

# **A World Without Borders Revisited: The Impact of Online Sales Tax Collection on Shopping and Search**

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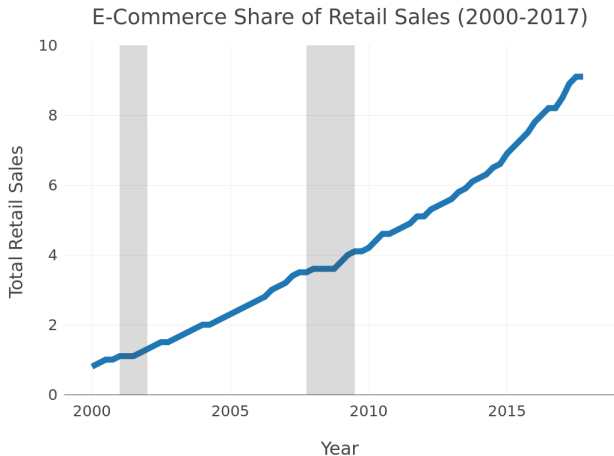
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# Background

*South Dakota v. Wayfair Inc.*



# Background



Source: U.S. Census Bureau

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- Online transactions have been effectively tax free
- Since 2008, states have started increasing enforcement of online sales tax collection
- As of April 1, 2017, Amazon now collects sales tax in all states



# Motivating Questions

- How responsive is consumer spending to sales taxes?
  - Do consumers shift spending away from Amazon when Amazon collects sales tax in their state?
  - If so, where do they shift their spending?
- Is consumer search behavior affected by sales taxes?

- **Cross-border Shopping:** Mikesell (1970); Asplund, Friberg, and Wilander (2007); Davis (2011); Agarwal, Marwell, and McGranahan (2017)
- **Online Shopping:** Goolsbee (2000); Alm and Melnik (2005); Scanlan (2007); Ballard and Lee (2007); Einav et al (2014); Baugh, Ben-David, and Park (2018); Houde, Newberry, and Seim (2017)

# This Paper

- Combine online shopping with cross-border shopping environments
- Estimate substitution patterns between online and offline shopping using granular browsing data
- Examine effects on consumer search

## Sales Tax Changes

- Consumers increase search
- Consumers reduce their offline spending, but increase their online spending by about twice the sales tax change

## Online Collection

- Consumers reduce their pre-tax Amazon spending by about -0.4% for each percent of sales tax
- Online spending is reduced when by about 0.8% per pp of sales tax

## Offline Effects

- Offline competition and cross-border shopping is more important to consumers
- For every 1pp difference in sales tax rate between home and adjacent county rate, online-only spending drops by about 5%

- **comScore Web Behavior Database**

- Granular browsing and transaction activity of ~50k households
- Households report various demographics and ZIP code
- Includes domain name
- Data from 2006 to 2016

Distribution

- **Nielsen Homescan Panel**

- Nationally representative panel that keeps track of all goods that they buy and consume
- High-quality data and well-maintained panel
- Stores are anonymized, but they are categorized
- Data from 2004 to 2015

Distribution

- **Tax Data Systems**

- Database of state, county, and local sales tax rates at a ZIP code level
- Data from 2006 to 2016

# Regression Specification

$$\begin{aligned} Y_{hct}^j = & \beta_0 + \underbrace{\beta_1 \log(1 + SalesTax_{ct})}_{\text{Effect of Sales Tax}} \\ & + \underbrace{\beta_2 \log(1 + SalesTax_{ct}) * \mathbb{1}_{ct}^{Collect}}_{\text{Effect of Sales Tax After Amazon Collection}} \\ & + \underbrace{\beta_3 TaxDiff_{ct}}_{\text{Cross-Border Shopping}} \\ & + \underbrace{\alpha X_h + \lambda_c + \lambda_t}_{\text{Fixed Effects and Observables}} + \epsilon_{hct} \end{aligned}$$



# Regression Results (Expenditures)

**Table 1: Amazon Expenditures**

	Log Expenditures			
	All Counties		Border Counties	
	(1)	(2)	(3)	(4)
Log(1 + Tax)	0.015 (1.022)	0.152 (1.023)	0.782 (1.264)	-14.151** (5.771)
Log(1 + Tax) * Collect		-0.461*** (0.164)	-0.457*** (0.164)	-2.715** (1.166)
Tax Diff			-1.199 (1.414)	
Observations	156,486	156,486	156,486	5,386
R <sup>2</sup>	0.061	0.061	0.061	0.078
Adjusted R <sup>2</sup>	0.044	0.044	0.044	0.045

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Household race, income, age, and presence of children as well as month-year and county fixed effects are included.

# Regression Results (Search)

**Table 2: Amazon Browsing (Minutes)**

	Log Minutes			
	All Counties			Border Counties
	(1)	(2)	(3)	(4)
Log(1 + Tax)	-0.985*** (0.369)	-0.986*** (0.369)	-1.416*** (0.456)	-7.411*** (2.446)
Log(1 + Tax) * Collect		0.044 (0.062)	0.040 (0.062)	-0.062 (0.476)
Tax Diff			0.845 (0.528)	
Observations	1,543,204	1,543,204	1,543,204	43,792
R <sup>2</sup>	0.064	0.064	0.064	0.073
Adjusted R <sup>2</sup>	0.062	0.062	0.062	0.069

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Household race, income, age, and presence of children as well as month-year and county fixed effects are included.

# Regression Results (Search)

**Table 3: Total Browsing (Minutes)**

	Log Minutes			
	All Counties		Border Counties	
	(1)	(2)	(3)	(4)
Log(1 + Tax)	0.958*** (0.176)	0.953*** (0.176)	1.184*** (0.217)	5.071*** (1.199)
Log(1 + Tax) * Collect		0.200*** (0.033)	0.202*** (0.033)	−0.038 (0.249)
Tax Diff			−0.468* (0.256)	
Observations	8,268,270	8,268,270	8,268,270	219,504
R <sup>2</sup>	0.027	0.027	0.027	0.027
Adjusted R <sup>2</sup>	0.027	0.027	0.027	0.026

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Household race, income, age, and presence of children as well as month-year and county fixed effects are included.

# Key Takeaways from comScore Data

- Amazon purchases are moderately reduced in response to sales tax collection
- Consumer search is sensitive to any change in the sales tax rate
  - Increased search when sales tax is collected online
  - Consumers search across all types of retailers

# Total Household Spending

**Table 4: Real Online Expenditures**

	Log Expenditures						
	All Counties			Post-tax		Border Counties	Post-tax
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(1 + Tax)	-0.933 (0.661)	-1.115* (0.661)	1.875** (0.875)	1.867** (0.875)	1.909** (0.875)	-0.684 (4.546)	-0.722 (4.547)
Log(1 + Tax) * Collect		-0.831*** (0.094)	-0.809*** (0.094)	-0.712*** (0.117)	0.231** (0.117)	-3.048*** (0.657)	-2.056*** (0.657)
Tax Diff			-5.106*** (0.978)	-5.011*** (0.980)	-5.020*** (0.981)		
Tax Diff * Collect				-0.618 (0.439)	-0.685 (0.440)		
Observations	352,424	352,424	352,424	352,424	352,504	9,813	9,814
R <sup>2</sup>	0.079	0.079	0.080	0.080	0.079	0.095	0.093
Adjusted R <sup>2</sup>	0.072	0.072	0.072	0.072	0.071	0.078	0.076

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Household race, income, and age as well as month-year and county fixed effects are included.

# Total Household Spending

**Table 5: Real Offline Expenditures**

	Log Expenditures					
	All Counties		Post-tax		Non-Grocery	Border Counties
	(1)	(2)	(3)	(4)	(5)	(6)
Log(1 + Tax)	-0.692*** (0.110)	-0.684*** (0.111)	-1.142*** (0.140)	-0.167 (0.140)	-0.870*** (0.181)	-2.376*** (0.744)
Log(1 + Tax) * Collect		0.064*** (0.019)	0.061*** (0.019)	0.061*** (0.019)	-0.040 (0.025)	0.057 (0.138)
Tax Diff			0.877*** (0.164)	0.909*** (0.164)	-0.079 (0.212)	
Observations	5,189,069	5,189,069	5,189,069	5,189,289	5,020,334	134,568
R <sup>2</sup>	0.103	0.103	0.103	0.101	0.067	0.106
Adjusted R <sup>2</sup>	0.102	0.102	0.102	0.101	0.066	0.105

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Household race, income, and age as well as month-year and county fixed effects are included.

# Total Household Spending

**Table 6: Real Total Expenditures**

	Log Expenditures					
	All Counties		Post-tax		Non-Grocery	Border Counties
	(1)	(2)	(3)	(4)	(5)	(6)
Log(1 + Tax)	-0.632*** (0.110)	-0.624*** (0.110)	-1.036*** (0.139)	-0.075 (0.139)	-0.676*** (0.180)	-2.506*** (0.739)
Log(1 + Tax) * Collect		0.060*** (0.019)	0.058*** (0.019)	0.073*** (0.019)	-0.045* (0.025)	-0.001 (0.137)
Tax Diff			0.789*** (0.163)	0.822*** (0.163)	-0.265 (0.211)	
Observations	5,194,180	5,194,180	5,194,180	5,194,387	5,035,154	134,715
R <sup>2</sup>	0.103	0.103	0.103	0.101	0.066	0.106
Adjusted R <sup>2</sup>	0.102	0.102	0.102	0.101	0.066	0.105

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Household race, income, and age as well as month-year and county fixed effects are included.

# Summary

- Consumers avoid taxes by shopping online
  - Online spending increases in response to sales tax increases
- Online spending is sensitive to sales taxes
  - Amazon spending is reduced by about 0.4% per percentage point of sales tax
  - Overall online spending is reduced by about 0.8% per percentage point of sales tax
- Offline shopping channels are more attractive than offline options
  - Tax differences between counties counteract online spending fully
  - Border counties are more sensitive to any tax changes



- Explore how this informs firm decisions and competitive responses
  - How does a firm's online and offline channels interact? Are they complements or substitutes?
  - How should a traditional retail firm respond to online-only retailers?
  - How should retailers weigh competition between online-only retailers and nearby offline competition?
  - How does the online option affect firm entry/exit decisions?

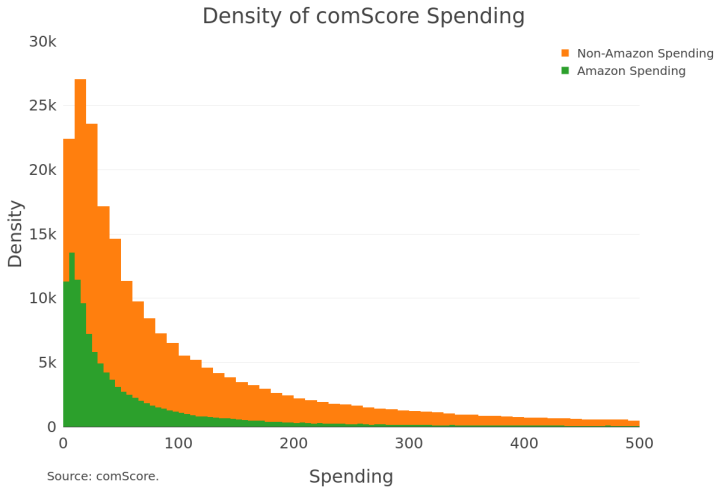
# Questions?



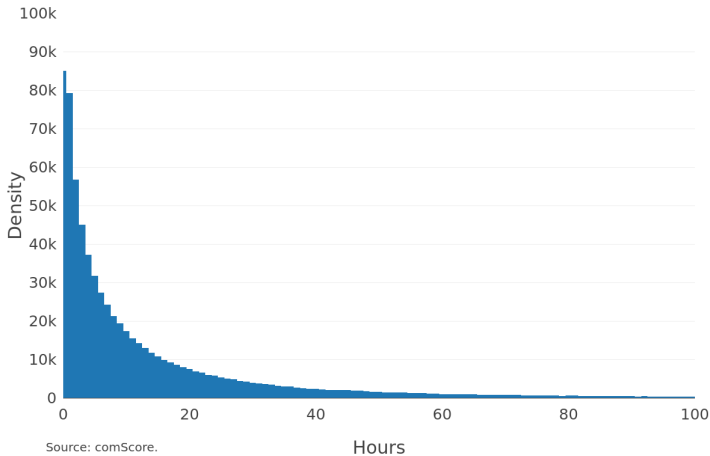
Thanks!



THANK  
YOU



Histogram of Monthly Shopping Browsing



Source: comScore.

