Class #18
Toxics and Risks

Part 1: Consumers & Risks

• The figure presents the demand for drinking water, both with and without perchlorate and the MC to provide that water. What areas indicate the benefits and the costs to consumers that would be used to determine if the regulation passes a benefit-cost test?

But usually, risks are not so simple, demand curves for risks are very hard to estimate. We have to think in terms of a statistical life.

Cost of a statistical life
General form

• CSL - Cost per statistical life
• C - Cost per person
• \( \Delta R \) - Change in mortality risk (probability of dying)

\[
CSL = \frac{C}{\Delta R}
\]

Team Exercise

• Suppose that eliminating perchlorate will reduce the annual risk of fatal pancreatic cancer by 0.000002 from 0.000108 (108/million) to 0.000106 (106/million).
  – Suppose 10 million people are exposed equally to perchlorate, how many lives would be saved?
  – If the cost per individual is $30 per year, what’s the total cost of this regulation?
  – What is the cost per statistical life.
Value of a statistical life
General form

- VSL – Value of a statistical life
- V  - What a person is WTP to reduce a risk
- ΔR - Change in mortality risk (probability of dying)

\[ VSL = \frac{V}{\Delta R} \]

Team Assignment

- Suppose that individuals, on average, pay $100 per year for safety devices that reduce their mortality risk from 0.00459 (about 1 in 217) to 0.00457 (about 1 in 218).

- Based on these data, what is your estimate of the value of a statistical life?

Costs of various risk-reducing regulations

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Annual lives saved</th>
<th>Cost per life saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unvented space heaters</td>
<td>50.0</td>
<td>$130,000</td>
</tr>
<tr>
<td>Seat belts</td>
<td>1,850.0</td>
<td>$390,000</td>
</tr>
<tr>
<td>Floor lighting in airplanes</td>
<td>5.0</td>
<td>$900,000</td>
</tr>
<tr>
<td>Benzene emissions</td>
<td>0.3</td>
<td>$3,610,000</td>
</tr>
<tr>
<td>Asbestos</td>
<td>74.7</td>
<td>$115,030,000</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0.01</td>
<td>$92,741,890,000</td>
</tr>
</tbody>
</table>


A Different Case

- Suppose that individuals, on average, pay $100 per year for safety devices that have no effect on their safety?

- Based on these data, estimate the value of a statistical life?

- Do you think such purchases actually happen? Why?

Bottom line

- Consumers are not always very “rational” when making risky choices especially when:
  - Probabilities are small and consequences are high
  - There is a lot of uncertainty or poor information
  - People are influenced by others who have little experience with the risks
Part 2: Risks in the workplace

1. Why do workers accept risky jobs?
2. What incentives do employers have to reduce risks in the workplace?
3. Why are employers reluctant to reduce risks?

The efficient level of precaution

An efficient labor market:
- Workers voluntarily accept the risks and receive compensation sufficient to get them to accept those risks.
- Firms strike a balance between paying to reduce risks in the workplace and paying workers more.

Part 3: Risky lotteries

- http://nyti.ms/10o63LJ
- Team decision:
  - Was the labor market at Royale Comfort Seating efficient?

Everyone starts with 1000 Game dollars (1000 Game dollars = $1)

- In the container there are 1,000 pieces of paper with the numbers 1 – 1,000.
- We will play the following game:
  - Players will pick a number between 1 and 1,000 called Y. Write Y on your white board.
  - We will draw my number from the container, D
  - If Your Number < Drawn Number then you win Y
  - If D < Y you lose D
- Small numbers will almost certainly win.
- Big numbers may have a less chance of winning but you might win more money, and might also lose more money.

Practice round

- Everyone pick a number and write it on their white board.
- Payoffs are calculated but don’t count.
  - \( Y = \text{Your Number} \quad D = \text{Drawn Number} \)
  - If \( Y < D \) you win \( Y \)
  - If \( D < Y \) you lose \( D \)
Game 1: Private Gamble
• Everyone’s payoffs only affect their own pot

\[ Y = \text{Your Number} \quad D = \text{Drawn Number} \]
– if \( Y \leq D \) you win \( Y \)
– if \( D < Y \) you lose \( D \)

Game 2: Public Gamble
• First one team will be chosen to play. His or her choice will affect all other players.

\[ Y = \text{Your Number} \quad D = \text{Drawn Number} \]
– if \( Y \leq D \) everyone wins \( Y \)
– if \( D < Y \) everyone loses \( D \)

Game 3: Private gains, public losses
• First one team will be chosen to play. His or her choice will affect all other players.

\[ Y = \text{Your Number} \quad D = \text{Drawn Number} \]
– if \( Y \leq D \) player wins \( Y \)
– if \( D < Y \) everyone else loses \( D \)

Types of risks
• Private risks: One makes the decision and then pays the consequences.
• Public risks: We’re all in it together, but usually only one makes the decision.
• Private gains, public losses: One makes the decision and will gain, but everyone might lose.

Should these be treated the same?

Risk Neutrality and Risk Aversion

\[ U(-4) = 4 \times U(+1) \]
\[ P(\text{Winning}) = 4 \times P(\text{Losing}) \]
\[ \Rightarrow Y = 200 \]

Risk Neutrality and Risk Aversion

\[ U(-4) > 4 \times U(+1) \]
\[ P(\text{Winning}) > 4 \times P(\text{Losing}) \]
\[ \Rightarrow Y < 200 \]