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INCOME SHIFTING, INVESTMENT, AND TAX COMPETITION: THEORY AND EVIDENCE FROM PROVINCIAL TAXATION IN CANADA

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Abstract

We study corporate income tax competition when firms operating in multiple jurisdictions can shift income using financial planning strategies. Several such strategies, particularly intra-corporate lending, appear to be actively pursued by companies to reduce subnational corporate taxes in Canada. A simple theoretical model shows how interjurisdictional tax planning can give rise to asymmetries in jurisdictions' tax policies, with one jurisdiction becoming a "tax haven" to attract taxable income through financial transactions, while others set higher statutory rates. Further, increased competition from tax havens may paradoxically lead to tax increases by high-tax jurisdictions. Analysis of data from administrative tax records suggests income shifting has pronounced effects on provincial tax bases in Canada. According to our preferred estimate, the elasticity of taxable income with respect to tax rates for "tax shifting" firms is 4.3, compared to 1.6 for other, comparable firms.

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Income shifting, investment, and tax competition: Theory and evidence from provincial taxation in Canada

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1 Introduction

Recently, two Canadian provinces – Alberta and Ontario – have announced sharp reductions to take place in general corporate income tax rates, from 15.5 per cent to 8 per cent by the year 2005. However, such dramatic changes have occurred in the past – Quebec lowered its corporate income tax rate on active business income from 16 per cent to 5 per cent in 1982, but has slowly raised the rate to about 9 per cent over the past two decades. At the same time, most other provinces have either held their corporate income tax rates to remain the same or slightly increased since 1986 when corporate income tax reform was introduced at the federal level with a strategy of rate reduction and fewer tax incentives.

Similarly, at the international level, there has been a significant decline in statutory corporate income tax rates, falling from about 48 per cent in 1980 to 34 per cent in 2000 (Mintz and Chen, 2000). At the same time, governments have been broadening tax bases and removing incentives

for capital investment. Corporate income tax revenues as a percentage of GDP has been rising and even marginal effective tax rates on capital have risen in many countries over time.[1].

What explains the competitive behaviour of governments with respect to the statutory corporate income tax rate? As a number of papers have pointed out, reported income of corporations can be highly elastic with respect to the statutory tax rate since income can be easily shifted from one tax jurisdiction to another without moving real assets.[2] Several empirical studies have found evidence of highly elastic responses in tax bases that are consistent with income shifting (for example, see Hines (1999), Grubert and Slemrod (1998), and Harris et al. (1993)). Hines (1994) suggest that income shifting can be quite dramatic: a tax haven's tax rate increase of 1 per cent would lower reported earnings by 7 per cent. Bartelsman and Beetsma (2000) report that a 1 percentage point change in a country's tax rate leads to a decline in reported before-tax income of 2.7 per cent. Jog and Tang (2001) suggest that a corporate income tax rate reduction of one percentage point can increase taxable income of Canadian corporations by about 20 per cent. A number of recent theoretical contributions have studied corporate tax competition in the presence of multinational firms and profit shifting strategies. Gordon and MacKie-Mason (1995) developed a model of international profit shifting through manipulation of transfer prices that is related to our model of debt shifting introduced below; however, they do not consider the implications of profit shifting for the location of real investment. Haufler and Schjelderup (2000) introduce investment into a model of transfer pricing, but their focus is on the implications of profit shifting for investment tax credit provisions in corporate tax systems.

Few studies have examined income shifting at the subnational level,[3] in part because many countries only have a corporate income tax at the national level and some that have subnational corporate income tax structures, like the United States, require consolidation of companies within a corporate group and an allocation of profits according to a formula based on factors such as sales, payroll and capital. Allocation methods make it more difficult for a company to use certain techniques, particularly financing, to shift income from high to low tax jurisdictions.[4] Therefore, the sensitivity of taxable income to subnational rate changes would be expected to be lower for companies that allocate income, compared to those that do not. On other hand, when consolidation is not permitted, as in Canada, subnational tax rates would be expected to impact significantly more on taxable income of those companies that establish separate subsidiaries in each subnational jurisdiction, since income shifting via financing techniques is easier to implement.

Section 2 of the paper describes a theoretical model that motivates the optimal choice of corporate income tax rates in the presence of income shifting via financing techniques. We show how income shifting influences real investment decisions of corporations and incentives in tax-setting of competing governments. The remainder of the paper provides evidence on the extent of income shifting by corporations among Canadian provinces. Section 3 provides background on the Canadian corporate income tax system. Section 4 estimates elasticities of taxable income for the

[1] See Devereux and Griffith (1998) and also the Technical Committee on Business Taxation (1998)

[2] For a recent survey on corporate tax competition, see Mintz (2000).

[3] See Hines (1996) for an examination of foreign direct investment at the subnational level. See also Büttner (1999) for an examination of German municipal corporate income tax rates.

[4] Many studies tend to focus on transfer pricing techniques for shifting income at the international level. However, the simplest way to shift income is through financial transactions, including "double dipping" deductions for interest expenses (see Mintz, 2000). At the subnational level, "double dipping" is not easily accomplished, given the absence of low-tax havens, but financing is a cost-effective method to shift income in the absence of allocation methods for determining subnational income. However, as Søren Bo Neilsen pointed out to us, corporations can generally shift only normal profits on capital with financing techniques, while transfer pricing (including misreporting of interest rates) may be used to shift rents as well.

provinces and examines how tax rate elasticities differ for firms that can engage in interjurisdictional tax planning and those that cannot. Section 5 concludes the paper.

2 A model

Consider a single firm with the opportunity to invest in n jurisdictions. If K_i is invested in productive capital in jurisdiction i, cash flow net of non-capital costs accruing to the firm there is $F_i(K_i)$, where F_i is a strictly concave, increasing function. The firm incorporates separately and borrows D_i in each jurisdiction, and finances the balance of investment costs $K_i - D_i$ with equity. The pre-tax costs of debt and equity finance are r and ρ, respectively, equal in all jurisdictions since investors may lend in a single, integrated capital market, and there are no differential personal taxes levied on investment income received from the various source jurisdictions.[5]

Each jurisdiction operates a separate source-based, classical corporation income tax system, levying a tax rate τ_i on corporate earnings net of interest expenses, $F_i(K_i) - rD_i$. After-tax corporate earnings in jurisdiction i are then

$$\pi_i(K_i, D_i) = (1 - \tau_i)(F_i(K_i) - rD_i) - \rho(K_i - D_i)$$

To elucidate the impact of income shifting on the firm's investment decisions, we suppose that the firm may freely borrow and lend among subsidiaries incorporated in each jurisdiction, and interest expenses in each jurisdiction may be deducted up to the full amount K_i invested there.[6] We further suppose that, on a consolidated basis, the firm's external debt is constrained not to exceed an exogenous fraction α of its capital stock, so that $\sum_i D_i \leq \alpha \sum K_i$. Thus, while lending among subsidiaries is unlimited, borrowing from external sources is not. In the absence of some restriction on leverage, the firm could avoid all taxes on marginal investments by issuing debt, so that interjurisdictional income shifting would be irrelevant. The firm's problem is therefore to

$$\begin{aligned} &\max_{(K,D)} \sum_i \pi_i(K_i, D_i) \\ &\text{subject to } \; D_i \leq K_i \qquad (i = 1, \ldots, n) \\ &\sum_{i=1}^{n} D_i = \alpha \sum_{i=1}^{n} K_i \end{aligned} \tag{1}$$

The solution to the problem is most easily characterized by considering the nested problem, in which the firm first chooses a financial strategy D for any investment plan K, and then makes its investment decisions given the optimal financial strategy $D^*(K)$. Let μ denote the Lagrange multiplier for the aggregate leverage constraint. The first-order necessary condition for D_i^* is then

$$\rho - (1 - \tau_i)r + \mu \geq 0$$

with equality if $D_i < K_i$. Since $\sum D_i = \alpha \sum K_i$ and $K_i \geq 0$, at least one constraint must be slack, say $D_m < K_m$. The first-order conditions for D^* then reduce to

$$\tau_i > \min\{\tau_1, \ldots, \tau_n\} \implies D_i^* = K_i \tag{2}$$

[5] Thus in particular we abstract from jurisdiction-specific withholding taxes on capital income. This simplification is appropriate for the case of provincial corporate income taxation in Canada, which we study in our empirical work below. In order to deal with international profit shifting, the model could easily be amended to deal with these issues.

[6] Since the borrowing constraint for each subsidiary is $D_i \leq K_i$, we ignore the possibility that local tax authorities impose thin capitalization rules.

together with the leverage constraint $\sum D_i^* = \alpha \sum K_i$. Since borrowing among subsidiaries is a pure arbitrage activity in the model, an optimal strategy for the firm is to borrow the maximum deductible amount in any jurisdiction with a statutory tax rate above the minimum of all jurisdictions, say $\tau_m = \min\{\tau_1, \ldots, \tau_n\}$, and to issue a mix of debt and equity in low-tax jurisdictions to satisfy the aggregate leverage constraint.

Now consider the determination of real investment. An expression for the firm's after-tax profit given its optimal financial strategy can be obtained by substituting the first-order conditions (2) and the leverage constraint into the profit function to obtain

$$\Pi^*(K) = \sum_i \pi_i(K_i, D_i^*(K)) = \sum_i \{(1-\tau_i)F_i(K_i) - [c_m - r(\tau_i - \tau_m)]K_i\} \tag{3}$$

where

$$c_m = (1-\alpha)\rho + \alpha(1-\tau_m)r$$

is the weighted-average after-tax cost of capital in jurisdiction m.[7] In effect, the firm's strategy is to finance all investment by issuing a mix of debt and equity in jurisdiction m and lending to subsidiaries in high-tax jurisdictions to finance investment there. The unit cost of investment in i is then the after-tax financial cost c_m, less the tax gain through debt shifting of $r(\tau_i - \tau_m)$. The optimal rule for real investment K_i^* therefore sets

$$F_i'(K_i^*) = \frac{c_m - r(\tau_i - \tau_m)}{1-\tau_i} \tag{4}$$

A full characterization of the effects of taxation on investment in the model requires that we determine the relationship between the costs of debt and equity finance in the model. We adopt the (standard but admittedly extreme) assumption that investors are indifferent between debt and equity income on the basis of non-tax characteristics, and that the two forms of income are taxed at the same rate through the personal income tax system. It follows that $\rho = r$ in equilibrium, so that the user cost of capital (4) in jurisdiction i reduces to

$$F_i'(K_i^*) = \left(1 + \frac{\tau_m}{1-\tau_i}\right) r \tag{5}$$

Thus, in the presence of income shifting, the effective tax rate on investment in jurisdiction i, say $t_i = \tau_m/(1-\tau_i)$, depends both on the local tax rate (where rents to production are taxed) and the tax rate of the low-tax jurisdiction (where capital income is effectively taxed).[8] Let $K_i^*(t_i) = F_i'^{-1}(1+t_i)$ denote the firm's optimal investment in jurisdiction i. Equation (5) shows how real investment distortions depart from standard effective tax rate calculations in the presence of income shifting, and how statutory tax rates of high-tax and low-tax jurisdictions interact to affect the location of real investment. Proposition 1 summarizes these implications.

[7] For simplicity, we describe the solution for the case in which a unique jurisdiction levies the lowest tax rate τ_m. The analysis is unchanged, however, if several jurisdictions levy τ_m.

[8] This reflects the fact that shifting one dollar of capital income from a high-tax jurisdiction gives rise to an additional tax liability τ_m in the low-tax jurisdiction, and is a consequence of our assumption that securities prices adjust in equilibrium to make investors indifferent to holding debt and equity. As Søren Bo Nielsen pointed out to us, other assumptions about arbitrage opportunities of firms and investors leave to different equilibrium returns to debt and equity, and different conclusions about investment distortions. For instance, another possible equilibrium has $(1-\tau_m)r = \rho$ (firms are indifferent to issuing debt and equity in the low-tax jurisdiction). In this case, the additional tax on shifted income in the low-tax jurisdiction is offset by an additional tax deduction in the high-tax jurisdiction, so that the user cost expression reduces to $F_i' = \rho/(1-\tau_m)$, which is independent of the tax rate in the source jurisdiction. However, such an equilibrium exists only if there are constraints on individual holdings of debt and equity and unlimited arbitrage trading by firms.

Proposition 1 *The marginal effective tax rate on capital in any jurisdiction is an increasing function of the lowest tax rate levied in all jurisdictions. In particular, if the lowest tax rate is zero, then the marginal effective tax rate in all jurisdictions is zero, independent of the local tax rate.*

Proposition 1 points to a very direct spillover in governments' tax policies when multi-jurisdiction firms may shift taxable income through financial transactions: the statutory rate affects the user-cost of capital in high-tax jurisdictions and so distorts investment there. This influences strategic interactions among governments, the subject of the next section. As well, the proposition shows that income shifting may reduce investment distortions in high-tax jurisdictions, even as it leads to erosion of corporate tax revenues there.

2.1 Equilibrium tax rates

How does the presence of income shifting by multi-jurisdiction firms influence tax policy design and the game among competing governments? To provide a heuristic analysis, we restrict attention to the case of two jurisdictions ($n = 2$), and we simplify the preceding model of financial strategy by assuming the firm is constrained to issue only equity on its consolidated balance sheet, so that $\alpha = 0$. Since the cost of financial capital r is fixed in equilibrium, we set it to unity in order to suppress it from the notation. In this case, the firm's strategy is particularly simple: for any investment levels (K_1, K_2), it raises $K_1 + K_2$ by issuing equity in the low-tax jurisdiction, say jurisdiction 2, and it lends K_1 to its subsidiary in the high-tax jurisdiction in order to finance real investment there.

Suppose that governments move simultaneously in choosing tax rates $\tau_i \in [0,1]$ and seek to maximize corporate income tax revenues.[9] Consider the problem from the perspective of a single jurisdiction, say jurisdiction 1. If $\tau_1 > \tau_2$, then the firm shifts all capital income to jurisdiction 2, and revenues of the high-tax jurisdiction are

$$R_1^H(\tau_1, \tau_2) = \tau_1[F_1(K_1) - K_1] \tag{6}$$

where $K_1 = K_1^*(t_1)$ and the effective tax rate is $t_1 = \tau_2/(1-\tau_1)$. If $\tau_1 < \tau_2$, in contrast, then capital income is shifted to jurisdiction 1, and revenues are

$$R_1^L(\tau_1, \tau_2) = \tau_1[F_1(K_1) + K_2] \tag{7}$$

where $K_i = K_i^*(t_i)$ and $t_i = \tau_1/(1-\tau_i)$. We can therefore write the revenue correspondence of jurisdiction 1 as

$$R_1(\tau_1, \tau_2) = \begin{cases} R_1^L(\tau_1, \tau_2) & \text{if } \tau_1 < \tau_2 \\ \in [R_1^H(\tau_1, \tau_2), R_1^L(\tau_1, \tau_2)] & \text{if } \tau_1 = \tau_2 \\ R_1^H(\tau_1, \tau_2) & \text{if } \tau_1 > \tau_2 \end{cases} \tag{8}$$

Our analysis is formally similar to the model of Janeba and Peters (1999), who consider a game between two jurisdictions that choose a single tax rate that applies to two tax bases, one of which is mobile internationally and one of which is not. So, in our model, the statutory corporate

[9] The assumption that governments maximize revenues rather than welfare is less restrictive here than in standard models of capital tax competition, since governments do in fact value rents to production through their effect on tax revenues. It is straightforward to show that augmenting the objective of the high-tax jurisdiction (where the tax base is equal to production rents) to include a fraction of rents merely subtracts a constant from its best-response tax rate. The case of the low-tax jurisdiction (where the tax base is rents plus capital income) is more complicated, but the extension does not significantly influence qualitative results.

income tax rate of each jurisdiction is effectively levied on two distinct bases of different degrees of mobility: rents to local investment by the firm $F_i - K_i$, and worldwide capital income $K_1 + K_2$ that may be costlessly shifted between the two jurisdictions.[10] As in Janeba and Peters, the perfect mobility of the latter tax base induces a discontinuity into governments' revenue functions along the ray $\tau_1 = \tau_2$. It follows that a Nash equilibrium in which the two governments set equal tax rates cannot exist in the model, even if $F_1(\cdot) = F_2(\cdot)$, so that the two revenue functions are symmetric. To see this, observe that a symmetric equilibrium could only exist at $\tau_1 = \tau_2 = 0$, since if the two governments set equal positive tax rates then at least one could gain through a small tax rate reduction that attracted all tax planning income.[11] When both tax rates are zero, however, either government would benefit from a deviation to a strictly positive tax rate: while all capital income would shift to the low-tax jurisdiction, the deviating government would derive positive revenues from taxes on locational rents $F_i - K_i$ in the jurisdiction.

It follows that, in any Nash equilibrium, governments set different tax rates. To simplify matters, we characterize an equilibrium (τ_1^*, τ_2^*) in which $\tau_1^* > \tau_2^*$. (The case in which $\tau_1^* < \tau_2^*$ is analogous.) In this case, all capital income is shifted to jurisdiction 2. Necessary conditions for such an equilibrium is that each tax rate is a local best response to that chosen by the other jurisdiction; i.e. there exists no unilateral deviation that increases revenue of either jurisdiction, given that all capital income is taxed in jurisdiction 2. Thus

$$\tau_1^* \in \arg\max_{\tau} R_1^H(\tau, \tau_2^*) \tag{9}$$

and

$$\tau_2^* \in \arg\max_{\tau} R_2^L(\tau_1^*, \tau) \tag{10}$$

Further, existence of an equilibrium requires that neither jurisdiction can benefit from a deviation that induces capital income to shift to jurisdiction 1; thus

$$R_1^H(\tau_1^*, \tau_2^*) \geq \sup_{\tau < \tau_2^*} R_1^L(\tau, \tau_2^*) \tag{11}$$

and

$$R_2^L(\tau_1^*, \tau_2^*) \geq \sup_{\tau > \tau_1^*} R_2^H(\tau_1^*, \tau) \tag{12}$$

Conditions (9)–(12) are jointly necessary and sufficient for existence of a Nash equilibrium.

What characteristics of a jurisdiction are conducive to it adopting a high or low tax rate in equilibrium? Intuitively, a low tax rate that attracts income shifting into the jurisdiction imposes costs on each government in the form of lost revenues from immobile production rents $F_i - K_i$. Since governments compete in a Bertrand-like fashion for mobile capital income, the incentive to become a low-tax jurisdiction is stronger in the jurisdiction with lower production rents per unit of capital invested.

[10] If governments could choose investment tax credit rates in addition to statutory tax rates, it would be possible to levy distinct tax rates on real investment and on "tax planning" income. See Slemrod (2001) and Haufler and Schjelderup (2000) for a discussion.

[11] This argument relies on $K_1 + K_2 > 0$ and $F_i - K_i > 0$ for all (τ_1, τ_2).

2.2 Intensification of tax competition

The foregoing analysis suggests that, in the presence of income shifting, jurisdictions' tax rates may diverge despite tax competition, as high-tax jurisdictions tax locational rents to the firm, and real investment escapes high tax rates through income shifting. How do high-tax jurisdictions respond to intensification of competition from tax havens?

In standard models of competition for productive capital (e.g. Zodrow and Mieszkowski, 1986), tax rates of competing revenue-maximizing governments are, under weak conditions, strategic complements, and a tax reduction by a single jurisdiction leads to tax reductions by all its competitors. When competition is for financial rather than real capital, however, intensification of tax competition may lead to further divergence in rates. To see this, observe that the best response of the high-tax jurisdiction in the model satisfies the first-order condition for (9), so that

$$\frac{\partial R_1^H}{\partial \tau_1} = F_1(K_1) - K_1 + \frac{\tau_1}{1-\tau_1}\left(\frac{\tau_2}{1-\tau_1}\right)^2 \frac{\partial K_1^*}{\partial t_1} = 0 \tag{13}$$

where we have used the first-order condition (5) for the firm's investment decision. Thus the first-order impact of a decrease in τ_2 is to *decrease* the marginal deadweight loss of taxation in the high-tax jurisdiction (since $\partial K_1/\partial t_1 \leq 0$), which tends to increase the tax rate of the high-tax jurisdiction. This incentive is strongest when $\tau_2 = 0$, so that increases in τ_1 do not distort the firm's investment decision, and the best response of jurisdiction 1 is to choose the maximal tax rate $\tau_1 = 1$. More generally, the slope of the reaction function of the high-tax jurisdiction depends on the curvature of the firm's capital demand function $K_1^*(t_1)$, and tax rates of the two jurisdictions are unlikely to be global strategic substitutes in general. When K_1^* is a linear function of the tax rate (F_i is quadratic), however, observe from (14) that

$$\frac{\partial^2 R_1^H}{\partial \tau_1 \partial \tau_2} = \frac{\tau_2}{(1-\tau_1)^2}\frac{1+\tau_1}{1-\tau_1}\frac{\partial K_1}{\partial t_1} \leq 0 \tag{14}$$

In the linear case, the reaction function of the high-tax jurisdiction slopes downward at all tax rates. Analogously, the reaction function for the low-tax jurisdiction satisfies the first-order condition

$$\frac{\partial R_2^L}{\partial \tau_2} = F_2(K_2) + K_1 + \frac{\tau_2}{(1-\tau_2)^3}\frac{\partial K_2^*}{\partial t_2} + \frac{\tau_2}{1-\tau_1}\frac{\partial K_1^*}{\partial t_1} = 0 \tag{15}$$

so that, when K_1^* is linear,

$$\frac{\partial^2 R_2^L}{\partial \tau_1 \partial \tau_2} = \frac{2\tau_2}{(1-\tau_1)^2}\frac{\partial K_1}{\partial t_1} \leq 0 \tag{16}$$

Thus tax rates of two jurisdictions are strategic substitutes in the linear case.

Proposition 2 *In the linear case, an exogenous tax reduction by the low-tax jurisdiction induces an increase in the equilibrium tax rate of the high-tax jurisdiction, and conversely.*

Thus, when competition among jurisdictions is for highly mobile financial capital rather than real investment, intensification of tax competition need not lead to convergence in tax rates. In particular, a tax cut by a low-tax jurisdiction reduces investment distortions elsewhere, and governments may respond by increasing tax rates.

3 Subnational corporate taxation in Canada

Canada provides a useful case study of income shifting through financial transactions and its implications for how provinces may engage in corporate income tax rate competition. Canada does not consolidate income earned by corporate groups for tax purposes, so that multi-jurisdictional companies with separate subsidiaries in each province have opportunities to shift income from high-tax (such as British Columbia) to low-tax jurisdictions (such as Quebec). On the other hand, there are many multi-jurisdictional companies with branches and sales offices in different provinces which must allocate income across provinces according to an allocation formula agreed upon by the provinces.[12] Thus, there are three types of companies relevant to our study: (i) firms that operate in a single jurisdiction, (ii) firms that operate in multiple jurisdictions through separate subsidiaries and so do not allocate income, and (iii) firms that operate in multiple jurisdictions through a single corporate entity, so that income of the corporation is allocated across provinces according to the formula.

In Canada, provinces may set their own corporate income tax rates. Three provinces (Alberta, Ontario and Quebec) collect their own corporate income taxes; these together account for about 75 per cent of provincial corporate income (Technical Committee on Business Taxation, 1998, Chapter 10). The rest of the provinces allow the federal government to collect the corporate income tax on their behalf, while retaining the right to set their own statutory corporate income tax rates. Generally, the provinces have a general rate of tax on large corporations that vary from as low as 9.12 per cent in Quebec to as high as 17 per cent in New Brunswick, Newfoundland, Manitoba and Saskatchewan (as of 1999). Quebec imposes a higher tax rate on investment income of corporations. Most provinces (except Quebec in recent years) provide a lower corporate income tax for small Canadian-controlled private corporations (CCPCs).[13] A few provinces have lower tax rates on manufacturing and processing income, as does the federal government. Table 1 reports combined federal and provincial statutory rates for large corporations and small CCPCs for 1986, 1999, and for an average of the 1986-99 period. As the Table indicates, statutory rates on large corporations have declined over the past fifteen years, mostly as a result of reductions in federal rates; rates levied on small businesses have remained stable. Moreover, statutory rates for large corporations declaring income in Quebec are substantially lower than in other provinces, although the difference in rates has recently declined somewhat in recent years. Canada integrates corporate and personal taxes by providing a dividend tax credit and excluding a portion of capital gains from taxation. At the small business level, the combined corporate and personal tax rate on equity income is roughly equal to the personal rate on employment and interest income, while for large companies combined tax rates on equity income exceed that of other income. When the small corporate tax rate has been changed in the past, governments have typically adjusted dividend and capital gains tax rates to maintain integration at the small-business level, in order to minimize incentives for shifting between corporate and personal tax bases.

Provinces that have concluded tax collection agreements with the federal government adhere to the same tax base as for the federal corporate income tax (except for provincial tax credits). While the three provinces that collect their own corporate income taxes may set any tax base, they generally have followed the federal rules for determining taxable income. Corporate income tax

[12] This is unlike the United States, where individual states have been free to choose the weights for allocating income. Although there are some small differences among jurisdictions in Canada, the weights are generally the same. See *Report* of the Technical Committee on Business Taxation (1998), Chapter 10.

[13] The low tax rate applies to the first $200,000 (a lower threshold applied in the mid-1980s). Since 1992, the low rate is clawed back for companies with more than $10 million in taxable capital (essentially book assets). All income is taxed at the full rate when taxable capital exceeds $15 million.

Table 1: Combined federal-provincial tax rates, by size and province

	General tax rates			Small business tax rates		
Province	1986	1999	Average	1986	1999	Average
Atlantic provinces	0.52	0.44	0.45	0.23	0.18	0.21
Quebec	0.39	0.33	0.34	0.14	0.21	0.17
Ontario	0.52	0.43	0.45	0.24	0.22	0.23
Prairie provinces	0.53	0.45	0.46	0.24	0.21	0.22
Alberta	0.47	0.43	0.44	0.19	0.19	0.19
British Columbia	0.53	0.45	0.45	0.22	0.20	0.22
All provinces	0.49	0.42	0.43	0.21	0.20	0.21

Notes: Tax rates are averages of rates levied on manufacturing-processing and other industries, weighted by 1984 provincial industry value-added shares.

harmonization has led provinces to agree in general to a common method of allocate income across the provinces. The general formula for allocating income is the sum of shares of payroll and sales in a province, divided by two. Some other formulas are used for special cases such as transportation and financial industries—these replace the sales factor with other indicators, such as passenger miles and assets.

There are several important rules that impact on the willingness of provinces to engage in corporate income tax competition:

- The federal government provides equalization payments to all provinces except Ontario, Alberta and British Columbia. The effect of the formula, especially for the small provinces, is that a rate reduction that leads to a greater corporate income tax base can reduce the amount of equalization paid to the province. Therefore, the equalization program can reduce the incentive for smaller equalization-recipient provinces to engage in tax competition (Smart, 1998).
- Provincial corporate income taxes are not deductible from federal corporate income tax, so that there is less incentive for provinces to raise corporate income tax rates if the burden of tax increases were shared with the federal government.
- Given the lack of corporate consolidation, there can be significant incentives for companies that do not allocate corporate income, to shift profits from high-tax to low-tax provinces. The well-known Quebec financing lease structure results in companies shifting income from high-tax provinces to Quebec where there is a substantially lower rate of tax. There are some tax rules to limit the ability of companies to shift income across jurisdictions, even within a corporate group of subsidiaries separately located across provinces. For example, companies cannot deduct interest expense if debt is more than the fixed and other real assets of the corporation.

4 Income shifting and tax base elasticities

A central assumption of our model is that corporate taxable income is substantially more mobile among jurisdictions when firms may use income shifting strategies, so that tax setting by govern-

ments is governed principally by competition for financial flows rather than for productive investment. To lend support for this assumption, we examined administrative tax data for Canadian provinces and estimated elasticities of taxable income for corporations that have significant inter-jurisdictional tax planning opportunities and for those that do not.

4.1 Data and estimation procedure

The principal source of our data is the Corpac data set, which is maintained by the Canadian Customs and Revenue Agency and which records a subset of information from T2 tax records for the universe of Canadian corporations. We use Corpac's recorded taxable corporate income and total declared assets[14] as dependent variables in our analysis.

Corpac includes records for an average of nearly 900,000 firms in each year in the 1986-99 period. In order to preserve confidentiality, the Department of Finance aggregated the data; that is, firm-level records were summed for each province and year in which the corporations operated and the broad industry groups that were their principal lines of business. Data for the small provinces were combined, yielding seven province identifiers in our constructed data set: Atlantic provinces, Quebec, Ontario, Prairie provinces, Alberta, and British Columbia.[15] Similarly, there are seven industry groups in our data set: Primary, Construction, Manufacturing, Transportation, Communications and Utilities, Wholesale and Retail Trade, and Services. Financial corporations were excluded from the population.

The source data set also contains information on whether the corporation allocated income to several provinces for tax purposes or paid tax in only a single province, and on whether the corporation is a subsidiary of another corporation. (It is not possible, however, to link records of members of a corporate group.) Since these characteristics influence the ability of the firm to engage in income shifting, the data were aggregated by the Department of Finance into distinct groups of firms that paid tax in a single or in multiple jurisdictions, and groups of firms that are subsidiaries and those that are not. The data were also aggregated separately for "small" firms that paid tax in a single or in multiple jurisdictions.[16] In summary, the aggregation procedure yielded six categories of firms (four large firm categories and two small firm categories) for each of the 588 province-industry-year cells, and a total of 3509 observations. (Nineteen cells were not available to us, because of confidentiality restrictions.)

Using the constructed data, we estimated taxable income elasticities for the standard log-linear specification:

$$\log y_{iptc} = x'_{iptc}\beta + \eta_c \log(1 - \tau_{iptc}) + \epsilon_{iptc} \tag{17}$$

where y_{iptc} is real taxable income per capita of firms in province p, industry i, year t, and firm category c; τ_{iptc} is the corresponding combined federal and provincial statutory tax rate, and x_{iptc} is a vector of other explanatory variables.

Our specification allows tax rate elasticities η_c to differ based on observable characteristics of firms that are related to their ability to shift income among jurisdictions using tax planning strategies. In our preferred specification, we estimate separate elasticities for three categories of firms: (i) large corporations that pay tax in a single province (i.e. that do not allocate income using

[14] Total of all current capital, long term assets and assets held in trust, as reported on firm's balance sheet.

[15] The Atlantic provinces are Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick. The Prairie provinces are Manitoba and Saskatchewan. Together, these six small provinces comprised less than 15 per cent of the Canadian population during the 1990s and eight per cent of corporate profits.

[16] "Small" firms are corporations eligible for the federal small business deduction, i.e. Canadian-controlled private corporations with income less than $200,000 and assets less than $15 million.

the statutory formula) and are subsidiaries of other corporations; (ii) other large corporations; and (iii) small corporations. (We experiment with other classifications below.) To the extent that this classification is a good proxy firms' opportunities to engage in interjurisdictional tax planning, we expect the estimated elasticity for the first category of firms to reflect income shifting as well as mobility of real investment, whereas elasticities for the latter two categories should mainly reflect mobility of real investment. (Since our data set does not record information on firms' deductible interest expenses or leverage decisions, it is not possible to identify debt-shifting activities *per se*.) For convenience, we refer to the three categories as "shifters", "non-shifters", and "small" firms.

Naturally, drawing policy inferences from our approach is a precarious exercise, and our estimates cannot be regarded as estimates of structural parameters. Importantly, however, it is likely for a number of reasons that our approach underestimates true differences in elasticities of shifting and non-shifting firms. First, our classification places firms that are subsidiaries but which do some business in multiple provinces in the second, non-shifting category, and subsidiaries that are related only to firms incorporated in the same province (for which income shifting opportunities are therefore limited) in the first, shifting category. Both of these misclassifications should lead to attenuation bias in elasticity estimates. Second, our approach regards corporate organization decisions as exogenous, unrelated to tax rate differences among provinces. In reality, an increase in tax rate differentials is likely to induce more firms to incorporate separately in a number of jurisdictions in order to engage more easily in income shifting. For this reason as well, therefore, our approach tends to underestimate "structural" tax rate elasticities.

4.2 Estimates

Table 2 reports estimates of equation (17) for the classification of firms described above. In column (1), explanatory variables include, in addition to the statutory tax rate, the logarithms of real provincial per capita income ("income") and an index of US producer prices for the industry in which the firms operate ("export price"),[17] together with fixed effects for firm type and the complete set of province-industry interactions. Thus we employ a "difference-in-differences" estimator, in which identification of tax rate elasticities is derived from differences in tax rates among industries, provinces, and firm types. Results in this column are consistent with expectations. The estimated tax rate elasticity for "shifting" firms is 4.3; put differently, a one percentage point reduction in the tax rate from 0.43 (the mean for large firms in the sample) to 0.42 induces a 7.5 per cent increase in taxable income. As expected, estimated elasticities for the two categories of "non-shifting firms are much smaller: 1.6 for other large corporations and an insignificant 0.1 for small firms. It is perhaps not surprising that income of small firms is insensitive to tax rates, since for non-tax reasons most of these firms are likely to be immobile across provincial boundaries. More important is the finding that elasticities are substantially lower for large non-shifting corporations, which are otherwise comparable to the shifting firms.

The remaining three columns of the Table present results for different specifications of the other explanatory variables. The specification in column (2) includes year fixed effects, which control for unobserved factors affecting all firms that may be correlated with tax rates. (In the base specification, the primary control for economic factors is the export price variable.) Estimated elasticities in this case are comparable, although point estimates are somewhat higher. Column (3) reports results for a specification that excludes the province-industry interaction fixed effects but includes fixed effects for industry and for province-firm type interactions. This specification allows us to investigate the possibility that our results merely reflect differences in corporate organization

[17] The US price data are from Jorgenson and Stiroh (2000).

Table 2: Estimated taxable income elasticities

	Dependent variable: log real taxable income per capita			
	(1)	(2)	(3)	(4)
log $(1-\tau)$ for firm type:				
1. large single-jurisdiction	4.3*	4.9*	3.6*	4.4*
subsidiaries	(0.9)	(0.9)	(1.1)	(0.8)
2. other large corporations	1.6*	2.3*	1.1	1.8*
	(0.6)	(0.7)	(0.6)	(0.6)
3. small firms	0.1	1.2	-6.0*	0.4
	(1.8)	(1.9)	(2.6)	(1.8)
log income	3.8*	3.0*	3.9*	–
	(1.0)	(1.4)	(1.0)	
log export price	1.7*	0.9	1.4*	1.7*
	(0.4)	(0.8)	(0.4)	(0.4)
R^2	0.32	0.33	0.29	0.33
Fixed effects:				
Industry-province interactions	yes	yes	no	yes
Year effects	no	yes	no	no
Province-firm type interactions	no	no	yes	no

Notes: All regressions include province, firm type, and industry fixed effects.

*: Significant at 5 per cent level. Standard errors in parentheses.

among provinces—for example, that firms in low-tax provinces are less likely to operate in multiple jurisdictions or more likely to be members of corporate groups for reasons that are unrelated to tax rates. Estimated elasticities for large corporations are smaller in this case (3.6 for shifting firms and 1.1 for non-shifting firms), but the difference between elasticities of shifting and non-shifting firms remains significant. The estimated elasticity for small corporations is significantly negative in this case, which leads us to reject the specification in any case. Column (4) reports results for a specification identical to that of column (1), except that provincial per capita income is excluded as a potentially endogenous regressor. Estimated elasticities are essentially the same.

Table 3 reports estimates for alternative classifications of firms into the shifting and non-shifting categories. To aid in comparisons, column (1) of the Table repeats the estimates for our base specification, i.e. from column (1) of Table 2. In all columns, other regressors are income, export price, and industry-province and firm type fixed effects. In column (2), "shifters" are defined as all large corporations that are subsidiaries of other corporations. Thus firms that are subsidiaries but that allocate income among several provinces by formula are reclassified from the second category to the first. The predicted impact of this on estimated elasticities is ambiguous, since the reclassified firms may include both shifting firms with high elasticities and non-shifting firms with low elasticities. In fact, the estimated tax rate elasticity for shifting firms is 2.7 in this case, compared to 4.3 in the base specification. The estimate for non-shifting firms remains unchanged at 1.6, but the difference between the two elasticities becomes insignificant in column (2) (p-value of 0.15). Column

Table 3: Alternative classifications of firm type

	Dependent variable: log real taxable income per capita		
	(1)	(2)	(3)
log $(1-\tau)$ for firm type:			
1. large "shifters"	4.3*	2.7*	4.9*
	(0.9)	(0.7)	(0.7)
2. large "non-shifters"	1.6*	1.6*	3.2*
	(0.6)	(0.7)	(0.7)
3. small firms	0.1	0.0	1.3
	(1.8)	(1.8)	(1.8)
log income	3.8*	3.8*	3.4*
	(1.0)	(1.0)	(1.1)
log export price	1.7*	1.7*	1.7*
	(0.4)	(0.4)	(0.4)
R^2	0.32	0.33	0.55

Notes: All regressions include fixed effects for industry–province interactions and firm type. The classifications of firm type are:

(1) "shifters" are subsidiaries that do not allocate.

(2) "shifters" are all subsidiaries.

(3) "shifters" are all subsidiaries, and firms that allocate are excluded from the regression.

*: Significant at 5 per cent level. Standard errors in parentheses.

(3) reports results for a third classification of firms; in this case, firms that allocate taxable income are excluded entirely from the sample, so that "non-shifters" consist only of large corporations that are not subsidiaries and that pay tax in a single jurisdiction. The estimated elasticity of non-shifters is larger in this case at 3.2, which is somewhat surprising. Nevertheless, the difference between estimates for shifting and non-shifting firms remains significant (p-value of 0.03).

Table 4 reports results for analogous regressions using different dependent variables, including taxable income per firm, taxable assets per capita, and taxable assets per firm. Since it is not possible to assign the assets of multi-jurisdictional firms to the various provinces in which they operate, multi-jurisdictional firms were deleted from the sample, and the classification of firms corresponds to that in the last column of Table 3. To aid in comparisons, column (1) of Table 4 repeats the results for that specification with real taxable income per capita as the dependent variable. In column (2), the dependent variable is real taxable income per firm. This is unlikely to be the correct dependent variable for the analysis, since if production occurs under constant returns to scale, as in standard theories of tax competition, the model offers no prediction for the effects of taxes on the number of firms operating in a jurisdiction. Nevertheless, results in this case may be more comparable with other studies based on firm-level data. In this case, tax rate elasticities for all firm categories are significant and positive, but our main result is reversed: the elasticity for large "non-shifting" firms at 6.1 exceeds that of tax shifting firms at 3.1. Column (3) reports results of a regression in which the dependent variable is real taxable assets per capita. Observe that, like taxable income, reported assets should respond to tax rate differentials when firms engage in

Table 4: Alternative dependent variables

	Real TI per capita	Real TI per firm	Real assets per capita	Real assets per firm
log $(1-\tau)$ for firm type:				
1. large "shifters"	4.9*	3.1*	4.0*	1.6*
	(0.7)	(0.7)	(0.6)	(0.5)
2. large "non-shifters"	3.2*	6.1*	1.1	2.6*
	(0.7)	(0.5)	(0.6)	(0.4)
3. small firms	1.3	1.6*	1.7	1.1*
	(1.8)	(0.5)	(1.5)	(0.3)
log income	3.4*	4.2*	2.4*	1.6*
	(1.1)	(0.3)	(0.9)	(0.2)
log export price	1.7*	0.3*	0.4	-0.1
	(0.4)	(0.1)	(0.3)	(0.1)
R^2	0.55	0.77	0.44	0.92

Notes: In all cases, the regression specification is the same as column (3) of Table 3.

*: Significant at 5 per cent level. Standard errors in parentheses.

tax shifting. Such "asset shuffles" may reflect avoidance of corporation income taxes on operating through leasing strategies (see Section 3 above), avoidance of capital gains taxes, and avoidance of provincial capital taxes. Once again, the estimated tax rate elasticity is largest at 4.0 for shifting firms, and is in this case insignificantly different from zero for other corporations. Column (4) repeats the regression using taxable assets per firm as the dependent variable. As with column (2), the estimated elasticity for large non-shifting firms exceeds that of shifting firms, although the difference in this case is insignificant (p-value is 0.11). Again the specification based on assets per capita seems preferable, since the theory offers no predictions about the impact of taxes on the number of firms in a jurisdiction.

5 Conclusion

In recent years, the process of globalization has brought nations closer together and, apparently, brought their governments into greater competition for business tax bases. Two aspects of globalization have had important and conceptually distinct implications for business tax competition: reductions in transportation and communication costs may make real business investment more mobile across jurisdictional boundaries, and financial innovation and liberalization may facilitate international tax avoidance by less footloose firms.

Our analysis suggests that the distinction between these two forms of economic integration is important. When firms may costlessly shift income to low-tax jurisdictions through financial transactions, real investment choices of firms and the tax policy environment of governments are changed. Income shifting tends to make the location of real investment less responsive to tax rate differentials, even as taxable income becomes more elastic. Income shifting can induce stark asymmetries in tax policies of competing governments, as some jurisdictions reduce statutory tax rates

to attract taxable income, and other governments maintain high tax rates on inframarginal locational rents earned by firms, while tolerating erosion of the corporate capital income tax base that results from income shifting. Since income to marginal investments can escape taxation through income shifting, the effective tax rate on capital depends in part on statutory tax rates levied in low-tax jurisdictions. Consequently, an intensification of tax competition can paradoxically lead to a *divergence* in tax rates of high-tax and low-tax jurisdictions.

Subnational corporate income taxation in Canada provides a useful case study of the effects of income shifting. All provinces operate significant corporate income tax systems but (consistent with our model) one province, Quebec, imposes statutory tax rates substantially below those of other provinces. Further, since corporate groups are not required to consolidate income for tax purposes, a number of tax planning devices are essentially unrestricted for firms that incorporate separately in different provinces. Consistent with the model, we find that taxable income of corporate subsidiaries that do not allocate income is significantly more elastic with respect to tax rates than income of other, comparable firms that do allocate income by formula and those that are not corporate subsidiaries. These results are suggestive of the role of income shifting in the investment decisions of large, multi-jurisdiction firms, and of its implications for tax policy choices of affected governments.

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