Proof In Pricing: Tax Salience and Consumer Behavior in the Liquor Market*

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Abstract

To what extent does tax salience affect consumers' purchases of alcohol? In 2010, the Canadian province of British Columbia harmonized its provincial and federal sales taxes, effectively lowering the tax rate on liquor by 3%. To mitigate the potential increase in alcohol consumption from this cost decrease, the provincial government increased centrally-determined alcoholic beverage shelf-prices by an amount exactly offsetting the tax decrease, so that the after-tax prices were unchanged. Because liquor stores in the province post tax-exclusive shelf-prices, if consumers were unaware of the decrease in the tax rate, this change would appear to them as a significant price increase. Consistent with a parsimonious model of consumer behavior with salience effects, we find consumers responded to this cost neutral change by decreasing their purchases of alcohol by approximately 4%. In addition, we propose a methodology to estimate the level of salience during reform.

Keywords: tax salience, alcohol consumption, harmonized sales tax, Canada
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1 Introduction

To what extent do consumers respond to real vs perceived changes in cost? Numerous empirical studies, including the seminal paper by Chetty, Looney, and Kroft (2009) have documented that consumers are less responsive to changes in taxes presented on the sticker than those charged at the register. Theirs and subsequent studies have emphasized the empirical and theoretical importance of taking these behavioral effects into account when crafting policy, as these effects lead to deviations from classical predictions of the effects of taxes on revenue, the distribution of burdens, and aggregate welfare. This paper provides a case study, illustrating the importance of taking these forces into account when crafting policy to achieve a particular economic objective.

In July 2009, the Canadian province of British Columbia, in line with the desires of the federal government, announced it would undertake a policy of sales tax harmonization, which would effectively reduce the ad-valorem tax on all alcoholic beverages by 3%. Worrying this decrease would spur an increase in the consumption of alcohol, British Columbia ordered the Liquor Distribution Branch, which possesses a monopoly on all wholesale purchases and controls 68% of the retail market for alcohol in BC, to increase the binding minimum price floor on all alcoholic beverages so that the after tax price on alcohol would remain constant. Under classical theory, a truly cost neutral change ought not produce any change in demand ceteris paribus.

Nonetheless, our estimates indicate this reform resulted in decreased demand for alcohol by roughly 4 percent. Utilizing these estimates, we adapt the model produced by Chetty, Looney, and Kroft (2007) and use elasticity of BC alcohol demand estimates produced by Stockwell et al. (2012) to estimate what level of salience could rationalize the observed response. We find salience alone cannot fully account for the magnitude of decline in alcohol demand and attribute part of this decline in consumption to the negative income shock generated by the other tax increases that were part of the reform package. In order to parse the degree to which the magnitude of the decline was due to salience, we estimate the treatment effect induced by the repeal of the reform, which was widely advertised and enacted through referendum. Comparing the impact of the policy on alcohol demand and the impact of its reform reveals that the repeal was associated with a smaller in magnitude change in aggregate consumption, which we interpret as reduced form evidence for salience playing a key role.

2 Policy Background

Liquor[1] sales in Canada are highly regulated by both federal and provincial or territorial governments. Provincial governments operate liquor control authorities that govern most aspects of liquor markets, including production, importation, marketing, sale, and consumption. Due to the decentralization of authority, provincial regimes differ in their policies; however, there are significant similarities across provinces.

All provincial governments have monopolies over wholesaling and have significant power in retail markets. These wholesale monopolists are either branches of government, called liquor control authorities, or provincially-owned businesses called "crown corporations". Regardless of any legal distinctions, these entities each regulate provincial wholesale markets by selecting which products to import or purchase from domestic producers and by setting markups which determine the wholesale prices of each product. Three provinces[2] also have retail monopolies.

In the remaining provinces, retail markets are served by a combination of public and private businesses, though all private businesses must purchase their products from the provincial authority. Additionally, private businesses must acquire licenses from the provincial government in order to enter (and remain in) the market. These licenses often restrict the type of products that can be sold by private businesses. For example, the only private liquor retailer in Ontario is *The Beer Store*, which is only permitted to sell beer. For a summary of liquor retailers in each province see Appendix A.2.

2.1 British Columbia

2.1.1 Liquor Market Regulation

The British Columbia Liquor Distribution Branch (BC LDB) operates as the exclusive importer, distributor, and wholesaler of alcohol in the province. It oversees approximately 200 government-run retail liquor stores, known as BC Liquor Stores, which account for roughly 68% of the provincial market. In addition to its direct control over alcohol sales through these public stores, the BC LDB regulates the alcohol market by setting wholesale prices for private retailers[3]. It also restricts the number of liquor licenses granted to private businesses, further constraining the overall availability of alcohol in the province[4].

[1] In Canada, liquor refers to wine, beer, spirits, and other alcoholic beverages.

[2] The provincial governments of New Brunswick, Northwest Territories, and Prince Edward Island have retail monopolies over their liquor markets.

[3] Private retailers include private liquor stores, rural agency stores, independent wine stores, bars, and restaurants.

[4] In 2015, the BC LDB began allowing grocery stores to sell wine and beer

Table 1: Numeric Example of Alcohol Pricing in British Columbia

Prime Cost per litre		\$10.00
Federal Duty:		
Customs	0.0187/L	0.02
Excise	0.6720/L	0.67
Duty-Inclusive Cost		\$10.69
Percentage Markup	89%	9.51
Container Recycling Fee	0.13/L	0.13
Public Retailer Shelf Price		\$20.34
Less: Wholesale Discount	16%	(3.25)
Private Liquor Store Wholesale Price		\$17.09

One of the primary ways the BC LDB limits alcohol consumption is through binding price floors in public stores. The tax-exclusive prices on BC Liquor Stores' shelves are calculated as a sum of the prime cost, federal excise and customs duties, a percentage markup (for wine, spirits, and coolers), or a volume-based markup (for beer), along with a container recycling fee. Although these prices are technically subject to vary with changes in world market prices, they are rarely adjusted. Between 1987 and 2009, the BC LDB raised the minimum prices of cider, coolers, beer, wine, and liqueurs only four times, and the minimum price of spirits only ten times during this 23-year period (Stockwell et al., 2012).

Furthermore, as the province's sole wholesaler, the BC LDB sets minimum retail prices for all alcohol sold, including sales by private retailers. Prior to 2015, private retailers' prices were based on a "discount off display price"—the tax-exclusive price in public stores minus a wholesale discount. This discount varied by type of retailer: 16% for private liquor stores, 12% for rural agency stores, and 30% for independent wine stores. These minimum prices were binding, not only because they established the wholesale costs for private retailers but also because provincial law prohibited retailers from selling below their input costs. Given these wholesale prices, private retailers individually determine their markups and set their shelf prices, which cannot be lower than the prices set in public stores.

To illustrate how retail prices are calculated, consider the example presented in Table 1: a one-litre bottle of wine has a prime cost of \$10.00, which implies a public retailer shelf price of \$20.34 and a private liquor store wholesale price of \$17.09.

2.1.2 Tax Reform and Pricing Policy Response

Prior to July 1, 2010, British Columbia's sales tax system included a provincial sales tax (PST) at a base rate of seven percent and a federal goods and services tax (GST) at a rate of five percent. However, these taxes were not applied uniformly; the GST was a value-added tax, while the PST was levied only on purchases of final goods and services. As a result, the effective tax rate for any taxable purchase could range from five to 12 percent. Notably, the PST rate on alcoholic beverages was set at 10%, three percentage points higher than the standard provincial rate, leading to a total combined rate of 15%.

In response to the 2008 federal budget announcement, which identified sales tax harmonization as "the single most important step" for provinces to boost economic competitiveness (Flaherty, 2008), British Columbia announced in July 2009 that it would undertake harmonization. This new regime was set to come into effect a year later.

Beginning on July 1, 2010, the sales tax bases were harmonized, and a new Harmonized Sales Tax (HST) rate of 12% was implemented. Most consumer products, previously subject to both the PST and the GST, did not experience a change in their tax rate. However, because the PST base included fewer products than would be taxed under the HST, the products that were affected by the reform tended to see rate increases[5], while a small minority saw a decrease. Alcoholic beverages fell into the latter category. Previously taxed at 15%, harmonization reduced the rate to 12%, significantly lowering the after-tax price of alcoholic beverages. Anticipating increased alcohol consumption due to this price drop, the British Columbia government instructed the Liquor Distribution Branch to increase the percentage markups used to determine retail prices. These adjustments were designed to fully offset the tax rate decrease, leaving the after-tax prices unchanged.

To illustrate this adjustment, consider the bottle of wine from the above example, which had a pre-tax shelf price of $20.34. Under the old tax system, its PST/GST-inclusive price was $23.39. After the tax harmonization, the HST-inclusive price would have dropped to $22.78. To prevent the rate decrease from affecting the after-tax price, the markup rate had to be raised from 89% to 94%, increasing the shelf price to $20.88. Therefore, although the after-tax price remained unchanged, consumers salient only to pre-tax shelf prices would perceive a price increase following the reform.

Standard theory predicts consumers would fully optimize given the reforms and maintain their alcohol consumption. However, if consumers were not salient to the tax rate, they would reduce their consumption in response to the perceived price increase. This possibility is supported by the prevalence of misconceptions about which products were affected by

[5]The affected consumer products are listed in Appendix A.3

Table 2: Responses to Survey of Beliefs about the Effects of the HST

Good/Service Type	"HST Increased Prices..."			*Actual*
	"Significantly" (%)	*"Somewhat" (%)*	*"Not at all" (%)*	*Change*
Alcoholic beverages	30	31	39	-
Restaurant meals	49	40	11	↑
Haircuts	27	39	34	↑
Basic groceries	27	36	37	-
Furniture and appliances	23	25	52	-
Re-sale homes	20	16	64	-
New homes less than $525,000	23	16	61	-
Electronics	22	26	52	-
Prescription drugs	13	21	66	-
Gasoline	23	26	51	-

Source: HST Information Office (2010).

the tax change. A BC government survey conducted shortly after the HST implementation highlighted these misconceptions. The survey results, detailed in Table 2, showed that while 89% of respondents correctly identified that restaurant meal prices would increase post-reform, a significant portion mistakenly believed that the prices of unaffected products also rose. Notably, despite stable after-tax alcohol prices due to the policy, 61% of respondents incorrectly thought the reform increased the cost of alcoholic beverages.

2.1.3 Repeal

Despite the initial policy objectives driving the adoption of the HST, British Columbia repealed the HST on April 1, 2013, following substantial public backlash and a province-wide referendum held in 2011, in which 53% of those eligible voted. The repeal restored the pre-2010 dual tax system comprising the seven percent provincial sales tax (PST) and the five percent federal goods and services tax (GST). Although the initial HST introduction aimed to simplify tax compliance and stimulate economic growth through a broader, consumption-based tax base, public opinion was unfavorable as the tax was perceived to disproportionately affect consumers, particularly for goods and services that were newly taxed under the HST structure.

With the reversion to the PST/GST structure, the effective tax rate on alcohol sales returned to the higher pre-HST rate of 15 percent. Just as with the original introduction of the HST, the BC LDB accordingly reduced its retail markup rates to maintain after-tax prices the same as those under the HST. This was done to prevent the large price increase

that would have come from the tax rate change, which would have been a significant cost to consumers. The repeal also saw a 7% reduction in the sales tax rate on goods that had been subject to increases under harmonization.

Because the HST repeal occurred due to a referendum rather than a legislative initiative, it is likely that most British Columbians were aware of the reversal. If this was the case, and consumers were truly aware that the repeal would result in no change to the after-tax price of alcohol, then any change in purchasing behavior in response to the repeal would not be due to salience effects. Rather, the change could be attributable only to income and substitution effects generated by the simultaneous reduction in the tax rate on a large subset of other goods.

3 Theoretical Motivation

Following Chetty, Looney, and Kroft (2007), consider a representative agent with wealth Z and quasilinear separable utility over two goods, x and y where:

$$U(x,y) = a\frac{x^{1-b}}{1-b} + y$$

b fixed the price elasticity of good x. y is the untaxed numeraire good. Let the after tax price be given by $p^a = p(1+t)$. In this context, p is the shelf price observed in British Columbia, while p^a is the price actually paid by consumers.

Assume that in British Columbia there are two types of consumers [6]. Type 1 consumers are fully salient to all changes and so choose their consumption of good x according to demand $x^*(p,t) = \left(\frac{p(1+t)}{a}\right)^{\frac{-1}{b}}$. Type 2 consumers are only salient to changes in the shelf price p, and so choose their consumption of good x according to demand function $x^p(p,t) = \left(\frac{p}{a}\right)^{\frac{-1}{b}}$.

Normalizing the population to 1, let θ be the total fraction of type 1, fully salient agents. This implies that aggregate demand for good x is given by

$$\hat{x}(p,t,\theta) = \theta x^* + (1-\theta)x^p = \left(\frac{p}{a}\right)^{\frac{-1}{b}}\left[1-\theta+\theta(1+t)^{\frac{-1}{b}}\right]$$

Taking the log of this expression and totally differentiating, we obtain

$$\frac{(1+t)}{\hat{x}}\frac{d\hat{x}}{d(1+t)} = \frac{-1}{b}\left[\frac{(1+t)}{p}\frac{dp}{d(1+t)} + \frac{\theta(1+t)^{\frac{-1}{b}}}{1-\theta+\theta(1+t)^{\frac{-1}{b}}}\right] \tag{1}$$

which states that the percent change in alcohol consumption in response to the tax will be a function of the price response induced by the change in addition to a correction term,

[6] Chetty, Looney, and Kroft (2007) demonstrate that this two type model can be generated with a heterogenous agent model with homogeneous preferences, but a distribution of cognitive costs.

which is an increasing function of θ.

3.1 The Reform in British Columbia

The reform in BC decreased the tax on alcohol and increased the shelf price, so that the after tax price on alcohol remained unchanged. Assuming BC sets the price of alcohol, this reform can be mapped into the above model by noting that

$$p(1+t) = p^a \implies dp((1+t) + pd(1+t) = 0 \implies \frac{dp}{d(1+t)} = \frac{-p}{(1+t)} \tag{2}$$

Substituting this constraint into (1) yields

$$\frac{d\log(\hat{x}^{BC})}{d\log(1+t^{BC})} = \frac{(1-\theta)}{b(1-\theta+\theta(1+t)^{\frac{-1}{b}})} \tag{3}$$

Note that when $\theta = 1$, this reform would lead to no change in quantity. This is because all consumers would fully internalize the fact that there was no change in the after-tax price of alcohol. When $\theta = 0$, all consumers merely respond to the increase in the shelf price, so a decrease in the tax, under this reform, is viewed as a price increase! Or, in other words,

$$\frac{d\log(\hat{x}^{BC})}{d\log(1+t^{BC})}|_{\theta=0} = \frac{1}{b} = -\frac{d\log(\hat{x})}{d\log p}$$

Our results below suggest that consumers responded to reform by decreasing their consumption of of all alcohol varieties, consistent with a model of imperfect salience.

4 Data

4.1 Data Sources

We use publicly available aggregate data from Statistics Canada that include the total volume in litres and the total value in $CAD of alcohol purchases made in each province or territory and in each fiscal year. These data are broken down by the alcohol type (e.g. red wine) and by the product's location of origin (e.g. imported red wine and domestically-produced red wine). To estimate the effects of the reform on the total ethanol content of alcoholic beverage purchases, we additionally use data that describe the mean ethanol content of beverage types over time from Martinez et al. (2019), and construct the absolute volume of ethanol associated with the total volume of each beverage type.

The data from Statistics Canada also include mean household income, unemployment rate, GDP per capita, and yearly provincial adult population counts (i.e. the number of provincial/territorial residents aged 15 or older), which we use to construct measures of alcohol consumption and expenditure per adult.

Summary statistics for provincial characteristics before 2010 are presented in Table 3. In our primary specification, British Columbia is the treated unit, and all provinces except Ontario and Alberta are control units. We present difference in means tests between BC and all control provinces. For each statistic other than population, British Columbia is very similar to the average of control provinces in the pre-period. As the third largest province, British Columbia's population is naturally larger than the average of control provinces. To account for this, we convert our outcome variables into per-adult terms so that the magnitudes across provinces are comparable.

We also make use of publicly-available Statistics Canada data from the Survey of Household Spending to measure the fraction of average household spending that was affected by the reform. Unfortunately the Survey of Household Spending was completely redesigned starting in January 2010, so the expenditure magnitudes are not comparable pre- and post-reform. We use the mean expenditures in calendar year 2010 to simply illustrate that affected goods comprised a moderate share of households' total expenditures. These values are presented in Appendix A.3 Table 7. Goods that were subject to a 7% tax rate increase comprised approximately 14% of expenditure, while alcoholic beverages comprised approximately 1.5%.

Table 3: Difference in Means Tests

	Mean		**Difference**	**P-value**
	British Columbia	*Control*		
Household income	36146.93	36575.28	428.35	0.8889
Unemployment rate	5.77	8.01	2.24	0.1133
GDP per capita	44948.62	52528.65	7580.03	0.3787
Population (1000s)	4325.75	1449.35	-2876.4	0.0024
Total sales per adult				
Litres	104.413	105.668	1.255	0.9302
Absolute litres	21.529	21.788	0.259	0.9302
$ CAD	700.14	667.76	-32.38	0.77
Beer sales per adult				
Litres	77.168	85.684	8.517	0.4472
Absolute litres	3.858	4.284	0.426	0.4472
$ CAD	291.44	333.96	42.52	0.3794
Wine sales per adult				
Litres	14.503	9.019	-5.484	0.008
Absolute litres	1.827	1.136	-0.691	0.008
$ CAD	195.69	110.46	-85.23	0.002
Spirits sales per adult				
Litres	6.692	6.814	0.122	0.926
Absolute litres	2.506	2.551	0.046	0.926
$ CAD	183.57	197.76	14.19	0.7746

Note: P-values from two-sided t-tests. The control group for British Columbia includes all provinces other than Ontario and Alberta.

5 Empirical Methodology

This paper seeks to quantify the aggregate effects of this reform on alcohol consumption and expenditure and then compare these estimates to theoretical predictions of behavior under imperfect salience in order to assess the degree to which British Columbian consumers are salient to sales taxes.

5.1 Impacts of the Reform

To estimate the overall effects of the reform, we employ a difference-in-differences (DiD) approach. In our primary model, British Columbia is treated as the intervention group, with all Canadian provinces outside of Ontario and Alberta acting as controls. While Ontario and Alberta are arguably the provinces most similar to British Columbia (by size,

income, and culture[7]), we exclude Ontario from the control group as it undertook sales tax harmonization at the same time as British Columbia. Additionally, since Alberta is British Columbia's geographic neighbor, we exclude it in order to eliminate the concern of inter-provincial spillover effects.

Our difference-in-differences approach allows us to capture the joint impact of the tax rate decrease and accompanying adjustments in shelf prices. Notably, since after-tax prices remained constant due to concurrent retail markup increases, we would expect zero change in quantity purchased if consumers were perfectly attuned to both shelf and tax-inclusive prices. Any deviation from this prediction would indicate a level of tax salience among consumers. Since the reform was in place for three years before it was repealed, we use the Callaway and Sant'Anna (2021) approach to DiD, which is designed to accommodate time-varying treatment effects, and then aggregate up using their suggested weighted scheme to estimate a single treatment effect.

Our DiD approach rests on two main assumptions: that treatment assignment is exogenous to provincial liquor markets and that alcohol purchases in the treated and control provinces would have evolved in parallel in the absence of the reform. Since the sales tax reform was implemented as broad tax policy change rather than as a targeted response to alcohol consumption levels, we are confident in the exogeneity of treatment assignment. Regarding parallel trends, pre-treatment purchase patterns were comparable across treated and control provinces, as seen in the plots presented in Figure 1 in Appendix A.1, which implies that this assumption is also likely to hold, though it cannot be tested directly. That being said, our identification strategy does face a potential threat, as the unit of observation in our data may violate the Stable Unit Treatment Value Assumption (SUTVA).

SUTVA requires that the potential outcomes of a particular observation depend only on that observation's treatment status, and not on the treatment status of other observations. In our context, the unit of observation in our full dataset is a product-province-year (e.g. imported red wine sales in BC in 2010). This means that SUTVA would be violated if, for example, the treatment status of imported white wine were to affect the observed or counterfactual consumption of imported red wine. More generally, if a pair of products have a non-zero cross-price demand elasticity, then SUTVA will be violated. In order to partially mitigate this, in our main specifications we aggregate individual products into categories (total wine, beer, and spirits), and estimate our DiD specification using these totals as the unit of observation. Because these aggregate categories are likely less substitutable than two products in the same category, this specification minimizes the bias generated by the

[7]While Québec is the second largest province by population, and so comparable to BC in this respect, its distinct language and culture make it a poor comparison group.

violation of SUTVA. To eliminate this concern entirely, we additionally employ a specification where the unit of observation is total consumption (the sum across all categories), though it is less informative than our category-specific specifications.

5.2 Measuring Salience

To quantify the level of salience, we utilize the parsimonious relationship described by equation (3) and the elasticity of BC alcohol demand estimated by Stockwell et al. (2012) Specifically, using the estimates for elasticity of demand induced by changes in the minimum price and using our results to estimate the percent change in consumption attributable to reform, we obtain direct estimate of θ.

Stockwell et al. (2012) utilize the exogenous changes in the minimum price set by the BC Liquor Distribution Branch over a 20 year period. Crucially, changes in the minimum price correspond to changes in the shelf price at government liquor stores in BC. Using a two-way fixed effects regression and time varying controls they estimate the price elasticity demand of total alcohol consumption as well as the price elasticity of demand specific product categories (eg. wine, beer, etc.).

By imposing quasi-linear utility and separable preferences, our specification rules out changes in alcohol demand due to income effects and product substitution effects that may have been induced by the aggregate reform. Or more precisely, our specification will attribute any changes in alcohol demand induced by the tax reform to the mechanical change in the minimum price set by the BC Liquor Distribution Branch and subsequent reaction of non-salient consumers. As will be illustrated below, equation (3) cannot be rationalized by the data given the price elasticity of demand for alcohol and our estimated treatment effects.

5.3 Impact of the Repeal

To attempt to account for the alcohol consumption changes driven by the concurrent changes in the after-tax prices of other goods affected by harmonization, we estimate a DiD model using the repeal period as the treatment time. In this specification, we define the pre-treatment period as the years during which sales taxes were harmonized (fiscal years 2011 to 2013), and estimate the effect in 2014 only. We restrict the treated period to only 2014 because in 2015, the BC LDB began to approve the sale of beer and wine in grocery stores, leading to a large increase in wine and beer purchases. As in the initial specification, the control group includes all provinces other than Alberta and Ontario.

We assume that because the repeal was initiated through a province-wide referendum, this represents a policy shock in which consumers are fully salient. Making this assumption

allows us to estimate only the effects of lowering the tax rates on the goods that saw increases under the HST, which provides us with an estimate of the magnitude of the alcohol consumption changes driven by income and substitution effects rather than by salience. Concretely, the magnitude of this treatment effect gives an approximation of the share of the harmonization treatment effect that arose not due to salience issues, but due to changes in the relative prices of other goods.

6 Results

6.1 Impact of the Reform

Our primary findings presented in Table 4 suggest that British Columbia's sales tax reform led to a significant reduction in per-adult alcohol consumption, which is consistent with some consumers lacking salience to the sales tax. The difference-in-differences coefficient on total litres consumed per adult is approximately -4.5, corresponding to a 4.3% decrease in alcohol consumption from the pre-reform mean of 104.4 litres per adult. We additionally observe a parallel decline in total expenditure per adult, with a DiD coefficient of -29.9, indicating a 4.3% decrease in per-adult alcohol expenditure from the pre-reform mean of $700.14. This overall reduction suggests that, despite fixed after-tax prices, a non-zero fraction of consumers may have perceived higher prices due to the increase in tax-exclusive shelf prices and thus adjusted their consumption downwards, pointing to limited salience to the tax change.

Further analysis of the mean price per litre reveals that, while the treatment effects on total mean prices are insignificant when the unit of observation is aggregate consumption, our product-level specification in column 2 indicates a notable increase in the mean price per litre in British Columbia relative to control provinces. Specifically, on average across products, the price per litre rose by an estimated $2.17 more than in the controls, translating to a 9.4% increase over the pre-reform mean price of $23.10 per litre. The statutory adjustment to shelf prices—a 2.7% increase designed to offset the 3% tax reduction—accounts for only part of this change, implying an unexplained residual price effect of 6.7%. This residual effect may be attributable to private liquor retailers capturing some of the tax savings by increasing their markups beyond the policy-mandated minimum prices. Alternatively, the residual price increase could reflect a consumer-driven shift in preference toward higher-priced products in British Columbia at a rate exceeding that observed in control provinces.

To explore these possibilities further, we decompose the effects by product category, revealing a pattern of substitution between categories rather than within-category price increases. Within each product category, the price effects are insignificant, supporting the

interpretation that the overall average price increase reflects a reallocation in consumption from lower-priced to higher-priced items rather than an unregulated price hike beyond the mandated markup. Specifically, we observe a pronounced decline in beer consumption, which decreased by 4.7% (coefficient on beer quantity: -3.634), compared to smaller declines for wine and spirits. Since beer is the least expensive alcohol type, with a pre-reform mean of $3.78 per litre, the shift away from beer toward wine and spirits, which have higher average prices of $13.45 and $27.42 per litre, respectively, drives up the mean price per litre across all alcohol products.

These findings suggest that British Columbian consumers responded to the tax reform by reducing their consumption heterogeneously. The greater reduction in beer consumption relative to wine and spirits does not necessarily imply that individual consumers substituted from cheaper to more expensive products. Instead, it suggests that consumers who primarily purchased beer before the reform were the most likely to reduce their consumption relative to those who primarily purchased wine or spirits.

This greater reduction among beer consumers could reflect lower tax salience among these consumers compared to wine and spirits consumers, leading to a behavioral response to the shelf price increase. Alternatively, it could indicate that beer consumers, who tend to spend less per litre than other consumers, may be more sensitive to concurrent price increases in other goods resulting from harmonization, necessitating reductions in their alcohol consumption as a budgetary adjustment. Thus, our findings highlight both a general response to the tax reform and distinct responses across product types, consistent with variation in both salience and price sensitivity among different consumer groups.

Table 4: Treatment Effects Estimates for British Columbia

Variable	(1) *Total*	(2) *Individual Beverages*	(3) *Beer*	(4) *Wine*	(5) *Spirits*
Litres per adult	-4.474***	-0.338***	-3.634***	-0.335***	-0.398***
	(0.670)	(0.0478)	(0.653)	(0.1001)	(0.0508)
Absolute litres per adult	-0.922***	-0.0288***	-0.182***	-0.0422***	-0.149***
	(0.138)	(0.0026)	(0.0327)	(0.0126)	(0.019)
Expenditure per adult	-29.989***	-2.347***	-19.35***	-1.315	-9.039***
	(7.411)	(0.546)	(4.966)	(2.193)	(2.121)
Mean price per litre	0.0633	2.173***	-0.0233	-0.0469	0.197
	(0.0444)	(0.317)	(0.0488)	(0.115)	(0.545)
Mean price per absolute litre	0.307	3.382***	-0.467	-0.372	0.527
	(0.215)	(1.09)	(0.976)	(0.914)	(1.454)
Observations	99	1,287	99	99	99

Note: Clustered standard errors are computed using the Callaway and Sant'Anna (2021) method. Specification (1) includes observations at the province-year level (e.g. total purchases of alcohol in British Columbia in 2010). Specification (2) includes observations at the beverage-product-province-year level (e.g. red wine purchases in BC in 2010). Specifications (3)-(5) include observations at the product-province-year level (e.g. total wine purchases in BC in 2010).

6.2 Measure of Salience

While θ only possesses a structural interpretation in the context of our parsimonious model, it still provides context for the level of salience that would rationalize the response of alcohol consumption. Estimates close to 1 would suggest that consumers did not change their behavior in response to the cost neutral change, and potentially indicates little role for salience, while estimates close to 0 imply that consumers changed their behavior to a large degree in response to a perceived price increase.

Table 5: Salience Estimate

	Point Estimate	*95% Confidence Interval*
Estimated Treatment Effect	-4.474	[-5.788, -3.160]
Percent Change due to Reform	-4.19%	[-5.42%, -2.96%]
Elasticity Estimate	-0.34	[-0.8, -0.14]
	Estimate	
Salience Estimate	-5.06	

Elasticity estimates are from Stockwell et al. (2012).

Our estimate of θ is outside the bounds of our model. Given the price elasticity of demand for alcohol and the large decline in consumption, salience alone cannot fully account for the decline. Data from the Survey of Household spending reported by Statistics Canada suggests that roughly 14% of household expenditures were subject to an increased tax rate due to the reform. This implies a portion of the magnitude of the decline is likely attributable to a negative income effect on alcohol demand and/or large substitution effects out of alcohol demand due the real (or perceived) changes in the relative prices of other goods.

In order to assess the reduced form role of salience, we quantify the impact of the reform's repeal which occurred three years later. The reform's repeal was widely advertised and was enacted in response to a referendum in which every household received a ballot. We believe this implies that the level of salience was much greater and so the change in alcohol demand much more likely to be driven by the classical considerations of income and substitution effects alone.

6.3 Impact of Repeal

The coefficient estimates presented in Table 6 indicate that the impact on alcohol demand due to the HST's repeal is smaller in magnitude than the impact on alcohol demand induced by its enactment. If we interpret the impact of repeal as the estimated response of alcohol demand purged of any salience effects, we can then interpret the estimated impact of repeal as the response of alcohol demand induced by the global HST reform due to the combination of income and substitution effects. Of course, this is a strong assumption, as it requires that there were no structural changes in the BC economy during the reform period and that the

impact of repealing the policy is of equal and opposite magnitude to that of adopting the policy.

Table 6: Comparison of Treatment Effect Estimates

	(1) HST Treatment Effect		(2) Repeal Treatment Effect	
Variable	*Coefficient*	*Percent Change*	*Coefficient*	*Percent Change*
Litres per adult	-3.98***	-3.727%	2.636***	2.701%
	(0.359)		(0.465)	
Absolute litres per adult	-0.821***	-3.728%	0.544***	2.703%
	(0.0739)		(0.0958)	
Expenditure per adult	-16.829***	-2.235%	-21.578***	-2.892%
	(4.375)		(3.580)	
Mean price per litre	0.147***	2.085%	-0.397***	-5.192%
	(0.0496)		(0.0524)	
Mean price per absolute litre	0.713***	2.085%	-1.923***	-5.186%
	(0.241)		(0.254)	
Observations	56		24	

Clustered standard errors in parentheses. Both specifications provide the treatment effects for only the first year after the policy change. For specification (1), this treatment effect is measured in fiscal year 2011, and for specification (2) the treatment effect is measured in fiscal year 2014. The percent change columns illustrate the treatment effect as a fraction of the mean in the year before treatment.

7 Conclusion

Utilizing the unique institutional context of the British Columbia liquor market and the implementation of the HST to explore the role of tax salience, we find large declines in demand for alcohol despite the BC Liquor Distribution Branch modifying pretax prices to keep the after tax price fixed. Fitting a quasi linear model of consumer behavior and taking estimates for the elasticity of BC alcohol demand from the literature, we find salience alone can not account for the aggregate decline in alcohol consumption. Estimating the impact of the HST's repeal, which was likely to be much more well known, reveals a smaller in magnitude increase in demand, which we interpret as evidence that salience played a significant role when the policy was adopted. In the future, we hope to more precisely quantity the level of salience likely present when the HST was adopted.

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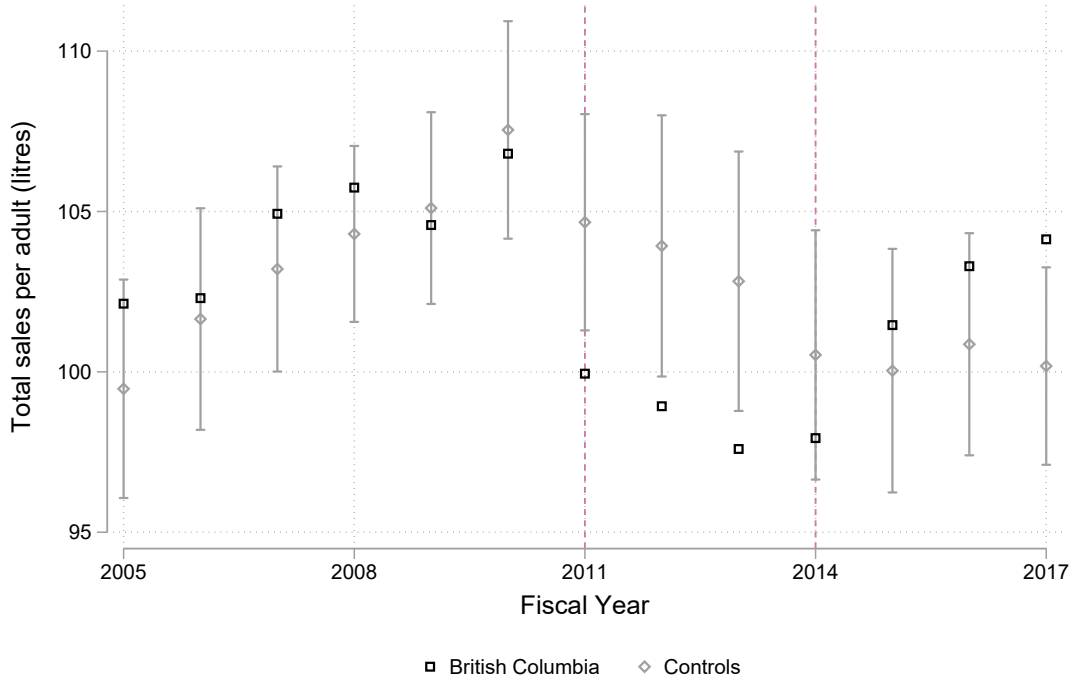
A Appendices

A.1 Figures

Figure 1: Parallel Trends Plots



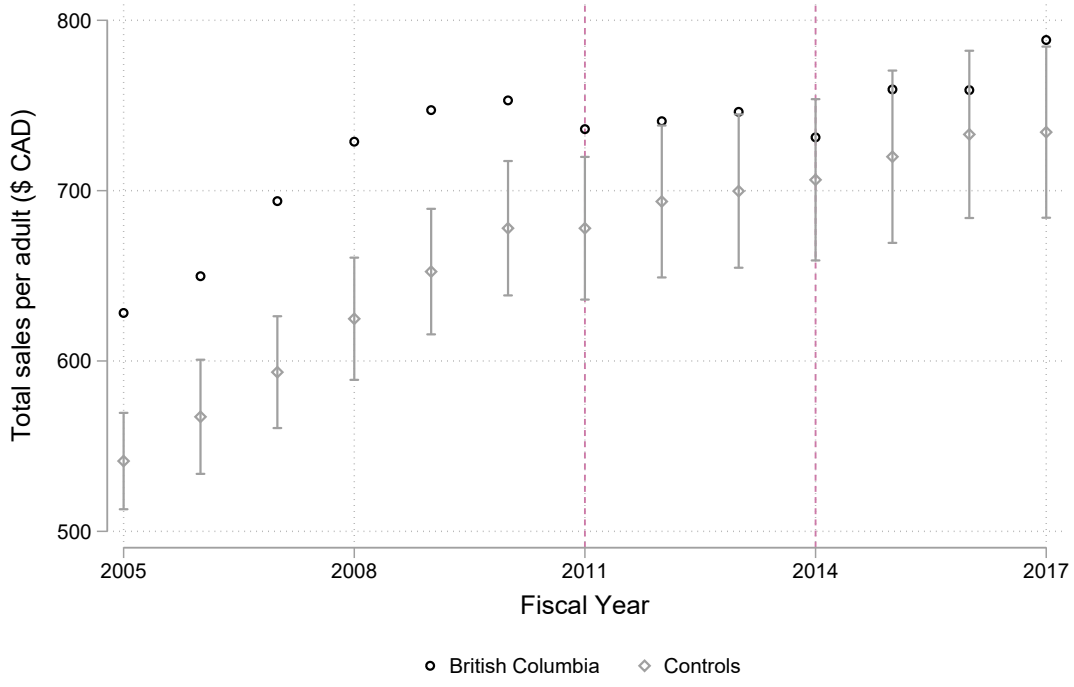


Figure 2: BC Treatment Effects - Total

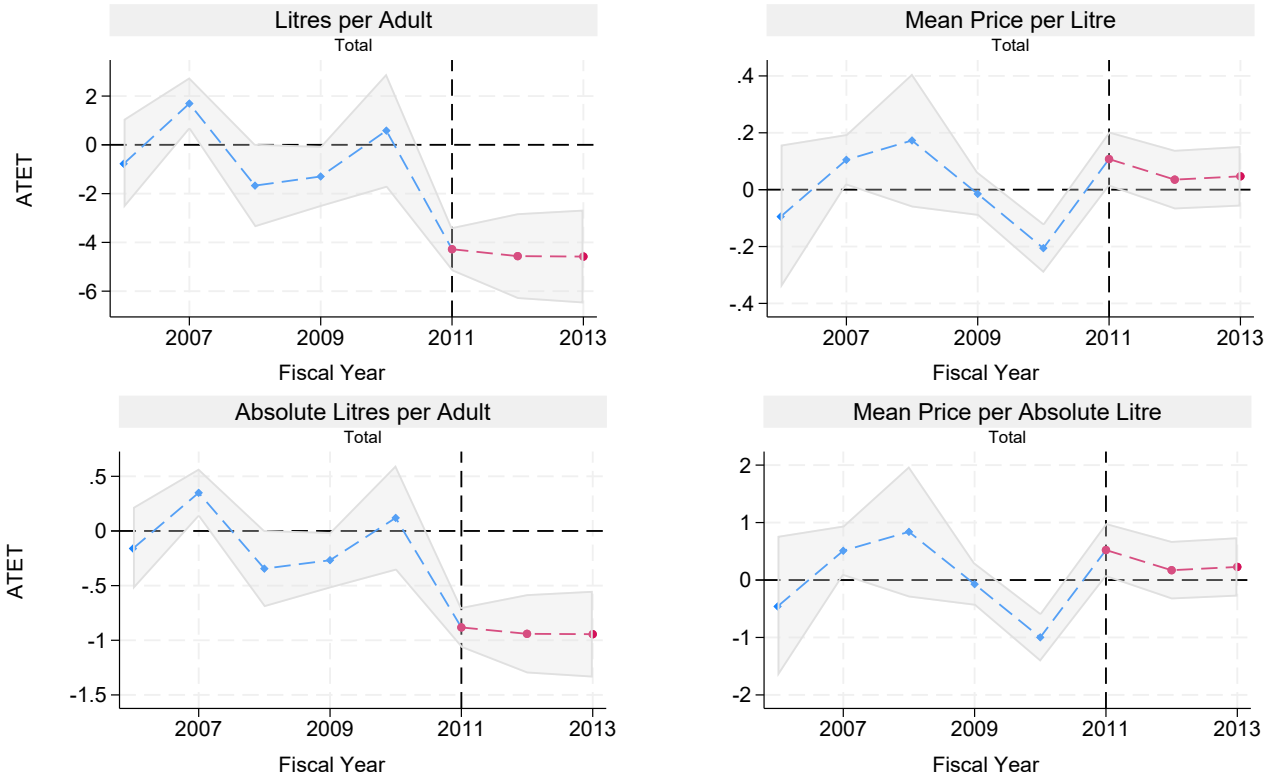


Figure 3: BC Treatment Effects - All Products

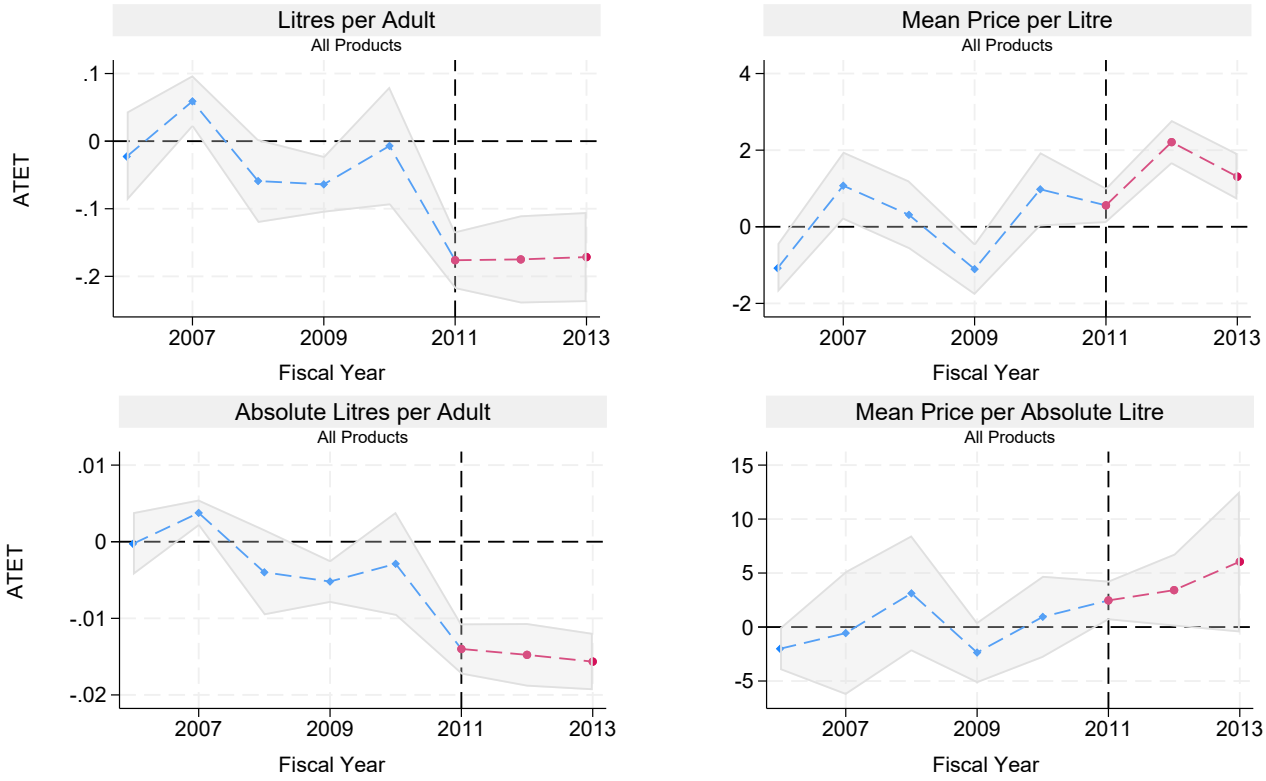


Figure 4: BC Treatment Effects - Beer

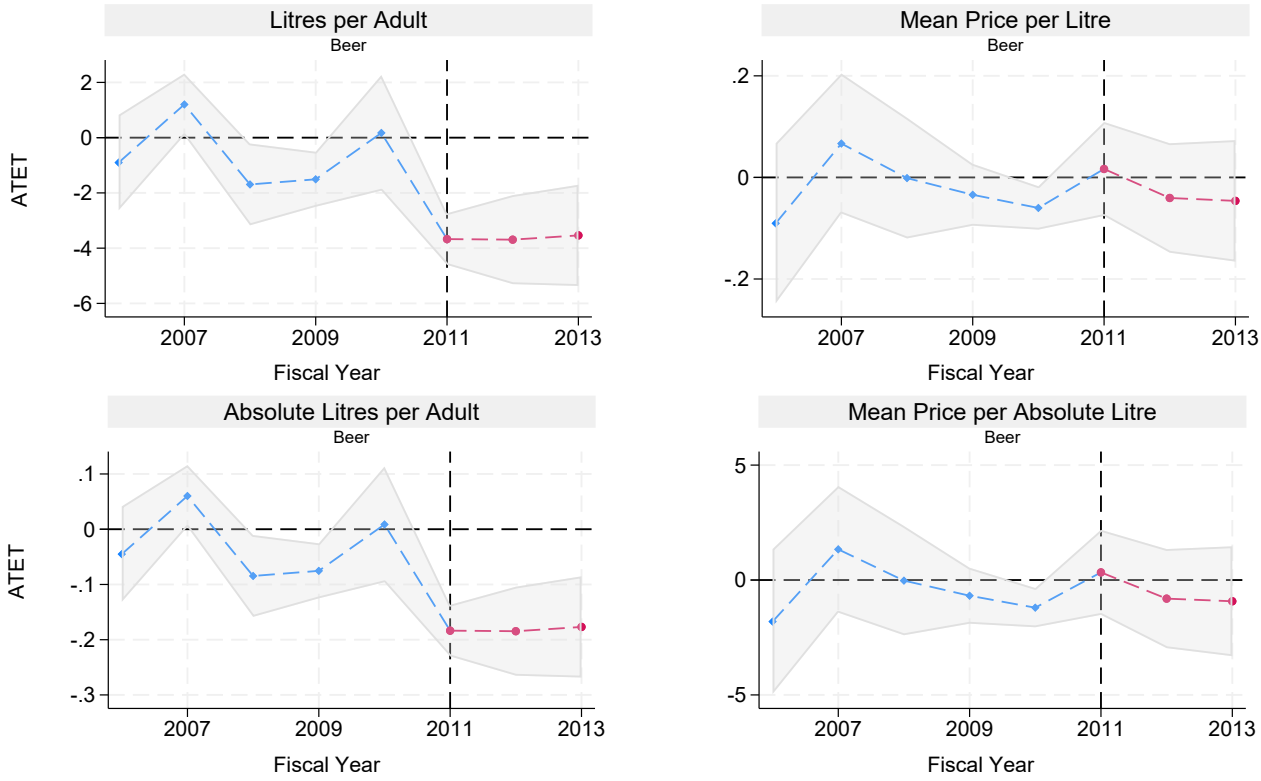


Figure 5: BC Treatment Effects - Wine

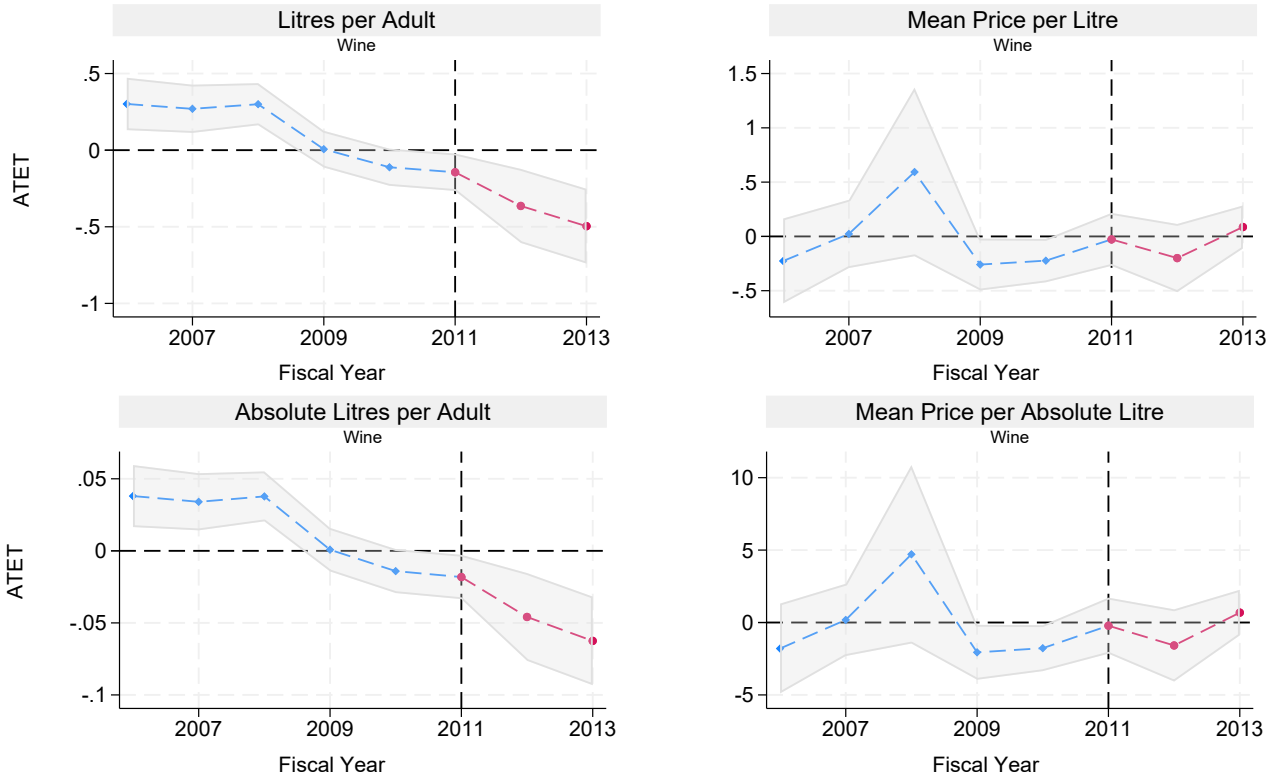
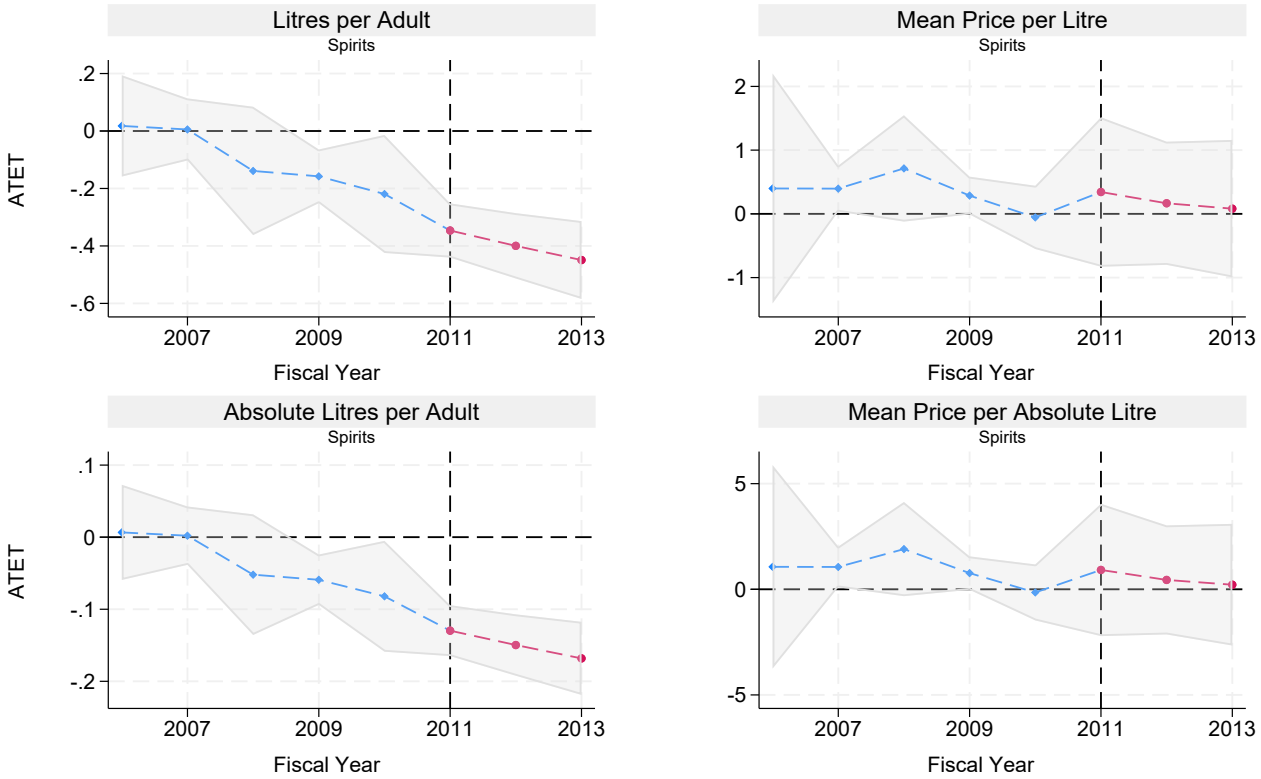


Figure 6: BC Treatment Effects - Spirits



A.2 Summary of Provincial Retail Liquor Markets in 2010

PROVINCE	Wine		Beer		Spirits	
	Public	Private	Public	Private	Public	Private
British Columbia	×	×	×	×	×	×
Alberta		×		×		×
Saskatchewan	×		×		×	
Manitoba	×	×	×	×	×	
Ontario	×		×	×	×	
Quebec	×	×		×	×	
Nova Scotia	×		×		×	
New Brunswick	×		×		×	
Prince Edward Island	×		×		×	
Newfoundland and Labrador	×		×	×	×	

A.3 Products Affected by Harmonization in British Columbia

The HST added a 7% sales tax on:

Clothing, footwear, and accessories:

- Adult sized clothing for children
- Used adult clothing
- Adult sized ski gloves for children
- Adult sized ski boots for children
- Children's sized ski boots

Entertainment and leisure:

- Professional sports tickets
- Movie tickets
- Golf memberships
- Driving range fees
- Extracurricular lessons
- Tickets for live theatre
- Bicycles
- Admission to museums and art galleries
- Music concerts
- Ski lift passes
- Hockey rink and hall rentals
- Electronic downloads of MP3s

Food and beverages:

- Snack foods
- Restaurant meals

Health and beauty:

- Over-the-counter medications
- Vitamins
- Safety helmets for sports
- Gym and athletic memberships

Household products:

- Newspapers
- Certain school supplies
- Magazines
- EnergyStar windows
- Thermal insulation, weather stripping and caulking
- Smoke detectors valued less than $250 for residential use
- Food producing plants and trees

Services

- Household moving services
- Shoe repair
- Tailoring services
- Dry cleaning
- Catering and event planning services
- Household appliance repairs
- Repair, maintenance, or renovation services
- Landscaping, lawn care, private snow removal, and house cleaning
- Real estate commissions
- Massage therapy services
- Funeral services
- Fitness trainer services
- Hairstylist/barber services
- Esthetician services
- Accounting services
- Interior design services
- Wedding planning services
- Veterinarian services

Tobacco

- Cigarettes
- Cigars
- Chewing tobacco
- Nicotine replacement products

Travel

- Taxis
- Camping sites
- Domestic air, rail, and bus travel
- Parking

Utilities

- Basic cable television
- Local residential phone

The HST lowered the sales tax on:

- Children's disposable diapers (from 12% to 5%)
- Alcoholic beverages (from 15% to 12%)
- Residential electricity and heating (from 5.4% to 5%)
- Hotel rooms (from 13% to 12%)
- Certain vehicle leases (from 15% to 12%)
- Certain vehicle purchases (from 15% to 12%)

Table 7: Average Household Expenditure on Affected Products - 2010

	Mean	*Share of total consumption*
Total current consumption	58,473	
Restaurant meals	2,253	3.853%
Restaurant snacks and beverages	304	0.520%
Commissions for sale of real estate	349	0.597%
Landline telephone services	433	0.741%
Veterinarian and other services	253	0.433%
Athletic footwear (women)	127	0.217%
Athletic footwear (men)	131	0.224%
Children's wear	52	0.089%
Laundry and dry-cleaning services	17	0.029%
Services for clothing, footwear and jewellery	13	0.022%
Parking	261	0.446%
Taxi (including tips)	73	0.125%
Airplane	896	1.532%
Inter-city bus	11	0.019%
Other inter-city passenger transportation services	117	0.200%
Household moving, storage and delivery services	85	0.145%
Non-prescribed medicines, pharmaceutical products	517	0.884%
Hair grooming services	224	0.383%
Other personal care services	103	0.176%
Sports and athletic equipment and related services	125	0.214%
Movie theatres	53	0.091%
Live sporting and performing arts events	93	0.159%
Admission fees to museums, zoos and other sites	61	0.104%
Television and satellite radio services	633	1.083%
Dues and fees for sports and recreation facilities	305	0.522%
Bicycles (purchase), parts and accessories	58	0.099%
Newspapers	28	0.048%
Magazines and periodicals	34	0.058%
Cigarettes	207	0.354%
Other tobacco products and smokers' supplies	58	0.099%
Other financial services	161	0.275%
Funeral services	62	0.106%
Total of products subject to tax rate increase	8,097	13.847%
Alcoholic beverages	912	1.560%