Cross-Border Shopping: Implications for Policy Evaluation

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Outline

- Cross-border shopping
  - What is it?
  - Where is it?
  - Why care?
- Conceptual framework
  - Firm: an import/export approach
  - Individual: cost/benefit of cross-border shopping
- Practical considerations
  - Ideal data
  - Available data
  - How to combine existing data to best advantage
    - TUS-CPS
    - Sales data
    - Distance data
- Evidence

Cross-Border Shopping

What is it?

- Shopping across jurisdictional boundaries to get lower prices

Where does one find it?

- Everywhere prices differ

Why care?

- Proper evaluation of policy effects

Conceptual framework - Firm

Consider sales in a given state

- Total Cigarette Sales$_{st}$=
  (1) Cigarettes would sell if no trade existed
  + (2) Cigarettes exported (out-of-state customers)
  - (3) cigarettes imported (residents who bought elsewhere)

  if (2)≠(3) and analyst fails to account for them then estimation of policy effects ***on local consumption*** will be biased

Stated differently

- If interested in total and partial policy effect
- Must account for

  – local smokers who buy in other jurisdictions
  – out-of-state smokers who buy in local markets

  – Inflow and outflow depends on factors that influence individual decisions

Conceptual framework - Individual

- Decision about where to buy
  - at home
  - “abroad”
- What factors influence decision?
  - Travel cost (distance, gas prices)
  - Time cost (wage rate, employment status)
  - Potential savings (price/tax differentials)
  - Durability of product (how quality deteriorates with time)

- Potential savings
  - increase with amount buy
  - decreases if product quality deteriorates faster (wastage)

Hypotheses

If treat data as if generated on an “island” then estimated effect of tobacco control policies will be biased

- **upward** the closer one is to lower-cost jurisdiction
- **downward** the closer one is to higher-cost jurisdictions

Ideal Data

Would identify:

- prices (in all markets)
- each individual's location (in all markets)
- distance to each market
- cost of travel to each market
- market where buy

Available Data

- TUS-CPS
- State cigarette (stamp) sales
- External data on
  - population
  - distances
  - gasoline prices

TUS-CPS

Combine data from:

- February 2003
- June 2003
- November 2003
- May 2006
- August 2006
- January 2007

TUS-CPS

Variable	Mean	Std. Dev.
Age	45.31	(18.11)
Female	0.53	
White	0.84	
Black	0.09	
Hispanic	0.10	
Asian	0.04	
Other	0.02	
Ever smoked (181193)	0.37	
Currently smoke (85411)	0.18	
N	486805	

TUS-CPS

Variable	N	Mean	Std. Dev.
Cigarettes per day	64693	15.22	(10.10)
Buy packs	62142	0.66	
Buy cartons	62142	0.41	
Price - carton	20227	26.76	(8.65)
Price - pack	12807	3.77	(1.22)

Price differentials

Price	In-state	Out-of-state	Difference
Carton	**27.02**	**24.13**	**2.89**
(N)	(18416)	(1811)	
Pack	**3.76**	**4.12**	**-0.37**
(N)	(12344)	(463)	

Delaware-DC-Maryland-New Jersey-Penn.-VA

Price	In-state	Out-of-state	Difference
Carton	**29.28**	**25.08**	**4.19**
(N)	(1489)	(336)	
Pack	**3.92**	**4.08**	**-0.16**
(N)	(1361)	(82)	

Price differentials – by state

Delaware

Price	In-state	Out-of-state	Difference
Carton	**25.28**	**16.00**	**9.28**
(N)	(307)	(1)*	
Pack	**3.07**	**3.65**	**-0.57**
(N)	(147)	(4)	

DC

Price	In-state	Out-of-state	Difference
Carton	**29.43**	**26.62**	**2.81**
(N)	(43)	(51)	
Pack	**4.17**	**3.66**	**0.51**
(N)	(170)	(25)	

Maryland

Price	In-state	Out-of-state	Difference
Carton	**31.69**	**24.48**	**7.21**
(N)	(190)	(121)*	
Pack	**3.82**	**3.41**	**0.41**
(N)	(249)	(21)	

New Jersey

Price	In-state	Out-of-state	Difference
Carton	**42.75**	**29.01**	**13.74**
(N)	(111)	(71)*	
Pack	**5.25**	**4.48**	**0.77**
(N)	(222)	(14)	

Pennsylvania

Price	In-state	Out-of-state	Difference
Carton	**32.54**	**22.58**	**9.96**
(N)	(467)	(81)*	
Pack	**3.81**	**4.91**	**-1.10**
(N)	(394)	(12)	

Virginia

Price	In-state	Out-of-state	Difference
Carton	**23.19**	**18.54**	**4.65**
(N)	(371)	(11)	
Pack	**3.14**	**5.85**	**-2.72**
(N)	(179)	(6)	

*The highlighted cells show the number of people who bought cigarettes in another state for those living in Delaware (the focus of the analysis) and the three main states that border Delaware.

Origin and destination states

	State of residence	State of residence	State of residence	State of residence	State of residence	State of residence		
State buy	DE	DC	MD	NJ	PA	VA	Total	%export
DE	868[a]	0	58[b]	32[b]	24[b]	0	982	0.12[c]
DC	1	482[a]	5	0	0	0	488	0.01
MD	4	35[b]	887[a]	0	5	0	931	0.05
NJ	2	0	2	853[a]	3	0	860	0.01
NY	0	1	3	16	28[b]	0	48	
NC	0	3	5	6	8	14[b]	36	
PA	0	0	1	37	1,964[a]	0	2,002	0.02
SC	1	0	1	0	2	3	7	
VA	1	73[b]	75[b]	6	11[b]	919[a]	1,085	0.15[c]
WV	0	0	12[b]	1	21[b]	0	34	
Total	879	597	1,058	961	2,072	941	6,508	
%import	0.01	0.19[c]	0.16[c]	0.11[c]	0.05	0.02		

a. Indicates number of smokers who bought their last pack/carton of cigarettes in their own state.
b. Indicates considerable numbers of persons that bought outside their state of residence and where they bought their last pack/carton of cigarettes.
c. Indicates the cumulative % of those who bought cigarettes out of state of residence (thus importing cigarettes into their state from outside) or % of cigarettes from a given state that was sold to non-residents (thus exporting)

Monthly cigarette sales data

- Next analyze data on cigarette packs sold each month from January 1983 to April 2009
- Source: Delaware State Finance
- Combine with
  - Population (measure packs per capita)
  - DE cigarette tax
  - DE smoking ban
  - Population weighted distance to VA/MD

External data used

- For Neighboring state
  - Population within 100 miles of DE border (divided by DE pop)
  - Population weighted distance to DE
  - Cigarette tax
  - Gasoline price
  - Gasoline price*distance
  - Minimum wage (state and federal)
  - Unemployment rate

Sample means

Variable	DE	MD	NJ	PA	VA
Packs per capita	11.80				
State cigarette tax	0.40	0.64	1.10	0.62	0.08
Months smoking ban	0.24				
Unemployment rate	4.29	4.70	5.49	5.98	
Federal min. wage	6.16				
State min. wage	6.41	6.20	6.48	6.27	
State pop. w/in 100 miles (in units of DE pop.)		6.26	4.96	8.66	
Population weighted distance to DE		71.15	63.92	47.21	
Gasoline price (cents)	143.38	144.82	150.41	141.70	144.11
N		315			

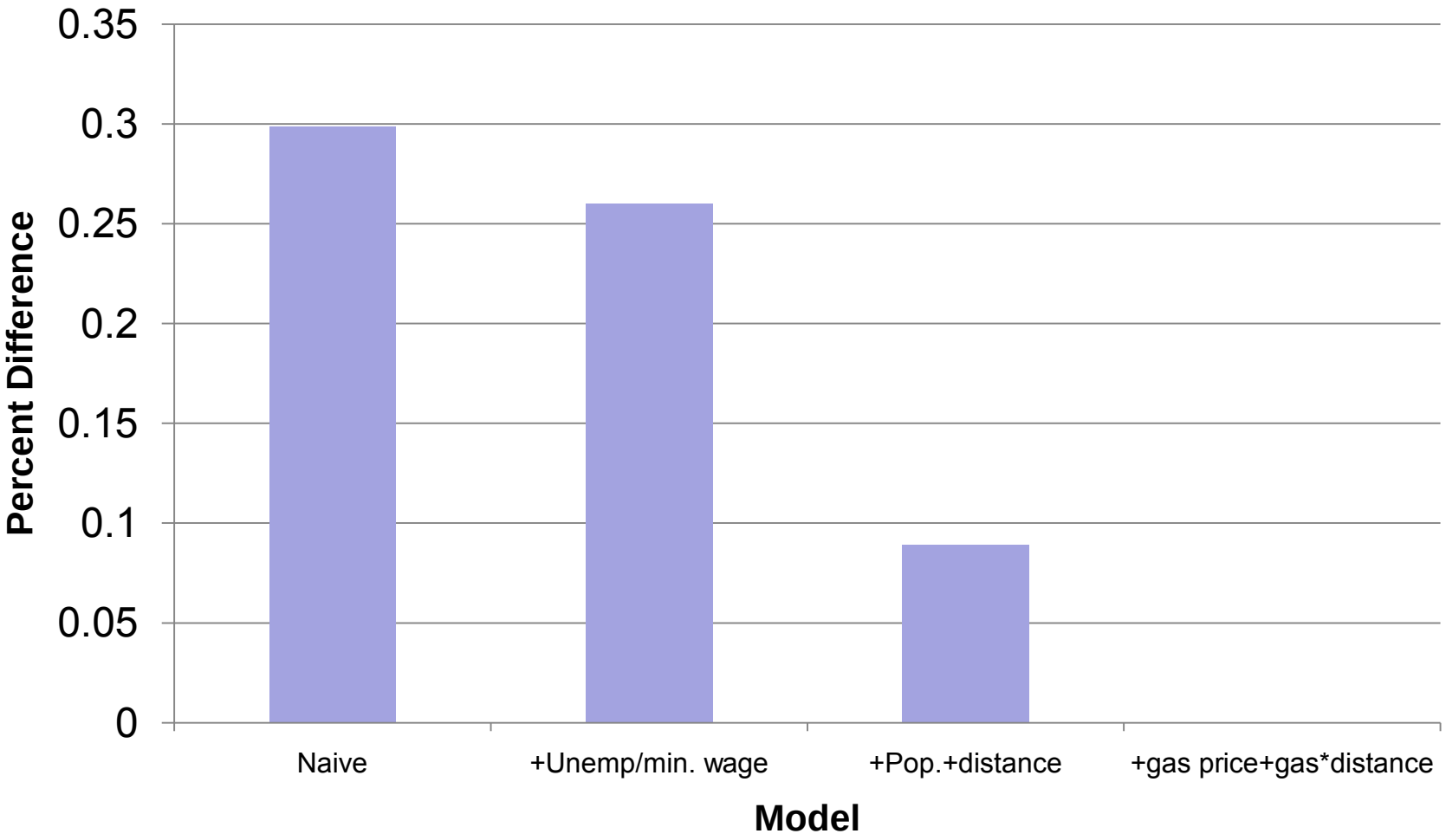
Notes: all prices in constant 2009 dollars (January).

Results: Delaware monthly cigarette sales January 1983-April 2009

Variable	1	2	3	4
Cig. tax DE	-10.305 ***	-10.876 ***	-13.389 ***	-14.699 ***
Cig. tax MD		1.100	3.634 **	4.013 **
Cig. tax NJ		3.482 ***	4.810 ***	5.285 ***
Cig. tax PA		0.848	-1.972	-2.981
Cig. tax VA		0.186	2.204	1.188
DE smoking ban in force	3.945 ***	-0.202	-0.918	-1.144
Controls				
Neighboring state				
Taxes	No	Yes	Yes	Yes
Unemployment	No	Yes	Yes	Yes
Minimum wage	No	Yes	Yes	Yes
Population	No	No	Yes	Yes
Distance	No	No	Yes	Yes
Gas prices*distance	No	No	No	Yes
Season dummies	Yes	No	No	No
Month dummies	No	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	315	315	315	315
R-squared	0.481	0.599	0.610	0.620

Notes: Standard errors in parentheses. ***, **, and * denote coefficients that statistically differ from zero with p-values < .01, .05, and .10 respectively.
All price in constant 2009 dollars.

Percent difference in coefficient on cigarette tax (relative to coefficient on model 4)



Discussion

- TUS-CPS data provides insight about cross-border shopping
- Can use to establish price advantages
- Patterns in direction of imports/exports
- Complementary with aggregate sales data

Discussion (cont.)

- Aggregate sales data support hypothesis of bias
- If fail to account for cross-border shopping and costs of traveling
  - estimated effect of price biased by about 30%
  - Smoking ban predicted to ***increase*** sales

Conclusions

- TUS-CPS is valuable for richer understanding of tobacco consumption
- Requires careful data construction
- Can add significant value
- Can usefully combine with external data for greater insights
- Much more can be done