

# **Foreign tax credits, the supply of foreign capital, and tax exporting**

## **A numerical general equilibrium model of corporate tax reform in Canada\***

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This paper employs a numerical general equilibrium model to emphasize the importance of tax exporting in determining the welfare effects of tax changes in open economies. Tax exporting occurs through both changes in the terms of trade and changes in the net return paid to foreign-owned capital. Results indicate that tax exporting may be as significant as efficiency in evaluating potential reforms. Moreover, efficiency effects are strongly influenced by whether foreign capital flows are modelled as responding to the gross rental on capital or to the net rental in consideration of the role of foreign tax credits.

### **I. Introduction**

In a recent paper, Thirsk (1986) explored the various channels through which the corporate tax influences economic welfare in an open economy such as Canada. Central to the argument is the issue of tax exporting, resulting both from changes in the terms of trade and from changes in the net return paid to foreign-owned capital. Using a numerical general equilibrium approach, it is demonstrated that the beneficial tax-exporting effect associated with marginal increases in the corporate tax in Canada will completely swamp any efficiency costs associated with the differential tax treatment of capital; that is, the corporate income tax in Canada is welfare improving. Related results are to be found in Damus, Hobson and Thirsk (1987), Boadway and Treddenick (1978) and Whalley (1980).

A novel feature of Thirsk's (1986) analysis is the recognition of the importance of foreign tax credits in specifying international capital flows. This issue is discussed in detail in Ballentine and Thirsk (1979). In recognition of international tax treaties that allow foreign companies (the source of foreign capital) to offset Canadian tax obligations against domestic tax liabilities, at least to the extent that effective Canadian rates are below foreign nominal rates, the supply of capital to Canada is modelled as a positive function of the gross return to capital in the corporate sector.

Other analyses of the corporate income tax in an open economy [e.g. Whalley (1980) and Melvin (1982)] either treat the supply of capital as fixed or, most commonly [e.g. Harris (1984)], as responding to the net return to capital in the corporate sector.

Recent analysis of the impact of capital taxes in open economies [e.g. Mutti and Grubert (1985), Bovenberg (1986), and Goulder and Eichengreen (1988)] has focussed on the steady-state properties of alternative capital tax regimes within a two-country framework that permits two-way foreign investment flows and portfolio balance considerations. In all of this work the admission of international capital mobility dramatically alters the manner in which capital taxes influence the economy in comparison with their effects in a closed economy. Moreover, taxes that affect savings behaviour produce a markedly different set of outcomes than those that are associated with taxes on investment, regardless of whether they are discriminatory in their treatment of domestic and foreign

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investment.

Our model of an open economy is not as complex or highly articulated as some of the more recent comparative dynamic models. In particular, we take behaviour in the rest of the world as given, except for capital supply decisions, and we do not consider long-run decisions that involve intertemporal optimization. Domestic factor supplies are fixed in our model but we allow for a variable supply of physical capital through trade in capital services. The small open economy can rent existing capital goods from the rest of the world, oil drilling rigs for example, but it does not engage in the production and exchange of new capital goods. Unlike the recent comparative dynamic models, the perspective is entirely that of a small capital-importing country whose corporate tax policies have a bearing on the intersectoral allocation of domestic capital and the international allocation of foreign capital.

In this paper, our primary objective is to explore the significance of the way in which foreign capital flows are modelled, gross or the net rental, in measuring the welfare effects of corporate tax changes in Canada. Two experiments are considered: the first involves a 10 percent increase in the Canadian corporate tax rate and the second involves the elimination of the corporate tax in Canada. The first experiment has some relevance to the current round of tax reform in Canada, mimicking the impact of the base broadening aspect of corporate tax reform coupled with lower personal income tax rates. The second experiment highlights the role of the corporate income tax within the existing tax structure, as one of a number of forms of capital taxation and as a tax with considerable potential for exporting the burden.

The next section explores the intricacies of the foreign tax credit mechanism as it is applied in the United States to see whether foreign capital flows are most appropriately modelled as functions of either gross or net of tax returns to capital. That is followed in section 3 by a presentation of the simulation model and a discussion of its calibration. In section 4 the breakdown of the welfare effects of each experiment into a tax-exporting effect and an efficiency effect is outlined. Section 5 presents the simulation results for the different experiments and offers some interpretation. The final section provides a summary and outlines directions for further work.

## 2. The economics of the foreign tax credit

Multinational corporations are subject to the competing pressures of both the home country, in which the company is located, and the host country, in which the company's investments are located, for a share of their investment income. In the absence of special rules to mediate these conflicts, multinational corporations would face the threat of double taxation. To prevent double taxation, some countries, such as Canada, essentially ignore the foreign source earnings of their multinationals and allow the country in which the income originates (the source country) to exert an exclusive claim for taxes. Other countries, such as the United States, permit foreign taxes, within limits, to be set against the payment of domestic tax liabilities. Since the United States is the most important source of foreign capital in Canada, the foreign tax credit (FTC) mechanism in that country will be examined in detail below.

Prior to the 1986 tax reform the FTC was calculated using the following formula to obtain the foreign corporate income tax "deemed to have been paid",  $T_d$ :

$$T_d = [D/(\pi - T)]T,$$

where

$D$  = dividends repatriated from the host to the home country, inclusive of any withholding taxes assessed by the host country.

$\pi$  = profits of the subsidiary in the host country calculated according to U.S. accounting conventions.

$T$  = corporate income taxes paid by the subsidiary to the host country in the year in which dividends

were repatriated.<sup>1</sup>

Only if a company repatriated all of its after-tax profits would actual taxes paid by the subsidiary coincide with the amount deemed to have been paid for crediting purposes. Essentially the crediting procedure pro-rates the amount of taxes paid to give an estimate of the taxes that have been incurred by the repatriated dividends. Notice also that if a host country provides tax incentives which reduce the value of  $T$ , its creditable taxes will also decline.

Another important feature of the procedure is that most companies can, and do, choose to use the overall limitation method, which allows them to pool their subsidiary earnings, dividends and taxes and calculate their FTC on an aggregate basis. The value of the FTC is also constrained to be the minimum of the U.S. corporate tax rate applied to the sum of dividends and “deemed paid taxes” or the sum of those taxes and any withholding taxes that may have been assessed. This part of the procedure establishes an upper limit on the value of FTC --- it cannot exceed taxes that would otherwise be payable in the United States on gross of tax earnings.

Reduced to a formula, the effective value of the FTC is

$$\min [t(D + T_d); T_d + W],$$

where  $t$  is the nominal U.S. corporate rate and  $W$  represents taxes withheld. The value of the FTC may be used to offset U.S. tax liabilities,  $t(D + T_d)$ , on the repatriated dividends.

When creditable taxes are less than the value of foreign taxes paid, or deemed paid,  $T_d + W$ , the company is said to have surplus or excess foreign tax credits which, nonetheless, can be carried backward for two earlier tax years and forward for five future tax years. With excess foreign tax credits, repatriated earnings face the U.S. corporate income tax plus any withholding taxes less a FTC equal to U.S. tax liabilities so that the net tax burden is the amount of taxes withheld by the host country.

Conversely, if the U.S. tax liability exceeds the value of the FTC, there is a deficit of foreign tax credits. Under these circumstances, withholding taxes and host country corporate taxes are fully creditable and repatriated earnings attract an extra home country corporate tax at the time of repatriation.

Hartman (1984) has recently argued that, for mature companies debating on when to repatriate their earnings, only the host country tax rate matters. The home country tax rate is alleged to be irrelevant because the present value of home country taxes is independent of the date of repatriation. This argument is correct as far as it goes and implies that companies compare only after-tax rates of return on investment in different locations.

However the Hartman perspective does not adequately allow for the diversity of company incentives to repatriate earnings that arise from the overall limitation procedure. To some extent, the overall limitation allows companies to choose the tax regime for their foreign source income and a profit-maximizing company would always attempt to apply the regime with the lower tax rate. For example, if a company is in a deficit position and if the effective host country tax rate is higher than the nominal home country rate, a profit-maximizing company should repatriate immediately to obtain the advantage of the lower home country rate and receive a credit for the higher taxes paid abroad. For this type of company the home rate rules and it is the gross rate of return on foreign investment that matters.<sup>2</sup>

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<sup>1</sup> Since the 1986 U.S. tax reform, past undistributed profits are considered to be part of the pool from which dividends were paid. The impact of this reform was to effectively curb companies' use of the rhythm method of dividend repatriation which allowed companies to shield their profits from any higher home country taxation. With the rhythm method companies would alternate years of high and low dividend repatriation so as to avoid a deficit credit position that would make them taxable in the United States. Companies would then be subject only to the lower effective tax rates applied in the host country.

<sup>2</sup> For a more detailed discussion of some of the intricacies of the foreign tax credit see Chapter 5 of the recent research report of the Economic Council of Canada ( 1987).

The situation analysed by Hartman is directly relevant for a firm with a deficit of credits investing in a low tax country. Such a firm would be subject to the higher home country tax sooner or later and, as long as the tax is not expected to increase in the future, it should not have any bearing on the desirability of investment decisions in the host country. Only the host country's tax rate matters if retained earnings are used to finance investment in Hartman's so-called "mature" firms.

The same result would occur for a company with surplus credits investing in a low tax country. This company would be shielded by the excess credits from any home country taxation of its repatriations from the low tax country. In this situation too the host country's tax rate would rule and the marginal tax rate applicable to foreign investment income would be the effective corporate tax rate in the host country. Similarly, a company in a surplus credit situation investing in a high tax country will be effectively taxed at the higher rate in the host country.

Empirically, it is extremely difficult to determine the relative importance of these four cases at any moment. It is likely that for some firms it is the gross rate of return in the host country that is relevant; for others it is the net rate of return that drives investment decisions. An earlier study by Deutsch and Jenkins (1979) found that most U.S. subsidiaries operating in Canada were in a deficit credit position but did not ascertain whether Canada was a relatively high or low tax country.

In the simulation model that is presented next we experiment with two alternative tax scenarios, one that specifies foreign investment as a function of the gross investment return and the other that makes foreign investment depend on the net return.<sup>3</sup>

### 3. The model

The model builds on work by Ballentine and Thirsk (1979). There, a general equilibrium model was specified in the form of a system of differential equations, constituting linear approximations to a set of underlying explicit functional forms. The model was calibrated to a 1969 Canadian data set. Here, a non-linear version of that model is employed [see Damus (1986) for a general description of this class of model], adapted to fit the conventional framework associated with numerical general equilibrium models of the type developed by Shoven and Whalley (1972), incorporating explicit functional forms and using iterative solution techniques. The model is calibrated to a 1980 Canadian data set. The same model was employed in Damus, Hobson and Thirsk (1987).

Since models of this type are now reasonably familiar, the model description will be kept brief. There are seven production sectors, broken down by type of output. Each of these sectors is listed in table 1. The first four sectors represent non-traded output, broken down into a housing sector (H), a domestic agricultural sector (A), a domestic manufacturing sector (C), and a domestic service sector (Z). Noticeably, we have avoided any attempt to separate sectors by corporate or non-corporate affiliation. There is both corporate and non-corporate involvement in all four sectors, although domestic manufacturing includes a significant proportion of corporate activity, whereas domestic services is largely non-corporate.

The next two sectors represent traded output, broken down into fixed-price exports (F) (exports over which Canada has no influence in setting world prices) and flexibly-priced exports (E) (exports over which Canada does exercise some influence in setting world prices).<sup>4</sup>

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<sup>3</sup> While the agent in the model responsible for foreign investment decisions is implicitly a multinational corporation there are many aspects of this corporate behaviour that are neglected in the model. In particular, the ability and incentive of the corporation to employ transfer pricing and debt decisions to shift the taxable corporate base between high and low nominal tax rate countries is overlooked.

<sup>4</sup> A = expenditures on food products and non-alcoholic beverages; H = expenditures on gross paid and imputed rent and lodging; E = exports of manufactured goods and resources; F = exports of agricultural products plus ten percent of manufactured exports (amounting to approximately 20 percent of total exports); Z = educational and cultural services, medical and hospital care services, expenditures on restaurants and hotels, and household and personal care services; and C = expenditures on alcohol and tobacco, clothing and footwear, household furnishings and supplies, reading and recreation, travel and transportation.

The final production sector is the government sector. This sector is assumed to produce output through a conventional production function. It is assumed that government sector output yields a separable “government utility”. In all experiments, this “government utility” is held constant in the sense that real tax revenue and real government expenditure are held constant. This is accomplished through adjustments in personal transfers.

Table 1		
Descriptive features of the general equilibrium model		
A. Commodity Composition		
	Consumer commodity sector	Mnemonic
	Housing services	H
	Domestic agriculture	A
	Domestic manufacturing	C
	Domestic services	Z
	Flex-price exports	E
	Fix-price exports	F
	Government services	G
	Imports	M
B. Mobility assumptions		
Factor	Intersectoral	International
Land	Imperfectly mobile	Immobile
Labour	Perfectly mobile	Immobile
Capital	Perfectly mobile	Imperfectly mobile

There are three factors of production: capital, labour and land. All three factors are employed in the housing, agricultural and fixed-price export sectors. The remaining sectors employ only capital and labour. Land is thus modelled as a specific factor. Factors are perfectly mobile between sectors with the exception of land used in housing. The total supplies of land and labour are assumed to be fixed. Constant returns to scale, CES-type production functions are assumed. Capital is assumed to be imperfectly mobile internationally. Two distinct specifications are employed with regard to the international mobility of capital. In the first, it is assumed that capital services flow in and out of Canada in response to changes in the net rental on capital in Canada. In the second, international capital flows are modelled as responding to the gross rental on capital in Canada. This corresponds to the procedure followed in Ballentine and Thirsk (1979) and is appropriate in the presence of international tax treaties which provide for a domestic tax credit for corporate taxes paid on foreign investments. If the primary source of foreign capital is through international corporations and if earnings are instantaneously repatriated, then, as argued earlier, there will be some circumstances where the gross of tax rental on capital determines international capital flows.

This latter specification follows from the recognition that, under the assumptions that have

been made, the effective rate of tax on foreign-owned capital will be the home country rate. Thus, any increase in the Canadian rate that increases the gross rental in Canada will increase the net return to foreign-owned capital making Canada more attractive to foreign capital and inducing a further inflow. If a higher Canadian tax rate depresses the net rental on capital, the loss in capital income experienced by owners of foreign capital will be offset by reduced tax obligations to the home government; that is, some portion of the burden is exported and will be borne by the foreign treasury. The capital service flow function is given by

$$K_f = c \left[ 1 - \left( \frac{r}{\pi e} \right)^n \right],$$

where

- $c$  = a calibrated parameter of the model,
- $r$  = Canadian rental on a unit of capital,
- $\pi$  = U.S. rental on a unit of capital,
- $e$  = the implicit exchange rate (\$Can per \$US),<sup>5</sup> and
- $n < 0$ .

The corresponding elasticity of supply of international capital services is given by

$$\eta = \frac{nx}{x-1},$$

where  $x = (r/\pi e)^n$ .

There are five consumer choice categories in the model: housing, domestic agricultural products, domestic manufacturing products, domestic services, and imports. As specified above, each commodity sector represents an aggregation of consumers' final demands.

Consumers are split into ten distinct income groups corresponding to different deciles in the income distribution. Each consumer is assumed to have a CES utility function.

Using an input-output table, a dollar of expenditure on each category of output can be translated into value-added contributions from twelve one-digit industries in the economy. National accounts data on factor payments by industry are used to relate household expenditures to income receipts received by different factor groups, while Thirsk (1985) is the source of the information on tax rates used to determine the corporate and property tax payments in each industry. A literature search is relied on to furnish plausible estimates for the relevant parameters associated with the production and utility functions.

The model treats Canada as an “almost” small open economy. Prices of imports and some exports (fixed-price) are exogenously given. However, as implied above, Canada is assumed to have some monopoly power in flexibly priced exports. The problem of cross-hauling of exports and imports found in the data is resolved by treating net exports as products of separate industries not consumed in Canada. Also, as mentioned above, while capital is internationally mobile, it is not assumed to be perfectly mobile. Rental rates vary across countries and tax changes in Canada may alter the rental rate on capital employed in Canada. The two key elasticities are therefore the foreign

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<sup>5</sup> In our model we have effectively chosen the price of the GNP deflator as our *numéraire*. In so doing, the real exchange rate  $e$ , relative to the *numéraire*, is one of the relative price variables that is solved in our model. The function of the real exchange rate is to achieve balance of payments equilibrium by adjusting the price ratio between tradeable and non-tradeable goods in the model until equilibrium is achieved.

Balance of payments equilibrium requires that

$$\dot{P}_F F + P_E E - P_M - rK_f = 0,$$

where  $P_M = eq_M$ ,  $e$  = exchange rate and  $q_M$  = price of foreign goods in foreign currency.

Finally notice that balance of payments equilibrium is always satisfied in our model by Walras' Law since both the private and public sectors are continuously constrained to operate within their budget limitations.

demand elasticity for flexibly priced exports and the supply elasticity for international capital service flows. The foreign demand elasticity for flexibly priced exports is set at -2.5, based on a study by Burgess (1985).<sup>6</sup> The capital supply elasticity is also initially set at 2.5, based on a study by Hood et al. (1982). Murray (1982) also suggests that the supply elasticity of foreign capital to Canada is between 1 and 3.<sup>7</sup>

The base case solution to the model is contained in table 2. The data portray an initial equilibrium of the economy in 1980. The first section of the table shows the allocation of factors across sectors, the corresponding outputs by sector, producer prices, the various factor prices, and the exchange rate. Notice that the model has been calibrated such that all producer and net factor prices are unity in the base case solution. The second section of the table shows household demands for each type of output by household group. Consumer prices are given gross of indirect taxes. The third section of the table shows model equivalent tax rates by sector and total revenues from each tax. Tax rates reflect the rates on net-of tax prices/incomes required to generate given levels of revenues except for personal income tax rates which are expressed as rates on gross-of tax income. Finally, the fourth section of the table shows income (before and after personal taxes and transfers), net taxes paid (after allowances for transfers), and utility by household group.

Prices are normalized on nominal GNP in 1980. As always in such models, the choice of *numéraire* is arbitrary. However, we find that this particular specification highlights the relative price effects associated with tax changes quite nicely.

Finally, from the third section of table 2, note that property tax rates tend to be relatively high in sectors in which the corporate tax rate is relatively low, resulting in considerably less dispersion in overall capital tax rates than is present in the separate corporate and property tax rates. Note, too, the significance of property tax revenues in total tax collections. Table 3 shows capital tax rates by sector split into a property tax component and a corporate tax component, then aggregated into an overall capital tax rate. Property tax rates vary from 0.144 in domestic agriculture to 0.31 in the housing sector. Corporate tax rates vary from 0.06 in the housing sector to 0.37 in the fixed-price export sector. Overall capital tax rates vary from 0.33 in domestic agriculture to 0.528 in the fixed-price export sector.

#### 4. The measurement of welfare change

Aggregate welfare change ( $\Delta W$ ) is measured as the sum of equivalent variations across income groups. Alternatively, this measure can be partitioned into a tax-exporting effect and an efficiency effect. Following Ballentine and Thirsk (1979), the change in the economy's real income resulting from a given tax change can be expressed as

$$\Delta W = (V_E \widehat{P}_E + V_F \widehat{P}_F - V_M \widehat{P}_M - V_K^f \widehat{P}_K) + DWL$$

where  $V_E$ ,  $V_F$ ,  $V_M$  and  $V_K^f$  refer, respectively, to the initial value of foreign consumed outputs E (flex-price exports) and F (fix-price exports), the initial value of imports (M) and the initial value of payments made to foreign-owned capital, and  $\widehat{P}_E$ ,  $\widehat{P}_F$ ,  $\widehat{P}_M$  and  $\widehat{P}_K$  indicate the tax-induced percentage changes in the producer prices of E, F, M and in the net return to capital, respectively.

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<sup>6</sup> Burgess's elasticity estimate is for aggregate exports. Adoption of this estimate for the flex-price export sector in our model implies that our aggregate price elasticity will exceed -2.5 since our model assumes that 20 per cent of exports face infinitely elastic demand.

<sup>7</sup> Murray's measurement of the supply elasticity is based on econometric estimation of foreign direct investment in Canada. Hood et al., on the other hand, use an analysis of risk premia, in which the foreign demand for Canadian assets is a function of risk-adjusted interest rates, to establish plausible limits for the values of the capital supply elasticity.

Table 2					
Base case solution for Canada, 1980					
	Factor payments and output by sector (\$billion)				
	Capital	Labour	Land	Output	Producer Price
Housing	9.954	6.592	3.296	25.551	1
Domestic agriculture	4.575	11.744	1.130	19.160	1
Domestic services	4.948	15.790	0	22.460	1
Domestic manufacturing	15.976	52.952	0	76.466	1
Fox-price exports	2.904	6.656	0.944	12.191	1
Flex-price exports	12.863	29.210	0	48.765	1
Government	3.117	45.295	0	48.412	1
Total	54.337	168.239	5.370		
After-tax rental price of capital	1.000				
Payments to foreign capital	7.400				
Before-tax land rents:	Housing	1.612			
	Agriculture	1.770			
	Flex-price	1.162			
Nominal wage	1.000				
Capital flow elasticity	2.506				
Flex-price export demand elasticity	-2.500				
GNP	264.727				

Household demands					
	Housing	Domestic agriculture	Domestic services	Domestic manufacturing	Imports
1	1.178	0.917	0.713	1.383	0.935
2	1.559	1.327	1.117	2.360	1.118
3	1.724	1.460	1.456	3.613	1.930
4	2.105	1.640	1.811	4.651	2.547
5	2.329	1.858	2.055	5.545	2.947
6	2.696	2.034	2.263	6.952	4.348
7	2.982	2.222	2.564	8.751	5.289
8	3.272	2.318	2.854	10.527	6.426
9	3.578	2.538	3.302	12.720	8.116
10	4.128	2.846	4.325	19.964	13.417
SUM	25.551	19.160	22.460	76.466	47.043
	Consumer prices				
	1.000	1.000	1.050	1.167	1.109
Tax rates					
	Corporate income tax	Property tax on capital	Property tax on land	Sales taxes	
Imports				0.099627	
Housing	0.060880	0.309926	0.612257		
Domestic agriculture	0.185792	0.144481	0.176991		
Domestic services	0.169563	0.178456		0.049510	
Domestic manufacturing	0.273410	0.198423		0.167028	
Fix-price exports	0.370179	0.158058	0.162076	0.008367	
Flex-price exports	0.354738	0.165513		0.008346	

Personal income tax rates				
Household 1	0.050682	Household 6	0.178245	
2	0.121050	7	0.170086	
3	0.117840	8	0.173592	
4	0.134461	9	0.173207	
5	0.179029	10	0.205689	
Tax revenues				
Corporate income taxes	12.301	Sales taxes	14.393	
Property taxes on capital	10.387	Imports	4.729	
Property taxes on land	2.371	Personal income taxes	39.010	
Household income				
Deciles	Before tax	Disposable	Net taxes	Utility
1	1.539	5.495	-3.956	5.115
2	3.544	8.052	-4.508	7.450
3	7.943	11.069	-3.126	10.160
4	12.472	13.898	-1.426	12.720
5	16.394	16.083	0.311	14.701
6	21.880	20.039	1.841	18.250
7	26.369	23.971	2.398	21.760
8	31.453	27.996	3.450	25.346
9	38.278	33.425	4.850	30.196
10	60.674	49.689	10.985	44.600
Total	220.546	209.717	10.829	
Return to foreign-owned capital			7.400	
Total tax revenue			83.191	

The expression in brackets represents the tax exporting effect (*TEE*) associated with a given tax change and captures the possibility of exporting tax burdens to foreigners. This can occur either through a change in the terms of trade or through a change in the net return paid to foreign-owned capital employed in Canada.

The second term on the right-hand side, *DWL*, represents the efficiency effect (deadweight loss or gain) associated with a given tax change. This captures the impact on resource allocation resulting from any change in the overall pattern of taxation in the economy. Note that in this model,

although domestic factor supplies are assumed to be fixed, changes in domestic tax policy may nonetheless alter the supply of capital services through changes in the flow of foreign capital services. In this context, the modelling of foreign capital flows as responding to either the gross or net rental becomes particularly important. In addition, the efficiency effect will capture the impact of tax-induced price wedges.

From this, we have

$$DWL = \Delta W - TEE.$$

	Effective property tax rate ( $t_k$ )	Effective corporate tax rate ( $t_c$ )	Effective capital tax rate ( $t_k + t_c$ )
Domestic manufacturing	0.198	0.273	0.471
Domestic agriculture	0.144	0.186	0.330
Domestic services	0.178	0.170	0.348
Housing	0.310	0.060	0.370
Flex-price exports	0.166	0.355	0.521
Fix-price exports	0.158	0.370	0.528

<sup>a</sup> Effective tax rates are computed as the ratio of taxes paid to after-tax capital income

## 5. Results

In this section, simulation results are reported. The first experiment involves a 10 percent increase in the corporate tax rate in Canada. Revenues are held constant through a reduction in personal income tax rates. Results are reported for two cases: first for a model in which foreign capital flows respond to the net of tax rental in Canada, second for a model in which it is the gross of tax return which matters. This latter experiment corresponds to the case examined in Thirsk (1986).

For the case in which foreign capital flows respond to the net of tax return Canada experiences a net welfare gain of \$28.4 million (0.01 percent of GNP). This is comprised of a \$196.7 million tax-exporting effect (0.07 percent of GNP), a gain for Canadians, and a \$168.3 million (0.06 percent of GNP) efficiency loss. This efficiency loss arises from two primary sources. First, there is the increased wedge between returns in the corporate and non-corporate sectors. Second, the net rental on capital falls by 1.23 percent, resulting in an outflow of foreign owned capital of 3.64 percent. Corporate tax revenues rise by 7.66 percent.

In Damus, Hobson and Thirsk (1987) the point is emphasized that in experiments of this type the results may hinge crucially on the type of tax substitution that is undertaken. In the case under consideration here, personal income tax rates are lowered to compensate for higher corporate tax rates. In Damus, Hobson and Thirsk (1987) an experiment is undertaken in which lower property tax rates are compensated for through an increase in corporate tax rates. In that case, a positive net welfare change was also observed. What is important, however, is that there too the tax-exporting effect and the efficiency effect were of similar magnitude but of opposite sign.

The results discussed above contrast strongly with those from a model in which foreign capital flows respond to the gross of tax rental. In that case, the net welfare gain is \$143.7 million (0.05 percent of GNP), comprised of a \$179.7 million (0.07 percent of GNP) tax-exporting effect and a

\$35.9 million (0.01 percent of GNP) efficiency loss. The net rental on capital falls by 1.72 percent. The implied increase in the gross rental on capital results in an increase in foreign capital inflows. As it turns out, foreign capital flows increase by 0.2 percent. The efficiency loss is significantly reduced over the previous case precisely because the tax increase results in an inflow of foreign capital rather than the usual outflow. Corporate tax revenues rise by 7.79 percent.

These latter results compare favourably with those found in Thirsk (1986), where the tax-exporting effect dominates the efficiency effect, although the tax-exporting effect here is significantly greater. This difference would seem to arise from the value assigned to the export demand elasticity which is set at -6 in Thirsk compared with -2.5 here.<sup>8</sup>

The effects on outputs and prices associated with both sets of experiments are summarized in table 4.

Next, we consider two experiments in which the corporate income tax is eliminated. These experiments shed some light on the absolute net welfare effects of the corporate income tax, in contrast to the experiments already discussed which pertain to the marginal net welfare effects. For the case in which foreign capital flows respond to the net rental, elimination of the corporate income tax produces a net welfare loss of \$ 1.611 billion (-0.61 percent of GNP). This is comprised of a reduction in tax exporting of \$2.824 billion (-1.07 percent of GNP) and an efficiency gain of \$1.214 billion (0.46 percent of GNP). The net of tax rental on capital rises by 16 percent and there is an increase in capital inflows of 33 percent.

For the case in which foreign capital flows respond to the gross rental, there is a net welfare loss of \$2.058 billion (-0.78 percent of GNP). This is comprised of a reduction in tax exporting of \$2.198 billion (-0.83 percent of GNP) and an efficiency gain of \$139.6 million (0.05 percent of GNP). The net rental on capital rises by 21 percent, but because the gross rental has fallen there is an outflow of foreign capital of 2.55 percent. That the elimination of the corporate tax does not result in an inflow of foreign capital considerably dampens the efficiency effects of the tax change. In terms of corporate tax revenues, the marginal net welfare change associated with the corporate income tax appears to be in the neighbourhood of +1.5 percent for the case in which capital flows respond to the net rental and +15 percent for the case in which it is the gross rental that matters. The absolute net welfare change associated with the corporate tax appears to be +13 percent for the case in which capital flows respond to the net rental and +17 percent for the case in which it is the net rental that matters. Based on these results, there would appear to be considerable scope for further exploitation of the corporate tax in Canada, more so if the foreign tax credit mechanism in the United

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<sup>8</sup> The results are, of course, sensitive to the value assigned to the foreign demand elasticity and the capital supply elasticity. We have undertaken sensitivity analyses associated with each of these values. First, we allowed the foreign demand elasticity to rise to -6, then to -12. Next we varied the capital supply elasticity between 0.5 and 6.

In the former case, we found that *TEE* falls and *DWL* rises as the elasticity rises. These results agree with intuition that as the elasticity rises the ability to export the burden through a favourable change in the terms of trade will diminish. At the same time, *DWL* will increase because of the resulting allocation of resources from the export sector to non-traded sectors. The effects of tax changes now show up to a greater extent in relative factor prices, impacting also on foreign capital flows. As expected, this sensitivity of *DWL* is most pronounced in the net return case. This corresponds to a similar result in Thirsk (1986) where it is *TEE* rather than *DWL* that appears to be most sensitive to increasing elasticities (he finds that *TEE* is cut significantly while *DWL* is virtually unchanged in a model in which the gross return matters). As *DWL* increases, the sign of the net welfare effect may change. For example, in the net return case, the net welfare effect was negative for an elasticity of 6.

In the latter case, we found that both *TEE* and *DWL* move in the same direction as the change in the elasticity of supply of foreign capital services. However, they do not change in the same proportions and as the elasticity rises the net welfare effect falls, becoming negative for an elasticity of -12. The *DWL* effect is quite sensitive to the size of the elasticity as would be expected especially in the net return case; the smaller the elasticity, the less is the outflow of foreign capital resulting from a corporate tax increase.

In either case, we are not particularly concerned with the sign of the net welfare effect. The interesting and apparently robust result is that *TEE* is of similar magnitude to *DWL* but of opposite sign, especially for reasonable estimates of the relevant elasticities. This suggests that in open economy models, the potential to export the burden of taxes is at least as significant an issue as the efficiency effects. Yet, in the recent round of tax reform in Canada and elsewhere, the focus has been primarily on efficiency effects.

States causes the inflow of foreign capital to Canada to hinge on the gross rental, rather than on the net rental as is commonly assumed.

Table 4						
Experiment 1: A 10 percent increase in effective corporate tax rates compensated through a reduction in personal income tax rates. Foreign capital flows respond to net rental						
	Effects on the allocation of factors, outputs and prices					
	Capital	Labour	Land	Outputs	Producer prices	Consumer prices
M						+
H	+	+		+	-	-
A	-	+	+	+	-	-
Z	+	+		+	-	-
C	-	+		-	+	+
F	-	-	-	-	+	
E	-	+		-	+	
G	+	-			-	
After-tax rental on capital		-	Before-tax land rents:		Housing:	+
Foreign capital flows		-			Agriculture	-
Nominal wage		-			Fix-price exports	-
Experiment 2: A 10 percent increase in effective corporate tax rates compensated through a reduction in personal income tax rates. Foreign capital flows respond to gross rental						
	Effects on the allocation of factors, outputs and prices					
	Capital	Labour	Land	Outputs	Producer prices	Consumer prices
M						+
H	+	+		+	-	-
A	+	+	+	+	-	-
Z	+	+		+	-	-
C	-	+		+	+	+
F	-	-	-	-	+	
E	-	+		-	+	

G	+	-			-	
After-tax rental on capital		-	Before-tax land rents:		Housing:	+
Foreign capital flows		+			Agriculture	-
Nominal wage		-			Fix-price exports	-

## 6. Summary

The objective of this paper was twofold. First, we wanted to emphasize the importance of tax exporting in determining the welfare effects of tax changes in open economies such as Canada. Tax exporting can occur either through favourable changes in the terms of trade or through changes in the net return paid to foreign-owned capital. Second, we wanted to emphasize the importance of incorporating the full details of the tax system in the model, including the availability of foreign tax credits. Under certain circumstances pertinent to the Canadian case, the existence of foreign tax credits makes it appropriate to model the supply of foreign capital as responding to the gross rather than the net rental in Canada.

In order to quantify these features, a simulation model was developed. The model was used to explore the net welfare effects of a 10 percent increase in effective corporate tax rates in Canada with revenues held constant through an offsetting reduction in personal income tax rates. In addition, results were reported on the effects of eliminating the corporate tax in Canada. Comparisons were made between the results from a model in which foreign capital flows respond to the net rental in Canada and those from a model in which foreign capital flows respond to the gross rental in Canada. The simulation results reported suggest that the welfare effects differ noticeably between the two model specifications. In particular, in the model in which it is the gross rental which matters, the efficiency loss associated with a 10 percent increase in the corporate tax rate in Canada is reduced by almost a factor of 5 relative to the model in which the net rental matters. This difference results from the very different response of foreign capital flows under the two model specifications. In general, our results indicate that the potential tax-exporting effect associated with a change in the corporation income tax can be quite significant and warrants at least as much attention as the efficiency effects. Moreover, efficiency effects will themselves be strongly influenced by the modelling of foreign capital service flows.<sup>9</sup>

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<sup>9</sup> Mutti and Grubert (1985), and more recently Goulder and Eichengreen (1988), on the other hand have indicated the importance of modelling capital outflows as well as inflows. The solution to the capital service flow function above can show an outflow if  $r < \pi e$ ; see Experiment 1. (This last sentence was added in the year 2001),

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