Online Shopping, Taxes, and Time Use
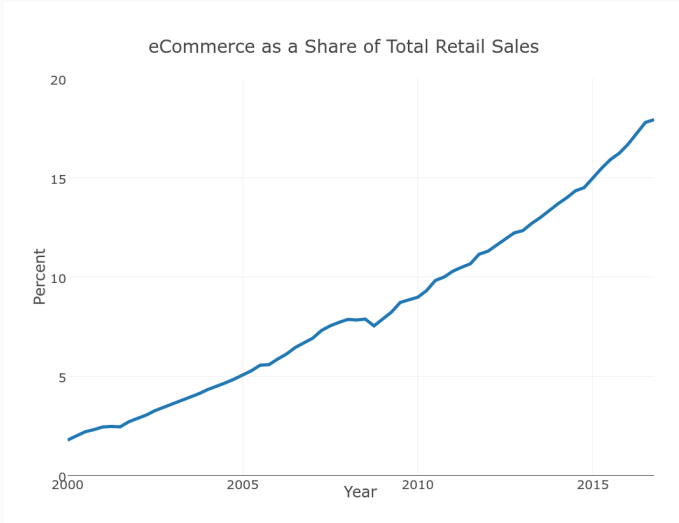
Mallick Hossain

Background

- Online shopping has grown substantially over the past few decades

eCommerce as a Share of Total Retail Sales

Implications

- **Economic:** Online shopping is a growing share of consumption

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- **Economic:** Online shopping is a growing share of consumption

- **Policy:** Most online shopping is untaxed
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- **Time Use:** Understand how individuals use time when online
  - Use online shopping data to estimate how individuals value time

Research Question

- What does online shopping data reveal about price and time elasticities?
    - How much of the growth in online shopping is attributable to lower prices (e.g. lower search costs, low/no sales tax)?
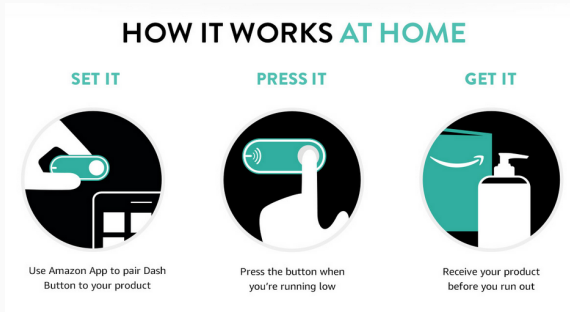   - How much is due to the increased time savings?

Policy Implications

- Potentially large negative impacts on state finances
    - States cannot compel out-of-state vendors to collect sales taxes
    - States rely on **use taxes** which consumers must self-report

- Price/tax-sensitive consumers would respond to lower sales tax

- Time-sensitive consumers would respond to increased enforcement

PA Tax Form

24. **TOTAL PAYMENTS and CREDITS.** Add Lines 13, 18, 21, 22 and 23. . . . .

25. **USE TAX.** Due on internet, mail order or out-of-state purchases. See the instructions.

26. **TAX DUE.** If the total of Line 12 and Line 25 is more than Line 24,
    enter the difference here. . . . .

- Through online shopping individuals can more finely choose their time-money preferences

- Historically, there was a lower bound on time allocated to shopping
  - This lower bound is rapidly approaching zero

HOW IT WORKS AT HOME

SET IT

Use Amazon App to pair Dash Button to your product

PRESS IT

Press the button when you're running low

GET IT

Receive your product before you run out

Related Literature

- **Online Shopping and Taxes**
  - Goolsbee (2000), Alm (2005), Ballard (2007), Scanlan (2007), Goolsbee et al (2010), and Einav et al (2014) all find that online shopping decisions are sensitive to sales taxes
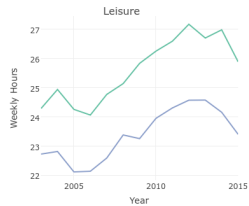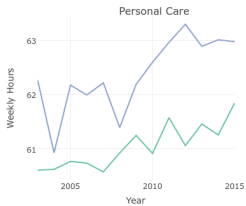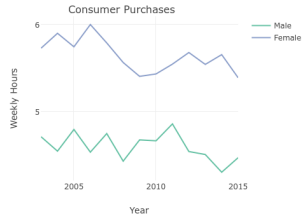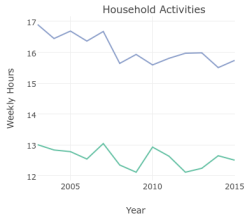- **Online Shopping and Search**
  - Koulayev (2009), Kim et al (2010), and de Los Santos et al (2012) use online data to evaluate search models
- **Time Use**
  - Becker (1965), Ghez and Becker (1975), Benhabib et al (1991), and Greenwood and Hercowitz (1991) develop the theory of how households allocate time
  - Rupert et al (1995), Aguiar and Hurst (2007), Gelber and Mitchell (2009), Nevo and Wong (2015), McGrattan et al (1997), Chang and Schorfheide (2003), and Karabarbounis (2011) estimate the elasticity of substitution between market and home goods

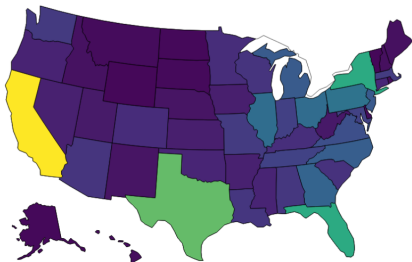# Time Trends

comScore Web Behavior Data

- ATUS does not provide enough granularity to parse out how people trade off time and money

- comScore Web Behavior database has information on online shopping and browsing activity of about 50,000 households going back to 2002
  - **Transaction data:** Website, price, quantity, basket total, product category, product description, and time
  - **Browsing data:** Website, pages viewed, browsing duration, and time
  - **Demographic data:** Household size, income, children, connection speed, ZIP code, head of household's education, age, and race
    - Similar demographics to CPS demographic profile of internet users

Demographic Summary

	25%	Median	75%
Household Size	2	3	4
Age	35-39	45-49	55-59
Income	25k-35k	35k-50k	75k-100k

	Mean
Child Present	0.60
Hispanic	0.15
White	0.74
Black	0.12
Asian	0.03
Other	0.11

comScore Geography
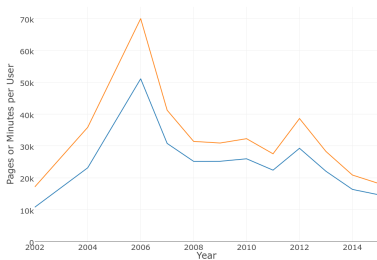

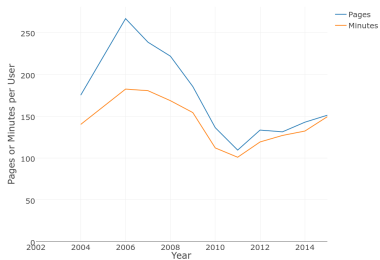comScore Population   Census Population (2016)
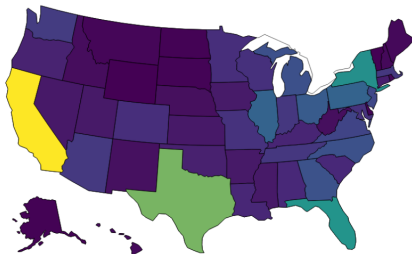
Trends in Browsing and Shopping

Online Browsing Behavior

Browsing Behavior for Online Transactions

Reduced-Form Analysis of Search and Price

- Focus on 63,447 single-book purchases
  - Relatively homogeneous good

- Explore relationship between search intensity and price paid

- Explore relationship between tax rates and search intensity

Regression Results (Price and Search)

	Dependent variable:	
	Price Paid	
	(1)	(2)
Duration	−0.007**	
	(0.003)	
Pages Viewed		−0.019***
		(0.003)
Amazon	−1.373***	−1.419***
	(0.238)	(0.238)
BN	0.042	0.039
	(0.309)	(0.309)
Book Club	−0.092	−0.207
	(0.387)	(0.387)
Low Income (<$35k)	−0.333**	−0.318*
	(0.166)	(0.165)
Middle Income ($35k-$75k)	−0.369**	−0.366**
	(0.156)	(0.156)
Children	−0.579***	−0.570***
	(0.136)	(0.136)
Age 25-54	−1.247***	−1.255***
	(0.329)	(0.329)
Age 55+	−3.295***	−3.334***
	(0.337)	(0.337)
Constant	20.016***	20.432***
	(0.419)	(0.422)
Observations	63,447	63,447
R^2	0.005	0.006
Adjusted R^2	0.005	0.006
Residual Std. Error (df = 63437)	16.518	16.513
F Statistic (df = 9; 63437)	37.772***	42.182***
Note:	*p<0.1; **p<0.05; ***p<0.01	

Regression Results (Tax and Search)

	Dependent variable:	
	Browsing Duration	Pages Viewed
	(1)	(2)
Average Tax Rate	0.195***	0.224***
	(0.059)	(0.062)
Amazon	−1.323***	−3.479***
	(0.341)	(0.356)
BN	−2.705***	−2.174***
	(0.445)	(0.464)
Book Club	−8.364***	−9.243***
	(0.551)	(0.575)
Low Income (<$35k)	3.310***	2.106***
	(0.245)	(0.256)
Middle Income ($35k-$75k)	1.770***	0.826***
	(0.226)	(0.236)
Children	−0.106	0.481**
	(0.203)	(0.211)
Age 25-54	−0.204	−0.742
	(0.495)	(0.516)
Age 55+	−0.940*	−2.637***
	(0.507)	(0.529)
Constant	20.232***	28.783***
	(0.740)	(0.772)
Observations	52,199	52,199
R^2	0.009	0.009
Adjusted R^2	0.009	0.009
Residual Std. Error (df = 52189)	22.002	22.955
F Statistic (df = 9; 52189)	54.687***	51.816***

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Canonical Life-Cycle Model

- Maximize lifetime utility with time and budget constraints:

$$V_t(a_t, s_t) = \max_{\{H_{it}\}, \{X_{it}\}, L_t, a_{t+1}} U(C_{1t}, \ldots, C_{Nt}) + \beta \int V_{t+1}(a_{t+1}, s_{t+1}) \pi_t(s_{t+1}|s_t) ds_{t+1}$$

$$\text{s.t.} \quad C_{it} = f^i(H_{it}, X_{it})$$

$$L_t + \sum_{i=1}^{N} H_{it} \leq 1$$

$$\sum_{i=1}^{N} p_{it} X_{it} + a_{t+1} \leq w_t L_t + (1+r)a_t + T_t$$

$$a_{t+1} \geq \phi$$

Model Improvements

- Incorporate different home production technologies for the same good
  - Offline shopping has fixed cost, high search cost, but immediate utility
  - Online shopping has no fixed cost, low search cost, but delayed utility

- Stylized facts to match
  - Match decline in time allocated to shopping activities
  - Match increase in time allocated to leisure
  - Match increase in share of expenditures done online

Conclusions and Future Research

- **Takeaways**
  - Estimate consumer sensitivity across time and price dimensions
  - Estimate a model that includes different home production technologies

- **Future Research**
  - Combine with Nielsen scanner data
  - Explore the recent decline in leisure