Use of Diversion Ratios in Addressing the Consequences of Tax Policy Associated with Non-Alcoholic Beverages

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Background

• Tax on non-alcoholic beverages
  – Deal with health and obesity
  – Environmental issues
  – Government revenue
• More specifically..........
  – Sales/excise tax on sugar-sweetened beverages to combat obesity
  • Jacobson and Brownell, 2000;
  • Brownell et al., 2009;
  • Chaloupka et al., 2009;
  • Zhen et al., 2009;
  • Smith et al., 2010;
  • Dharmasena and Capps, 2010
Background

- American Beverage Association response
  - Obesity is a complex problem of calories in and calories out
  - Tax would harm “hard working middle income Americans”
  - Loss of about 60,000 jobs
  - Mere tax on beverages does not work
More specifically .......

- Sales tax on bottled water
  - State of Florida to raise state Revenue; not approved
  - City of Chicago; 5 cents per bottle; raise city revenue, clean city
  - State of Washington; raise state revenue; environmental issues

- International Bottled Water Association response
  - Disproportionate impact on
    - Low-income households
    - People with compromised immune systems
    - Elderly and infants
• Our thoughts
  – Taxing a beverage would decrease the consumption of that particular beverage, *ceteris paribus*
  – However, interrelationships among beverages matter
  – Interrelationships and their ramifications on body weight reduction have been studied in the past
    • Dharmasena and Capps, 2010; Smith *et al*, 2010; Zhen *et al*, 2010
  – Volume-wise and calorie-wise movement not studied
  – If a gallon of beverage is taken away, where would that gallon be diverted to?
  – If a calorie from consumption of a beverage is taken away, where would that calorie be diverted to?
Objectives

• to ascertain volume-wise and calorie-wise movement of consumption of non-alcoholic beverages as a result of a tax
• Uncompensated own-price and cross-price elasticities are obtained from Dharmasena and Capps, Jr., 2010 (LA/QUAIDS model for 10 non-alcoholic beverages) for 10 beverages

• Calculate
  – volume-wise diversion ratio
  – calorie-wise diversion ratio
Analytical Framework and the Model

\[ DR_{ji}^{Vol} = \frac{e_{ji} q_j}{e_{ii} q_i} = \frac{\Delta q_j}{\Delta q_i} \]

\[ DR_{ji}^{Cal} = \frac{e_{ji} q_j \mu_j}{e_{ii} q_i \mu_i} = \frac{\Delta \mu_j}{\Delta \mu_i} \]
Data

Nielsen HomeScan scanner data for household purchases of non-alcoholic beverages
January 1998 through December 2003

Initially monthly purchases of NABs (quantity and expenditure information) were
gathered for each household

Aggregation across households for each month for each beverage
72 monthly Q & TE for each beverage

72 monthly observations for each beverage
Real Total Expenditure per month
Quantity gallons/person/month
Real price $/gallon

Smith et al., 2010
Calories/gallon

Dharmasena & Capps, 2010; LA/QUAIDS model
Elasticity estimates

Diversion Ratio calculation
### Elasticity Estimates

(Dharmasena & Capps, 2010)

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<th>DSD</th>
<th>HFM</th>
<th>LFM</th>
<th>FD</th>
<th>FJ</th>
<th>BW</th>
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## Quantity Diversion Ratios

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<tr>
<th></th>
<th>Isotonics</th>
<th>Regular soft drinks</th>
<th>Fruit drinks</th>
<th>Bottled Water</th>
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## Caloric Diversion Ratios

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Conclusions and Implications

• Volume-wise movement
  – Tax on isotonics, regular soft drinks and fruit drinks....
    • Increase the consumption of coffee $\rightarrow$ increase caffeine intake $\rightarrow$ unintended consequence
    • Increase consumption of fruit juices $\rightarrow$ more calories intake $\rightarrow$ unintended consequence
  – Tax on bottled water....
    • Increase consumption of tea $\rightarrow$ increase caffeine intake $\rightarrow$ unintended consequence
    • Increase consumption of diet soft drinks $\rightarrow$ increase caffeine intake $\rightarrow$ unintended consequence
Conclusions and Implications

• Calorie-wise movement
  – Loss of calories due to reduction of intake of isotonics, regular soft drinks and fruit drinks is replaced by....
    • Increase consumption of fruit juices → more calories intake → unintended consequence
    • Increase consumption of milk → more calories intake → unintended consequence
Conclusions and Implications

• It is desirable to consider both quantity-wise and calorie-wise movement of beverage consumption when evaluating tax policy on beverages dealing with health and environmental issues.
Limitations and Strengths

• Limitations
  – Data pertains only to at-home consumption of beverages and their associated caloric contributions to the diet

• Strengths
  – First attempt in the literature to use quantity diversion ratio and caloric diversion ratio to ascertain consequences of tax policies on food and beverage consumption
Thank You

Questions/Comments?