14.23 Government Regulation of Industry

Class 18: Valuing non-market goods

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Outline

- Non-market goods
- Willingness to pay vs alternative measures
- Household production analysis - smoke detectors
- Wage market analysis
- Contingent valuation - LA pollution
- Links to regulation

The Issue

- We need to value non-market goods in cost benefit analyses. Why?
- Sources of value:
  - Accident risk e.g. nuclear facility
  - Amenity value e.g. public park
  - Option value e.g. biodiversity
  - Existence value e.g. Blue Whale

EPA and OSHA

- Agencies should determine what value environmental amenities have.

- These non-market valuations should be incorporated into cost-benefit analyses of policies.

- The problem is how do we value something that does not have a market price.

- Distinguish use value and non-use value (which is which in previous list?).

- EPA and OSHA are explicitly not allowed to do cost benefit analyses. Why? What restrains their activities in the absence of CBA?

Willingness to Pay Approach

- Willingness to pay approach is the one that should be used in valuing non-market goods. Why is this consistent with consumer theory?

- Alternative approaches exist:
  - Human capital approach
  - Direct cost approach

- What differences in the value of life would we see between using the WTP, Human Capital and Direct Cost approaches?

Approaches to Estimation of WTP

- Revealed Preference approaches:
  - Household Production Analysis e.g. purchases of equipment such as smoke detectors
  - Hedonics e.g. effect on house prices, wages
- Stated Preferences:
  - Contingent valuation analysis e.g. via survey of WTP for risk reductions
- Experimental analysis
  - Hybrid of Revealed Preference and Contingent valuation e.g. ask WTP for smoke detector

Household Production Function

- Look at quantity demanded of market goods that are compliments or substitutes to or directly produce the intangible in order to infer the demand for the intangible.

- Examples:
  - Hotelling: travel cost models. Cost of travel to a site acts as proxy for its price.
  - Averting behaviour models: cost of the device shows WTP for intangible. E.g. smoke detector, ?

Household Production Function

- Assumptions:
  - Indirect markets exist and are complete (there is some way of producing every level of the intangible good).
  - Continuous, well identified and known production function (you know the cost of the market good and the rate at which the market good generates the intangible).
  - Only the user benefits (no non-user benefits, no public goods aspects).

Travel Cost Methodology (Clawson-Knetsch)

1. For a given recreational site, divide the surrounding area into zones, each zone representing a given level of cost to travel to site.

2. Ask visitors to tell you where they came from (which zone).

3. Calculate the number of visits per zone.

4. Find cost/visit by zone, where c=mileage*cost/mile+opportunity cost of time*time it takes to travel to site.

5. Assume that an increase in cost is equivalent to an increase in price (one to one correspondence).

6. Plot cost/visit against visits per population.

7. Plot cost against number of visits.

Numeric example

- Suppose over 1 year you get 1000 visits from visitors from 5 zones, A-E.
  - A=400, B=300, C=200, D=100, E=0.
- Costs of travelling from the center of each zone to the site including opportunity cost of time travelled are:
  - A=25, B=50, C=75, D=100, E=125.
  - From this data plot visits per year against costs.
  - Treating an increase in cost as an increase in price (over time), this tells us each zone's demand curve.
  - Aggregate individual demand curves to get the aggregate willingness to pay function.
  - WTP equals the area under the Demand Curve.
- We assume that demand is linear, no entrance fee, equal population in each zone, additivity is ok and income effects are small, identical preferences across zones, no multi-site visits, time spent per visit is constant, no congestion etc.

Smoke detectors and the value of life (Dardis, 1980)

- Purchases must be voluntary (why?).

- Start by assuming marginal WTP for a change in risk of death=cost of device that changes risk.

- Cost=change in probability of death X value of life (assuming that injury = $0).

- Cost estimates: Smoke detectors cost $52 in 1974, batteries cost $7 per year, detectors last 10 years, discount rate = 10%: annualised cost = $21.37.

Smoke detectors and the value of life (Dardis, 1980)

- Probability of death from a fire = 6492/74000000 households

- Probability of reducing death if detector works = 0.45.

- Probability of detector working = 0.8.

- Together risk decreases by 0.0000315 if you have a smoke detector.

- Value of life=cost/change in probability of death = 21.37/0.0000315 = $676,266

- What does this mean for regulation and for revealed preference?

Hedonics

- WTP can be detected by examining how the price for a traded good varies with the amount of intangible characteristic it contains.

- You can use method if you have differentiated market goods.

- See how the variation of price of the tangible good varies with the intangible characteristic, obtain marginal WTP for intangible, then see who levels of intangible are related to MWTP and income level to get demand for intangible.

- It does not capture non-use value.

- You have a potential identification problem if you just observe prices and characteristics - need to identify demand function from this.

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Hedonics - Value of Life

Wage
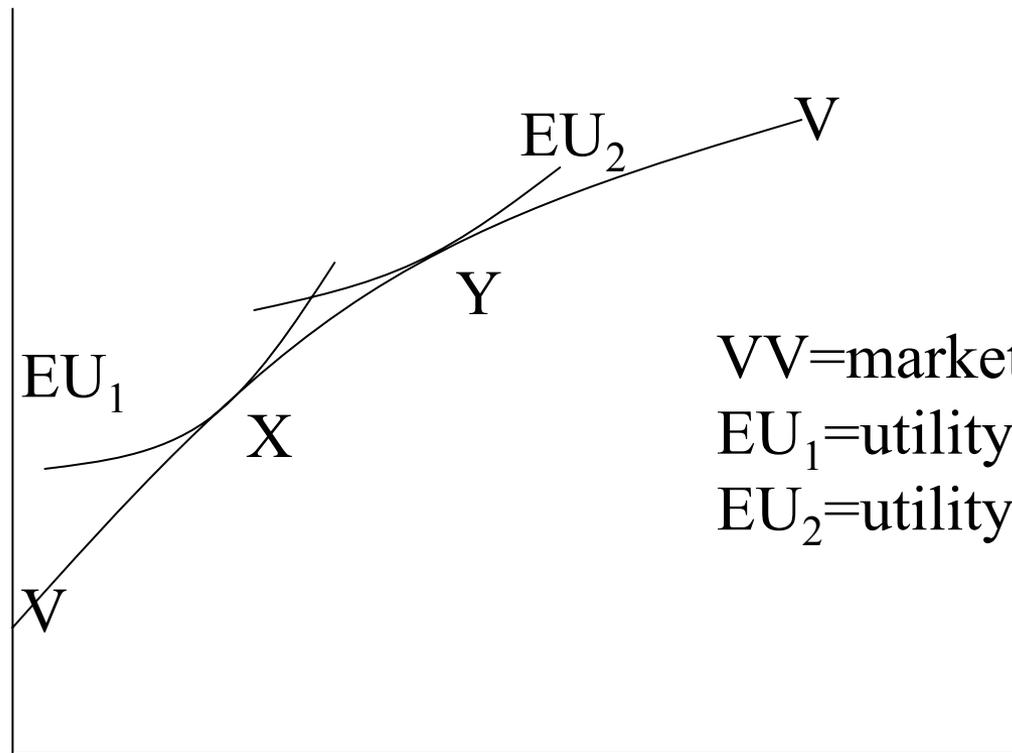
VV=market opportunity locus
EU$_1$=utility curve of worker 1.
EU$_2$=utility curve of worker 2.

Risk

0

Hedonics - Value of Life

- We can estimate the value of life from wage and job risk data:

$$Annual\ Earnings\ = \alpha + \beta_1 Annual\ Death\ Risk$$

$$+ \sum_{i=1}^{n} \gamma_i Personal\ Characteristic_i + \sum_{i=1}^{n} \psi_i Job\ Characteristic_i + \varepsilon_i$$

- β_1= Value of Life estimate in this case. Why?
- Estimates vary between $1m and $6m in a range of studies.
- What variables would it be important to include in the regression analysis and why?

Contingent Valuation Method (CVM)

- Can find WTP via a survey. Ask people what they would be prepared to pay to avoid given risks. Thus if people say they are willing to pay $500 to reduce death risk by 1% then this is the marginal WTP.

- This requires that hypothetical constructs be taken as real. Why might this be a problem?

- However can use this method to get at non-use valuations e.g. Blue Whales.

- One problem is that the results are subject to calculation errors, inconsistency, framing effects and 'sounds reasonable' effects. Example of UK safety survey (Beattie et al., 1998).

CVM - Pollution in LA

- 1982 in LA. Looked at air quality and tried to determine people's willingness to pay for better air quality as measured by visibility.

- Shown 3 pictures with poor, fair and good air quality.

- Asked how much WTP to go from one level to the next.

- Got income data etc and found WTP between $5.55 and $28.18 for improved air quality.

- Method used extensively for damages assessment.

- How could you have used another measure of WTP in this particular case (see Brookshire et al, 1982)?

Back to regulation

- Do regulatory agencies apply a consistent value of life?

- Should look at life years saved as this may vary with who is likely to be effected and when.

- Example of the EPA. Maximum is billions per life...

- Why do they not behave consistently?

- Evidence is that values of life too high in many cases. However the analysis may still be useful for deciding cost effectiveness of EPA budget and their budget priorities in any given period.

Risk-Risk Analysis

- Risk analysis compares the risk of regulatory inaction to the risk of regulatory action.

- For instance, because regulation involves financial costs and has budget implications as opposed to the hypothetical value of its benefits we need to consider the effect of government expenditure on human life.

- Making society poorer via regulation means that $50m of regulatory expenditure will lead to a statistical loss of life.

- Also cross-effects, regulating one sector may cause migration of demand to more risky sectors. E.g. example of reaction to Hatfield rail crash in UK.

Conclusions

- The consistent way to measure the value non-market goods is using a willingness to pay concept.

- There are a number of ways to calculate WTP.

- These give rise to inconsistent and often contradictory results which are time and place sensitive.

- However they are aids to informed decision making.

- A clear message from each of them is that the better informed individuals are about risks the more likely they are to make consistent choices about their WTP for non-market goods.

Next

- *Introduction to Environmental Regulation*

- *Read VVH Chapter 21*