Induced Demand

Lather. Rinse. Repeat

Introduction

• Two key concepts we’ve be stressing this semester collide in this section
  – The role of incentives
  – Asymmetric information
• Subject know as “induced demand”
• Lively area of research
• Lots of suggestive but few definitive results

• Idea: when providers are paid on a per unit basis, they have an incentive to order more procedures, whether needed or not

• Reason: patients are in poor position to understand whether a procedure is needed, so they do not have the ability to monitor

• Notion took root when people observed that areas with greater hospital beds had more higher hospitalization rates
• Why would many dismiss these results immediately as simply correlation and not causation?
• Tests have become more sophisticated over time
Table 3. Actual and Predicted Days in Hospital (1985)

<table>
<thead>
<tr>
<th>Category</th>
<th>Actual Days</th>
<th>Predicted Days</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Average</td>
<td>2.0 - 4.0</td>
<td>3.0 - 5.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Mediocre</td>
<td>5.0 - 7.0</td>
<td>6.0 - 8.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Worst</td>
<td>8.0 - 10.0</td>
<td>9.0 - 11.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Fakewest</td>
<td>&gt; 10.0</td>
<td>&gt; 10.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Data Source: Medicare Current Beneficiary Survey, 1985 Data

Plot: Hospital Beds vs. Hospital Discharges, Health Reporting Region

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Plot: Hospital Beds vs. Hospital Discharges, Health Reporting Region
Attributes of VA hospitals in different Quartiles of the EQ-AD:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Quartile of EQ-AD</th>
<th>Rate (Highest to Lowest)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall supply beds per 1,000 beds</td>
<td>1</td>
<td>2.6, 2.6, 2.9, 3.9, 4.2, 4.2</td>
</tr>
<tr>
<td>Beds in teaching hospitals</td>
<td>2</td>
<td>18.8, 18.8, 18.8, 18.8, 18.8, 18.8</td>
</tr>
<tr>
<td>Beds in hospitals with &gt;100 beds</td>
<td>3</td>
<td>21.6, 21.6, 21.6, 21.6, 21.6, 21.6</td>
</tr>
<tr>
<td>Physicians (per 1,000 beds)</td>
<td>4</td>
<td>184.8, 184.8, 184.8, 184.8, 184.8, 184.8</td>
</tr>
<tr>
<td>Medical staff/ACU</td>
<td>5</td>
<td>32.8, 32.8, 32.8, 32.8, 32.8, 32.8</td>
</tr>
<tr>
<td>Critical care staff/ACU</td>
<td>6</td>
<td>23.6, 23.6, 23.6, 23.6, 23.6, 23.6</td>
</tr>
<tr>
<td>Protocols/ACU</td>
<td>7</td>
<td>15.9, 15.9, 15.9, 15.9, 15.9, 15.9</td>
</tr>
<tr>
<td>Surgeons</td>
<td>8</td>
<td>45.6, 45.6, 45.6, 45.6, 45.6, 45.6</td>
</tr>
<tr>
<td>All other specialties</td>
<td>9</td>
<td>20.5, 20.5, 20.5, 20.5, 20.5, 20.5</td>
</tr>
</tbody>
</table>

Table 1: Quality of Care according to Level of Medicare Spending in Hospital Referral Region of Residence.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Quality of EQ-AD</th>
<th>Test for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access/Location</td>
<td>Overall</td>
<td></td>
</tr>
<tr>
<td>Rural hospitals within 12 from</td>
<td>54.9</td>
<td>55.1, 54.7, 54.7, 54.4</td>
</tr>
<tr>
<td>Rural state in the hospital</td>
<td>47.7</td>
<td>47.9, 47.4, 47.4, 47.0</td>
</tr>
<tr>
<td>Rural state at discharge</td>
<td>43.4</td>
<td>43.6, 43.1, 43.1, 42.8</td>
</tr>
<tr>
<td>Rural state of discharge</td>
<td>41.7</td>
<td>41.9, 41.4, 41.4, 41.1</td>
</tr>
<tr>
<td>Rural state of discharge</td>
<td>39.5</td>
<td>39.7, 39.2, 39.2, 38.9</td>
</tr>
<tr>
<td>Rural state of discharge</td>
<td>37.7</td>
<td>37.9, 37.5, 37.5, 37.2</td>
</tr>
</tbody>
</table>

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Example: invasive heart attack treatments
Hillman et al, 1990 (NEJM)

- Doctors can send patients to diagnostic clinics
- Sometimes, the clinics are owned by physicians, sometimes they are not
- Compared rates that physicians referred patients to imaging centers based on certain conditions
Compared two groups

- Physicians that owned their own imaging centers
- Those that did not (and had to refer patients to radiologists)
- Find much higher referral rates for physicians that had a stake in the business
- Possible explanations?

Some evidence against

- Dranove et al., looked at the induced demand for childbirth
- Compared frequency of childbirth with concentration of OB/GYNs
- Found that OG/GYNs ‘induced’ childbirth
- Tongue in cheek paper, but it drives the point home

Simple model

- Physician utility
  - $U(\text{Income}, \text{Inducement}) = U(Y,I)$
- baseline demand for service=$Q_0$
- Price of service = $m$
- Income without inducement is $Y_0=mQ_0$
- $\text{Mu}_i>0$ but inducement is a “bad” $\text{MU}_i<0$
  - $\text{MU}_i=d^2U/dI^2>0$
  - Increasing disutility with inducement
MRS

- $U(Y,I)$
- Hold utility constant
- $U_y dy + U_i di = 0$
- $dy/di = (slope \ of \ indifference \ curve) = -U_i/U_y = [dU/di]/[dU/dY] = dY/di$
- How much $y$ do you need to induce one more unit of induced demand
- Since $U_i>0$, need increasing compensation

Budget Constraint

- $Q_0 =$ baseline level of demand
- $m =$ price per procedure
- $Y$ intercept $= mQ_0$
- $Y = mQ_0 + mI$
  
  for ever unit you induce, receive $M$
  slope of BC $= m = dY/dI$
Income

Induced demand

\[ Y_1 \quad mQ_0 \quad I_1 \quad U_1 \]

\[ Q_1 \quad mQ^* \quad I_2 \quad I_3 \]

Price increases to \( m^* \)

Substitution effect

Income effect

\[ U_2 \quad U_1 \]

Summary

- Price increase for \( m \)
  - Increase incentive to induce demand
  - Because induced demand is an inferior good, income effects suggests less inducement
  - Income and substitution effects going in opposite directions
  - Do definitive prediction
- Drop in baseline demand
  - Generates an income effect that encourages induced demand
Gruber-Owings

• Excellent example of empirical analysis of SID
• Different type of identification strategy
• Most papers rely on either
  – Cross area variation in doctors
  – Fee schedules that may induce demand

• Exploits the fact that
  – OB/GYNs paid more if deliver by c-section
  – Between 1970-82, fertility declined 13.5%
  – C-sections were at 5.5% in 1970, rose 240% over the next decade
• Question: did doc’s respond to the income ‘shock’ of reduced births by performing more c-sections

• Some key facts
  – Tremendous variation across areas in fertility rates. Use this fact in model
  – During this time period, physicians made $500 more delivering by c-section (1989$)
    • C-section, $2100
    • Vaginal, $1600
21% reduction in Fertility from 1970-1976
Results in Gruber

• Fall in fertility can explain 16% of the rise in c-sections over the 1970-1982 period