Lecture 12
Price discrimination

Bronwyn H. Hall
Economics 220C, UC Berkeley
Spring 2005
Outline

• Introduction (review)
• Shepard
• Others
• Leslie
Introduction

“price discrimination is present whenever two or more similar goods are sold at prices that are in different ratios to marginal costs.” Stigler (1987)

• Necessary conditions for PD:
  – firm must have some market power
  – must have ability to sort consumers
  – must be able to prevent resale
Types of price discrimination

- First degree (perfect) – seller charges a different price for each good exactly equal to willingness to pay of buyer.
- Second degree (nonlinear, quantity discount) – prices differ by amount of good purchased, not by consumer.
- Third degree – different consumers charged different prices
How to prevent resale

• for some goods, difficult to resell (services, utilities)
• barriers imposed by tariffs, taxes, transport costs (international price differences)
• legal restrictions (computer software, educ. discount)
• change the product (student versions)
Welfare results (Varian)

• First degree
  – welfare enhancing, but surplus to monopolist
  – transactions costs from haggling

• Second degree
  – two part tariff with identical consumers is optimal
  – more ambiguous result with varying demand

• Third degree
  – compare uniform price to two prices:
    • necessary condition for welfare to increase is that output increase
    • sufficient condition is that output weighted by $p - mc$ in the two markets increase
    \[ (p^0 - c)(\Delta x_1 + \Delta x_2) \geq \Delta W \geq (p^1 - c)\Delta x_1 + (p^2 - c)\Delta x_2 \]
  – If price discrimination allows a second market to open, welfare increase is unambiguously positive.

• Conclusion: *in general, an empirical question.*
Empirical questions

1. **Positive**: can observed price differentials be explained by cost differences? or is there evidence of price discrimination?

2. **Normative**: what are the welfare consequences of the observed price discrimination? positive or negative?
Shepard 1991

• distinguish cost-based explanations of variation in price of retail gas from price discrimination
• “quasi-natural” experiment: compare pricing at
  – multi-product (full and self-serve) stations
  – single product (full or self-serve) stations
• assume
  – station choice exogenous conditional on other differences between stations (other services offered, location)
  – demand for full-serve less elastic than demand for self-serve
Shepard 1991 model

retailers face demand for low (self) and high (full) quality gas
MC of supplying the two goods the same at all types of stations
alternative demand structures:

1. retailer market power (horizontal diff products) predicts
   - full-service price: multi-product > single product
   - self-service price: multi-product < single product
2. competitive (no horizontal diff) – no price differentials
3. peak-load pricing, zero profit equilibrium – prices vary because some consumers WTP not to wait
Shepard 1991 data

- 1527 stations in Boston area, collected over 12 week period in early 1987
  - retail price, wholesale price, quantities, and characteristics
  - each station located in Cartesian coordinates to construct market areas
    - based on one half to two mile radii
    - based on being on the same route
- Station characteristics:
  - CSTORE – convenience store
  - REPAIR – auto repair available
  - SPFCAP, SPSCAP, MPCAP – n of fueling spots
  - UNBRANDED – dummy for non branded stations
  - MINI – limited self service
  - NEW – remodeled in past 3 years
Shepard 1991 tests

- Pricing equation:
  \[ p_{ikgj} = \beta_0 + \beta_1 D_g + \beta_2 D_k + \beta_3 D_g D_k + \gamma_1 M_j + \gamma_2 M_j D_k + X_{ikg} \phi + \varepsilon_{ikgj} \]
  - i = station; k = MP or SP; g = full or self; j = market
  - X = vector of station characteristics;
  - M is market fixed effect

- Price differentials:
  \[ \beta_1 = \Delta_{SP} = p_f^{SP} - p_s^{SP} \]
  \[ \beta_2 = \Delta_s = p_s^{MP} - p_s^{SP} \]
  \[ \beta_2 + \beta_3 = \Delta_f = p_f^{MP} - p_f^{SP} \]
  \[ \beta_3 = \Delta = \Delta_f - \Delta_s = (p_f^{MP} - p_f^{SP}) - (p_s^{MP} - p_s^{SP}) \]

- Predictions:
  - competitive case – all differentials are zero
  - price discrimination: \( \Delta > 0 \), \( \Delta_f \geq 0 \), \( \Delta_s \leq 0 \)
<table>
<thead>
<tr>
<th></th>
<th>Single-Product Full-Service</th>
<th>Single-Product Self-Service</th>
<th>Multiproduct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of stations</td>
<td>1,006</td>
<td>282</td>
<td>239</td>
</tr>
<tr>
<td>Number of branded stations</td>
<td>791</td>
<td>136</td>
<td>232</td>
</tr>
<tr>
<td>Repair service (%)</td>
<td>89.3</td>
<td>32.4</td>
<td>90.1</td>
</tr>
<tr>
<td>Convenience store (%)</td>
<td>3.7</td>
<td>41.9</td>
<td>5.2</td>
</tr>
<tr>
<td>Remodeled (%)</td>
<td>44.2</td>
<td>72.8</td>
<td>74.1</td>
</tr>
<tr>
<td>Average islands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.64)</td>
<td>(2.09)</td>
<td>(1.89)</td>
</tr>
<tr>
<td>Average fueling places</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.02)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.88</td>
</tr>
<tr>
<td>Average monthly sales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(thousands of gallons)</td>
<td>(29.93)</td>
<td>(42.49)</td>
<td>(40.33)</td>
</tr>
<tr>
<td>Average capacity utilization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(thousands of gallons)</td>
<td>(8.15)</td>
<td>(7.97)</td>
<td>(7.94)</td>
</tr>
</tbody>
</table>

*NOTE* — Standard deviations are in parentheses.
<table>
<thead>
<tr>
<th></th>
<th>Regular Leaded</th>
<th>Regular Unleaded</th>
<th>Premium Unleaded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>75.47</td>
<td>83.02</td>
<td>97.18</td>
</tr>
<tr>
<td></td>
<td>(1.36)</td>
<td>(1.48)</td>
<td>(1.59)</td>
</tr>
<tr>
<td>$D_g (\Delta_{SP})$</td>
<td>6.89</td>
<td>7.64</td>
<td>8.04</td>
</tr>
<tr>
<td></td>
<td>(1.45)</td>
<td>(1.56)</td>
<td>(1.68)</td>
</tr>
<tr>
<td>$D_h (\Delta)$</td>
<td>.00</td>
<td>-2.89</td>
<td>-2.03</td>
</tr>
<tr>
<td></td>
<td>(1.67)</td>
<td>(1.79)</td>
<td>(1.90)</td>
</tr>
<tr>
<td>$D_g D_h (\Delta)$</td>
<td>9.39</td>
<td>11.23</td>
<td>9.22</td>
</tr>
<tr>
<td></td>
<td>(1.58)</td>
<td>(1.69)</td>
<td>(1.82)</td>
</tr>
<tr>
<td>UNBRANDED</td>
<td>-1.97</td>
<td>-4.65</td>
<td>-6.44</td>
</tr>
<tr>
<td></td>
<td>(.55)</td>
<td>(.53)</td>
<td>(.58)</td>
</tr>
<tr>
<td>MINI</td>
<td>.19</td>
<td>2.96</td>
<td>2.88</td>
</tr>
<tr>
<td></td>
<td>(.90)</td>
<td>(1.01)</td>
<td>(1.07)</td>
</tr>
<tr>
<td>SPFCAP</td>
<td>-.89</td>
<td>-.72</td>
<td>-.70</td>
</tr>
<tr>
<td></td>
<td>(.16)</td>
<td>(.16)</td>
<td>(.17)</td>
</tr>
<tr>
<td>SPSCAP</td>
<td>-.21</td>
<td>-.28</td>
<td>-.17</td>
</tr>
<tr>
<td></td>
<td>(.18)</td>
<td>(.20)</td>
<td>(.21)</td>
</tr>
<tr>
<td>MPCAP</td>
<td>-.21</td>
<td>.25</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td>(.18)</td>
<td>(.18)</td>
<td>(.19)</td>
</tr>
<tr>
<td>REPAIR</td>
<td>1.80</td>
<td>.38</td>
<td>.11</td>
</tr>
<tr>
<td></td>
<td>(.55)</td>
<td>(.59)</td>
<td>(.63)</td>
</tr>
<tr>
<td>CSTORE</td>
<td>1.43</td>
<td>.68</td>
<td>-.57</td>
</tr>
<tr>
<td></td>
<td>(.70)</td>
<td>(.76)</td>
<td>(.81)</td>
</tr>
<tr>
<td>NEW</td>
<td>-1.40</td>
<td>-1.66</td>
<td>-1.64</td>
</tr>
<tr>
<td></td>
<td>(.39)</td>
<td>(.41)</td>
<td>(.44)</td>
</tr>
<tr>
<td>STATIONS</td>
<td>1.052</td>
<td>1.291</td>
<td>1.237</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.46</td>
<td>.45</td>
<td>.42</td>
</tr>
</tbody>
</table>

Note.—Standard errors are in parentheses.
Shepard 1991 conclusions

• Differentials:
  – single product stations: full-self = 7 or 8 cents
  – self: multi-single = 0 to -2 cents
  – full: multi-single = 9 to 11 cents
• Controlling for market gets same results
• peak-load model rejected because cost of capital higher for multi than single-product stations
• Borenstein 1991 – similar conclusions using leaded/unleaded gas
Borenstein and Rose 1994

- Price dispersion in airline tickets
- 10% sample of coach airline tickets for city pairs, nonstop only
- Average spread of 36% in ticket prices
  - varies positively with competition in market and congestion
  - negatively with tourist destinations and route density
- distinguish between “monopoly” discrimination and “competitive” horizontal discrimination
  - monopoly – more price discrim if fewer firms
  - competitive – more price discrim in more firms
- no welfare analysis
- cannot rule out all cost-based explanations
Leslie 2004

- Demand and price discrimination for a single Broadway show that ran 199 days (*Seven Guitars*)
- Complex ticket sales:
  - variation in quality
  - discount coupons
  - discount at TKTS (booth) day of performance
  - \( \Rightarrow \) second and third-degree price discrimination
- Uses BLP/Nevo style model of demand
- Welfare: increases profits 5%; not much effect on consumer welfare
  - TKTS does not make the theater money (lose full price customers to discounts)