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# Tax Avoidance through E-Commerce and Cross-Border Shopping

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# Tax Avoidance through E-Commerce and Cross-Border Shopping

## Abstract

As e-commerce has grown over the last few decades so has states' concern for its use for sales tax avoidance. Using a panel of Washington State tax jurisdictions from 2005 through 2015, I estimate the effect of a sales tax regime change on the elasticities of taxable sales. I find the regime change, targeted at reducing sales tax avoidance through remote purchases, had a differential impact that varied by tax jurisdiction. I find that in tax jurisdictions near the border of lower-sales-tax states (Oregon and Idaho) consumers became more responsive to the difference in sales tax rates across borders than their counterparts in the interior of the state. I interpret this as a substitution by consumers along the Oregon and Idaho border from e-commerce purchases to cross-border shopping in order to avoid sales taxes.

JEL-Codes: H260, H710.

Keywords: sales tax avoidance, destination-based taxation, cross-border shopping.

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# I Introduction

The growth of e-commerce over the last few decades has placed increased pressure on states' ability to raise revenue through sales taxes. The United States Government Accountability Office (GAO) estimates the lost revenue for state and local governments from avoidance on e-commerce purchases to be between \$8 and \$13 billion for 2017 (GAO, 2017). Consumers were able to avoid sales taxes on many e-commerce purchases because out-of-state sellers with no physical presence in a state were not required by law to collect sales taxes.<sup>1</sup> The Supreme Court of the United States overturned the physical presence requirement in a June 2018 ruling.<sup>2</sup> Prior to the Supreme Court's ruling, several states enacted reforms in an attempt to improve sales tax collection. One such reform is a July 2008 Washington State tax regime change (hereafter known as the regime change). This paper studies the effects of the regime change on sales tax avoidance by looking at consumers' response to changes in sales tax rate differential. The regime change and the Supreme Court's ruling focused on reducing sales tax avoidance on e-commerce purchases, but cross-border shopping remains as an avenue to avoid sales taxes.

The effectiveness of ending sales tax avoidance on e-commerce purchases will depend on consumers' substitution to cross-border shopping. The degree to which consumers substitute between the two forms of avoidance could dampen the effects of the regime change. The incentive to cross-border shop varies across each of Washington State's borders because of variation in its neighbor's rates. I look at how consumers respond to changes in the rate differentials before and after the regime change. In order to identify the effect, I use a difference-in-difference approach using the interior counties as the control and a separate group for each border. I find that following the regime change, tax jurisdictions near lower-tax state borders saw the largest increase in responsiveness. Consumers in tax jurisdictions near the Oregon border, where the rate differential is the largest, are the most responsive

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<sup>1</sup>This was the key ruling in *National Bellas Hess, Inc. v. Department of Revenue of Ill.*, 386 U. S. 753 (1967) and *Quill Corp. v. North Dakota*, 504 U. S. 298 (1992).

<sup>2</sup>The requirement was overturned in *South Dakota v. Wayfair, Inc.*, 585 U.S. \_\_\_\_ (2018).

to a change in the rate differential following the regime change. I find that following the regime change, a one percentage point increase in the sales tax rate differential leads to approximately a 29 percent decrease in taxable retail sales per capita, on average, in tax jurisdictions near Oregon. I also find that following the regime change consumers in the interior of the state became less responsive to changes in the tax differential.

E-commerce purchases provide a means of sales tax avoidance for all consumers while cross-border shopping tends to be limited to consumers near lower-tax borders. A policy that reduces sales tax avoidance on e-commerce purchases would have a differential effect depending on consumers' outside option of avoidance. Washington State provides an excellent case study because its three neighbors (Oregon, Idaho, and British Columbia) each have substantially different sales tax rates. Oregon has no sales tax and provides the largest incentive to cross-border shop. Idaho imposes a six percent sales tax rate and provides less of an incentive to cross-border shop.<sup>3</sup> British Columbia is unique because it provides no incentive to cross-border shop as it levies a five percent federal VAT in addition to its seven percent sales tax.<sup>4</sup> While Washington State has a uniform sales-tax rate of 6.5 percent, the rates consumers face vary across tax jurisdictions because of local-option sales taxes.<sup>5</sup> The average combined sales-tax rate for tax jurisdiction in the sample is 8.2 percent.

The tax regime change consisted of two components. First, Washington State changed its sourcing rules from an origin principle to a destination principle. Under a destination principle, goods are taxed based on where they are received instead of being taxed based on their shipping origin.<sup>6</sup> Thus, consumers can no longer have goods shipped to them from lower-tax jurisdictions to avoid sales taxes. Second, Washington State became a full member of the Streamlined Sales and Use Tax Agreement (SSUTA) which improved the collection

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<sup>3</sup>Idaho decreased its sales tax rate to five percent for the period of July 1, 2005, to September 30, 2006.

<sup>4</sup>It could also be the case that Canadians shop in Washington State to avoid British Columbia sales tax. Canada's VAT was seven percent until June 30, 2006, when it dropped to six percent from July 1, 2006, to December 31, 2007. On January 1, 2008, it decreased to five percent.

<sup>5</sup>In my analysis tax jurisdictions are defined as either cities or the unincorporated parts of counties. Both cities and counties have local option sales taxes, but state law places constraints on the local option rates.

<sup>6</sup>This change in sourcing rules only applies to within state sales. Washington State sales taxes cannot be collected on goods sold to consumers out of state.

of sales taxes on e-commerce purchases.<sup>7</sup> It did so by increasing the number of out-of-state businesses collecting sales taxes for Washington State. While I cannot separate the effects, both effects should work in the same direction.

Finally, I estimate the effect of the regime change on the taxable sales per capita for the different border groups while holding each border group's tax differential constant at its sample average. As expected, the regime change increases the reported taxable retail sales per capita for the tax jurisdictions in counties that border either Idaho or Canada. Consumers in these jurisdiction either face higher cost of travel to a lower-tax state or the tax differentials are much smaller. I find that the regime change increases the reported taxable retail sales per capita by almost 20 percent, on average, for tax jurisdictions that border Canada. For the tax jurisdictions that border Idaho, I find that the regime change increases the reported taxable retail sales per capita by 18.5 percent. I find no effect of the regime change on the reported taxable retail sales for the tax jurisdictions that border Oregon. This is expected if consumers substitute to cross-border shopping.

## II Literature Review

### A Sales Tax Avoidance

Tax avoidance through cross-border shopping has been studied for a variety of goods including retail trade, groceries, alcohol, cigarettes, gasoline, and lottery tickets. Leal et al. (2010) provide a survey of the literature. The literature consistently finds evidence that differences in sales tax rates between tax jurisdictions induce cross-border shopping, although the estimated elasticities vary across the good covered in the studies. I build upon this literature by following the standard approach of comparing tax jurisdictions on the border of the state

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<sup>7</sup>SSUTA is a multi-state sales tax agreement with the goal of improving sales tax collection by out-of-state businesses. The agreement works to reduce the compliance cost for businesses collecting and remitting sales tax to multiple state and local tax jurisdictions.

to those in its interior.<sup>8</sup>

As the internet grew and online shopping became more prevalent, remote sellers who did not collect sales taxes became a more feasible option for consumers to avoid sales tax. The earliest studies of the impact of e-commerce on sales tax avoidance are Goolsbee (2000), Alm and Melnik (2005), and Ballard and Lee (2007). All three use survey data on consumers' use of the internet for shopping and find that consumers in higher sales tax areas were more likely to use the internet for shopping. The broadest of these studies, Ballard and Lee (2007), uses data from the 1997 and 2001 Current Population Surveys. They find that consumers in higher sales tax counties are more likely to shop on the internet, but to a lesser degree in a county bordering a county with a lower sales tax rate. They interpret these results as evidence of cross-border shopping.

The findings of Ballard and Lee (2007) suggest that consumers in higher tax rate jurisdictions of Washington State are more likely to use the internet to avoid sales tax. Because the higher tax jurisdictions are located in the interior of Washington State, a policy that decreases sales tax avoidance through e-commerce purchases will have a differential effect that varies with distance from the state border. Since e-commerce in the United States has grown, from \$27.6 billion in 2000 to over \$449 billion in 2017, it is worth reconsidering if the greater number of e-commerce options available to consumers have changed these results.<sup>9</sup>

More-recent studies of sales tax avoidance through e-commerce purchases focus on consumers' use of specific companies to avoid sales tax. Einav et al. (2014) analyze detailed browsing data from eBay from 2008 to 2010 and estimate that purchases by interested buyers fall by about two percent for every one percentage point increase in the sales tax rate charged by the seller. They also find that a one percentage point increase in a state's sales tax rate leads to about a two percent increase in online purchases from other states and a three to four percent decrease in online purchases from home sellers.

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<sup>8</sup>In the literature a tax jurisdiction tends to be a county.

<sup>9</sup>Author's calculation using data from U.S. quarterly e-commerce reports. The data used can be found at <https://www.census.gov/retail/index.html>. As a percentage of retail trade sales e-commerce was 0.93% of retail sales in 2000 and 8.87% of retail sales in 2017.



Baugh et al. (2014) evaluate the impact of 19 states implementing so-called “Amazon Laws” on household purchases from Amazon.com, Inc. using daily financial transaction data for 460,000 households from January 2011 to May 2015.<sup>10</sup> They find that households reduced the dollar amount of their purchases from Amazon by 9.1 percent after Amazon laws are enacted. For large purchases (at least \$250) they find an even stronger effect, with households reducing the dollar amount of their Amazon purchases by 29.1 percent.

The Baugh et al. (2014) study is of particular relevance to this paper because Amazon’s headquarters are in Washington State. Therefore, Amazon has always been required to collect sales taxes on its in-state sales.<sup>11</sup> So while the change in sourcing rules would change the sales tax rate charged to many consumers on their purchases from Amazon, any substitution to Amazon’s competitors (that do not collect sales tax) should have occurred before the law change. For other states, this could be a concern because when Baugh et al. (2014) limit their analysis to transactions involving only electronics item, they find some evidence of households substituting from Amazon to a competing online electronics retailer. Because Amazon is the largest online retailer, the impact of increased sales tax collection on e-commerce purchases could have a larger impact on cross-border shopping in other states if Amazon were one of the companies to start collecting sales taxes.

While both the Einav et al. (2014) and Baugh et al. (2014) studies highlight the use of e-commerce for sales tax avoidance they do not address its impact on cross-border shopping. The findings of both studies suggest that consumers substitute to other e-commerce options to avoid sales taxes. The regime change I study does not eliminate avoidance through e-commerce purchases; it only reduces its feasibility. Therefore, depending on how successful other policies are at reducing avoidance through e-commerce purchases, the effects could be larger. To the best of my knowledge, this is the first paper that provides evidence on the degree to which consumers substitute between the two methods of avoidance.

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<sup>10</sup>Amazon Laws are laws with the goal of requiring Amazon.com, Inc. to collect sales tax from consumers at checkout. The main approach is to establish a click-through-nexus. A click-through-nexus objective is to get around the physical presence requirement and establish a nexus for Amazon.

<sup>11</sup>There are sellers who use Amazon’s marketplace that may not have been collecting sales taxes.

## B Cross-Border Shopping in Washington

Previous research has established that sales tax avoidance through cross-border shopping occurs in Washington State (McAllister, 1961; Beck, 1992; Wooster and Lehner, 2010). The most recent work, Wooster and Lehner (2010), uses annual reported taxable sales data aggregated to the county level from 1992 to 2006. It estimates the difference between interior and border counties in their elasticities of sales with respect to the tax differences to be -3.11 over this time period. I build on their results in several ways. First, I use quarterly jurisdiction-level data. Second, I use a different classification of the border and interior.<sup>12</sup> Third, my study includes observations made both before and after the regime change. This allows me to estimate the effect of joining the SSUTA and switching from an origin principle to a destination principle.

## III Background and the Regime Change

State officials are concerned with sales tax collection by businesses because if sales taxes are not collected and remitted by businesses, it falls on the consumer to pay use tax.<sup>13</sup> Compliance with use tax by consumers is known to be low, leading to large revenue losses for states and local governments. The rise of e-commerce increased the feasibility of sales tax avoidance increasing revenue losses. The Washington State regime change was trying to reduce this revenue loss from e-commerce.

Sales tax avoidance through e-commerce and mail-order purchases is a newer means of avoidance. It arose from the Supreme Court's ruling in *National Bellas Hess, Inc. v. Department of Revenue of Ill.*<sup>14</sup> The *Bellas Hess* ruling was upheld 25 years later in *Quill*

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<sup>12</sup>In their classification of the border and interior, they treat all counties along the Canadian border as part of the interior of the state, while grouping counties that border Oregon or Idaho as the border counties. I deviate by allowing for a different effect along all three borders. I do so because the sales tax rate differential varies across all three borders.

<sup>13</sup>Use tax is a sales tax equivalent rate that is owed on all purchases for which sales tax is owed but has not been collected. When use tax is not paid it is tax evasion.

<sup>14</sup>*National Bellas Hess, Inc. v. Department of Revenue of Ill.*, 386 U. S. 753 (1967)

*Corp. v. North Dakota*.<sup>15</sup> Both rulings held that a state cannot compel businesses without a physical presence in that state to collect and remit sales tax.<sup>16</sup> However, “physical presence” was not well defined in these rulings and many states expanded the definition of physical presence to establish a nexus for out-of-state sellers (Agrawal and Fox, 2017).<sup>17</sup> The option for consumers to avoid sales tax through e-commerce purchases has likely ended with the United States Supreme Court overturning *Quill Corp. v. North Dakota* and the physical presence requirement in the June 21, 2018 ruling in *South Dakota v. Wayfair, Inc.*<sup>18</sup> Therefore, many states could see an increase in cross-border shopping as consumers substitute to this longstanding method of sales-tax avoidance.

On July 1, 2008, Substitute Senate Bill 5089 (SSB 5089) went into effect. This changed Washington State’s sales tax sourcing rules from an origin principle to a destination principle. Simultaneously they became full members of the SSUTA. I study the full effect of the tax regime change because I am unable to separate the two effects. However, both components should work in the same direction, increasing the difficulty of avoiding sales taxes through e-commerce purchases. I expect a differential effect within Washington State as many consumers still have the option to cross-border shop to avoid sales taxes.

A shift from an origin to a destination basis for sales taxation only matters for goods that are shipped between tax jurisdictions. Goods taken possession of in a store, or delivered within the same tax jurisdiction are charged the same sales tax rate under either sourcing principle. Because the tax regime shift should primarily affect goods that can easily be shipped, it should have a differential impact on different types of good. To test this, I analyze the reported taxable dollar amount of sales per capita for four classifications of business separately; all businesses selling taxed goods, non-retail trade businesses, retail trade businesses, and e-commerce or mail-order businesses. I expect retail goods and e-

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<sup>15</sup>*Quill Corp. v. North Dakota*, 504 U. S. 298 (1992)

<sup>16</sup>The justification in *Quill* was the high compliance cost for businesses to file sales tax returns in multiple states and local tax jurisdictions.

<sup>17</sup>Nexus refers to the legal requirement to collect and remit sales tax. A business that has a physical presence in a state is said to have established a nexus in a state.

<sup>18</sup>*South Dakota v. Wayfair, Inc.*, 585 U.S. \_\_\_\_ (2018).

commerce goods to be more conducive to tax avoidance, and therefore the expected effect of the regime shift to be larger for those categories.

While the change to a destination principle was about reducing avoidance on consumer purchases from out-of-state businesses, the change in sourcing principle removed the possibility for consumers to use remote purchases within the state to pay a lower sales tax rate. Because Washington State has a uniform state sales tax rate, under either set of sourcing rules the state does not lose tax revenue from within-state avoidance of local sales tax. Following the change in sourcing rules, some local governments were expected to lose sales tax revenue because it changed which tax jurisdiction receives the revenue for sales which are delivered across jurisdictions. Because of variation in local option sales tax rates, the change in which jurisdiction receives revenue from a sale also changed the sales tax rate applied on these within state purchases.<sup>19</sup>

The second part of the regime change, the joining of the SSUTA, improved sales tax collection at both the state and local level by increasing voluntary collection by out-of-state sellers.<sup>20</sup> When Washington State became a full member of the SSUTA all businesses that were registered as sellers with SSUTA and were not previously collecting sales tax for sales in Washington State were required to do so. While I cannot observe how many sellers started collecting following the regime change, the upper bound would be the 1200 sellers registered with the SSUTA at the time of the regime change.<sup>21</sup>

While the SSUTA cannot compel businesses to register with it, there are some incentives for companies to join.<sup>22</sup> All SSUTA member states adopt common language and definitions in their tax codes to reduce the compliance costs of businesses collecting and remitting sales

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<sup>19</sup>The change in sourcing rules also established clear rules for out-of-state sellers regarding the sales tax rate they should apply. This should have improved collection, by clarifying compliance requirements for out-of-state sellers.

<sup>20</sup>Voluntary compliance is necessary because states could not compel many businesses to collect sales tax. So they worked together to get businesses to register with SSUTA.

<sup>21</sup>As of July 31, 2018, there were 3969 sellers registered with the SSUTA.

<sup>22</sup>Its member states are: Arkansas, Georgia, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Nebraska, Nevada, New Jersey, North Carolina, North Dakota, Ohio, Oklahoma, Rhode Island, South Dakota, Utah, Vermont, Washington, West Virginia, Wisconsin, Wyoming. Tennessee is an associate member.

taxes. Each member state also uses a central state agency for the collection of state and local tax revenue, which ensures that businesses only have to file with each state and not with individual local tax jurisdictions within states. All member states also publish resources to help companies calculate the appropriate sales tax to collect on each transaction.<sup>23</sup>

The SSUTA also provides several additional incentives to register. When a business registers with the SSUTA, it is automatically registered with all member states and is assigned a unique tax identification number to simplify filing in member states. In addition, registered sellers are allowed the use state-certified automated software for all tax calculations and receive liability relief for incorrect tax calculations by the software. For sellers who are voluntarily collecting taxes, member states absorb a fraction of the cost of the software.

Businesses uncertain of their legal obligation to collect sales taxes may also voluntarily register to avoid any penalties and fines.<sup>24</sup> Many states changed their laws to expand the definition of physical presence and businesses would have to be constantly watching for changes in their legal obligation to collect sales taxes. If the cost of ensuring compliance with all states was high, businesses could choose to voluntarily collect sales taxes. In this paper I do not study why businesses choose to collect sales taxes voluntarily, I only observe that they do. So while increased collection by businesses is observed I do not distinguish why it is occurring.

A 2011 study by the Washington State Joint Legislative Audit & Review Committee (JLARC) found that while new revenue was received from voluntary compliance following SSB 5089, it was less than expected. For the 2009 fiscal year, the expected tax revenue from voluntary compliance was \$49.1 million, but the actual revenue received was \$5.6 million. For 2010, sales tax revenue from voluntary compliance was expected to be \$59 million but the actual tax revenue collected was \$7.1 million. These results are not unique as several other

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<sup>23</sup>One such resource is a GIS database of sales tax rates that can be used to find the appropriate sales tax rate.

<sup>24</sup>Some states have offered amnesty for tax penalties in exchange for businesses registering with the SSUTA. Sellers must remain registered and continue to collect and remit the applicable sales taxes for at least 36 months. Currently, Tennessee is the only state offering amnesty.

states that joined SSUTA had lower than expected collection from voluntary compliance (Joint Legislative Audit & Review Committee 2011). To some extent, Washington State may have been overly optimistic in its projections, but an unanticipated substitution to other means of avoidance would contribute to the lower sales tax revenue as well. This paper provides evidence that substitution occurred.

## IV Empirical Framework

The change of the sourcing principle alters both the tax base and taxpayers' response to a change in the sales tax rate differential between neighboring jurisdictions. In addition, a change in the sourcing principle can improve enforcement on remote purchases.

### A Reported Taxable Sales under an Origin Principle

The total expenditure by a tax jurisdiction's residents under an origin principle can be expressed as

$$E_o = P \times (q_s^o + q_r^o + q_b^o), \quad (1)$$

where  $q_s^o$  is the quantity of goods purchased under an origin principle within the jurisdictions,  $q_r^o$  is the quantity of goods purchased remotely, and  $q_b^o$  is the quantity of goods purchased across a border. The variable  $P$  represents a composite price of the goods. The reported taxable sales for a tax jurisdiction under an origin principle can be expressed as

$$S_o = P \times (q_s^o + q_n^o + q_{r,n}^o + \theta_r^o q_r^o + \theta_b^o q_b^o). \quad (2)$$

The variable  $q_n^o$  is the quantity of goods purchased in tax jurisdictions by non-residents shopping in the jurisdiction. The term  $q_{r,n}^o$  is the remote purchases by consumers from other tax jurisdictions in Washington State. This can be thought of as tax jurisdictions exporting goods and receiving sales tax revenue from these sales. The term  $\theta_r^o$  is the fraction of remote

purchases on which use tax is paid and the term  $\theta_b^o$  is the fraction of purchases across borders on which use tax is paid.

A consumer in a tax jurisdiction can make online or mail-order purchases from businesses within the state or out-of-the state. I assume that all remote purchases by consumers from out-of-state businesses are untaxed under the origin principle and that no use tax is paid on these purchases. Consumers who remotely purchase goods from a business within their state are charged the sales tax rate of the tax jurisdiction where the business is located. The tax jurisdiction where the business is located receives the revenue for the sale. This means on remote purchases a consumer's home jurisdiction receives no sales tax revenue. Under these assumptions then  $\theta_r^o = 0$ . I also assume that no use tax is paid on cross-border purchases and therefore  $\theta_b^o = 0$  as well. This allows me to rewrite Equation (2) as

$$S_o = P \times (q_s^o + q_n^o + q_{r,n}^o). \quad (3)$$

Then the change in the reported total taxable sales with respect to a change in a tax jurisdiction's sales tax rate is

$$\frac{dS_o}{dt_s} = P \times \left( \frac{dq_s^o}{dt_s} + \frac{dq_n^o}{dt_s} + \frac{dq_{r,n}^o}{dt_s} \right). \quad (4)$$

This tells us that a tax jurisdiction's reported taxable sales depend on consumers decisions to buy within jurisdiction as well as the decision of non-jurisdiction residents to purchase goods for a jurisdiction.

## B Reported Taxable Sales under a Destination Principle

Total expenditure by a tax jurisdiction's residents under a destination principle can be expressed as

$$E_d = P \times (q_s^d + q_r^d + q_b^d). \quad (5)$$

The variable  $q_s^d$  is the quantity of goods purchased within jurisdiction,  $q_r^d$  is the quantity of goods purchased remotely, and  $q_b^d$  is the quantity of goods purchased across borders. Now under a destination principle the reported taxable sales for a tax jurisdiction can be expressed as

$$S_d = P \times (q_s^d + q_n^d + \theta_r^d q_r^d + \theta_b^d q_b^d) \quad (6)$$

where  $q_n^d$  is the quantity of goods purchased in the tax jurisdiction by non-jurisdiction residents shopping there. The term  $\theta_r^d$  is the fraction of remote purchases on which either sales or use tax is paid and the term  $\theta_b^d$  is the fraction of purchases made across borders on which use tax is paid. I again assume no use tax is paid on cross-border purchases and so  $\theta_b^d = 0$ . Because remote purchases are now credited to the jurisdiction receiving them,  $\theta_r^d > 0$  if any remote purchases are made by consumers from businesses in the state. If there are still out-of-state sellers not collecting sales tax on remote purchases and consumers do not pay use tax on these remote purchases then  $\theta_r^d < 1$ . For simplicity, I assume that after a state joins the SSUTA no sales tax avoidance through remote purchases remains so that  $\theta_r^d = 1$ . Equation (6) can then be written as

$$S_d = P \times (q_s^d + q_n^d + q_r^d). \quad (7)$$

The change in the reported total taxable sales with respect to a change in a tax jurisdiction's sales tax rate is

$$\frac{dS_d}{dt_s} = P \times \left( \frac{dq_s^d}{dt_s} + \frac{dq_n^d}{dt_s} + \frac{dq_r^d}{dt_s} \right) \quad (8)$$

where  $q_r^d \approx q_r^o + \frac{\partial q_r}{\partial t_r}(t_s - t_u)$ . Where  $t_r$  is the tax rate actually paid on remote purchases,  $t_s$  is the sales tax rate of the jurisdiction, and  $t_u$  is the use tax rate actually paid on remote purchases prior to the regime change. So  $t_r$  primarily captures the response of consumers to remote purchases going from untaxed to taxed.



## C Change in a Jurisdiction's Tax Base

For a given sales-tax rate the change in reported taxable sales for a tax jurisdiction because of the regime change is

$$\Delta S = S_d - S_o = P \times (q_s^d + q_n^d + q_r^d) - P \times (q_s^o + q_n^o + q_{r,n}^o). \quad (9)$$

I now make several simplifying assumptions. First,  $q_s^d = q_s^o$  when there is no change in the sales tax rate. Second, I assume that  $q_n^d = q_n^o$  when there is no change in the sales tax rates. Therefore,

$$\Delta S = S_d - S_o = P \times (q_r^d - q_{r,n}^o). \quad (10)$$

For the first-order approximation that  $q_r^d \approx q_r^o + \frac{\partial q_r}{\partial t_r}(t_s - t_u)$ ,

$$\Delta S = P \times (q_r^o + \frac{\partial q_r}{\partial t_r}(t_s - t_u) - q_{r,n}^o). \quad (11)$$

Equation (11) states that the change in the reported taxable sales in a tax jurisdiction increases by the remote purchases made in a jurisdiction less any substitution by consumers away from remote purchases. Consumers substitute away because these purchases are now subject to sales taxes. A jurisdiction also loses revenue from any remote purchases made to businesses in the jurisdiction by consumers in other tax jurisdictions. The percentage change in reported total taxable sales because of the change in sourcing rules and the improved enforcement on remote purchases is therefore

$$\frac{\Delta S}{S_o} = \frac{q_r^o + \frac{\partial q_r}{\partial t_r}(t_s - t_u) - q_{r,n}^o}{P \times (q_s^o + q_n^o + q_{r,n}^o)}. \quad (12)$$

In terms of the elasticity of remote purchases with respect to the tax rate collected on remote purchases,

$$\frac{\partial q_r}{\partial t_r}(t_s - t_u) = \eta_{r,t} q_r^o \frac{(t_s - t_u)}{t_r}. \quad (13)$$

If no use tax is paid on remote purchases,  $t_u = 0$  and  $\frac{(t_s - t_u)}{t_r} = 1$ , so

$$\frac{\Delta S}{S_o} = \frac{q_r^o + \eta_{r,t} q_r^o - q_{r,n}^o}{P \times (q_s^o + q_n^o + q_{r,n}^o)}. \quad (14)$$

The value of  $\eta_{r,t}$  depends in part on the ease of cross-border shopping for consumers. In tax jurisdictions close to the Oregon border, where the cost of travel to cross-border shop is lower and consumers can fully avoid sales tax, consumers will be more responsive to remote purchases being taxed than will consumers elsewhere in the state.

## D Changes in the Elasticities

Because a change in sourcing rules changes the tax base for a jurisdiction, taxable-sales elasticities will differ by tax regime. Any change in the observed elasticities also includes the differential enforcement of sales tax collection on remote purchases under the two regimes.

### D.1 Under the Origin Principle

Under the origin principle the elasticity of reported taxable sales with respect to a change in the sales tax rate is

$$\frac{\partial S_o}{\partial t_s} = P \times \left( \frac{\partial q_s^o}{\partial t_s} + \frac{\partial q_n^o}{\partial t_s} + \frac{\partial q_{r,n}^o}{\partial t_s} \right). \quad (15)$$

In response to an increase in the sales tax rate differential, consumers in a tax jurisdiction can substitute to remote purchases or cross-border shopping. This should make the elasticities more similar across jurisdictions under the origin principle as consumers have a fairly equal way to avoid sales tax. If it is difficult for consumers to avoid their local sales tax, either because the good is difficult to obtain through remote purchase or because the cost of travel to cross-border shop is high, then the tax elasticities will be smaller than those for areas where it is easier to avoid.

## D.2 Under the Destination Principle

If the destination principle makes sales-tax avoidance on remote purchases prohibitively difficult, then the elasticity of taxable sales with respect to the tax differential is

$$\frac{\partial S_d}{\partial t_s} = P \times \left( \frac{\partial q_s^d}{\partial t_s} + \frac{\partial q_n^d}{\partial t_s} + \frac{\partial q_r^d}{\partial t_s} \right). \quad (16)$$

Each tax jurisdiction's base has now changed; as only purchases within a jurisdiction are subject to its sales tax. Under my assumptions, consumers in all tax jurisdictions are now limited to cross-border shopping as a way to avoid sales taxes. This should increase the difference in the elasticities between the tax jurisdictions on the borders of the state and those in the interior of the state.

## D.3 Effect of the change in Policy

The change in elasticities due to a change in tax basis is

$$\frac{\partial S_d}{\partial t_s} - \frac{\partial S_o}{\partial t_s} = P \times \left( \frac{\partial q_s^d}{\partial t_s} + \frac{\partial q_n^d}{\partial t_s} + \frac{\partial q_r^d}{\partial t_s} - \frac{\partial q_s^o}{\partial t_s} - \frac{\partial q_n^o}{\partial t_s} - \frac{\partial q_{r,n}^o}{\partial t_s} \right). \quad (17)$$

Assuming that under both principles that consumers respond the same to the change in the sales tax rate on purchases already subject to tax, that is  $\frac{\partial q_s^d}{\partial t_s} = \frac{\partial q_s^o}{\partial t_s}$  and  $\frac{\partial q_n^d}{\partial t_s} = \frac{\partial q_n^o}{\partial t_s}$ , then the change in the elasticities because of the change in policy is

$$\frac{\partial S_d}{\partial t_s} - \frac{\partial S_o}{\partial t_s} = P \times \left( \frac{\partial q_r^d}{\partial t_s} - \frac{\partial q_{r,n}^o}{\partial t_s} \right). \quad (18)$$

The difference in the change in the elasticities across tax jurisdictions will capture both the differences in the ability of consumers to substitute away from taxable remote purchases to cross-border shopping and the loss of remote purchases by consumers not in the tax jurisdiction.

## V Data

To estimate the effect of the regime change on the change in the elasticities with respect to the sales tax rate differential, I use the quarterly reported taxed dollar amount of sales in a tax jurisdiction from 2005 to 2015. These data are available at the Washington State (DOR) website. The DOR publishes the dollar amount of taxed sales based on the broad business classification of the seller. The DOR classifies sellers by their primary taxable activity using the North America Industry Classification System (NAICS). In my analysis, I use four levels of classifications to measure the impact on the reported dollar amount of taxed sales: all sellers, non-retail trade sellers, retail trade sellers, and e-commerce and mail-order sellers. Retail trade sellers are identified by the NAICS two-digit codes 44 and 45, while e-commerce and mail-order sellers are identified by the four-digit NAICS code 4541.<sup>25</sup> I expect the regime change to have the largest impact on taxable retail trade and e-commerce sales because these are the goods for which consumers can feasibly avoid sales taxes by either means.

The DOR compiles data on the dollar amount of taxed sales at the tax jurisdiction level from tax returns filed by businesses with the DOR.<sup>26</sup> They also publish the number of businesses reporting taxable sales in a jurisdiction.<sup>27</sup>

Sales tax rates are set and published quarterly for all tax jurisdictions. A jurisdiction's sales tax rate consists of the state rate (6.5 percent throughout the sample), its local option city and county rates, and any additional rates applied by special districts.<sup>28</sup> The data on the combined sales tax rates were collected from sales tax rate flyers published by the DOR. There are 324 tax jurisdictions in the panel. By using quarterly data, I can accurately account for the start of the regime change, which went into effect at the start of the third

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<sup>25</sup>E-commerce and mail order sellers are a subcategory of retail trade sellers. A list of what is classified as retail trade can be found at <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2012>. Some of the stores included are those that sell furniture, electronics, appliances, and clothing.

<sup>26</sup>Businesses either report monthly, quarterly, or annually depending on their estimated annual tax liability. A monthly filing is required for an estimated annual tax liability over \$4,800, annually filling for a liability less than \$1,050 and quarterly for any tax liability in between.

<sup>27</sup>A tax jurisdiction either corresponds to a city or the unincorporated parts of a county.

<sup>28</sup>Special districts are primarily public transportation benefit areas whose rate often apply to several tax jurisdictions.

quarter of 2008.

Because the number of residents in a tax jurisdiction varies substantially, I convert all the reported dollar amount of taxed sales to per capita values. As a measure of the population in a tax jurisdiction, I use annual population estimates for cities and the unincorporated parts of counties published by the Washington State Office of Financial Management (OFM). I match the population estimates to their corresponding tax jurisdictions to obtain the per capita dollar amount of taxed sales.

To control for income differences across tax jurisdictions that could affect per capita sale, I use IRS tax return data at the five-digit postal zip code level. I match these data on the adjusted gross income and number of returns to their corresponding tax jurisdictions using zip codes obtained from the DOR. I then calculate an average adjusted gross income per return as a proxy for a tax jurisdiction's per capita income.<sup>29</sup> I include OFM data on population demographics at the county level as additional controls. These include the fraction of the population younger than 19 and the fraction of the population older than 64. Both demographic controls are observed annually. Because Washington State does not tax food, food ingredients, or prescription drugs, areas with a larger number of elderly people are expected to have a lower taxable retail sales because they spend less income on taxable goods (Wooster and Lehner, 2010).<sup>30</sup> I also expect that e-commerce is used less in areas with older populations.

Because a higher cost of travel should decrease cross-border shopping, I include a proxy for the cost of travel that uses the road distance (in miles) to a lower-tax neighbor and fuel cost. To obtain a measure of road distance to a lower-tax neighbor, I use GIS data published by the DOR to calculate the centers of the tax jurisdictions. Using the center point, I calculate road distance to a lower-tax neighbor using the Stata command `georoute` created by Weber and Péclat (2017). In defining a lower-tax neighbor, I choose the closest

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<sup>29</sup>It should be noted that Washington State has no income tax.

<sup>30</sup>For a full list of goods that are exempt from Washington State sales tax see <https://dor.wa.gov/find-taxes-rates/retail-sales-tax/retail-sales-and-use-tax-exemptions>.

out-of-state major city in a lower-tax state that provides a significant retail opportunity.<sup>31</sup> For most of the sample this is measured to either Portland, Oregon or Coeur D’Alene, Idaho.

In calculating the cost of travel, I deviate from previous work on cross-border shopping in Washington State in two ways. First, I use road distance instead of linear distance. Second, I measure distance from a tax jurisdiction rather than from a county seat to its lower-tax neighbor. The use of road distance should produce a better proxy for travel cost because road routes are not direct. For example, in many places in Washington State crossings to the neighboring states are limited to bridges over rivers.

To construct my measure of travel cost, I multiply the road distance to a lower tax neighbor by the quarterly average real price of regular gasoline in Washington State. The weekly price of gasoline was obtained from the United States Energy Information Administration and used to create a quarterly average. By measuring distance from the tax jurisdiction instead of the county seat and using road distance instead of linear distance, I more accurately measure the cost of travel consumers face.

To control for business activity in a tax jurisdiction, I include a proxy for the number of firms in a jurisdiction using the number of firms covered by unemployment insurance in the county. This is reported quarterly by the Employment Security Department of Washington State (ESD). Because some purchases by businesses are also subject to sales taxes, including the number of businesses will improve my estimates. A 2016 study by the Washington State DOR estimates that for 2011 use-tax non-compliance by businesses accounted for \$86.3 million in unreported taxes (Washington State Department of Revenue, 2016). This suggests that sales-tax avoidance by businesses could be significant because use-tax evasion is only possible when sales taxes have not been collected.

I also include a proxy for the number of retail firms in a tax jurisdiction to control for

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<sup>31</sup>In defining a major city I follow Wooster and Lehner (2010). The jurisdictions in Benton County are measured to Hermiston, OR. The jurisdictions in Walla Walla County are measured to Milton-Freewater, OR. The jurisdictions in Whitman County are measured to Moscow, ID. The jurisdictions in Pend Oreille County are measured to Oldtown, ID. The jurisdictions in Asotin, Columbia, and Garfield County are measured to Lewiston, Idaho

the retail shopping available to consumers. These data are also obtained from the ESD.<sup>32</sup> Tax jurisdictions with fewer retail shopping options are likely to have lower reported dollar amounts of taxable retail sales if consumers shop elsewhere. Consumers may also purchase more goods through e-commerce when they have fewer physical stores to shop at.

Since economic conditions will affect the dollar amount of taxed sales in a jurisdiction, I also include the quarterly average unemployment rate for the counties. Data on the unemployment rate are obtained from the local area unemployment statistics published by the United States Bureau of Labor Statistics. I also include quarter-year fixed effects to account for economic trends.

Table 1 presents the summary statistics for the tax jurisdictions in the panel split by border group.<sup>33</sup> Figure 1 illustrates the border groups. The border groups are all tax jurisdictions that are located in counties that border Oregon, all tax jurisdictions in counties that border Idaho, all tax jurisdictions that border British Columbia, and the remaining tax jurisdictions make up the interior.<sup>34</sup> As is expected, the tax jurisdictions in the interior of Washington State and those that border Canada have the highest reported taxable retail sales per capita. For the tax jurisdictions near a lower-sales-tax-rate border, I observe lower reported taxable sales per capita. These observations are consistent with the story that greater sales tax avoidance is occurring in jurisdictions near the border.

Because the focus of this paper is on the differential impact of the regime change, Table 2 presents the averages broken down by border group before and after the regime change. Comparing the pre and post columns in Table 2 it appears that all border groups experience an increase in e-commerce sales per capita, with the largest increase occurring in those tax jurisdictions that border Canada. This is expected because British Columbia has a higher sales tax rate and does not provide a feasible option to cross-border shop. The effect of the

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<sup>32</sup>These are identified by the NAICS two-digit codes 44 and 45.

<sup>33</sup>For some small tax jurisdictions, no Zip Code level IRS tax return data is published. This leads to 324 observations being dropped during estimation.

<sup>34</sup>Three counties that sit on the Oregon border, Asotin, Columbia, and Garfield, are included in the Idaho border group. This is because they have no direct crossing to Oregon and their nearest neighbor is Lewiston, Idaho.

regime change on reported taxable retail sales also appears to differ across groups. Because it appears that the average response varies across border groups, I allow for each border group to have a different response to the regime change in my analysis.

Figure 2 presents a heat map of sales-tax rates by jurisdiction. The map shows that the jurisdictions with the highest tax rate tend to be cities far from the borders. This is expected because these are the jurisdictions where the cost of travel to cross-border shop is the highest. Cities also tend to have higher tax rates than the unincorporated parts of the counties in which they are located. This is because county sales tax rates also apply to cities, increasing their combined sales tax rate.

Following the change in sourcing rules, businesses collecting sales tax in Washington State must collect sales tax for each Washington State tax jurisdiction to which they deliver goods. If a large number of businesses deliver goods to multiple jurisdictions, then the regime change would increase the number of reported sellers in all jurisdictions. It is important to note that I cannot distinguish between the number of new sellers collecting in the state following the regime change and a change in how businesses report their sales. Figures 3, 4, and 5 show that the average number of sellers reporting in tax jurisdictions did increase across all border groups and for all business classifications.<sup>35</sup> The increase is expected given the change in reporting, and the increase is the number of out-of-state sellers voluntarily collecting sales taxes for Washington State.

Figure 3 shows that, while the average number of businesses classified as e-commerce is increasing over time for all groups, it appears to be increasing faster in interior tax jurisdictions than in border counties tax jurisdictions following the regime change. This would indicate that consumers in border counties purchase fewer goods from e-commerce companies. Because retail trade businesses that have brick-and-mortar stores can also maintain an online presence their online sales would also be affected by the regime change.<sup>36</sup> This means that retail stores are also counted for each tax jurisdiction they shipped goods to. Looking

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<sup>35</sup>These figures were created using a binscatter while allowing for a discontinuity at the regime change.

<sup>36</sup>This is because the DOR classifies businesses according to their primary taxable activity.



at Figure 4 it appears that on average the number of retailers sellers in tax jurisdictions is increasing but not at the same rate as e-commerce and mail order sellers. The pattern of a greater increase in the number of e-commerce and mail orders sellers in the interior counties is expected as consumers in tax jurisdictions near the state borders should be more likely to cross-border shop and less likely to buy from local sellers or e-commerce companies that collect sales taxes.

## VI Empirical Strategy

Because Washington State's neighbors have different sales-tax rates, I expect the response to the regime change and changes in tax elasticities to vary location. Oregon has no sales tax and therefore provides the largest differential in tax rates. Idaho has a sales tax rate of 6 percent, so while it provides an incentive for Washington State residents to cross-border shop, it is much smaller than the incentive to shop in Oregon. Canada, with its much higher tax rate, offers no incentive for Washington State consumers to cross-border shop there to avoid sales taxes. The differential in rates between British Columbia and Washington State actually provides an incentive for Canadians to shop in Washington, increasing the taxable sales in jurisdictions near the Canadian border.

To estimate the response of consumers to the regime change observed at the tax jurisdiction level, I estimate Equation (19) using OLS including both tax-jurisdiction and time fixed effects. To estimate if a differential consumer response occurs I allow for the impact of

the policy to vary across border groups by including interaction terms. I estimate

$$\begin{aligned}
\ln Sales_{icqt} = & \beta_0 + \alpha_i + \tau_{qt} + \beta_1 TaxDiff_{iqt} + \beta_2 Policy_{qt} \\
& + \beta_3 Policy_{qt} \times TaxDiff_{iqt} \\
& + \sum_j^3 \{ \beta_{4,j} Policy_{qt} \times Border_j + \beta_{5,j} Border_j \times TaxDiff_{iqt} \\
& + \beta_{6,j} Border_j \times Policy_{qt} \times TaxDiff_{iqt} \} \\
& + \beta \mathbf{X} + \varepsilon_{icqt}.
\end{aligned} \tag{19}$$

My dependent variable,  $\ln Sales_{icqt}$ , is the log of the reported real per capita taxed dollar amount of sales in tax jurisdiction  $i$  in county  $c$ , for quarter  $q$  in year  $t$ . The variable  $Border_j$  represents three unique dummy variables, one for each border group. The variable  $Border_1$  is equal to one if a tax jurisdiction is in a county that borders Oregon. The variable  $Border_2$  is equal to one if a tax jurisdiction is in a county that borders Canada and  $Border_3$  is equal to one if a tax jurisdiction is in a county that borders Idaho. The omitted group is the interior of the state. The variable  $\alpha_i$  represents the tax jurisdiction fixed effect while  $\tau_{qt}$  is a quarter-year fixed effect. The variable  $\mathbf{X}$  is a vector of controls. It includes the number of establishments per 1000 people, the number of retail establishments per 1000 people, the unemployment rate, the fraction of the population under the age of 19, the fraction of the population over the age of 64. These are all measured at the county level. It also includes the log of income per capita observed annually, and the cost of travel, measured quarterly, at the tax jurisdiction level.

To measure the incentive to cross-border shop, I include the variable  $TaxDiff$ , which is the difference in the sale-tax rates between a Washington State jurisdiction and the closest lower-tax neighboring state. To allow for the effect of the sales-tax rate differential to vary before and after the regime change I interact the variable  $TaxDiff$  with the variable  $Policy_{qt}$ , which is a binary variable equal to one in all periods after the regime change. I also allow this effect to vary across the different border groups by including the triple interaction terms

among *Border*, *TaxDiff*, and *Policy*.

## VII Empirical Results

I estimate Equation 19 for the reported dollar amount of taxed sales per capita for four classifications of goods, *all taxable goods*, *taxable non-retail trade*, *taxable retail trade*, and *taxable e-commerce goods*. The results are presented in Table 3. The primary interest of this paper is to what degree do consumers substitute between the two means of avoidance. I use the change in enforcement on avoidance on e-commerce purchases to understand how consumer responsiveness to tax differentials changes with improved enforcement. Because the regime change focused on ending sales tax avoidance on e-commerce purchases, it should primarily affect retail and e-commerce purchases. Therefore, I focus on these two categories. The results from these regressions are presented in Columns (3) and (4). The coefficient on the interaction of the regime change and the tax differential,  $Policy \times TaxDiff$ , shows that consumers in the interior became less responsive to increases in the tax differential for their taxed retail purchases following the regime change. For taxed e-commerce purchases, consumers in the interior became more responsive to increases in the tax differential following the regime change. Together these results suggest that the regime change increased collection of sales taxes on e-commerce purchases and limited consumers sales-tax avoidance. Because consumers are less able to avoid sales taxes, they should become less responsive to increases in the tax differential following the regime change.

I now look at consumers behavior when cross-border shopping is possible. The differential response by consumers in the three border groups to changes in the tax differential following the regime change can be seen in the coefficients on the triple interactions of  $Policy \times Border \times TaxDiff$ . For taxed retail sales, these coefficients show that all border groups became more responsive relative to the interior, in absolute value, following the regime change. The coefficients of the differential response for consumers near the Oregon or Idaho

border both have the expected sign and are large in magnitude but noisily estimated. The price of goods also determines the feasibility of cross-border shopping. For lower-price goods, e-commerce may have been a feasible means of avoidance while the cost of travel makes cross-border shopping infeasible. Increases in tax differentials following the regime change may then make cross-border shopping feasible for both new goods and new consumers farther from the border.

The interpretation of estimates for jurisdictions near British Columbia is complicated by Canadian shopping in Washington State. While I do not estimate it in this paper, the tax differential between Washington State and British Columbia is beneficial for Canadians to shop in Washington State. How beneficial the tax differential is, depends on the exchange rate, a complication I do not address here because my primary focus is on Washington State consumers. Given that consumers near British Columbia tend to be farther from lower-tax states than consumers in the other groups it is expected that they are less able to avoid sales taxes by cross-border shopping.

The overall responsiveness of consumers before and after the regime change is also of interest, so I present the elasticities concerning the tax differentials in Table 4. Column (6) shows the expected result that consumers near lower-tax borders are the more responsive to the tax differential than their counterparts in the interior of the state. Consumers near Oregon are the most responsive, with a one percentage point increase in the rate differential leading to approximately a 29 percent decrease in the dollar amount of taxable retail sales per capita. Consumers near Idaho are also responsive to changes in the tax differential but less so than consumers near Oregon. A one percentage point increase in the tax differential leads to approximately an 18 percent decrease in taxable retail sales per capita, though the estimate is noisy. As is expected, consumers in the interior of the state are not responsive to increases in the tax differential following the regime change. For a one percentage point increase in the tax differential taxable retail sales increase by 0.42 percent, but the effect is not statistically different from zero.

The change in each group's tax elasticities in response to regime change is also of interest. The within border group differences in the tax elasticities for retail goods (the differences between Columns (5) and (6)) are statistically significant for each group except those that are near Oregon.<sup>37</sup> This is expected because for the other groups the best option of sales tax avoidance is e-commerce purchases. For consumers near Oregon, cross-border shopping allows them to avoid sales taxes completely, so we expect the regime change to have less of an impact.

Understanding the impact of the regime change on the tax elasticities for tax e-commerce sales is more complicated. The regime change shifted which jurisdiction received the revenue from many of these transactions, so comparing the before and after elasticities also captures a change in the tax base. Looking at the elasticities across the groups in Column (8) we can see which group of consumers are the most responsive. Consumers near Oregon are the most responsive as is expected. Even if the taxed e-commerce purchases represent hard to obtain goods, consumers near Oregon could have the good delivered to an Oregon address and completely avoid sales taxes. This option is not available to consumers elsewhere in the state suggesting they would be less responsive to changes in the tax differential.

In order to understand the effect of the regime change on taxable sales, I estimate Equation (19) replacing quarter-year fixed effects with a quadratic time trend and seasonal dummies. Running the specification with a time trend and seasonal dummies allows me to estimate the effect of the regime change because the regime change is perfectly collinear with the quarter 3, 2008 fixed effect. The results from this alternative specification are presented in Table 5. All coefficients are similar in sign, magnitude and statistical significance to the estimates in Table 3. Using the coefficient estimates from Table 5, I evaluate the effect of the regime change at each border group's average tax differential. The results are presented in Table 6.

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<sup>37</sup>The null hypothesis that the elasticities in columns (5) and (6) are equal is rejected at the one percent level for both the consumers in the interior and those near Canada. The same hypothesis is rejected at the five percent level for consumers near Idaho.

The regime change focuses on reducing sales tax avoidance on e-commerce purchases and increasing taxable sales. Column (3) and (4) presents the change in the dollar amount of taxed sales per capita as a result of the regime change. The regime change did have a positive effect on the taxable sales for jurisdictions near either Idaho or Canada. It did so without having a significant effect on either taxed non-retail sales or taxed e-commerce sales. If consumers choose to purchase goods through e-commerce primarily to avoid taxes then removing that option would encourage them to substitute back to brick-and-mortar stores if they can no longer avoid sales taxes. This would increase taxed retail sales while not affecting taxed e-commerce sales. I find no statistically significant effect on either taxed retail trade sales or e-commerce purchases for consumers near Oregon. This is consistent with the story of consumers substituting between the two means of avoidance. It also holds that consumers near Oregon are unique as both means of avoidance allow them to avoid sales taxes completely.

## **VIII Conclusion**

I estimate the effects of a tax regime change in Washington State which changed their sourcing rules from an origin to a destination principle and made them members of the SSUTA. My results suggest that improving sales tax collection on e-commerce purchases is less effective when consumers can substitute to cross-border shopping. I find that consumers in tax jurisdictions near the state's borders become more responsive to the difference in sales tax rates across borders when they are less able to avoid sales taxes on e-commerce purchases. Consumers near Oregon are the most responsive to the tax differential following the regime change. I find that a one percentage point increase in the tax differential reduces the dollar amount of taxed retail sales per capita by approximately 29 percent. I also find similar evidence that consumers near Idaho are responsive to the tax differential following the regime change.

Additionally, I find evidence that the regime change increased taxable retail sales in jurisdictions that are near either Idaho or British Columbia. It increased taxable retail sales per capita by 18.5 percent and approximately 20 percent. I find no evidence that the regime change had an effect on taxable retail sales for jurisdictions that are near Oregon. Combined the results suggest that consumers take advantage of opportunities to avoid sales taxes. For consumers near Oregon, cross-border shopping continue to provide an attractive option for sales tax avoidance following the regime change. Consumers elsewhere in the state face either a higher cost of travel or lower tax differentials making cross-border shopping less attractive. Thus, the elimination of a universally available means of avoidance should have a differential effect. The results of this paper are consistent with these expectations.

These findings are important to understanding the effects of the Supreme Court’s ruling in *South Dakota v. Wayfair, Inc.*<sup>38</sup> The ruling overturned the precedent that required a physical presence of the firm in order for the State to compel tax collection. As states respond to the Supreme Court’s ruling and adjust their laws, consumers will lose e-commerce purchases as a means of sales tax avoidance. For consumers near the border of a lower-tax state, the option to shop across borders will remain. Revenue collections for both states and local government in jurisdictions near borders could be lower than expected following *Wayfair* if consumers substitute to cross-shopping.

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<sup>38</sup>*South Dakota v. Wayfair, Inc.*, 585 U.S. \_\_\_\_ (2018).

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# IX Tables

Table 1: Summary Statistics by Border Group

	Tax Jurisdictions in Counties that							
	Border Oregon		Border Canada		Border Idaho		Are in the Interior	
	mean	sd	mean	sd	mean	sd	mean	sd
<i>Quarterly Taxed Sales Per Capita</i>								
All Sellers (\$)	3607	2192	4414	4169	3196	3866	5421	8342
Non-Retail Trade Sellers (\$)	2293	1588	2373	2330	2005	3491	3035	4301
Retail Trade Sellers (\$)	1314	961	2041	2106	1190	1220	2387	4481
E-commerce and Mail Order Sellers(\$)	43	36	88	144	43	38	55	62
Fraction E-commerce	0.044	0.036	0.065	0.074	0.063	0.063	0.046	0.055
Income Per Capita (\$)	60523	11014	48873	10034	52483	8023	66235	36286
Combined Sales Tax Rate	0.0789	0.0040	0.0788	0.0036	0.0791	0.0038	0.0841	0.0059
TaxDiff	0.0789	0.0040	0.0355	0.0293	0.0203	0.0047	0.0695	0.0291
Road Distance ( <i>Miles</i> )	55	36	184	68	35	16	167	45
Travel Cost (Proxy)	189	129	628	257	119	59	568	181
Retail Establishments ( <i>Per 1000 People</i> )	2.61	0.76	3.59	0.93	2.42	0.62	2.69	0.78
Establishments ( <i>Per 1000 People</i> )	32.58	6.22	38.32	8.24	32.99	9.45	33.45	7.92
Unemployment Rate	8.75	2.62	8.64	2.77	7.21	2.60	7.43	2.49
Fraction Youth	0.26	0.03	0.26	0.01	0.26	0.02	0.27	0.04
Fraction Elderly	0.16	0.05	0.17	0.03	0.14	0.05	0.14	0.04
<i>N</i>	1715		1327		1833		9003	

**Notes:** All dollar amounts have been converted to 2015 dollars using the West Coast CPI published by the BLS. Income per capita is a proxy calculated from zip code level tax return data published by the IRS. The number of returns is used instead of number of people to calculate the income per capita value.

Table 2: Summary Statistics by Border: Pre and Post Regime Change

	Tax Jurisdictions in Counties that							
	Border Oregon		Border Canada		Border Idaho		Are in the Interior	
mean:	Pre	Post	Pre	Post	Pre	Post	Pre	Post
<i>Quarterly Taxed Sales Per Capita</i>								
All Sellers(\$)	3786 (2563)	3523 (1991)	4457 (4522)	4393 (3993)	2930 (2180)	3320 (4434)	5943 (8585)	5175 (8213)
Non-retail Trade Sellers (\$)	2456 (1875)	2217 (1428)	2491 (2629)	2317 (2173)	1802 (1291)	2100 (4131)	3424 (4739)	2851 (4065)
Retail Trade Sellers (\$)	1330 (1082)	1307 (900)	1966 (2187)	2076 (2067)	1127 (1157)	1220 (1248)	2520 (4408)	2324 (4514)
E-commerce and Mail Order Sellers (\$)	24 (32)	52 (35)	36 (40)	112 (167)	20 (19)	53 (40)	33 (48)	66 (65)
Fraction E-commerce	0.025 (0.02)	0.053 (0.039)	0.042 (0.062)	0.076 (0.077)	0.038 (0.043)	0.075 (0.068)	0.028 (0.038)	0.055 (0.059)
Income Per Capita (\$)	60257 (11809)	60647 (10625)	48091 (11557)	49244 (9208)	49796 (8589)	53736 (7423)	65958 (36756)	66366 (36063)
Combined Sales Tax Rate	0.0780 (0.0037)	0.0793 (0.0040)	0.0780 (0.0031)	0.0791 (0.0037)	0.0785 (0.0038)	0.0794 (0.0038)	0.0825 (0.0045)	0.0849 (0.0064)
TaxDiff	0.0780 (0.0037)	0.0793 (0.004)	0.0363 (0.028)	0.0351 (0.0299)	0.0221 (0.0059)	0.0194 (0.0038)	0.0686 (0.0273)	0.0700 (0.0299)
Road Distance ( <i>Miles</i> )	55 (36)	55 (36)	184 (69)	184 (69)	35 (16)	35 (16)	167 (45)	167 (45)
Travel Cost (Proxy)	182 (124)	192 (132)	603 (243)	640 (263.8)	116 (57)	121 (60)	549 (170)	577 (186)
Retail Establishments ( <i>Per 1000 People</i> )	2.75 (0.86)	2.54 (0.71)	3.71 (0.86)	3.53 (0.96)	2.53 (0.54)	2.37 (0.65)	2.82 (0.81)	2.64 (0.75)
Establishments ( <i>Per 1000 People</i> )	31.59 (6.47)	33.04 (6.05)	37.99 (8.22)	38.49 (8.25)	32.53 (8.34)	33.20 (9.93)	33.19 (8.04)	33.58 (7.86)
Unemployment Rate	6.88 (1.23)	9.62 (2.64)	7.10 (1.99)	9.37 (2.79)	5.68 (1.65)	7.93 (2.65)	5.69 (1.70)	8.25 (2.38)
Fraction Youth	0.27 (0.03)	0.25 (0.03)	0.27 (0.01)	0.25 (0.01)	0.26 (0.01)	0.26 (0.03)	0.28 (0.04)	0.27 (0.05)
Fraction Elderly	0.15 (0.04)	0.17 (0.05)	0.15 (0.02)	0.18 (0.03)	0.13 (0.04)	0.15 (0.06)	0.12 (0.03)	0.14 (0.04)
<i>N</i>	546	1169	427	900	583	1250	2892	6111

**Notes:** Standard deviations in parentheses. All dollar amounts have been converted to 2015 dollars using the West Coast CPI published by the BLS. Income per capita is a proxy calculated from zip code level tax return data published by the IRS. The number of returns is used instead of number of people to calculate the income per capita value.

Table 3: Log Real Per Capita Taxable Sales

	(1)	(2)	(3)	(4)
	All Goods	Non-Retail Trade	Retail Trade	E-commerce
TaxDiff	-4.644 (4.46)	-5.756 (4.996)	4.266 (4.512)	-2.955 (5.945)
Policy	0.465*** (0.111)	0.574*** (0.138)	0.436*** (0.103)	0.608*** (0.0887)
Policy $\times$ TaxDiff	-3.163*** (1.157)	-3.709** (1.485)	-3.848*** (0.958)	-4.054*** (0.763)
Borders OR $\times$ TaxDiff	-20.68*** (7.243)	-19.26** (7.904)	-17.14* (10.08)	-3.643 (14.49)
Borders Canada $\times$ TaxDiff	0.785 (4.33)	0.423 (4.897)	-3.414 (4.293)	-3.285 (5.481)
Borders ID $\times$ TaxDiff	8.595* (4.597)	8.678* (4.974)	-4.982 (5.137)	8.748 (6.693)
Policy $\times$ Borders OR	0.868 (1.113)	0.916 (1.047)	1.115 (1.339)	1.523 (1.278)
Policy $\times$ Borders Canada	-0.106 (0.104)	-0.151 (0.126)	-0.177* (0.0882)	-0.377*** (0.0729)
Policy $\times$ Borders ID	0.256 (0.242)	0.33 (0.311)	0.293 (0.235)	0.0728 (0.152)
Policy $\times$ Borders OR $\times$ TaxDiff	-9.348 (14.25)	-9.872 (13.61)	-12.68 (16.65)	-18.34 (16.09)
Policy $\times$ Borders Canada $\times$ TaxDiff	3.247** (1.293)	3.146** (1.553)	6.525*** (1.189)	10.13*** (0.988)
Policy $\times$ Borders ID $\times$ TaxDiff	-13.34 (10.61)	-19.08 (13.59)	-15.13 (9.236)	-6.985 (6.013)
Tax Jurisdiction F.E.	Yes	Yes	Yes	Yes
Quarter-Year F.E.	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	13931	13902	13902	13900
Adjusted $R^2$	0.179	0.172	0.142	0.701

**Notes:** Standard errors in parentheses. Standard errors are clustered at the county level. Dependent variable is log of the real per capita dollar amount of taxed sales in a tax jurisdiction in a quarter. It is based on the NAICS classification of the seller. All dollar amounts are in 2015 dollars. The variable Policy is perfectly collinear with the 2008 Quarter 3 fixed effect so the fixed effect is dropped.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 4: Semi-elasticities with respect to the TaxDiff

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Goods		Non-retail Trade		Retail Trade		E-commerce	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Interior	-4.644 (4.460)	-7.807* (4.147)	-5.756 (4.996)	-9.465** (4.439)	4.266 (4.512)	0.418 (4.148)	-2.955 (5.945)	-7.009 (5.326)
Borders Oregon	-25.32*** (6.156)	-37.83*** (13.33)	-25.01*** (6.942)	-38.59** (16.20)	-12.87 (9.357)	-29.40** (12.00)	-6.599 (14.40)	-28.99 (25.93)
Borders Canada	-3.859* (2.021)	-3.774** (1.593)	-5.333** (2.259)	-5.896*** (2.107)	0.852 (2.389)	3.529 (2.201)	-6.240** (3.066)	-0.166 (3.261)
Borders Idaho	3.951 (2.933)	-12.55 (12.25)	2.921 (2.923)	-19.87 (14.88)	-0.715 (3.723)	-19.70 (12.30)	5.792 (4.476)	-5.247 (6.688)

**Notes:** Standard errors in parentheses. Standard errors are clustered at the county level. Elasticities are obtained from Table 3.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 5: Log Real Per Capita Taxable Sales

	(1)	(2)	(3)	(4)
	All Goods	Non-retail Trade	Retail Trade	E-commerce
TaxDiff	-4.710 (3.975)	-6.817 (4.603)	5.727 (3.849)	-10.58 (6.880)
Policy	0.171* (0.0879)	0.182 (0.113)	0.290*** (0.0642)	0.215*** (0.0551)
Policy $\times$ TaxDiff	-3.215*** (1.134)	-3.614** (1.464)	-4.101*** (0.903)	-3.638*** (0.822)
Borders OR $\times$ TaxDiff	-20.52*** (7.324)	-18.44** (7.655)	-17.74* (10.20)	3.257 (16.10)
Borders Canada $\times$ TaxDiff	0.909 (4.485)	0.531 (5.045)	-3.420 (4.258)	-7.631 (6.998)
Borders ID $\times$ TaxDiff	8.088 (4.822)	8.392 (5.227)	-5.960 (5.074)	1.252 (8.404)
Policy $\times$ Borders OR	0.842 (1.111)	0.928 (1.047)	1.030 (1.320)	1.503 (1.294)
Policy $\times$ Borders Canada	-0.102 (0.104)	-0.143 (0.128)	-0.179** (0.0843)	-0.399*** (0.0770)
Policy $\times$ Borders ID	0.254 (0.245)	0.333 (0.310)	0.275 (0.232)	0.0804 (0.163)
Policy $\times$ Borders OR $\times$ TaxDiff	-8.973 (14.25)	-9.968 (13.61)	-11.56 (16.43)	-18.35 (16.38)
Policy $\times$ Borders Canada $\times$ TaxDiff	3.154** (1.280)	2.973* (1.572)	6.564*** (1.079)	10.47*** (1.084)
Policy $\times$ Borders ID $\times$ TaxDiff	-13.30 (10.93)	-19.12 (13.69)	-14.64 (9.395)	-8.174 (6.512)
Tax Jurisdiction F.E.	Yes	Yes	Yes	Yes
Quadratic Time Trend	Yes	Yes	Yes	Yes
Seasonal F.E.	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	13931	13902	13902	13900
Adjusted $R^2$	0.178	0.170	0.140	0.693

**Notes:** Standard errors in parentheses. Standard errors are clustered at the county level. Dependent variable is log of the real per capita dollar amount of taxed sales in a tax jurisdiction in a quarter. It is based on the NAICS classification of the seller. All dollar amounts are in 2015 dollars.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 6: Policy Effect at Border Group Sales Tax Rate Averages

	(1)	(2)	(3)	(4)
	All Goods	Non-retail Trade	Retail Trade	E-commerce
Interior	-0.0521** (0.0235)	-0.0687** (0.0319)	0.00514 (0.0219)	-0.0375 (0.0257)
Borders Oregon	0.0519 (0.0669)	0.0385 (0.0682)	0.0843 (0.0789)	-0.0163 (0.0729)
Borders Canada	0.0667* (0.0353)	0.0168 (0.0417)	0.199*** (0.0322)	0.0589 (0.0432)
Border Idaho	0.0898* (0.0523)	0.0541 (0.0591)	0.185** (0.0696)	0.0559 (0.0475)

**Notes:** Standard errors in parentheses. Standard errors are clustered at the county level. The effect of policy is calculated using each border group's sample average of TaxDiff. These can be found in Table 1.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

# X Figures

Figure 1: Map of Border Groups

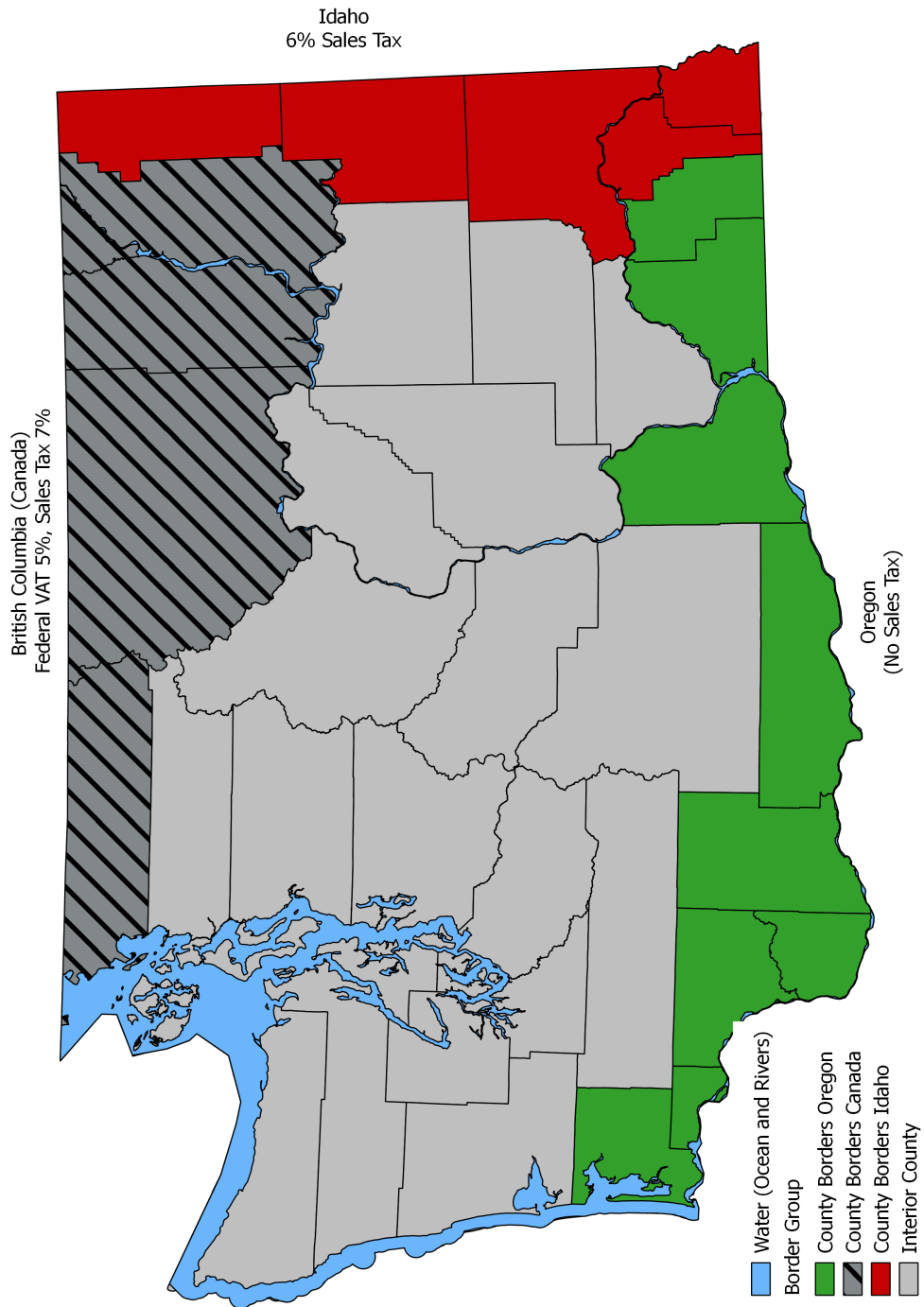




Figure 2: Heat map of Tax Jurisdictions  
(Q4 2016)

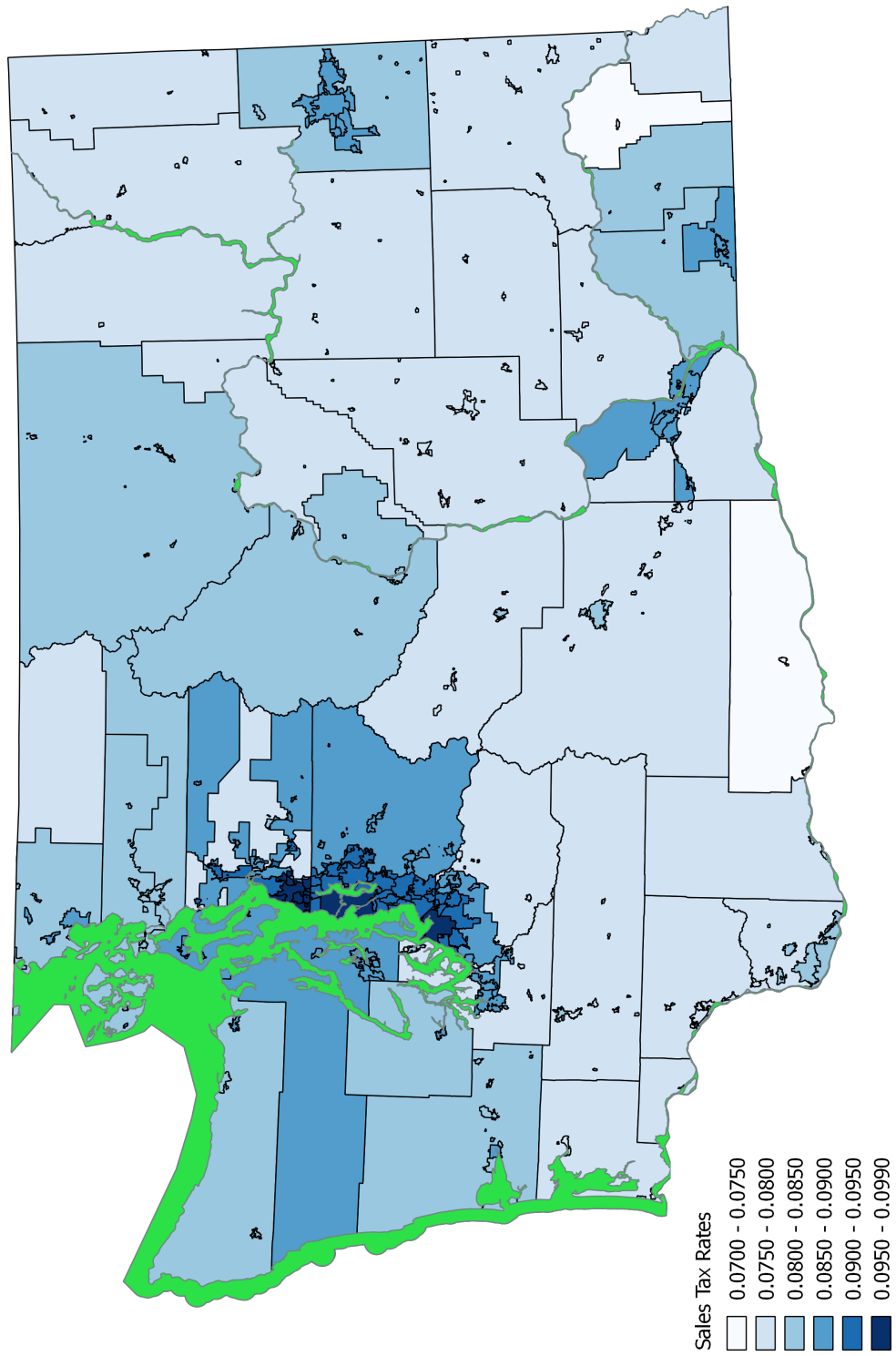


Figure 3: Taxed E-commerce and Mail Order

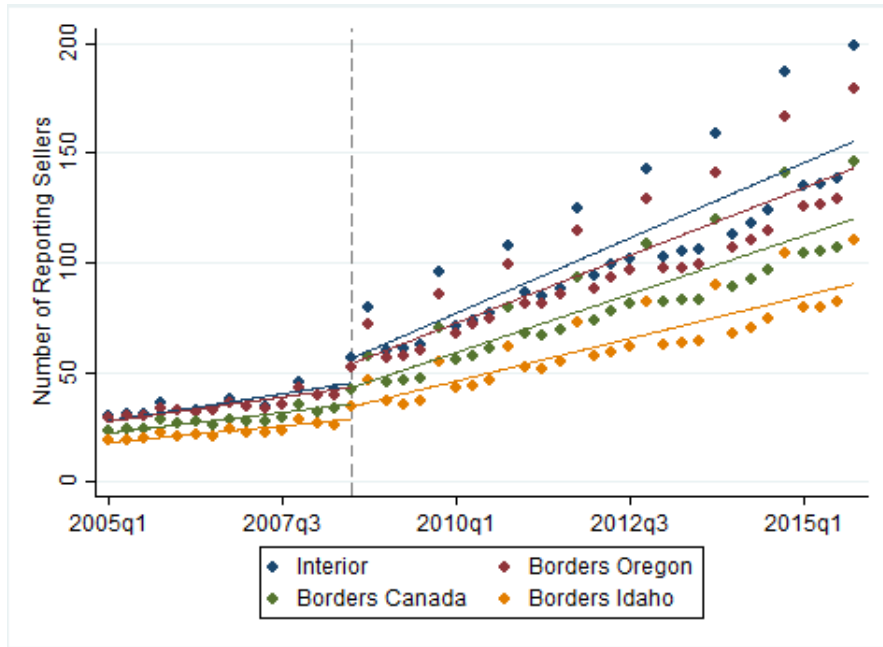


Figure 4: Taxed Retail Trade

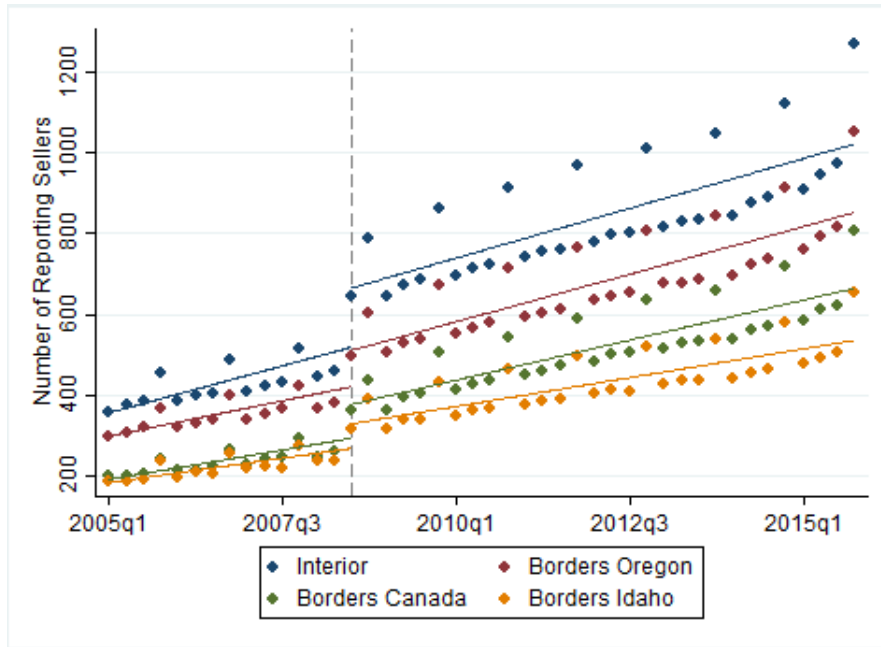
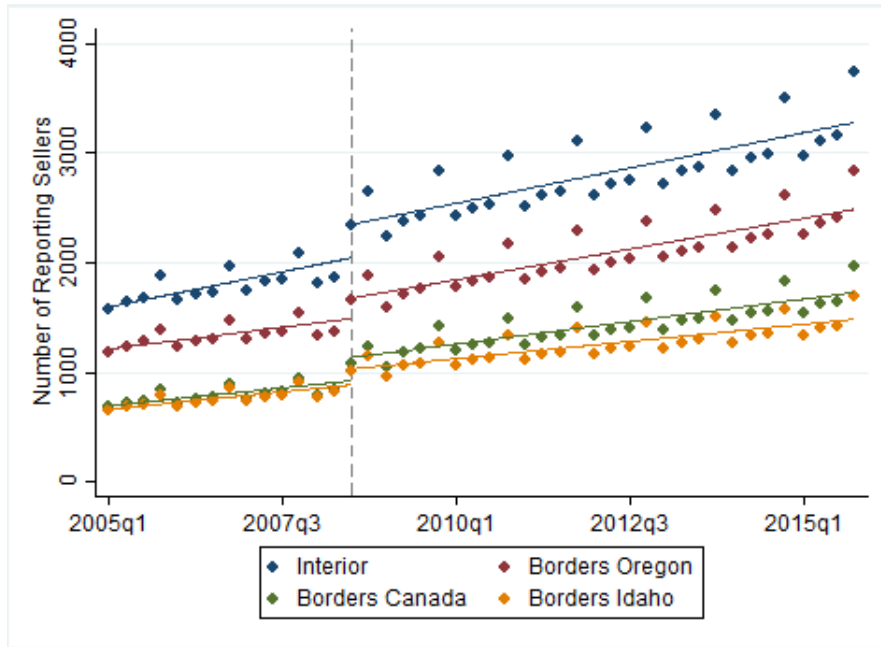


Figure 5: All Taxed Goods



# Appendix

Figures 6, 7, and 8 present the general trends in the tax dollar amount of sales per capita in Washington State tax jurisdictions broken down by the border group averages. The figures show strong seasonality, with a spike in the taxed dollar amount of sales per capita in the fourth quarter of each year. Therefore, I control for quarter-year fixed effects in my analysis to address this.

Figure 6: Taxed E-commerce and Mail Order Sales

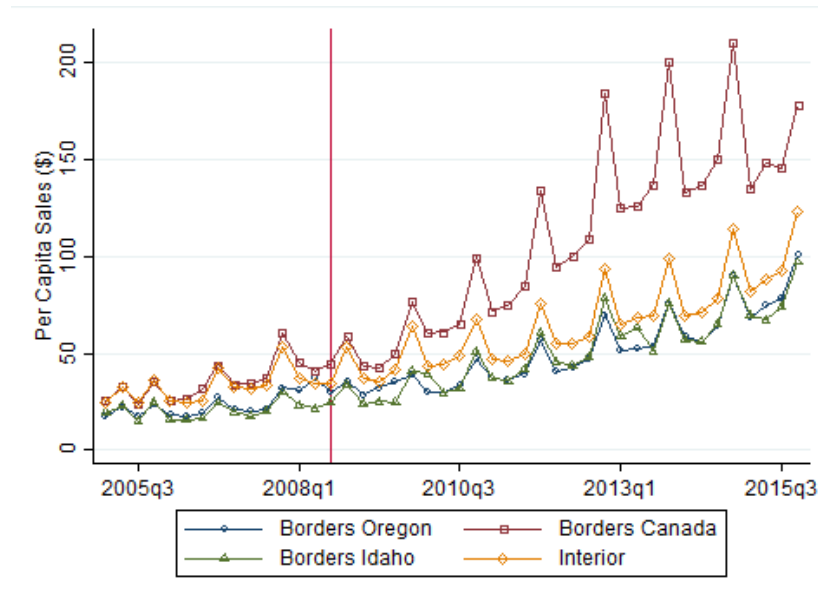


Figure 7 show that prior to the regime change tax retail sales per capita in the interior counties were much higher than in all border counties, but following the regime change they become similar to the taxed retail sales per capita of the tax jurisdictions in counties that border Canada.

Figure 7: Taxed Retail Trade Sales

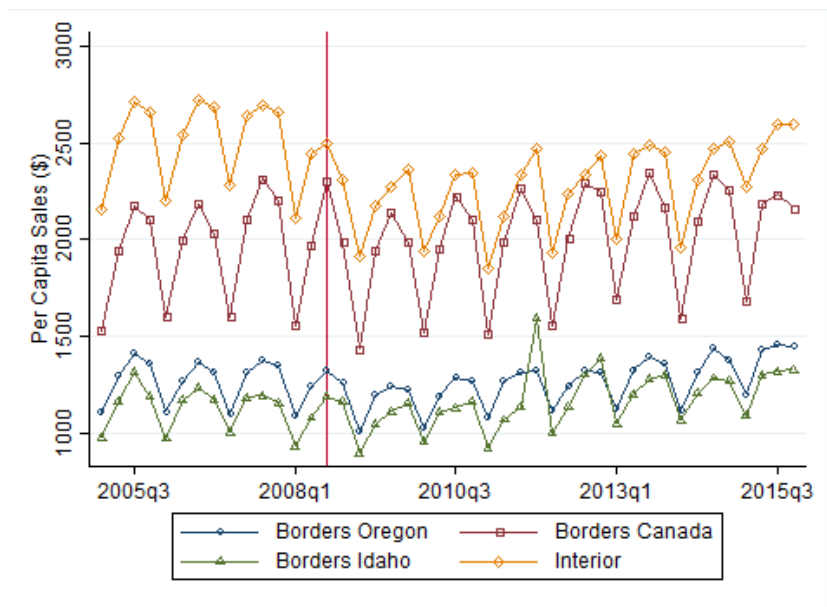


Figure 8: All Taxed Good Sales

