Health Information

does it make a difference to wine choice?

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Observation

Motivation

• Empirical evidence of a trend

• Why have people switched to red from white wine?
  – ageing?
  – health information change?

![Wine sales in Ontario](chart)

- Improve on existing wine demand models

  - Goals supporting the basic objective
    - develop a measure of health information change for wine
    - compare methods for measuring health information change
    - provide an empirical evaluation of the hypothesis that changes in health information have had an impact on the demand for wine
Ontario, Canada

Market Context
wine sales in Guelph, Ontario

Consumer choice decision tree

alcoholic beverages

table wines  non wine alcoholic beverages

red domestic  red import  white domestic  white import

stage 1 estimation

stage 2
Demand Model

- Lancaster model...modified
  - \( Q_d = f(\text{wine's attributes}) \)
  - Changing health information affects perceived attributes
  - Changing age affects response to attributes

Determinants of Demand

- \( TEXP \): total expenditure on wine per capita = \( f(\ldots) \)
- \( TEXP(-1) \): lagged \( TEXP \) and represents habit formation;
- \( Ad \): sum of total advertising expenditure per capita;
- \( HI \): Wine Health Information Indicator;
- \( P_{ow} \): expenditure weighted price index for all wine;
- \( P_{nonALC} \): Consumer Price Index for non alcoholic beverages;
- \( WS \): per capita wages and salaries and represents total income;
- \( MD \): monthly dummies;
- \( AGE \): proportion of the pop over 15 which is over 45 is \(+45/+15\);
- Time: time trend.

Note: per capita values use population over 15 years of age.

Data

- **Wine:**
  - 1985:4 - 1998:12 LCBO Retail Sales by brand - volumes and values
  - Private Ontario Winery Retail Sales and Volumes by colour

- **Advertising:**
  - Monthly ad expenditures by brand - Nielsen Media Services

- **Health Information:**
  - Lexis/Nexis for Canadian news publications

- **Other:**
  - Ontario Population, Income and Price Indices:
    - Statistics Canada

Empirical Model

- Based on Lancaster theoretical model
- 2-stage demand system
  - flexible enough to estimate demand for wine by type
  - translog empirical model based on utility theory in the second stage
  - separate preference shifters enter as separate variables in the utility function
- an error term is added
- Estimated as a simultaneous set of equations using non-linear Least Squares with TSP.
Stage 1
- Stage one of the 2-stage demand model is illustrated here with a double log generalized form assuming weak separability between wine and non-wine alcoholic beverages

\[ \ln(\text{TEXP}_n) = f(\ln(A_d), \ln(H_I), \ln(P_{ow}), \ln(P_{nonALC})), \]
\[ \ln(\text{WS}), \ln(\text{AGE}), \ln(\text{TEXP(-1)}), \text{MD}, \text{Time}) \]

Stage 2
- 4 translog share equations are expressed as

\[ \frac{\alpha_i + \sum_j b_{ij} \ln P_i}{D} + \sum_j c_{ij} \ln A_d + b_{n} \ln H_I + g_{i} \ln \text{AGE} + m_{ij} \ln (\text{vol} - 1) + n_{i} \ln (\text{MD}) \]

- \( Y \) is Total Expenditure on the 4 wine types
- All other variables are as defined above
- \( D \) is defined as

\[ D = \sum_i \alpha_i + \sum_j b_{ij} \ln P_i + \sum_j c_{ij} \ln A_d + \sum_j b_{n} \ln H_I \]
\[ + \sum_j g_{i} \ln \text{AGE} + \sum_j m_{ij} \ln (\text{vol} - 1) + \sum_j n_{i} \ln (\text{MD}) \]

Constraints
- Imposing symmetry, adding up and maintaining a hypothesis of homotheticity requires the following respective constraints on the system.

\[ b_{ij} = b_{ji}, \quad \sum_i a_i = -1, \quad \sum_j h_j = 0. \quad \text{where} \quad k = 1, \ldots, 4 \quad \text{for} \quad 4 \quad \text{goods}. \]

Measuring health information change
- Article counts
  - cumulative article counts
  - net article counts: (# Encouraging - #Discouraging)
- Article scores
  - evaluate information provided in articles
Health information indicator

- Goals
  - Improve on the "Counts" Indicator
  - Create Health Information Indicators (HII)
    - Indicate how encouraging or discouraging health information is to wine and red wine consumption.
- Create 2 Indicators
  - Wine Health Indicator (WHI)
  - Red Wine Health Indicator (RWHI)

Steps Method Base
1. Scoring Exercise Moderate Consumption
   - (1 - 11)
2. Indicator: HI=actual score/neutral score Neutral or Balanced Advice

Quantity of information

The search terms:

- (((french paradox) or (wine and health)) and ((wine and cholesterol) or (wine and cancer) or (wine and migraine) or (wine and coronary) or (wine and addiction) or (wine and heart) or (wine and stroke) or (wine and additive) or (wine and chemical)) and not restaurant.

Step 1. Scoring wine information

Scoring the benefits of moderate wine consumption

<table>
<thead>
<tr>
<th>Category</th>
<th>Evaluation</th>
<th>Score: 1 - 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>W: Wine Benefit</td>
<td>Wine in particular is best compared to other alcoholic beverages.</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Wine is no better or not mentioned.</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Wine is the worst.</td>
<td>1</td>
</tr>
<tr>
<td>RW: Red Wine</td>
<td>Red Wine is particular is best compared to other alcoholic beverages.</td>
<td>11</td>
</tr>
<tr>
<td>Benefit</td>
<td>Red Wine is no better or worse than white.</td>
<td>6</td>
</tr>
<tr>
<td>Score only if Red Wine is mentioned.</td>
<td>Red Wine is the worst.</td>
<td>1</td>
</tr>
</tbody>
</table>
Step 2. Health Information Indicator

Relative Indicator Based on Scores

Cumulative Sum of Scores

\[
\text{Cumulative Sum of Scores} = (\text{Cumulative # Articles}) \times \text{Neutral Score}
\]
### Elasticities: stage 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimated Coefficient</th>
<th>Health Indicator</th>
<th>Net Counts</th>
<th>(t-statistics in brackets. * indicates significance to 0.95 level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>-0.32**</td>
<td>-0.53**</td>
<td>(-5.55)</td>
<td></td>
</tr>
<tr>
<td>Advertising</td>
<td>-0.002</td>
<td>-0.002</td>
<td>(-0.35)</td>
<td></td>
</tr>
<tr>
<td>Wine Health</td>
<td>0.27</td>
<td>0.005</td>
<td>(2.90)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.94*</td>
<td>-0.12</td>
<td>(2.92)</td>
<td></td>
</tr>
<tr>
<td>Non Alcoholic Beverage Price Index</td>
<td>-0.16</td>
<td>-0.05**</td>
<td>(-1.87)</td>
<td></td>
</tr>
</tbody>
</table>

### Marshallian Total Price Elasticities

<table>
<thead>
<tr>
<th></th>
<th>Red Domestic</th>
<th>Red Import</th>
<th>White Domestic</th>
<th>White Import</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Domestic</td>
<td>-0.6535</td>
<td>-0.6159</td>
<td>-0.2012</td>
<td>-0.3478</td>
</tr>
<tr>
<td></td>
<td>(-1.5422)</td>
<td>(-1.5541)</td>
<td>(-0.9441)</td>
<td>(-1.021)</td>
</tr>
<tr>
<td>Red Import</td>
<td>-0.1584</td>
<td>-0.1945*</td>
<td>-0.1030</td>
<td>-0.0514</td>
</tr>
<tr>
<td></td>
<td>(-1.8251)</td>
<td>(-2.7156)</td>
<td>(-1.0764)</td>
<td>(-0.2765)</td>
</tr>
<tr>
<td>White Domestic</td>
<td>-0.1531*</td>
<td>-0.1946*</td>
<td>0.0274</td>
<td>-0.6274*</td>
</tr>
<tr>
<td></td>
<td>(-1.8256)</td>
<td>(-2.7120)</td>
<td>(1.1517)</td>
<td>(-1.3740)</td>
</tr>
<tr>
<td>White Import</td>
<td>-0.0134</td>
<td>-0.0136</td>
<td>-0.0010</td>
<td>-0.0135*</td>
</tr>
<tr>
<td></td>
<td>(-1.4275)</td>
<td>(-1.4106)</td>
<td>(-0.1070)</td>
<td>(-2.9361)</td>
</tr>
<tr>
<td>Stage 1 Price Elasticity</td>
<td>-0.1584</td>
<td>-0.0136</td>
<td>-0.0010</td>
<td>-0.0135*</td>
</tr>
<tr>
<td></td>
<td>(-1.8256)</td>
<td>(-1.4106)</td>
<td>(-0.1070)</td>
<td>(-2.9361)</td>
</tr>
</tbody>
</table>

* Income has a unit root suggesting that this coefficient is insignificant according to the Dickey-Fuller critical t test.

### Elasticities by Wine Type: Stage 2

<table>
<thead>
<tr>
<th></th>
<th>Red Domestic</th>
<th>Red Import</th>
<th>White Domestic</th>
<th>White Import</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Domestic</td>
<td>2.82*</td>
<td>2.61*</td>
<td>1.5591*</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(4.70)</td>
<td>(4.98)</td>
<td>(3.3911)</td>
<td>(0.56)</td>
</tr>
<tr>
<td>Red Import</td>
<td>1.62*</td>
<td>1.43*</td>
<td>0.4027*</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(5.06)</td>
<td>(5.36)</td>
<td>(2.2710)</td>
<td>(0.87)</td>
</tr>
<tr>
<td>White Domestic</td>
<td>0.43</td>
<td>-0.09</td>
<td>-0.4877*</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(1.56)</td>
<td>(-0.49)</td>
<td>(-2.6535)</td>
<td>(-0.89)</td>
</tr>
<tr>
<td>White Import</td>
<td>-1.64*</td>
<td>-1.20*</td>
<td>-0.2058*</td>
<td>-0.0003</td>
</tr>
<tr>
<td></td>
<td>(-7.17)</td>
<td>(-6.68)</td>
<td>(-1.9116)</td>
<td>(-0.37)</td>
</tr>
</tbody>
</table>

* Scores in brackets. * indicates significance to 0.95 level.
Conclusions

- Choice of Health Indicator affects inferences made about the importance of Health Information for determining the pattern of demand.
  - If a Count Health Indicator is used, Health Information is estimated to have had an insignificant effect on the pattern of demand.
- People received information
  - People changed their pattern of consumption
- Based on the estimates produced by the 2-stage demand model for 4 wine types with a Score Health Indicator:
  - Increased Red Wine Health Information and Ageing of the Population
  - increased red wine demand
  - reduced white demand
  - Price elasticities are low - between -1 and 0.
  - Advertising has had a largely insignificant impact on demand.

Next steps

- Extend estimation period
- Add a variable of combined age and health
- Relax homotheticity constraint
- Government Duty of Care?
  - Is information transmission through newspapers good enough?
  - Harm plus benefits exist.
Background

- **Ontario Market**
  - Liquor Control Board of Ontario (LCBO) sells all imported wine.
  - Private Ontario wineries sell at LCBO and cellar door and private winery stores.
  - Sales shift to private retail stores from the LCBO.
  - GATT(1987) - Jan 1 1989 starts 7-year phase out of discriminatory practices affecting imports - pricing and tariffs (previously a 1% domestic mark-up vs 66% for imports).

- **World Market**
  - Since the late 1980s white wine consumption declines and red wine consumption increases.
  - 1990 - first of the post-war "baby boomers" reaches 45.
  - Ageing is associated with preference shift from beer and spirits to wine - (ARP, Health Canada).
  - Growing body of evidence that red wine consumption is associated with significantly better cardiovascular health.

Final Results

- **1998 Simulations – info and age impact**