Do Internet Tax Policies Place Local Retailers at a Competitive Disadvantage?

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Current United States tax laws do not require retailers who lack a physical presence in a state to collect sales tax on purchases from consumers living in that state. By contrast, a retailer with a physical presence must collect retail sales tax on all transactions in that state, including catalog and Internet purchases. In this paper, we examine whether the obligation to collect taxes places retailers who establish a local market presence at a competitive disadvantage when they compete with out-of-state retailers who sell via catalogs or the Internet.

We document two ways in which this tax policy may affect retail competition. First, we use a natural experiment in which a remote retailer opens its first store in a state. Using a difference-in-difference model, we show that the obligation to collect retail sales tax reduces consumer purchases by 5%. There is substantial variation in the loss in demand across channels and customers; Internet demand decreases 16% and new customer demand decreases 11%.

The second way in which this tax discrepancy may affect retail competition is via the expansion strategies of multi-channel retailers. We find that multi-channel retailers who conduct a large fraction of their overall business via Internet and catalog channels are less likely to open retail stores in states with high sales tax rates. We interpret this as evidence that the tax discrepancy influences out-of-state retailers' store location decisions. Together, our findings appear to confirm that the obligation to collect state sales tax places local retailers at a competitive disadvantage.

1. Introduction

Retail state sales taxes can add up to 9 percent to the price of an item. However, the obligation to collect retail sales taxes does not apply universally to all retailers. If a retailer does not have a measurable physical presence in a state, such as a warehouse, office or retail store, there is no obligation to collect local retail sales taxes. This distinction is particularly relevant for retailers who use remote channels, such as the Internet or direct mail catalogs. Whether such a retailer is obligated to collect retail sales tax from consumers depends on whether it has a local presence in the state. As a result, the *effective* sales taxes on catalog and Internet sales vary from firm to firm.

This differential tax policy, which results from constitutional principles, has been highlighted in recent years with the emergence of the Internet and the growth of remote distribution channels. The US Department of Commerce estimates non-travel e-commerce sales to be $86.3 billion, which represents an increase of 24.6% from 2004.[1] The Direct Marketing Association (2005) estimates that in 2004 its member firms generated $143 billion in catalog sales and $53 billion in Internet sales. As they are not obligated to collect sales tax, Internet and catalog retailers who lack a physical presence in a state might be expected to enjoy a competitive advantage over local retailers. Both state governments and retailers have urged the United States Congress to enact legislation to remedy this perceived inequity. In Congressional testimony, Christopher Rants, speaker of the Iowa House of Representatives, noted:

> "The new economy or if you prefer, electronic commerce, which is not bound by state and local borders, makes it critical to simplify and reform state and local taxes to ensure a level playing field for all sellers, to enhance economic development, and to avoid discrimination based upon how a sale may be transacted." (Rants, 2006)

In support of new legislation, Thomas Stemberg, founder and chairman emeritus of Staples, wrote:

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[1] This is a lower bound of potentially taxable Internet commerce since this estimate excludes business-to-business sales.

> "It is illogical and now patently unfair that Staples.com is required to collect and remit sales taxes because of our local commitment when many other dot.com competitors do not have a similar requirement." (Stemberg 2005)

In July 2006, the Senate Finance Subcommittee on International Trade heard arguments on both sides of this debate. While there were reasonable conjectures regarding how sales tax affected retail competition, virtually no empirical evidence was offered regarding whether the current tax policy substantively affected either customer or firm behavior.

In this paper, we show that current Internet tax policy affects retail markets in two important ways. First, we show that the obligation to collect retail sales tax significantly reduces consumer demand. The loss in demand is most pronounced amongst Internet orders and amongst new customers. Internet use has steadily increased since the time of our study, which suggests that sales tax laws may have become increasingly distortionary. Second, we show that competing out-of-state retailers avoid opening stores in high-tax states, which preserves their tax advantage in these states. Together, our results quantify how current Internet tax policies affect both consumer behavior and retail growth.

To document the effect of sales taxes on demand, we analyze a natural experiment in which a remote retailer opens its first store in a state. Before opening the store, the retailer sold to customers in this state via mail order catalogs and the Internet but did not collect sales taxes on these purchases. After opening the store, retail sales tax was collected on all transactions from customers in this state. We present qualitative evidence from complaint letters that some customers viewed the collection of this sales tax as unfair and threatened to shift their purchases to competing retailers. We then quantify this behavior by comparing the purchasing behavior of customers within the state to those in a neighboring state where the tax policy did not change. To control for store effects we focus on customers located more than 100 miles from the new store. Using a difference-in-difference estimator, we find that sales tax reduces units sold by 5%. The effects are particularly large for Internet orders (-16%) and amongst new customers (-11%). We

also report that the obligation to collect retail sales tax reduces new customer acquisitions by 7%.

We identify two competing effects that moderate the impact of taxes. One might expect that customers with a strong preference for a retailer may be less sensitive to the increase in sales tax. In contrast, customers who purchase large dollar amounts have the greatest financial incentive to shift their business to a competing retailer. Empirically, we find support for both moderating effects. Tax effects are significantly more negative among customers who purchase large dollar orders. However, tax effects are significantly reduced among customers who recently purchased from the firm.

Over the last decade, many retailers have expanded their channels of distribution to include catalog, Internet, and retail stores. We use variation in the percentage of each retailer's business that is conducted via remote channels to test whether Internet tax policy affects retail expansion decisions. If a retailer conducts most of its business in physical stores, then tax considerations are less likely to affect whether they open a new store in a state. In contrast, if they conduct a substantial portion of their business via remote channels, then tax considerations may be quite important. We hypothesize that such retailers are more likely to avoid opening stores in states with high retail sales tax rates. Using a sample of national retailers, we find support for this hypothesis: retailers who conduct more than 70% of their business via remote channels tend to avoid opening stores in states with high tax rates.

Previous Literature

The law surrounding the taxation of remote purchases was reaffirmed in 1992, by the Supreme Court ruling in *Quill Corporation v. North Dakota*.[2] The Court decided that Quill, a Delaware corporation, was not obligated to collect a North Dakota sales tax from customers because Quill did not have a measurable physical presence or "nexus" in North

[2] 504 U.S. 298 (1992).

Dakota. This clarified an earlier decision, *Complete Auto Transit, Inc. v. Brady*,[3] which required a taxpayer to have a nexus within a state before a state had jurisdiction to require the collection of sales taxes. Although retail sales taxes do theoretically apply, the burden of collection resides with consumers rather than with merchants. Because the amounts involved are small and enforcement costs are high, state governments have not aggressively pursued these tax revenues.

In recent years, the growth of remote transactions over the Internet has increased the attention that state governments are paying to the issue. The proposed federal *Sales Tax Fairness and Simplification Act* would allow participating states to impose remote sales taxes on businesses with gross profits exceeding $5 million. The bill was introduced in December 2005 and is currently awaiting discussion in the Senate Finance Committee. Sponsors of the bill argue that an important benefit of the Act is that it would level the playing field for competing retailers, negating the current advantage conferred on out-of-state retailers. In the interim, most states have ratified or are considering ratifying the *Streamlined Use and Sales Tax Agreement*. This agreement is designed to encourage remote retailers to collect sales tax by establishing simpler and more uniform tax policies, and offering an amnesty for breaches of historical sales tax obligations.[4]

There is a well-established academic literature studying the impact of sales tax on customers' behavior. However, the majority of these studies have focused on changes in aggregate demand when states vary their tax rates. These studies find that retail sales typically decrease by between 1 percent and 10 percent following a sales tax increase.[5] In these studies, a customer faced with a higher tax rate may decrease consumption or shift consumption to a neighboring state with a lower tax rate. The tax effects we consider may be more pronounced, since they involve different obligations of retailers to collect sales tax on transactions within a state. If a retailer opens a store and begins

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[3] 430 U.S. 274 (1977)

[4] The level of physical presence at which a nexus is invoked is often ambiguous. As a result, the amnesty offers a potentially valuable benefit to retailers whose past status was uncertain.

[5] See for example: Fisher (1980); Mikesell (1970); Mikesell (1971); Mikesell and Zorn (1986); Fox (1986); and Walsh and Jones (1988).

collecting sales tax, a consumer may simply shift consumption towards a competing local retailer.

More recently, economists have tried to measure state tax effects at the individual level. Goolsbee (2000) measures the effect of taxes on consumer behavior using a 1997 survey of 25,000 online consumers. He finds that in states where sales taxes on physical purchases are higher, online purchases also increase in value. He argues that these results are unlikely to result from unobserved correlation between tax rates and technical sophistication, because there is no measured correlation between high tax rates and Internet usage or computer ownership. Brynjolfsson, Smith and Montgomery (2004), in their study of consumer shopbot behavior, find that consumers are more sensitive to a dollar of tax than to a dollar change in the unit price of an item.

Ellison and Ellison (2003) use hourly data collected from pricewatch.com to further extend this research. They find that increases in state sales taxes leads to substitution, with more customers purchasing over the Internet: A one percentage point increase in a state's sales tax increases *online* purchasing by that state's residents by seven to eight percent. They have two identification strategies to deal with unobserved heterogeneity. First, they compare sales in California, where nexus forced the firm to collect sales taxes, with other states where no sales tax was collected. They find that sales to California customers are about 60 percent lower than would be expected if there were no sales taxes. Second, they evaluate customers' responses to different products with different tax rates and how they vary with the customer's own state's tax rate. They find that customers are responsive to state tax rates but are more responsive to price differences.

A key challenge in this literature is establishing causality between the tax rate and consumer response. Previous studies that have used variation in tax rates between states to infer a causal effect suffer from the limitation that state tax rates may not be independent of consumer characteristics within a state. Our empirical analysis of firm behavior suggests that this can be problematic when analyzing retail demand. We find that retailers with little remote business are more likely to open stores in states with high

sales tax rates. This is consistent with both Goolsbee (2000) and Ellison and Ellison (2003) who find that sales are higher in states with higher tax rates. To overcome this issue, in our analysis of customer demand we use a natural experiment in which we compare the change in behavior of customers over time. This approach provides an explicit control for individual differences.

A review of the literature revealed no previous studies of how retailers' entry decisions respond to state sales taxes. There is an extensive literature investigating firm entry decisions (see for example Holmes 1998), but this work does not explicitly consider the role of state taxes.

Structure of the Paper

In this paper, we quantify the effect of retail sales tax on both customer and firm behavior. We start in Section 2 by investigating how customers respond when a retailer begins collecting sales tax following the introduction of a retail store in the customer's state. In Section 3 the focus shifts to firm behavior, where we investigate whether retailers who do not have a physical store in a state are less likely to open a store in a high tax state. Section 4 concludes the paper with a review of the findings.

2. Measuring Customers' Response

In this section we use qualitative and quantitative data to measure how customers of a catalog retailer respond to the introduction of sales taxes following the opening of the firm's first retail store in the customers' state. The qualitative data describe written and verbal reactions to a letter alerting customers of the impending change in the retailer's sales tax policy. The quantitative data describe a before and after comparison of actual purchasing behavior.

The data analyzed in this section of the paper were provided by a multi-channel apparel retailer. The company sells men's and women's clothing through company-owned distribution channels, which include catalogs, an Internet site and retail stores. The

products are moderately priced and customers purchase relatively frequently. The average item price is approximately $40, and customers purchase approximately 2.4 items per year.

Qualitative Data

Two months prior to opening its first retail store in a state, the company sent a series of two letters to existing customers explaining the retailer's obligation to collect sales tax.[6] The first letter advised customers that the company would start charging sales tax on any items shipped to customers after the store opening. This letter was mailed to 210,000 customers who lived in the state and had purchased at least twice from the firm through either its catalog or Internet channels in the previous twenty-four months. A second letter was sent to 1,815 customers who had placed an Internet or catalog order *prior* to the store opening that was backordered and would not be shipped until *after* the new store opened. The letter included an apology and explained that the firm was legally obligated to collect sales tax when these items finally shipped. As compensation for this additional expense, the letter included a $10 gift certificate.

In reaction to these letters, the company received a total of 80 unsolicited consumer responses. 54 responses represented complaints about the introduction of the sales tax; 7 responses lauded the new store opening; the remaining 19 responses discussed other issues. A transcript of several of the complaints is summarized below:[7]

- "I never order items when I have to pay both shipping and sales tax. This combination is often more than the item is worth. Sorry, because I have dealt with you for years. You have no choice, but I do."
- "This is bad news. The store is not convenient and is more than an hour away. Now I will be taxed on items! [Competing retailer] was my second choice until now but it's just been elevated to first. I am very disappointed by the news."
- "I am quite a distance from the store. One of the pleasures of shopping with you is the sales tax free shopping. Now you have lost the advantage and I will be forced to look for alternatives if I want to preserve my tax free shopping."

[6] For reasons of confidentiality we cannot identify the state.

[7] The transcripts have been slightly edited in places to preserve confidentiality without changing the message or tone.

- "I have bought mail order from you for a long time. The new location is not in my shopping area. You've just increased the price for me for anything I order. I consider that to be terrible news for me."
- "I am not pleased. The store is nowhere near my house and it is more convenient to order from the catalog. All it means is the tax!"
- "I stopped ordering from [Competing Retailer 1] when they opened and only ordered from you to save the tax. Now I will stop ordering from you and have to order from [Competing Retailer 2]. The store is at least 45 minutes away and I won't drive that far to shop."

A common feature of the complaints was that the customers were upset about the sales tax and reported they were less likely to order from the firm. In particular, some customers indicated they were more likely to order from a competing retailer that did not have a retail store in their state. Presumably these responses only reflect the tail of the response distribution: writing or telephoning the company to register a complaint requires effort. Other customers may have had similar reactions, without bothering to contact the company to report their reactions. To assess the impact on overall demand, we now consider a sample of historical transaction data to measure how opening a store affected demand of customers in that state.

Quantitative Data

Our analysis focuses on a sample of 13,021 customers who lived in either the focal state or a neighboring state when the store opened. At the time of our study, the neighboring state had a small number of retail stores but there were no retail stores in the focal state. To control for any intervening events, we compare the change in customer purchase behavior before and after the store opening for customers living on both sides of the border (Card and Krueger 1994). Customers in the focal state did not pay sales tax on catalog and Internet orders prior to the store opening, but they were charged sales tax from the date that the store opened. For confidentiality reasons, we cannot reveal the exact location of the store. But, the focal state is one of 32 states that charges between 4% and 6% tax on retail transactions. Customers in the neighboring state did not pay sales tax on purchases from this company either before or after the store opening.

The 13,021 customers had all made purchases from the company's Internet or catalog channels in the 39 months before the store opened in the focal state. They were identified by matching their household zip codes to counties along either side of the state border. All of the customers lived at least 100 miles from the new store. This is well outside the store's retail trade area, so these customers were not expected to be otherwise affected by the opening of the new store. Reassuringly, only 13 customers out of a total of 13,021 placed orders in the post-store-opening period at the new store.

We observed customers' historical purchases over the 39 months prior to the store opening. In our statistical analysis, we study the purchase behavior of households in the year before and after the store opening (Bertrand et al. 2004). In the direct marketing industry, *Recency*, *Frequency* and *Monetary Value* are often used to summarize customers' historical purchasing behavior.[8] In Table 1 we report the average of these variables for the focal state and neighboring state in the period 13-39 months prior to the new store opening. The difference in the average of each measure between states is statistically insignificant, which suggests that the customers in the focal and neighboring state have similar characteristics.

Table 1. A Comparison of Historical Purchasing Behavior by State

	Focal State	**Neighboring State**	**Difference**
Recency (days since last purchase)	-612.14 (2.75)	-609.92 (2.56)	2.22 (3.75)
Frequency (orders)	3.06 (0.05)	3.20 (0.05)	0.14 (0.08)
Monetary Value (dollars)	$85.65 (0.92)	$88.03 (0.87)	$2.38 (1.27)
Sample Size	4963	5682	

Standard errors are in parentheses.
[*]Significantly different from zero, $p < 0.05$.
[**]Significantly different from zero, $p < 0.01$.

[8] *Recency* describes the number of days between a customer's last order and the date of the store opening. We code this as a negative variable so that higher values represent more recent customers. *Frequency* describes the number of orders placed in that 39-month period, while *Monetary Value* describes the average dollar value of those orders.

While Table 1 shows that the customers in each state are quite similar, we control for potential differences by analyzing the change in individual demand over time. In particular, for each household we construct a measure of demand in the 12 months preceding the store opening, and a second measure in the 12 months after the store opening. We then compare how demand changes between the pre- and post-opening periods for customers in the focal state and customers in the neighboring state. We begin our analyses with univariate results and then turn to a multivariate approach.

In Table 2 we summarize the average number of units purchased by customers in the pre- and post-opening periods. Within each state, we analyze the purchase behavior of customers who purchased prior to the store opening. Due to the natural attrition of customers, units purchased in the post-period decreased in both states. However, the decrease in total units purchased is 14% (-0.406 units) in the focal state but only 10% (-0.309 units) in the neighboring state.

Table 2. Average Number of Units Ordered in 12-Month Pre- and Post-Opening Periods

	Pre-Opening Period	Post-Opening Period	Difference
All Purchases in Focal State	2.98 (0.07)	2.56 (0.08)	-0.41** (0.11)
All Purchases in Neighboring State	3.19 (0.08)	2.89 (0.08)	-0.31** (0.11)
Internet Purchases in Focal State	0.42 (0.03)	0.38 (0.02)	-0.05* (0.02)
Internet Purchases in Neighboring State	0.35 (0.02)	0.37 (0.03)	0.01 (0.03)
Catalog Purchases in Focal State	2.25 (0.06)	1.85 (0.06)	-0.41** (0.05)
Catalog Purchases in Neighboring State	2.12 (0.05)	1.72 (0.05)	-0.39** (0.05)
Store Purchases in Focal State	0.31 (0.06)	0.34 (0.06)	0.04 (0.03)
Store Purchases in Neighboring State	0.73 (0.05)	0.80 (0.05)	0.07 (0.06)

Standard errors are in parentheses. Significance tests use paired sample t-tests.
*Significantly different from zero, $p < 0.05$. **Significantly different from zero, $p < 0.01$.

When we consider orders placed over the Internet, there is a 4% increase (+0.014 units) in Internet purchases in the neighboring state. This reflects the increased popularity of ordering via the Internet; in the 12 months preceding store opening, the percentage of customers placing any order via the Internet nearly doubled. Despite this trend, we observe a 12% decrease (-0.049 units) in Internet orders in the focal state. In contrast, the percentage decrease in catalog purchases (18%) and percentage increase in store purchases (+10%) is approximately equal in both states. We tentatively conclude from this univariate analysis that customers in the focal state tend to purchase fewer units after the store opening and that the loss in demand is more pronounced for Internet transactions. We now turn to a multivariate analysis, which allows us to directly estimate the tax effect and identify moderating factors.

In our data, customers purchase a discrete number of units in either the pre-period or the post-period. As this is a count measure, we use Poisson regression in the remainder of our empirical analysis. We model the purchase rate as $\ln \lambda_{it} = \beta X_{it}$ and use the following specification for the independent variables:

$$\beta X_{it} = \beta_0 + \beta_1 Post\ Opening_{it} + \beta_2 Focal\ State_{it} + \beta_3 Post\ Opening_{it} * Focal\ State_{it} \quad (1)$$

There are two time periods in the model, reflecting the pre- and post-opening periods (i.e., $t = 1$ or 2). The subscript i refers to the 13,021 customers. *Post-Opening* and *Focal State* are both dummy variables, identifying the post-opening period and customers in the focal state. Under this specification the *Focal State* variable controls for underlying differences between the customers in each state and the *Post-Opening* measure controls for common demand changes over time. The coefficient of interest is the interaction coefficient (β_3), which measures the percentage change in post-opening demand amongst customers in the focal state compared to customers in the neighboring state. We will interpret β_3 as the percentage change in units purchased due to the introduction of the sales tax in the focal state.

We also estimated several alternative specifications. These include models with customer fixed effects, customer random effects, and controls for the recency, frequency and monetary value of customers' historical purchases. Reassuringly, none of these alternative specifications substantively changed the size or significance of the coefficients of interest. The robustness of the results suggests that customers in the neighboring state serve as an adequate control group in our natural experiment.

In Table 3, we report the findings of models that include all purchases, Internet purchases and catalog purchases as the dependent variable. There were no results of interest when we analyzed store purchases and to simplify exposition we provide these findings in the Appendix (Table A1). We find that total units purchased decreased by 5% when sales tax was collected. Consistent with Table 2 this effect is more pronounced among Internet transactions and does not affect catalog transactions. Internet purchases decrease 16% but catalog transactions are unaffected.

Table 3. Poisson Regression:
All Purchases, Internet Purchases and Catalog Purchases

	All Purchases	**Internet Purchases**	**Catalog Purchases**
Post-Opening * Focal State	-0.047** (0.015)	-0.162** (0.040)	0.007 (0.018)
Focal State	-0.071** (0.010)	0.187** (0.028)	0.062** (0.012)
Post-Opening	-0.102** (0.010)	0.040 (0.028)	-0.206** (0.012)
Constant	1.162** (0.007)	-1.046** (0.020)	0.750** (0.008)
Log Likelihood	-113,351	-31,309	-88,404
Sample Size	26,042	26,042	26,042

Standard errors are in parentheses.
*Significantly different from zero, $p < 0.05$.
**Significantly different from zero, $p < 0.01$.

Moderating Effects

Table 3 clearly shows that there is a negative impact of sales tax on demand. We now consider two effects that may moderate this effect. First, we might expect sales tax to have less of an effect on loyal customers who show a strong preference for the firm. Second, we might expect the impact of sales tax to vary with customer spending levels. Those customers who typically place large dollar orders have the largest savings from switching to another retailer. For example, if the sales tax is 5% then a customer who spends $500 a year may save $25 annually by switching to a competing retailer. In contrast, a customer who spends only $50 per year saves only $2.50 by switching retailers.

To examine the moderating effect of customer loyalty, we divide our sample of 13,021 customers into 2,376 *New* customers and 10,645 *Existing* customers. New customers are defined as customers whose first purchase is within 0-12 months of the new store opening in the focal state. Existing customers made their first purchase prior to this 12 month pre-period. In Tables 4 and 5 we replicate model (1) for both groups of customers.

Table 4. Poisson Regression: New Customers
All Purchases, Internet Purchases and Catalog Purchases

	All Purchases	Internet Purchases	Catalog Purchases
Post-Opening * Focal State	-0.108*	-0.277**	0.093
	(0.043)	(0.101)	(0.057)
Focal State	-0.100**	0.288**	0.015
	(0.024)	(0.056)	(0.030)
Post-Opening	-0.703**	-0.680**	-0.967**
	(0.027)	(0.070)	(0.039)
Constant	1.123**	-0.749**	0.606**
	(0.016)	(0.041)	(0.021)
Log Likelihood	-12,697	-4,955	-9,395
Sample Size	4,752	4,752	4,752

Standard errors are in parentheses.
*Significantly different from zero, $p < 0.05$.
**Significantly different from zero, $p < 0.01$.

In Table 4, we observe that there is an 11% reduction in demand among new customers. Consistent with our previous findings, the loss in demand is limited to the Internet (-28%); there is no significant effect on catalog demand. In Table 5, we find a similar pattern of results for existing customers. Overall demand decreases by 5%, Internet demand decreases by 13% and catalog demand is unaffected. We conclude that the adverse impact of sales tax on overall demand is at least twice as large amongst new customers.

Table 5. Poisson Regression: Existing Customers
All Purchases, Internet Purchases and Catalog Purchases

	All Purchases	**Internet Purchases**	**Catalog Purchases**
Post-Opening * Focal State	-0.046** (0.016)	-0.129** (0.045)	0.006 (0.019)
Focal State	-0.065** (0.011)	0.154** (0.033)	0.070** (0.013)
Post-Opening	-0.009 (0.010)	0.196** (0.032)	-0.110** (0.013)
Constant	1.170** (0.007)	-1.127** (0.023)	0.779** (0.009)
Log Likelihood	-99,508	-26,190	-77,836
Sample Size	21,290	21,290	21,290

Standard errors are in parentheses.
*Significantly different from zero, $p < 0.05$.
**Significantly different from zero, $p < 0.01$.

To further analyze the moderating impact customer history and customer spending, we modify equation (1) to include interaction effects for *Recency*, *Frequency* and *Monetary Value* (see Table 1). For new customers these variables equal zero, by definition, so our analysis focuses only on existing customers. To aid with interpretation of the model results, the *Recency*, *Frequency* and *Monetary Value* variables are each standardized by subtracting the mean and dividing by the standard deviation. This yields the following specification:

$$\begin{aligned}\beta X_{it} = {} & \alpha_0 + \beta_1 Post\ Opening_{it} + \beta_2 Focal\ State_{it} + \beta_3 Post\ Opening_{it} * Focal\ State_{it} \\ & + \beta_4 Recency_{it} * Post\ Opening_{it} * Focal\ State_{it} \\ & + \beta_5 Frequency_{it} * Post\ Opening_{it} * Focal\ State_{it} \\ & + \beta_6 Monetary\ Value_{it} * Post\ Opening_{it} * Focal\ State_{it} + \sum_{k=7}^{25} \beta_k X_{k,it}\end{aligned} \quad (2)$$

The four coefficients of interest in (2) are β_3 through β_6, which capture the impact of taxes on consumer demand. The remaining variables include interactions between the *RFM* measures and both *Post Opening* and *Focal State*, together with interactions between the *RFM* measures themselves. For completeness we estimate each of these interactions separately and estimate them jointly. Due to the large number of coefficients in (2), a complete set of results is provided in Table A1 of the Appendix. The coefficients of interest are summarized in Table 6.

Table 6. Moderating Effect of Recency, Frequency and Monetary Value for Existing Customer Demand

	Model 1	**Model 2**	**Model 3**	**Model 4**
Post-Opening * Focal State	-0.078** (0.020)	-0.053** (0.017)	-0.042** (0.016)	-0.069** (0.020)
Post-Opening * Focal State*Recency	0.047* (0.022)			0.057* (0.024)
Post-Opening * Focal State*Frequency		0.001 (0.006)		-0.004 (0.006)
Post-Opening * Focal State*Monetary Value			-0.029* (0.011)	-0.031** (0.011)
Log Likelihood	-73,849	-73,491	-73,488	-73,485
Sample Size	21,290	21,290	21,290	21,290

Standard errors are in parentheses.
*Significantly different from zero, $p < 0.05$.
**Significantly different from zero, $p < 0.01$.

In all four models, the *Post Opening * Focal State* coefficients indicate that for customers with average purchase histories post-opening demand is lower in the focal state compared to the neighboring state. This reduction in demand is moderated by both how recently customers had previously purchased and the average dollar value of those orders. Recall that the *Recency* measure is standardized and reverse-coded and so higher *Recency* values

indicate more recent purchase. To interpret the recency interaction; if the *Recency* measure is one standard deviation above the mean (more recent purchasers) there is a 3.1% reduction in demand, while if it is one standard deviation below the mean (less recent purchasers) there is a 12.5% loss in demand.

The *Monetary Value* interaction in Table 6 indicates that customers in the focal state who place large orders were also more likely to decrease their post-opening demand. If a customer's average order size was one standard deviation larger than the mean, the model predicts a 7.1% reduction in post-opening demand. In contrast, if the average order size is one standard deviation below the mean, there is only a 1.3% reduction in demand. Because the RFM variables are standardized, the findings in Model 4 give a sense of the relative importance of each interaction. A one standard deviation increase in *Recency* reduces the tax effect by 5.7%; a one standard deviation increase in *Monetary Value* leads to a 3.1% increase in the tax effect. In this sense, the moderating impact of *Recency* outweighs the effect of *Monetary Value*.

We also replicated the analysis in Table 6 separately for Internet and catalog demand (complete results are in Tables A3 and A4 of the Appendix). We find that the RFM variables do not moderate the tax effect on catalog demand. This suggests that the null effects for catalog demand in the previous analyses are not due to heterogeneous tax effects that cancel each other out in the aggregate. The results for Internet demand are qualitatively similar to those in Table 6: there is a positive moderating effect of *Recency*; a negative moderating effect of *Monetary Value*; but no moderating effect of *Frequency*. The results are not as statistically significant ($p < 0.10$) and we conjecture that this is due to less statistical power.

The Acquisition of New Customers

So far our analysis has focused on customers who purchased at least once in the 39 months prior to the store opening. The change in the tax policy following the store opening may also have affected the acquisition of new customers. To investigate this possibility, we calculated how many customers were acquired in the focal and

neighboring states in the 12-month post-opening period (using the same border counties). We then compared these metrics with both the number of existing customers in each state, and the number of customers acquired in the 12-month pre-opening period. The findings are summarized in Table 7.

Table 7. New Customers Acquired in 12-Month Post-Opening Period

	Focal State	Neighboring State
Number of customers acquired pre-opening	1094	1282
Number of customers acquired post-opening	848	1081
Difference	-246	-201
Percentage Difference	-22.5%	-15.7%

The number of new customer acquisitions post-opening decreases 22.5% (-246) in the focal state and 15.7% (-201) in the neighboring state, suggesting that the change in the tax policy may have led to a 7% drop in new customer acquisitions in the focal state. We caution that these differences are not statistically significant, in part reflecting the small sample size.

Other Dependent Measures

We have measured demand by the number of units purchased. An alternative measure of demand is the number of orders placed. When analyzing this measure we observe similar results: post-opening orders were 5% lower in the focal state compared to the neighboring state. Moreover, we again find that the moderating effect of *Recency* is positive, that of *Frequency* is not significant and that of *Monetary Value* is negative. These findings are consistent with the "units purchased" results in Table 6.

Another potential impact of the sales tax is that customers may substitute to less expensive items. To examine this effect, we estimated (2) using average price paid as the dependent variable. Because this is a continuous variable, we use OLS rather than a

Poisson regression and only consider customers who purchased in both 12 month periods. The results show that there is no evidence that sales tax leads customers to substitute towards less expensive items (see Table A4). Overall, the results suggest that sales tax reduced units purchased and customer orders, but had no effect on average price paid.

Robustness Checks

We have attributed the findings to the introduction of sales taxes in the focal state following the store opening. This interpretation presumes that in the absence of the store opening event, demand in the two states would have changed at the same rate. To justify this assumption, we focused on customers living in neighboring counties along a state border. Because this border is over 100 miles from the new store, it is unlikely that these customers were otherwise affected by the store opening decisions. Moreover, an audit of the mailing activities around this period confirmed that the findings cannot be attributed to promotional mailings targeted at customers in just one of the states. However, we cannot rule out the possibility that there were other unobserved intervening events that contributed to the change in demand between the two states.

To investigate this assumption more closely, we varied the lengths of the pre- and post-opening measurement periods. Recall that letters advising customers about the impending change in the firm's tax policy were mailed in the two months preceding the store opening. This raises a risk that demand during the pre-opening period may capture some of the impact of the store opening. It is also likely that other unobserved store opening activities occurred in the weeks around the store opening. A conservative solution is to interpret the "event" of the store opening as the three months before and after the actual opening date. We then define our pre- and post-opening periods as the six months before and after this "event". In particular, if the store opening "event" is defined as January 1 to July 1, then the pre-period is July 1 to December 31 of the previous year and the post period is July 1 to December 31 of the year the store opened. This ensures that the event does not coincide with our measurement periods, and also maintains symmetry in the months represented in each period (providing a control for seasonality). We estimated (1) using this new definition and the results are similar to Table 3 (the

results are available from the authors). We conclude that our results are robust to alternative definitions of the store opening event.

Another possible limitation is that all customers who recently purchased in the focal state received a tax letter. Thus, eligibility for the tax letter is confounded with recency of last purchase. However, if the tax letter raised awareness of sales tax among recent buyers then we should be more likely to find a negative tax effect for this group of customers. But, recent buyers are precisely those customers who have the least negative tax effect. The letter also biases our results towards finding a negative moderating effect for *Recency*, but we find a positive effect. Therefore, the findings we report occur despite and not because of this confound.

Summary

We have reported a series of changes in demand surrounding a remote retailer opening a store in a state, and having to collect taxes from its Internet and catalog customers. The findings suggest that the opening of the new store and collection of taxes in the focal state led to a 5% drop in demand for customers who were not close to the store. The adverse outcome is reflected in both the demand of existing customers and the acquisition of new customers. In the next section our focus shifts from customer behavior to firm behavior. In particular, we use data on store opening decisions to investigate whether retailers avoid opening stores in high-tax states.

3. Measuring Firms' Response

The evidence in the previous section suggests that Internet customers react adversely to the introduction of sales taxes when a retailer opens a first store in their state. The implication is that local firms who have a physical presence in a state are at a competitive disadvantage compared to out-of-state firms. To preserve this advantage, we might expect out-of-state multi-channel firms to avoid opening stores in high tax states. This is particularly relevant for retailers that conduct a large proportion of their business over the Internet. In contrast, retailers with little remote business have both less to gain by

avoiding state taxes, and, in order to compete in a state, they generally have to open a store.

To investigate retailers' store opening decisions, and evaluate whether the decisions are influenced by state tax rates, we constructed a dataset from several sources. First, we identified a sample of apparel, jewelry, sporting goods and home furnishing retailers that sell through both retail stores and remote channels. The sample was identified from the *2005 Multichannel Merchant 150*, which includes a description of each retailer's business, together with the percentage of sales conducted through retail stores and remote channels (it does not distinguish between Internet and catalog channels). We restricted attention to retailers with fewer than 200 stores, and excluded any retailers that charged sales taxes on remote purchases in states in which they did not have a physical presence.[9]

Second, we used the *Retail Tenants Directory* to identify states in which retailers had physical retail locations. This is an annual publication that is used by landlords, retailers and realtors to support the retail leasing process. It contains detailed profiles of retailers across the United States - listing individual retail locations. The intersection of qualifying retailers listed in both the *Multichannel Merchant 150* and the *Retail Tenants Directory* resulted in a panel of 14 retailers (see Table 8).

As a preliminary analysis, we grouped the 14 retailers according to the percentage of their sales that are remote, and report the average tax rate in states in which retailers have stores and states in which they do not. We restricted attention to the 48 contiguous states, although including additional observations for Hawaii, Alaska and Washington DC had little impact on the findings. We also omitted 19 observations to remove states with either company headquarters or fulfillment centers (these qualify as a physical presence and so there is no incremental tax effect from opening a store in these states).

[9] For example, we excluded Lands End as it was acquired by Sears in the middle of our analysis period. Similarly, we excluded Orvis, because it charges sales taxes even in states in which it does not have a physical presence. This (conservative) policy is apparently designed to avoid liability for tax penalties that may arise because of ambiguities in the definition of a "physical presence".

Table 8. Composition of Retailer Panel

Blair Corporation
Coldwater Creek Inc.
Crate & Barrel
Draper's & Damon's Inc.
Golfsmith International Holdings, Inc.
J. Crew Group
L.L. Bean Inc.
Lillian Vernon Corporation
Norm Thompson Outfitters Inc.
Restoration Hardware
Ross-Simons
Sharper Image Corp.
The J. Jill Group, Inc.
Tiffany & Co.

The analysis reveals that there is a difference in the average tax rates in states where retailers have stores, compared to those where they do not (Table 9). Moreover, this difference varies with the percentage of the retailer's business that is conducted remotely. Amongst retailers with a high percentage of remote business (70% or more), there is a strong tendency to have retail stores in states with lower tax rates. However, as the percentage of remote sales decreases this tendency disappears. Indeed, for retailers with little remote business we observe the opposite result: they tend to have stores in higher tax states. We conclude that this preliminary analysis provides at least initial evidence that the decision to open a physical store in a state is influenced by the interaction between the state's tax rate and the percentage of sales that are remote.

While our focus is on this interaction, the finding that retailers with little remote business favor stores in high-tax states is itself interesting and counter-intuitive. However, as has previously been noted, the variation in tax rates across states is not exogenous: high tax rates may be correlated with other state characteristics that retailers find attractive.

Table 9. Average Tax Rates in 2001

	Percentage of Sales that are Remote		
	less that 30%	30%-70%	over 70%
Average 2001 Tax Rates			
States with stores	5.03% (0.17%)	5.11% (0.15%)	2.65% (0.93%)
States without stores	4.45% (0.14%)	4.55% (0.15%)	4.90% (0.11%)
Difference	0.58%** (0.22%)	0.06%* (0.23%)	-2.25%** (0.52%)
Sample Sizes			
States with stores	114	79	10
States without stores	119	154	177

Standard errors are in parentheses.
*Significantly different from zero, $p < 0.05$.
**Significantly different from zero, $p < 0.01$.

We use a multivariate approach to directly estimate how the interaction between state tax rates and the percentage of remote business influences store opening decisions. The multivariate approach allows us to include explicit controls for state and retailer differences and also allows us to focus more explicitly on the decision to open a *first* store in a state. Recall that the physical presence rule is invoked when the first store is opened in a state. After this first store, there is no incremental change in the tax policy if a retailer opens additional stores. Therefore, we focus on a retailer's decision to open a first store in a state by identifying states in which the retailers did not have stores in 2001. We then use data from 2004 to identify whether retailers had opened a first store in those states by 2004. The focus of our multivariate analysis is explaining the variation in these intervening store opening decisions.

In particular, we used the *Retail Tenants Directory* to identify states in which the panel of 14 retailers did not have a retail store, headquarters, or fulfillment center in 2001. On

average, each retailer had approximately 35 states without stores, and so across all 14 retailers this resulted in a sample of 450 state-retailer observations in which there was an opportunity to open a first store. This is the sample used in our multivariate analysis. For each of these 450 observations, we then used the *Retail Tenants Directory* to determine whether a store had been opened by that retailer in that state by 2004. The dependent measure in the analysis is *Store in 2004*$_{r,s}$, which is a binary variable defined as 1 if retailer *r* had a store in state *s* in 2004; and as 0 otherwise. A total of 54 first stores were opened in a state by the fourteen retailers.

The goal of the analysis is to explain the variation in this dependent measure, and in particular whether retailers with a high percentage of remote sales were less likely to open stores in high tax states. The analysis used logistic regression, and included the following independent variables:

Interaction of Interest

Tax Rate$_s$ * Percent Remote$_r$	The interaction between *Tax Rate*$_s$ and *Percent Remote*$_r$.

Controls for State Characteristics

Tax Rate$_s$	The 2001 state sales tax rate in state *s*.
Stores in State$_s$	The total number of retail stores in state *s* in 2001 for the sampled product categories, excluding retailers in the sample (measured in hundreds).
State Store Growth$_s$	The percentage change in *Stores in State*$_s$ between 2001 and 2004.

Controls for Retailer Characteristics

Percent Remote$_r$	The percentage of retailer *r*'s 2001 sales that comes from remote (Internet and catalog) channels.
Apparel$_r$	A binary variable indicating whether retailer *r* sells apparel.

Controls for State : Retailer Interactions

Bordering States$_{r,s}$	A binary variable indicating whether in 2001 retailer *r*

	had stores in any state bordering state *s*.
Other Close States$_{r,s}$	A binary variable indicating whether in 2001 retailer *r* had stores in any state two borders from state *s*.

Summary statistics for all of the variables are reported in the Appendix (Table A6). Our focus is the interaction between *Tax Rate*$_s$ and *Percent Remote*$_r$. Recall that the prediction is that retailers will avoid opening stores in high tax states if they conduct a large proportion of their business remotely. Therefore we expect the interaction between *Tax Rate*$_s$ and *Percent Remote*$_r$ to yield a negative coefficient: retailers with a high percentage of remote sales are less likely to open stores in high tax states.

The other independent variables act as controls for state and/or retailer differences. The state effects include a control for the state's 2001 tax rate, which has been the variable of interest in previous studies. We also include variables measuring the number of retail stores in the state in 2001, and the growth in retail stores between 2001 and 2004. These variables control for state characteristics that make opening retail stores attractive, together with any changes in those characteristics between 2001 and 2004.

The controls for retailer differences include the percentage of business that is remote. There are two binary variables indicating whether the retailer had stores (or any physical presence) in either a state bordering state *s* or in a state two borders from state *s*. Our rationale for including these variables is that retailers may seek to improve the efficiency of their logistics by opening stores in states that neighbor each other. Model 1 is a logistic regression model with all covariates and Model 2 is a retailer random effects specification with the same covariates. The findings are reported in Table 10.

Table 10. Logistic Regression:
The Probability of Opening a First Store in a State

	Model 1	Model 2
Tax Rate$_s$ * Percent Remote$_r$	-116.403* (54.046)	-192.190** (73.375)
Tax Rate$_s$	74.552 (40.658)	128.704* (52.842)
Percent Remote$_r$	5.861* (2.834)	7.748 (4.219)
Stores in State$_s$	0.181 (0.145)	0.571** (0.168)
State Store Growth$_s$	5.808** (1.716)	6.970** (2.038)
Bordering States$_{r,s}$	1.820** (0.423)	0.621 (0.538)
Other Close States$_{r,s}$	1.692 ** (0.467)	1.027 (0.596)
Apparel$_r$	2.236** (0.433)	2.193* (1.063)
Constant	-10.349** (2.399)	-11.870** (3.410)
Log Likelihood	-126	-102
Sample size	450	450

Standard errors are in parentheses. Model 2 is a random effects specification.
*Significantly different from zero, $p < 0.05$.
**Significantly different from zero, $p < 0.01$.

The coefficient for the interaction between *Tax Rate$_s$* and *Percent Remote$_r$* is negative in both models, indicating that retailers with a high percentage of remote sales were less likely to open stores in high tax states. For a retailer with 100% remote business, a 1% increase in the sales tax rate decreases the probability of opening a store in that state by 3%. This is consistent with our prediction that remote retailers will seek to preserve their competitive advantage over local retailers by avoiding a physical presence in high tax states.

The interaction reported in Table 10 is not subject to the limitation that arises in most of

the previous studies investigating the impact of state tax rates. Recall from the literature review that previous studies have had to argue that state tax rates vary exogenously across states, and are not correlated with other factors that could explain the results. In this paper we are interested in the interaction between state tax rates and the percentage of business that the firm conducts remotely. It is more difficult to identify alternative explanations for why only firms with a high percentage of remote business avoid entering states with high tax rates.

There is additional anecdotal evidence that the discrepancy in current tax policies distorts firm behavior in ways that extend beyond store location decisions. Sales tax collection could be a deterrent from competing in the retail sector altogether: in 2004, Gateway Computers closed all its retail stores. Among other reasons for the move, sales taxes for online sales had apparently put Gateway at a disadvantage to other computer sellers. Cabela's and Bass Pro Shops, both large retailers of outdoor goods, have diverted corporate funds to lobbying to ensure they obtain concessions from many states on the collection of sales taxes.[10] Some firms have engaged in "entity isolation", or the practice of incorporating a subsidiary that owns all direct sales operations to avoid nexus with retail locations. This practice, however, is becoming more vexed as states become more aggressive in pursuing sales tax revenues. For example, in a recent case in California, the State Equalization Board found that Borders.com owed $167,000 in sales tax on Internet sales from 1998-2001. The Board based its reasoning on the fact that Internet customers had been allowed to return books to Borders' physical stores, despite the legally separate status of Borders and Borders.com.

4. Conclusions

In this paper, we have shown how current sales tax policy influences both firm and customer behavior. On the customer side, we use a natural experiment, in which a multi-channel retailer opens a first store in a state, to measure the change in consumer demand.

[10] New York Times, November 30, 2005

A combination of both qualitative and quantitative evidence indicates that customers purchase fewer items when a firm collects sales tax. Our firm-level analysis investigates whether a multi-channel retailer's store expansion decisions are affected by state tax rates. We find that retailers who have a larger proportion of Internet and catalog sales are less likely to enter a state with high sales taxes.

On average, we find that the tax effect reduces consumer demand by 5%. Since the tax rate in this state is in the 4-6% range, this corresponds to an elasticity of approximately -1.0. We find that there is considerable variation in the sales tax effect between customers and across channels of distribution. The sales tax effects for new customers and Internet customers are 11% and 16%, respectively, which imply tax elasticities in the -2 to -4 range. We also show that the tax effect is smaller among customers who recently purchased from the retailer. Among customers who purchase large orders the tax effect is significantly larger.

We conjecture that our results on consumer demand may reflect differences in customers' outside options and/or the relative salience of the new tax policy in the different channels. When customers order via the Internet, retail sales tax may be more salient and competing options may be readily found. For example, when a customer finalizes an order online, the web site is typically very clear about the sales tax charge (if any). In contrast, when placing an order over the phone, the customer is told the total amount but the sales tax charge may not be emphasized. Even if a customer is aware of the sales tax, the search cost of finding a substitute retailer may differ by type of channel. A customer ordering online may be able to quickly search the Internet to find a competing retailer who sells similar products and does not charge sales tax. However, a customer ordering over the phone may not have as many low-cost alternatives.

We interpret our firm-level results as evidence that retail store expansion decisions are affected by current tax policy. We conjecture that retailers with a large proportion of their business in catalog and Internet channels avoid opening stores in states with high sales tax to preserve their competitive advantage.

The current United States tax policy was determined by a court ruling in 1992, which preceded the Internet era. Our finding that catalog customers are relatively unaffected by sales tax suggests that the impact of the tax policy on competition may have been less of a concern prior to the Internet. Indeed, many proponents of retail tax reform support the original *Quill* ruling (Cowell 2006, Anderson 2006). However, the emergence of the Internet may have altered market conditions beyond what the Supreme Court could have imagined in *Quill*. The Internet is the fastest growing channel of distribution for many multi-channel retailers. For the focal firm in this study, only 17% of customers ordered via the Internet prior to the store opening; this proportion now exceeds 50%. Since the tax effect was largest for Internet orders, and the share of Internet purchases has grown, our estimates may understate the adverse impact of sales tax.

The key contribution of this paper is to provide rigorous empirical evidence that current tax laws on nexus reduce consumer demand and distort the expansion decisions of firms. Policy makers and retailers who support new legislation have argued that the playing field is not level. Our empirical results speak directly to how tax policy affects retail competition and the extent to which the playing field is not level. Current tax policy reduced consumer demand for the firm that we study. We speculate that at least some of this lost demand represents a gain for a competing retailer. Our results also show that the current tax policy is affecting retail competition in states with high sales tax. Our results show that fewer retail stores were opened in high tax states, which may have reduced competition between physical stores in these states.

The relationship between tax policy and retail competition is clearly an important component of Internet tax policy debate. However, the issue is complex. For example, proponents of new legislation focus on the consequences of the loss of state tax revenues. Opponents cite the costs and complexities involved in collecting sales tax across more than 7,000 local tax jurisdictions. While our paper is silent on these issues, we offer new evidence that may shape a more informed debate on the extent to which tax policy affects retail competition.

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Table A1. Poisson Regression: Store Purchases

	All Customers	New Customers	Existing Customers
Post-Opening * Focal State	0.041 (0.038)	-0.023 (0.098)	0.041 (0.041)
Focal State	-0.884** (0.027)	-0.968** (0.028)	-0.865** (0.030)
Post-Opening	0.094** (0.019)	-0.273** (0.048)	0.166** (0.021)
Constant	-0.320** (0.014)	-0.262** (0.032)	-0.332** (0.016)
Log Likelihood	-21794	-3712	-17997
Sample Size	26,042	4,748	21,290

Standard errors are in parentheses.

*Significantly different from zero, $p < 0.05$.
**Significantly different from zero, $p < 0.01$.

Table A2. Existing Customer Demand for All Units

	Model 1	Model 2	Model 3	Model 4
Post-Opening * Focal State	-0.078**	-0.053**	-0.042**	-0.069**
	(0.020)	(0.017)	(0.016)	(0.020)
Post-Opening * Focal State*Recency	0.047*			0.057*
	(0.022)			(0.024)
Post-Opening * Focal State*Frequency		0.001		-0.004
		(0.006)		(0.006)
Post-Opening * Focal State*Monetary			-0.029*	-0.031**
			(0.011)	(0.011)
Focal State	0.049**	0.036**	0.030*	0.044**
	(0.015)	(0.014)	(0.013)	(0.015)
Focal State*Recency	-0.221**	-0.197**	-0.196**	-0.225**
	(0.017)	(0.013)	(0.013)	(0.018)
Focal State*Frequency	0.430**	0.430**	0.431**	0.432**
	(0.014)	(0.014)	(0.014)	(0.014)
Focal State*Monetary	-0.019**	-0.019*	-0.004	-0.003
	(0.007)	(0.007)	(0.009)	(0.009)
Focal State*Recency*Frequency	-0.300**	-0.300**	-0.301**	-0.300**
	(0.012)	(0.012)	(0.012)	(0.012)
Focal State*Recency*Monetary	0.007	0.006	0.006	0.006
	(0.008)	(0.008)	(0.008)	(0.008)
Focal State*Monetary*Frequency	-0.074**	-0.074**	-0.073**	-0.074**
	(0.004)	(0.004)	(0.004)	(0.004)
Post	0.035**	0.024	0.019	0.030*
	(0.014)	(0.013)	(0.013)	(0.014)
Post*Recency	-0.095**	-0.075**	-0.075**	-0.099**
	(0.015)	(0.012)	(0.012)	(0.016)
Post*Frequency	-0.001	-0.001	-0.001	-0.001
	(0.009)	(0.009)	(0.009)	(0.009)
Post*Monetary	0.005	0.005	0.016	0.016*
	(0.007)	(0.007)	(0.008)	(0.008)
Post*Recency*Frequency	0.001	0.001	0.001	0.002
	(0.009)	(0.009)	(0.009)	(0.009)
Post*Recency*Monetary	0.001	0.001	0.004	0.004
	(0.008)	(0.008)	(0.008)	(0.008)
Post*Monetary*Frequency	0.019**	0.019**	0.019**	0.019**
	(0.004)	(0.004)	(0.004)	(0.004)
Recency	0.580**	0.569**	0.569**	0.581**
	(0.011)	(0.010)	(0.010)	(0.011)
Frequency	0.290**	0.290**	0.290**	0.290**
	(0.007)	(0.007)	(0.007)	(0.007)
Monetary	0.204**	0.204**	0.198**	0.198**
	(0.006)	(0.006)	(0.006)	(0.006)
Recency*Frequency	-0.077**	-0.077**	-0.077**	-0.078**
	(0.007)	(0.007)	(0.007)	(0.007)
Recency*Monetary	-0.017*	-0.017*	-0.018*	-0.019*
	(0.007)	(0.007)	(0.007)	(0.007)
Monetary*Frequency	0.119**	0.119**	0.119**	0.119**
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	0.861**	0.867**	0.870**	0.864**
	(0.010)	(0.010)	(0.009)	(0.010)
Log Likelihood	-73,849	-73,491	-73,488	-73,485

Table A3. Existing Customer Demand for Internet Units

	Model 1	Model 2	Model 3	Model 4
Post-Opening * Focal State	-0.136*	-0.077	-0.057	-0.093
	(0.058)	(0.048)	(0.046)	(0.059)
Post-Opening * Focal State*Recency	0.068			0.118
	(0.065)			(0.069)
Post-Opening * Focal State*Frequency		-0.024		-0.033
		(0.019)		(0.020)
Post-Opening * Focal State*Monetary			-0.133**	-0.134**
			(0.033)	(0.033)
Focal State	0.227**	0.194**	0.182**	0.206**
	(0.045)	(0.041)	(0.040)	(0.046)
Focal State*Recency	-0.032	0.007	0.008	-0.059
	(0.052)	(0.037)	(0.037)	(0.054)
Focal State*Frequency	0.219**	0.233**	0.222**	0.240**
	(0.042)	(0.044)	(0.042)	(0.044)
Focal State*Monetary	-0.082**	-0.081**	-0.004	-0.004
	(0.019)	(0.019)	(0.027)	(0.027)
Focal State*Recency*Frequency	-0.137**	-0.140**	-0.140**	-0.142**
	(0.038)	(0.038)	(0.038)	(0.038)
Focal State*Recency*Monetary	-0.016	-0.017	-0.016	-0.015
	(0.023)	(0.023)	(0.023)	(0.024)
Focal State*Monetary*Frequency	-0.144**	-0.141**	-0.141**	-0.139**
	(0.012)	(0.012)	(0.013)	(0.013)
Post	0.271**	0.241**	0.230**	0.243**
	(0.041)	(0.039)	(0.038)	(0.042)
Post*Recency	-0.222**	-0.185**	-0.190**	-0.237**
	(0.047)	(0.036)	(0.035)	(0.047)
Post*Frequency	0.066*	0.065*	0.061*	0.060*
	(0.030)	(0.030)	(0.030)	(0.030)
Post*Monetary	0.047*	0.048*	0.096**	0.097**
	(0.019)	(0.019)	(0.023)	(0.023)
Post*Recency*Frequency	-0.071*	-0.062*	-0.065*	-0.053
	(0.029)	(0.030)	(0.029)	(0.030)
Post*Recency*Monetary	0.024	0.022	0.037	0.036
	(0.023)	(0.023)	(0.024)	(0.024)
Post*Monetary*Frequency	0.065**	0.067**	0.058**	0.060**
	(0.013)	(0.013)	(0.013)	(0.013)
Recency	0.620**	0.598**	0.600**	0.628**
	(0.036)	(0.031)	(0.031)	(0.037)
Frequency	0.275**	0.274**	0.277**	0.276**
	(0.023)	(0.023)	(0.023)	(0.023)
Monetary	0.218**	0.218**	0.184**	0.184**
	(0.017)	(0.017)	(0.020)	(0.020)
Recency*Frequency	-0.075**	-0.078**	-0.077**	-0.082**
	(0.023)	(0.023)	(0.023)	(0.023)
Recency*Monetary	-0.031	-0.030	-0.038	-0.037
	(0.021)	(0.021)	(0.022)	(0.022)
Monetary*Frequency	0.116**	0.115**	0.120**	0.117**
	(0.012)	(0.012)	(0.012)	(0.012)
Constant	-1.445**	-1.427**	-1.421**	-1.431**
	(0.032)	(0.030)	(0.030)	(0.032)
Log Likelihood	-23,398	-23,378	-23,370	-23,368

Table A4. Existing Customer Demand for Catalog Units

	Model 1	Model 2	Model 3	Model 4
Post-Opening * Focal State	-0.025 (0.024)	-0.014 (0.020)	-0.018 (0.020)	-0.022 (0.024)
Post-Opening * Focal State*Recency	0.012 (0.027)			0.020 (0.028)
Post-Opening * Focal State*Frequency		-0.004 (0.007)		-0.006 (0.008)
Post-Opening * Focal State*Monetary			0.001 (0.013)	0.000 (0.013)
Focal State	0.161** (0.017)	0.155** (0.016)	0.158** (0.016)	0.160** (0.017)
Focal State*Recency	-0.255** (0.020)	-0.249** (0.015)	-0.249** (0.015)	-0.258** (0.020)
Focal State*Frequency	0.454** (0.016)	0.456** (0.016)	0.454** (0.016)	0.457** (0.016)
Focal State*Monetary	0.001 (0.009)	0.001 (0.009)	0.000 (0.010)	0.001 (0.010)
Focal State*Recency*Frequency	-0.292** (0.015)	-0.292** (0.015)	-0.292** (0.015)	-0.292** (0.015)
Focal State*Recency*Monetary	-0.025* (0.010)	-0.025* (0.010)	-0.025* (0.010)	-0.025* (0.010)
Focal State*Monetary*Frequency	-0.054** (0.005)	-0.054** (0.005)	-0.054** (0.005)	-0.054** (0.005)
Post	-0.087** (0.017)	-0.093** (0.016)	-0.091** (0.016)	-0.089** (0.017)
Post*Recency	-0.053** (0.019)	-0.046** (0.015)	-0.047** (0.014)	-0.055** (0.020)
Post*Frequency	-0.031** (0.012)	-0.031** (0.012)	-0.031** (0.012)	-0.031** (0.012)
Post*Monetary	-0.026** (0.009)	-0.026** (0.009)	-0.026* (0.010)	-0.026* (0.010)
Post*Recency*Frequency	0.035** (0.012)	0.036** (0.012)	0.035** (0.012)	0.037** (0.012)
Post*Recency*Monetary	0.019 (0.010)	0.019 (0.010)	0.019 (0.010)	0.019 (0.010)
Post*Monetary*Frequency	0.014** (0.004)	0.015** (0.005)	0.014** (0.004)	0.015** (0.005)
Recency	0.574** (0.014)	0.570** (0.012)	0.571** (0.012)	0.574** (0.014)
Frequency	0.311** (0.009)	0.311** (0.009)	0.311** (0.009)	0.311** (0.009)
Monetary	0.211** (0.007)	0.211** (0.007)	0.211** (0.007)	0.211** (0.007)
Recency*Frequency	-0.121** (0.009)	-0.122** (0.009)	-0.121** (0.009)	-0.122** (0.009)
Recency*Monetary	0.009 (0.009)	0.010 (0.009)	0.009 (0.009)	0.010 (0.009)
Monetary*Frequency	0.112** (0.004)	0.112** (0.004)	0.112** (0.004)	0.112** (0.004)
Constant	0.496** (0.012)	0.499** (0.012)	0.498** (0.012)	0.497** (0.012)
Log Likelihood	-59,679	-59,679	-59,679	-59,679

Table A5. Other Dependent Variables

	All Orders	Average Price
Post-Opening * Focal State	-0.049 (0.030)	-2.176 (1.552)
Post-Opening * Focal State*Recency	0.058 (0.035)	0.104 (1.800)
Post-Opening * Focal State*Frequency	-0.002 (0.010)	0.389 (1.039)
Post-Opening * Focal State*Monetary	-0.059* (0.023)	-1.783 (1.382)
Focal State	0.058** (0.022)	2.469* (1.144)
Focal State*Recency	-0.261** (0.026)	0.440 (1.340)
Focal State*Frequency	0.464** (0.022)	0.493 (1.552)
Focal State*Monetary	0.012 (0.017)	0.887 (1.058)
Focal State*Recency*Frequency	-0.327** (0.019)	0.869 (1.339)
Focal State*Recency*Monetary	0.024 (0.015)	-0.407 (1.928)
Focal State*Monetary*Frequency	-0.067** (0.008)	-0.664 (1.665)
Post	0.001 (0.021)	0.801 (1.101)
Post*Recency	-0.087** (0.023)	-0.704 (1.254)
Post*Frequency	-0.009 (0.015)	0.072 (1.409)
Post*Monetary	0.030 (0.016)	0.229 (1.982)
Post*Recency*Frequency	0.011 (0.014)	0.279 (1.282)
Post*Recency*Monetary	-0.017 (0.015)	0.485 (1.926)
Post*Monetary*Frequency	0.006 (0.008)	-0.321 (1.663)
Recency	0.560** (0.017)	0.759 (1.895)
Frequency	0.244** (0.011)	-0.712 (1.099)
Monetary	0.079** (0.012)	2.597** (1.713)
Recency*Frequency	-0.037** (0.011)	-0.034 (1.024)
Recency*Monetary	-0.017 (0.013)	-0.063 (1.800)
Monetary*Frequency	0.075** (0.007)	0.764 (1.580)
Constant	0.040** (0.015)	43.858** (1.787)

LL for All Orders is -33,759; R-squared for Average Price is 0.013.

Table A6. Descriptive Statistics for Retail Data

	Mean	Min	Max	StdDev
Open Store in $2004_{r,s}$	0.12	0.00	1.00	0.33
Tax Rate_{s}	0.05	0.00	0.07	0.02
$\text{Percent Remote}_{r}$	0.67	0.11	1.00	0.30
Stores in State_{s} (hundreds)	1.05	0.15	8.37	1.14
$\text{State Store Growth}_{s}$	0.08	-0.12	0.36	0.10
$\text{Bordering States}_{r,s}$	0.50	0.00	1.00	0.50
$\text{Other Close States}_{r,s}$	0.61	0.00	1.00	0.49
Apparel_{r}	0.54	0.00	1.00	0.50