

# Asymmetric Information & Insurance

Lecture 3

# Insurance Markets

- Why do people buy insurance?
- People are risk averse
  - Risk aversion implies decreasing marginal utility of wealth
  - Every extra dollar increase happiness but by a smaller amount than previous dollars
- Assume there are 2 states in the world
  - Equally likely ( $p=.5$  for both)
  - Good outcome (no injury)
  - Bad outcome (bad injury)

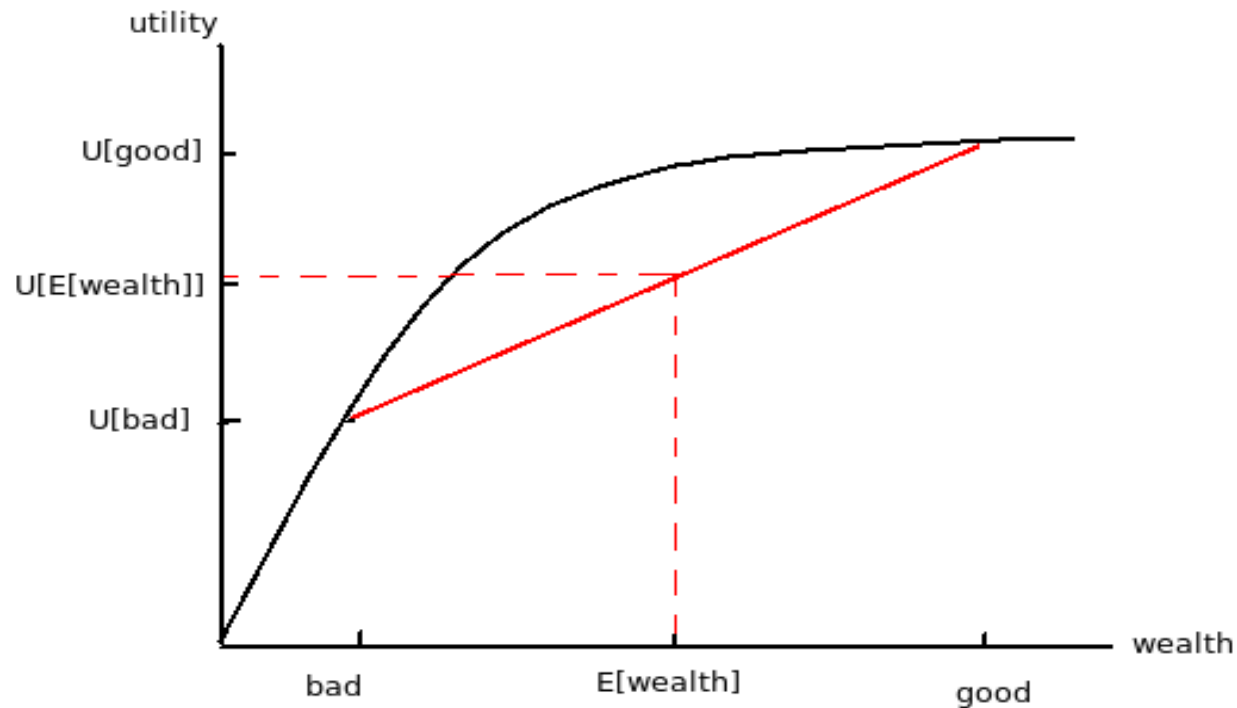
- Expected wealth- on average the amount of income/wealth a person receives
- Certainty Equivalent- the amount of income/wealth that would make someone as happy as the average amount
- Risk Premium- the difference between expected wealth and the certainty equivalent
  - The “cost” of the uncertainty
  - The amount someone would pay to remove the uncertainty (insurance)

# Decreasing MU of wealth



2 outcomes are equally likely so the expected value of wealth is  $\frac{1}{2}$  way between

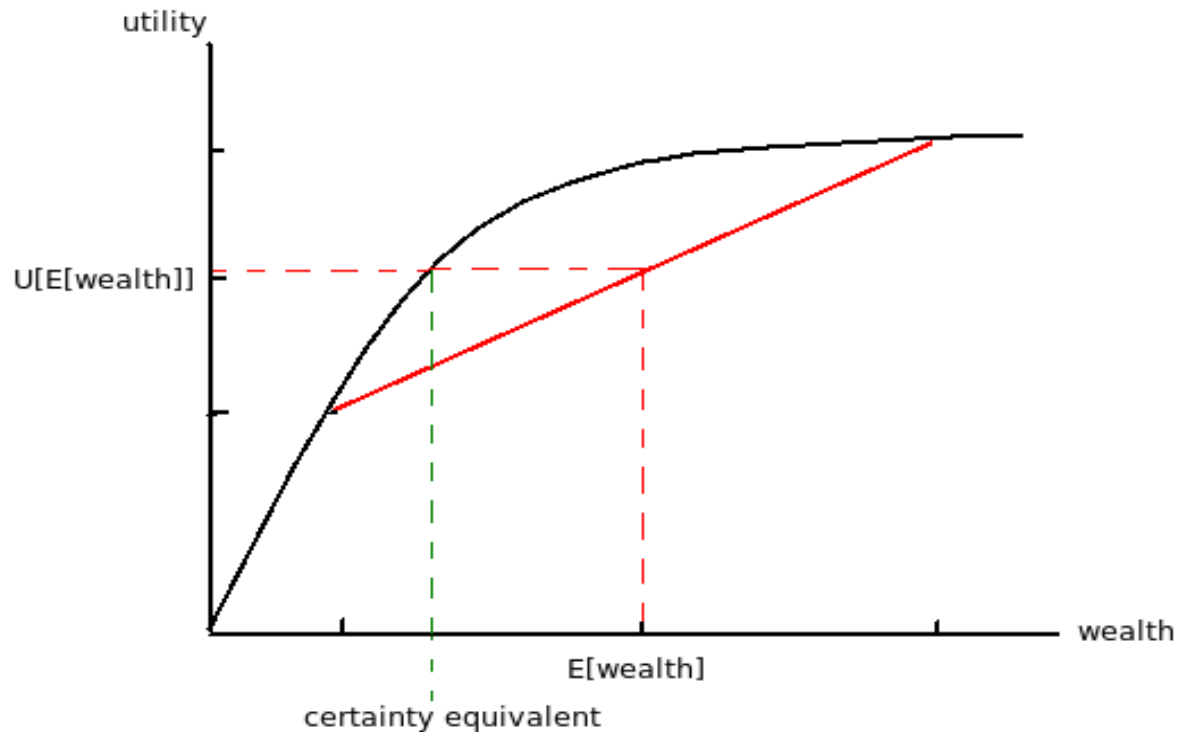
$$E[\text{wealth}] = p(\text{bad}) \times \text{wealth}(\text{bad}) + p(\text{good}) \times \text{wealth}(\text{good})$$



Suppose you make \$20k in a good year

In a bad year you get sick and can't work (5k)

$$E[\text{wealth}] = (.5 \times 20) + (.5 \times 5) = 10 + 2.5 = 12.5$$



# Insurance Premiums

- The premium is based on the expected cost (payout) plus admin costs
- The expected cost is  $\sum_i (P_i \times C_i)$ 
  - $P_i$  = probability of event
  - $C_i$  = cost of event
- 10% prob of paying \$100, 20% prob of paying \$1000, 30% prob of paying \$10,000, 40% prob of paying \$0
  - $E[\text{cost}] = .1 \times 100 + .2 \times 1,000 + .3 \times 10,000 + .4 \times 0$
  - $E[\text{cost}] = 10 + 200 + 3,000 = \$3,210$
- Set premium = \$3,210 + admin cost + (profit)

# Where do premiums come from?

- To get good estimates of probability of payout you want lots of people
  - How many people (age 30-40) get colon cancer?
  - 10 million people give good estimate of likelihood of a given event
- Experience Rating- premiums are based on past history (auto insurance)
- Community Rating- each member of a group pays the same amount (med mal insurance)

# Adverse Selection

- Sometimes referred to as “Hidden Information”
- The insured knows more than the insurer
- Insurance examples
  - If you know you are going to die in a year, take out life insurance policy
  - Know you are going to get pregnant, get job with good health insurance
- Used cars (lemons) – sellers of used cars know more than buyers – untrustable?

# Adverse selection example

- 2 types of drivers (careful, careless)
  - Careful driver in accident w/  $p=.5\%$
  - Careless driver in accident w/  $p=5\%$
  - Cost of accident = \$10,000
- Expected payouts
  - Careful:  $.005 \times \$10,000 = \$50$
  - Careless:  $.05 \times \$10,000 = \$500$

# With perfect information

- What are the insurance premiums if the company can identify driver's type?
  - Careful = \$50/year
  - Careless = \$500/year
  - At these prices, both types would want insurance (risk averse)
- Total premiums (100 of each type)
  - =  $(100 \times \$50) + (100 \times \$500)$
  - =  $\$5,000 + \$50,000 = \$55,000$

# Without information

- Company knows number of each type
  - Can't identify individual drivers
- Ask each person their type and charge the proper premium
  - Everyone lies
  - Total premiums =  $200 \times \$50 = \$10,000$
  - Expected payouts =  $\$55,000$
  - Profits =  $-\$45,000$  ☹

# The company is not stupid

- Recognize that people have incentive to lie
- Pool everyone together and charge the same price
  - Premium =  $\$55,000/200 = \$275/\text{person}$
- Who wants this insurance?
  - Careful: premium  $>$  E[cost] ( $\$275 > \$50$ )
  - Careless: premium  $<$  E[cost] ( $\$275 < \$500$ )
- Total premium =  $\$275 \times 100 = \$27,500$
- Expected payout =  $\$500 \times 100 = \$50,000$
- Profits =  $-\$22,500$  ☹️

# Pooling Equilibrium

- If the careful are very risk averse, then they may be willing to pay this premium
- The careless are subsidized by the careful
  - Careful pay more than the  $E[\text{payout}]$
  - Careless pay less than the  $E[\text{payout}]$
- If everyone purchases at the pooled price
  - Pooling equilibrium

# Separating Equilibrium

- Offer separate policies with different prices
- Full insurance costs \$500 (\$10,000 coverage)
  - Premium = expected cost (careless drivers)
- Partial insurance costs \$25 (\$5,000 coverage)
  - Premium = expected cost (careful drivers)
- If only the careful drivers want to buy the partial insurance
  - Separating equilibrium

# Community rating

- Solve the adverse selection problem with a large group/pool
- If everyone in KY pays the same amount, the vast majority of healthy people subsidize the few sick people
- Employer group insurance
  - IBM, GM, Dell
  - Local bakery or gas station

# Moral Hazard

- Sometimes referred to as “Hidden Action”
- People behave differently when they have insurance
  - Homeowner’s insurance and fire extinguishers
  - Business insurance and the mob
  - Postal workers (job insurance)
  - Bartenders (no job insurance)

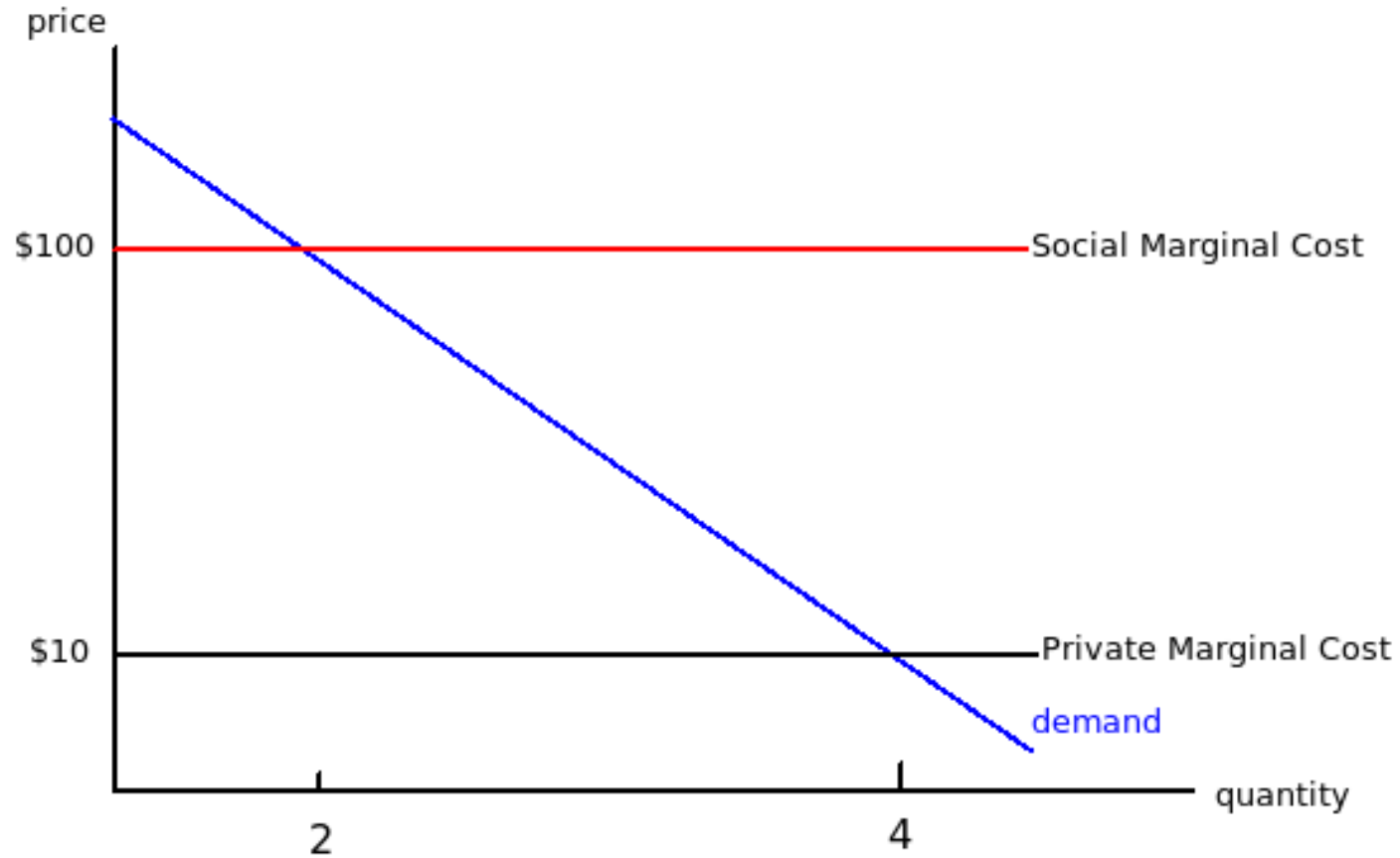
# Moral Hazard

## Health insurance

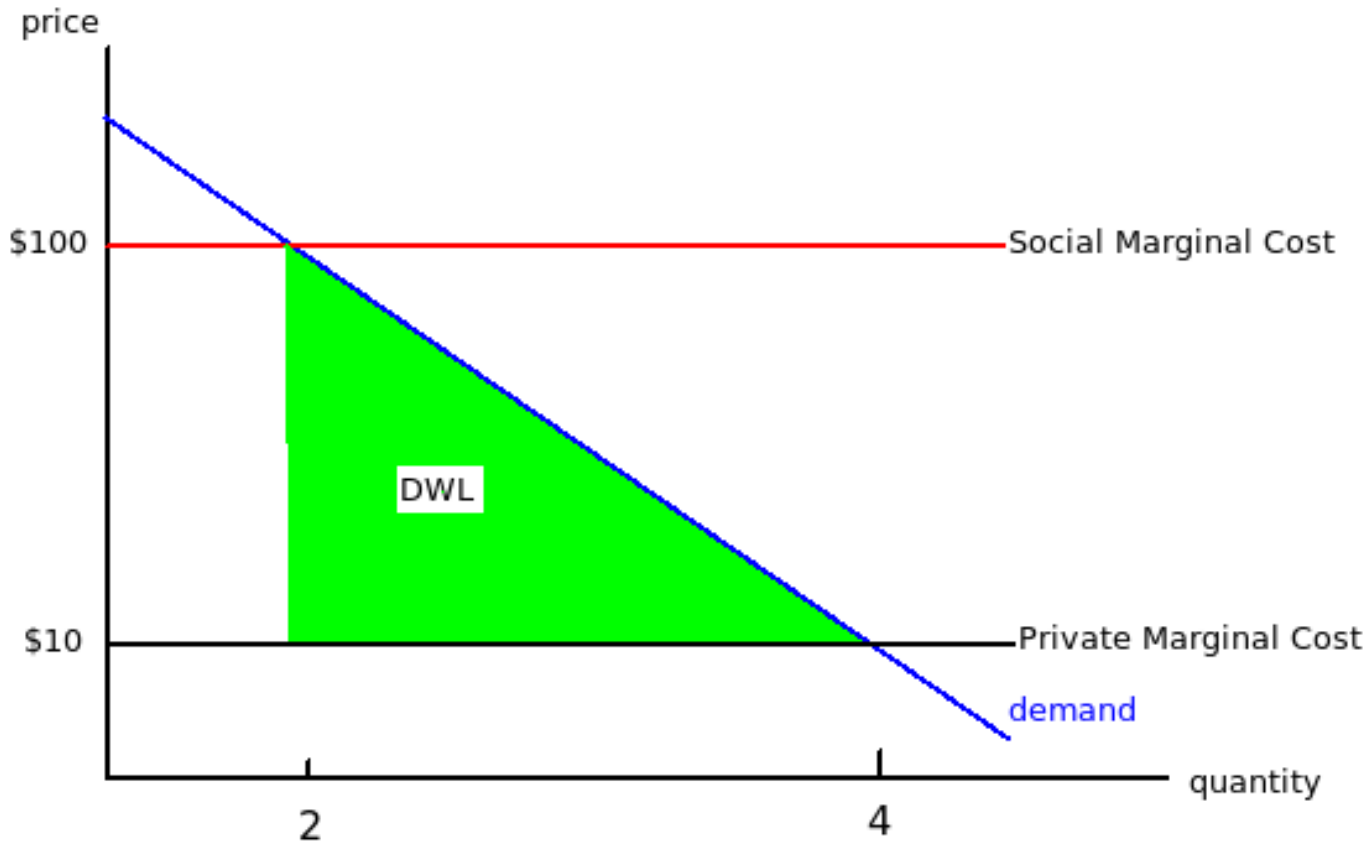
- Suppose a patient pays the full cost of a dr. visit (\$100) and goes 2 times/year
- If he gets insurance with a \$10 copay, he goes to the dr. 4 times/year

# Moral Hazard

## Health insurance



# Why is this bad?



# How do we reduce Moral Hazard?

- Deductibles – with car insurance you are on the hook for the 1<sup>st</sup> \$500 of damage
  - Pay less w/ higher deductible
- Co-payments – pay something for every prescription
  - Makes you think about true need
- Customary fees – get paid for the patient not the procedures
  - Reduces the incentive of inappropriate procedures

# Moral hazard and health care incentives

- Fee-for-service – leads to wasteful over consumption
  - Answer: managed care
- Managed care – leads to under provision of care
  - Answer: fee-for-service

# Solutions to health care “crisis”?

- If moral hazard is the problem
  - Make patients “think” about cost/benefits
  - Consumer driven health plans
- If adverse selection is the problem
  - Create a large insurance pool
  - National health care