

**The economic impacts of value added taxation:
Evidence from the HST provinces¹**

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Abstract

This paper estimates the effects of the 1997 Harmonized Sales Tax Reform on business investment and consumer prices in the reforming provinces. Consistent with theory, I find the reform led to significant increases in machinery and equipment investment, in the short run at least, and that the resulting effective tax rate changes were shifted forward to consumers in most sectors of the economy. On the basis of the evidence, I conclude a similar reform in the remaining Retail Sales tax provinces would result in increases, possibly substantial, in capital stocks, while the distributional effects of the reform would be small.

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1. Introduction

Recent developments in federal-provincial relations in Canada have renewed interest in the possibility of reforming provincial sales tax systems. At present, five provinces operate retail sales tax (RST) systems, which are collected separately and on a very different basis from the federal Goods and Services Tax (GST), a value added tax on consumption; four other provinces, in contrast, levy value added taxes which are largely integrated with the federal GST.

Conventional wisdom among public finance economists has it that retail sales taxes are inferior to value added taxes that raise the same revenue for a variety of reasons, including the narrowness of their base (which distorts relative prices of marketed goods), their susceptibility to tax evasion, and their tendency to cascade through the value added chain, which distorts the relative prices of business inputs, particularly capital goods. Indeed, by one much cited estimate (Baylor and Beausejour, 2004), the excess burden of the RST tax on capital goods exceeds that of all other major tax bases operated by Canadian governments.

The aim of this paper is to go beyond conventional wisdom and provide quantitative estimates of the likely economic impacts of converting provincial RSTs to a value added base like the GST – with particular emphasis on the effects on business investment, and on consumer prices and the distribution of tax burdens resulting from the reform. To do so, we examine the actual impacts of reform in the four provinces which have already adopted value added bases (the “harmonizing provinces”),² comparing their experience to what happened in the same period in provinces which retained their RSTs. Thus we view the asymmetric nature of past sales tax reform in Canada as analogous to a “natural experiment” that allows us to control contemporaneous changes in the economic environment that would otherwise confound the analysis. This permits better inferences about cause and effect than previous studies, which have not considered a similar “control group” for the reform.

² The four are Newfoundland and Labrador, Nova Scotia and New Brunswick, which introduced the Harmonized Sales Tax (HST) on the same base as the federal GST in 1997, and Quebec, which during the 1990s gradually introduced the Quebec Sales tax (QST), a value added tax with a base now quite similar to the GST.

In the simplest terms, the policy implications of the analysis may be summarized as follows. Examination of detailed revenue data for RSTs shows that effective tax rates on business inputs including capital goods are remarkably high – indeed, more than 43% of aggregate RST revenues are estimated to come from taxing business inputs. Eliminating such taxes through harmonization would have substantial effects on business investment. By my estimates, annual machinery and equipment investment in harmonizing provinces rose 12.2 per cent above trend levels in the years following the 1997 sales tax reform. Given the high taxes on capital inputs in the remaining provinces, it seems reasonable to expect a similarly large short-run effect of reform on investment in the RST provinces as well.

The necessary implication of high taxes on business inputs under RSTs is that, if reform were to be revenue neutral, then the tax burdens levied directly on personal expenditures of consumers would rise substantially. The analysis of effective tax rates shows that, if the GST base were to be adopted, this would be achieved through the broadening of the base to include purchases of new homes and, to a lesser extent, some goods and services, rather than through increases in the statutory tax rate levied under provincial sales tax regimes.

This shift in burdens from business to consumers is typically regarded as a major obstacle to implementing such a reform. For economists, however, all taxes are ultimately paid by some people, somewhere – and never by business. That is, we must distinguish between the “statutory incidence” of a the tax – who the tax law says must pay the tax – and its “true economic” incidence – which depends on how business tax burdens are “shifted forward” to consumers or “shifted backward” to factors of production, like labour, capital, and land, through changes in prices and wages that result from the tax.

To provide some sense of the true economic distribution of burdens under the RSTs, I examine the relationship between changes in consumer prices and changes in effective tax rates in the harmonizing provinces in the years following the 1997 reform, again exploiting comparisons with the non-reforming provinces to control for economic and especially monetary factors that otherwise affected the rate of consumer price inflation at

the same time. The results show that the pattern of relative price changes among broad consumer expenditure categories was quite similar to the pattern of relative changes in taxes and business costs induced by the reform – that is, each one per cent increase in costs induced by taxes leads to approximately a one per cent increase (or perhaps more) in the price paid by consumers.

Indeed, overall, consumer prices in the harmonizing provinces fell with the 1997 reform, although prices rose somewhat for purchases of shelter and clothing and footwear, which tended to make the reform slightly regressive. The pattern of reform-induced tax changes would presumably be different if harmonization were extended to the remaining RST provinces, but their current tax systems differ from those replaced in the 1997 reform. What is important is that the results are consistent with the notion that taxes are fully shifted forward (or even “overshifted”) in most sectors, so that the change in statutory burdens would not result in large distributional effects.

The rest of the paper is organized as follows. Section 2 describes the sales tax systems of the Canadian provinces and discusses the presumed deadweight costs associated with the RSTs. Section 3 presents an accounting analysis of the changes in revenues and statutory tax burdens resulting from a hypothetical reform in which RST provinces adopted the federal GST base, while keeping statutory tax rates at current levels. Estimates of the effect of the 1997 HST tax reform on investment are presented Section 4, and on consumer prices in Section 5. Section 6 concludes.

2. Provincial sales taxation

Five Canadian provinces currently operate retail sales tax (RST) systems, while four others have adopted value added taxes which are largely integrated with the federal GST.³ Provincial sales tax reform began in 1992 with the Quebec Sales Tax, a modified value added tax system that initially accorded only limited input tax credits to firms. Input tax credits under the QST were gradually expanded, however, and by 1995 the base of the QST was largely harmonized with the federal GST. The differences between the two tax bases are described in detail in Table 2. Further reform followed in 1997 with the

³ The tenth, Alberta, levies no general sales tax.

introduction of the Harmonized Sales Tax in Newfoundland and Labrador, Nova Scotia, and New Brunswick. The base of the HST is essentially the same as that of the federal GST, collection of the federal and provincial taxes is unified, and the provincial portion of the rate is 8 per cent in all three provinces, replacing the previous RST system that levied effective rates of 11.7 to 12 per cent. Traditional RSTs remain in the provinces of Prince Edward Island, Ontario, Manitoba, Saskatchewan, and British Columbia. Alberta levies no direct taxes on consumption.

Provincial RSTs are levied on essentially all purchases of goods which take place at retail points of sale. In contrast, the GST/HST is an invoice-and-credit value added tax, which taxes sales of most goods and services by registered traders, while according full credit for taxes paid on registered traders purchases of taxable goods. In practice, the chief differences between the GST and RST bases are:

- RSTs tax many purchases of intermediate inputs by businesses, while having no provision for rebating tax paid on inputs, as in a value-added tax system. Indeed, as we shall see, a remarkable proportion of provincial “retail” sales tax revenues actually come from taxing business inputs.
- Many services, even those consumed as final demand and purchased at the “retail” level, are exempted from taxation under the RSTs. The treatment of services is complicated under the GST, with many service sectors receiving tax exempt status, while international transportation services are in fact zero-rated.⁴ Moreover, the input tax rebates paid under the GST to exempt suppliers in the Municipal, Academic, Schools, and Hospitals (MASH) sector makes these services much closer to zero-rated (i.e. tax free) under the GST.
- Consumption of housing services is exempt under the RSTs: that is, payments of rent are untaxed, and purchases of owner-occupied housing are untaxed as well. The GST also exempts market rents and implicit rents to owner-occupied housing, but it taxes purchases of new houses, albeit at a reduced rate, especially for properties valued at less than \$450,000.⁵

⁴ For supplies that are tax exempt under the GST, no tax is charged on the sale, but no input tax credits may be claimed for taxable inputs that went into its production. For zero-rated supplies, in contrast, no tax is charged but input tax credits may be claimed, so that the transaction is entirely tax free.

⁵ There is a 36 per cent rebate (implying an effective GST rate of about 4.5 per cent when the standard rate was 7 per cent) for new houses valued at less than \$350,000, with the marginal

It is conventional among public finance economists to critique RST systems because they result in substantial changes in the relative prices of marketed commodities (both RST and value added tax change the relative price of marketed versus non-marketed commodities such as leisure). In particular, RSTs exempt many types of consumption, chiefly services and intangibles, from taxation entirely, and for the most part do so in arbitrary way that has no policy justification. The resulting changes in relative after-tax prices of various goods and services are likely to lead to large departures from tax neutrality, as some sectors of the economy are artificially favoured at the expense of others. Different firms and different sectors of the economy rely on purchases of inputs subject to RST to different degrees, resulting in unequal increases in costs of production and prices, and so to further departures from neutrality and competitiveness. According to the Diamond-Mirrlees principle of production efficiency, taxes on business inputs are quite generally not part of an optimal tax system.

Related, and probably most important, provincial RSTs tax purchases of most capital goods by firms. Taxes on capital are deemed to be especially undesirable, inasmuch as they have long-lasting effects on the economy, limiting the growth of the capital stock and reducing the long-run growth of productivity and employment. Approximately one-quarter of the marginal effective tax rate (METR) on capital in Canada is the result of taxes on business inputs (Chen and Mintz, 2003). Some provincial governments in recent years have devoted much attention and political capital to reducing their “headline” rates of corporate income taxation; a simpler and perhaps more effective (though less visible) choice might be simply to eliminate the RSTs’ implicit tax on capital by moving to value-added taxation.

These problems with the RST base, as emphasized by Dahlby (2005), may be hidden from public view but are far from inconsequential. Baylor and Beauséjour (2004) report results of various simulated tax reforms from a dynamic, computable general equilibrium model of the Canadian economy. According to their estimates, the marginal cost of a dollar in revenue raised by provincial governments through sales taxes on capital is about \$2.30, compared to a mere \$1.13 for consumption taxes like the

rebate progressively decreasing to zero for house values over \$450,000. There is a similar system under the QST, but the starting and ending points are much lower (\$200,000 and \$225,000, respectively).

GST/HST. Since, as reported below, a move from provincial RSTs to the GST base would reduce taxes on capital by about \$1.5 billion at current rates of taxation, a very rough calculation suggests the potential long-run gains for the economy could be as high as \$1.75 billion.⁶

Against these advantages of the GST relative to RST base, some commentators have emphasized that broadening the tax base to include additional services may create additional economic distortions. Piggott and Whalley (2001) and Emran and Stiglitz (2005) show that value added taxation may encourage the expansion of a relatively inefficient informal sector providing services, to the extent that these producers are not subject to the tax or can more easily evade it than can other producers. This argument evidently corresponds to the casual impression of many Canadians that introduction of the GST was associated with an increase in tax evasion, particularly among smaller traders supplying household services – an impression that is to my knowledge largely untested with data, although see Spiro (1993). But, as noted by Keen (2006), these formal results ignore the fact that real-world invoice-and-credit VAT systems do tax production in the informal sector indirectly, by denying input credits to traders that evade tax on their sales. Moreover, the issue of service taxation under provincial harmonization proposals appears to be of only secondary importance: the estimates below show that the effective rate of taxation of consumption of services under the GST is about 2 per cent in aggregate, compared to about 1 per cent under the RSTs. While the aggregate figures mask greater variation for narrower commodity classifications, the differences are relatively small.

3. Fiscal consequences of reform

These differences mean that a move by the provinces from their current RST bases to any true value-added tax base will potentially have large consequences for government revenues and for the distribution of tax burdens between business and consumers, and among sectors of the economy. Just how big is however an open question. As a preliminary step, therefore, I report estimates of the change in tax revenues and

⁶ The Baylor-Beauséjour estimate is valid only for small tax changes, and the benefits to large scale reform may be somewhat smaller. Note that this calculation excludes the economic benefits of eliminating RST taxes on non-capital business inputs.

statutory tax burdens that would result if the remaining RST provinces were to replace their tax bases with the federal GST base, while keeping statutory tax rates fixed at current levels.⁷

The estimates of revenue impacts, supplied by Statistics Canada and reported in Table 1 below, are based on actual revenues of the GST and each province's RST in 2002 and effective tax rate estimates based on a detailed reading of each the tax codes, which is used to attribute revenues to various sectors of the economy using weights from the 2002 provincial input-output tables. In short, underlying my calculations are very detailed estimates of the statutory tax burdens of the existing RST and GST tax systems in 2002.⁸

To estimate the effects of reform, suppose that provinces move to the GST base, including the same exemptions and rebates for the municipal, academic, schools, and hospitals (MASH) sector and for financial services,⁹ and zero-rating of basic foods and exports (including interprovincial exports, as in the QST)¹⁰. For the 2002 data, the GST statutory rate was 7 per cent (although it has since been reduced to 6 per cent), while the RST rate was 8 per cent in Ontario, 10.7 in Prince Edward Island, and 7 per cent in the other provinces. The estimated statutory tax burdens (revenues collected) are therefore just eight-sevenths of GST revenues in Ontario, and so on proportionally for the other provinces.¹¹ Table 1 presents estimates of the change in statutory tax burdens from different sectors of the economy under such a reform.

In summary, Table 1 shows:

⁷ In Prince Edward Island, where the RST base includes GST payments, the statutory tax rate would rise to keep the effective provincial rate constant.

⁸ Thus the calculations do not incorporate effects of the various RST reforms implemented since 2002. In particular, British Columbia has since enhanced the exemptions for business inputs under their RST; the resulting reduction in revenues derived from taxing business inputs would therefore presumably be smaller today than what is reported in Table 1.

⁹ Note that this does not mean that the GST treatment of these sectors is 'ideal': for an argument that it is not, see e.g. Bird and Gendron (2007).

¹⁰ For more on the issue of implementing a subnational VAT with differential rates among provinces, see Smart and Bird (2007), as well as Bird and Gendron (2007) and McLure (2005), *inter alia*.

¹¹ Our approach assumes that exemptions and rebates for housing and the MASH sector would be the same in percentage terms as under the GST, so that effective tax rates under the hypothetical Ontario eight per cent PVAT would be eight sevenths of the corresponding GST effective rates.

- (i) Statutory burdens on business would decline substantially with harmonization to the GST base. The revenue changes are largest for current inputs, including construction inputs, but reductions in capital taxes are also substantial. Indeed, unreported detailed calculations indicate that revenues from taxing machinery and equipment purchases under the RSTs are between 4 and 6 per cent of the corresponding estimates of private gross fixed capital formation from the 2002 national accounts, including 4.4 per cent in Ontario, the largest province. Such high effective tax rates on investment prompt the work on investment impacts of harmonization in the next section of the paper.
- (ii) Effective tax rates on services would, perhaps surprisingly, change little: the reported increase in revenues from taxing services represent about 0.5 per cent of the corresponding base in Ontario, and 1.4 per cent in British Columbia. This reflects the rather low effective tax rates on services under the federal GST, as well as some recent base-broadening reforms in RST provinces that have made parts of the service sector subject to RST. Effective tax rates are low under the GST because of the tax-exempt status accorded many large services industries, including most of the finance, insurance and housing sectors, the health sector, and the MASH quasi-governmental sector.¹² Furthermore, many of the aforementioned service sectors are accorded large rebates for input taxes under the GST – they are nearly zero-rated rather than tax-exempt – so that total taxes paid on outputs and use of these sectors are indeed small. In summary, sales tax harmonization in Canada would result in a much smaller increase in taxes on consumer services than is generally believed to be the case.
- (iii) Taxes on the final demand in the housing sector would rise, primarily because the GST taxes sales of new houses (albeit at a reduced rate). However, the construction industry also faces one of the highest effective tax rates on business inputs under the RSTs, as evidenced by the large decline in input taxes in Table 1. (As a rough estimate, about half of RST taxes on construction inputs relate to residential buildings, and half to non-residential structures.) Thus the reforms would lead to reductions in construction costs

¹² Tax-exempt status implies these sectors do pay some tax under the GST, which is included in the business inputs section of the table and netted out from the much larger reduction in input taxes that results when provincial RSTs are removed.

that offset much of the new explicit taxes on housing, leaving changes in true economic tax burdens that are relatively small.

- (iv) Provincial revenues would change relatively little in aggregate – according to these estimates, the reform would be nearly revenue neutral. The single exception is Manitoba, where revenues are estimated to decline by \$151 million, or about \$130 per capita in 2002. Of course, these estimates for a single year may be a poor guide to future impacts, particular given that RSTs rely so heavily on taxation of investment goods, one of the most volatile components of the economy. Note as well that the net revenue impacts in Table 1 are based on the assumption that the RST provinces would adopt exactly the tax exemptions and rebates for various sectors that are available under the federal GST.¹³ In fact, reforming provinces would have considerable freedom to increase their revenues under the revenue by reducing the rebates available to tax-exempt or favoured sectors – just as the HST provinces did in 1997.

4. Sales tax harmonization and investment

The foregoing shows that a primary effect of reform in the RST provinces would be to reduce effective tax rates on capital. To estimate the effect of such a change on investment and long-run capital stocks, we turn to a retrospective analysis of the effects of the introduction of the Harmonized Sales Tax in 1997. While the previous RSTs of the harmonizing provinces differed from the remaining RSTs in some respects, they too imposed high effective tax rates on some capital goods, with estimated average effective tax rate on machinery and equipment in 1996 ranging from 2.6 per cent in manufacturing to 10.4 per cent in Construction, and averaging about 4.95 per cent. (Estimates of pre-reform effective tax rates are discussed in more detail below and presented in Table 4.) The broad empirical strategy is therefore to examine changes in various measures of aggregate investment in the harmonizing provinces compared to the RST provinces in the years following the reform.

¹³ This assumption is required given our data on the GST, which presents revenues net of the effects of the existing exemptions and rebates.

Figure 1 presents a graph of total private investment per capita¹⁴ in 1997 dollars for the 1986-2004 period, on average for Quebec, the HST provinces, and the five provinces that have retained their RSTs.¹⁵ The figure shows that, in the years prior to the reform, investment per capita was considerably lower in the HST provinces than others, reflecting the traditionally lower levels of GDP per capita and of capital per unit of GDP in the Atlantic provinces. However, year-to-year variations in the two investment series for HST and RST provinces track each other very closely, as both were affected by nationwide economic shocks. That pattern changes dramatically following the 1997 sales tax reform (the vertical line is between 1996 and 1997) as investment per capita in the reforming provinces began to rise, particularly relative to investment in the provinces that retained their RSTs. Notice however that the sudden rise in relative investment appears to slow or even reverse after 1999; this is as expected, since a reduction in the effective tax rate on capital goods should lead to a permanent rise in capital per unit of output, but not a permanent rise in investment flows.

A similar pattern appears in the graph of investment per capita for Quebec, although the data in this case are more difficult to interpret. We noted previously that value-added taxation was phased in under the QST during the 1990s, so that there is no clear delineation between pre- and post-reform periods; furthermore, the phase-in if anticipated by firms might actually have induced them to defer investment rather than increase it – consistent with the pattern displayed in the graph. Lastly, many of the capital assets that tend to be taxed under RSTs are still not accorded full input tax credits under the QST either, at least for large firms; it may therefore be that the QST lies “in between” a retail sales tax and a value added tax in terms of its effects on the cost of capital. For this reason, we generally exclude the Quebec data from the empirical analysis, although see below for one exception.

Of course, the pattern displayed in Figure 1 is only suggestive of the possible impacts of sales tax reform, and many other factors may have caused the run-up in relative investment rates in HST provinces. For example, it may reflect a general rise in economic growth in the HST provinces, rather than investment per se; it may reflect long-term trends in the HST provinces unrelated to the reform; and it may reflect changes in the relative cost of capital there that have nothing to do with taxes.

¹⁴ The data are for business gross fixed capital formation, from the Provincial Economic Accounts.

¹⁵ Alberta, which does not levy a sales tax, is excluded.

To address some of these concerns in a simple way, we present in Table 3 estimates of the effects of HST reform on investment based on a multiple regression strategy. In each of the regressions, the logarithm of real investment per capita in each of the nine provinces is regressed on the logarithm of real provincial GDP per capita (to control for provincial business cycle effects) and a dummy variable equal to one in years and provinces for which the HST was in place and equal to zero otherwise. All regressions also include estimated fixed effects for each year and separate estimated linear trends for each province, not reported in the table. That is, this approach allows for the possibility that investment was on average higher in Canada after 1997 for reasons unrelated to sales tax reform, and say that investment grew faster over the sample period in Newfoundland and Labrador (a HST province) than in other provinces for reasons unrelated to sales tax reform.¹⁶ That is, the estimating equation is

$$(1) \quad \text{LOGINVPC}_{it} = \alpha_i^0 + \alpha_i t + \delta_t + \beta \text{HST}_{it} + \gamma \text{LOGGDPPC}_{it} + \varepsilon_{it}$$

where LOGINVPC is the logarithm of investment per capita in province i and year t , and HST is a categorical variable equal to one in the HST provinces in years after the reform and equal to zero otherwise. The key coefficient to be estimated is evidently β , our difference-in-difference effect of the reform. For the estimates reported below, we calculate estimated standard errors of estimates that are robust to arbitrary heteroskedasticity and contemporaneous correlation among provinces within the HST and RST groupings.¹⁷

In the leftmost column of figures in Table 3, the dependent variable is real gross fixed capital formation per person, as in Figure 1. The estimated coefficient of 0.111 for HST dummy variable indicates that investment per capita rose 11.1 per cent higher above the trend in HST provinces in post-reform years, relative to RST provinces in post-reform years. The difference is significantly different from zero at the 95 per cent significance level.

¹⁶ Certainly, investment in Newfoundland has risen with the development in recent years of the offshore oil sector. This is addressed in part in the regressions by including provincial GDP per capita as a control variable; moreover, the qualitative results of the analysis are robust to excluding Newfoundland and Labrador entirely from the data set.

¹⁷ The robust standard errors are calculated with the “cluster” option to Stata’s regress command.

The remaining three columns report estimates of the same regression equation, using narrower components of investment as the dependent variable. In the second column, the dependent variable is real business investment in machinery and equipment – the component most affected by the reform. The effect of HST reform on M&E investment is larger, at 16.7 per cent, than for the total, significantly different from zero at the 95 per cent confidence level. In the third column, the dependent variable is real business investment in non-residential buildings per capita; the HST impact here is larger than before but not significantly different from zero. This is not entirely unexpected, since the provincial RSTs that the HST replaced tend to tax M&E investment more heavily than investment in buildings.

The last column of Table 3 performs a further robustness check of the results, using real investment in residential buildings per capita as the dependent variable. Observe that HST reform should likely *not* have a positive effect on housing investment, since housing final demand is taxed under the GST/HST base, and the direct negative effect of the reform probably outweighed the indirect positive effect of the reduction in implicit taxes on residential construction. However, if the results so far simply reflect an improvement in asset values and investment climate in the reforming provinces relative to the others, then the regression approach might suggest a positive effect of HST on housing as well. The results however essentially no change in housing investment in the HST provinces relative to the others in the years following the reform, which reinforces the idea that the results reported so far reflect the sales tax reform rather than other contemporaneous factors.

While the results are suggestive, the aggregate investment data may include a number of confounding effects of economic changes in the Atlantic provinces that were roughly coincident with the HST reform, and which are therefore not adequately handled by the difference-in-difference strategy. Most notably, offshore oil and gas projects in Newfoundland and Nova Scotia likely boosted investment in that sector for reasons unrelated to sales tax reform, and the introduction of the Atlantic Investment Tax Credit and related provincial credits from 1997 may have had similar effects in manufacturing and processing industries.

To go further, therefore, I turn to investment data disaggregated to the two-digit industry level from Statistics Canada's Capital and Repair Expenditures survey. Unlike the Provincial Economic Accounts (PEA) data, the Capital Expenditures data are available on a consistent basis only for the 1992-2005 period, and only nominal values of investment expenditures are recorded. I deflate the data with the province-specific implicit price indexes for gross fixed capital formation derived from the PEA data.

Table 4 presents the average annual investment levels per capita for each of the six industry groupings examined, the two-digit industries for Agriculture, Mining, Construction, and Finance and Insurance, and for two broader aggregates of Wholesale and Retail Trade and Transportation and for Other Services.¹⁸ The first column shows the population-weighted averages of provincial total investment per capita in each industry, an indication of the relative importance of each in the aggregates. The remaining two columns report the effective tax rate on capital goods induced by the pre-reform RSTs in the harmonizing provinces. These tax rates were estimated by Statistics Canada on the basis of the 1996 provincial Input-Output tables and a detailed reading of the tax laws of each of the three provinces, and are calculated to include the direct effect of taxes paid on capital inputs as well as the indirect effects of the higher costs in capital goods-producing industries, assuming full forward shifting of the taxes.

The data show that the highest effective tax rates were imposed on machinery and equipment investment in the Construction sector at a 10.4 per cent average effective rate, and the rates vary widely among sectors, to a low of 2.6 per cent in manufacturing. Estimated effective tax rates on buildings are above four per cent in most sector, which of course reflects not the direct imposition of retail sales taxes on business purchases of structures, but rather the RSTs on construction inputs that are deemed to be "embedded" in their producer prices. For structures, the lowest effective rate is in Mining, which presumably reflects the large share of imported capital goods in use in the sector.

¹⁸ Other Services includes all other two-digit industries except Public Administration, Education Services, and Health Care and Social Assistance, where investment decisions are likely to reflect factors other than taxes, and which are therefore excluded altogether from the analysis. Indeed, many producers in these sectors are tax-exempt under the HST, so that effective tax rates on investment were in any case largely unaffected by the reform.

Table 5 reports further difference-in-difference estimates of the effect of HST reform, based on the alternative data. In the interests of brevity, only the coefficients on the dummy variable for the HST reform are reported; all regressions include controls for log real GDP per capita and year fixed effects and province-specific linear time trends, as before. The first row is the “baseline” specification corresponding most closely to the results for the PEA data; in it, the investment data are for the aggregate of all industries excluding Public Administration. The estimates in this case are similar but smaller, which may reflect the shorter sample period or differences in definitions, and now only the estimate for the machinery and equipment category is significantly different from zero. Since this appears to be the most reliable estimate of the aggregate effect of HST reform per se, I highlight the result that machinery and equipment investment in the harmonizing provinces rose 12.2 per cent above trend, excluding Mining, in the years following the reform.

To address the possibility that the results are confounded by unrelated changes in oil and gas capital investments, I next exclude Mining sector investment from the total. Results in the second row show that the significant effect remains for the machinery and equipment category, though the point estimate for buildings is now essentially zero. As a further robustness check, results in the third row are for the baseline specification including the Quebec observations, treating them as part of the treatment group beginning in 1995, the year that widespread input tax credits were available under the QST. Once again, a significant positive effect remains for machinery and equipment. The final row reports results of a “pure” difference-in-difference specification, which excludes the province-specific time trends, which is also broadly similar.

Table 6 addresses the influence of contemporaneous changes in corporate tax systems, which may in principle confound our estimates of the impact of HST reform. To do so, I obtained estimates of the Hall-Jorgensen user cost of capital (UCC) by industry, province, and year for the 1993-2004 period from the federal Department of Finance¹⁹ for each of our broad industry groups except Mining.²⁰ The user cost estimates are based on fixed assumptions about the financial structure and financial costs of representative firms, and reflect detailed data on the asset mix of the different industries and the statutory tax rates, capital cost allowances, and investment tax credits in the federal and

¹⁹ For detail on the user cost methodology, see Department of Finance (2005).

²⁰ Corporate taxation in the Mining sector is complicated.

provincial income tax laws. In fact, inspection of the user cost data shows that the corporate tax treatment of investment remained largely unchanged over the sample period in all sectors other than Manufacturing, where user costs fell after the introduction of the Atlantic Investment Tax Credit in 1997 and related provincial credits.

To control for such effects, I perform the difference-in-difference regressions for each industry group separately, and I include the log of the estimated user cost of capital as an additional control variable. Thus the estimating equation becomes:

$$(1') \quad \text{LOGINVPC}_{it} = \alpha_i^0 + \alpha_i t + \delta_t + \beta \text{HST}_{it} + \eta \text{UCC}_{it} + \gamma \text{LOGGDPPC}_{it} + \varepsilon_{it}$$

Where UCC is the computed user cost of cost of capital for the relevant industry, province, and year, based on federal and provincial corporate income tax considerations alone – excluding the effect of input sales taxes.

The user cost data exclude two years, 1992 and 2005, covered by the investment data. To keep the sample unchanged when the UCC is included, the 1993 UCCs are simply imputed for the 1992 values, and the 2004 UCCs for the 2005 values. This imputation notwithstanding, the investment data at the two-digit industry level is missing for some industries, provinces, and years for reasons of confidentiality. This problem is especially pronounced among the reforming provinces, where industrial concentration is presumably higher. As a consequence, the two-digit industry panels are unbalanced, and the regression sample years and provinces differ from sector to sector in the rows and columns of Table 6. For this reason, caution must be exercised in comparing estimates for different sectors and asset groups.

Table 6 again reports only the estimated coefficient for the HST reform variable and suppresses the others for brevity. Note, however, that the unreported coefficient estimates for the UCC variable are typically very large (implausibly so) and occasionally of the wrong sign, but are in most cases insignificantly different from zero. This likely reflects the aforementioned stability of the user cost over the sample period, which makes the variables roughly collinear with the unobserved province effects. In short, there is not enough within-province variation in user costs to allow us to distinguish its effects on investment from other, unobserved factors that explain the persistent

differences in per capita investment levels among the provinces. In any case, the inclusion of UCC has only a negligible impact on the estimated effect of the HST reform in all sectors other than Manufacturing. In Manufacturing, the estimated effect of the HST reform is a 20.3 per cent increase in machinery and equipment investment when the UCC is excluded from the regression, but a mere 2.3 per cent when it is included.

Indeed, in most of the six sectors, the estimated effect of HST reform on machinery and equipment investment is small and insignificant. In Agriculture, Fishing, and Forestry, however, machinery investment rose about 26 per cent above the trend level following the reform, when the separate impact of UCC changes is controlled for. In the Trade and Transportation sector, investment is estimated to have declined significantly following the reform. Aside from Manufacturing, where the estimate reflects the contemporaneous changes in corporate taxes, the smallest point estimate is for the Finance and Insurance sector. In fact, Finance and Insurance is the industry with the smallest change in effective tax rates following the HST reform, since a substantial portion of the sector is treated as exempt from the GST/HST and therefore does not receive input credits for taxes paid on its inputs.

The estimates for investment in buildings, reported in the second column of the table, are more widely dispersed, and indeed some of the estimates seem implausibly large. The estimate for Manufacturing is a 79 per cent increase. The estimates are significantly positive in four sectors and significantly negative in one.

5. Economic incidence of harmonization

The analysis thus far has focused on the effects of eliminating RST taxes on business inputs, particularly capital goods, by adopting instead the GST tax base. If such a reform were to be implemented on a revenue neutral basis for the RST provinces, however, then the statutory tax burdens imposed on consumer expenditures would necessarily rise concomitantly. The accounting analysis of statutory burdens in Section 3 implies that this change would be achieved primarily through expansion of the sales tax base (particularly to include purchases of new homes) rather than through changes in

statutory tax rates. This shift in statutory burdens is typically regarded as a major obstacle to implementing such a reform.

The question is to what extent shifts in statutory burdens are reflected in shifts in true economic incidence, which in turn depends on the extent to which input taxes are shifted forward to consumers in the form of higher prices, or backward to factors of production, under the existing RSTs. The housing sector gives an apt example of the issue: the figures reported in Section 3 indicate that (in the absence of behavioural responses) the tax reform would result in roughly \$1.8 billion annually in new taxes on housing in the province of Ontario, while simultaneously reducing taxes on residential and non-residential construction there by about \$1.6 billion. It should then be evident that the distributional implications of such a reform depend crucially on the extent to which the reduced taxes on construction inputs are shifted forward to consumers in the form of lower housing prices and residential rents, or shifted backward to owners of labour, capital, and land used in the production of housing services.

The notion that the economic effects of a tax are independent of whether it is imposed on the seller of a good (as under the RST) or on the purchaser (as under the GST) is a fundamental – but largely untested – precept of public finance. However, RSTs apply to only a portion of business inputs, so that the effects of the reform on consumer prices are in principle more complicated than a pure, neutral shift in statutory tax incidence. Furthermore, when firms have market power and consumers are imperfectly informed about taxes, it may be reasonable to suppose that business markups change when “hidden” taxes on business inputs are replaced by explicit taxes on consumers (Chetty et al., 2006).

To address the economic incidence question, I again turn to an analysis of the actual effects of the 1997 reform in the HST provinces. In this section, I examine the relationship between changes in consumer prices and changes in effective tax rates in the harmonizing provinces in the years following the 1997 reform, again exploiting comparisons with the non-reforming provinces to control for economic and especially monetary factors that otherwise affected the rate of consumer price inflation at the same time.

My empirical strategy of examining changes in consumer prices after the reform was also employed by Murrell and Yu (2000), who estimated the effect of HST reform as the average forecast error after 1997 from an estimated autogressive process for consumer prices in the reforming provinces. The present analysis differs from theirs chiefly by incorporating measures of the effective tax rate changes by expenditure category, and by estimating *differences in* price changes between HST and RST provinces, in order to control for nationwide factors unrelated to the reform that may have affected the rate of price inflation after 1997. One such factor, which is likely to have exerted an important influence on price changes throughout the country during the period, is monetary policy. From July 1997, when the reform was implemented, the bank rate rose from 3.25 per cent to 6 per cent in the latter half of 2000, suggesting a significant tightening of monetary policy that may well have impeded price growth in the reforming and non-reforming provinces alike.

In some respects, the 1997 reform exerted a different influence on prices than might be anticipated to result from further harmonization in the remaining RST provinces. In the 1997 reform, statutory tax rates fell from 11.7 per cent in Nova Scotia and New Brunswick and 12 per cent in Newfoundland and Labrador to 8 per cent in all three provinces under the HST; the analysis of Section 3 indicates that harmonization to the GST base would be approximately revenue neutral if statutory tax rates remained unchanged at 8 per cent in Ontario and 7 per cent in British Columbia.²¹ This might suggest that the tax base in the RST provinces is already broader than it was in the HST provinces prior to the reform, that provincial revenues declined with the 1997 reform (Blagrove, 2005), or both. Furthermore, to the extent that a smaller portion of the value added chain lies within the HST provinces (which are smaller and have less developed secondary and tertiary economic sectors) than other provinces, the elimination of taxes on business inputs there had a smaller effect on business costs than it would in the RST provinces, where embedded input taxes are larger in proportion to consumer expenditures, and elimination of input taxes would “cascade” through the value added chain and so potentially result in more than proportional reductions in costs. Nevertheless, comparing changes in effective tax rates in the 1997 reform to the corresponding changes in consumer prices allows us to estimate the average degree of “passthrough” of tax changes to price changes. In particular, we are able to test the hypothesis that tax

²¹ The same is true for Prince Edward Island, Manitoba, and Saskatchewan, for which revenue data are not reported in Section 2.

changes are fully shifted forward to consumer prices, consistent with the standard theory.

The goal is to estimate the relationship between consumer prices, cost, and taxes, say

$$(2) \quad q_{it} = f[DIRTAX_{it}, p_{it}(\tau_{it})]$$

where q_{it} is the consumer price of a particular commodity group in province i and year t , $DIRTAX_{it}$ the corresponding tax rate levied directly on sales to consumers, and p_{it} the producer price (or marginal cost) of the good, which may in principle depend on the full vector of input tax rates τ_{it} . In my data, I observe consumer prices and direct and indirect tax rates, but not producer prices; I therefore proxy the producer price by the function

$$(3) \quad p_{it} = p_{it}^0(1 + IND TAX_{it})$$

where $IND TAX_{it}$ is the estimated percentage by which unit costs of the good sold in province i are increased through the input tax system in place in year t , and p_{it}^0 is the unobserved component in producer prices unrelated to taxes, discussed further below. Combining (2) and (3) and employing a log-linear approximation gives a general reduced form estimating equation

$$(4) \quad \log q_{it} = \alpha_i + \delta_t + \beta \log(1 + DIRTAX_{it}) + \gamma \log(1 + IND TAX_{it}) + \varepsilon_{it}$$

where α_i and δ_t are fixed effects to be estimated, which together capture unobserved factors influencing the unobserved component in both producer prices and pricing behaviour that varies persistently among provinces, or nationally over time; and ε_{it} is an iid error term. In (4), the parameters β and γ measure the elasticity of consumer prices with respect to direct and indirect taxes – the extent to which taxes are shifted forward to consumers. Under the null hypothesis of competitive behaviour and full forward shifting, $\beta = \gamma = 1$.

In general, in non-competitive industries, shifting elasticities may differ from unity, and the direct and indirect shifting elasticities may differ from each other.²² In practice, in my data, *DIRTAX* and *INDTAX* are highly collinear, since both tax rates fell for most commodity groups in the HST provinces after the 1997 reform, which makes separate estimation of the two elasticities difficult. I therefore constrain $\beta = \gamma$ and define the combined tax rate

$$(5) \quad TOTTAX_{it} = (1 + DIRTAX_{it})(1 + INDTAX_{it}) - 1$$

yielding the final estimating equation

$$(6) \quad \log q_{it} = \alpha_i + \delta_t + \beta \log(1 + TOTTAX_{it}) + \varepsilon_{it}$$

To estimate (6), I obtained from Statistics Canada's Input-Output division estimates of the effective tax rates on consumer purchases of goods and services under all provinces' RSTs in 1996, and for the reforming provinces in 1998, after the reform had been implemented. As noted, the effective tax rates incorporate both the taxes imposed directly on consumer purchases and indirectly on business input costs, and are based on a detailed reading of the sales tax laws of each of the provinces.²³ The effective tax rates were then aggregated to the level of the eight major expenditure categories in the Consumer Price Index survey, using province-specific fixed weights from the 1998 provincial Input-Output tables. These calculations allow us to estimate the "tax shock"

²² This is particularly the case because the indirect tax is a tax on marginal costs, whereas the direct tax is a tax on marginal revenues; see Keen (1998).

²³ The estimates, which were provided by Ziad Ghanem of Statistics Canada, reflect the extent to which input taxes have increased the unit cost of commodities, the extent to which those cost increases have further increased the cost of commodities, and so on. Algebraically, let $A=(a_{ij})$ denote the matrix of expenditure shares of each reproducible commodity j in the production of commodity i , derived from the 1998 input-output tables, and let τ_t denote the vector of ad valorem input tax rates for all commodities in year t . Taking a first order approximation to the cost functions of all sectors and employing Shephard's lemma yields a formula for the year t vector of indirect tax rates

$$INDTAX_t = (I - A)^{-1} A \tau_t$$

that is the basis for the estimates in my data.

of the 1997 reform – the extent to which producer prices plus sales taxes changed on average in the HST provinces – for each of the major expenditure categories.

These estimated effective tax rate changes, together with the corresponding expenditure shares for the CPI basket, are reported in the first two columns of Table 7. Observe that the overall effect of the reform was to reduce effective taxes by 0.5 per cent of consumer expenditures, indicating that the decline in statutory tax rates and elimination of input taxes more than offset the impact of expanding the base to include additional consumer expenditures. While the overall decline is small, there is considerable variation among expenditure categories, with effective tax rates rising for shelter costs and clothing and footwear due to base expansion, whereas rates declined by as much as 3.4 per cent of expenditures for alcohol and tobacco products, reflecting the reduction in statutory tax rates, as well as other changes in excise taxation that were contemporaneous with the HST reform.

Before turning to the elasticity estimates, consider first a regression where the tax term in (6) is replaced by a dummy variable for the HST reform, in addition to the dummy variables for each province and year.²⁴ This corresponds exactly to the investment regressions of Section 4, and it generates a convenient estimate of the percentage by which prices fell in the HST provinces after the reform, compared to the contemporaneous change in the RST “control” provinces. For these and subsequent regressions, I use CPI data for the 1992-2005 period, since the CPI reference basket changed in 1992. The regressions are performed separately for each of the eight major expenditure categories in the CPI bundle, as well as the aggregate of all commodities. Naturally, innovations in the price series tend to be persistent over time, which may reduce the efficiency of OLS coefficient estimates and bias the estimated standard errors. I deal with this by using annual rather than monthly CPI data and by reporting Prais-Winsten Generalized Least Squares estimates which allow for province-specific first-order auto-correlation in the error term.

The results for each expenditure category are reported in the third column of Table 7. The first row shows that in aggregate CPI prices fell by about 0.3 per cent in HST provinces after 1997, relative to the corresponding change in RST provinces. This

²⁴ In fact, the index numbers are normalized so that each series equals 100 in all provinces in 1986, so that province fixed effects tend to be small and often insignificant.

difference is statistically insignificant but extremely close to the estimated 0.5 per cent reduction in taxes under the reform.

Regressions for the eight component expenditure categories tell a similar story. On average, prices in HST provinces declined relative to RST provinces for five of the eight categories and rose for three. The signs correspond to the sign of the estimated change in the effective tax rate in all categories but one (Transportation, where prices rose despite a decline in taxes) and the magnitudes are generally quite similar.

Particularly notable, perhaps, are the estimated 1.4 per cent price increase for Shelter, reflecting the extension of the tax base to include new house purchases, and 1.5 per cent price increase for Clothing and Footwear, which also likely reflects the broader base of the HST. Since expenditure shares for these categories tend to be larger for low-income households, this raises the possibility that the reform was regressive, raising the average prices faced by low-income households while decreasing them overall. The notion that the federal GST is less progressive than the Manufacturers' Sales Tax it replaced in 1991 or than an equal-yield expansion of federal income taxes has been a significant issue since its inception (see, e.g., Ruggeri and Bluck, 1990). Differences in progressivity of the GST and the RSTs should be smaller, since the bases are far more similar. A simple way of measuring progressivity of the estimated price changes is to consider a notional household that allocates 20 percentage points more of its income to the categories for Food, Shelter, and Clothing and Footwear than the shares in the aggregate CPI bundle reported in Table 7, which corresponds roughly to the way Statistics Canada estimates low-income cutoff levels below which families are often deemed to be poor.²⁵ Using these weights to aggregate the estimated tax and price changes, we find that on average effective tax rates were unchanged for low-income households, but the corresponding price index rose by 0.24 per cent. Thus I conclude that the HST reform had a mild regressive impact. In the absence of similarly detailed information on the pattern of effective tax rates in the RST provinces today, however, we are unable to determine whether further harmonization would also be regressive.

²⁵ Thus the expenditure shares for Food, Shelter, and Clothing and Footwear rise to 23.6 per cent, 37.0 per cent, and 8.4 per cent, respectively, while the other shares of scale down proportionately in order that the total sum to 100 per cent. This does not correspond exactly to the definition of the low-income cutoff, which is the income level at which a typical household's expenditures on food, shelter, and clothing exceeds that of the average family with the same demographic characteristics by 20 percentage points.

Our primary concern remains with the “passthrough elasticity,” estimating the degree to which tax changes in each category are shifted forward to consumer prices. Observe that the ratio of estimated changes in each row of columns 3 and 2 of the table already gives one estimator of the passthrough elasticity. Excluding the Transportation sector where the estimated changes are of opposite sign, though insignificant, the elasticity estimates range between 0.5 for Recreation, Education and Reading and 2.4 for Household Operations and Furnishings.

The alternative estimate of the passthrough elasticity is the point estimate of the tax term coefficient in equation (6) above; this estimator therefore also exploits the variation in tax changes among provinces within the reforming group (which initially had separate RST systems imposing different effective tax rates). The results for each expenditure category are reported in the fourth column of Table 7. The estimated passthrough elasticity for the aggregate price index is in fact 1.0, and the estimates for individual categories range from -1.5 for Transportation to 8.6 for Recreation. The estimated elasticities are in fact statistically indistinguishable from 1.0 (full passthrough) for four of the eight component categories, as well as the aggregate. In two of the others, the estimate is significantly greater than unity, suggesting that taxes are “overshifted” to consumer – a common finding in the empirical literature on tax incidence in oligopolistic markets.

In summary, the results show that the pattern of relative price changes among broad consumer expenditure categories was quite similar to the pattern of relative changes in taxes and business costs induced by the reform. Overall, consumer prices in the harmonizing provinces fell with the reform, although prices rose somewhat for purchases of shelter and clothing and footwear, which tended to make the reform slightly regressive. The pattern of reform-induced tax changes would presumably differ in the remaining RST provinces, but the results are consistent with the notion that taxes are fully shifted forward (or even overshifted) in most sectors, so that the change in statutory burdens would not result in large distributional effects.

6. Conclusion

Conventional wisdom among public finance economists has it that retail sales taxes are inferior to value added taxes that raise the same revenue for a variety of reasons, including the narrowness of their base (which distorts relative prices of marketed goods), their susceptibility to tax evasion, and their tendency to cascade through the value added chain, which distorts the relative prices of business inputs, particularly capital goods. Indeed, Baylor and Beausejour (2004) find that the excess burden of the RST tax on capital goods exceeds that of all other major tax bases operated by Canadian governments.

This paper has provided quantitative estimates of the likely economic impacts of converting provincial RSTs to a value added base like the GST – with particular emphasis on the effects on business investment, and on consumer prices and the distribution of tax burdens resulting from the reform. To do so, we examined the actual impacts of reform in the four provinces which have already adopted value added bases (the “harmonizing provinces”), comparing their experience to what happened in the same period in provinces which retained their RSTs.

Examination of detailed revenue data for the RSTs showed that effective tax rates on business inputs including capital goods are remarkably high. Eliminating such taxes through harmonization would have substantial effects on business investment. By my preferred estimate, annual machinery and equipment investment in harmonizing provinces rose 12.2 per cent above trend levels in the years following the 1997 sales tax reform. Given the high taxes on capital inputs in the remaining provinces, it seems reasonable to expect a similarly large short-run effect of reform on investment in the RST provinces as well.

The necessary counterpart of the observation about RST input taxes is that a revenue neutral harmonization would increase statutory tax burdens on consumers substantially, especially through the broadening of the base to include purchases of new homes. This shift in statutory burdens is typically regarded as a major obstacle to implementing such a reform. The question is to what extent shifts in statutory burdens are reflected in shifts in true economic incidence, which in turn depends on the extent to which input taxes are shifted forward to consumers, or backward to factors of production, under the existing RSTs.

To answer this, we examined the relationship between changes in consumer prices and changes in effective tax rates in the harmonizing provinces in the years following the 1997 reform, again exploiting comparisons with the non-reforming provinces to control for economic and especially monetary factors that otherwise affected the rate of consumer price inflation at the same time. Results showed that the pattern of relative price changes among broad consumer expenditure categories was quite similar to the pattern of relative changes in taxes and business costs induced by the reform. Overall, consumer prices in the harmonizing provinces fell with the reform, although prices rose somewhat for purchases of shelter and clothing and footwear, which tended to make the reform slightly regressive. The pattern of reform-induced tax changes would presumably differ in the remaining RST provinces, but the results are consistent with the notion that taxes are fully shifted forward (or even “overshifted”) in most sectors, so that the change in statutory burdens would not result in large distributional effects.

Table 1: Revenue consequences of implementing provincial VATs

	Prince Edward Island	Ontario	Manitoba	Saskatchewan	British Columbia
- \$ millions -					
Estimated change in statutory tax burdens on:					
Consumers					
- Goods	+28	+1252	+67	+200	+353
- Services	+11	+754	+70	+115	+722
- Housing	+16	+1816	+73	+52	+549
Business					
- Construction inputs	-25	-1553	-116	-130	-519
- Other intermediate	-16	-1516	-106	-119	-516
- Capital	-12	-1021	-125	-79	-351
Government	-4	+147	-14	-24	-15
Total	-1	-121	-151	+16	+224
Tax rate	10.7%	8%	7%	7%	7%

Source: 2002 Input-Output tables and Department of Finance calculations.

Table 2. Differences between GST and QST

<u>Item</u>	<u>GST</u>	<u>QST</u>
Rate of Tax	6% of taxable sales	7.5% applied to taxable sales including GST (7.95% on price excluding GST)
Treatment of Input Costs	Full Input Tax Credit (ITC) for all taxable and zero-rated sales	Input Tax Refund (ITR) Subject to limits specified below ¹
<u>Rebates for:</u>	100%	0
Municipalities	68%	47%
Schools	67%	47%
Universities and Colleges	83%	51.5%
Hospitals	50%	50%
Charities and other qualifying NPOs		Zero-rated
Treatment of Financial Services	Exempt ²	
Sales to Federal Government	Taxable	Exempt
Sales to Quebec Government	Exempt	Exempt
New housing rebates	36% rebate of GST if house price is \$350 K or less; phased to zero rebate at house prices of \$450 K or over	36% rebate of QST if house price is \$200 K or less; phased to zero rebate at house prices of \$225 K or more ³
Books (including audio recordings of printed books)	Taxable	Zero-rated

1. Under the QST, all financial institutions and other businesses with taxable sales above \$10 Million are not eligible for ITRs on: motor vehicles (except vehicles above 3000 kg), fuel, services or parts for motor vehicles; electricity, gas or fuel (except used for the production of taxable goods for sale), telecommunications services (except for toll free and internet access services); meals and entertainment (subject to the 50% income tax deduction limit).

2. Under the GST financial institutions can only claim ITCs for operating expenses incurred solely in relation to commercial activities (taxable sales). ITCs for capital property of financial institutions are pro-rated on the basis of the percentage used in commercial activities.

3. The QST otherwise applicable to the GST rebate is also rebated.

Source: Bird, Mintz and Wilson (2006).

Table 3: Regression-based estimates of the investment impact of HST reform

	Total Investment	Machinery and equipment	Non-residential construction	Residential construction
HST	0.111** [2.41]	0.167** [3.35]	0.242 [1.52]	-0.003 [-0.08]
logarithm of GDP	1.06*** [3.68]	1.43*** [4.71]	1.00 [1.33]	0.83* [2.00]
Observations	180	180	180	180
R-squared	0.95	0.96	0.88	0.90

Notes: All specifications include province-specific linear trends and year fixed effects, coefficients not reported. Robust t statistics in brackets.

* significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 4: Summary statistics
Investment and effective sales tax rates by industry

	Average provincial investment per capita	Pre-reform effective tax rate on investment in HST provinces:	
	- 1992 \$ per year -	Machinery	Buildings
		- per cent -	
Agriculture	35.6	5.6	4.2
Mining and oil & gas	699.2	3.9	2.6
Construction	94.4	10.4	4.9
Manufacturing	603.5	2.6	4.6
Trade and transportation	192.1	8.9	4.4
Finance and insurance	367.1	6.1	4.1
Other services	121.0	8.6	4.0

Notes: The figures reported are population-weighted averages of provincial per capita investment data, and of the estimated effective tax rates on investment under sales taxes in HST provinces prior to the reform. These do not correspond to national averages because some provincial observations are missing due to confidentiality restrictions.

Source: Statistics Canada

**Table 5: Further estimates of
the investment impact of HST reform**

	Total Investment	Machinery and equipment	Non-residential construction
Baseline	0.095 [1.68]	.071* [1.86]	0.096 [0.81]
Excluding mining sector	0.005 [0.19]	.121** [2.48]	-0.02 [-0.49]
Including Quebec	0.013 [0.32]	.055* [1.82]	-0.043 [-0.55]
Excluding provincial trends	.066** [2.40]	.064** [2.08]	0.061 [1.26]

Notes: Estimates based on aggregated data from the Capital and Repair Expenditures survey.
Robust t statistics in brackets.

* significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 6: Regression-based estimates of investment impacts by sector

	Machinery	Buildings
Agriculture	0.261 ** [2.51]	0.443 ** [2.76]
Construction	0.114 [1.64]	0.135 * [2.01]
Manufacturing	0.023 [0.15]	0.794 ** [2.03]
Trade and transportation	-0.242 *** [-3.46]	-0.492 *** [-2.87]
Finance and insurance	0.057 [0.80]	0.601 ** [2.18]
Other services	0.064 [0.52]	-0.022 [-0.18]

Notes: All specifications include controls for provincial log GDP per capita and the user cost of capital based on provincial and federal corporate tax measures, as well as controls for unobserved province-specific linear trends, year, and province-industry fixed effects, coefficients of which are not reported.
 * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 7: Regression-based estimates of the impact of HST reform on consumer prices

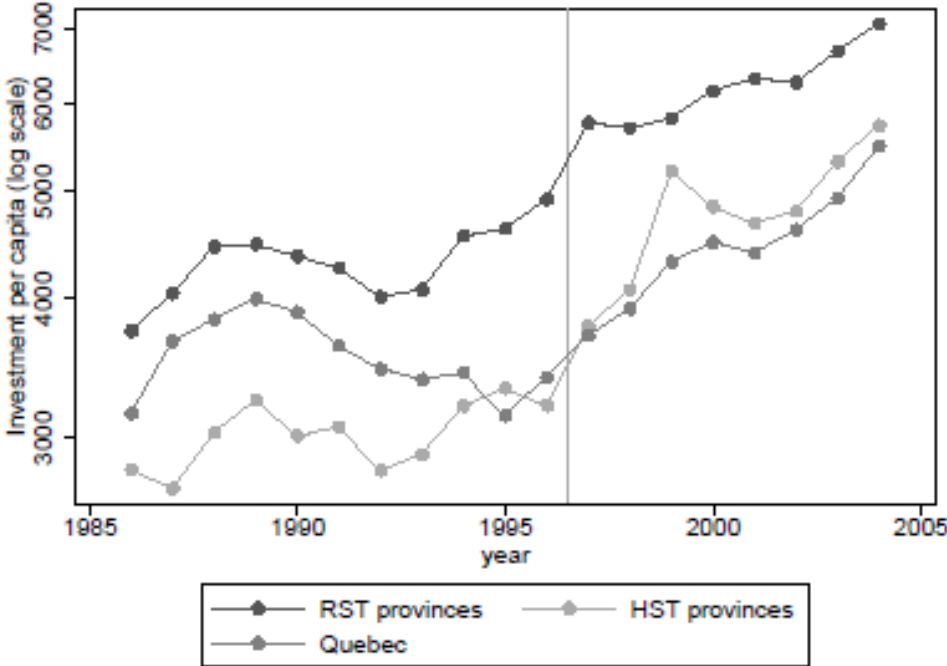
	Expenditure shares	Estimated impact of HST reform on tax rates	Estimated impact of HST reform on CPI prices	Estimated elasticity
	- per cent -			
All items	100.0%	-0.5%	-0.3%	1.0 **
Food	16.8%	-0.6%	-0.7%	1.4 **
Shelter	26.3%	1.0%	1.4% **	1.4 **
Household operations and furnishings	11.1%	-1.2%	-2.9% ***	2.1 ***
Clothing and footwear	6.0%	1.6%	1.5% **	1.1 ***
Transportation	19.4%	-0.5%	0.8%	-1.5 *
Health and personal care	4.6%	-0.3%	-1.4% ***	8.6 ***
Recreation, education, and reading	12.5%	-2.0%	-0.4%	0.2
Alcohol and tobacco products	3.3%	-3.4%	-3.2% *	1.0 *

Notes: Columns 3 and 4 present difference-in-difference GLS estimates of HST price changes, given panel-specific AR(1) errors.

See text for details.

* significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Figure 1: Gross investment per capita in HST and RST provinces



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