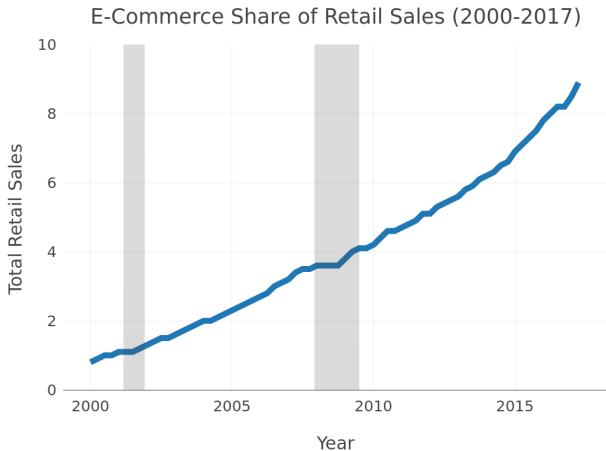


A World Without Borders Revisited: The Impact of Online Sales Tax Collection on Shopping and Search

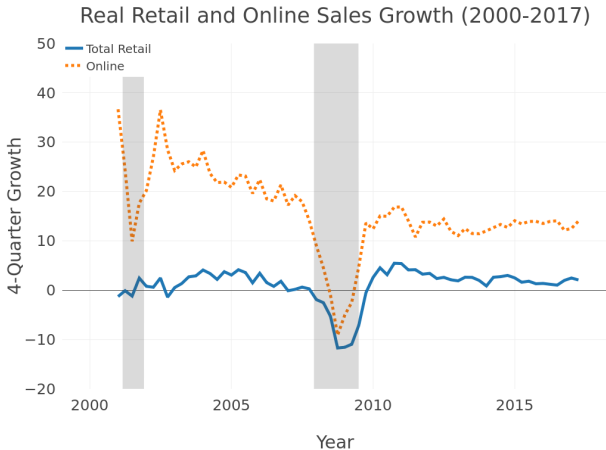
Mallick Hossain

Background



Source: U.S. Census Bureau

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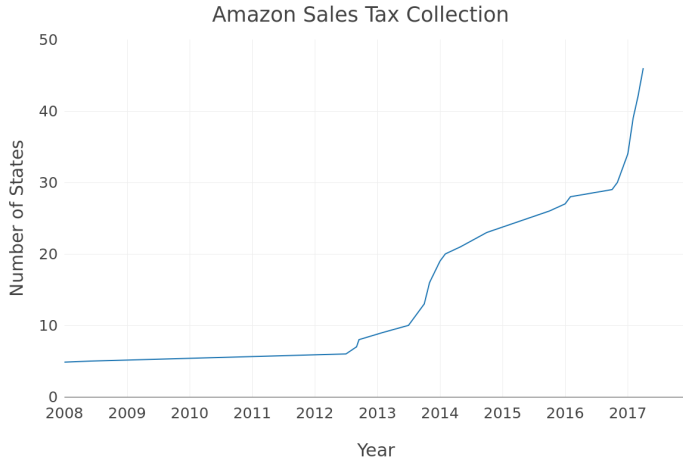
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- Sales taxes makes up 33% of state tax revenue
- People try to avoid paying taxes when possible [\[Citation needed\]](#)
- Online transactions have been effectively tax free
- Since 2008, states have started increasing enforcement of online sales tax collection
- As of April 1, 2017, Amazon now collects sales tax in all states

Growth of Amazon Tax Collection



Source: Author's calculations based on news reports.

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**

- Consumers living close to borders are more tax sensitive than those not close to borders
- Mikesell (1970); Asplund, Friberg, and Wilander (2007); Davis (2011); Agarwal, Marwell, and McGranahan (2017)

- **Online Shopping**

- Sales taxes influence individual's decisions of whether to shop online and how much they spend
- Goolsbee (2000); Alm and Melnik (2005); Scanlan (2007); Ballard and Lee (2007); Einav et al (2014); Baugh, Ben-David, and Park (2017); Houde, Newberry, and Seim (2017)

- **Contributions**

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

Amazon Effects

- Consumers reduce their pre-tax Amazon spending by about -0.4% for each percent of sales tax Amazon collects
 - Effect is more pronounced for consumers zero-tax border counties
- Consumers increase their searching in response to any sales tax change

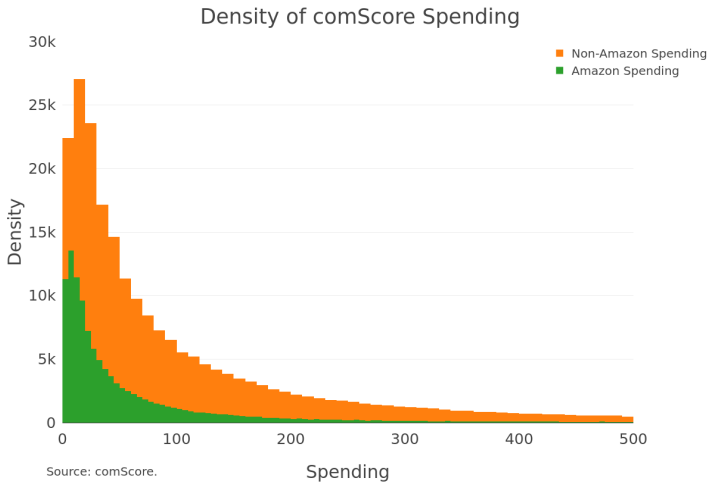
Online Shopping Effects

- In response to sales tax changes, consumers reduce their offline spending commensurate with the sales tax change, but increase their online spending by about twice the sales tax change
- Online spending is reduced when sales tax is collected online by about 0.8% per pp of sales tax

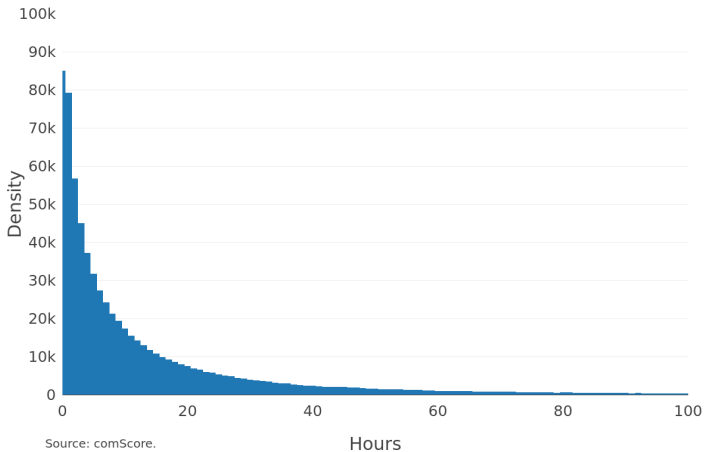
Offline Shopping Effects

- 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**
 - Captures computer-level browsing and transaction activity
 - Households report various demographics and ZIP code
 - Includes domain name
 - Data from 2006 to 2016

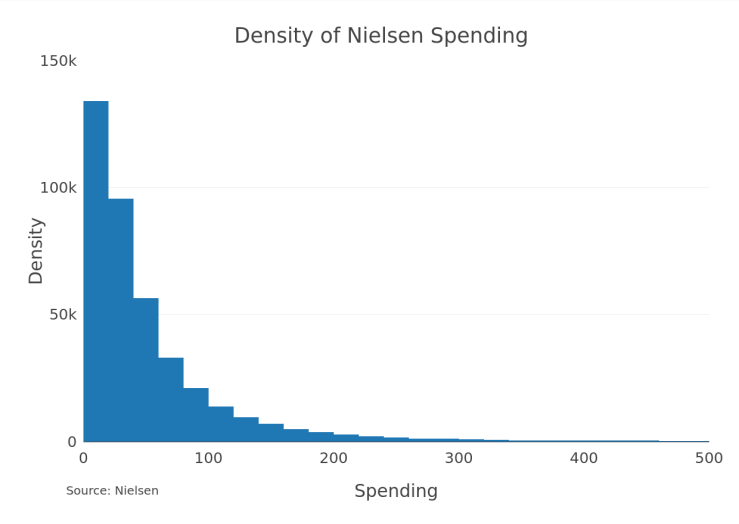


Histogram of Monthly Shopping Browsing



- **Nielsen Homescan Panel**

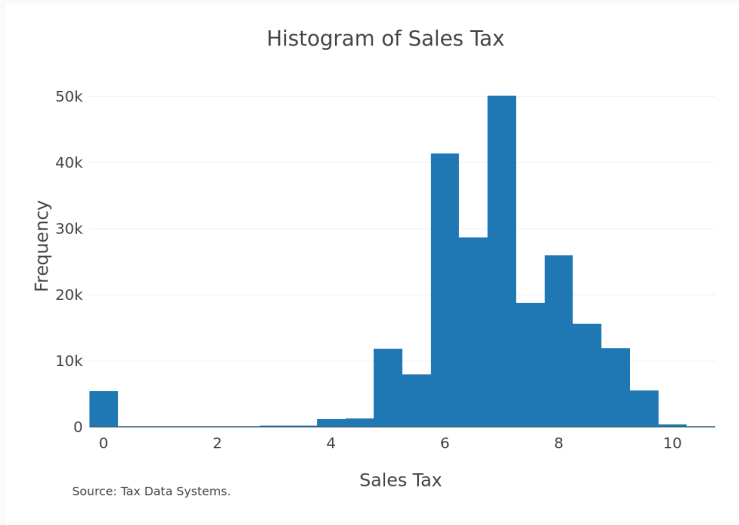
- Nationally representative panel that keeps track of all goods that they buy and consume
- High-quality data and well-maintained panel
- Stores are anonymized, but they are categorized
- Data from 2004-2015



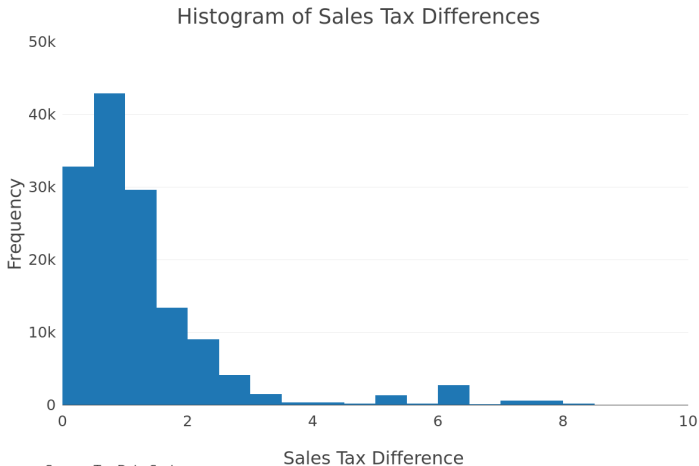
- **Tax Data Systems**

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

Tax Data



Tax Data



Regression Specification

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

Regression Results (Expenditures)

Table 1: Amazon Expenditures

	Log Expenditures					
	All Counties		Post-Tax		Border Counties	Post-Tax
	(1)	(2)	(3)	(4)	(5)	(6)
Log(1 + Tax)	0.015 (1.022)	0.152 (1.023)	0.782 (1.264)	1.299 (1.113)	-14.151** (5.771)	-10.249** (5.122)
Log(1 + Tax) * Collect		-0.461*** (0.164)	-0.457*** (0.164)	-0.333** (0.145)	-2.715** (1.166)	-2.001* (1.035)
Tax Diff			-1.199 (1.414)	-1.603 (1.245)		
Observations	156,486	156,486	156,486	156,486	5,386	5,386
R ²	0.061	0.061	0.061	0.059	0.078	0.083
Adjusted R ²	0.044	0.044	0.044	0.042	0.045	0.051

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			
	(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 ²	0.064	0.064	0.064	0.073
Adjusted R ²	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			
	(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 ²	0.027	0.027	0.027	0.027
Adjusted R ²	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	Non-Grocery	Border Counties
	(1)	(2)	(3)	(4)	(5)	(6)
Log(1 + Tax)	-0.947 (0.661)	-1.130* (0.661)	1.841** (0.875)	1.885** (0.875)	1.825** (0.921)	0.162 (4.574)
Log(1 + Tax) * Collect		-0.832*** (0.094)	-0.810*** (0.094)	0.123 (0.094)	-0.700*** (0.097)	-3.067*** (0.657)
Tax Diff			-5.073*** (0.978)	-5.094*** (0.979)	-6.403*** (1.030)	
Observations	352,424	352,424	352,424	352,504	284,497	9,813
R ²	0.079	0.080	0.080	0.079	0.068	0.097
Adjusted R ²	0.072	0.072	0.072	0.071	0.058	0.079

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 ²	0.103	0.103	0.103	0.101	0.067	0.106
Adjusted R ²	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 ²	0.103	0.103	0.103	0.101	0.066	0.106
Adjusted R ²	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