External Costs of Poor Health

Health Economics
Spring 2015

Introduction

• Much of morbidity and mortality is caused by behavior
  – 50% of all deaths (tobacco, alcohol, driving, etc)
• Sometimes these behaviors only impact the individual making the decision
• Other times, the behavior can impact others
  – Financially
  – Health wise

Examples

• Obvious examples
  – Infectious diseases
  – Drunk driving
  – Second hand smoke
• Some not so obvious
  – Obesity or tobacco use increases costs of health insurance premiums for others
  – Your immunization reduces the chance that others will be infected

This section

• Examine in detail general topic of externalities
  – Define them
  – Why they are bad or good from an economic sense
  – How can we measure the size of welfare loss
• Show how taxes can be used to limit the social costs of an externality
This section

• Extended example: Do smokers and drinkers pay their way?
  – Alcohol and cigarette consumption generates externalities
  – They are also taxed at the local, state and federal level
  – Sum up the external costs of smoking/drinking
  – Compare to the revenues raised by taxes
  – Surprising results

• Excellent example of how economists look at problems

Before we start

• Basic review of the dead weight loss from externalities
• How taxes can internalize the costs of externalities

Consumer’s Surplus

• Consumers continue to purchase so long as the value of the next unit is greater than price
• But all units priced the same
• Consumer’s value the last unit at $P_1$
• For all units consumed up to $Q_1$, the value to the consumer exceeded price
• Area $A$ represents consumer’s surplus
Example

- Inverse demand curve
- \( P = 100 - 4Q \)
  - When \( Q = 0 \), \( P = 100 \)
  - When \( P = 0 \), \( Q = 25 \)
- Suppose \( P = 40 \), \( Q = 15 \)
- \( CS = \frac{1}{2} \text{Height} \times \text{base} \)
- \( \text{REV} = P \times Q \)

\[
\begin{align*}
\text{CS} &= \frac{1}{2} \times 60 \times 15 = 450 \\
\text{REV} &= 40 \times 15 = 600
\end{align*}
\]

Producer’s Surplus

- In competitive market, market supply curve is the horizontal summation of firm’s marginal cost curve
- Height represents the amount firms must receive to sell the last unit
- Since this is the marginal cost curve, it also represents what it costs society to produce the last unit
- Difference between price received and the marginal cost of production is Producer’s Surplus
Demand: \( P = 12 - 0.5Q \)
Supply: \( P = 2 + 0.3Q \)

Graphing:
- Demand
  - \( Q = 0, P = 12 \)
  - \( P = 0, Q = 24 \)
- Supply
  - \( Q = 0, P = 2 \)

Externalities:
- Actions of one party make another worse/better off, yet the first party does not bear all the costs/benefits.
- The full costs/benefits of an economic transaction are not fully captured in the transacted prices.
  - What person pays in price
  - What a firm pays in costs

\[ CS = 0.5H \times B = 0.5(6.25)(12.5) = 39.06 \]
\[ PS = (0.5)(3.75)(12.5) = 22.44 \]
Negative Externalities

- Pollution from a production process
- Noise from a nightclub near a residential neighborhood
- The person next to you during an exam has a cold
- Second hand smoke

Positive Externalities

- You get a flu shot. This reduces the probability others will get the flu as well. You do not get the entire benefit although you paid all the costs
- Your beautiful garden raises the value of your neighbor’s house
- Lojak:
  - Transmitted on car that can be used to locate a stolen vehicle
  - Reduced auto thefts in areas where it was introduced
  - Only a small fraction have Lojak. As a result, non-Lojak users benefit

Excess production and negative externalities

- Suppose production of the good generates externalities that are not reflected in costs of inputs (e.g., pollution)
- The true cost of producing the good is above the costs firms pay to produce
- Since firms are not paying all the costs of production, the ‘wedge’ between private costs and social costs encourages overproduction

Production externalities

- Perfectly competitive market. Supply Curve = marginal cost curve (MC)
- Not all costs of production are borne by the firm, e.g., pollution
- PMC = private marginal cost, the firm’s costs, therefore, the industry supply
- SMC = social marginal cost
- SMC > PMC for all Q
At market price $P_1$, firms are willing to sell $Q_1$ units. However, from a social standpoint, if all costs were paid by the firm, they would only be willing to supply $Q_2$.

The firm overproduces the good since they do not pay all the costs of production.

At $Q_1$, the firm receives $P_1$ but it costs society $MC_3$ to produce.

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Market output ($P_1, Q_3$)

At $Q_1$, $SMC_1 > P_1$.

Costing society more to produce than is transacted in the market.

Social optimum ($P_2, Q_2$)
Social Costs of Overproduction

- Notice that as one moves from Q₂ to Q₁
- Society is spending an extra d+b+c on additional resources
- Consumers are however enjoying b + c in additional welfare
- The difference is area d, the deadweight loss of overproduction
- If there ever is a ‘wedge’ between what it costs to produce a good and what people are paying for it, there will be a deadweight loss

What about negative consumption externalities?

- Start with a standard downward sloping demand for a good – the private marginal benefit
- Consumption of the good however has health/financial costs to others (e.g., second hand smoke or drunk driving)
- Private Marginal Benefit > Social Marginal Benefit

At Q₁, people value the last unit at P₁
- However, not all costs of the good are paid by the consumers
- The SMB is SMB₁ which is lower than price
- If people had to pay all the costs of the good (forget how they will do it for now), they would consume a lot less
- Therefore, there is over-consumption of the good
Internalize the Externality

- Per unit tax on output — Pigouvian taxes
- “Excise tax”
- For every unit sold, charge consumers $t in a tax
- The excise tax will shift down the demand curve by an amount equal to the tax
- Remember, the Y (price) axis is the price transacted between buyers and sellers, does not reflect true cost

\[ D = S \text{ at } (P_1, Q_1) \]

- At this point
- Costs society and extra \( a + b \) to produce
- Society only receives an extra area \( b \) in benefits
- Difference (area \( a \)) is the deadweight loss of over production
- Again notice the wedge between value of marginal good and the price of the product
  - The marginal cost of producing the last unit is \( P_1 \)
  - The SMB is however only SMB₂

\[ P \]

\[ S \]

\[ b = \text{additional social benefit from excess consumption} \]

\[ a + b = \text{additional social costs from excess production} \]

\[ D = \text{PMB} \]

\[ P_1 \]

\[ S \text{MB}_2 \]

\[ Q \]

\[ Q_2 \]

\[ Q_1 \]

\[ P_{1-t} \]

\[ D-t \]

\[ Q_1 \]

\[ Q \]

Excise tax of \( t \) per unit

With tax of \( t \), retail price must fall to \( P_{1-t} \) in order for demand to stay the same
• Vertical axis, amount transacted between buyers and sellers
• Without excise tax, at price $P_1$, people willing to consume $Q_1$
• With a tax of $t$/unit, price paid to sellers would have to fall to $P - t$ in order to demand $Q_1$
  - Pay $P_1 - t$ to firm
  - Pay $t$ to government
  - Pay $P_1 - t + t = P_1$ in total

Example
• Inverse demand: $P = PMB = 20 - Q$
• Inverse SMB: $SMB = 20 - 2Q$
• Inverse Supply: $P = 2 + Q$
• Market outcome
  - Supply = demand
  - $20 - Q = 2 + Q$
  - $Q = 9$
  - $P = 2 + Q = 11$

• Social optimum
  - Supply = Social Marginal Benefit
  - $2 + Q = 20 - 2Q$
  - $Q = 6$
  - $P = 2 + Q = 8$
• What tax should be charged to obtain the social optimum?
• Want output to be $Q = 6$. 
• Must choose a tax rate that reduces demand to 6
• People will demand Q=6 if \( P_d = 14 \)
  \(-\) \( PMB = 20 - Q \), so when \( P=14 \), \( Q=6 \)
• Suppliers will supply 6 if \( P_s = 8 \)
• \( P_d \) is inverse demand
• \( P_s \) is inverse supply
• With a tax, demand falls to \( P_d-t \) and we equate \( P_d-t = P_s \),
  so \( t = P_d - P_s \)
• Therefore, \( t = P_d - P_s = 14 - 8 = 6 \)

Can show a per unit tax on suppliers can also solve externality problem
• Per unit tax will shift up supply curve by an amount \( t \)
• Vertical axis is amount transacted between buyers/sellers
• Without tax, at price \( P_1 \) producers willing to supply \( Q_1 \).
• When tax is imposed, suppliers receive a price, then pay \( t \) back to the government
• In order for supply to stay at \( Q_1 \) with a tax, their price must rise to \( P_1 + t \)
• At $P_1$, firms were willing to supply $Q_1$
• With an excise tax, in order for firms to supply $Q_1$, the price must increase to $P_1 + t$
  = Firm receives $P_1 + t$
  = Pay the government $t$ in taxes
  = Net $P_1$
• Therefore, an excise tax will shift the supply curve up by the amount of the tax

Example
• Demand: $P_d = 20 - 2Q$
• PMC: $P_s = 2 + Q$
• SMC: $P_{smc} = 2 + 2Q$

• Market output: $P_s = P_d$
• $20 - 2Q = 2 + Q$
• $Q = 6$, $P = 8$
• Social Optimum: $P_d = P_w$
  • $20 - 2Q = 2 + 2Q$
  • $Q=4.5$, $P=11$

• At the Market output, $Q=6$, so $SMC = 14$
• $DWL = \text{area } d$
• $D = \frac{1}{2}\text{Height} \cdot \text{base}$
  $= \frac{1}{2}(6-4.5)(14-8) = 4.5$

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Example

• Demand: $P_d = 30 - .3Q$
• $PMC: P_s = 2 + .1Q$
• $SMC: SMC = 2 + .2Q$

• Social optimum
  • $P_d = SMC$
  • $30 - .3Q = 2 + .2Q$
  • $28 = .5Q$
  • $Q= 56$, $P= 13.2$

• Market equilibrium
  • $P_d=P_s$
  • $30 - .3Q = 2 + .1Q$
  • $28 = .4Q$
  • $Q= 70$, $P= 9$
What is the optimal tax?
- Want $Q = 56$, the social optimal
- People will demand 56 when their price is 13.2
- What price will encourage firms to supply 56?
- Firms will receive $P + t$, but they have to give $t$ back to the government.
  - $P = 2 + .1Q = 2 + .1(56) = 7.6$
  - When firms receive 7.6, they will supply 56.
  - Therefore $13.2 - 7.6 = 5.6$ (tax)

Excises taxes on poor health

- Alcohol and cigarettes are taxed at the federal, state and local level
- Some states sell liquor rather than tax it (VA, PA, etc.)
- Most of these taxes are excise taxes -- the tax is per unit
  - Rates differ by type of alcohol, alcohol content
  - All cigarettes taxed the same
- Revenues in 2013
  - $17$ billion at state and local level
  - $14$ billion at Federal level
  - $7.3$ billion in Master Settlement Payments
Current Cigarette Excise Tax Rates

- **States**
  - Low: MO ($0.17), VA ($0.30), LA ($0.36)
  - High: NY ($4.35), MA ($3.51), RI ($3.50), CT ($3.40)
  - Average of $1.46 across states
  - Average in tobacco producing states: $0.485
  - Average in non-tobacco states, $1.61
- **Federal:**
  - $1.0066/pack
- **Local**
  - NYC ($1.50), Cook Co ($3.00), Chicago ($1.18), Anchorage ($2.206)

Federal Taxes on Alcohol

- **Beer**
  - $18/31 gallon barrel or $0.05/12 ounce can
- **Wine**
  - $0.21/750ml bottle for 14% alcohol or less
  - $0.31/750ml bottle for 14 – 21% alcohol
- **Liquor,** $13.50 per 100 proof gallon (50% alcohol), or, $2.14/750 ml bottle of 80 proof liquor

State taxes on Alcohol

- **Beer**
  - High: $1.05/gallon Alabama
  - Low: $0.08/gallon Kentucky
- **Wine**
  - High: $2.25/gallon Florida
  - Low: $0.11/gallon Louisiana
- **Spirits**
  - High: $24.63/gallon Oregon
  - Low: $1.50/gallon DC and Maryland

NYC

- **Cigarettes**
  - Local+state+federal=1.50+4.35+1.01=$6.86 per pack
  - One carton of cigarettes costs $68.60 in taxes
- **Case of wine**
  - state+federal = 0.059+0.21=$0.269 per bottle
  - $3.23/case
  - Would need to buy 21 cases of wine to pay the same tax as one carton of cigarettes
Do taxes reduce consumption?

- Law of demand
  - Fundamental result of microeconomic theory
  - Consumption should fall as prices rise
  - Generated from a theoretical model of consumer choice
- Thought by economists to be fairly universal in application
- Medical/psychological view – certain goods not subject to these laws

Starting in 1970s, several authors began to examine link between cigarette prices and consumption

- Simple research design
  - Prices typically changed due to state/federal tax hikes
  - States with changes are ‘treatment’
  - States without changes are control

Near universal agreement in results
- 10% increase in price reduces demand by 4%
- Change in smoking evenly split between
  - Reductions in number of smokers
  - Reductions in cigs/day among remaining smokers

Results have been replicated
- in other countries/time periods, variety of statistical models, subgroups
- For other addictive goods: alcohol, cocaine, marijuana, heroin, gambling

Taxes now an integral part of antismoking campaigns

- Key component of ‘Master Settlement’
- Surgeon General’s report
  - “Raising tobacco excise taxes is widely regarded as one of the most effective tobacco prevention and control strategies.”
- Tax hikes are now designed to reduce smoking
• By the end of 1996
  – 9 states with cigarette excise taxes of $0.50
  – only 3 states with taxes in excess of $0.75/pack.
• By the end of 2002
  – 24 states had taxes of $0.50 or more
  – 13 states having a tax of a dollar per pack or more.
• Today
  – 18 states with taxes >= $2/pack
  – 32 states with taxes >= $1/pack
\[ S_{ijt} = \begin{cases} 1 & \text{if person } i, \text{state } j, \text{year } t \text{ smokes} \\ 0 & \text{otherwise} \end{cases} \]

\[ C_{ijt} = \text{cigs/day for } S_{ijt} = 1 \]

For everyone:
\[ S_{ijt} = \alpha_i + \text{tax}_j \theta_i + x_{ijt} \beta_i + u_{ijt} + \lambda_{ijt} + \epsilon_{ijt} \]

If \( S_{ijt} = 1 \)
\[ C_{ijt} = \alpha_2 + \text{tax}_j \theta_2 + x_{ijt} \beta_2 + u_{ijt} + \lambda_{ijt} + \epsilon_{ijt} \]

\( x_{ijt} = \text{demographic controls} \)
\( u, \lambda = \text{state and year effects} \)

Generating an Elasticity
\[ Q = \text{Pr}(S = 1) \times C \]
where \( C = \text{Cigs}\mid S = 1 \)
\[ \frac{\partial Q}{\partial \text{tax}} = \frac{\partial \text{Pr}(S = 1)}{\partial \text{tax}} C + \frac{\partial C}{\partial \text{tax}} \text{Pr}(S = 1) \]
\[ = \theta C + \theta_j \text{Pr}(S = 1) \]
\[ \xi_j = \frac{\partial Q}{\partial P} \left( \frac{P}{Q} \right) \]
\[ Q = f(P(\text{tax})) \]
\[ \frac{\partial Q}{\partial \text{tax}} = \frac{\partial Q}{\partial P} \left( \frac{\partial P}{\partial \text{tax}} \right) \]
Generating an Elasticity

\[ \xi_P = \frac{\partial Q}{\partial \alpha} \left( \frac{P}{Q} \right) \left( \frac{\partial P}{\partial \alpha} \right) \]

\[ Q = \Pr(S = 1) \]

\[ \xi_P = \left[ \theta_P / \Pr(S = 1) \right] + \left[ \theta_P / \Pr(S = 1) \right] \left( \frac{\partial P}{\partial \alpha} \right) \]

\[ \Pr(S = 1) = 0.24 \]

\[ C = 18.3 \]

\[ \frac{(0.00019 * 183)}{0.24} \]

\[ \frac{(0.0152 * 183)}{18.7} \]

\[ \xi_P = 0.144 \]

\[ \xi_P = 0.149 \]

\[ \xi_P = 0.293 \]

---

**Table 7**

OLS Estimates of UPC-Level Real Retail Price Equation, IRI Data 2001-2006

<table>
<thead>
<tr>
<th>Covariate</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real tax (S-pack)</td>
<td>0.993</td>
<td>0.987</td>
</tr>
<tr>
<td>(0.089)</td>
<td>(0.079)</td>
<td></td>
</tr>
<tr>
<td>[0.938]</td>
<td>[0.872]</td>
<td></td>
</tr>
<tr>
<td>Month/year effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>State Effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>UPC effects</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>1,126,478</td>
<td>1,126,478</td>
</tr>
<tr>
<td>Distinct UPCs</td>
<td>2,843</td>
<td>2,843</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.687</td>
<td>0.939</td>
</tr>
</tbody>
</table>

---

**Table 8**

Two-Part Cigarette Demand Model Estimates, Adults aged 18+, BRFSS Data, 1985-1995

<table>
<thead>
<tr>
<th>Sample</th>
<th>Obs. Smoker (smokers only)</th>
<th>Cigs./day probability smokers</th>
<th>Mean values Cigs./day smokers</th>
<th>Parameter estimates (standard error) price elasticity on real tax</th>
</tr>
</thead>
</table>
| Full         | 812,185                   | 0.260                          | 18.7                        | \(-0.00319\) \((-0.0034) \)
|              |                           | \(-0.0144\) \([-0.149\) \([-0.293\) \([0.007)\] \)

\[ \xi_P = \left[\left( \theta_P / \Pr(S = 1) \right) + \left( \theta_P / \Pr(S = 1) \right) \right] \left( \frac{\partial P}{\partial \alpha} \right) \]

\[ \Pr(S = 1) = 0.24 \]

\[ C = 18.7 \]

\[ \frac{(-0.00019 * 183)}{0.24} + \frac{(-0.0152 * 183)}{18.7} \]

\[ \frac{(-0.144)}{-0.149} = -0.293 \]

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External costs of poor health

- Manning et al. paper
- Accounting exercise
  - What are the external costs of alcohol, tobacco, sedentary lifestyle
  - Will focus on the first two in class
- Consider three sets of costs
  - Direct costs
    - Lives lost, fires, criminal justice
  - Collectively financed programs
    - Sick/medical leave, all types of insurance, retirement, federal transfer programs
  - Taxes on earnings

Direct costs

- Lives lost due to poor health
  - Drunk driving deaths
  - Fires from smoking
  - Does not include
    - Death of the person
    - Any other family member (why is this? Is this a good assumption?)
    - Second hand smoke
  - Criminal justice costs

Collectively financed programs

- Health/life insurance
  - Costs of a smoker are paid collectively by those enrolled in an insurance program
  - Externalities can be reduced if premiums are correlated with smoking
- Gov't transfer programs tricky
  - Smoking/drinking increases current costs in Medicare/Medicaid
  - May decrease costs in the future

Taxes on Earnings

- Smokers and heavy drinkers
  - Are less productive during working years (do not know whether this is causal)
  - If die prematurely, pay less in state/local income taxes
What is NOT an external cost

- The smoker/drinkers diminished health or the health of their family members
- The lost earnings of these activities
- Why?

Special case of Federal Programs

- Expenditures are correlated with longevity
  - Social security, Medicare/Medicaid costs increase for older people
- Because smoking kills people early
  - Prevents people from getting to the age when medical costs are very high
  - Reduces payment of Social Security benefits

From the perspective of the other taxpayers, these are positive externalities

- Smokers pay $ to Federal and states
- They do not take as much out (SS, Medicare/aid) because they die early

External costs of smoking/drinking
(5% discount rate)

<table>
<thead>
<tr>
<th></th>
<th>Cigarettes (per pack)</th>
<th>Heavy drinking (per ounce)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collectively financed</td>
<td>$0.05</td>
<td>$0.23</td>
</tr>
<tr>
<td>Direct costs</td>
<td>$0.02</td>
<td>$0.93</td>
</tr>
<tr>
<td>Taxes on earnings</td>
<td>$0.09</td>
<td>$0.06</td>
</tr>
<tr>
<td>Total</td>
<td>$0.15</td>
<td>$1.19</td>
</tr>
</tbody>
</table>
External costs of smoking – socially financed

<table>
<thead>
<tr>
<th></th>
<th>Cigarettes (per pack)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical costs</td>
<td>$0.26</td>
</tr>
<tr>
<td>Sick leave/life</td>
<td>$0.06</td>
</tr>
<tr>
<td>insurance</td>
<td></td>
</tr>
<tr>
<td>Nursing homes</td>
<td>-$0.03</td>
</tr>
<tr>
<td>Pensions</td>
<td>-$0.24</td>
</tr>
</tbody>
</table>

External costs of smoking/drinking

<table>
<thead>
<tr>
<th></th>
<th>Cigarettes (per pack)</th>
<th>Heavy drinking (per ounce)</th>
</tr>
</thead>
<tbody>
<tr>
<td>External costs</td>
<td>$0.16</td>
<td>$1.19</td>
</tr>
<tr>
<td>Total taxes</td>
<td>$0.37</td>
<td>$0.20</td>
</tr>
</tbody>
</table>

• Dollars values are in real 1986 dollars
• Between 1986 and now, prices have doubled
  – CPI, Jan 1986 = 109.6
  – CPI, Dec 2012 = 225.9
• Holding all else fixed, external costs have moved to $0.30/pack
• If assume all deaths due to fires and passive smoke are external costs
  – Smoking cost rises to $0.29/pack in 1986 dollars
  – Roughly $0.60/pack in todays dollars
• Average state tax=$1.48, Federal tax=$1.00

• Results
  – Smokers pay their way
  – Drinkers do not
Why the difference between alcohol and cigs?

• Most of the external costs of alcohol are monetized value of a statistical life
  – Value of life is valued at $5 million
  – Drunk drivers kill 10,000 people/year (other than themselves)
  – External costs of $50 billion
• DD fatalities have fallen from 23,000 to 10,000 from 1981 to 10,000 – so external costs have fallen a lot
• But real taxes on alcohol have fallen as well
Value of a statistical life

- People trade off $ for job characteristics
  - Jobs with nice characteristics paid less
  - Jobs with unattractive characteristics paid more
  - Hold ALL ELSE CONSTANT
- One characteristic is job risk
- Workers in higher risk jobs get paid more
- Can use the willingness to accept risk to calculate a 'statistical value of life'

• Among blue collar workers, there is a 1 in 10,000 chance of dying on the job during the year.
• People in jobs with twice the average risk are estimated to make $500 more than identical people in average risk jobs.
• For every additional 10,000 workers in high-risk jobs, they will receive an extra $500 x 10,000 = $5 million in income

• But among these additional workers, on average, 1 will die.
• VSL = value of a statistical life
• VSL = additional income people are willing to take for additional risk/expected additional deaths

• Example: Suppose that a group of workers requires an additional $350 to accept an additional risk of death of 0.000152
  Just divide $350/0.000152 = $2.3 million
• Suppose there are an addition 50000 workers
  - Take home an additional 50000*350 = $17.5 million
  - But an additional 50000*0.000152 = 7.6 will die
  - 17.5/7.6 = $2.3 million
Drunk Driving Facts

- 17,000 MV deaths due to drunk drivers in 2003
  - down from 26K in 1981
  - 40% of all MV deaths in 2003
  - The drunk drivers themselves are 2/3rds of the alcohol-related MV fatalities, so you only count the 1/3 left over
- External costs of alcohol are now much lower -- probably too high by 34%

Viscusi (1995)
Costs of smoking

- External insurance costs per pack (1993$)
  - Medical care $0.388
  - Sick leave $0.016
  - Group life insurance $0.072
  - Nursing home care $0.062
  - Retirement pensions $0.286
  - Fires $0.092
  - Total $0.238
- Taxes paid $0.53/pack

What is not included in these numbers?

- Second hand smoked deaths
  - Disagreement about extent of deaths
  - Most exposure is within house
  - Is this an externality?
- Costs to children
  - Increases miscarriages
  - Increases LBW

Second hand smoke risks -- BMJ

- Study of 36,000 never smokers in CA, 1960-1998
- No significant associations were found for current or former exposure to environmental tobacco smoke before or after adjusting for seven confounders and before or after excluding participants with pre-existing disease.
- The results do not support a causal relation between environmental tobacco smoke and tobacco related mortality, although they do not rule out a small effect. The association between exposure to environmental tobacco smoke and coronary heart disease and lung cancer may be considerably weaker than generally believed.
- EPA identifies second hand smoke as a Class I carcinogen
- Surgeon General notes that exposure to second hand smoke at work or home increases risk of heart disease/lung cancer by 20-30% 
- California environmental protection agency – 50,000 deaths annually from second hand smoke

What are some other justifications for higher cigarette taxes
- Recall the market graph. The problem w/ external costs is that people consume above a socially optimal level
- Can be other reasons why people ‘over consumer’ smoking
- Maybe people do not understand the health risks. If they did, they would not smoke

Viscusi

- Survey, “of 100 smokers, how many will get lung cancer because they smoke?”
- Survey responses
  - Smokers
  - Non smokers
- The true risk level is
  -
- People over state the risk of smoking

TABLE 5—Subjective and Actuarial Probability of Survival or Age 75, by Smoking Status: Whites, Aged 50 through 65 Years

<table>
<thead>
<tr>
<th></th>
<th>Mean Survival Probability</th>
<th>Risk Ratio, 95%</th>
<th>Life Table Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subjective*</td>
<td>(95%)</td>
<td>Life Table</td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal smokers</td>
<td>0.970 (0.950)</td>
<td>0.960</td>
<td>100</td>
</tr>
<tr>
<td>Current light smokers</td>
<td>0.970 (0.950)</td>
<td>0.960</td>
<td>94</td>
</tr>
<tr>
<td>Current heavy smokers</td>
<td>0.970 (0.950)</td>
<td>0.960</td>
<td>90</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal smokers</td>
<td>0.980 (0.960)</td>
<td>0.970</td>
<td>100</td>
</tr>
<tr>
<td>Current light smokers</td>
<td>0.980 (0.960)</td>
<td>0.970</td>
<td>95</td>
</tr>
<tr>
<td>Current heavy smokers</td>
<td>0.980 (0.960)</td>
<td>0.970</td>
<td>90</td>
</tr>
</tbody>
</table>

Note: Subjective probability: The respondents’ own expectation was rated on a scale of 0 to 10 by respondents in the 1988–90 Health and Retirement Survey (HRS respondents were asked) to smoking by age 75. Life table values were calculated by Rogers and Lahaier. The subjective response was calculated by Rogers and Lahaier, who used data from the 1988–90 Health and Retirement Survey (HRS respondents were asked) to smoking by age 75. Life table values were calculated by Rogers and Lahaier. The subjective response was calculated by Rogers and Lahaier, who used data from the 1988–90 Health and Retirement Survey (HRS respondents were asked) to smoking by age 75. Life table values were calculated by Rogers and Lahaier.
Do smokers underestimate the addictiveness of smoking?

- 82% of smokers say they would like to quit
  - About 50% of ever smokers eventually quit
  - What does this measure?

- Survey of HS smokers
  - 56% say they will NOT be smoking in 5 years
  - Only 31% actually quit
  - Among pack a day smokers
    - 72% who say they will quit in 5 yrs are still smoking
    - 74% who say they will not quit in 5 yrs are still smoking