Impacts of E-Commerce & Service Expectations on Transportation: Conceptual Possibilities and Selected Research Questions

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U.S. E-shopping Trends

www2.census.gov/retail/releases/current/arts/ecommerce.xls, accessed October 19, 2016
Motivation

- E-shopping continues to rise
  - In absolute terms
  - As a share of total retail sales
- What will be the transportation-related impacts?
  - Contribute to reductions in travel?
  - Impacts on bricks-and-mortar retail?
  - Implications for retail, warehouse locations?
- Primary focus: first-order consumer-based travel impacts
  - Conceptual framework(s) within which to view potential impacts
Outline

- Comparative advantages of electronic v. store shopping
- Elements of the shopping process and their spatial/temporal reorganization
- Potential transportation impacts of e-shopping
- Research issues/approaches
- Conclusions
Advantages of E-Shopping

- Unlimited selection
- Lower prices/search costs
- Information
- Personalization
- Convenience
GO NAKED
shopping.yahoo.com

TO THE MALL

Too busy to hit your favorite stores? Shop on-line with Yahoo's Shopping. With more choices of everything from flowers to jeans, stereo to jewelry. It's fast. It's safe. It's a shopper's paradise.

Worldwide. Webwide. Visa® It's everywhere you want to be.

© 1998 VISA U.S.A.

Newsweek 11/23/98

When you're looking for the perfect digital TV, go to BestBuy.com first. Then, when you come to the store for a closer look, you'll feel, well, totally at home.
(Theoretical) Advantages of E-Shopping

- Unlimited selection
- Lower prices/search costs
- Information
- Personalization
- Convenience
- Speed

(adapted from Underhill, 2000)
(Potential) Advantages of Store Shopping

- Sensory information
- Tangibility
- Immediate possession
I just ordered us a pizza on-line!...

How do I download it?
(Potential) Advantages of Store Shopping

- Sensory information
- Tangibility
- Immediate possession
- Social interaction
I telecommute to work,

I get my information from the Net,

And my entertainment,

Send e-mail to acquaintances,

And now I'm shopping online, too.

What are you looking for?

A life.

There must be a good website for one...
(Potential) Advantages of Store Shopping

- Sensory information
- Tangibility
- Immediate possession
- Social interaction
- Entertainment
- Movement
- Trip chaining

(adapted from Underhill, 2000 and others)
Implications for the Adoption of E-Shopping

- Several studies have collectively identified four segments of early adopters:
  - the mobility-limited
  - the time-limited
  - those who like technology
  - those who dislike shopping
ICT has Enabled the Fragmentation/Recombination (in Time & Space) of Shopping Components

- Desire
- Information gathering/receiving
- Trial/experience
- Evaluation

- Selection
- Transaction
- Delivery/possession
- Display/use
- Return
Future Shopping-Related Change in Transportation

- Net outcome of 4 hierarchical factors
- Series of concentric circles, where moving outward represents successive relaxation of the constraints of holding remaining factors constant at previous stages
- Factors arranged in order of increasing indirectness (perhaps in increasing likelihood of being neglected)
Potential Travel Impacts

Change can be decomposed into 4 components:

- Changing shares of shopping channel given other components fixed
- Changing volumes given fixed per capita spending and demographic characteristics
- Changing per capita spending
- Demographic changes
Potential Travel Impacts

- Changing Demographics
- Changing Per Capita Spending
- Changing Volumes
- Changing Shopping Channel Shares
1. Changing Shopping Channel Share Given Fixed Purchase “Volume”

To the extent some store shopping is replaced:

- **Passenger side:** trip/activity chaining
  - Electronic purchase may replace some but not all items purchased in store
  - Store may be on the way to/from other activities conducted anyway
  - Reducing transit/bike/walk shopping trips won’t help

- **Freight side:** efficiency/timeliness tradeoff
  - Greater demand for fast, time-constrained, deliveries...
  - …Partly counteracted by greater goods movement efficiencies through info-sharing
1. Changing Channel Share Given Fixed Volume (cont’d)

- Frequency may increase
- “Destinations” may be more distant
- Better information about physical stores may prompt trips to more distant stores, or entirely new trips
- If electronic goods are “reconstituted”, must account for prior/later delivery of generic storage and display media (paper, disks)
Potential Travel Impacts

- Changing Demographics
- Changing Per Capita Spending
- Changing Volumes
- Changing Shopping Channel Shares
2. Changing Volume Given Fixed Per Capita Spending

- Cost savings could lead to more goods being purchased for same amount of money
- *Travel* may be among those goods

“By booking with Hotwire, I saved enough to swing both trips!”
2. Changing Volume Given Fixed Per Capita Spending

- Cost savings could lead to more goods being purchased for the same amount of money.
- *Travel* may be among those goods.
- Digital goods reduce volume...
2. Changing Volume Given Fixed Per Capita Spending

- Cost savings could lead to more goods being purchased for same amount of money
- *Travel* may be among those goods
- Digital goods reduce volume...
- But if (1) quantity of digital goods demanded increases (due to cost savings) and (2) goods are then reconstituted, volume will increase
- Higher value added could lead to fewer goods purchased given fixed budget
- Shifts among material and immaterial goods
Potential Travel Impacts

- Changing Demographics
  - Changing Per Capita Spending
  - Changing Volumes
  - Changing Shopping Channel Shares
3. Will Per Capita Spending Remain Fixed?

- Targeted marketing, ease of purchase may increase volume of impulse purchases
3. Will Per Capita Spending Remain Fixed?

- Targeted marketing, ease of purchase may increase volume of impulse purchases
- Convenience, variety may stimulate deliberate new purchases
- Location-based marketing likely to increase both spending and travel
- Personalization may release latent demand
- Uniqueness of the internet
HEY, if I took pictures of the baby and e-mailed them to the in-laws, maybe they wouldn’t visit as often. WAIT. What if that just made them want to visit more?
3. Will Per Capita Spending Remain Fixed? (cont’d)

- Transportation impacts of increased consumer spending:
  - For tangible goods purchased online, freight travel will increase
  - For goods purchased through location-based marketing, personal travel to stores likely to increase
  - The more money spent on travel as a good, the more travel will increase
Potential Travel Impacts

- Changing Demographics
  - Changing Per Capita Spending
  - Changing Volumes
    - Changing Shopping Channel Shares
4. Demographic Changes

- Changes in:
  - population
  - household size
  - employment rate
  - per capita incomes

and so on will affect aggregate consumer spending

- Not due to the internet, but have direct implications for forecasting
The Net Effect

- Effects described work in different directions, counteracting each other
- *Magnitude* of net impact is uncertain
- *Direction* of net impact is almost certainly toward increasing travel
- Systemwide effects probably small
- But localized impacts could be substantial
Research Issues

- Hypothetical study:
  - Total (passenger and freight) travel impact of “shopping”, and
  - Short-term spatial, temporal redistributions of travel (segmented by passenger, freight)

- Need to segment the market based on purchase frequency/price, search area:
  - reg’l (cars), city (electronics), local (groceries)
Research Issues: Data Collection

- Disaggregate measurement challenges -- collecting and combining online and travel data
- Freight impacts -- how far back up the chain must we go?
- Challenge to combine passenger and freight impacts -- obtaining data on same purchases from both sides
- Need something like a Life Cycle Analysis
Research Issues: Analysis Methodologies

- Proper assessment of causality may require panel surveys of “complete” travel and communication activity
- No one study can provide the definitive answer; will require multiple studies of partial aspects
  - aggregate: offers the “big picture”
  - disaggregate: better insight into causality
Interesting (to me) Research Questions

Are consumer expenditures increasing?
- Are savings decreasing?
- Can any portion of the change be attributed to a stimulative effect of online (or ICT-enabled) shopping?
- What is the role of impulse buying (who does it, under what circumstances)?
- If expenditures are remaining constant, from what categories is the growth in online spending taken?
What impacts are changing demographics having?

- Delayed “nest flight” (or boomerangers), marriage, child-bearing
- Declining birth rate, retiring baby-boomers
- Immigration

all have effects on household formation, sizes, distribution of expenditures, ICT savviness
Interesting (to me)
Research Questions (cont’d)

What are the spatial/urban form impacts?

- Optimal warehouse locations may differ for online-only vs. bricks-&-clicks merchants
- Fragmentation/recombination of manufacturing/distribution functions
- Closure of some retail outlets (videos, books, software, travel agencies)
- Added functionality of others (neighborhood pick-up/drop-off; deepening the shopping “experience”)
- Mobile commerce/location-based marketing more effective with higher densities of physical retail outlets
Conclusions

- Not an “either/or” choice: both e-shopping and store shopping will coexist
- Substitution can occur at the margin, but both forms likely to expand overall
- Dominant impact likely to be interactive augmentation/modification of both forms
- Assessing transportation impacts is a formidable, but worthwhile, challenge
Selected References (1)


- **Lee RJ, IN Sener, PL Mokhtarian, SL Handy** (under review) Relationships between the online and in-store shopping frequency of Davis, CA residents.


Selected References (2)


