

Border Taxes, Cross-Border Shopping, and the Differential Incidence of the GST

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PRÉCIS

Lorsque la taxe sur les produits et services (TPS) fut introduite au Canada, on s'attendait généralement à ce que compte tenu de sa base de destination, le fardeau en soit subi par les consommateurs. Toutefois les premières analyses avaient omis de tenir compte d'un facteur : le potentiel de mobilité des consommateurs et l'incitation que la TPS donnerait aux achats trans frontaliers. Cet article présente des preuves théoriques et économétriques démontrant que la capacité du consommateur de se déplacer entre juridictions a provoqué une importante répercussion de la TPS en amont sur les producteurs canadiens.

L'analyse examine les données sur les prix pour les communautés frontalières et non frontalières afin d'évaluer quantitativement l'effet de la TPS sur différentes communautés. Les résultats économétriques montrent que la TPS a eu un impact inégal selon les diverses régions géographiques. Dans les communautés frontalières jusqu'à 60 pour cent du fardeau fiscal de la TPS semble s'être répercuté en amont sur les entreprises. Dans d'autres régions cependant, la TPS a eu les effets prévus de reporter le fardeau en aval sur les consommateurs au moyen de prix plus élevés. Finalement, quoique la TPS puisse avoir contribué à améliorer l'équité verticale, l'analyse d'incidence décrite dans cet article montre que ceci s'est produit au détriment de l'équité horizontale. À cause de la répercussion en amont significative de la TPS dans les communautés frontalières, les contribuables à faibles revenus de ces régions sont moins lourdement frappés par la TPS que la même catégorie de contribuables des autres régions.

ABSTRACT

When the goods and services tax (GST) was introduced in Canada, it was widely anticipated that the burden of the GST would be shifted to consumers as a result of its destination basis. What earlier analysis overlooked was the potential for consumer mobility and the impetus that the GST would provide to cross-border shopping. This article provides

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theoretical and econometric evidence that this neglected feature of interjurisdictional mobility on the part of the consumer has provoked substantial backward shifting of the GST onto Canadian producers.

The analysis examines price data for border and non-border communities to quantify the impact the GST has had on different communities. The econometric results indicate that the GST has had an uneven geographical impact. In border communities, as much as 60 percent of the GST's tax burden appears to have been shifted backward onto business. In other areas, the GST has had the predicted forward shifting effects of burdening consumers through higher prices. Finally, while the GST may have contributed to greater vertical equity, the incidence analysis provided in this article illustrates that those benefits may have been achieved at the cost of greater horizontal inequity. As a result of significant backward shifting of the GST in border communities, low-income taxpayers residing in those areas are less heavily burdened by the GST than are low-income taxpayers living elsewhere.

INTRODUCTION

In a closed economy, the incidence of a commodity tax is the same no matter whether it is imposed on the consumer or on the producer. In an open economy, however, tax authorities must choose whether the consumer or the producer should bear the burden of the commodity tax—that is, they must choose between the destination principle of commodity taxation and the origin principle. Under the destination principle, exports are exempted from tax, and the same tax burden is imposed on imports as on competing domestic producers. Domestic consumers are expected to shoulder the tax burden when the destination principle applies. If the origin principle is adopted instead, exports are taxed, imports are exempt, and domestic producers are expected to bear the burden of the commodity tax.

When the goods and services tax was introduced in Canada, the federal government implemented the destination approach to value-added taxation by zero-rating exports and imposing the tax on all imports. It was widely anticipated that, given its destination basis, the GST's burden would be shifted to consumers, and that, as a broad-based consumption tax, the GST would relieve some of the pressure on the federal government to use higher income taxes as a method of curbing the federal budget deficit. Earlier analysis by Davies¹ and in the federal overview paper² was founded on the assumption that the GST would be shifted forward to Canadian consumers.

¹ James B. Davies, "Manufacturers' Sales Tax, Value-Added Tax, and Effective Tax Incidence," in *Report of Proceedings of the Thirty-Seventh Tax Conference*, 1985 Conference Report (Toronto: Canadian Tax Foundation, 1986), 15:1-14.

² Canada, Department of Finance, *Goods and Services Tax: An Overview* (Ottawa: the department, August 1989).

What that earlier discussion overlooked, however, was the potential for consumer mobility and the impetus that the GST would provide to cross-border shopping. No one predicted that surprising result because, on the face of it, the GST appeared to provide no additional incentive to shop south of the border. In fact, because the GST was replacing a highly defective manufacturers' sales tax, it was expected that the prices of many domestic manufactured goods would fall, making them more attractive to buy than imports. While the prices of most services were expected to rise under the GST, the appeal of relatively cheaper US haircuts and restaurant meals was not felt to be strong enough to trigger a flood of bargain-conscious Canadian consumers to the United States.

Encouraged by a relatively strong Canadian dollar and freer US-Canada trade, cross-border shoppers discovered that significant savings could be reaped from shopping in the United States, savings sufficient to cover the extra transportation and accommodation costs involved in making the trip. While some shoppers may have used their duty exemptions more intensively and others may have escaped the GST by either concentrating their purchases on services or understating their purchases to customs officials, a major source of savings came from the ability to avoid provincial sales and excise taxes. Until recently, federal customs posts were not equipped to collect the provincial commodity taxes that would be payable on the purchase of a comparable item from a domestic producer.

In this paper we argue that interjurisdictional mobility on the part of consumers has provoked substantial backward shifting of the GST onto Canadian producers of products that compete with similar imports. The inability of the federal government to apply the destination principle with much precision has forced Canadian retailers and other Canadian producers to reduce their after-tax incomes in their struggle to remain competitive and stem the tide of cross-border shopping.³ Thus a commodity tax that was meant to fall on the shoulders of consumers—a destination principle tax—has been transformed in many areas of the country into almost an origin principle tax because of the interjurisdictional mobility of consumers.⁴

In the section below, we present more formally the theoretical argument in favour of backward shifting of the GST. After that, we offer some econometric evidence supporting our view of the incidence of the GST. We also discuss some of the weaknesses in the available data that prevent us from being able to draw even stronger conclusions about the impact of the GST on prices and sales. A final section pulls together our major findings and allows us to speculate that the GST is probably much more progressive a tax than most suspect. Yet the GST has become widely

³ Retailers advertising that "We will pay the GST" may have been more accurate than they knew.

⁴ The GST is only partly an origin type of tax because exporters remain exempt from the GST as a result of the zero-rating of their activities. Significant delays in paying rebates of the tax paid on the inputs used in export production would also effectively impose the tax on exports.

reviled, a *bête noire* of such immense unpopularity that the new Liberal government has promised to scrap it. As T.S. Eliot said, "Between the idea / And the reality . . . Falls the Shadow."⁵

COMMODITY TAX INCIDENCE IN OPEN ECONOMIES

A simple graph (see figure 1) illustrates the shifting of a destination-based commodity tax under different assumptions about the mobility of consumers. In figure 1, domestic demand and supply conditions are represented by the curves D and S_d respectively. In a small open economy, the fixed price of competing imports is determined in world markets, and the supply of imports, S_f , is perfectly elastic at this world price of P_0 . Because imports are the marginal source of product supply, the world price also prevails in the domestic market in the absence of any taxes or tariffs. At that price, domestic production in figure 1 is given as the amount X_0 , domestic demand is X_1 and the difference between the two, $X_1 - X_0$, represents the quantity of imports.

Next we introduce a destination principle commodity tax and assume initially that consumers are interjurisdictionally immobile. Under the destination principle tax, the tax-augmented supply curves for both imports and domestic production shift upward by the same percentage amount if the tax is of the ad valorem type. In figure 1, this ad valorem tax rate is measured by the ratio $(P_1 - P_0)/P_0$, and is responsible for shifting the tax-inclusive supply of imports to $S_f + Tx$ and the tax-inclusive supply of domestic production to $S_d + Tx$ (where Tx is a variable representing the ad valorem tax included in the after-tax or tax-inclusive supply curve for domestic production). Since the tax applies with equal force to both imports and domestic output, the supply curves of both are shifted upward by the same amount for the original domestic output level of X_0 . Imports remain the marginal source for supply, and once again determine domestic prices, only now at the tax-inclusive price of P_1 .

At this higher price, domestic production is unchanged at X_0 , since the net-of-tax price P_0 realized by the producer is the same as in the absence of the tax, but domestic demand declines to X_2 .⁶ Imports therefore drop to the difference $X_2 - X_0$, and the tax is shifted forward completely to consumers. Domestic producers bear no part of the tax burden.

This incidence result rests on the inability of the consumer to avoid paying the tax. The preceding diagrammatic model has the consumer paying the tax no matter what source of supply he or she turns to. This model ignores the consumer's option to shop in other jurisdictions. Once that opportunity is recognized, the results of the analysis change dramatically. When consumers can take their business to lower price (and tax) jurisdictions, they can make their purchases at the tax-exclusive price P_0 in

⁵ T.S. Eliot, *The Hollow Men*, V.

⁶ With a broad-based sales tax like the GST, the prices of other commodities are also affected by the tax, and demand for any particular commodity is unlikely to fall by as much as figure 1 suggests.

Figure 1 Commodity Tax Incidence and Varying Degrees of Consumer Mobility

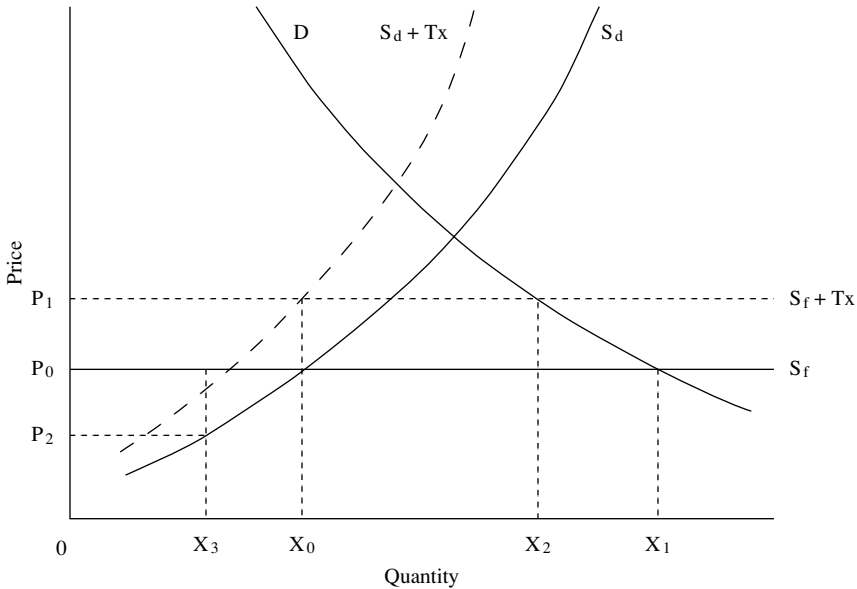


figure 1. For jurisdictionally mobile consumers, the relevant supply curve for imports is S_f rather than the tax-inclusive supply curve $S_f + Tx$.

Cross-border shopping by Canadian consumers is an effort to substitute the lower-priced function S_f for the tax-inclusive supply function $S_f + Tx$. This price substitution will be easiest for consumers living closest to the border, since their transportation and accommodation costs in making the substitution will be less. For consumers residing in communities remote from the border, the cost of engaging in this price substitution will likely exceed any benefit from lower prices.

This differential attractiveness of cross-border shopping means that the GST is likely to have had an uneven impact on different communities. Producers in border areas would find it more difficult to compete with foreign suppliers if they attempted to pass the GST onto consumers. In figure 1 the price those producers would have to compete against is P_0 , and the force of that competition will cause the burden of the tax to be passed backward onto producers. If consumers will not pay a price higher than P_0 , producers will have to accept a lower price of P_2 in order to be competitive, and at that lower price they will curtail production to the amount shown as X_3 . Since domestic demand stays the same at X_1 and domestic production diminishes to X_3 , the gap is made up by a larger volume of imports, $X_1 - X_3$. In that case the GST would be fully shifted backward onto suppliers, and consumers would bear none of the burden

of the tax in the form of higher prices.⁷ Although the GST may be formally applied on a destination basis, the interjurisdictional mobility of consumers has the potential to convert it into a de facto origin type of tax.

EVIDENCE OF BACKWARD SHIFTING OF THE GST

Our discussion in the previous section leads naturally to the hypothesis that, after the introduction of the GST, the behaviour of consumer prices should differ noticeably between border and non-border cities. More precisely, if the GST has been shifted backward in border cities, the consumer price index (CPI) in those cities should rise at a smaller rate than elsewhere. Our attempt to test this hypothesis directly was thwarted by the absence of regularly published price data for true border communities such as Windsor, Sault Ste. Marie, Cornwall, and Niagara Falls.

Instead, we were restricted to examining the price data that were available for 15 cities across Canada. This restriction also forced us to use some judgment about whether or not a city constituted a border community from which significant cross-border shopping occurred. In the end we designated Saint John, Montreal, Ottawa, Toronto, Thunder Bay, Winnipeg, Regina, and Vancouver as border cities and St. John's, Charlottetown, Halifax, Quebec, Saskatoon, Edmonton, and Calgary as non-border cities. In the case of the two Alberta cities, the absence of a provincial sales tax means that there is less incentive for cross-border shopping than in other provinces.

With this particular grouping of communities, we compared the average monthly percentage change in CPI for 1990, the year before the introduction of the GST, and 1991, the first year of operation for the GST. As can be seen from table 1, the variation in behaviour of the CPI between these two groups was imperceptibly small.⁸ The CPI, however, is dominated by the pricing performance of non-tradable items, and our hypothesis strictly applies only to tradable goods and services. When we instead compare only the pricing behaviour of the clothing component of the CPI, we find some support for our hypothesis. Before the GST, clothing prices rose at about the same rate in both groups of cities. With the advent of the GST in 1991, however, clothing price increases were 57 percent greater in non-border cities than in border cities. (In the discussion and tables that follow, we refer to the clothing component of the CPIs as "clothing CPIs.")

A second test of our hypothesis consisted of correlations, by pairs, of the monthly city CPIs for 1990 and 1991, shown in tables 2 and 3, respectively. Before the GST was ushered in, price movements were highly uniform across all the cities in both groups. The average correlation

⁷ But, although demand is unchanged, the cost of satisfying that demand has risen, and there is an associated excess burden of the GST, in the form of the additional travel costs borne by consumers.

⁸ For each border city, we have indicated in brackets the nearest US destination serving as a mecca for cross-border shoppers.

Table 1 Average Monthly Percent Change in Consumer Price Indexes

City (US border city)	In overall CPIs		In clothing CPIs	
	1990	1991	1990	1991
<i>Border</i>				
Saint John (Calais)	0.0045	0.0010	0.0031	0.0064
Montreal (Burlington)	0.0039	0.0016	0.0007	0.0041
Ottawa (Massena)	0.0035	0.0012	0.0015	0.0042
Toronto (Buffalo)	0.0030	0.0009	0.0021	0.0040
Thunder Bay (Duluth)	0.0037	0.0013	0.0031	0.0044
Winnipeg (Grand Forks)	0.0041	0.0010	0.0030	0.0043
Regina (Williston)	0.0038	0.0007	0.0029	0.0123
Vancouver (Seattle)	0.0036	0.0007	0.0033	0.0049
Average	0.0038	0.0011	0.0025	0.0056
<i>Non-border</i>				
St. John's	0.0040	0.0003	0.0044	0.0122
Charlottetown	0.0047	0.0008	0.0015	0.0070
Halifax	0.0050	0.0003	0.0038	0.0066
Quebec	0.0041	0.0012	0.0009	0.0041
Saskatoon	0.0041	-0.0001	0.0026	0.0070
Edmonton	0.0044	0.0005	0.0026	0.0070
Calgary	0.0047	0.0008	0.0027	0.0179
Average	0.0044	0.0005	0.0026	0.0088

Source: CPI statistics are from Statistics Canada, *The Consumer Price Index*, catalogue no. 62-001 (monthly). Statistics presented employ the CPIs found in this catalogue to calculate the average monthly percentage change. The calculations were done by the authors.

between any pair of cities is about 0.99. After the GST is in place, however, this correlation breaks down. The average correlation is lower, and some coefficients even take on negative values. Generally, the correlation coefficients are higher within either group of cities than they are between cities belonging to different groups.

Clearly, there is an observable break in the data series for the city CPIs that coincides with the introduction of the GST. But is it statistically significant? To answer this question we resort to more refined regression techniques of analysis, which allow us to hold constant a host of other influences on the city CPIs besides the GST.

REGRESSION ANALYSIS OF CITY CPIs

We ran a statistical test on our hypothesis—that the GST has been shifted backward in border cities—by doing a regression analysis on nine of the city overall CPIs and clothing CPIs.⁹ Several explanatory variables were introduced into the equations for each CPI. Both the appropriate lagged CPI and national wages were included to measure, respectively, the influence of past prices and business costs on current prices. Lagged city

⁹ Various cities were excluded from the regression analysis because explanatory sales data for them were not available. The regression approach therefore uses as dependent variables only the CPIs for Halifax, Montreal, Quebec, Ottawa, Toronto, Winnipeg, Calgary, Edmonton, and Vancouver.

Table 2 Correlation of Consumer Price Indexes Between Cities (1990)

St. John's	1.00																				
Charlottetown	0.96	1.00																			
Halifax	0.98	0.98	1.00																		
Saint John	0.99	0.97	0.98	1.00																	
Quebec	0.99	0.96	0.98	0.98	1.00																
Montreal	0.98	0.98	0.98	0.99	0.99	1.00															
Ottawa	0.99	0.98	0.99	0.99	0.99	0.98	1.00														
Toronto	0.96	0.96	0.96	0.97	0.99	0.99	0.98	1.00													
Thunder Bay	0.98	0.96	0.97	0.97	0.99	0.99	0.99	0.98	1.00												
Winnipeg	0.99	0.98	0.99	0.98	0.99	0.99	0.99	0.98	0.99	1.00											
Regina	0.95	0.97	0.96	0.94	0.94	0.94	0.96	0.97	0.95	0.97	1.00										
Saskatoon	0.99	0.98	0.99	0.98	0.98	0.98	0.99	0.99	0.98	0.98	0.98	1.00									
Edmonton	0.96	0.97	0.96	0.95	0.97	0.99	0.99	0.98	0.98	0.99	0.95	0.97	1.00								
Calgary	0.97	0.99	0.97	0.96	0.97	0.98	0.99	0.98	0.98	0.99	0.97	0.98	0.99	1.00							
Vancouver	0.97	0.98	0.97	0.96	0.97	0.99	0.99	0.98	0.98	0.99	0.96	0.99	0.99	0.99	1.00						

Source: Statistical correlations calculated by the authors.

department store sales were also included to quantify a demand effect on prices. And, finally, dummy variables, both intercept and slope (separately), were included to test for the presence of a structural change in price behaviour resulting from the introduction of the GST.

Equation 1 describes the linear form in which our set of explanatory variables enters the regression equation:

$$CPI_i = \beta_1 + \beta_2 WAGES(-1) + (\beta_3 + \beta_4 D) DEPT_i(-1) + \beta_5 CPI_i(-1) + \epsilon \quad (1)$$

The regression coefficient, β_1 , is a constant term that captures all trend-like influences that escape detection in the other variables. The second coefficient, β_2 , measures the influence of the national average wage level (*WAGES*) on the city CPI one period later. This supply-side variable enters the equation on the assumption that cost increases in the form of higher wages feed through to higher consumer prices with a one-period lag. As a proxy for demand conditions, increases in a city's department store sales (*DEPT_i*) in each city are assumed to be reflected in higher values for that city's CPI with a lag of one period. On the assumption that prices adjust gradually to demand and supply shocks, we included the value of the previous period's CPI as an additional explanatory variable.

Finally, we included a dummy variable, *D*, to detect the impact of the GST on prices. This variable has a value of 0 for all periods before the adoption of the GST and a value of 1 afterward. The dummy variable entered the regression as a slope dummy modifying the demand relationship between department store sales and the value of the CPI.¹⁰ From our earlier findings, we anticipate that all our regression coefficients should have a positive sign. Our regression results using monthly data from January 1989 to October 1993 are reported in table 4, for overall CPI, and table 5, for clothing CPI.

The signs for all variables conform to expectations. For all cities the impact of the wage variable is positive and significant, illustrating the positive influence of wages or business costs on prices. The coefficient for lagged department store sales is generally positive and significant for the clothing CPI, indicating that increases in demand eventually lead to higher future prices. However, for the overall CPI this variable is generally insignificant. And as expected, past prices have a positive and significant effect on current prices.

The more important results for the present purpose, however, surround the differential values for the slope dummy coefficients. These variables were included to ascertain whether a structural break occurred in the behaviour of the city CPIs, coinciding with the introduction of the GST. As can be seen from the regression results in tables 4 and 5, each dummy coefficient is positive and significant, therefore reinforcing the view that

¹⁰ We also experimented with an intercept dummy as an alternative approach to capturing the influence of the GST, but the results were less satisfactory. We found no consistent relationship between border and non-border cities using this formulation of the regression equation.

Table 4 Overall CPI Regression Results for Border and Non-Border Cities

	β_1	β_2	β_3	β_4	β_5	R ²	SSR	DW
<i>Border cities</i>								
Montreal	10.624 (4.39)	5.1E-07 (2.57)	-5.6E-06 (-0.19)	1.4E-05 (5.04)	0.7816 (14.6)	0.99	11.48	1.59
Ottawa	7.1082 (3.68)	4.9E-07 (2.58)	1.6E-06 (0.36)	1.5E-05 (3.50)	0.8150 (15.1)	0.99	6.906	1.568
Toronto	11.25 (4.23)	3.4E-07 (1.93)	-4.1E-07 (-0.33)	3.1E-06 (2.81)	0.8280 (15.2)	0.99	8.93	1.93
Winnipeg	7.5857 (2.97)	9.2E-07 (3.54)	-5.4E-06 (-0.79)	2.1E-05 (3.21)	0.7052 (9.53)	0.99	11.08	2.099
Vancouver	-1.317 (-0.60)	1.1E-06 (3.52)	8.4E-07 (0.25)	1.0E-05 (3.74)	0.7184 (9.88)	0.99	9.071	1.900
<i>Non-border cities</i>								
Halifax	6.592 (2.23)	1.5E-07 (0.85)	4.8E-06 (0.35)	1.7E-05 (1.20)	0.9083 (17.7)	0.99	16.48	1.67
Quebec	34.06 (3.01)	2.0E-07 (0.90)	-1.1E-06 (-0.004)	6.0E-05 (2.70)	0.6452 (5.54)	0.88	78.29	1.68
Edmonton	8.533 (2.89)	4.3E-07 (1.93)	6.6E-06 (1.06)	1.6E-05 (2.82)	0.8157 (13.3)	0.99	17.64	2.16
Calgary	6.424 (2.39)	4.3E-07 (2.05)	7.5E-06 (1.11)	1.6E-05 (2.62)	0.8338 (15.6)	0.99	16.01	2.16

Note: β_1 is a constant term; β_2 is a coefficient on wage level lagged one period; β_3 is a coefficient on department store sales lagged one period; β_4 is a slope dummy coefficient based on lagged department store sales; β_5 is a coefficient on lagged CPI; R² is the correlation coefficient; SSR is the sum of squared residuals; DW is the Durbin Watson statistic; values in parentheses represent the T statistic for each coefficient, respectively; E is scientific notation, that is, 4.9E-07 = 0.00000049.

Source: Calculations by the authors.

the GST did indeed place upward pressure on prices in both border and non-border communities. The regression results are particularly suggestive when comparing the average size of the coefficient across border and non-border communities. For the average non-border city, the values of the slope dummy coefficients are about twice that of the average border coefficient for both the overall CPI regressions and the clothing CPI regressions.¹¹

To see whether this difference in CPI behaviour between border and non-border cities is statistically significant, our approach now pools the various city data according to the border/non-border classification described earlier. Unrestricted regressions were estimated for these pooled data, allowing all coefficients to vary within each grouping. Next, we

¹¹ The relative sizes of the dummy coefficients were calculated by dividing the average value of the non-border dummy coefficients by the average value of the border dummy coefficients. For the overall CPI regressions, this is (2.74E-05/1.28E-05), or 2.1415. For the clothing CPI regressions, it is (4.33E-05/2.30E-05), or 1.8826.

Table 5 Clothing CPI Regression Results for Border and Non-Border Cities

	β_1	β_2	β_3	β_4	β_5	R ²	SSR	DW
<i>Border cities</i>								
Montreal	15.75 (2.16)	4.9E-07 (1.36)	7.5E-06 (1.11)	4.0E-05 (6.90)	0.7301 (13.23)	0.97	132.4	1.80
Ottawa	10.17 (2.35)	3.0E-07 (1.14)	2.4E-05 (2.75)	2.5E-05 (3.50)	0.8294 (12.73)	0.98	46.81	1.80
Toronto	9.39 (1.73)	1.2E-07 (0.48)	9.6E-06 (3.48)	4.9E-06 (2.17)	0.8791 (12.52)	0.96	59.11	2.07
Winnipeg	4.73 (91.0)	5.2E-07 (1.58)	4.5E-05 (3.31)	3.3E-05 (3.10)	0.8116 (10.76)	0.97	64.37	2.04
Vancouver	5.25 (1.06)	5.5E-07 (1.85)	6.8E-06 (1.14)	1.3E-05 (2.52)	0.8038 (10.95)	0.97	63.77	1.92
<i>Non-border cities</i>								
Halifax	-10.34 (-1.27)	4.8E-07 (1.02)	1.4E-04 (3.22)	-3.8E-05 (-1.01)	0.9456 (8.81)	0.93	183.4	2.08
Quebec	16.36 (2.20)	5.5E-07 (1.53)	3.0E-05 (0.98)	1.7E-04 (6.78)	0.7077 (12.32)	0.97	136.48	1.70
Edmonton	3.65 (0.63)	2.1E-07 (0.73)	4.5E-05 (3.83)	1.7E-05 (1.78)	0.8945 (13.04)	0.96	83.81	1.86
Calgary	3.985 (0.69)	2.1E-07 (0.73)	5.1E-05 (3.71)	2.2E-05 (1.96)	0.8933 (12.96)	0.96	82.28	1.81

Note: Coefficients are the same as for table 4.

Source: Calculations by the authors.

consider the hypothesis of uniform price behaviour after the introduction of the GST by restricting the slope dummy coefficient to take on the same value across border and non-border communities, and determining the loss of explanatory power resulting from this restriction. Comparisons of the unrestricted and restricted regressions are presented in table 6, for overall CPI, and table 7, for clothing CPI.

The Chow test for the significance of the structural break between border and non-border cities rejects the hypothesis of uniform price behaviour and confirms the divergent behaviour of the CPIs for the two groups. However, while the results of the clothing CPI regressions confirm the divergent behaviour of clothing prices for the two groups, the Chow test fails.¹² Nonetheless, in the unrestricted regressions the non-

¹² The overall CPI regressions result in a significant Chow test, since the calculated F statistic of 5.37 (see the calculation below) for the slope dummy regression exceeds the F critical value of 3.86 at the 5 percent level of significance.

$$F = \frac{[(498.7995 + 678.4677) - (497.7178 + 666.8420)]/1}{(497.7178 + 666.8420)/492} = 5.37$$

where $F^*[1,492,5\%] = 3.86$.

In reference to the clothing CPI regression, the calculated F of 1.72 for the slope dummy regression does not exceed the critical value.

Table 6 Pooled CPI Regression Results

	β_1	β_2	β_3	β_4	β_5	R ²	SSR	DW
<i>Unrestricted regressions</i>								
Non-border cities	4.9488 (1.34)	1.1E-06 (7.33)	7.8E-06 (1.12)	2.6E-05 (3.47)	0.6789 (19.63)	0.91	666.84	1.32
Border cities . . .	-4.191 (-1.8)	2.6E-06 (22.4)	7.6E-06 (4.96)	1.0E-05 (5.72)	0.3609 (13.51)	0.95	497.72	0.872
<i>Restricted regressions</i>								
Non-border cities	0.1577 (0.05)	1.1E-06 (7.92)	1.2E-05 (1.86)	1.1E-05 (5.18)	0.7029 (21.42)	0.91	678.47	1.403
Border cities . . .	-3.111 (-1.4)	2.6E-06 (22.3)	7.1E-06 (4.67)	1.1E-05 (6.78)	0.3549 (13.32)	0.95	498.80	0.854

Note: Coefficients are the same as for table 4.

Source: Calculations by the authors.

Table 7 Clothing CPI Regression Results for Pooled Series

	β_1	β_2	β_3	β_4	β_5	R ²	SSR	DW
<i>Unrestricted regressions</i>								
Non-border cities	-10.28 (-2.1)	1.5E-06 (7.82)	9.8E-06 (0.97)	2.3E-05 (2.21)	0.6881 (19.75)	0.91	1263.34	1.577
Border cities . . .	-6.629 (-1.7)	1.4E-06 (9.23)	2.6E-06 (1.02)	9.2E-06 (3.17)	0.6899 (24.28)	0.91	1338.62	1.490
<i>Restricted regressions</i>								
Non-border cities	-13.84 (-3.6)	1.6E-06 (8.44)	1.5E-05 (1.60)	1.0E-05 (3.42)	0.7010 (20.99)	0.91	1271.64	1.588
Border cities . . .	-5.718 (-1.5)	1.4E-06 (9.15)	2.1E-06 (0.84)	1.0E-05 (3.74)	0.6868 (24.24)	0.91	1339.40	1.480

Note: Coefficients are the same as for table 4.

Source: Calculations by the authors.

border slope dummy coefficients are again at least twice the size of the border slope dummy coefficient, lending further support to our view that the GST has, in part, been shifted backward in border areas.

Holding constant the other important influences on the CPI, our pooled regression results, shown in table 6, imply that, per dollar of department store sales, the introduction of the GST augmented the overall price level in non-border cities by 2.6E-05 and, in border cities, by a substantially smaller amount, 1.0E-05. If it is assumed that the GST was fully shifted forward in non-border areas, the degree of forward shifting in border areas can be inferred to about 40 percent (1.0E-05/2.6E-05 = 0.38). By

implication, about 60 percent of the GST was shifted backward onto suppliers of capital and labour in border areas. We use this result in the next section to perform our incidence calculations for the GST.

THE INCIDENCE OF THE GST

Our econometric evidence indicates that the GST so far has had an extremely uneven geographical impact. In border communities, as much as 60 percent of the GST's tax burden appears to have been shifted backward onto factor suppliers. In other areas the GST has had the predicted forward shifting effects of burdening consumers through higher prices. The overall incidence of the GST is a weighted average of these two effects. For illustrative purposes we provide some rough measurements below of each of these two effects and then combine them to present a composite picture of GST incidence for all households.

According to Statistics Canada data, collections of the GST in fiscal year 1991-92 raised \$17,648 million in revenue.¹³ A broad measure of factor income is net national income at factor cost. From the national income accounts,¹⁴ aggregate factor income was \$489,447 million in 1991, yielding an effective GST rate of 3.6 percent for that portion of the tax experienced as a backward-shifted burden.

How is this aggregate burden distributed among different income groups? As a first approximation, we assume that each income group bears a burden given by the proportionate amount of factor income it receives.¹⁵ For our purposes we define income groups to represent each quintile in the distribution of income, since this is the standard unit adopted by Statistics Canada in its income distribution measurements. The important feature of a backward-shifted GST is that it imposes a zero burden on recipients of transfer incomes. If, for example, a particular income group received only transfer income, it would completely escape the burden of a backward-shifted GST.¹⁶

Table 8 presents our attempts to approximate the relative importance of transfer payments for different quintiles.¹⁷ Not surprisingly, our calculations suggest that the bottom quintile enjoys the bulk of its income,

¹³ Statistics Canada, *Public Finance Historical Data, 1965/66-1991/92*, catalogue no. 68-512, 3, table H1.

¹⁴ Statistics Canada, *National Income and Expenditure Accounts: Annual Estimates 1980-1991*, catalogue no. 13-201, 8, table 6.

¹⁵ This assumption implies that all wage and profit incomes are considered to bear the brunt of the GST evenly. Another plausible assumption is that, at least in the brief period since the GST was introduced, profits have borne most of the burden of the GST. This alternative would impart even greater progressivity to the GST.

¹⁶ This is the important insight offered by Edgar K. Browning, "The Burden of Taxation" (August 1978), 86 *Journal of Political Economy* 649-71.

¹⁷ On a quintile basis, Statistics Canada, *Income After Tax, Distributions by Size in Canada, 1990*, catalogue no. 13-210, reports on the distribution of factor income (income
(The footnote is continued on the next page.)

Table 8 Incidence of a Backward-Shifted GST

Quintile	Share of transfers in total income	Effective tax rates	Credit-adjusted effective tax rate
		<i>percent</i>	
Bottom	79.0	0.76	-2.74
Second	31.0	2.48	0.73
Third	16.6	3.00	3.00
Fourth	11.8	3.18	3.18
Top	9.0	3.28	3.28

Source: Calculations by the authors.

about 79 percent of its total money income, in the form of transfer payments. For the top decile, the share of transfer payments declines to only 9 percent. This pattern of transfer payment implies, for example, that the first quintile bears only 21 percent of the GST burden on factor incomes compared with 91 percent for the top quintile. Using the same approach for the other quintiles, we obtain the configuration of effective tax rates shown in the second column of table 8. The upper quintile is seen to experience a tax burden that, as a per unit of total income, is about 4.5 times the rate imposed on the lowest quintile. In short, the backward-shifted portion of the GST is highly progressive in its impact.

There is more to our story than this, however. It is necessary to make an adjustment for the provision of the GST tax credit, which is an integral part of the GST design. As originally implemented in 1991, the refundable tax credit was worth \$190 for each adult in a family and \$100 for each child. The value of the credit vanished by one dollar for every five dollars of family income in excess of \$24,800. For example, in a family with two adults and two children, the credit would disappear when family income reached a level of \$27,700.¹⁸

The philosophy behind the GST credit was that it would act to remove the entire GST burden for the lowest income groups and a portion of that burden for households with lower-middle incomes. For these groups, however, the burden was anticipated to come in the form of higher consumer

17 Continued . . .

before transfers) and total money income (factor income plus transfers). If Y^i and TR^i denote, respectively, the factor and transfer income of the i th quintile, we observe $Y^i/\Sigma Y^i = \alpha^i$ and $Y^i + TR^i/(\Sigma Y^i + \Sigma TR^i) = \beta^i$. Using the preceding notation, the share of transfer income in total money income for the i th quintile is $TR^i/(\Sigma Y^i + \Sigma TR^i) = \beta^i - \alpha^i(\Sigma Y^i/(\Sigma Y^i + \Sigma TR^i))$. This result, divided by the i th quintile's share in total money income, gives us the group's dependence on transfer payments, $TR^i/(Y^i + TR^i)$. For all quintiles, Statistics Canada provides a measure of the overall importance of transfer payments that seems inappropriately narrow. We have, therefore, adjusted that figure upward to 20 percent in our calculations, to take into account private transfers as well as omitted public transfers such as workers' compensation. This concession toward greater accuracy has only a minor effect on our incidence calculations.

¹⁸ A breakeven level of income, Y^* , at which there is a zero credit, can be determined by solving the following equation: $\$580 - 0.2(Y^* - \$24,800) = 0$, where \$580 is the amount received in this case whenever family income is below the level \$24,800.

prices, and the size of the credit was based on that presumption. To the extent that the GST is instead shifted backward, the GST tax provides an effective subsidy to lower income groups rather than the removal of an effective tax burden.

We do not have information on the distribution of GST tax credits by income level, and we are unable, therefore, to calculate effective subsidy rates with much precision. We can, however, develop some crude estimates of those subsidy rates. In 1990 the upper income limit was \$14,775 for the first quintile and \$24,696 for the second quintile.¹⁹ A tax credit of \$580, for example, received by a family of four with two children, would represent 3.9 percent of a family income worth \$14,775. A family with income of \$24,696 would be very close to the breakeven point. Therefore, it seems reasonable to infer that the GST tax credit subsidizes households in the bottom quintile on average by about 3.5 percent of their income, and that it subsidizes households in the second quintile by perhaps half as much as that. Incorporating these refinements into our earlier calculation, the third column of table 8 shows the tax rates adjusted for the tax credit. Under these conditions the GST confers benefits rather than burdens on the lowest income group, and this adjustment considerably enhances the progressive influence of the GST on income distribution.

What about the portion of the GST that is shifted forward in the form of higher prices? Here we adopt the perspective that the most accurate measurement of this burden recognizes that future as well as current consumption participates in carrying the burden. The act of saving offers only a temporary deferment of the tax, not a permanent escape from it. When savings are spent in some future period, the present value of the future tax payments will equal the amount that would be collected if savings were taxed at the same rate when they occurred.

This line of reasoning suggests that households will shoulder the forward-shifted tax burden in proportion to their claim on disposable household income. In 1991, according to the national income accounts, aggregate disposable income is estimated to be \$467,151 million. With total GST collections of \$17,648 million, the forward-shifted tax rate is 3.78 percent of disposable income, and is the same for all income groups if the GST tax credit is ignored. When the tax credit is taken into account, once again we make the rough assumption that the entire GST burden is completely eliminated for the first quintile, and that half the GST burden is refunded to the second quintile. Once more, the distribution of GST burdens is progressive, but less so than before, and it is more nearly proportional in its influence on income distribution. This incidence pattern is displayed in the first column of table 9.

The aggregate incidence of the GST is a weighted average of the two polar cases we have considered, with the weights reflecting the preponderance of population in border communities as well as our finding that

¹⁹ See *Income After Tax*, supra footnote 17, at 70, table 26.

Table 9 Forward-Shifted and Total GST Incidence

Quintile	Incidence of a forward-shifted GST	Total GST incidence
	<i>percent</i>	
Bottom	0	-1.1
Second	1.89	1.42
Third	3.78	3.47
Fourth	3.78	3.54
Top	3.78	3.58

Source: Calculations by the authors.

in border communities about 60 percent of the GST burden is apparently shifted backward. Since the bulk of Canada's population is concentrated close to the border in most provinces, we adopt the conservative assumption that two-thirds of the population resides in border areas where shopping in the United States is a feasible consumption alternative.

Making the further assumption that the distribution of income is the same in both types of community, our weighting scheme implies that, for each quintile, 40 percent of the GST burden is shifted backward and the remainder of the burden forward. Our final incidence calculations are shown the last column in table 9. Because of backward shifting and the availability of the personal GST credit, the bottom quintile benefits from the GST. The second quintile experiences a positive tax burden, but it is almost 2.5 times smaller than that borne by the top quintile. Beyond the second quintile, the burden of the GST is more or less proportional. Overall, the GST appears to be a progressive tax, a tax whose progressivity is enhanced by the extent of any backward shifting.²⁰

CONCLUSIONS

As Kemp has observed, cross-border shopping surged dramatically between 1986 and 1991.²¹ Over that period, same-day border trips doubled to 18 million by 1991, and trips of more than one day nearly doubled to

²⁰ Our incidence calculations look only at the effects of introducing the GST, not at the combined effects of installing the GST and removing the federal sales tax (FST) on manufactured goods. Thus our calculations ignore compositional effects arising from the substitution of one broad-based tax for another. For example, the GST, unlike the previous FST, extends to a variety of household services, and most budget surveys suggest that consumption of many services is disproportionately larger in the budgets of higher income groups. Taking account of this type of compositional effect would make the GST even more progressive than our estimates imply. In other words, we do not compare the incidence of the GST with that of the FST. Earlier studies by Davies, *supra* footnote 1, and John Whalley, "The Economics of the GST Proposal," in *Report of Proceedings of the Forty-First Tax Conference*, 1989 Conference Report (Toronto: Canadian Tax Foundation, 1990), 5:1-21, have undertaken that kind of comparison. Our benchmark is a revenue-neutral alternative that would burden all income groups proportionately.

²¹ Katharine Kemp, "Cross-Border Shopping: Trends and Measurement Issues" [December 1992], *Canadian Economic Observer*, Statistics Canada catalogue no. 11-010, 5.1-5.12, at 5.2-5.3, also notes that, as a result of cross-border shopping, "sales and employment in the retail sector have suffered badly, especially in border cities."

5 million. We have presented some evidence to show that this flood of Canadian consumers to the United States has caused a significant portion of the GST to be shifted backward onto factor owners in border communities. Since 1992, however, cross-border shopping has crested and begun to decline, coincident with the drop in the external value of the Canadian dollar. Moreover, the provinces have reached new agreements with the federal government to allow it to collect provincial taxes at the border. This closing off of the consumer exits to the GST could mean the eventual disappearance of the backward shifting of the GST that we have detected. The degree of backward shifting is tied directly to the degree of international consumer mobility. If mobility declines, so should the extent of any backward shifting. In the future, the incidence profile of the GST could more closely resemble the forward shifting profile given in table 9.

Until there is some convergence in the behaviour of prices in border and non-border areas, our results indicate that the GST may be a more progressive tax instrument than previously suspected, and much more progressive than the federal sales tax (FST) it replaced.²² Since the GST also eliminated many of the inefficiencies inherent in the FST, the GST should be accepted as a welcome addition to the Canadian tax family.²³ Instead, antipathy toward the GST is strongly entrenched. Possibly the explanation for this paradox lies more in the realm of psychology than of economics. Replacing a hidden FST with a highly visible GST may bring into view, for the heavily taxed average Canadian, a convenient but symbolic target against which protest over the high cost of government services can be aimed. Instead of being a true tax villain, the GST may be acting as a lightning rod for taxpayer discontent.

Finally, while the GST may have contributed to greater vertical equity in the system, its benefits along that dimension may have been achieved at the cost of greater horizontal inequity. As a result of significant backward shifting of the GST in border communities, low-income taxpayers residing in those areas are less heavily burdened by the GST than are low-income taxpayers living elsewhere.

²² Estimates of the incidence of the FST can be found in Davies, *supra* footnote 1, and the federal overview paper, *supra* footnote 2.

²³ See Malcolm Gillis, "Federal Sales Taxation: A Survey of Six Decades of Experience, Critiques, and Reform Proposals" (1985), vol. 33, no. 1 *Canadian Tax Journal* 68-98 for a discussion of the FST's shortcomings.