Volume Title: International Economic Transactions: Issues in Measurement and Empirical Research

Volume Author/Editor: Peter Hooper and J. David Richardson, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-35135-1

Volume URL: http://www.nber.org/books/hoop91-1

Conference Date: November 3-4, 1989

Publication Date: January 1991

Chapter Title: Financial Flows versus Capital Spending: Alternative Measures of U.S.-Canadian Investment and Trade in the Analysis of Taxes

Chapter Author: Harry Grubert, John Mutti

Chapter URL: http://www.nber.org/chapters/c8433

Chapter pages in book: (p. 293 - 320)

# 8 Financial Flows versus Capital Spending

## Alternative Measures of U.S.-Canadian Investment and Trade in the Analysis of Taxes

Harry Grubert and John Mutti

### 8.1 Introduction

The potential sensitivity of direct investment and trade flows to changes in tax rates in home and host countries often plays an important role in the evaluation of changes in tax policy. In U.S. discussions leading up to the Tax Reform Act of 1986, the fear was frequently expressed that the elimination of the investment tax credit and the reduction in accelerated depreciation would cause many U.S. companies to shift operations abroad. Canada was cited as one convenient, readily available location. As another example, in the 1970s Canada enacted a lower tax rate for manufacturing because of fears that the tax benefits granted to U.S. exports by the Domestic International Sales Corporation (DISC) provisions would adversely affect Canadian industry.

The purposes of this paper are to evaluate several alternative measures of direct investment, trade, and taxes, and to size up their interrelation in a U.S. and Canadian data sample. Almost all recent empirical analyses of the impact of tax policy on cross-border investments by multinational companies have focused on the financial flows used in the balance of payments accounts as a measure of investment (Hartman 1984 and 1985, Boskin and Gale 1987, Newlon 1987, Jun 1989, Slemrod 1990). These direct investment data represent new transfers to affiliates in the form of either debt or equity plus reinvested earnings abroad. But, as Guy Stevens (1972) suggested, the financial flow data are an inadequate starting point for a study of real investment deci-

Harry Grubert is an international economist in the Office of Tax Analysis, U.S. Treasury Department. John Mutti is professor of international economics at Grinnell College.

The authors would like to thank John Helliwell, the conference discussants, and participants in seminars at the NBER Summer Institute and at the Treasury Department for helpful comments. Jack Mintz, James Hines, and Jane Gravelle generously provided important data on taxes. David Belli of the U.S. Commerce Department gave very useful advice on the investment data. James Hodgson of Grinnell College rendered excellent research assistance.

sions and changes in the location of U.S. controlled production. Real spending by foreign affiliates on plant and equipment can be financed in several ways, including depreciation allowances, local borrowing, and reduced holding of financial assets, as well as transfers from the parent and reinvested earnings. Conversely, the foreign direct investment flow can finance increased holdings of financial assets and inventories as well as fixed capital.

One goal of this paper is to assess whether the two measures reported by the U.S. Commerce Department (real spending on plant and equipment by U.S. affiliates and foreign direct investment flows recorded in the balance of payments) give different indications of the importance of tax policy in influencing U.S.-controlled manufacturing in Canada. It is difficult to predict on a priori grounds whether financial flows or real spending will be more responsive to changes in U.S. and Canadian tax rates. On the one hand, it would appear that financial assets are more mobile than fixed capital assets and that financing decisions are very flexible, even with given investment plans. Higher statutory tax rates abroad may cause multinational corporations (MNCs) to shift their borrowing to their affiliates in countries where deductions are more valuable. However, it may also be true that factors such as exchange instability inhibit transfers from the parent, so that affiliates' fixed investment abroad may be highly responsive to local tax rates without any accompanying changes in financial inflows. Finally, any difference between financial flows and real spending may be purely a matter of timing. Funds may be transferred to the affiliate in the anticipation of capital expenditures, but the increased spending may not be observed for some time.

Real spending by U.S. affiliates in Canadian manufacturing is interesting in its own right and for how it compares with aggregate capital expenditures in Canadian manufacturing. Even in the absence of multinational corporations, increased U.S. corporate tax rates could lead to an outflow of portfolio investment and increased real spending abroad. Yet are MNCs vehicles for still greater capital mobility? The question is whether any response of total Canadian capital expenditures to U.S. and Canadian tax rates is attributable largely to the activities of U.S. MNCs.

The paper also considers the extent to which U.S.-Canadian trade patterns are influenced by changes in tax rates, including export incentives. Trade data are collected by both the U.S. and Canadian governments. In the 1980s, a discrepancy between Canadian measures of imports and U.S. measures of exports caused the U.S. government to begin using the Canadian figures. Another goal of this paper is to assess whether these different data series, and by implication efforts to measure trade flows more accurately, indicate a different role for tax policy in affecting trade. Alternatively, if data were more accurate, would analysts be able to determine the role of policy more clearly? Or is economic theory itself so imprecise that refinements in the trade data are not a critical step in helping sort out policy questions?

Still another empirical issue that emerges in the present study is the proper

representation of tax policy. Recent analysis of domestic investment by public finance economists has focused on the marginal effective tax rate applicable to new capital spending. Such a measure is a constructed variable, dependent upon assumptions regarding the appropriate discount rate, inflationary expectations, and depreciation practices. In this study we test various assumptions to see if the ones commonly made are the most consistent with actual investment behavior.

The data comparisons in the paper are, therefore, of several types. In one type, such as in the comparison of the financial flow data and the real spending data, series which differ in concept are examined (although many studies have used direct investment as a proxy for capital expenditures). In a second type, exemplified by the U.S. and Canadian trade data, alternative measures of the same variables are tested. Yet another type is alternative measures of marginal effective tax rates, because the differences are due not to measurement error but to the different empirical assumptions made in constructing them.

The empirical results suggest that the role of taxes in the investment process is much clearer and more significant in the case of capital spending than in balance of payments flows. Effective tax rates based on assumptions typically made are not as successful in explaining investment as alternative measures. The effect of taxes on trade is less clearcut than the effect on investment. Finally, MNCs appear to be the major source of any tax-induced reallocation of investment between Canada and the United States.

## 8.2 The Alternative Data Sources and their Uses

Canada was chosen as the subject of the study in part because series on marginal effective tax rates can be adapted from other studies. In addition, the integration of the U.S. and Canadian economies may make it easier to identify the responsiveness of investment and production to changes in tax policy. Also, a long time series for U.S. investment in Canada can be assembled without disclosure problems. In the case of trade, Canadian statistics are a useful check on U.S. data. The analysis concentrates on manufacturing because investment in petroleum, mining, or agriculture may be subject to different forces and may be affected by very specific types of tax provisions.

### 8.2.1 Investment

The appropriate choice of the data series to be used depends on the issue at hand. As noted, expenditures on fixed investment are most relevant for considering shifts in the location of production and their impact on trade flows.[1] In contrast, the balance of payments direct investment data are useful in study-

1. After all, studies of domestic capital expenditure by U.S. corporations are not based on changes in the book value of their equity—which would be parallel to the balance of payment concept of foreign investment.

ing cross-border savings flows, the relationship between the capital and current account, and pressures on the exchange rate. For example, consider a large new investment project by a U.S. affiliate abroad that is financed entirely by local borrowing. It will eventually represent an important expansion of productive capacity abroad, but it may have very little current impact on the structure of the balance of payments or exchange rates.

These two measures of investment by U.S. affiliates in Canada, direct financial investment flows as reported in the balance of payments and fixed investment expenditures by majority-owned affiliates, are both published by the U.S. Commerce Department. After 1976, the definition of majority ownership changed from "50 percent or more ownership" to "greater than 50 percent," but this change seems to have had very little significance for Canadian investment.[2] While the plant-and-equipment series includes only investment by majority-owned affiliates, this difference from the financial flow series does not appear significant. The 1982 Commerce benchmark survey indicates that 93.5 percent of sales and 80.3 percent of capital expenditures by U.S. manufacturing affiliates in Canada are accounted for by majority-owned affiliates.

There are other coverage differences as well. For example, U.S. takeovers of Canadian companies would, in principle, be in the financial flow data if financed directly by the parent, but not in the investment-spending series (apart from the annual investment expenditures by the newly acquired affiliate). However, it is not clear that the failure to include takeover investments is a shortcoming from a conceptual point of view. Takeovers of existing Canadian operations may differ from investments increasing the capacity of affiliates in terms of their impact on technology and trade flows.

The foreign direct investment data itself are available in two forms. The version used in the analysis is the balance of payments capital outflow and is simply the sum of retained earnings plus equity and intercompany account flows. The other version is the change in the book value of the foreign direct investment position from the beginning of the year to the end of the year. These differ because of "valuation adjustments." For example, if a subsidiary is liquidated for more than its book value and the funds are repatriated, the decline in the direct investment position will reflect the original book value and not the larger capital outflow. Valuation adjustments are usually not large, but they are significant in some years.

Figure 8.1 displays the movements of gross plant and equipment spending by manufacturing affiliates (PPE) and the two versions of foreign direct in-

2. The major benchmark adjustment in both series in 1977 was dealt with by using dummy variables in the regressions. Data on a 1977 base were available through 1984. The data after 1984 on the new 1982 base were adjusted by using observations available on both bases for 1984. We chose to keep the data for 1982 through 1984 on the 1977 base in order to limit the number of years for which spliced data had to be used. Although data were available on both bases for two or more years when benchmarks were changed, no attempt was made to exploit the overlapping information for years other than 1984.

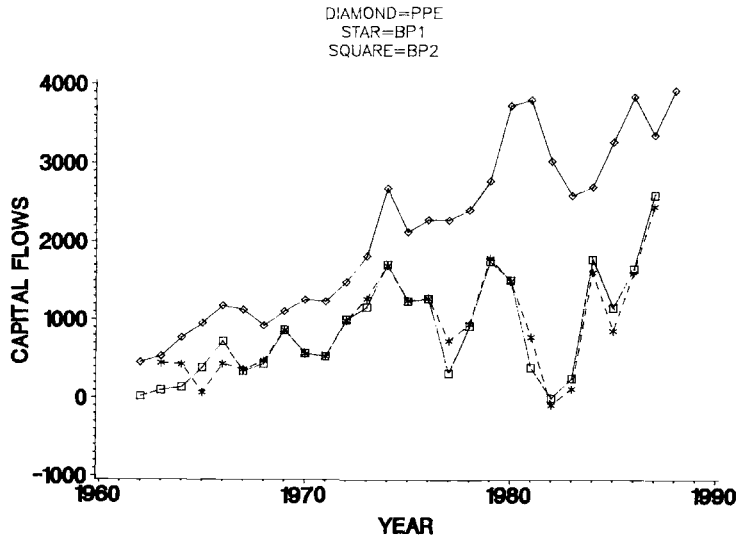


**Fig. 8.1 Financial flows and real spending; U.S. investment in Canadian manufacturing**

vestment in manufacturing. BP1 refers to the change in the direct investment position, while BP2 is the total direct flow without valuation adjustments. It is evident that the real spending and financial flows frequently have behaved differently, particularly in the late 1970s and early 1980s. In fact, when each series is detrended, there is virtually no remaining correlation between them.

### 8.2.2 Manufacturing Imports and Exports

Two trade series are used. One is data on the value of trade by product category published in the *Bank of Canada Review*.[3] The product detail given made it possible to exclude manufactured products with a large resource content, such as forest products and nonferrous metals. It is one reason that total manufacturing import and export figures based on Canadian data may differ from the total manufacturing trade series derived from U.S. data.

The second series is based on various publications of the U.S. Commerce Department. Imports and exports from 1965 to 1980 were taken from *Overseas Business Reports*. For 1980 and subsequent years, *U.S. Foreign Trade Highlights* was used. The published data after 1979 have been adjusted for undocumented transactions over the Canadian border.[4] In addition, the defi-

3. In the 1966–87 period for which these data were available, there were occasional changes in some product categories. In all cases, however, there were several years in which the data were available on both bases. These overlapping data were used to splice the series together, with the accurate representation of the year-to-year rate of growth of trade as the objective.

4. Data were available for 1980 on both bases and could therefore be spliced together.

nition of manufacturing trade was expanded to include "category 9, other exports."

Figures 8.2. and 8.3 present U.S. manufacturing imports and exports, as derived from Canadian and U.S. published sources. The two alternative series on U.S. imports in figure 8.2, shown as Canadian exports (CNEX) and U.S. imports (USIM), are surprisingly close. Figure 8.3 confirms the year-by-year increase before 1980 of underreporting of U.S. exports by official U.S. data (USEX) compared to Canadian import data (CNIM). The published U.S. data for 1980 and later, which include the undocumented exports, were spliced to the earlier series. The gap between the Canadian and U.S. series would, therefore, be expected to continue because of the way we have constructed them. However, the gap does not seem to expand after 1980, so it appears that U.S. procedures have eliminated most of the inconsistency between the two series.

### 8.2.3 Effective Tax Rates

Marginal effective corporate tax rates for Canadian and U.S. manufacturing were derived from Hall-Jorgenson cost-of-capital estimates. The cost of capital is the annual pretax real return that a unit of capital has to earn for the discounted value of its net after-tax cash flows to just equal its initial price. The rate of return used to discount these real cash flows is the after-corporate-tax return required by investors in the corporate sector. The discounted real cash flow includes the gross earnings of the capital (net of the corporate tax rate on these earnings), plus the value of the depreciation deductions allowed for tax purposes and any investment grant or credit offered as an incentive by the government. Since the depreciation allowances are usually based on the historical cost of the capital, the discounted real value of these deductions depends on the expected inflation rate. Accordingly, the cost of capital (and the marginal effective tax rate derived from it) summarizes the various characteristics of the tax system, such as the statutory or nominal tax rate and depreciation allowances. However, it is necessary to make assumptions about the required real return and the nature of inflationary expectations.[5]

The effective tax rates for Canada are based on data provided by Jack Mintz and were used in Boadway, Bruce and Mintz (1987). In some cases, these basic data were revised after consulting Boadway and Kitchen (1980) and *the CCH Canadian Master Tax Guide*.[6]

The U.S. corporate effective tax rates were adapted from the data used by Auerbach and Hines (1988). In general an attempt was made to make assump-

5. A more detailed explanation of the derivation of effective tax rates is given in the Appendix.

6. Newlon (1987) computed Canadian effective tax rates from basically the same sources, and while his series is generally consistent with ours for earlier years, there appear to be unexplained disparities toward the end. (See fig. 8.4; NTAXCAN is Newlon's tax series.) In particular, Newlon has Canadian effective tax rates increasing sharply in 1981 and remaining high through 1985 (the last year in his sample). Neither our series nor the one developed by Boadway, Bruce, and Mintz shows such a large jump over this period. It is true that a half-year convention for tax depreciation was effective *after* 12 November 1981, but Newlon seems to exaggerate its effect.

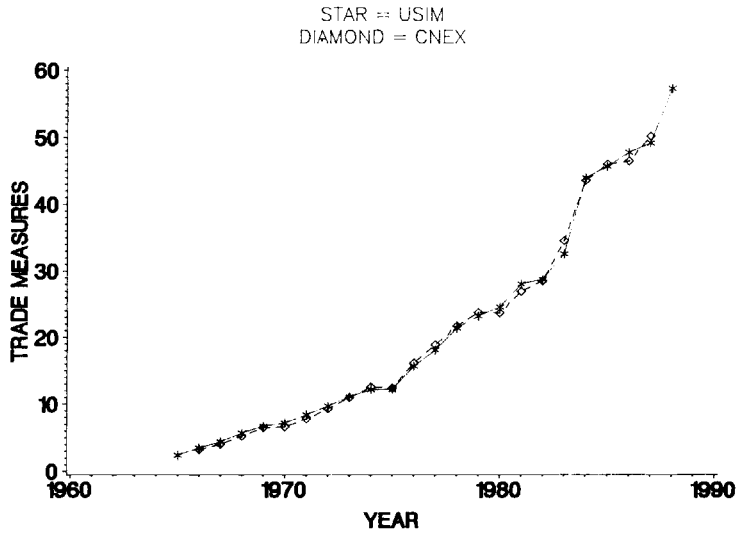


**Fig. 8.2 Canadian sales of manufactured goods to the United States, measured by U.S. and Canadian sources**

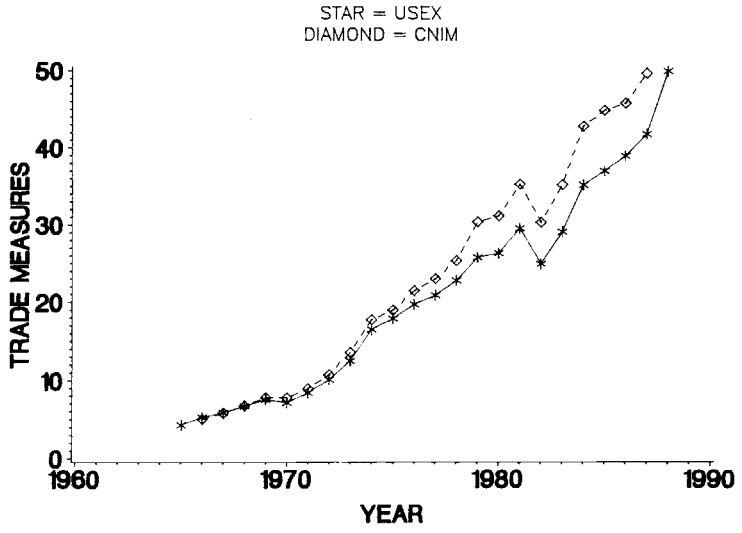


**Fig. 8.3 U.S. sales of manufactured goods to Canada, measured by U.S. and Canadian sources**

tions parallel to the Canadian estimates. Since the Auerbach and Hines data are only reported through 1986, information in Fullerton, Gillette, and Mackie (1987) was used to project effective tax rates after 1986.

In each case the effective tax rates refer to equity investment only. By introducing the statutory tax rate differential as an explanatory variable, an attempt is made to control for the possibility that differences in statutory tax rates and inflation rates make it relatively more advantageous to finance with debt in one country rather than another. In addition, there is no necessary connection between the location of an investment and the currency denomination of the debt with which it is financed. For example, the U.S. parent could finance its domestic investment with debt in Canadian dollars. Estimating effective tax rates for debt-financed investment is, therefore, not as straightforward as in the purely domestic context because it requires judgments on the currency denomination of the borrowing.

Alternative Canadian and U.S. marginal effective tax rate series were constructed based on differing assumptions on required rates of return and inflationary expectations. A required after-tax rate of return of 4 percent is commonly used (e.g., by Auerbach and Hines 1988, and by Newlon 1987), and we show it for Canada as TAXCAN4 in figure 8.4. Also, we calculated a set based on an 8 percent return, shown for Canada as TAXCAN8. In each case the required real rates of return are combined with expected inflation rates derived from ARIMA forecasts to form nominal interest rates. The nominal interest rates are used to discount future depreciation deductions. These inflation forecasts were developed by Boadway, Bruce, and Mintz for Canada and by Auerbach and Hines for the United States. The 8 percent rate-of-return assumption is in part motivated by Summers' (1986) finding that companies apply a higher rate of discount to cash flows than would be indicated by observed real rates of return. The higher rate tends to increase the weight of statutory tax rates relative to investment incentives such as investment credits and to smooth out the effect of changes in inflation. Figure 8.5 shows these series for Canada and the United States (TAXUS8), and it demonstrates the divergence in policy between the two countries in the 1980s. As another variation (identified as ITAXCAN in fig. 8.4), we combine a 4 percent required real return with a constant assumed rate of inflation of 6 percent, to test the possibility that standard effective tax rate estimates overemphasize the role of changes in inflationary expectations.

The effective tax rates for direct investment in Canada do not reflect any residual U.S. tax paid on repatriated income. In part this is due to the virtual impossibility of constructing a valid time series. Furthermore, over most of this period U.S. companies were apparently able to reduce or even eliminate the U.S. tax on Canadian income by using the "rhythm method" in timing their repatriations and real investments (or depreciation deductions) in Canada. They would repatriate in years in which their realized Canadian tax rate

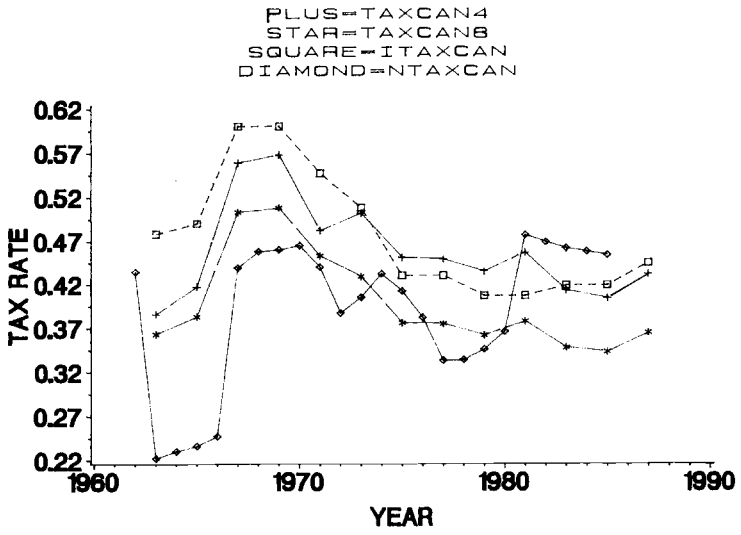


**Fig. 8.4 Alternative measures of Canadian marginal effective tax rates**

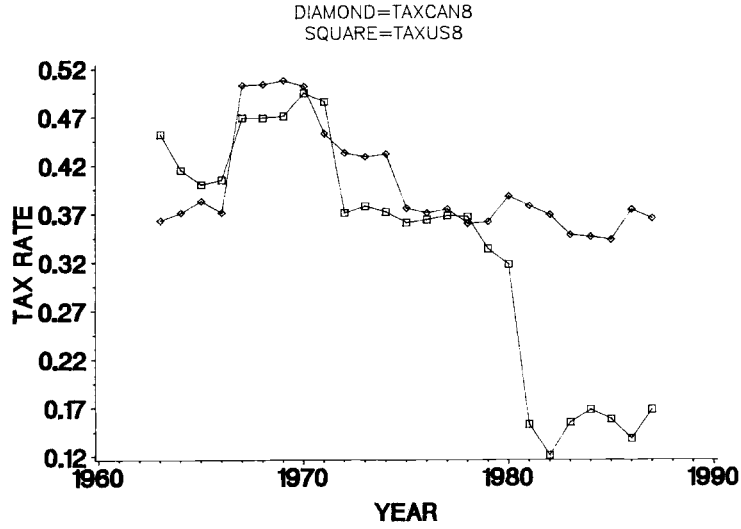


**Fig. 8.5 U.S. versus Canadian marginal effective tax rates**

was high so that they would earn higher credits against U.S. tax. (The Tax Reform Act of 1986 ended the benefits of these cyclic repatriation schemes.)[7]

In calculating effective tax rates relevant for investment decisions by U.S. MNCs, one issue that arises is the significance of the oligopolistic nature of MNC activities. Does the standard Hall-Jorgenson cost of capital calculation represent it adequately? Even if a corporation has market power for some reason, its marginal cost of capital is no more than the competitive return, because that is all it has to offer new shareholders or bondholders. In a purely domestic context, no adjustments appear necessary. If, however, an MNC is choosing between investment locations, the taxation of any monopoly rents becomes important. Consider the case in which the cost of capital (and therefore the marginal effective tax rate as usually measured) and marginal costs are the same in the two locations, but statutory rates differ. Shifting a dollar of capital from one country to the other (while continuing to supply the same market) will change the company's after-tax profits by the difference in the statutory tax rates times the average monopoly rent per unit of capital. This is a further reason for adding, as a variable, the difference in the statutory tax rates on manufacturing income. While the differential was never very great, the preference granted to Canadian manufacturing did create a gap of 8.0 percentage points for a time in the late 1970s.

In some of the trade regressions, the U.S. effective tax rate is adjusted to reflect the benefits, beginning in 1972, offered to export income by the Domestic International Sales Corporation (DISC) and subsequently by the Foreign Sales Corporation (FSC) provisions. The reduction in effective tax rates on exports attributable to the DISC-FSC rules is based either on deferral or exemption rates in the relevant statutes, or, when deferral rates could vary, the actual rates given in annual U.S. Treasury reports on the operation and effect of the DISC legislation.

### 8.2.4 Other Variables

Relative unit labor costs, adjusted for exchange rates, are used as one indicator of the cost of manufacturing in Canada relative to the United States.[8] Capacity utilization rates are used as an indicator of demand-side determinants. Unit labor costs and capacity utilization rates in manufacturing were obtained from *OECD Main Economic Indicators*.

7. A final reason for excluding the residual U.S. tax is the claim by Hartman (1985) that the residual U.S. tax is irrelevant for the choice of investment location if it is financed by an affiliate's retained earnings; the reason is that the tax has to be paid sooner or later. The analysis thus parallels the so-called "new view" of dividend taxation in the purely domestic context.

8. A conventional real exchange-rate measure could be used, but it might confound the role of taxes in costs. Because taxes are one of the costs that can be reflected in prices, some of the variations in real exchange rates could be attributable to tax changes. A real exchange-rate measure may play a role in determining foreign investment, apart from its effect on relative costs. For example, Froot and Stein (1989) have argued that the apparent increase in direct investment in the United States when the real value of the dollar is low results from the increased relative financial strength of foreign corporations.

## 8.3 Analysis of the Alternative Series

The investment equations used are designed to represent the choice of investment location by U.S. multinational corporations. Thus, they are not of the Jorgenson "neoclassical" type, in which output or sales are regarded as exogenous, because the amount of output or sales in a given location is part of the decision process.[9] Actual net rates of return earned in Canada by U.S. affiliates relative to U.S. returns are not included explicitly for several reasons. One is that, as Jun (1989) and others have pointed out, perturbations in rates of return are transmitted mechanically to measured direct investment, which is composed mainly of retained earnings. In addition, a reported profit in any location can itself be a function of the tax rate and may not be an accurate indicator of "true" profitability (e.g., Grubert and Mutti 1991).

In relating investment to tax and other variables over time, it is necessary to choose a proper scaling factor for investment because of potential heteroscedasticity problems when an unscaled dependent variable is used. Slemrod and Newlon each use host country GDP. For plant and equipment spending by U.S. affiliates in Canada, comparable investment spending in the United States seems a natural denominator. The ratio of Canadian to U.S. expenditures is expressed in real terms by first converting affiliate spending into Canadian dollars and then dividing spending in each country by the country's Gross National Expenditure deflator. The regression equation can then be interpreted as representing U.S. companies' choice between real investment in the United States or in Canada. One advantage of this formulation is that it controls for worldwide changes in capital costs, which would affect investment spending in both the United States and Canada. Financial flows are divided (scaled) by the total (internal and external) sources of funds of the U.S. nonfinancial corporate sector, as reported by the Federal Reserve Board. The variable therefore represents the share of the U.S. MNCs' funds (not including affiliates' third-party borrowing) that are allocated to Canada.

Tables 8.1 and 8.2 present results for balance of payments direct investment and capital expenditures respectively. The various cases correspond to different forms of the tax variables used, as well as to other changes in specification, such as whether the tax rates are lagged or not. (For example, "US METR 4% Return" refers to the U.S. marginal effective tax rate in manufacturing assuming a required real after-corporate-tax return of 4 percent.)[10] In most cases, a linear equation is used. In addition to U.S. and Canadian marginal tax rates, the independent variables include:

a. a dummy variable for the years after 1976, to reflect the 1977 benchmark adjustment;

9. For a discussion of various types of investment equations, see Feldstein (1982).

10. Durbin-Watson statistics are not separately reported because of space limitations. In no case were they of a level to suggest the need for correction for serial correlation.

**Table 8.1** **Comparison of Regressions Using Alternative Investment and Effective Tax Rate Measures. Dependent Variable: Balance of Payments Measure of Foreign Direct Investment, Divided by U.S. Flow of Funds (*t*-values in parenthesis)**

| Case | U.S. Tax | Canadian Tax | Dummy 1977 | Time Trend | Canadian Capacity Utilization | Real Exchange Rate | Exchange Rate Uncertainty | Intercept | Adjusted $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| US METR 4% Return | 3.36 | 3.98 | −4.53 | .30 | .18 | | | −16.17 | .57 |
| CN METR 4% Return | (.93) | (.54) | (−3.15) | (2.82) | (2.01) | | | (−2.01) | |
| US METR 8% Return | 11.57 | −4.09 | −4.92 | .41 | .19 | | | −17.57 | .60 |
| CN METR 8% Return | (1.83) | (−.48) | (−3.56) | (3.51) | (2.51) | | | (−2.50) | |
| US 6% Inflation | 16.18 | −10.37 | −5.69 | .44 | .22 | | | −18.69 | .61 |
| CN METR 6% Inflation | (2.00) | (1.38) | (−4.11) | (3.54) | (3.01) | | | (−2.60) | |
| US METR 4% Return | 4.75 | −3.66 | −5.36 | .41 | .17 | | | −13.09 | .57 |
| CN Newlon Tax | (1.33) | (−.59) | (−3.18) | (2.64) | (1.74) | | | (1.64) | |
| US METR 4% Return, Total | 13.00 | −6.99 | −4.77 | .40 | .22 | | | −18.72 | |
| CN METR 4% Return | (3.11) | (−.98) | (−3.97) | (4.47) | (3.42) | | | (−3.06) | .70 |
| US METR 4% Return, Total | 17.08 | −11.52 | −4.07 | .44 | .23 | 1.16 | −.30 | −20.02 | |
| CN METR 4% Return | (2.91) | (−1.35) | (2.59) | (3.19) | (3.36) | (.21) | (−1.19) | (−2.30) | .69 |
| US AVG TAX | 24.60 | .47 | −3.95 | .23 | .26 | | | −18.43 | .71 |
| CN AVG TAX | (3.38) | (0.03) | (−2.75) | (3.10) | (3.52) | | | (−2.92) | |

*Note:* Time period is 1963–87, annual data (except for Newlon tax series terminated in 1985). METR = marginal effective tax rate; AVG = average effective tax rate after removing the influence of cyclical factors. Tax rates apply to manufacturing only, except where the total or economy-wide rate is noted.

b. a time trend, which indicates the impact of any difference in long-term growth in Canada compared to the United States;
c. the capacity utilization rate in Canadian manufacturing (in part intended as an indicator of the profitability of investing in Canada; for financial flows, there may be a more direct relationship if increased profits result in higher retained earnings);
d. a relative labor cost variable, equal to the ratio of U.S. to Canadian unit labor costs adjusted for exchanges rates; and
e. a measure of exchange-rate instability based on the squared changes in the previous three years, with the more recent years weighted more heavily. Companies may hedge exchange-rate uncertainty by engaging in more local borrowing in host-country currencies, reducing balance of payments flows.

The results for financial flows in table 8.1 reveal that the coefficient for U.S. effective tax rates is sometimes significant, although the Canadian rate generally is not; this result tends to cast doubt on the role of taxes. Tax rates tend to have more explanatory power when the U.S. economy-wide corporate rate, rather than the more noisy manufacturing-only rate, is used. The significance of taxes in determining financial flows is not increased when the tax rates are lagged.

Table 8.2 indicates that lagged effective tax rates *are* frequently significant in the capital spending regressions. This is particularly true when the effective tax rate based on an 8 percent required real return is used. In addition, we expect a reduction in Canadian tax rates to have at least as large an impact as an equivalent rise in U.S. tax rates, because the lower Canadian rate can attract investment from locations other than the United States and can lead to expansion in the total U.S.-Canadian market for the MNC's production.[11] The relative magnitudes of the Canadian and U.S. tax coefficients reported in table 8.2 for real capital spending generally support this view, whereas the effect seldom is observed in table 8.1 for financial flows. The lagged tax rates are also *highly* significant when stated as a differential to reduce the impact of multicollinearity. (In those cases only a coefficient for U.S. tax is given.) Table 8.2 also suggests that, while the *unlagged* form of the tax rates based on 4 and 8 percent rates of return are not significant, other variations of current tax rates are sometimes significant. However, these unlagged forms are gen-

11. Scholes and Wolfson (1989) claim that the rise in U.S. effective corporate tax rates as a result of the Tax Reform Act of 1986 actually increased foreign investment in the United States; foreign companies based in countries that grant a credit for foreign taxes could simply use the higher U.S. taxes to reduce their home-country tax liability. The ability to credit U.S. taxes gave them an advantage over domestic U.S. companies. This kind of effect could conceivably explain the insignificant or positive coefficient for Canadian taxes in some of the regressions, because the United States also grants a credit for foreign taxes. As noted earlier, however, before 1987 most U.S. companies in Canada were apparently able to eliminate any residual U.S. tax by using the "rhythm method." If that was the case, any increase in Canadian tax would not have caused an offsetting reduction in U.S. tax.

**Table 8.2** **Comparison of Regressions Using Alternative Investment and Effective Tax Rate Measures. Dependent Variable: Real Property, Plant and Equipment Expenditures of Affiliates, Divided by Real U.S. Expenditures for Plant and Equipment (*t*-values in parenthesis)**

| Case | U.S. Tax | Canadian Tax | Dummy 1977 | Time Trend | Canadian Capacity Utilization | Real Exchange Rate | Exchange Rate Uncertainty | Intercept | Adjusted $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| US METR 4% Return, Lagged | 10.41 | −17.16 | −3.91 | .21 | −0.05 | | | 22.85 | .49 |
| CN METR 4% Return, Lagged | (2.64) | (−1.79) | (−2.20) | (1.52) | (−.53) | | | (2.20) | |
| US METR 4% Return, Lagged | 10.05 | | −3.18 | .18 | −.03 | | | 17.54 | .50 |
| CN METR 4% Return, Lagged | (2.59) | | (−2.08) | (1.35) | (−.28) | | | (2.19) | |
| US METR 8% Return, Lagged | 20.75 | −26.15 | −4.74 | .30 | −.01 | | | 16.95 | .52 |
| CN METR 8% Return, Lagged | (2.86) | (−2.40) | (−2.68) | (1.96) | (−.07) | | | (1.87) | |
| US METR 8% Return, Lagged | 23.92 | −23.06 | −2.60 | .27 | .03 | −4.17 | −.43 | 17.11 | .52 |
| CN METR 8% Return, Lagged | (2.43) | (−1.80) | (−1.01) | (1.14) | (.28) | (−.52) | (−1.31) | (1.52) | |
| US METR 8% Return, Lagged | 23.78 | | −2.73 | .27 | .03 | −4.05 | −.42 | 17.50 | .55 |
| CN METR 8% Return, Lagged | (2.53) | | (−1.30) | (1.18) | (.27) | (−.53) | (−1.44) | (1.75) | |
| US AVG Tax, Lagged | 29.95 | −17.86 | −2.37 | −0.02 | 0.21 | | | −1.55 | .50 |
| CN AVG Tax, Lagged | (2.57) | (−0.87) | (−1.17) | (−0.16) | (1.90) | | | (0.16) | |
| US METR 4% Return, Lagged[a] | 24.18 | −44.88 | −9.52 | .84 | −.57 | | | 89.29 | .27 |
| CN METR 4% Return, Lagged | (2.89) | (−2.22) | (−2.52) | (2.82) | (−2.65) | | | (4.07) | |
| US METR 8% Return, Lagged[a] | 26.22 | −43.10 | −9.58 | .68 | −.38 | | | 70.55 | .05 |
| CN METR 8% Return, Lagged | (1.45) | (−1.59) | (−2.17) | (1.81) | (−1.68) | | | (3.12) | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| US METR 4% Return | .56 | 1.40 | −2.72 | .02 | .09 | | | 7.49 | .27 |
| CN METR 4% Return | (.12) | (.14) | (−1.44) | (.11) | (.75) | | | (.71) | |
| US METR 8% Return | 5.44 | −7.98 | −3.21 | .08 | .08 | | | 9.74 | .28 |
| CN METR 8% Return | (.64) | (−.70) | (−1.72) | (.51) | (.78) | | | (1.03) | |
| US METR 6% Inflation | −2.65 | −13.17 | −3.92 | −.04 | .11 | | | 14.84 | .35 |
| CN METR 6% Inflation | (−.25) | (−1.34) | (−2.17) | (−.22) | (1.17) | | | (1.58) | |
| US METR 4% Return, Total | 11.55 | −10.22 | −2.91 | .14 | .09 | | | 7.46 | .38 |
| CN METR 4% Return | (1.90) | (−.98) | (−1.67) | (1.09) | (.97) | | | (.84) | |
| US METR 4% Return, Total | 12.42 | −16.30 | −4.64 | .37 | .03 | | | 11.15 | .50 |
| CN Newlon Tax | (2.56) | (−2.35) | (−2.58) | (2.30) | (.37) | | | (1.35) | |
| US METR 4% Return, Total | 10.13 | −18.26 | −3.66 | .08 | .11 | | | 11.26 | .49 |
| CN METR 6% Inflation | (2.27) | (−2.28) | (−2.28) | (.79) | (1.33) | | | (1.40) | |
| US METR 4% Return, Total | 11.03 | −15.96 | −1.53 | .00 | .14 | −5.63 | −.36 | 15.55 | .49 |
| CN METR 6% Inflation | (1.95) | (−1.71) | (−.68) | (−.01) | (1.58) | (−.71) | (−1.22) | (1.38) | |
| US METR 4% Return, Total, Log | −.53 | .65 | −.14 | .00 | .34 | −.16 | −.05 | 3.03 | .47 |
| CN METR 6% Inflation, Log | (−2.03) | (1.92) | (−.55) | (.08) | (.24) | (−.22) | (−1.17) | (11.29) | |
| US METR 8% Return, Lagged, Log | −1.30 | 1.08 | −.11 | .02 | .65 | −.36 | −.07 | 2.58 | .56 |
| CN METR 8% Return, Lagged, Log | (−2.87) | (2.25) | (−.45) | (.75) | (.49) | (−.60) | (−1.60) | (7.93) | |

*Note:* Time period is 1963–87, annual data (except for Newlon tax series terminated in 1985). METR = marginal effective tax rate; AVG = average effective tax rate after removing the influence of cyclical factors. Dependent variable as noted, except in equations labelled with superscript *a*, where it is Canadian real plant and equipment expenditures in manufacturing divided by U.S. real plant and equipment expenditures. Tax rates apply to manufacturing only, except where the total or economy-wide rate is noted.

erally significant only when U.S. economy-wide tax rates are used, and they are conceptually less appealing than our basic rates for manufacturing.

In comparing the responsiveness of financial flows and real spending to tax changes, we are interested primarily in the absolute changes of investment spending in U.S. dollars. Does the increase of financial flows in response to changes in Canadian and U.S. tax rates greatly exceed any increase in real spending because of the mobility of financial capital? Alternatively, does the increase in financial flows represent only a small fraction of the increase in real spending because of other sources of finance such as local borrowing? The level of gross plant and equipment spending is always higher than direct investment flows because of the large base of gross investment necessary to replace depreciating capital. A comparison of elasticity measures is therefore not very helpful. Because different scaling factors are used for financial flows and capital spending, the coefficients have to be translated back into a comparable U.S. dollar basis.

Translating the coefficients in tables 8.1 and 8.2 into absolute changes in U.S. dollars suggests that not only is the effect of taxes more robust in explaining real capital spending, but the quantitative response to a given change in tax rates is also somewhat larger. For example if we take the typical coefficient of about $-11.0$ for Canadian tax rates in table 8.1 and $-23.0$ in table 8.2, and use the mean values of the appropriate denominator in the regression, we find that a reduction of Canadian tax rates of 10 percentage points increases capital spending (with a lag) by $335 million and financial flows by $265 million, a difference of about 20 percent.[12] While these are roughly comparable, they suggest that, if anything, capital spending is more responsive to tax rates than financial direct investment.

These results demonstrate that taxes can have a quantitatively large effect on cross-border investment. For example, the $335 million increase in plant and equipment expenditures corresponds to a 15.7 percent increase in capital spending (using the mean value) in response to the 10 percentage point reduction in tax rates. Moreover, this represents a percentage increase in *gross* capital expenditures; the percentage increase in *net* investment is (at least in the short run) much larger.

Tables 8.1 and 8.2 indicate that financial flows and real investment also behave differently in other ways. One clear difference is the much greater significance of the Canadian capacity utilization rates in financial flows, presumably due to the effect of profitability on retained earnings, one of the components of direct investment. Financial flows also exhibit a much more consistent and significant rising trend.

A further difference is the role of real exchange rates (or relative labor

12. The mean value of the denominator in the balance of payments regressions in table 8.1 is 241.7. The comparable factor for capital spending, reflecting the combined effect of the deflators and the U.S. investment in the denominator, is 145.5.

costs). Foreign direct investment in Canadian manufacturing increases as the U.S. real exchange rate increases. This is consistent with the findings of Froot and Stein (1989) for direct investment in the United States. The coefficient is not significant, but it probably would be if direct investment were expressed in Canadian dollars to be consistent with Froot and Stein. In contrast, real spending by U.S. affiliates decreases with an increase in the U.S. real exchange rate, although the coefficient is again insignificant. Thus, the Froot and Stein result does not hold up for real capital expenditures and seems more related to the rearrangement of financial portfolios.

One area in which, surprisingly, a difference does not show up is the impact of exchange-rate instability. A comparison of results in tables 8.1 and 8.2 indicates that financial flows are discouraged by exchange-rate instability no more than is real investment.

The results in tables 8.1 and 8.2 for the various forms of the tax variables suggest that the standard assumptions made in constructing effective tax rates do not produce the most successful explanations of changes in investment. Tax rates based on a required real rate of return of 8 percent generally have much more explanatory power, with larger coefficients (and the expected sign), than rates based on the usual 4 percent assumption. Other alternatives seem frequently to perform better than the basic 4-percent-plus-ARIMA-forecast; for example, when a constant 6 percent expected rate of inflation is substituted. In view of these results, it appears that the standard assumptions used in constructing marginal effective tax rates should be reexamined. In addition, a required return of 8 percent leads to much different conclusions as to the effect of the Tax Reform Act of 1986 on corporate effective tax rates. Instead of an substantial increase in the effective corporate tax rate, there would have been virtually no change.[13]

Tables 8.1 and 8.2 also show that the *average* effective U.S. corporate tax rate performs very well in the regressions both for real spending and financial flows. This result is surprising in light of the research popularity of marginal effective tax rates. Average effective rates have some advantages over marginal effective rates, because the latter focus on only a few basic features of the tax system, such as depreciation allowances and investment credits and may overlook other provisions more difficult to model.[14] The average effective Canadian corporate tax rate is not significant, but the coefficient of the lagged

13. At a presentation of an earlier version of this paper, Jane Gravelle of the Congressional Research Service kindly offered to make her U.S. effective tax rate series available. The Gravelle series is much smoother than the Auerbach-Hines series. Nevertheless, the general pattern of the results tends to be confirmed when the Gravelle series is used, with real spending more responsive to tax rates than the financial flows. However, the significance of the Canadian tax rate is reduced.

14. The average effective tax rates we use have been cyclically corrected by using the residuals from a regression of the average rates on the country's capacity utilization rates. Otherwise, the observed average tax rate might spuriously reflect changes in the business cycle and not in tax policy, because the larger number of loss companies in a recession raises the measured average effective tax rate.

version does have the expected sign in the real spending regressions and is quantitatively almost as large as when marginal effective tax rates are used. The less significant role of the Canadian average tax rate is not surprising because, as with the U.S. average rate, it applies to all corporations and not just manufacturing. The Canadian tax incentives were targeted to manufacturing by means of a special statutory tax rate and highly accelerated depreciation if the equipment was used in manufacturing and processing.[15]

The regressions reported in tables 8.1 and 8.2 follow previous studies on the impact of taxes on foreign direct investment in relating the flow of new investment to the *level* of U.S. and foreign tax rates. However, if the relationship between desired stocks of capital and effective tax rates is the starting point for the analysis, the *change* in tax rates would be a determinant of the change in the stock of capital (i.e., the net investment component of gross investment). (The level of the tax rate would also have an effect on net investment because of the growth in the economy.) When the first differences of the tax variables were substituted in the equation for plant-and-equipment spending they were generally not significant and often had the wrong signs. In the financial flow equations, the first differences of the tax variables tended to have coefficients with the expected signs and were of borderline significance for some versions of the effective tax rate measures. However, a complete specification with both current and lagged taxes was not very successful because of the multicollinearity that arises from using several tax variables.

The differential between the U.S. and Canadian statutory tax rates was included as a variable in some of the investment regressions. As suggested above, it might be expected to play a role in the balance of payments equations because of the likelihood of greater local borrowing if the Canadian statutory tax rate is higher; real spending could be affected because of the benefits of locating monopoly rents in a low statutory tax rate country. Nevertheless, the statutory tax rate differential was not significant in either case.

A useful check on our conclusions regarding the relationship between financial flows to Canada and capital expenditure by Canadian affiliates is provided in table 8.3. Table 8.3 presents sources and uses of funds data for a sample of worldwide majority-owned manufacturing affiliates from 1966 to 1976.[16] (Nondisclosure problems made it impossible to construct data for Canada only.) The sum of the first two sources of funds correspond basically to foreign direct investment as reported in the balance of payments, although the second also includes a small number of transfers from affiliates other than the

15. The regressions in table 8.1 are all linear, not log-linear, in part to avoid the problem of negative values in the financial flow data. The log-linear regressions at the end of table 8.2 indicate that the coefficients of the tax variables are somewhat more significant statistically than in the comparable linear regressions. The tax elasticities (with the linear elasticity evaluated at the means) are very close. (In the log version, the tax variable is one minus the effective tax rate.)

16. It is unfortunate that after 1976 the Commerce Department no longer published annual data on the sources and uses of funds of affiliates abroad. Partial sources-and-uses data begin to be available again after 1982.

**Table 8.3** **Sources and Uses of Funds of a Sample of U.S. Affiliates in Manufacturing, 1966–76 (in millions of dollars)**

| | Sources | | | | | | Uses | | |
|---|---|---|---|---|---|---|---|---|---|
| | Internal | | | | | External | | | |
| Year | Retained Earnings | Parent and other Affiliates | Depreciation | Other | Total Internal | Total | Fixed Investment | Change in Inventories | Other (including financial assets) |
| 1966 | 250 | 783 | 992 | 50 | 2,008 | 991 | 2,009 | 399 | 659 |
| 1967 | 464 | 453 | 1,165 | 41 | 2,123 | 514 | 2,121 | 8 | 508 |
| 1968 | 611 | 22 | 1,341 | 78 | 2,052 | 1,057 | 1,893 | 283 | 934 |
| 1969 | 908 | 204 | 1,458 | 174 | 2,744 | 1,431 | 2,175 | 776 | 1,224 |
| 1970 | 480 | 380 | 1,554 | 219 | 2,633 | 1,604 | 2,839 | 920 | 478 |
| 1971 | 773 | 404 | 1,849 | 225 | 3,251 | 1,386 | 3,114 | 611 | 912 |
| 1972 | 1,221 | 402 | 2,121 | 272 | 4,016 | 1,388 | 3,114 | 195 | 2,095 |
| 1973 | 1,937 | 431 | 2,481 | 345 | 5,194 | 3,467 | 3,892 | 2,343 | 2,426 |
| 1974 | 1,338 | 1,665 | 2,829 | 262 | 6,094 | 5,209 | 5,109 | 4,225 | 1,969 |
| 1975 | 1,394 | 846 | 2,945 | 449 | 5,674 | −43 | 4,590 | −430 | 1,431 |
| 1976 | 1,991 | 527 | 3,175 | 334 | 6,027 | 2,108 | 4,661 | 806 | 2,668 |

*Source:* "Sources and Uses of Funds of Majority-Owned Foreign Affiliates of U.S. Companies, 1973–76," Bureau of Economic Analysis Staff Paper (May 1976).

parent. The "other" internal source includes items such as proceeds from sales of assets. External sources include third-party borrowing by the affiliate.

As a result of the stability of depreciation allowances, fluctuations in internal sources of funds reflect mainly changes in foreign direct investment (indicated in the first two columns). Table 8.3 indicates that capital spending often tracks internal sources of funds but diverges significantly in some years, such as 1969 and 1972, when the increase in internal funds seems to be associated with increased financial assets. Overall, it appears that changes in inventories are the most volatile use of funds and are more closely linked to changes in external funding than to internal sources. On the whole, these data confirm our earlier finding that direct investment and capital spending are virtually uncorrelated apart from a trend and that they are affected by different forces.

One controversy in the analysis of MNCs is whether they contribute to more capital mobility and reallocation of investment than would occur simply because of portfolio adjustments. Even in the absence of direct investment, increased taxes on manufacturing companies in the United States could lower rates of return in the corporate sector and lead to an outflow of portfolio capital to other countries. The contribution of MNCs to capital mobility can be tested with regressions parallel to the affiliate spending equation in table 8.2, but with aggregate capital expenditures in Canadian manufacturing substituted for affiliate investment. The dependent variable would then become the ratio of total real capital expenditures in Canadian manufacturing to real investment in U.S. manufacturing.

The two equations marked with a superscript *a* in table 8.2 are based on this alternative dependent variable, and they suggest that MNCs are very significant contributors to the reallocation of capital between U.S. and Canadian manufacturing. The coefficients for U.S. tax rates in these linear regressions are virtually the same as in the comparable ones for U.S. affiliate investment only. The impact of U.S. tax rates on Canadian investment seems almost exclusively due to the decisions of U.S. multinational corporations. It is also interesting that the absolute size of the Canadian tax rate coefficient is much larger for total Canadian investment than for U.S. affiliates only; this may reflect the standard impact of taxes on investment in a purely domestic context. Even then, since total Canadian investment in manufacturing is on the average about three times the level of U.S. affiliate investment, investment by U.S. affiliates seems about twice as responsive to Canadian tax rates as other non-U.S.-controlled investment.

We now turn to the effect of taxes on trade. A standard formulation of Canadian demand for U.S. exports would express it as a function of economic activity in Canada (GDP), the price of U.S. goods expressed in Canadian dollars, and the price of Canadian goods. (The prices of other countries' products are generally ignored.) Determinants of U.S. and Canadian prices are substituted directly into this expression. Higher U.S. labor costs, a higher

value of the U.S. dollar, and lower unit labor costs and activity in Canada contribute to lower U.S. exports.

Taxes can affect trade through several channels. One is by their impact on the investment and productive capacity of U.S. affiliates in Canada. Another route is the change in output sourcing for a given distribution of capital in the two countries. For example, if capacity is available in each country, the company may have an incentive to produce in the location with the lower statutory tax rate. (If capital is given, incentives such as investment credits that cause the discrepancy between effective and statutory tax rates are not relevant.) Finally, changes in corporate tax rates may change the comparative advantage of various industries because of differences in capital intensity and the extent of incorporation. This effect can operate even in the absence of capital flows or direct investment.

Table 8.4 provides results for (log-linear) regressions on U.S.-Canadian manufacturing trade that attempt to identify the role of taxes. Separate equations for U.S. exports to Canada and Canadian imports from the United States are given because of the measurement differences between them displayed in figure 8.3. Separate regressions for Canadian exports to the United States are not given because they are virtually identical to measured U.S. imports. The equations in table 8.4 are different from conventional trade equations in that the absence of available deflators for U.S.-Canadian manufacturing trade necessitates the use of nominal imports or exports on the left-hand side.[17]

In the regressions for U.S. exports, the tax coefficients have the expected signs; lower U.S. taxes increase U.S. exports and lower Canadian taxes reduce them. When the U.S. tax rate is adjusted for DISC and FSC benefits, the coefficient is larger compared to the unadjusted rate and is of borderline significance. The Canadian tax rate is also of borderline significance when the Canadian capacity utilization rate is added as a variable. When only one plus the percentage-point reduction in the tax rate on export income attributable to DISC is used as the U.S. tax variable, it is close to being significant. Furthermore, the coefficient suggests a potentially large effect. The .84 coefficient would imply an expansion of U.S. exports to Canada of about 14 percent at the beginning of the program when benefits were high, and would further imply that exports are now about 6 percent higher than they would be in the absence of FSC benefits.

The U.S. export and Canadian import equations yield roughly comparable estimates. Even though the Canadian trade data may be more accurate than U.S. data, economic relationships expected on theoretical grounds cannot be

17. That is another reason why the various components of the real exchange rate used in the investment part of the study (unit labor costs in each country and the nominal exchange rate) are entered separately. The unobserved deflators are presumably functions of these variables as well as the tax rates, but the deflators for U.S. exports are likely to depend on U.S. unit labor costs much more heavily than on the exchange rate or Canadian costs.

**Table 8.4** **U.S.-Canadian Trade Relationships**

| DISC + U.S. Tax | DISC Only | Canadian Tax | Years | Real GDP of Importer | Exchange Rate | Exchange Rate Lagged | U.S. Unit Labor Cost | Canadian Unit Labor Cost | Canadian Capacity Utilized | Intercept | $R^2$ | D-W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **U.S. Exports** | | | | | | | | | | | | |
| .13 | | −.14 | −.05 | 3.45 | −.27 | | −.66 | .72 | | −15.86 | .99 | 1.51 |
| (1.43) | | (−.89) | (−2.20) | (7.45) | (−.94) | | (1.49) | (1.92) | | (6.43) | | |
| .15 | | −.14 | −.04 | 3.31 | −.16 | −.25 | −.73 | .75 | | −14.93 | .99 | 1.57 |
| (1.55) | | (−.90) | (−1.82) | (6.46) | (−.47) | (−.71) | (−1.58) | (1.95) | | (−5.28) | | |
| .15 | | | −.04 | 3.30 | −.16 | −.26 | −.76 | | | −14.08 | .99 | 1.59 |
| (2.00) | | | (−2.09) | (7.02) | (.52) | (−.83) | (−2.13) | | | (−6.30) | | |
| | .84 | −.11 | −.04 | 2.94 | −.16 | −.22 | −.69 | .91 | | −13.88 | .99 | 1.69 |
| | (1.72) | (−.77) | (−1.60) | (5.35) | (−.51) | (−.65) | (−1.57) | (2.25) | | (−4.73) | | |
| .14 | | −.22 | −.04 | 2.92 | −.46 | −.18 | −.22 | .57 | .53 | −16.67 | .99 | 1.62 |
| (1.52) | | (−1.39) | (−1.68) | (5.30) | (−1.23) | (−.54) | (−.39) | (1.47) | (1.53) | (−5.69) | | |
| **Canadian Imports** | | | | | | | | | | | | |
| .07 | | −.14 | −.01 | 2.44 | .37 | −.49 | −.33 | .80 | | −12.54 | .99 | 1.65 |
| (.59) | | (−.68) | (−.20) | (3.95) | (.92) | (−1.17) | (−.59) | (1.73) | | (−3.67) | | |
| .17 | | | .02 | 2.24 | .45 | −.72 | −.91 | | | −9.67 | .99 | 1.67 |
| (1.70) | | | (.63) | (3.52) | (1.10) | (−1.73) | (−1.90) | | | (−3.04) | | |
| .05 | | −.30 | .01 | 1.40 | −.36 | −.32 | 1.00 | .35 | .53 | −16.95 | .99 | 2.16 |
| (.87) | | (−2.63) | (.40) | (3.87) | (−1.50) | (−1.48) | (2.78) | (1.41) | (6.08) | (−8.89) | | |
| **U.S. Imports** | | | | | | | | | | | | |
| −.08 | | −.56 | .09 | 1.97 | −.87 | −.16 | 1.56 | −1.32 | | −15.29 | .99 | 2.05 |
| (−.61) | | (2.65) | (2.03) | (1.99) | (−2.06) | (−.35) | (2.46) | (−2.75) | | (−1.90) | | |
| | −.74 | −.55 | .10 | 1.92 | −.99 | −.23 | 1.69 | −1.59 | | −14.35 | .99 | 2.12 |
| | (1.26) | (−2.82) | (2.80) | (2.02) | (−2.36) | (−.55) | (2.79) | (−3.04) | | (−1.86) | | |

*Note:* Time period is 1966–87. Tax variables based on 4 percent after-tax return in manufacturing.

identified any more precisely. Some differences do emerge when the Canadian capacity utilization rate is included. Canadian taxes are much more significant in the Canadian import series, but the signs of some of the other coefficients are unexpected.

In the U.S. import equation, the Canadian tax rate has an unexpected negative coefficient (in this log $1 - t$ version) and is highly significant. In other words, lower Canadian taxes decrease U.S. imports from Canada. A further disturbing aspect of the U.S. import equation is that, while the U.S. and Canadian unit labor costs are highly significant and have the expected signs, the sign of the coefficient for the price of U.S. dollars is negative and significant. This may be explained by the significant resource content of Canadian exports even in manufacturing. The Canadian exchange rate may be high during worldwide booms in which commodity prices and Canadian nominal exports are high.

To sum up the role of tax rates in U.S.-Canadian trade: there is suggestive evidence that U.S. tax incentives for exports increased exports to Canada. Nevertheless, it is difficult to make firm judgments on the overall role of taxes because the coefficients for some of the variables, such as Canadian taxes in the Canadian export equation, have signs contrary to expectations.

## 8.4 Summary and Conclusions

1. U.S. and Canadian marginal effective tax rates appear to have a more statistically significant, robust, and quantitatively large effect on real capital spending than on financial flows. The common assumption that financial assets are more mobile in response to tax rates does not seem to be borne out. Exchange rate instability also does not have a greater effect on financial flows than on real spending. Financial direct investment *is* strongly influenced by cyclical factors, which determine the amount of profits available for retention abroad.

2. Multinational corporations seem to be very important vehicles for the reallocation of capital between the United States and Canada. Any response of total investment in Canadian manufacturing to U.S. corporate tax rates is attributable exclusively to investment by U.S. affiliates. Investment by U.S. affiliates in Canada is also much more responsive to Canadian tax rates than is non-U.S.-controlled investment.

3. Marginal effective tax rates based on the standard assumptions with respect to required rates of return and inflationary expectations are not as successful in explaining changes in investment as rates based on alternative assumptions. In particular, much higher required rates of return than are usually assumed seem to be warranted. In some cases, average corporate tax rates even have more explanatory power than standard marginal effective rates.

4. The role of taxes in trade seems much less clear than it is in cross-border

investment. There is suggestive evidence that U.S. tax incentives for exports may have led to an expansion of U.S. exports to Canada.

# Appendix
## *The Cost of Capital and Effective Tax Rates*

The cost of capital services, $c$ (the gross annual return a unit of capital must yield), is derived by equating the acquisition cost of a unit of capital, $q$, with the present value of the cash flows obtained by the capital. These cash flows are

$$\frac{c(1 - u)}{r + \delta} + qk + quZ$$

where $u$ is the statutory corporate tax rate, $r$ is the required real after-corporate-tax rate of return, $\delta$ is the exponential rate at which the capital good depreciates, $k$ is the investment tax credit rate, and $Z$ is the present value of depreciation allowances per dollar of investment. If depreciation allowances are in nominal terms based on historical costs, they have to be translated into real terms by discounting them with a nominal interest rate that is assumed to be the real rate, $r$, plus the expected rate of inflation. (We assume that the firm uses equity financing exclusively.) Equating $q$ with the present value of the cash flows above and solving for $c$ gives the familiar Hall-Jorgenson formula:

$$c = \frac{q(1 - k - uZ)}{(1 - u)}(r + \delta)$$

The marginal effective tax rate, $t$, is defined as the statutory tax rate that would yield the same cost of capital under a pure income tax with tax depreciation equal to real economic depreciation and no investment credit. Accordingly, it is the annual tax wedge (the difference between the gross cost of capital services c/q and $r + \delta$) divided by the pretax return net of economic depreciation, or

$$t = \frac{c/q - (r + \delta)}{c/q - \delta}$$

and can be computed using the above formula for $c$.[18]

18. See Auerbach (1983) for a detailed discussion of effective tax rate computations.

## References

Auerbach, Alan, 1983. Corporate Taxation in the United States. *Brookings Papers on Economic Activity*, 451–505.

Auerbach, Alan, and James Hines, 1988. Investment Tax Incentives and Frequent Tax Reforms. *American Economic Review Papers and Proceedings*, 211–16.

Boadway, Robin, Neil Bruce, and Jack Mintz. 1987. *Taxes on Capital Income in Canada: Analysis and Policy.* Toronto: Canadian Tax Foundation.

Boadway, Robin, and Harry Kitchen. 1980. *Canadian Tax Policy.* Toronto: Canadian Tax Foundation.

Boskin, Michael, and William Gale. 1987. New Results on the Effects of Tax Policy on the International Location of Investment. In *The Effects of Taxation on Capital Accumulation*, ed. Martin Feldstein. Chicago: University of Chicago Press.

Feldstein, Martin. 1982. Inflation, Tax Rules, and Investment: Some Econometric Evidence. *Econometrica* 50:825–62.

Froot, Kenneth, and Jeremy Stein. 1989. Exchange Rates and Foreign Direct Investment: An Imperfect Capital Markets Approach. NBER Working Paper, no. 2914.

Fullerton, Don, Robert Gillette, and James Mackie. 1987. Investment Incentives Under the Tax Reform Act of 1986. In *Compendium of Tax Research.* Washington, D.C.: Office of Tax Analysis, Department of the Treasury.

Grubert, Harry, and John Mutti. 1991. Taxes, Tariffs and Transfer Pricing in Multinational Corporation Decision Making. *Review of Economics and Statistics* 73, no. 2.

Hartman, David. 1984. Tax Policy and Foreign Direct Investment in the United States. *National Tax Journal* 37:475–88.

———. 1985. Tax Policy and Foreign Direct Investment. *Journal of Public Economics* 26:107–21.

Jun, Joosung. 1989. U.S. Tax Policy and Direct Investment Abroad. NBER Working Paper no. 3049.

Newlon, Scott. 1987. Tax Policy and Multinational Firms' Financial Policy and Investment Decisions. Ph.D. diss., Princeton University.

Scholes, Myron, and Mark Wolfson, 1989. The Effect of Changes in Tax Laws on Corporate Reorganization Activity. Stanford Business School. Manuscript.

Slemrod, Joel. 1990. Tax Effects on Foreign Direct Investment in the United States. In *Taxation in the Global Economy*, ed. Assaf Razin and Joel Slemrod. Chicago: University of Chicago Press.

Stevens, Guy. 1972. Capital Mobility and the International Firm. In *International Mobility and Movement of Capital*, ed. Fritz Machlup et al. New York: National Bureau of Economic Research.

Summers, Lawrence. 1986. Investment Incentives and the Discounting of Depreciation Allowances. NBER Working Paper no. 1941.

## Comment Edward M. Graham

To my mind, the Grubert and Mutti paper is an excellent contribution, not so much to the literature on the effects of tax policy on foreign direct investment

Edward M. Graham is a senior research fellow at the Institute for International Economics, Washington, D.C.

(FDI) as to the debate on how best to measure FDI. This is not to say that the paper makes no contribution to the tax question. It does. It is simply to say that I find the latter contribution to be more interesting and more important.

FDI represents something other than an international transfer of physical or financial capital. The essence of FDI is that a firm domiciled in one nation acquires managerial control over a firm domiciled in some other nation. The most widely accepted explanation for the phenomenon is that the parent firm possesses some sort of asset—usually one of an intangible nature such as technology or some other form of "human capital"—that can be transferred to the controlled subsidiary so as to generate a rent. Quite a long literature has been developed in recent years centering around the hypothesis that for FDI to make sense there must also be an advantage to the firm associated with internalization of the asset. That is, the optimal strategy for utilization of the asset must be to "work" it inside the firm, rather than to license it for a fee to other firms.

A basic question then is how to measure FDI. The standard flow measure used in analytic work has been FDI on a balance of payments basis, a measure of financial flow between a parent firm and a controlled subsidiary. Different national authorities define this measure in slightly different ways, and thus there is a comparability problem when using data from different nations. In the United States, the relevant authority is the Bureau of Economic Analysis (BEA). BEA considers an FDI flow to be the sum of any increase (or decrease) in the equity investment (including retained earnings) of a parent in a foreign subsidiary (providing that the parent holds at least 10 percent of the voting stock of the subsidiary), plus any net change in the intrafirm debt position between such a parent and subsidiary.

This measure can be misleading in a number of ways with respect to the goal of detecting changes in a parent firm's directly controlled interests in a foreign country. (i) What is really a passive investment by a parent can sometimes be classified as a direct investment (e.g., the holding of a substantial block of Du Pont stock by Seagrams. This holding is classified by BEA as an FDI, but Seagrams has made a point of asserting that it neither now holds nor intends to try in the future to establish managerial control over Du Pont). (ii) A subsidiary can increase the level of its participation in the host-nation economy without this increase being reflected in an increased holding of equity or intrafirm debt by the parent firm in the subsidiary (e.g., the subsidiary expands its operations and finances its capital expenditures via local debt). (iii) The parent can increase its holding of equity or intrafirm debt in a subsidiary without the subsidiary actually increasing the scale of its business in the host nation (e.g., in the mid-1980s British Petroleum increased its share of the voting stock held in its U.S. subsidiary from something like 60 percent to 100 percent, thus creating a large FDI flow into the United States by the balance of payments measure, even though the subsidiary did not significantly alter the nature or scale of its participation in the U.S. economy).

But if balance of payments measure of FDI is not wholly satisfactory as a measure of FDI, what is? Grubert and Mutti suggest new plant-and-equipment expenditures (PPE) by foreign affiliates of U.S. firms, a data series that is also published by BEA for overseas affiliates of U.S. firms. The authors show that with respect to U.S. firms' activities in Canada, the balance of payments FDI flow measure is not highly correlated with the PPE measure, and that the latter is more responsive to changes in effective tax rates than the former.

For established subsidiaries, the first result is not really surprising. From the perspective of the subsidiary, PPE are uses of funds, whereas increases in equity held by parent or debt owed to the parent are sources of funds. Equity and intrafirm debt are but two means by which PPE can be financed. Elementary finance theory teaches that whether to make a capital investment and how to finance the investment should be treated as largely separate decisions by a firm. Thus, only to the extent that PPE is financed by subsidiaries by calling upon parent-firm resources would one expect it to be correlated with balance of payments FDI flows. The correlation would be relatively low if we restricted our attention to expansion of existing subsidiaries. A well-capitalized subsidiary could, for example, finance an expansion program by means of host-country borrowing. And, at least with respect to Canada, most PPE by local affiliates of U.S. firms are made by ones that have been long established there. This correlation would be greater, however, if we were to restrict our observations to the creation of new subsidiaries investing in greenfields projects. Presumably, the financing of such a new venture would include a substantial block of equity capital.

But then, which is the better of the two measures? The answer will depend entirely on the objective of the analysis. Again, if the objective is to measure the response of *existing* local affiliates under control of foreign firms to changes in domestic economic policy variables implemented by the host-nation government, then the PPE measure likely will be the more appropriate one. But if the objective is to measure the response of *new* FDI flowing into a nation (including takeovers of formerly domestically controlled firms by foreign investors) to changes in these variables, then use of the balance of payments measure is more likely to be warranted. Actually, as is detailed below, what one would really wish to use as a measure of such new FDI would be a disaggregated balance of payments measure, but this is not presently available.

Thus, my interpretation of the finding by Grubert and Mutti that PPE are more responsive to changes in Canadian effective tax rates than are balance of payment FDI flows is simply that changes in these rates affect the operations of the many established Canadian subsidiaries of U.S. firms much more than they affect the rate of creation of new such subsidiaries.

This interpretation must be tempered by consideration of the composition of the balance of payment flows. Balance of payment FDI flows do not corre-

spond exactly with new subsidiary creation, nor are these flows wholly independent of PPE. BEA data do not at present allow disaggregation of new equity flows from parent to subsidiary into flows to new (greenfields) subsidiary creation, to takeovers of previously noncontrolled but existing firms, and to expansion of existing controlled subsidiaries. This disaggregation would be desirable for a thorough testing of my interpretation.

My major point here however is that the PPE and balance of payments measures of FDI activity really measure two quite different aspects of multinational firm activity. The contribution of Grubert and Mutti is to recognize that when one wishes to perform analysis of FDI to policy changes, one is dealing with a phenomenon (i.e., the behavior of multinational firms) that is both subtle and complex and cannot be adequately captured with one quantitative measure. Which of the two existing data series is appropriate for the analysis depends entirely upon what one is trying to do—with the caveat that neither of these series is likely to capture perfectly the exact behavior one wishes to know about. With respect to all econometric analysis of international economic transactions, of course, we live in a world of incomplete and imperfect information. But in the subworld of FDI, the existing data series tend to be more imperfect and incomplete than most.