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Effective Tax Rates and the Formation of Manufacturing Enterprises in Canada

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Executive summary

Policy analysts and governments are increasingly concerned with the “competitiveness” of the fiscal system relative to other jurisdictions. This is particularly true in the case of tax policy and, even more particularly, in the case of taxes levied on businesses. In a recent survey of investment fund managers in Canada, respondents were asked to rank policy areas in order of their importance in fostering a positive investment climate. The top four of ten policy areas were all related to taxation: corporate income tax, personal income tax, corporate capital tax, and capital gains tax.

In order to understand the competitiveness of a tax structure, it is imperative to consider the broad range of taxes that affect the costs of all inputs into production. We argue that simply comparing things like statutory Corporate Income Tax (CIT) rates does not provide a very clear picture of the overall tax structure. Surprisingly, the overall pattern of the Canadian business tax system has not been carefully examined. This publication addresses this by presenting and analyzing a summary measure of the tax structure for 21 Canadian manufacturing industries in six provinces (British Columbia, Alberta, Saskatchewan, Manitoba, Ontario and Quebec) over 28 years, from 1970 to 1997. The summary measure is known as the Effective Tax Rate on Marginal Cost (ETRMC). The ETRMC is the effective excise tax rate imposed on the cost of producing an incremental unit of output. It provides a consistent measure of the tax structure based on the economic theory of the firm and allows the comparison of the tax structure across industries, provinces, and time.

We find that the ETRMC increased on average over this period rather than declining along with the observed reductions in statutory CIT rates. Beginning in 1970, there was a general decline across the six provinces until 1972 followed by a slight upward trend throughout the 1970s. ETRMCs increased at a higher rate throughout the 1980s and have generally declined throughout the 1990s. Over the nearly three decades, Ontario and Alberta had nearly the same ETRMC while the other four provinces have higher ETRMCs. We find that the increase in ETRMCs was primarily due to increases in labour taxes.

Moreover, the variation in ETRMCs across space, time, and industries in Canada is extremely large. For example, in 1997 the ETRMC in Ontario ranged from a low of approximately 7% in Leather to a high of over 23% in Beverages. There is also significant variation across provinces. For example, in the Wood industry in 1997, the ETRMC was 8.6% in Alberta and 16.1% in Quebec.

We find that the ETRMC has a statistically significant and economically meaningful impact on the number of establishments locating in a given jurisdiction: increases in the ETRMC discourage enterprise formation. Specifically, we estimate the elasticity of the number of enterprises with respect to the ETRMC to be in the neighbourhood of −0.33. Thus, a 1% increase in the ETRMC leads to a 0.33% decrease in the number

of business enterprises. So, in 1997 when there were 34,840 manufacturing establishments in Canada, a 1% increase in the ETRMC from 20% (approximately the current level) to 20.2%, would lead to the loss of approximately 115 establishments. The negative relationship is robust to different model specifications.

All of this suggests that federal and provincial taxes on business inputs impinge significantly, and differentially, on the competitiveness of Canadian industries and a move to a more neutral tax system—the infamous "level playing field"—could yield significant gains.

1 Introduction

Governments are becoming increasingly preoccupied with the "competitiveness" of their fiscal system relative to that of other jurisdictions. This is particularly true in the case of tax policy and even more so in the case of taxes levied on businesses. This preoccupation is typically justified by concerns that if taxes on businesses in a jurisdiction are onerous relative to that jurisdiction's "competitors" then businesses will invest less in that jurisdiction or, perhaps, locate elsewhere altogether. With labour, capital, and businesses increasingly mobile across national and international borders, governments may be particularly concerned with how their business tax systems stack up relative to those of their neighbours. In a recent survey of investment fund managers in Canada conducted by the Fraser Institute, respondents were asked to rank policy areas in order of their importance in fostering a positive investment climate. The top four of ten policy areas were all related to taxation—corporate income tax, personal income tax, corporate capital tax, and capital gains tax. [1]

While much of the research on the impact of business taxation has focused on international comparisons, no less important are subnational comparisons at the state or provincial level. Empirical evidence justifies concern over fiscal competitiveness at the subnational level. The existing consensus appears to be that taxes are a significant, but perhaps not overwhelming, factor in explaining why some regions out-perform others in terms of attracting footloose factors of production. Bartik (1991) examined 84 econometric studies that sought to estimate the elasticity of some measure of business activity with respect to some measure of state and local taxes. The elasticity measures the percentage change in business activity associated with a 1% increase in the tax measure. He found that the elasticity estimates ranged from between −0.10 and −0.60 for studies focusing on interstate activity, with higher (more negative) elasticities for intermetropolitan studies. This means that a 1% increase in taxes reduces business activity from between 0.10 and 0.60%. More recent surveys by Wasylenko (1997) and Buss (2001) conclude that the majority find significant, albeit somewhat modest, effects of business taxes on location or investment decisions. In a recent meta-analysis Phillips and Goss (1995) conclude that the most reasonable elasticity of interstate business activity in the United States with respect to some measure of the tax rate is −0.35. We are not aware of any empirical studies based on Canadian data.

Two types of measurement issues must be confronted in any study of the impact of taxes on business activity: the first is how to measure business taxes and the second, how to measure business activity. Our primary focus in the first part of this paper is on the first issue—the measurement of the appropriate tax instrument—in a Canadian provincial context. We present a methodology for measuring taxation and analyze the

[1] Clemens 2002.

pattern of taxation in Canada. The second part of the paper examines the impact of taxation on business activity. Typical candidates for measuring business activity include investment, employment, and number of enterprises. We focus on the number of enterprises in this study.

There are several ways of measuring the competitive stance of a jurisdiction's business tax system. One obvious approach is simply to compare statutory tax rates—corporate income tax (CIT) rates, property tax rates, payroll tax rates, sales tax rates, personal income tax (PIT) rates and so on—across jurisdictions. While statutory rates are obviously important, economists typically take a dim view of this approach, as statutory tax rates miss many features of tax systems that can be important from a competitiveness perspective. For example, in the case of corporate taxes, the tax base, which is determined by the various rules that govern the rate and nature of various deductions and write-offs against corporate revenue, is at least as important as the statutory tax rate itself. There may also be tax credits associated with certain types of investments that further reduce corporate tax liability directly. Generous write-offs and credits can negate the impact of a high statutory tax rate. Moreover, many jurisdictions impose other taxes on capital, such as property taxes and explicit capital taxes, which are not taken into account in a simple comparison of statutory CIT rates.

This has prompted economists to come up with several measures that are thought to be more important, and more relevant, to things like investment and location decisions. These measures fall under the general heading of "effective tax rates." There are two broad types of effective tax rates that have typically been employed in empirical studies: average effective tax rates (AETR) and marginal effective tax rates (METR).

METRs are derived from the neoclassical theory of a profit-maximizing firm and can, in principle, be derived for any input that enters the production function. Inputs are usually measured on an aggregate basis, such as labour and capital, with capital perhaps broken down into machinery, buildings, land, and inventories, or possibly even finer aggregations. As the concept is employed in this paper, the METR on a business input measures the percentage increase in the cost to the user of employing an incremental unit of that input. In other words, the METR on a business input measures the effective excise tax rate imposed on an incremental unit of that input.

AETRs simply take some empirical measure of taxes (such as corporate income tax) and divide it by some measure of pre-tax income. AETRs can be calculated at either the micro-firm level or at the industry level at various degrees of aggregation.

Economists typically prefer METRs as a measure of marginal investment, employment, or production incentives because METRs are a forward-looking concept based upon the optimizing decisions of firms. The AETR, on the other hand, is a backward-looking concept, based on measures of taxes actually paid and pre-tax income. As such, the AETR is affected by, for example, tax provisions that may no longer be in force.

While METRs can in principle be calculated for any input, the overwhelming tendency in the literature is to focus on METRs on capital. While this emphasis may well be appropriate in many cases, McKenzie, Mintz, and Scharf (1997) have argued that it is misplaced when the objective is to measure the overall competitiveness of the business-tax regime. The problem is that by ignoring, or not properly accounting for, taxes on other inputs, in particular labour, these traditional measures misrepresent the overall tax burden faced by firms.

McKenzie, Mintz, and Scharf (1997) therefore develop a way of aggregating the various METRs on business inputs into an economically meaningful measure of tax competitiveness. As indicated above, the METR on a particular input measures the extent to which the tax system increases the cost to businesses of employing an incremental unit of that input. The insight of McKenzie, Mintz, and Scharf is that this tax-induced increase in the cost of purchasing incremental inputs in turn feeds through to higher production costs for businesses. The extent to which the input METRs increase marginal, or incremental, production costs can be measured by using what they call the effective tax rate on marginal costs (ETRMC), which aggregates the input METRs into an effective excise tax rate on marginal production costs. The ETRMC then indicates the extent to which the tax system imposes upon the cost competitiveness of a particular jurisdiction or sector.

Our purpose in this paper is two-fold. The first is to present and discuss a unique data set of effective tax rates calculated for Canada. Our calculations span several dimensions: six provinces (British Columbia, Alberta, Saskatchewan, Manitoba, Ontario and Quebec), over 28 years (1970 to 1997), and 21 manufacturing industries. The six provinces examined account for at least 95% of all manufacturing activity in Canada. We present METR calculations for each of labour and capital business inputs separately, and then aggregate these into a single measure of the competitiveness of the overall tax system using the ETRMC. Our calculations of effective tax rates reflect differences in corporate income taxes, capital taxes, payroll taxes, personal income taxes, and sales taxes across provinces and industries over time. Our second purpose is to examine empirically the impact of differences in effective tax rates on business investment decisions. We discuss some policy implications related to these calculations.

The calculations unveil several interesting, and perhaps surprising, insights. For example, we show that although statutory CIT rates have been following a slight downward trend over the 28-year period studied, overall taxes on business inputs in Canada, as measured by the ETRMCs, have been increasing. While the METR on capital has fluctuated throughout the period, with a slight downward trend, the METR on labour has generally increased. Since labour costs are more important than capital costs in most sectors, the result has been an overall tax-induced increase in the marginal cost of production.

Comparing effective tax rates across sectors reveals a remarkable degree of variation. For example, in 1997 the ETRMC in Ontario ranged from a low of 7.11% in Leather to a high of 23.71% in Beverages. There is also significant variation overall across provinces. For example, in the Wood industry in 1997 the ETRMC was 8.6% in Alberta and 16.1% in Quebec. All of this suggests that federal and provincial taxes on business inputs impinge significantly, and differentially, on the competitiveness of Canadian industries, and a move to a more neutral tax system—the infamous "level playing field"—could yield significant efficiency gains.

We find that the ETRMC has a statistically significant and economically meaningful negative effect on the number of establishments. Our estimates indicate that the elasticity of the number of business enterprises with respect to the ETRMC is in the neighbourhood of −0.33. This means that an increase in the ETRMC by 1% will cause the number of business establishments to decline by 0.33%. In 1997, when there were 34,840 manufacturing establishments in Canada, a 1% increase in the ETRMC from 20% (approximately the current level) to 20.2%, would lead to the loss of approximately 115 establishments.

The remainder of the study is organized as follows. In Section 2, we expand upon the basic idea of effective tax rates employed in this paper. In Section 3, we present and discuss the calculations of effective tax rates. Section 4 presents our estimates of the impact of the tax system on the location business establishments in Canada. Section 5 summarizes and offers concluding thoughts.

2 Effective tax rates—the basic idea

There are several approaches to measuring effective tax rates; we focus on two: the marginal effective tax rate (METR) on business inputs and the effective tax rate on marginal costs (ETRMC), which is an aggregation of the METRs on the business inputs. We do not undertake a formal derivation of the effective tax rates but rather focus on the intuition. The interested reader can consult our technical paper (Beaulieu *et al*., 2003) or refer to McKenzie, Mintz and Scharf (1997) for a more detailed and technical exposition.

First, consider the METRs on business inputs. Although there are obviously many inputs into the production process, we focus on aggregations of the two most important—capital and labour. In the case of capital we distinguish between buildings and structures, on the one hand, and machinery and equipment, on the other.

To begin, consider the notion of the user cost of a business input. The user cost of a business input is simply the cost to the business of employing one more unit of that input—one more unit of labour or one more unit of capital. In the absence of taxes, the user cost is simply the cost of purchasing an additional unit of the input as determined by the market. In the case of a non-enduring, or current, input such as labour, the user cost is simply the market wage rate. The user cost of capital, an enduring input that generates a flow of output over time, is more complicated and requires a little more elaboration; the basic idea, however, is the same.

The user cost of a unit of capital incorporates the notion of the hurdle rate of return. Investors have many opportunities to invest their savings and, to attract investment, businesses must generate an expected rate of return that at least compensates investors for their forgone investment opportunities. The hurdle rate of return is the minimum rate of return on an incremental dollar invested in capital required to just compensate investors for their forgone investment opportunities. All capital must generate an expected rate of return that is at least as great as the hurdle rate of return. The user cost of a capital input is then simply the hurdle rate of return multiplied by the cost of purchasing an additional unit of the capital, which gives the dollar return required on an incremental unit of capital.

All taxes on business, from the CIT to payroll taxes to capital taxes and sales taxes, can be viewed in terms of their impact on the user cost of the various business inputs (such as labour and capital). For example, a payroll tax increases the user cost of labour; the CIT, or an explicit capital tax, increases the user cost of capital. The *marginal effective tax rate* (METR) on business inputs as it is employed here measures the percentage increase in the user cost of an additional unit of an input due to the tax system. It can also be thought of as the effective excise tax on a business input.

As an illustration, consider the case of a capital input. Corporate taxes impinge upon the hurdle rate of return by lowering the income available to investors. For example, suppose that the hurdle rate of return is 10%. This is to say that, after the payment of corporate taxes, shareholders require an expected rate of return on capital of at least 10% in order to entice them to invest in the corporation. Now suppose that, after taking account of the various write-offs, deductions, and credits allowed under the CIT, paying taxes at the relevant statutory CIT rate, and paying any other taxes on the capital (such as property taxes and capital taxes), in order to generate a rate of return of 10% after the payment of corporate taxes, corporations need to generate a rate of return of 12% before the payment of corporate taxes. The METR on capital in this case is 20%, calculated simply as (12%−10%)/10%. Thus the METR reflects the tax wedge driven between the before- and after-corporate-tax hurdle rate of return on a marginal (incremental) capital investment in the business, where a marginal investment is simply an investment that just earns the required hurdle rate of return after the payment of corporate taxes. Expressing this tax wedge relative to the after-tax hurdle rate of return of 10% generates an effective excise tax on the user cost of the capital input. [2] In this example, the METR of 20% means that the tax system increases the user cost of the capital input by 20%. Similar calculations can be made for other inputs such as labour.

Differences in METRs across business inputs introduce distortions into the economy by causing businesses to over-use some inputs while under-using others. In the absence of other market distortions (such as externalities), these tax-induced distortions in turn cause a misallocation of resources in the economy, generating the associated inefficiency costs.

While knowing how a tax system affects the relative user cost of individual business inputs is important from a policy perspective, of themselves individual input METRs may not be particularly useful in gauging the overall "competitiveness" of the business tax system. For example, is a tax system that imposes a METR on capital of 20% and a METR on labour of 10% more or less "competitive" than a tax system that imposes a METR on capital of 10% and a METR on labour of 20%? Or, a METR of 15% on capital and 15% on labour?

To answer this question, some method of aggregating the various METRs on the business inputs is required. In order for this aggregation to be meaningful it must be done in a way that is consistent with the microeconomic foundations of investment, employment, and production decisions at the firm level. McKenzie, Mintz and Scharf (1997) develop such an approach. They show that input METRs can be meaningfully aggregated into a single measure of the overall competitiveness of the tax system by considering their impact on marginal production costs—the cost of producing one more unit of output.

Marginal production costs obviously reflect the user costs of the inputs used in that production. To the extent that the tax system increases the user cost of business

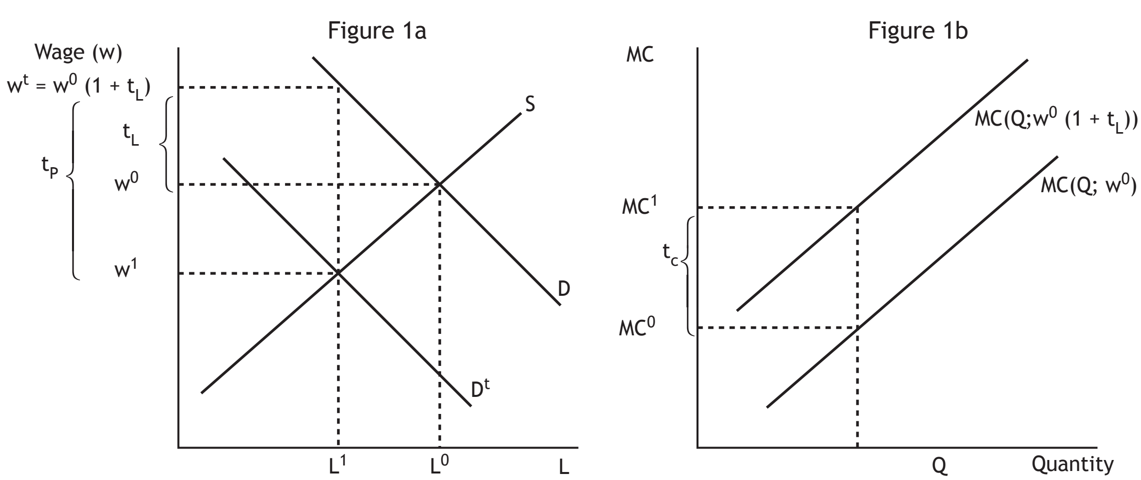
[2] In some studies, the METR is expressed relative to the before-tax hurdle rate of return, 12% in our example. In this case, the excise tax interpretation is not appropriate.

inputs (as measured by the input METRs), it also increases the cost of producing an incremental unit of output. The percentage increase in these marginal production costs due to the taxation of business inputs is the effective tax rate on marginal production costs (ETRMC). The ETRMC is an aggregation of the input METRs and can be thought of as the effective excise tax rate imposed on marginal costs by the tax system. It is a sensible and economically meaningful representation of the impact of the tax system on the cost competitiveness of businesses across jurisdictions and sectors.

The basic idea behind the approach is illustrated in figure 1. Figure 1a depicts an input market; for concreteness, we use the labour market. In the absence of taxes, the user cost of labour is given by the intersection of the labour supply curve (*S*) and the labour demand curve (*D*), generating a user cost of labour equal to the wage rate w^0. In this case, the wage cost of firms is equal to the take-home pay of the workers. Now consider a payroll tax (t_p) levied on firms. The tax lowers the firms' demand for labour at any given wage rate. Figure 1a depicts the lower demand as a downward shift in the demand curve for labour by the amount of the payroll tax, t_p, from *D* to D^t. This drives a wedge between the cost of labor inputs to the firm and the take-home pay of the workers. The user cost of labour to firms increases from w^0 to w^t, where $w^t = w^0(1+t_L)$ and t_L is the METR on the labour input. The payroll tax also lowers the take-home pay of workers from w^0 to w^1. Note well that the METR on labour, t_L, is less than the payroll tax rate, t_p. This is because some of the burden of the payroll tax is borne by workers through lower take-home pay. We will discuss this in more detail below.

The diagram on the right (figure 1b) depicts the output market (the demand curve for the output is suppressed for simplicity). In the absence of taxes, the marginal cost curve is given by $MC(Q;w^0)$, which is a function of the quantity of output produced

Figure 1: Measuring the effective tax rate on marginal cost



(Q) and the user cost of the firm's inputs, in this case labour (w^0). At output Q the marginal cost of production is MC^0. By increasing the user cost of labour from w^0 to w^t, the payroll tax shifts the marginal cost curve up from $MC(Q;w^0)$ to $MC(Q;w^0(1+t_L))$, increasing the marginal cost of production from MC^0 to MC^t. Expressing the after-tax marginal cost of production, MC^t, as $MC^t = MC^0(1+t_c)$ allows us to determine the impact that the METRs on the input (in this case labour) has on marginal production costs, where t_c is the ETRMC. The ETRMC is a function of the METR on labour, t_L, and the shape of the marginal cost function, which in turn reflects the characteristics of the firm's production function.

While figure 1 describes the input market for labour, a similar diagram can be used to describe the input market for capital. We can compute the METR on capital (t_K) generated by various taxes on capital inputs. In general the ETRMC, t_c, will reflect the METRs on all of the inputs, t_L and t_K. Comparing ETRMCs (t_c's) across jurisdictions and sectors allows us to assess the impact of tax systems on the relative marginal cost competitiveness of those jurisdictions and sectors. Thus, an important insight of figure 1 is that the ETRMC can be thought of as the effective excise tax rate implicitly levied on the firm's output due to the taxation of its inputs.

The METRs on the inputs depend both on the statutory parameters of the tax system and the characteristics of the input market as represented by the supply and demand curves. In figure 1a, for example, the rise in the user cost of labour, and therefore the METR on labour t_L, depends both on the size of the payroll tax (t_P), and on the relative slopes of the supply and demand curves, or more specifically the relative elasticities, which measure the responsiveness of supply and demand to changes in the user cost. The relative elasticities of the supply and demand curves for labour determine how much of the burden of the payroll tax is borne by businesses through a higher user cost and how much is borne by labour through lower wages (recall that the take-home wages of workers fall from w^0 to w^1 due to the imposition of the payroll tax). As also indicated above, the ETRMC depends not only upon the input METRs but also upon the shape of the marginal cost function. This requires us to express the production function in terms of parameters. For the calculations presented here, we assume a simple Cobb-Douglas parameterization, where input shares are allowed to vary across sectors. [3]

[3] We have also performed calculations for the Leontieff, or Fixed Proportions, case. The results are not materially different.

3 Effective tax rates—calculations

3.1 Data

Before we present and analyze our ETRMC calculations, it is important to consider some features of the federal and provincial tax systems that are reflected in the calculations. Although conceptually the METR and ETRMC outlined above are relatively straight forward, numerous assumptions are required to compute them. With respect to taxes on labour, the most important complication involves the presence of floors and ceilings associated with both federal and provincial payroll taxes. Lin, Picot, and Beach (1996) and Lin (2000) calculate effective payroll tax rates for all of the provinces taking these sorts of considerations in to account. Their calculations incorporate the payroll taxes administered by the federal government (the Employment Insurance Program and the Canada Pension Plan) and those administered by the provinces (Workers Compensation and various health and higher education taxes). We use their data for effective payroll taxes. Effective rates of sales and personal income taxes (PIT) are computed using data downloaded from CANSIM for six provinces. The effective sales tax rate is total sales taxes by retail sales. The effective PIT rate is personal income tax paid divided by personal income. It is important to note that, while our labour METRs vary by province and over time, they do not vary by industry. Keeping in mind that our calculations are for manufacturing industries, this should not be problematic. Inter-industry calculations of effective payroll taxes for a single year reported in McKenzie, Mansour, and Brule (1998) suggest that wage patterns across manufacturing sectors are quite similar, which means that there is little variation in effective payroll tax rates across manufacturing sectors.

In the calculations presented below, we assume that as small open economies the Canadian provinces have a supply of capital that is perfectly elastic and, therefore, that the entire burden of taxes on capital is reflected in a higher before-tax required rate of return. In the case of labour, we follow Dahlby (1992), who undertakes a survey of the literature and concludes that 30% of taxes on labour are borne by businesses through higher user costs and 70% by workers through lower take-home wages.

The taxes on capital included in our calculations are the federal and provincial corporate income tax, sales taxes on capital inputs, and provincial capital taxes. We do not include local property taxes because of the wide variation in effective property tax rates across localities and the lack of a consistent data set. For labour, we include federal and provincial payroll taxes and personal income taxes. We also treat sales taxes as equivalent to a tax on labour. This equivalence is well established in the literature on public finance. [4]

[4] Wilton and Prescott (1993) provide evidence that increases in sales taxes are reflected in higher wages.

3.2 *Effective tax rates on marginal cost*

In what follows, we analyze the calculations across several dimensions: time (28 years from 1970 to 1997), 21 manufacturing industries, six provinces, and inputs (labour and capital).

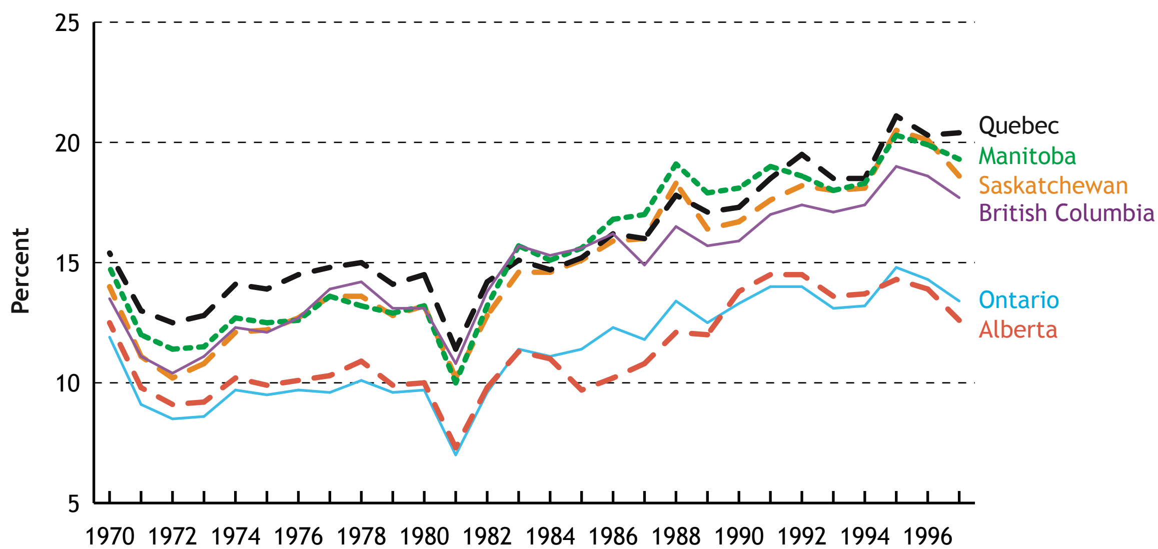
Trends over time

We begin by looking at the evolution of ETRMCs in Canada over almost three decades. Figure 2 compares the weighted average ETRMC (over the 21 manufacturing sectors) for each of the six provinces. Beginning in 1970, there was a general decline across the six provinces until 1972, followed by a slight upward trend until the early 1980s. At that point, there was a sharp decline in ETRMCs triggered by a period of high inflation and associated drop in capital METRs. [5] (We look at the METRs on capital and labour in more detail later.) The ETRMCs increased in the early 1980s and continued to increase slowly with spikes in the early and late 1990s. While figure 2 presents weighted averages across sectors, the ETRMCs for each sector (not shown) in each province follow a similar pattern.

The weighted average ETRMCs vary considerably in both level and growth across the six provinces. As seen in figure 2, Quebec has the highest ETRMC in most years but Manitoba takes that honor from 1983 to 1991. For example, in 1997 the weighted average effective rate in Quebec was 20.4%, nearly five percentage points above the national

[5] Episodes of high inflation reduce marginal effective tax rates on capital because of the deductibility of nominal rather than real interest costs.

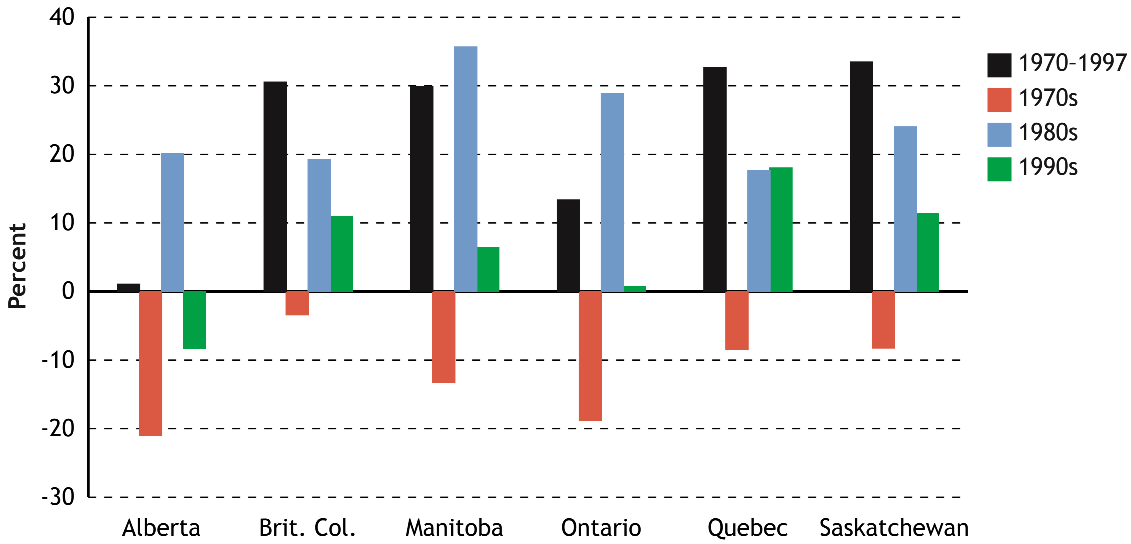
Figure 2: Weighted average of ETRMCs, by province



average for that year. The average ETRMC in Quebec from 1970 to 1997 was 16.1%. Manufacturing firms in Manitoba, British Columbia, and Saskatchewan typically faced the next highest tax rates with average ETRMCs over the period of 15.6%, 14.9%, and 15%, respectively. The ETRMC reached a high of over 20% in Manitoba and Saskatchewan, 19% in British Columbia, and over 21% in Quebec. The lowest average rates were in Alberta and Ontario with average ETRMCs of 11.5% and 11.4%, respectively. The maximum ETRMC in Alberta was 14.5% in 1991 and the minimum was 7.3% in 1981. Ontario's ETRMC reached its peak in 1995 at 14.8% and its minimum at 7% in 1981. In fact, for all six provinces, their ETRMC reached the lowest level in 1981.

In terms of growth rates, figure 3 shows that Alberta had by far the smallest increase in ETRMC of any province between 1970 and 1997. Alberta's weighted average ETRMCs increased only 1.6% over this 28-year period, from 12.5% in 1970 to 12.6% in 1997. The province with the next smallest increase in ETRMC over the period was Ontario with a 13% increase in its average ETRMC between 1970 (11.9%) and 1997 (13.4%). Much higher increases—between 29% and 33%—took place in Quebec, Manitoba, Saskatchewan, and British Columbia. The growth pattern differed substantially by decade. During the 1970s, ETRMC growth rates were negative across the board with Alberta experiencing decreases of 20%. In the 1980s, ETRMCs in all provinces showed "double digit" growth rates ranging from 17% to 35%. During the 1990s, Alberta's ETRMC declined, Ontario's rate was stable, and Manitoba's increased around 6%, Saskatchewan's and British Columbia's rates grew around 10%, and Quebec's increased close to 20%.

Figure 3: ETRMC growth rates across decades, by province



In figure 4, we compare the national ETRMC with the weighted average national statutory CIT rate. [6] The statutory CIT rate reflects differences in the proportion of income subject to the lower manufacturing and processing rate across sectors, as well as differences in both federal and provincial statutory CIT rates. [7]

Figure 4 shows that, while the statutory CIT has been generally trending downwards over the past three decades, the ETRMC has increased slightly. As figure 4 shows, the CIT rate declined from 53% in 1970 to 36.9% in 1997 but the ETRMC increased from 13.2% in 1970 to 16% in 1997. To understand the reason for this, we must refer to the calculations of the individual METRs.

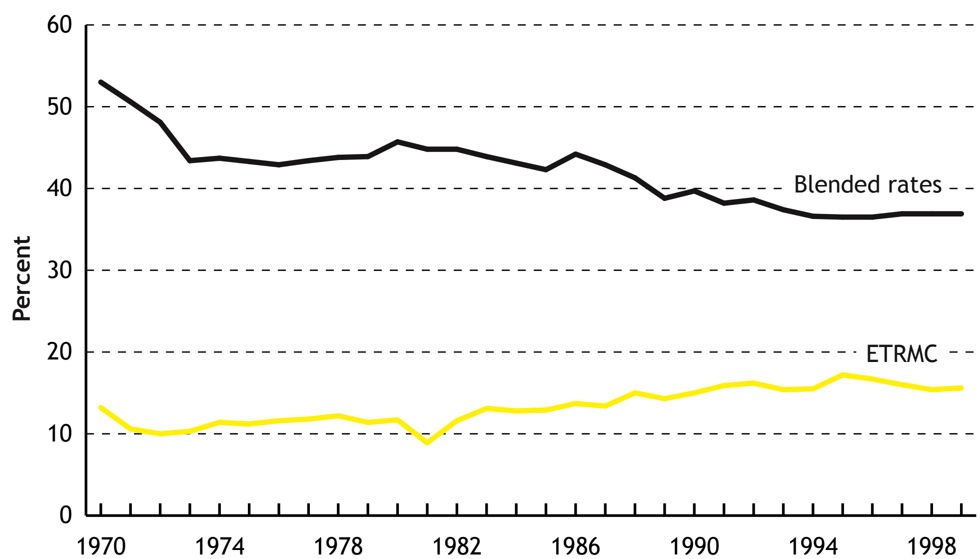
Variations across input METRs

It bears repeating that input METRs measure the extent to which the tax system increases the cost to firms of *employing* an incremental unit of an *input;* ETRMCs measure the extent to which the tax system increases the cost to firms of *producing* an incremental unit of *output*. Therefore, ETRMCs are a function of the input METRs simply because it requires many different inputs to produce one unit of output. To make the task more

[6] We use provincial weights from McKenzie, Mansour, and Brûlé (1998) normalized across the six provinces in order to compute a “national” ETRMC.

[7] The blended rate = (M&P share * Federal & Provincial Manufacturing rate) + ((1 − M&P share) * Federal & Provincial General Rate) Ibid. Income that is not a product of the manufacturing process is subject to the General CIT rate. Both the Manufacturing rate and the General rate are legislated at the provincial and federal level.

Figure 4: Blended rates and ETRMCs



manageable, individual METRs on buildings and machinery are aggregated into a single effective tax rate on capital. In some instances, these effective tax rates on capital are also averaged across sectors.

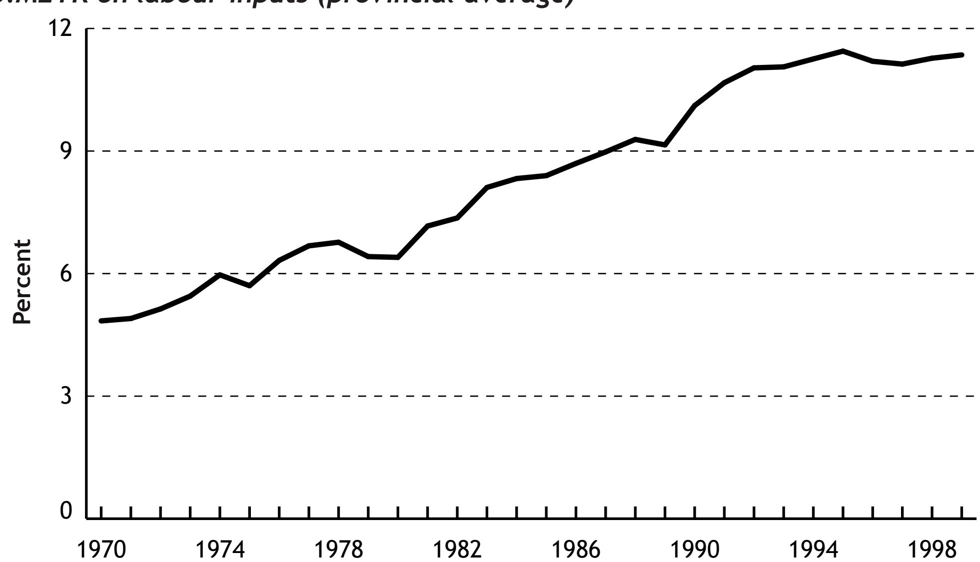
METRs on capital vary across time, province, and industries whereas METRs on labour vary over time and provinces. There are some aspects of the capital and labour METRs that we feel are important to highlight. Inter-industry and inter-provincial dispersions in both METRs and ETRMCs are far smaller than inter-input dispersions. METRs on capital inputs are generally higher than those on labour. For example, in 1997 the METR on capital in Ontario averaged 50% while its labour counterpart rate was 11.78%. [8] Manitoba (60%) and Saskatchewan (59%) lead the nation with the highest effective rates on capital while Alberta had the lowest effective rate on capital at 43%. Alberta also had the lowest METR on labour in 1997 with 6.5%, at least 4 percentage points lover than its provincial counterparts.

A high ETRMC is more often associated with a relatively high METR on labour rather than with a high METR on capital. Similarly, a relatively low labour METR usually foretells a low ETRMC. For example, in 1997 Quebec had the highest labour tax rate (at around 16%) as well as the highest ETRMC.

In terms of growth trends, the weighted average labour METRs trend upward dramatically across provinces (figure 5), concurrent with the rising importance of federal and provincial payroll taxes (see Lin, 2000). On the other hand, METRs on capital have

[8] Effective payroll, sales and personal income tax rates aggregate into the labour METR. The effective payroll tax rate is the largest component of labour METRs.

Figure 5:METR on labour inputs (provincial average)



generally decreased for all six provinces from 1970 to 1997 (figure 6). Again, Alberta leads the way with a fall of nearly 20 percentage points, from 62.6% to 43.5%. However, the major part of the decrease occurs mainly from 1970 to 1971, where it drops from 62.6% to 44.5%. The remainder of the decline took 27 years to complete. A trend line (not shown) across time reveals a slight downward trend in capital METRs.

As we have seen, statutory CIT rates have been on a downward trend for the past three decades. Moreover, METRs on capital inputs have not displayed any significant increase (and indeed a slight decrease) whereas labour METRs have increased significantly. Over the same period, the ETRMCs have increased across the provinces. This suggests that the labour METR is responsible for pushing ETRMCs upwards. This is no surprise in light of the fact that these industries are quite labour intensive. On average, labour accounts for 84% of the share of total costs and in some instances reaches 95% (e.g., Rubber). [9] Consequently, despite the fact that businesses bear only 30% of taxes levied on labour, rising labour taxes have largely dominated taxes on capital, causing the ETRMC to increase as well.

Labour taxes in our analysis are an aggregation of payroll taxes, personal income taxes, and sales taxes. Figure 7 breaks the labour taxes into these three components for Ontario. The figure shows that all three components have increased substantially over the period examined: effective payroll tax rates have tripled while sales and PIT rates have doubled. Similar trends are evident in other provinces, though with significant

[9] Inputs shares are normalized over three production inputs: buildings, machinery, and labour.

Figure 6: METR on capital inputs (provincial average)

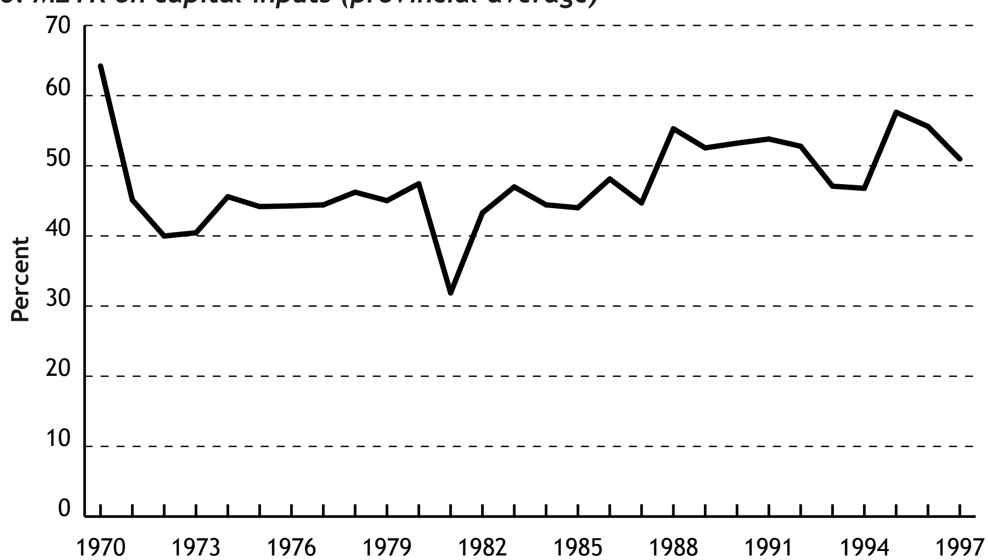
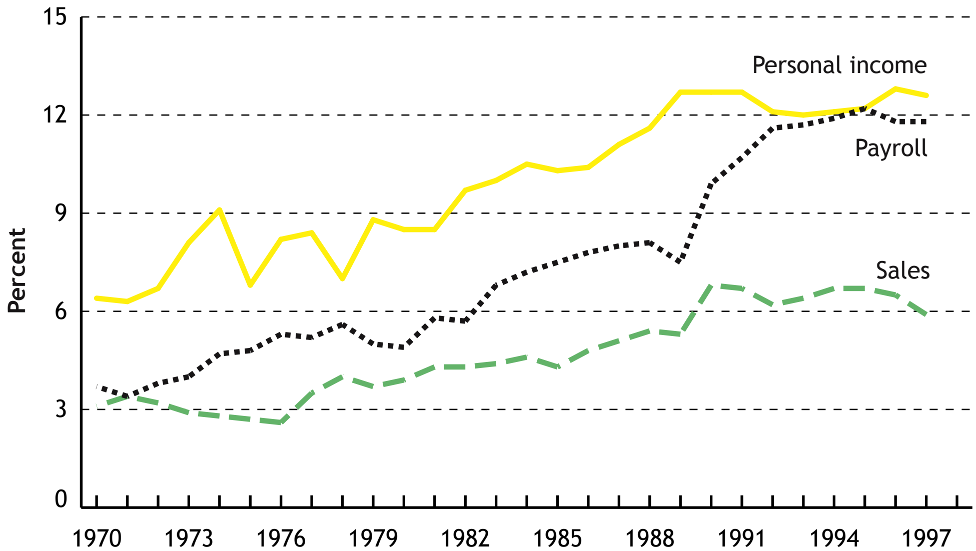


Figure 7: Growth in the subcomponents of labour METRs in Ontario, 1970-1996



differences in levels across the provinces. For example, in level as well as in growth, Alberta has consistently had the lowest effective sales tax rate, the lowest effective personal income tax rate, and the lowest effective payroll tax rate.

Perhaps surprisingly, industries with the highest ETRMCs were also the least labour-intensive sectors in the sense that they had the lowest labour inputs shares. This brings us to the next section where we look at variations in ETRMCs from industry to industry.

Variation across sectors

There is a considerable degree of variation in both the level and the growth of effective tax rates across sectors. It is clear that taxes affect individual industries quite differently. As shown in figure 8, in 1997 alone, the ETRMCs in Ontario ranged from a low of 7.1% in Leather to a high of 23.7% in Beverages. This remarkable degree of variation in levels across sectors can also be observed in the other five provinces. Sectors such as Beverages, Food, Tobacco and Chemicals have consistently been subject to relatively high rates ranging from 18% to as high as 28%. The Plastic, Printing and Publishing, Electrical and Mineral industries make up a medium group with rates ranging from 10% to 13%. The ETRMCs for the lower group, which includes all other industries, loosely range from 5% to around the 10% mark.

Sectors subject to high ETRMCs also seem to display more variation over time than those subject to lower rates. Figure 9 shows the trend over time of ETRMCs for Beverages and Leather in Ontario. The variance of the ETRMC in the Beverage industry is 7.4%, while the variance in the Leather industry was 2.4%. A similar pattern of

Figure 8: ETRMCs by industry in Ontario, selected years

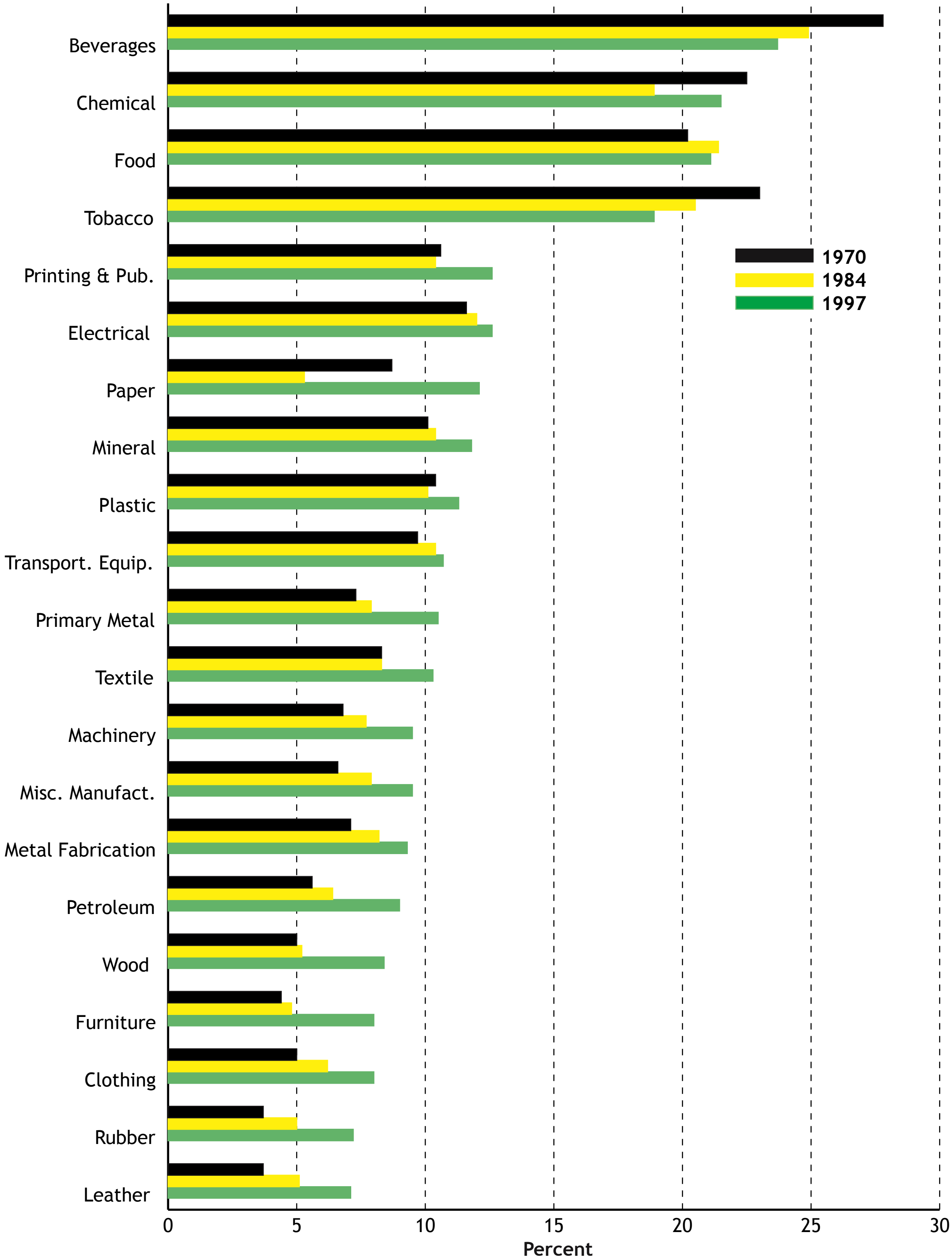
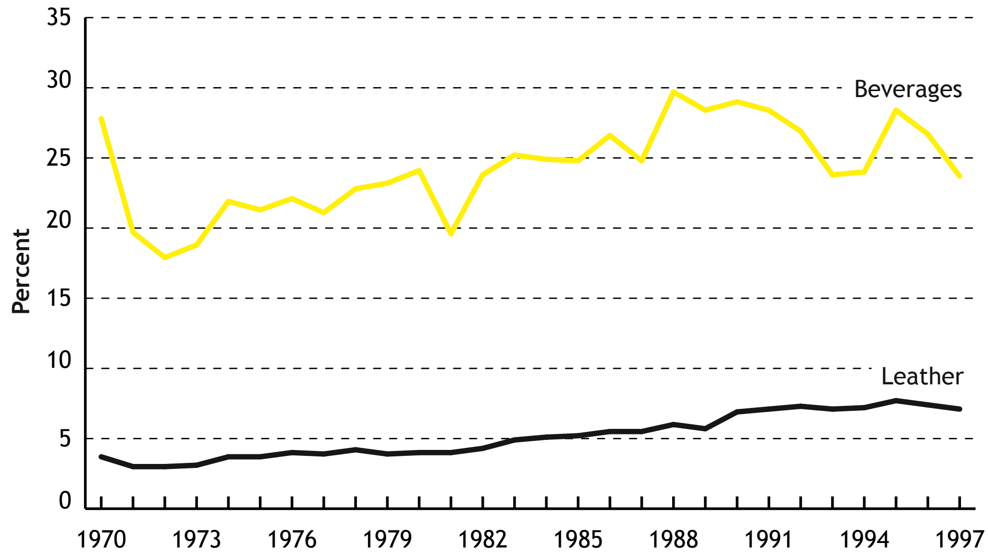


Figure 9: Trend over time of ETRMCs for Beverages and Leather in Ontario



inter-sector dispersion appears in other provinces. The explanation for this is found in differences in factor shares. Capital METRs are not only more volatile but substantially higher than labour METRs. Therefore, capital-intensive sectors (Beverages, Food, Tobacco, and Chemical) have ETRMCs tht are both high and variable.

Variations across provinces

Quebec had the highest weighted average ETRMC rate in 1997 at 20.4%, followed closely by Manitoba at 19.2%, Saskatchewan at 18.6%, and British Columbia at 17.6%. [10] Alberta and Ontario had the lowest rates at 12.6% and 13.4% respectively. Moreover, as illustrated in figure 10, there is a notable amount of variation across provinces within the same industry. For example, in the Miscellaneous Manufacturing sector in 1997 the ETRMC in Quebec was 17.29% but only 9.64% in Alberta. The ETRMC in Quebec's Miscellaneous Manufacturing sector also experienced a more rapid and higher growth than any other province. As shown in figure 11, its rate increased approximately 65% over the 28-year period whereas in Alberta the growth rate was only 25%.

[10] Industry weights are computed using normalized capital stock weights found in McKenzie, Mansour, and Brule 1998.

Figure 10: Differences in rates across provinces in Miscellaneous Manufacturing, selected years

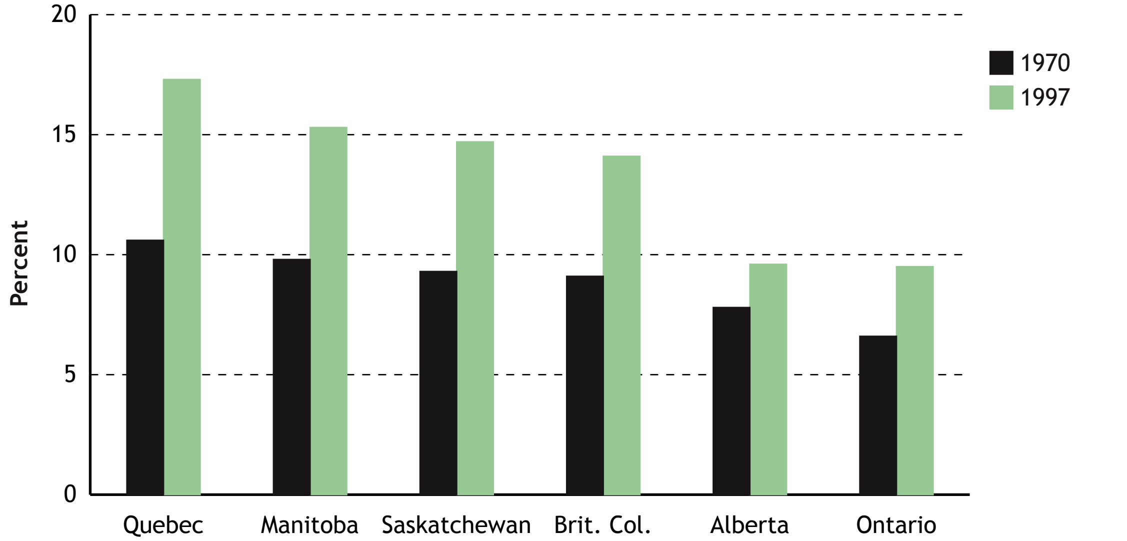
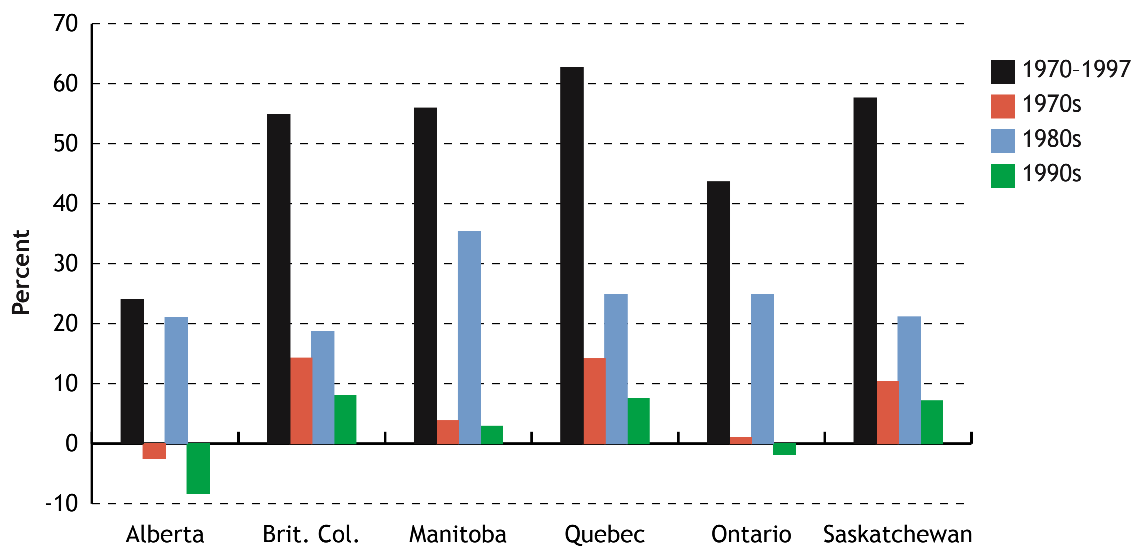


Figure 11: Differences in growth of ETRMC across provinces in Miscellaneous Manufacturing



4 The impact of taxes on business location decisions

In the preceding pages, we have documented a high degree of variation in ETRMCs across provinces and sectors and over time. A key question then becomes, does any of this matter? More specifically, does the level of business taxation as measured by the ETRMC actually retard business activity? In this section, we examine this question empirically by undertaking an econometric examination of the impact of the ETRMC on the number of establishments across industries and provinces in Canada.

In Beaulieu, McKenzie, and Wen (2002), we develop a simple theoretical model to illustrate the precise mechanism through which various taxes may affect the business location decision of firms. We do not replicate that analysis here. The model predicts, not surprisingly, that the higher the ETRMC, the lower the number of firms in equilibrium. The relationship depends, however, on the form of the production function and demand curve. The model also shows that, in the presence of substantial fixed (lumpy) costs of entry into an industry, the CIT rate itself should matter for business location decisions, independently of the effect of the CIT on the calculation of ETRMC. A higher statutory tax rate should reduce the flow of new business establishments, even if there were no change in the ETRMC.

The model generates the following reduced-form equation, which is the basis for our empirical investigation:

$$lnN_{ijt} = a_0 + a_1X_t + a_2Z_{ijt} + a_3Y_{jt} + a_4T_{ijt} + a_i + b_j + \mu_{ijt}$$

where the dependent variable, lnN_{ijt}, is the natural log of the number of establishments in sector i, province j at year t; X_t is a vector of time-varying explanatory variables common to all provinces and sectors; Z_{ijt} is a vector of time- and province-varying industry variables; Y_{jt} is a vector of time-varying province variables common to all industries; T_{ijt} are the tax variables of interest (ETRMC and CIT) that vary over industry, province, and time; a_i is an industry fixed effect and b_j is a province fixed effect. The random disturbance μ_{ijt} is *iid* normal.

Our primary interest is in the estimated parameters on the tax variables. We examine different specifications of the general reduced form model in which we include both contemporaneous and lagged values of the tax variables. The time-varying explanatory variables common to all provinces and industries may be captured by year dummy variables or a variable to control for the business cycle. We use US real GDP per capita as an exogenous control variable that picks up the macroeconomic conditions. The time-province-industry varying explanatory variables include input costs such as average real wages and energy costs. We include some control variables that vary over time and across provinces such as provincial population to capture possible agglomeration effects, and provincial government spending on infrastructure that may affect firm location decisions. Table 1 provides summary statistics.

Table 1: Summary Statistics

Variable	Definition	Obs.	Mean	Std. Dev.
lnfirms	Log Number of Establishments	3056	4.707484	1.53719
lntm	Log of (1+ETRMC)	3192	0.11904	0.046686
lnlagtm	Natural log of (1+ETRMC) lagged	3078	0.118177	0.046647
lntu	log of 1−u, u = statutory CIT tax rate	3192	−0.57309	0.081205
lnavwage	Log Average Hourly Wage	2682	−2.21582	0.267545
lnener2	Log of Energy per Shipment	2770	−4.15628	0.889613
us_pcgdp	US Real GDP per capita $'000	3192	21.6735	3.029347
pop	Population, in Thousands	3192	3898.179	3153.661
lntr	Log of Provincial Transportation Spending per Capita	3192	0.752089	0.265433

The regression results are reported in Table 2. These results are from estimating a fixed-effects version of the model where the data were pooled across the 6 provinces and 19 industries over the 28 years (1970–1997). The first four columns of table 2 present the results from estimating the model with dummy variables for sector, province, and year. The coefficient estimates on the dummy variables are suppressed but are found to be jointly statistically significant. The first four columns differ in the combinations of the tax variables that are included and the control variables that are included in the model. The last two columns of table 2 present the results from estimating a slightly different model where, instead of separate province and industry fixed effects, provinces and industries are combined to create 114 panels with 28 observations per panel.

Column 1 in table 2 presents the results from estimating the model with fixed industry and province effects. Dummy variables are used for province, industry, and year. The regression includes lagged values of the tax variables, real average wages and energy costs that vary by industry, province, and year; expenditure on transportation that varies by province and year; US GDP per capita and provincial population.

The general results are consistent with the prediction that higher taxes, as measured by the ETRMC, lead to a lower number of establishments, as is evidenced by the negative value of the coefficient on the ETRMC variable. A negative value for this parameter is robust to different model specifications. It is also statistically significant. The estimated value is economically important and yields a reasonable estimated elasticity of the tax rate. A coefficient of −2 implies an elasticity of 0.33 if the ETRMC is equal to 20%. [11] The lagged ETRMC variable (column 3) is not statistically significant and is found to be positive—but is smaller in absolute value than the coefficient estimate on contemporaneous ETRMC.

[11] The explanatory variable is actually the natural log of (1 + ETRMC).

Table 2: Regression results

Fixed effects estimation

	(1)	(2)	(3)	(4)	(5)
lntm	−1.599 C	−1.951 C	−2.078 C	−2.000 C	
	(0.556)	(0.704)	(0.973)	(0.656)	
lntu	−0.786 C	−0.033	−0.063		−0.158
	(0.196)	(0.319)	(0.540)		(0.302)
lnlagtm			0.102		
			(1.016)		
lnlagtu			0.095		
			(0.543)		
lnavwage	0.456 C	0.573 C	0.589 C	0.580 C	0.573 C
	(0.087)	(0.100)	(0.102)	(0.009)	(0.100)
lnener2	−0.051 B	−0.071 C	−0.075 C	−0.070 C	−0.070 C
	(0.022)	(0.022)	(0.022)	(0.023)	(0.022)
us_pcgdp	0.053 C				
	(0.007)				
lntr	0.105 B	0.080	0.072		
	(0.044)	(0.055)	(0.056)		
pop	0.000	0.000	0.000		
	(0.000)	(0.000)	(0.000)		
Constant	1.292 C	2.822 C	2.821 C	2.854 C	2.679 C
	(0.329)	(0.332)	(0.350)	(0.275)	(0.324)
Sector dummies	Yes	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes	Yes
Observations	2644	2644	2546	2644	2644
Adjusted R-squared	0.92	0.92	0.92	0.92	0.92

All of the models include dummy variables for province and sector. Models 2 through 5 also include year dummy variables. Each set of dummy variables is jointly statistically significant.
Parentheses indicate robust standard errors.
[A]significant at 10%; [B]significant at 5%; [C]significant at 1%.

The estimated coefficient on the statutory CIT variable is negative and is generally not statistically significant. According to our model, this coefficient should be positive, as it is measured as $1 - u$, where u is the statutory tax rate. There are several reasons that the coefficient on this variable may be imprecisely estimated and has the wrong sign. First, it is negatively correlated with the ETRMC variable and positively correlated with its lagged value. Second, the CIT differs by province but displays a great deal of persistence over time. That is, CIT remains constant for any given province for a number of years at a time. As a result, the variable is strongly correlated with the provincial dummy variables. When the ETRMC variables are excluded from the model, the coefficient on the statutory rate flips sign to be positive (column 5) but it remains statistically insignificant. When provincial dummies are excluded, the coefficient becomes positive (and very large) and becomes statistically significant at the 99% level. Therefore, it is impossible to statistically identify the independent effect of the statutory tax rate.

The coefficient estimate on ETRMC is robust to the different model specifications reported in table 2. Most of the control variables have the expected sign. The exception is the positive coefficient on the average wage variable that implies that higher wages are associated with more establishments. This result is robust across specifications and is likely the result of reverse causation: more establishments increase the demand for labour and, therefore, the number of establishments is positively correlated with average wages. We tried using lagged wages but the coefficient remains positive. We also excluded wages from the model. An important point to keep in mind is that the estimated parameters on the tax variables are not strongly affected by whether or not wages are included in the model or whether lagged wages are used instead of contemporaneous wages. Higher energy costs lower the number of establishments and higher US GDP per capita increases the number of establishments. Provincial population does not have a statistically significant effect on the number of establishments. Provincial per-capita expenditure on transportation has a positive effect on the number of establishments but this variable is generally not statistically significant. The other five columns of table 2 drop population and government expenditures from the model.

5 Discussion

This paper has presented calculations of effective tax rates on marginal costs (ETRMC) for 21 Canadian industries in six provinces covering 28 years from 1970 to 1997. The data set is unique in its scope and coverage across all three dimensions.

Our calculations show wide variations in ETRMCs across sectors, jurisdictions and over time. It is clear that the tax system in Canada produces far from a level playing field. Regardless of whether this is accidental, or in pursuit of industrial policy objectives, the extent of the variation is quite striking.

From a policy perspective, the "competitiveness" of tax systems tends to be a somewhat nebulous concept, meaning different things to different people. The ETRMC provides an economically sensible way of measuring the competitiveness of the business tax regime and comparing it across jurisdictions. The data set generated in this paper provides a unique opportunity for policy makers in Canada to undertake an assessment of the competitiveness of their tax systems relative to other provinces. The approach advocated here stresses the importance of taking all aspects of the tax system into account when assessing competitiveness. While statutory CIT rates and capital METRs have generally been falling in the six provinces studied, labour METRs have generally been increasing. The net effect has been a slight increase in the ETRMC over the 28 years studied. Moreover, the sectoral impact of the rising labour METRs has been determined in large part by the labour intensity of the various sectors. Further to this point, sectors with high capital shares tend to have both higher and more volatile ETRMCs.

The wide variation in effective tax rates across space, time, and sectors has important implications for the allocation of resources. Ultimately, tax policies affect the level, growth, and distribution of business activities in temporal, product, and geographic spaces. The emerging consensus from an empirical literature that focuses primarily upon the United States is that state and local taxes have a statistically significant, though economically modest, effect on business activity. Our empirical investigation confirms this in a Canadian setting. In particular, we find that a 1% increase in business taxes, as measured by the ETRMC, leads to about a 0.33% reduction in businesses establishments. Thus, even a small increase in the ETRMC will lead to loss of business establishments in the manufacturing sector. In 1997, when there were 34,840 manufacturing establishments in our data, a 1% increase in the ETRMC from 20% (approximately the current level) to 20.2%, would lead to the loss of approximately 115 establishments.

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