government Revenue	16	47	31	0	-10
Wages, Salaries, and Supplementary Income	53	107	44	-11	-13
Unemployment Rate	-0.001	-0.005	-0.005	0.000	0.004
Exchange Rate (Can/US)	0.000	0.000	0.000	0.000	0.000
Interest Rate (3-month T-bills)	0.000	0.001	-0.001	-0.003	-0.002

4.1.2 High Growth, Standard Import Propensity, Neutralized Interest Rate Impacts

The difference between Simulation 1 and Simulation 2 is the monetary regime pursued by the Bank of Canada. In this scenario, the Bank allows the exchange rate to float freely and holds nominal interest rates fixed. By allowing the exchange rate to float, the central bank allows the induced effects from the increase in construction to affect the trade sector of the economy. These induced effects have further stimulative effects on the economy. Comparison of the differences between each of the simulations will be analyzed in Section 5.

The cyclical effects in Simulation 2 are very similar to Simulation 1. Employment increases and wage increases peak in 2000. Government taxes also peak at this time. Real GDP has a longer lag and therefore also peaks in 2001. Unemployment rate changes reflect the changes in employment. In the bottom row of Table 2, the monetary policies are observed: interest rates are held at the same level as the base case while exchange rates are allowed to vary. Although there is an initial slight appreciation of the Canadian dollar this is followed by a depreciation in the exchange rate in 2001. In the near-term, the exchange rate is influenced by the government debt-to-GDP ratio. The stock of government debt declines very marginally as a higher tax revenues flow from a stronger economy; this effect, coupled with higher GDP lowers the government debt-to-GDP ratio which helps raise the value of the Canadian dollar relative to the base case. The stronger economy does, however, lead to higher prices which lower the purchasing power parity value of the Canadian dollar and dominates the first effect causing the dollar to depreciate in value from 2001 on. The devaluation improves exports and lowers imports, which supports economic growth so that there is a slightly higher growth rate than the base case in employment and real GDP

through 2003. Federal and provincial taxes fall below base case levels in 2003 because of a drop in direct corporate taxes in that year.

Table 4
Simulation #2

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.5	3.4	1.6	0.4	0.7
Real GDP (1986\$ millions)	19	88	92	36	11
Federal Government Revenue	22	57	34	3	-2
Provincial Government Revenue	17	46	29	3	-1
Wages, Salaries, and Supplementary Income	54	103	48	17	26
Unemployment Rate	-0.001	-0.005	-0.005	-0.001	0.001
Exchange Rate (Can/US)	0.001	0.002	-0.006	-0.011	-0.004
Interest Rate (3-month T-bills)	0.000	0.000	0.000	0.000	0.000

4.1.3 Low Growth, Standard Import Propensity, Neutralized Exchange Rate Impacts

The mechanics of the induced effects in Simulation 3 are very similar to that of Simulation 1. In this case, the economy is starting from a low point in the business cycle and is exhibiting a much lower rate of capacity utilization. A positive demand therefore should have higher effects on employment and real GDP than in the high growth case.

In other respects, the cycle follows a familiar pattern. Employment peaks in 2000 with an additional 3 800 jobs compared to the base case. The impact on wages reach a maximum of \$115 million, while real GDP is \$103 million higher in 2001 than the base case. Government taxes follow the cycle of employment income in this simulation; all these variables begin to grow slower than the base scenario in 2002. The cycle has run its course by 2003 and some of the higher growth in earlier years is reflected in slower economic growth in 2003.

Table 5
Simulation #3

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.6	3.8	1.7	-0.5	-0.6
Real GDP (1986\$ millions)	24	100	103	6	-46
Federal Government Revenue	24	61	35	-9	-21
Provincial Government Revenue	18	48	29	-5	-16
Wages, Salaries, and Supplementary Income	51	115	53	-14	-17
Unemployment Rate	-0.001	-0.005	-0.006	0.000	0.004
Exchange Rate (Can/US)	0.000	0.000	0.000	0.000	0.000
Interest Rate (3-month T-bills)	0.000	0.001	-0.002	-0.003	-0.002

4.1.4 Low Growth, Standard Import Propensity, Neutralized Interest Rates

As in Simulation 2, Simulation 4 assumes a monetary policy of fixed interest rates, this time in a period of low economic growth. In this case, all the variables of interest peak in 2000. Induced employment effects peak at 3 600 above the base case in 2000. The increase in real GDP over the low base case is slightly

higher in 2000, at \$99 million, than \$95 in 2001. The lower capacity of the economy is able to respond faster to signals of stronger economic activity, so the lag is smaller in this scenario. The exchange rate devaluation propels the economy to a continued slightly faster pace than the base case in 2003.

Table 6
Simulation #4

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.6	3.6	1.6	0.1	0.5
Real GDP (1986\$ millions)	19	99	95	23	0
Federal Government Revenue	25	59	30	-6	-9
Provincial Government Revenue	19	48	26	-3	-7
Wages, Salaries, and Supplementary Income	50	109	51	8	17
Unemployment Rate	-0.001	-0.006	-0.005	0.000	0.002
Exchange Rate (Can/US)	0.002	0.003	-0.006	-0.012	-0.005
Interest Rate (3-month T-bills)	0.000	0.000	0.000	0.000	0.000

4.1.5 High Growth, Double Import Propensity, Neutralized Exchange Rate Impacts

In Simulation 5 we return the assumption of high underlying economic growth and a fixed interest rate policy. In this simulation, it was assumed that the initial increase of new construction expenditure would have an import propensity twice its normal rate. This would lead to higher imports in the direct effect, however, it produces a smaller induced effect. Imports are in a sense a “leakage” from the domestic economy; every dollar spent on an import is not paid for a good domestically, and therefore does not create induced effects for that dollar. A doubled import propensity in the initial increase therefore has a lower effect on all of the variables in the induced effects stage.

Apart from the import propensity of the direct effect, Simulation 5 resembles Simulation 1, and the cyclical pattern here is the same. Employment and wages peak in 2000, with an additional 3 200 jobs being created from the induced effects. The absolute difference in real GDP reaches its highest point in 2001 at \$84 million, but its growth is already slowing and falls below base case levels by 2003. Employment and wages begin to grow slower in 2002. The cycle of the shock moves through government revenues in the same pattern as that of employment; a peak effect in 2000 with slower growth by 2002.

Table 7
Simulation #5

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.5	3.2	1.3	-0.4	-0.4
Real GDP (1986\$ millions)	18	82	84	15	-30
Federal Government Revenue	18	52	32	-2	-12
Provincial Government Revenue	14	42	27	0	-9
Wages, Salaries, and Supplementary Income	49	98	39	-10	-11
Unemployment Rate	-0.001	-0.005	-0.005	0.000	0.004
Exchange Rate (Can/US)	0.000	0.000	0.000	0.000	0.000
Interest Rate (3-month T-bills)	0.000	0.001	-0.001	-0.002	-0.002

4.1.6 High Growth, Double Import Propensity, Neutralized Interest Rate Impacts

Simulation 6 again assumes a double import propensity in import construction expenditures, and assumes a fixed interest rate policy under high economic growth. While the cycle peaks and troughs follow that of Simulation 2, the cycle is becoming more muted in its swings. Consequently, at its peak in 2000, the shock adds only 3 100 jobs to the economy above the base line, and the difference in real GDP reaches its high point in 2001 at \$81 million. However, the approach of the cycle to its peak is more gradual, with the real GDP increase in 2001 only \$2 million higher than in 2000. The cycle also falls more gradually, with the economy growing at a slightly higher pace than that of standard import propensity by 2003. Government taxes also reach their highest point of increase over the base case in 2000, and fall below the base period's 2003 figure.

Table 8
Simulation #6

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.4	3.1	1.4	0.3	0.6
Real GDP (1986\$ millions)	17	79	81	32	10
Federal Government Revenue	19	51	29	2	-2
Provincial Government Revenue	15	41	25	3	-1
Wages, Salaries, and Supplementary Income	50	94	42	15	24
Unemployment Rate	-0.001	-0.005	-0.005	-0.001	0.001
Exchange Rate (Can/US)	0.001	0.002	-0.005	-0.010	-0.004
Interest Rate (3-month T-bills)	0.000	0.000	0.000	0.000	0.000

4.1.7 Low Growth, Double Import Propensity, Neutralized Exchange Rate Impacts

With exchange rates held constant with the Low Growth Base Case, Simulation 7 also assumes that new construction expenditures are shocked with double the import propensity. The time-paths of Simulation 7 resemble those of Simulation 3, however the induced effects are dampened. Employment gains from the shock reach a maximum of 3 500 in 2000, as do wages and taxes. Real GDP has a flat induced effect, being virtually equal in 2000 and 2001. Employment grows less rapidly in 2002 and 2003 after its initial spurt following the shock; lower employment combined with smaller increases in corporation profits lowers total government revenues such that there is even slower growth than observed before.

Table 9
Simulation #7

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.5	3.5	1.5	-0.5	-0.5
Real GDP (1986\$ millions)	22	91	91	5	-41
Federal Government Revenue	21	54	30	-8	-19
Provincial Government Revenue	16	43	26	-5	-15
Wages, Salaries, and Supplementary Income	46	105	48	-13	-15
Unemployment Rate	-0.001	-0.005	-0.005	0.000	0.004
Exchange Rate (Can/US)	0.000	0.000	0.000	0.000	0.000
Interest Rate (3-month T-bills)	0.000	0.001	-0.001	-0.003	-0.002

4.1.8 Low Growth, Double Import Propensity, Neutralized Interest Rate Impacts

In the final simulation of a demand shock to new construction expenditure, the interest rate is held constant, construction expenditures are assumed to have twice the normal import propensity, and the shock is occurring during a period of low economic growth. Employment and wages reach their highest extra input into the economy in 2000, where there are 3 200 more jobs than in the low base case. In this scenario, real GDP also has its largest induced impact in 2000, with an additional \$90 million over the base case. In 2001, the induced impacts of all variables start to decline, with tax revenues lower than the base case in 2002.

Table 10
Simulation #8

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.4	3.2	1.4	0.0	0.4
Real GDP (1986\$ millions)	18	90	84	20	1
Federal Government Revenue	22	53	26	-5	-8
Provincial Government Revenue	17	43	23	-3	-6
Wages, Salaries, and Supplementary Income	46	99	45	7	16
Unemployment Rate	-0.001	-0.005	-0.005	0.000	0.002
Exchange Rate (Can/US)	0.002	0.003	-0.005	-0.011	-0.004
Interest Rate (3-month T-bills)	0.000	0.000	0.000	0.000	0.000

4.2 Residential Alterations and Improvements

In the second round of simulations, the increased expenditures were made to residential alterations and improvements rather than new construction. Other combinations of variables were held constant to generate another eight simulations. The following tables detail the increase in employment, real GDP, and taxes in each one.

The time-paths and cycles of each of these simulations follow the same patterns as the first eight simulations. Employment and tax revenues reach their maximum point in 2000. Real GDP induced impacts have the highest change above base case levels in 2001, except for cases where there is both low economic growth and a fixed interest rate. In these cases, simulation 12 and 16, the GDP cycle has a shorter rise and reaches its peak faster. In simulations with the exchange rate fixed, the increase in employment and tax revenues above the base cases is played out by 2002 and there is slower growth than base cases; GDP switches signs in 2003. Tax expenditure also switches signs in other simulations in 2002, except in simulation 10 and 14. In these scenarios, the economy is undergoing high growth and a fixed exchange rate. Corporate direct profits contribute to government revenues to hold the off the decline until 2003.

The following tables display the detailed description of each simulation and its impacts and time decay on employment, real GDP, and government tax revenues. Table 19 summarizes the timing impacts of all the simulations.

4.2.1 High Growth, Standard Import Propensity, Neutralized Exchange Rate Impacts

Table 11
Simulation #9

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.4	3.2	1.5	-0.3	-0.5
Real GDP (1986\$ millions)	18	84	92	21	-33
Federal Government Revenue	19	55	36	-1	-13
Provincial Government Revenue	15	44	30	1	-11
Wages, Salaries, and Supplementary Income	49	99	47	-5	-14
Unemployment Rate	-0.001	-0.005	-0.005	0.000	0.004
Exchange Rate (Can/US)	0.000	0.000	0.000	0.000	0.000
Interest Rate (3-month T-bills)	0.000	0.001	-0.001	-0.002	-0.002

4.2.2 High Growth, Standard Import Propensity, Neutralized Interest Rate Impacts

Table 12
Simulation #10

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.4	3.2	1.6	0.5	0.6
Real GDP (1986\$ millions)	17	82	89	37	10
Federal Government Revenue	20	54	33	3	-2
Provincial Government Revenue	16	44	28	4	-1
Wages, Salaries, and Supplementary Income	-0.001	-0.005	-0.005	-0.001	0.001
Unemployment Rate	49	97	51	21	25
Exchange Rate (Can/US)	0.001	0.002	-0.006	-0.010	-0.004
Interest Rate (3-month T-bills)	0.000	0.000	0.000	0.000	0.000

4.2.3 Low Growth, Standard Import Propensity, Neutralized Exchange Rate Impacts

Table 13
Simulation #11

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.2	3.2	1.8	-0.3	-0.6
Real GDP (1986\$ millions)	21	89	96	10	-45
Federal Government Revenue	22	58	35	-7	-21
Provincial Government Revenue	17	46	30	-4	-16
Wages, Salaries, and Supplementary Income	-0.001	-0.005	-0.006	0.000	0.004
Unemployment Rate	45	106	56	-9	-18
Exchange Rate (Can/US)	0.000	0.000	0.000	0.000	0.000
Interest Rate (3-month T-bills)	0.001	0.002	-0.002	-0.003	-0.002

4.2.4 Low Growth, Standard Import Propensity, Neutralized Interest Rate Impacts

Table 14
Simulation #12

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.1	3.0	1.7	0.2	0.4
Real GDP (1986\$ millions)	18	92	91	25	0
Federal Government Revenue	23	57	31	-4	-9
Provincial Government Revenue	18	46	26	-2	-6
Wages, Salaries, and Supplementary Income	-0.001	-0.005	-0.005	0.000	0.002
Unemployment Rate	45	102	54	13	17
Exchange Rate (Can/US)	0.001	0.002	-0.006	-0.012	-0.005
Interest Rate (3-month T-bills)	0.000	0.000	0.000	0.000	0.000

4.2.5 High Growth, Double Import Propensity, Neutralized Exchange Rate Impacts

Table 15
Simulation #13

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.3	2.9	1.3	-0.3	-0.4
Real GDP (1986\$ millions)	16	73	78	18	-28
Federal Government Revenue	16	47	30	-1	-12
Provincial Government Revenue	12	38	25	0	-9
Wages, Salaries, and Supplementary Income	-0.001	-0.004	-0.004	0.000	0.004
Unemployment Rate	44	88	40	-5	-11
Exchange Rate (Can/US)	0.000	0.000	0.000	0.000	0.000
Interest Rate (3-month T-bills)	0.000	0.001	-0.001	-0.002	-0.002

4.2.6 High Growth, Double Import Propensity, Neutralized Interest Rate Impacts

Table 16
Simulation #14

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.2	2.8	1.4	0.4	0.6
Real GDP (1986\$ millions)	15	71	75	31	9
Federal Government Revenue	17	46	27	3	-2
Provincial Government Revenue	13	37	23	3	-1
Wages, Salaries, and Supplementary Income	-0.001	-0.004	-0.004	-0.001	0.001
Unemployment Rate	44	85	42	18	22
Exchange Rate (Can/US)	0.001	0.001	-0.005	-0.009	-0.003
Interest Rate (3-month T-bills)	0.000	0.000	0.000	0.000	0.000

4.2.7 Low Growth, Double Import Propensity, Neutralized Exchange Rate Impacts

Table 17
Simulation #15

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.3	3.1	1.6	-0.3	-0.5
Real GDP (1986\$ millions)	20	81	85	8	-38
Federal Government Revenue	19	49	29	-6	-18
Provincial Government Revenue	15	39	25	-4	-14
Wages, Salaries, and Supplementary Income	-0.001	-0.004	-0.005	0.000	0.003
Unemployment Rate	40	93	49	-8	-15
Exchange Rate (Can/US)	0.000	0.000	0.000	0.000	0.000
Interest Rate (3-month T-bills)	0.000	0.001	-0.001	-0.002	-0.002

4.2.8 Low Growth, Double Import Propensity, Neutralized Interest Rate Impacts

Table 18
Simulation #16

Absolute Difference from High Base Case (\$ million except where noted)	1999	2000	2001	2002	2003
Employment ('000)	1.2	2.9	1.5	0.2	0.4
Real GDP (1986\$ millions)	16	81	79	22	1
Federal Government Revenue	20	48	25	-4	-8
Provincial Government Revenue	15	39	22	-2	-5
Wages, Salaries, and Supplementary Income	-0.001	-0.005	-0.005	0.000	0.002
Unemployment Rate	40	89	47	11	15
Exchange Rate (Can/US)	0.001	0.003	-0.005	-0.010	-0.004
Interest Rate (3-month T-bills)	0.000	0.000	0.000	0.000	0.000

Table 19
 Summary of Turning Points and Sign-Switching

Simulation	Employment								GDP Impacts								Tax Revenues							
	1999	2000	2001	2002	2003	2004	2005	2006	1999	2000	2001	2002	2003	2004	2005	2006	1999	2000	2001	2002	2003	2004	2005	2006
NEW CONSTRUCTION																								
High Growth, Exchange Rate exogenous [1]		T		S							T		S					T			S			S
High Growth, Interest Rate exogenous [2]		T		S							T		S					T			S			S
Low Growth, Exchange Rate exogenous [3]		T		S							T		S					T			S			S
Low Growth, Interest Rate exogenous [4]		T		S							T		S					T			S			S
High Growth, Exchange Rate, 2x Import [5]		T		S							T		S					T			S			S
High Growth, Interest Rate, 2x Import [6]		T		S							T		S					T			S			S
Low Growth, Exchange Rate, 2x Import [7]		T		S							T		S					T			S			S
Low Growth, Interest Rate, 2x Import [8]		T		S							T		S					T			S			S
ALTERATIONS & IMPROVEMENTS																								
High Growth, Exchange Rate exogenous [9]		T		S							T		S					T			S			S
High Growth, Interest Rate exogenous [10]		T		S							T		S					T			S			S
Low Growth, Exchange Rate exogenous [11]		T		S							T		S					T			S			S
Low Growth, Interest Rate exogenous [12]		T		S							T		S					T			S			S
High Growth, Exchange Rate, 2x Import [13]		T		S							T		S					T			S			S
High Growth, Interest Rate, 2x Import [14]		T		S							T		S					T			S			S
Low Growth, Exchange Rate, 2x Import [15]		T		S							T		S					T			S			S
Low Growth, Interest Rate, 2x Import [16]		T		S							T		S					T			S			S

5. Comparison of Results

Alternative scenarios were simulated with the same direct effect taking place in different economic environments, monetary regimes, import propensities, and different types of construction expenditures. Each simulation produces similar cycles through the economy, with minor variations in the time-paths and aggregate induced effects.

5.1 Exchange Rate Control Vs. Interest Rate Control

The relative strength of impacts of the two monetary regimes varies over the five year period. In the first two to three years, a fixed exchange rate policy produces a higher impact on employment and real GDP. However, in later years employment growth is strongest under a fixed interest rate policy. The switching effect shows the strength of trade policy as a multiplier to the Canadian economy compared to interest rate policy.

In the first two years, there is a slight exchange rate appreciation under the fixed interest rate regime. This appreciation dampens exports and increases imports. Imports are a leakage to the domestic economy so they slow growth from occurring as quickly as under exchange rate control. In Table 20 - Table 28, the increases in employment, wages and salaries, real GDP, and government revenue are stronger in the first two or three years of the neutralized exchange rate regimes (the interplay of other economic variables affects the exact turning point in each simulation). Imports increase in every simulation, as a result of the induced effect of higher GDP and higher demand. However, imports increase more under interest rate control, reflecting the lower price of imports caused by the appreciation of the exchange rate.

After 2000, economic growth slows because of the removal of the income and employment from the direct and indirect impacts. This leads to an abrupt slowing in consumption demand relative to the previous year. The exchange rate begins to depreciate, and it falls by more in 2001 than it rose in the first two years. In the interest rate control simulations, this effect on trade is allowed to feed back into the economy. Imports fall faster in these simulations and exports receive a boost. The change in net exports above base case levels becomes positive in 2002, which sends further positive induced effects rippling through the economy. While the reduction in domestic demand is observed in these simulations as well, it is offset by the continued stimuli to the economy coming from the trade sector. In comparison, under exchange rate control, there is no continued boost to the economy, and employment, real GDP, and taxes fall below base case growth.

It is also possible to see the effect that interest rate control has on the economy. Although the changes to the interest rate are very small, there is a consistency in the response of non-residential investment to these changes. In the first two years, there are marginal increases in the interest rate under exchange rate control. While non-residential investment is increasing due to higher demand (real GDP), there is slightly lower growth in business investment when the interest rate is allowed to increase rather than held fixed. In the following years, interest rates decline under exogenous exchange rate policy. These lower rates provide a stimulus to business investment under fixed exchange rate policy, offsetting some of the decline in investment due to slowing GDP growth.

Both non-residential business investment and net exports form key components of GDP. The two monetary regimes examined here therefore provide both positive and negative stimuli to the economy. Exchange rate control initially strengthens net exports and dampens business investment; interest rate

control initially strengthens business investment and dampens net exports. The impacts switch after the initial years when the economy is phasing down through its cycle of the shock.

Although each policy has both positive and negative effects on economic growth, in all cases net exports have a stronger feedback into the economy. Policies that encourage exports and discourage imports provide a stronger boost to the economy than policies that encourage investment only. Over the five years examined here the fixed interest rate policy has the stronger total effect on the economy. By shutting out trade sector feedbacks, exchange rate control loses more than it gains.

5.2 High Growth Economy vs. Low Growth Economy

One of the old adages often heard is “the higher they climb, the harder they fall”. While this may not always be true of everything in life, it is an accurate description of the induced effects resulting from an increase in construction expenditure during a high growth economy and a low growth economy.

Analysis of all sixteen of the simulations prepared by DRI are done by comparing them with the ‘base case’ scenarios of forecasted growth. These growth scenarios were developed using the benchmark of past periods of fast and slow economic growth.

Economic growth is based on the underlying productive factors in a society: labour, capital, land, and technological progress. In periods of rapid economic growth, there is higher capacity utilization of each of these factors. Consequently, there are fewer factors of production available that can respond to an additional stimulus to the economy. Lower capacity utilization rates in a slow-growing economy can respond more quickly and effectively to an increase in demand. Although the differences are small, higher direct and indirect effects translate into higher induced effects on the economy during the low growth environment than the high growth environment.

The main measures of economic growth in this analysis, employment, real GDP, and government tax revenues, all grow faster and higher in the low growth models than in the high growth models during the initial part of the cycle. However, the decay in this effect is also stronger in a low-growth environment than in the high growth environment. While a boost to construction expenditure promotes higher overall economic growth, in many of the simulations, more jobs were added in total to the economy under high economic growth because of the effect of this decay.

In summary, the dynamics of the impact are affected by the economic environment but the overall economic impact, when viewed over a five year period, is very similar in each environment. The low growth economic environment, in general, produces a cycle with a larger amplitude than the high growth environment.

5.3 Induced Effects of Import Propensities

There has been a noticeable rise in the propensity to import construction materials under continental free trade. The direct effect of a higher import propensity is to raise imports in the economy, which lowers induced economic growth. Given the relatively large impact that the trade sector has on the Canadian economy, the reduction can be quite substantial. In the tables below showing induced changes in the economy, a higher import propensity results in lower economic growth in employment, real GDP, and tax

revenues. Induced imports themselves are lower because slower growing income and business growth create less demand for imports.

The reduction in induced impact due to a higher import propensity is not particularly sensitive to most factors in the economic environment in DRI's simulations. Although the reduction in employment and real GDP is when the type of construction expenditures are alterations and improvements, this follows directly from the inputs derived from Informetrica. Generally, a doubled import propensity reduces employment by 12% and real GDP by 10%, or 14% under alterations and expenditure. The type of monetary policy and macroeconomic environment does not significantly affect the reduction in economic activity.

One exception to these results is seen in Simulation 11 and 12. In these cases, the real wage rate increases more than in other simulations in 1999 and 2000, as a result of changes in the rate of inflation. As employment in the model is very sensitive to changes in the real wage rate, the induced change in employment is much less than in other simulations. Consequently, the reduction in employment caused by a higher import propensity is much smaller than in other cases.

The peak reductions in economic growth caused by a higher import propensity are observed under a high growth, fixed interest rate regime where expenditures have been increased to alterations and renovations in the construction industry. In this simulation, compared to the standard import propensity, there impact on real GDP is lowered by \$33 million, employment by 1 000 jobs, and tax revenues by \$33 million. The lowest reduction in impact occurs under a low growth scenario, with the exchange rate exogenous, and under new construction. Compared to a standard import propensity, the impact on real GDP is \$13 million lower, 100 jobs fewer, and \$28 million lower in tax revenues.

5.4 Type of Construction Expenditure

Another factor varied in these simulations was the comparison of the induced effect of a \$1 annual billion increase in new residential construction to the effects of a \$1 billion increase in residential renovations and repair expenditures. As the renovations and repair sector involves fewer linkages to the rest of the economy, its effects will be more limited and slow-moving. This corresponds to lower induced effects. In Table 20 - Table 23, the data shows that a positive shock to the renovations and repair sector creates a lower rise in employment, real GDP, government revenues, and wages and salaries for 1999-2001 than new construction. In subsequent years, the difference from the base case is sometimes higher in renovations and repair; this is the result both of longer lags in the induced effects reaching the economy, and a lower displacement effect.

Table 20
Induced Impact on Employment - Absolute Difference, thousands

	High Growth Base Case							Low Growth Base Case						
	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.
New Construction														
Exchange Rate exogenous	1.6	3.5	1.4	-0.4	-0.5	5.6	1.1	1.6	3.8	1.7	-0.5	-0.6	6.0	1.2
Interest Rate exogenous	1.5	3.4	1.6	0.4	0.7	7.5	1.5	1.6	3.6	1.6	0.1	0.5	7.3	1.5
Exchange Rate exo, 2x import	1.5	3.2	1.3	-0.4	-0.4	5.1	1.0	1.5	3.5	1.5	-0.5	-0.5	5.4	1.1
Interest Rate exo, 2x import	1.4	3.1	1.4	0.3	0.6	6.8	1.4	1.4	3.2	1.4	0.0	0.4	6.6	1.3
Alterations & Improvements														
Exchange Rate exogenous	1.4	3.2	1.5	-0.3	-0.5	5.4	1.1	1.2	3.2	1.8	-0.3	-0.6	5.2	1.0
Interest Rate exogenous	1.4	3.2	1.6	0.5	0.6	7.3	1.5	1.1	3.0	1.7	0.2	0.4	6.6	1.3
Exchange Rate exo, 2x import	1.3	2.9	1.3	-0.3	-0.4	4.7	0.9	1.3	3.1	1.6	-0.3	-0.5	5.1	1.0
Interest Rate exo, 2x import	1.2	2.8	1.4	0.4	0.6	6.4	1.3	1.2	2.9	1.5	0.2	0.4	6.2	1.2

Table 21
Induced Impact on Real Gross Domestic Product - Absolute Difference, \$86 millions

	High Growth Base Case							Low Growth Base Case						
	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.
New Construction														
Exchange Rate exogenous	20	90	95	18	-34	189	38	24	100	103	6	-46	187	37
Interest Rate exogenous	19	88	92	36	11	245	49	19	99	95	23	0	236	47
Exchange Rate exo, 2x import	18	82	84	15	-30	169	34	22	91	91	5	-41	168	34
Interest Rate exo, 2x import	17	79	81	32	10	219	44	18	90	84	20	1	213	43
Alterations & Improvements														
Exchange Rate exogenous	18	84	92	21	-33	182	36	21	89	96	10	-45	170	34
Interest Rate exogenous	17	82	89	37	10	235	47	18	92	91	25	0	226	45
Exchange Rate exo, 2x import	16	73	78	18	-28	156	31	20	81	85	8	-38	156	31
Interest Rate exo, 2x import	15	71	75	31	9	202	40	16	81	79	22	1	200	40

Table 22
Induced Impact on Government Revenue - Absolute Difference, \$ millions

	High Growth Base Case							Low Growth Base Case						
	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.
New Construction														
Exchange Rate exogenous	39	111	69	-3	-25	191	38	45	115	66	-15	-39	172	34
Interest Rate exogenous	41	109	64	7	-1	219	44	46	113	58	-9	-15	194	39
Exchange Rate exo, 2x import	35	99	61	-4	-22	168	34	40	103	58	-14	-34	153	31
Interest Rate exo, 2x import	36	97	56	5	-1	194	39	41	101	51	-8	-13	172	34
Alterations & Improvements														
Exchange Rate exogenous	36	104	68	0	-25	182	36	41	109	68	-11	-38	168	34
Interest Rate exogenous	38	103	63	8	-2	210	42	42	108	60	-6	-15	189	38
Exchange Rate exo, 2x import	30	89	57	-2	-22	153	31	35	93	56	-11	-33	140	28
Interest Rate exo, 2x import	32	88	52	6	-2	177	35	36	92	49	-5	-12	160	32

Table 23
Induced Impact on Wages, Salaries & SLI - Absolute Difference, \$ millions

	High Growth Base Case							Low Growth Base Case						
	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.
New Construction														
Exchange Rate exogenous	53	107	44	-11	-13	181	36	51	115	53	-14	-17	187	37
Interest Rate exogenous	54	103	48	17	26	249	50	50	109	51	8	17	235	47
Exchange Rate exo, 2x import	49	98	39	-10	-11	165	33	46	105	48	-13	-15	170	34
Interest Rate exo, 2x import	50	94	42	15	24	224	45	46	99	45	7	16	213	43
Alterations & Improvements														
Exchange Rate exogenous	49	99	47	-5	-14	176	35	45	106	56	-9	-18	181	36
Interest Rate exogenous	49	97	51	21	25	242	48	45	102	54	13	17	232	46
Exchange Rate exo, 2x import	44	88	40	-5	-11	155	31	40	93	49	-8	-15	160	32
Interest Rate exo, 2x import	44	85	42	18	22	212	42	40	89	47	11	15	203	41

Table 24
Induced Impact on Exchange Rate (SUS/SCN) - Absolute Difference

	High Growth Base Case							Low Growth Base Case						
	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.
New Construction														
Exchange Rate exogenous	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest Rate exogenous	0.001	0.002	-0.006	-0.011	-0.004	-0.018	-0.004	0.002	0.003	-0.006	-0.012	-0.005	-0.017	-0.003
Exchange Rate exo, 2x import	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest Rate exo, 2x import	0.001	0.002	-0.005	-0.010	-0.004	-0.016	-0.003	2.000	0.003	-0.005	-0.011	-0.004	1.983	0.397
Alterations & Improvements														
Exchange Rate exogenous	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest Rate exogenous	0.001	0.002	-0.006	-0.010	-0.004	-0.018	-0.004	0.001	0.002	-0.006	-0.012	-0.005	-0.020	-0.004
Exchange Rate exo, 2x import	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interest Rate exo, 2x import	0.001	0.001	-0.005	-0.009	-0.003	-0.015	-0.003	0.001	0.003	-0.005	-0.010	-0.004	-0.015	-0.003

Table 25
Induced Impact on Interest Rate - Absolute Difference

	High Growth Base Case							Low Growth Base Case						
	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.
New Construction														
Exchange Rate exogenous	0.0004	0.001	-0.001	-0.003	-0.002	-0.004	-0.001	0.000	0.001	-0.002	-0.003	-0.002	-0.005	-0.001
Interest Rate exogenous	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exchange Rate exo, 2x import	0.0003	0.001	-0.001	-0.002	-0.002	-0.004	-0.001	0.000	0.001	-0.001	-0.003	-0.002	-0.004	-0.001
Interest Rate exo, 2x import	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alterations & Improvements														
Exchange Rate exogenous	0.0004	0.001	-0.001	-0.002	-0.002	-0.004	-0.001	0.001	0.002	-0.002	-0.003	-0.002	-0.004	-0.001
Interest Rate exogenous	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exchange Rate exo, 2x import	0.0003	0.001	-0.001	-0.002	-0.002	-0.003	-0.001	0.000	0.001	-0.001	-0.002	-0.002	-0.004	-0.001
Interest Rate exo, 2x import	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 26
Induced Impact on Non-Residential Real Investment - Absolute Difference, \$86 millions

	High Growth Base Case							Low Growth Base Case						
	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.
New Construction														
Exchange Rate exogenous	2	28	65	24	-23	96	19	3	34	61	11	-37	72	14
Interest Rate exogenous	2	30	61	13	-27	79	16	4	36	55	-1	-40	53	11
Exchange Rate exo, 2x import	1	24	56	21	-21	82	16	3	30	53	9	-34	62	12
Interest Rate exo, 2x import	2	26	53	11	-24	67	13	3	31	48	-1	-36	45	9
Alterations & Improvements														
Exchange Rate exogenous	2	27	63	23	-23	92	18	3	32	57	11	-35	68	14
Interest Rate exogenous	2	30	59	12	-27	76	15	4	34	53	-1	-39	51	10
Exchange Rate exo, 2x import	1	21	51	19	-20	73	15	3	27	49	9	-32	56	11
Interest Rate exo, 2x import	2	24	48	9	-23	60	12	3	29	44	-1	-33	42	8

Table 27
Induced Impact on Real Exports - Absolute Difference, \$86 millions

	High Growth Base Case							Low Growth Base Case						
	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.
New Construction														
Exchange Rate exogenous	0	1	1	0	-1	2	0	0	1	2	0	0	3	1
Interest Rate exogenous	0	-1	2	11	11	23	5	0	-2	3	14	16	30	6
Exchange Rate exo, 2x import	0	1	1	0	-1	2	0	0	1	2	0	0	3	1
Interest Rate exo, 2x import	0	-1	2	10	10	20	4	0	-2	3	13	15	28	6
Alterations & Improvements														
Exchange Rate exogenous	0	1	1	0	-1	2	0	0	0	1	0	-1	-1	0
Interest Rate exogenous	0	-1	2	10	11	22	4	-1	-2	3	14	16	30	6
Exchange Rate exo, 2x import	0	1	1	0	-1	2	0	0	1	1	0	0	3	1
Interest Rate exo, 2x import	0	-1	2	9	9	19	4	0	-1	3	12	14	27	5

Table 28
Induced Impact on Real Imports - Absolute Difference, \$86 millions

	High Growth Base Case							Low Growth Base Case						
	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.	1999	2000	2001	2002	2003	5-Year Total	5-Year Avr.
New Construction														
Exchange Rate exogenous	17	72	95	28	-36	175	35	18	75	91	15	-47	152	30
Interest Rate exogenous	17	78	89	7	-46	144	29	18	83	84	-7	-56	123	25
Exchange Rate exo, 2x import	15	64	83	23	-33	152	30	16	67	80	13	-42	134	27
Interest Rate exo, 2x import	15	69	77	5	-41	125	25	17	74	74	-7	-50	108	22
Alterations & Improvements														
Exchange Rate exogenous	15	67	92	29	-36	167	33	16	70	87	18	-44	147	29
Interest Rate exogenous	15	73	86	8	-45	138	28	17	78	80	-6	-55	113	23
Exchange Rate exo, 2x import	13	57	76	23	-32	137	27	15	60	74	14	-39	124	25
Interest Rate exo, 2x import	13	62	71	5	-39	113	23	15	67	69	-4	-47	100	20

6. Induced Effects on Taxes

Total federal and provincial government tax revenue was discussed in previous sections. This section examines federal and provincial taxes in more detail, as federal and provincial revenues contain many different types of taxes with different economic drivers. There are four main types of government taxes: direct-personal; direct-corporations; indirect; and CPP/QPP and EI. There were no induced changes in other types of government taxes. The first three types apply both to federal and provincial taxes. Provincial taxes are often based on federal taxes or use similar drivers in their determination.

6.1 Direct Taxes - Personal

Induced effects on federal direct taxes occur in these simulations through changes to personal income (see Figure 6). Provincial direct taxes are a percentage share of federal direct taxes. The main drivers to personal income are wages, salaries and supplementary income, investment income, non-farm business income, farm income, and government transfers (assumed constant in these simulations). Trends in wages, salaries and supplementary income (Table 22) are the main driver behind the cycles visible in federal and provincial direct personal taxes.

Induced changes to federal direct taxes form the largest single addition to changes in induced federal tax revenue. The added growth to federal income peaks in 2000 with a maximum of \$32 million added under the low growth/fixe exchange rate regime. The fixe exchange rate regime initially adds more to the direct personal taxes than a fixe interest rate policy. However, the decline in economic growth under a fixe exchange rate policy also erodes tax revenues by 2002.

Tax revenues both increase and fall faster under a low-growth case compared to the high-growth case. Induced effects are lower when construction expenditures are made in alterations and improvements, and when construction expenditures have a higher propensity to import.

Table 29
Induced Effect on Federal Direct Personal Tax - Absolute Difference, \$ millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	13.2	29.4	16.8	0.3	-3.8	13.6	31.6	17.9	-2.1	-6.8
Interest Rate exogenous	13.6	29.0	16.4	3.6	3.2	13.8	30.6	16.5	0.3	-0.1
Exchange Rate exo, 2x import	12.1	26.6	14.7	0.0	-3.2	12.4	28.5	15.8	-2.1	-6.0
Interest Rate exo, 2x import	12.4	26.1	14.2	3.0	3.1	12.5	27.5	14.5	0.1	0.1
Alterations & Improvements										
Exchange Rate exogenous	12.0	27.4	17.0	1.2	-4.0	12.0	29.9	19.1	-1.0	-7.0
Interest Rate exogenous	12.4	27.2	16.6	4.2	2.9	12.0	28.8	17.6	1.4	-0.1
Exchange Rate exo, 2x import	10.6	23.7	14.2	0.8	-3.3	10.8	25.5	15.4	-1.1	-5.8
Interest Rate exo, 2x import	11.0	23.5	13.7	3.4	2.7	10.9	24.8	14.3	0.9	0.0

Table 30
Induced Effect on Provincial Direct Personal Tax - Absolute Difference, \$ millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	7.7	17.2	10.9	1.1	-2.2	8.0	18.6	11.4	-0.6	-4.3
Interest Rate exogenous	8.1	16.9	10.4	2.4	1.5	8.2	18.1	10.5	0.4	-0.7
Exchange Rate exo, 2x import	7.1	15.5	9.5	0.8	-1.9	7.3	16.7	10.1	-0.7	-3.8
Interest Rate exo, 2x import	7.4	15.2	9.1	2.0	1.4	7.4	16.2	9.2	0.2	-0.6
Alterations & Improvements										
Exchange Rate exogenous	7.0	16.0	10.9	1.5	-2.3	7.4	17.7	11.8	-0.1	-4.4
Interest Rate exogenous	7.4	15.9	10.4	2.6	1.3	7.4	17.0	10.8	0.9	-0.7
Exchange Rate exo, 2x import	6.2	13.8	9.1	1.1	-1.9	6.3	14.9	9.7	-0.2	-3.6
Interest Rate exo, 2x import	6.6	13.6	8.6	2.2	1.3	6.5	14.5	8.9	0.7	-0.6

6.2 Direct Taxes - Corporations

Both federal and provincial direct taxes on corporations are driven primarily by before-tax corporate profits (see Figure 7). In DRI's model, corporate profits are a residual calculation where several income figures are removed from national income to derive corporate profits. Of these, the main income variables affected by these simulations are wages and salaries, farm income, non-farm business income, investment income, and inventory adjustments. Before-tax corporate profits are displayed in Table 33.

The cycles are observed in federal and provincial direct corporate profits are similar to other variables. The peak induced effects are in 2000, where the federal government receives an additional \$12-15, and the provincial government earns \$10-13 million above the base case. Growth becomes lower than the base case in 2002 in the high base case and under a fixed exchange rate policy in the low-growth base case. In other cases, this occurs in 2001.

One of the differences in these cycles is a higher induced effect under the high growth case compared to low growth scenario after 1999. The higher inflation observed in the low growth direct and indirect effects contribute to this anomaly.

Table 31
Induced Effect on Federal Direct Corporations' Tax - Absolute Difference, \$ millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	3.9	15.6	5.3	-6.5	-5.4	6.5	15.3	2.2	-9.7	-9.3
Interest Rate exogenous	5.0	15.0	3.5	-5.5	-3.7	7.4	14.5	-0.3	-9.3	-7.2
Exchange Rate exo, 2x import	3.1	13.6	4.6	-5.9	-4.9	5.5	13.4	1.8	-8.7	-8.4
Interest Rate exo, 2x import	4.0	13.0	3.0	-4.9	-3.4	6.2	12.6	-0.4	-8.4	-6.5
Alterations & Improvements										
Exchange Rate exogenous	3.9	15.1	5.1	-6.4	-5.5	6.3	14.8	2.2	-9.4	-9.2
Interest Rate exogenous	5.0	14.7	3.3	-5.5	-3.8	7.2	14.2	-0.2	-9.1	-7.1
Exchange Rate exo, 2x import	2.7	12.5	4.1	-5.7	-4.9	5.1	12.3	1.7	-8.2	-8.1
Interest Rate exo, 2x import	3.7	12.0	2.5	-4.7	-3.4	5.8	11.7	-0.4	-7.9	-6.2

Table 32
Induced Effect on Provincial Direct Corporations' Tax - Absolute Difference, \$ millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	3.3	13.3	4.6	-5.5	-4.6	5.6	13.0	1.9	-8.3	-7.9
Interest Rate exogenous	4.2	12.8	3.0	-4.7	-3.2	6.3	12.3	-0.2	-8.0	-6.1
Exchange Rate exo, 2x import	2.6	11.6	3.9	-5.0	-4.2	4.7	11.4	1.6	-7.4	-7.2
Interest Rate exo, 2x import	3.4	11.1	2.5	-4.2	-2.9	5.3	10.7	-0.4	-7.1	-5.5
Alterations & Improvements										
Exchange Rate exogenous	3.3	12.9	4.3	-5.4	-4.7	5.4	12.6	1.9	-8.0	-7.8
Interest Rate exogenous	4.3	12.5	2.8	-4.7	-3.2	6.2	12.1	-0.2	-7.8	-6.0
Exchange Rate exo, 2x import	2.3	10.6	3.5	-4.8	-4.1	4.3	10.5	1.4	-6.9	-6.9
Interest Rate exo, 2x import	3.2	10.2	2.2	-4.0	-2.9	4.9	10.0	-0.4	-6.7	-5.3

Table 33
Induced Effect on Before-Tax Corporate Profits - Absolute Difference, \$ millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	45.2	182.4	62.3	-75.2	-63.0	76.2	178.4	26.0	-113.1	-108.7
Interest Rate exogenous	57.9	175.3	41.1	-63.9	-43.1	86.1	168.6	-3.4	-108.9	-83.7
Exchange Rate exo, 2x import	35.8	159.1	53.6	-68.6	-56.9	64.2	155.8	21.4	-101.8	-98.0
Interest Rate exo, 2x import	47.0	152.0	34.5	-57.0	-39.5	72.5	146.4	-5.0	-97.5	-76.0
Alterations & Improvements										
Exchange Rate exogenous	45.3	176.2	59.0	-74.5	-64.3	73.9	173.0	26.2	-109.4	-107.3
Interest Rate exogenous	58.7	171.2	38.0	-64.4	-44.4	84.4	165.5	-2.1	-106.2	-82.6
Exchange Rate exo, 2x import	31.9	145.6	47.8	-66.1	-56.6	59.4	143.7	19.8	-95.1	-94.0
Interest Rate exo, 2x import	43.3	140.2	29.5	-55.4	-39.8	67.8	136.4	-4.9	-91.6	-72.7

6.3 Indirect Taxes

Federal indirect taxes are made up of four tax variables, three of which have induced effects in these simulations (see Figure 8). Federal sales taxes, GST, and federal import duties all have induced effects, but the largest induced effect is on GST, caused by changes in consumption. Provincial indirect taxes are primarily provincial sales taxes.

Federal indirect taxes reach their peak induced effect in 2000 or 2001, as does consumption. The biggest change in provincial indirect taxes is always in 2000, but there is only a small drop in 2001. Induced effects taper off and there is slower growth in federal and provincial indirect taxes in all simulations by 2002.

The time path of consumption expenditures under different monetary regimes varies more than other variables, which causes indirect taxes to also vary. However, the fixed interest rate policy gives the largest total impact over the five years, which is consistent with other variables. Federal taxes are also lowered in the fixed interest rate policy by a larger fall in residential investment, which brings about slower growth than base case levels by 2003.

Table 34
Induced Effect on Federal Indirect Taxes - Absolute Difference, \$ millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	5.9	23.0	24.2	7.4	-6.6	6.6	24.1	25.1	5.8	-7.9
Interest Rate exogenous	5.5	23.5	23.0	7.4	-2.0	6.2	25.6	23.9	5.4	-3.3
Exchange Rate exo, 2x import	5.4	20.7	21.3	6.2	-6.1	6.1	21.7	22.3	5.0	-7.2
Interest Rate exo, 2x import	5.0	21.2	20.2	6.2	-1.9	5.6	23.2	21.2	4.7	-2.9
Alterations & Improvements										
Exchange Rate exogenous	5.4	21.2	23.3	8.0	-6.4	6.2	22.4	24.3	6.6	-7.6
Interest Rate exogenous	5.1	21.9	22.2	7.8	-1.9	5.9	24.4	23.1	5.7	-3.1
Exchange Rate exo, 2x import	4.8	18.4	19.6	6.4	-5.8	5.4	19.3	20.7	5.4	-6.6
Interest Rate exo, 2x import	4.4	18.9	18.5	6.2	-1.8	5.0	20.9	19.8	5.1	-2.4

Table 35
Induced Effect on Provincial Indirect Taxes - Absolute Difference, \$ millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	4.6	16.2	15.5	4.5	-3.6	4.8	16.7	16.1	3.6	-4.1
Interest Rate exogenous	4.5	16.4	14.6	4.6	0.4	4.5	17.7	15.2	3.6	-0.3
Exchange Rate exo, 2x import	4.3	14.7	13.7	3.8	-3.4	4.4	15.1	14.3	3.1	-3.7
Interest Rate exo, 2x import	4.1	14.8	12.9	3.9	0.3	4.1	16.0	13.5	3.2	-0.2
Alterations & Improvements										
Exchange Rate exogenous	4.3	15.0	15.0	4.9	-3.5	4.5	15.7	15.8	4.3	-4.0
Interest Rate exogenous	4.1	15.3	14.2	4.9	0.3	4.3	16.9	14.9	4.1	-0.2
Exchange Rate exo, 2x import	3.8	13.0	12.6	4.0	-3.2	3.9	13.5	13.3	3.4	-3.4
Interest Rate exo, 2x import	3.7	13.2	11.9	4.0	0.2	3.6	14.5	12.7	3.5	-0.1

Table 36
Induced Effect on Consumption Expenditure - Absolute Difference, millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	40	154	157	56	-25	45	163	167	48	-33
Interest Rate exogenous	38	158	147	52	5	42	175	157	41	-4
Exchange Rate exo, 2x import	36	139	139	48	-24	41	147	148	42	-30
Interest Rate exo, 2x import	34	143	129	44	4	38	159	140	36	-4
Alterations & Improvements										
Exchange Rate exogenous	36	142	151	60	-24	43	154	163	53	-33
Interest Rate exogenous	34	147	142	54	5	41	168	152	43	-4
Exchange Rate exo, 2x import	32	123	127	49	-23	36	131	137	44	-28
Interest Rate exo, 2x import	30	127	118	44	3	34	143	130	38	-2

6.4 CPP/QPP and EI Revenues

The federal government also collects pension contributions and Employment Insurance premiums. These payroll taxes vary directly with wages to a certain maximum contribution level. The induced effects to CPP/QPP and EI are very similar, and follow the same pattern as wages, salaries, and supplementary income.

In their peak year, 2000, there are an additional \$4-6 million added to CPP/QPP and EI. The strength of induced effects switches between the two monetary regimes in 2001, where a fixed interest rate policy begins to be stronger. Growth in pension and employment insurance revenues falls beneath base case levels in 2002 under a fixed exchange rate regime. In the low growth scenario, under a fixed interest rate policy, these payroll taxes dip below base case levels in 2002 because of slow growth in wages and salaries, but they rebound the next year. Generally, the low growth scenario, new construction expenditures, and a lower import propensity have higher induced effects on pension plan and employment insurance contributions.

Table 37
Induced Effect on CPP & QPP Revenue - Absolute Difference, \$ millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	2.4	5.6	1.8	-1.1	-0.7	2.4	5.9	2.2	-1.3	-0.9
Interest Rate exogenous	2.3	5.5	2.1	0.4	1.4	2.4	5.6	2.1	-0.2	1.1
Exchange Rate exo, 2x import	2.2	5.1	1.6	-1.1	-0.6	2.2	5.4	1.9	-1.2	-0.8
Interest Rate exo, 2x import	2.1	5.1	1.8	0.3	1.3	2.2	5.1	1.9	-0.2	1.0
Alterations & Improvements										
Exchange Rate exogenous	2.2	5.2	2.0	-0.8	-0.8	1.8	5.4	2.8	-1.0	-1.0
Interest Rate exogenous	2.1	5.2	2.2	0.6	1.3	1.7	5.2	2.8	0.2	1.0
Exchange Rate exo, 2x import	1.9	4.6	1.7	-0.8	-0.7	1.9	4.9	2.1	-0.9	-0.8
Interest Rate exo, 2x import	1.8	4.6	1.8	0.5	1.2	1.9	4.7	2.0	0.1	1.0

Table 38
Induced Effect on Employment Insurance Revenue - Absolute Difference, \$ millions

	High Growth Base Case					Low Growth Base Case				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
New Construction										
Exchange Rate exogenous	2.5	5.7	1.7	-1.1	-0.7	2.6	6.0	2.1	-1.3	-0.9
Interest Rate exogenous	2.4	5.6	2.0	0.4	1.2	2.5	5.7	2.0	-0.2	0.9
Exchange Rate exo, 2x import	2.3	5.2	1.5	-1.1	-0.6	2.3	5.5	1.9	-1.2	-0.8
Interest Rate exo, 2x import	2.2	5.1	1.7	0.3	1.1	2.3	5.2	1.8	-0.2	0.9
Alterations & Improvements										
Exchange Rate exogenous	2.3	5.3	1.9	-0.9	-0.8	1.9	5.5	2.8	-0.9	-0.9
Interest Rate exogenous	2.2	5.3	2.2	0.5	1.1	1.8	5.3	2.8	0.1	0.9
Exchange Rate exo, 2x import	2.0	4.7	1.6	-0.8	-0.6	2.0	4.9	2.0	-0.9	-0.8
Interest Rate exo, 2x import	1.9	4.7	1.8	0.4	1.0	2.0	4.7	1.9	0.0	0.8

7. Conclusion

In addition to the direct and indirect effects that an increase in construction expenditure has on an economy, increased employment income generates an induced impact that increased economic growth. This impact last for several quarters, with a gradual decay after this time in the effects on employment, GDP, and tax revenues. The lag in reaching the peak effect on real GDP is longer than that for employment and tax revenues.

Several factors condition the strength and timing of the impact from an increase in construction expenditures. Generally, higher impacts on key economic variables are observed under a low economic growth situation, where under-utilized capacity can respond more quickly to the stimulus. However, the faster rise in economic growth also generates a faster decay in the positive impact over the medium-term.

The monetary policy pursued by the Bank of Canada has a key effect on the entire economy and conditions the way that a positive fiscal shock moves through the economy. In initial years, a fixed exchange rate policy has a larger impact on economic variables because it prevents an endogenous appreciation of the currency and a subsequent increase in imports which would slow economic growth. While the interest rate is able to climb under this regime, its movements are marginal and the slightly lower business fixed investment does not offset the gain from trade policy. However, over the medium term, the impact of the construction expenditures decays and the currency undergoes a devaluation. The resulting boon to net exports sustains continued higher growth than base case scenarios. Prevention of this devaluation under a fixed exchange rate policy reduces the total impact of the fiscal shock. Thus, exchange rate control has a larger effect on the economy, both positively and negatively, than interest rate control.

A higher import propensity observed under construction expenditures will dampen the impact of an increase in demand from this sector. The reduction is sensitive to the type of construction expenditure, the prevailing monetary policy in the economy, and the macroeconomic environment. While total impacts are higher under new construction expenditures, a doubled import propensity creates a greater absolute and relative decline in total impact under expenditures on alterations and improvements.

APPENDIX A

Figure 1

MODEL STRUCTURE

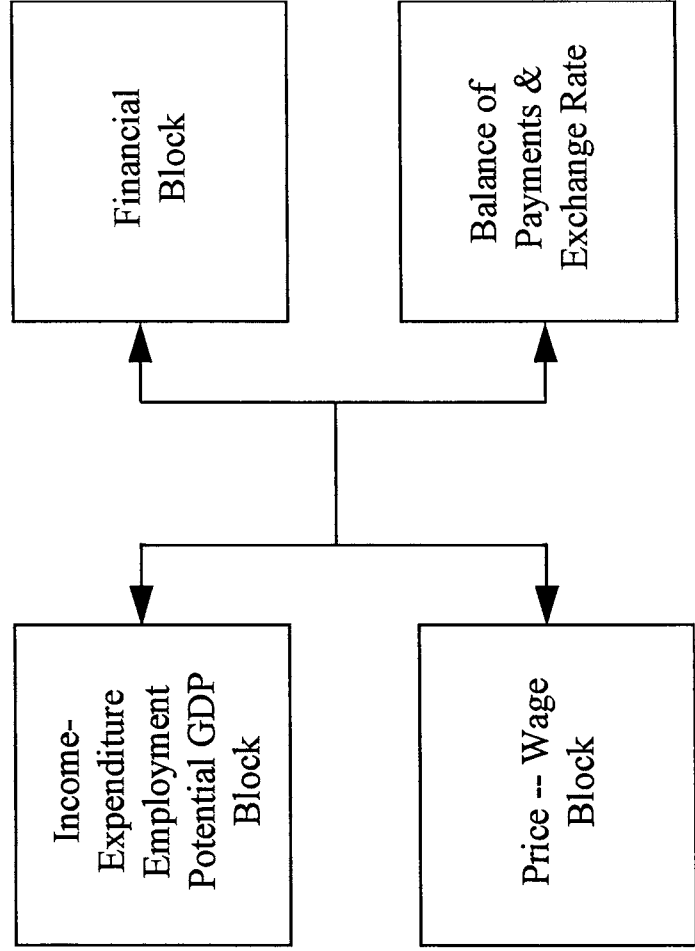


Figure 2

INDUCED IMPACT MECHANISM

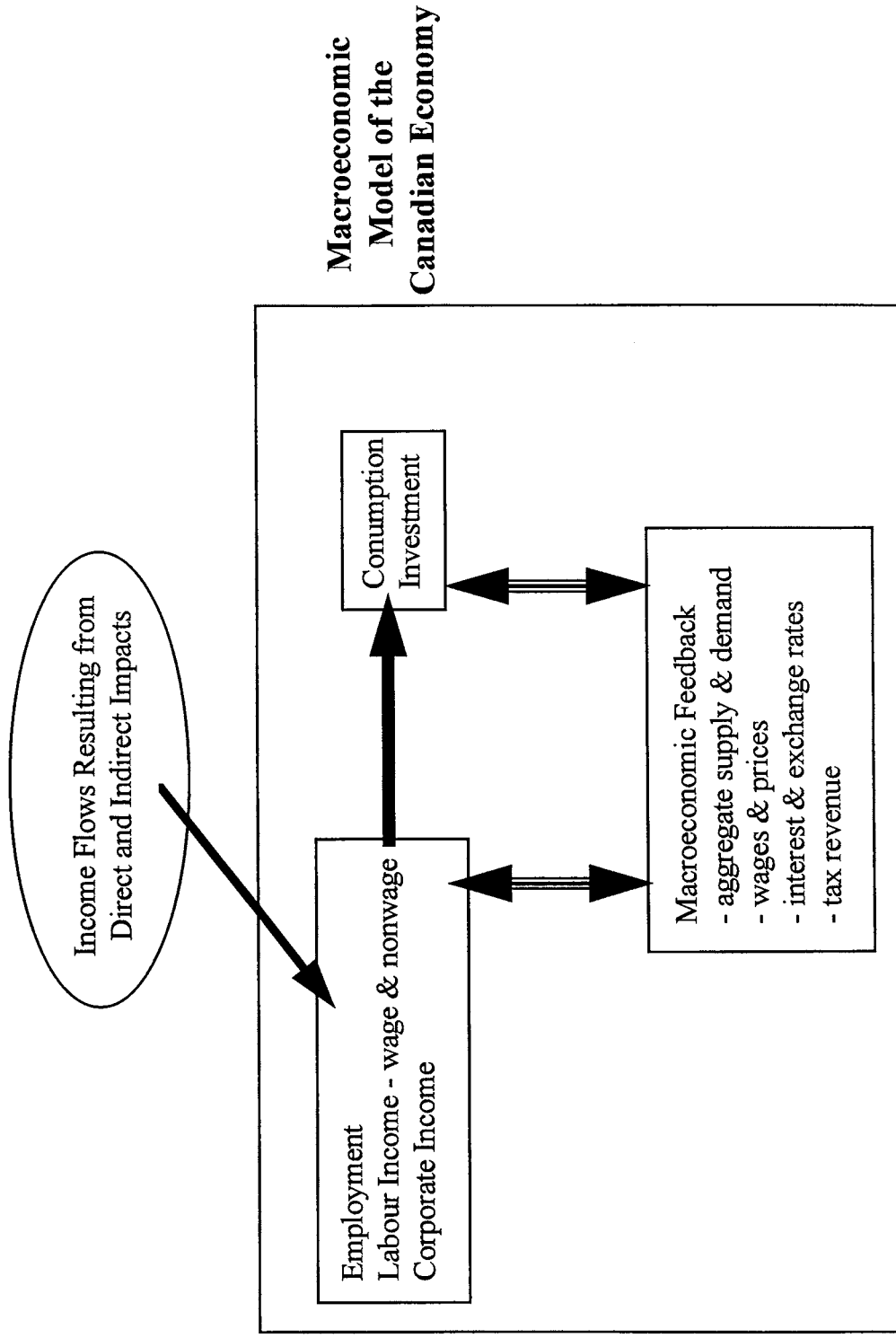


Figure 3

INCOME-EXPENDITURE, POTENTIAL GDP BLOCK

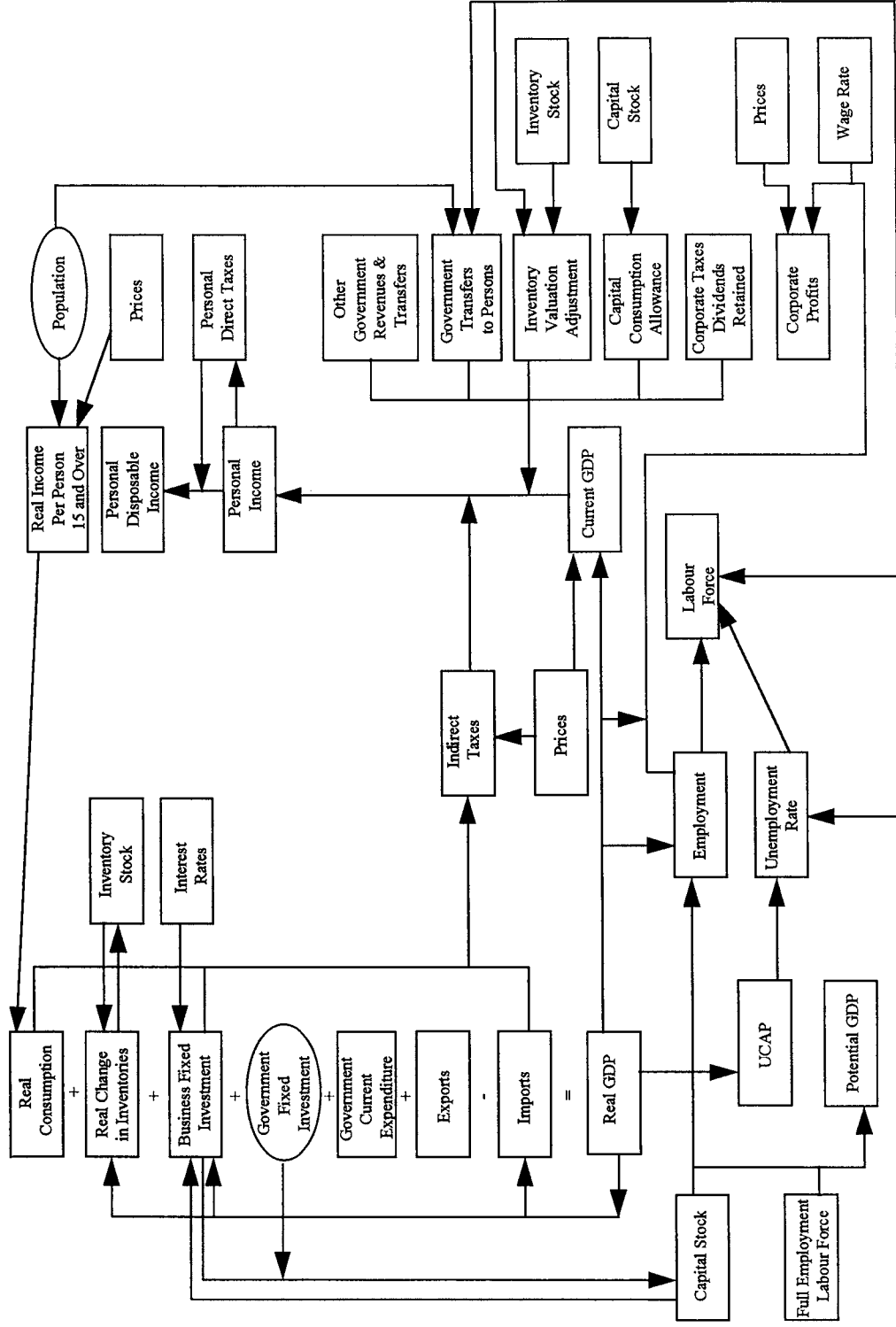


Figure 4

FOREIGN SECTOR

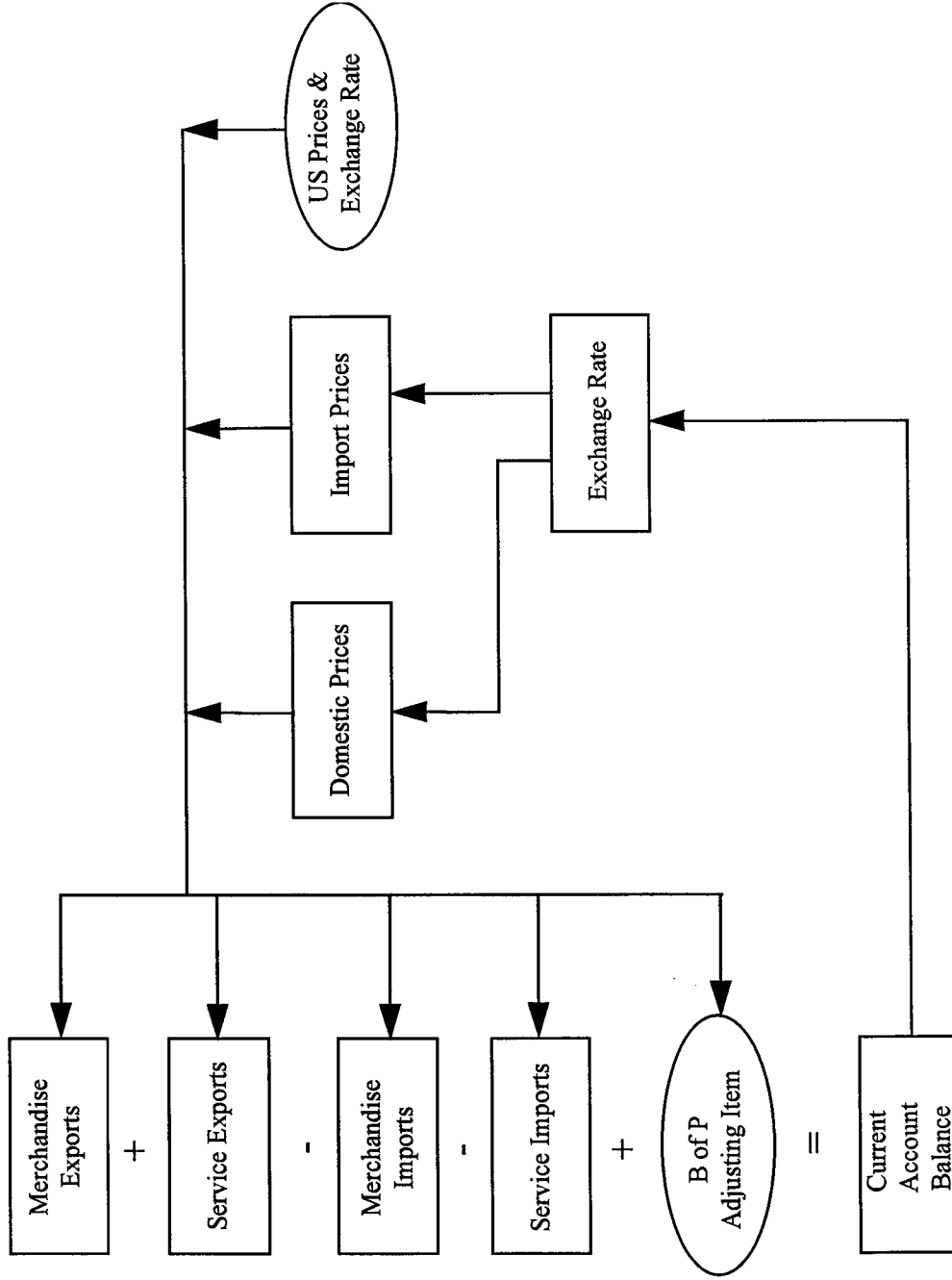


Figure 6

DIRECT TAXES -- PERSONS

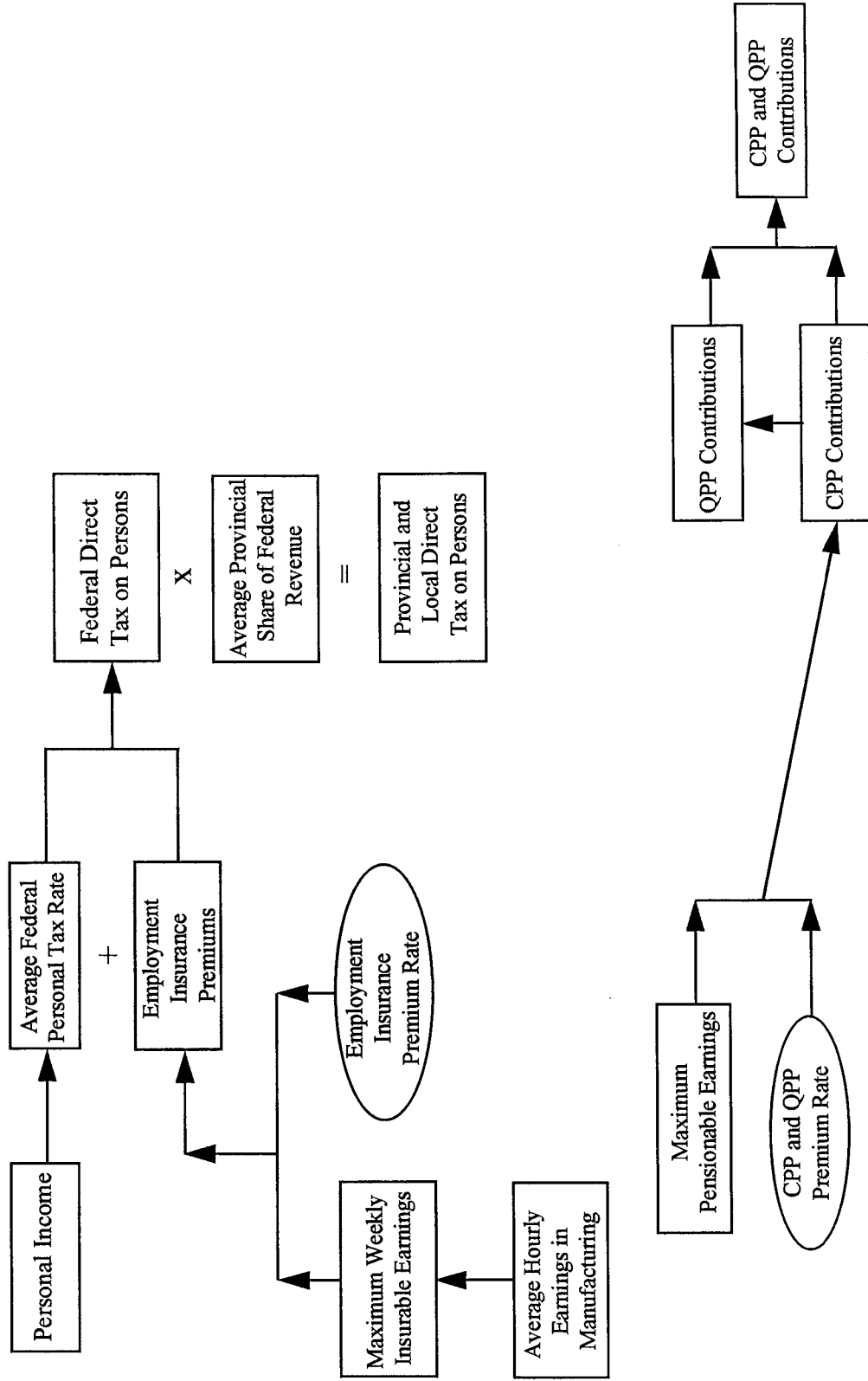


Figure 7
DIRECT TAXES -- CORPORATIONS

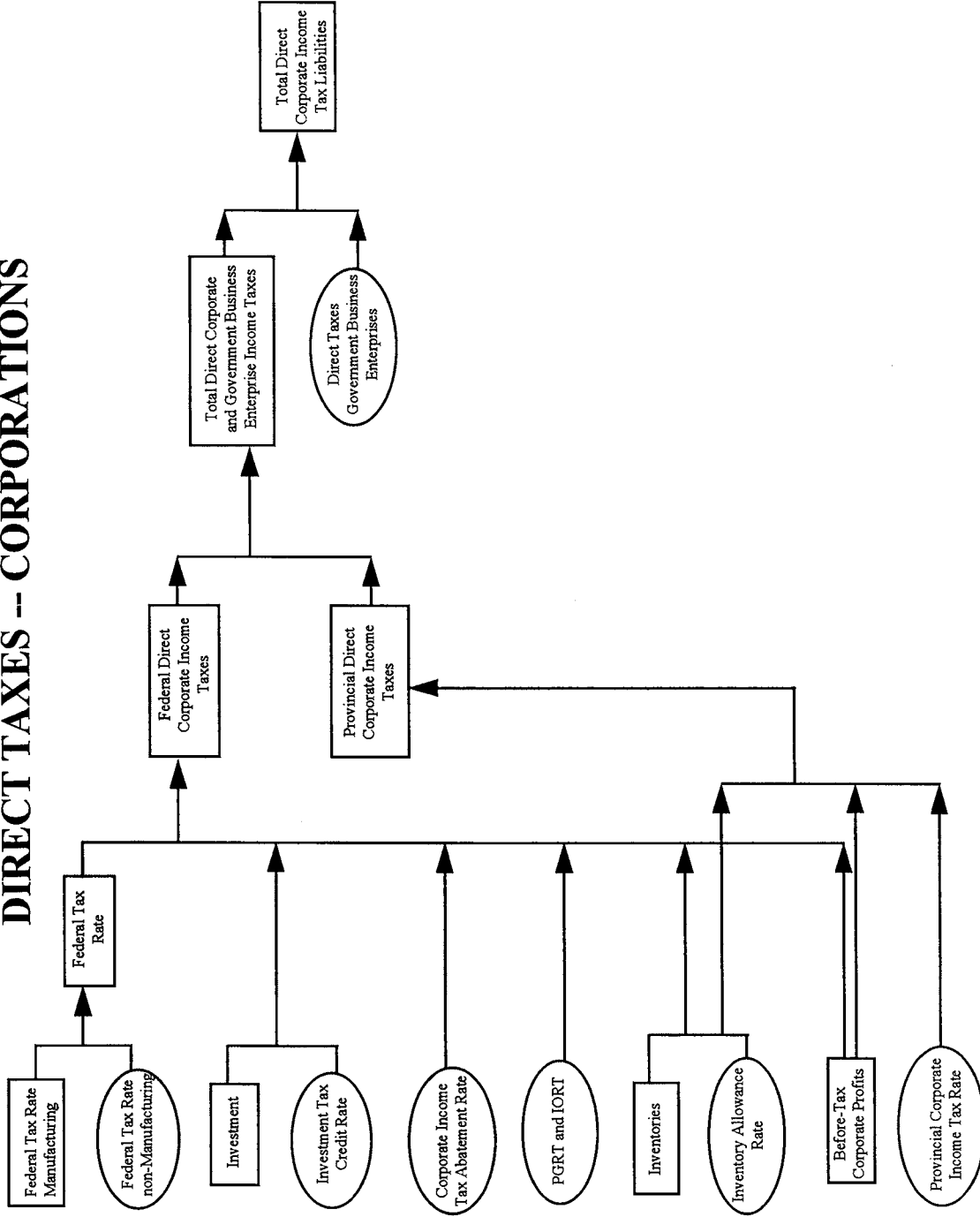


Figure 8

INDIRECT TAXES

