Economic Evaluation

Lec 14: Valuing Impacts from Observed Behavior: Indirect Market methods

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AM's reminders

- **Lecture plans**
- **Last lecture**
  - Sample questions exam-like (posted before weekend)
  - Q&A
- **No postponing assignment deadline**

Reading list

- **BGVW ch.14**

The nature of the game

- **Last time** valuation of markets $\exists$ **where market price**
  - Price observed, can run a regression
  - **Identification, structural assumptions**
- **Today:** situations in which
  - $\nexists$ **a market** (value of life, scenic view, noise . . .)
  - **Market price does not reflect all benefits/costs** (natural site)
  - Need estimate of price: **Shadow price**
- **Observed behavior, revealed preferences** (as opposed to stated preferences)
  - Use of proxies, observed behaviors in related goods

Indirect market methods

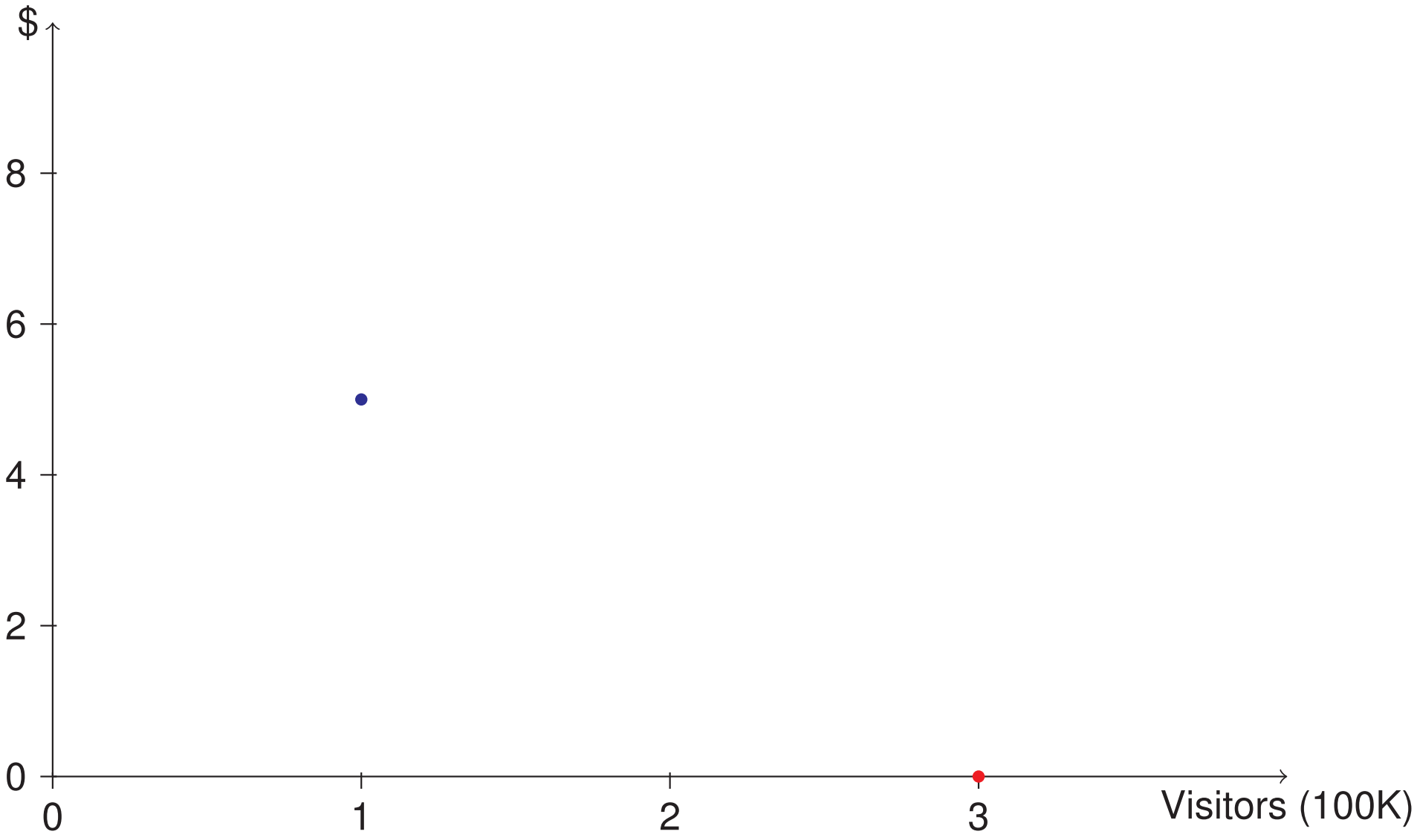
Today's sightseeing list

1. ~~Market analogy method~~
2. Trade-off method
3. Intermediate good method
4. Asset valuation method
5. Hedonic price method
6. Travel cost method
7. ~~Defensive expenditure method~~

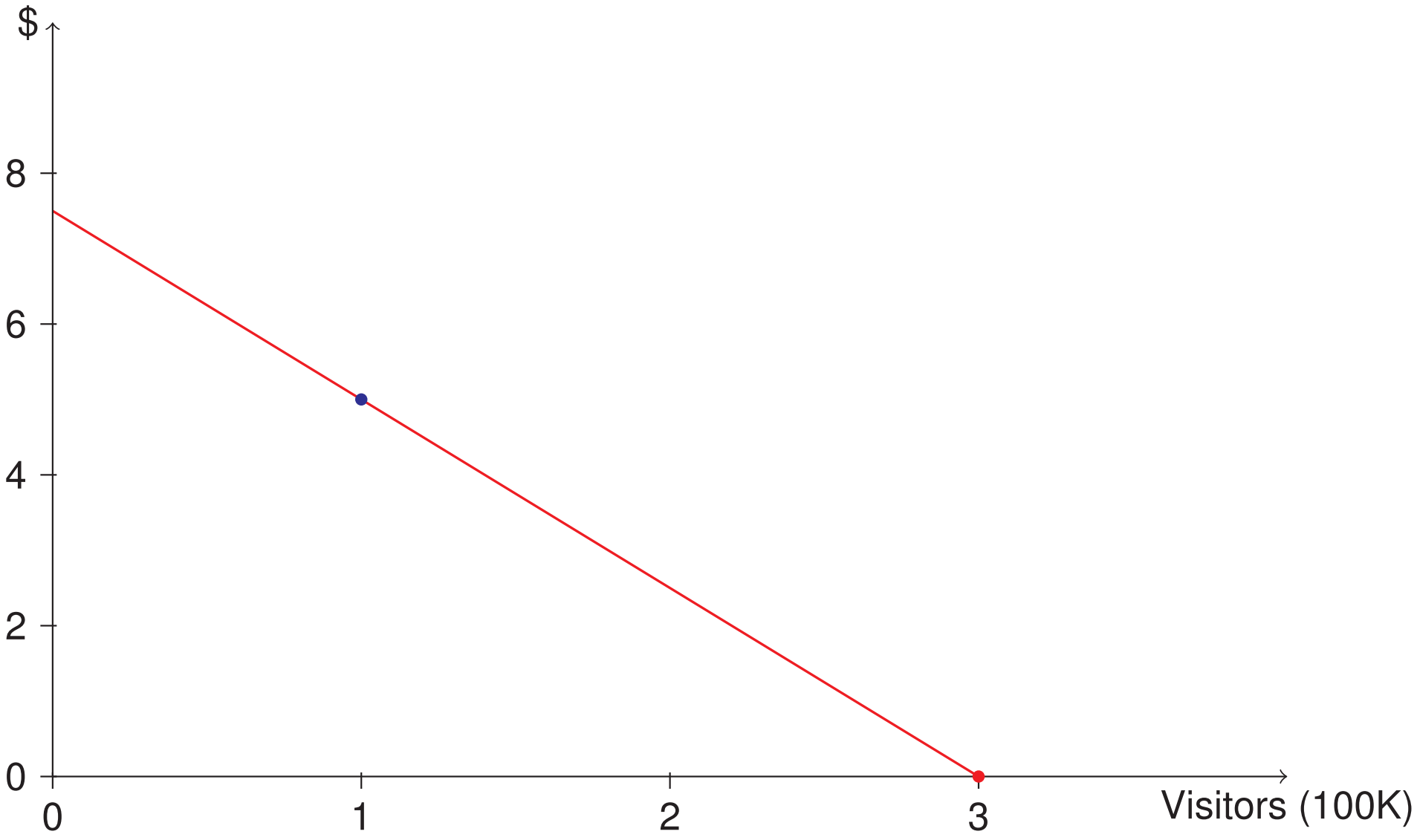
Market analogy method

- **Situation:** Public provides a good similar to those provided by private sector
- **Examples:** Public pool, stadium, parking lot, housing
- **Basic idea:** Market price of analogous good as shadow price
- **Problem with imputation:** selection of people into publicly provided good if competitive with the private (e.g. public housing)
- **Once price imputed, apply same techniques, e.g. extrapolation** for welfare analysis

Extrapolating a demand curve



Extrapolating a demand curve



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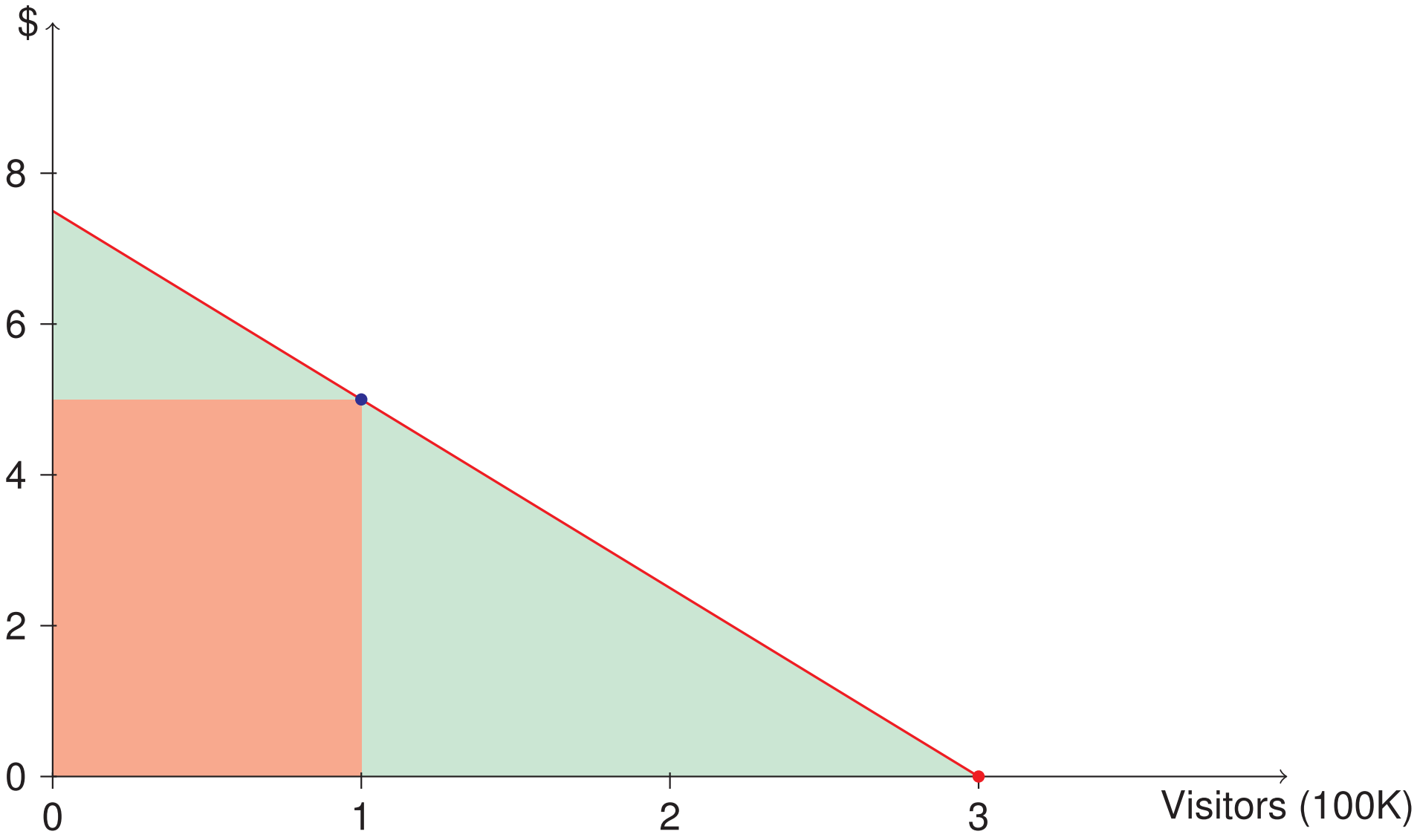


Trade-off method

- **Basic idea: $\approx$ shadow price with price of what one gives up to get (or avoid) good**

Example 1: value of time saved

Trade-off method

- **Basic idea: $\approx$ shadow price with price of what one gives up to get (or avoid) good**

Example 1: value of time saved = giving leisure up

- **Price of leisure = wage**
- **Problems:**
  - **Benefits** ignored
  - **Taxation**: tax rate changes with income
  - **Multitasking:** commuting by train/plane
  - **Heterogeneity of preferences** (selection)
  - **Working hours not flexible**
  - **Marginal productivity** not always = to wage (externality)

Trade-off method

Example 2: value of a life as

Trade-off method

Example 2: value of a life as foregone earnings

- **Not a good idea**
  - Value of life of housewife = 0
  - Value of life of elderly = 0
  - Value of life of drug lord? (externality)

Trade-off method

Example 3: value of a statistical life

- **Price paid to decrease mortality risk** (airbag cost)

$$(p+\omega)V(life) - \$300 = pV(life) \implies V(life) = \frac{\$300}{\omega}$$

  - $\omega = 0.0001 \implies$ V(life) = \$3M

- **Price asked to increase mortality risk** (dangerous jobs)

$$rV(life) = \$3500 \implies V(life) = \frac{\$3500}{r}$$

  - $r = 0.0001 \implies$ V(life) = \$3.5M

Trade-off method

Problems

- **Full information:** over/under-estimation of low probabilities
- **Self-selection:** more risk-seeking people self-select in risky jobs
  - Underestimation of VSL
- **Measuring of ω/r:** low-frequency events
  small noise $\Longrightarrow$ large differences
- **Efficiency of markets:** wage/price conveys all nfo

Intermediate good method

- **Situation:** Public provides a good used for production
- **Examples:** Water, transportation, education & training
- **Basic idea:** Use **value added** on **downstream** activity
  - E.g. water for farming,
    annual benefit = income of farms after project - income of farms before project

Intermediate good method - education

- Investments in **human capital**
- **Downstream activity:** wage/income
- **Problems:**
  - Consumption value of education **(underestimation)**
  - Non-market benefits of education **(underestimation)**
  - Self-selection, OVB **(overestimation)**
  - **Beware double-counting!**

Asset valuation method

- **Situation:** Public intervention capitalized in exist ing assets
- **Examples:** Noise from airport, scenic views, pollution
- **Basic idea:** Use **value added** on **asset pricing**
  - E.g. airport noise,
    price = change in price of houses next to airport
- **Event studies:** abnormal returns (also for stock market)
- **Conditions:** event unexpected

Problems with *simple* evaluation methods

- **OVB:** building a counterfactual
  - ***Simple* diffs studies**
  - **Double counting?**
    airport noise $\searrow$ price; airport job creation $\nearrow$ price
- **Self-selection:** heterogeneous effects
  - Who moves close to the airport?
  - **Roy model**

Hedonic pricing method

= Hedonic regression method: 2 steps

1. **Relationship btw price of asset and asset (i) char.**
   - Ideally, controls for **OVB**

$$P_i = f(\mathbf{Z_i}, VIEW_i) = \beta_0 VIEW_i^{\gamma} \prod_{m=1}^{M} Z_{m,i}^{\beta_m} e^{\zeta_i}$$

   - **Hedonic price:**

$$r_{v,i} = \frac{\partial P}{\partial VIEW} = \gamma \frac{P_i}{VIEW_i} > 0$$

Hedonic pricing method

2. **Relationship btw hedonic price and ind. (j) char.**
   - Ideally, controls for **self-selection**

$$r_{v,i} = g(\mathbf{X_j})$$

   - **Estimates individual willingness to pay in well-functioning markets**
     - **In well-funtioning MKTS** $r_{v,i} = WTP_{j,i}$
   - **Use individual (heterogenous) willingness to pay for** $\Delta VIEW$ for computing welfare gains

Trick through structural assumption, can be done in better ways

- Simultaneous equations, **exogenous variation**

Hedonic pricing method - VSL

- $\forall$ **workers** j **in sectors** i

$$\ln(w_{ij}) = \beta_0 + \beta_1(\text{risk}_j) + \beta_3 \ln(\text{edu}_i) + \beta_4 \ln(\text{tenure}_{ij}) + \zeta_{ij}$$

Issues with hedonic pricing method

- **Equilibrium assumption:** people rational and fully infomed
  - Understand extent of externality and incorporate them into decision
- **Perfect model:** no measurement error, all OVB included
- **Variation 2nd step from structure only:** linear?
- **Decisions not constrained**
  - $\exists$ correct combination of characteristics in market
  - Characteristics not perfectly correlated
- **Immediate price adjustments** (same as for simpler methods)

Travel cost method

- **Situation:** Typically **recreational sites**
- **Examples:** Parks, natural areas. . .
- **Basic idea:** Use **Travel cost** as proxy for **willingness to pay**
  - Same idea as trade-off method
- **Demand for site visits**

$$q = f(p, p_s, Y, Z)$$

- **Tickets the same, but people face $\neq$ costs to get there**
- **Total cost used as p, but collecting ind. info is expensive**

Zonal travel cost

1. **Specifies areas with $\approx$ travel costs**
   - Districts, post codes
2. **Draw random sample and asks for # of visits**
3. **Estimate zonal travel cost** (time + fees + gas...)
4. **Estimate total demand function**

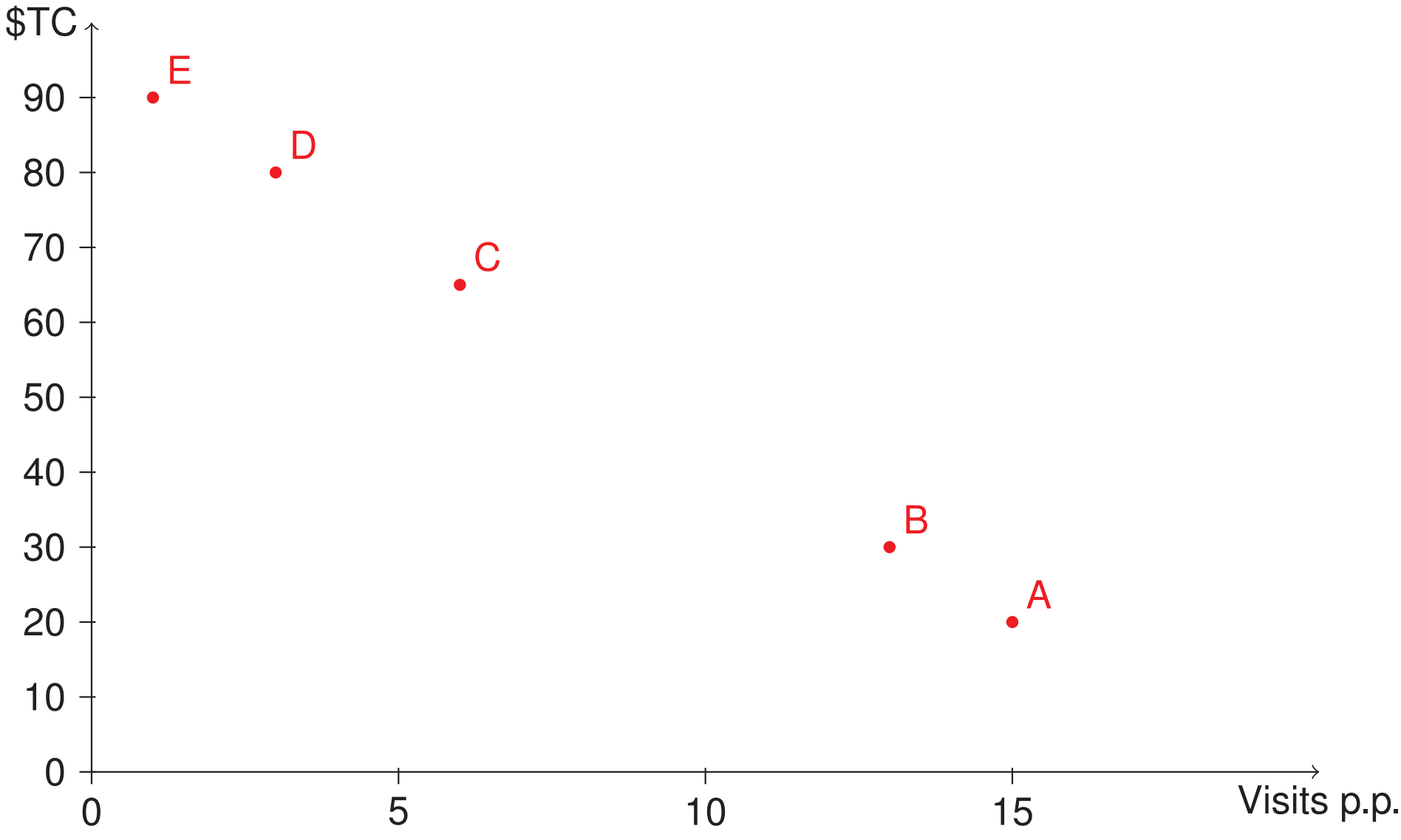
$$\ln\left(\frac{V}{POP}\right) = \beta_0 + \beta_1 \ln \overline{p} + \beta_2 \ln \overline{p_s} + \beta_3 \ln \overline{Y} + \ln \overline{Z}\beta_4 + \zeta$$

Example

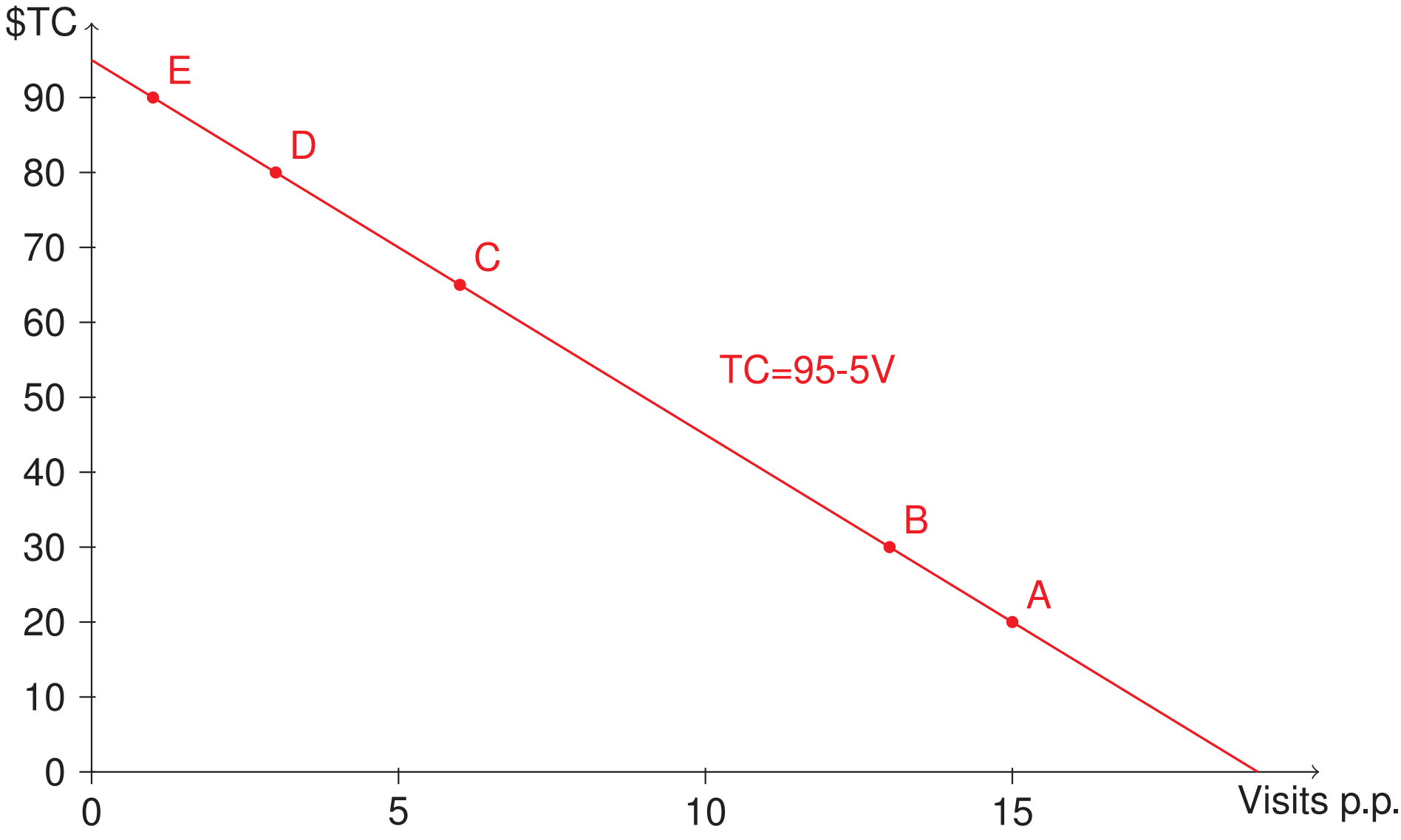
- **Fee = $10**

Zone	AVG tot cost per person	AVG #visits per person	Con. surplus per person	POP (K)	Consumer surplus per zone (K$)
A	20	15		10	
B	30	13		10	
C	65	6		20	
D	80	3		10	
E	90	1		10	

Example



Example



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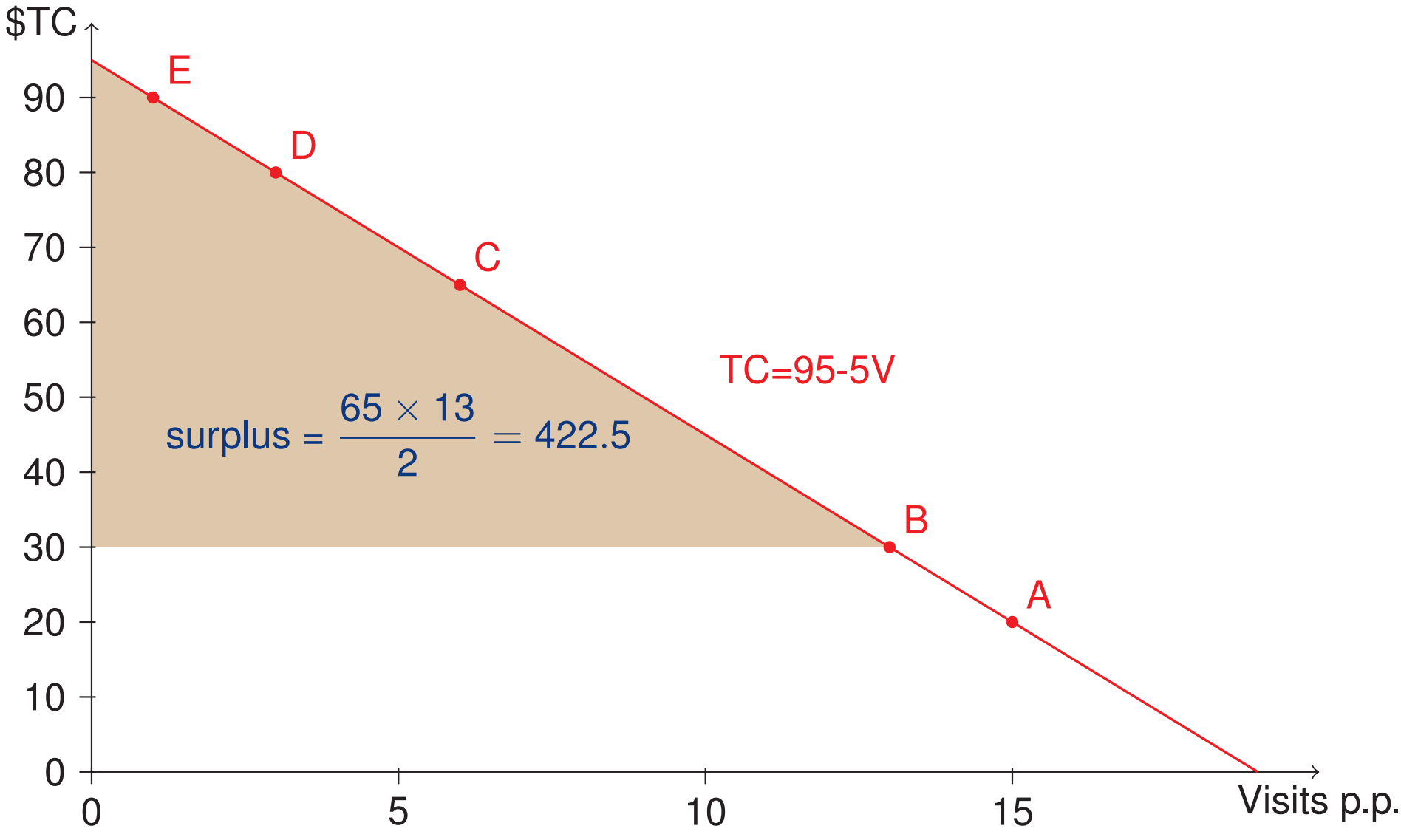

$TC
90
80
70
60
50
40
30
20
10
0
0
5
10
15
Visits p.p.
E
D
C
B
A
TC=95-5V
surplus = $\frac{65 \times 13}{2} = 422.5$

Example

Zone	AVG tot cost per person	AVG #visits per person	Con. surplus per person	POP (K)	Consumer surplus per zone (K$)
A	20	15	562.5	10	5625
B	30	13	422.5	10	4225
C	65	6	90	20	1800
D	80	3	22.5	10	225
E	90	1	2.5	10	25

- **Total visits:** 440K
- **Total consumer surplus:** 11.9M (+ fees)

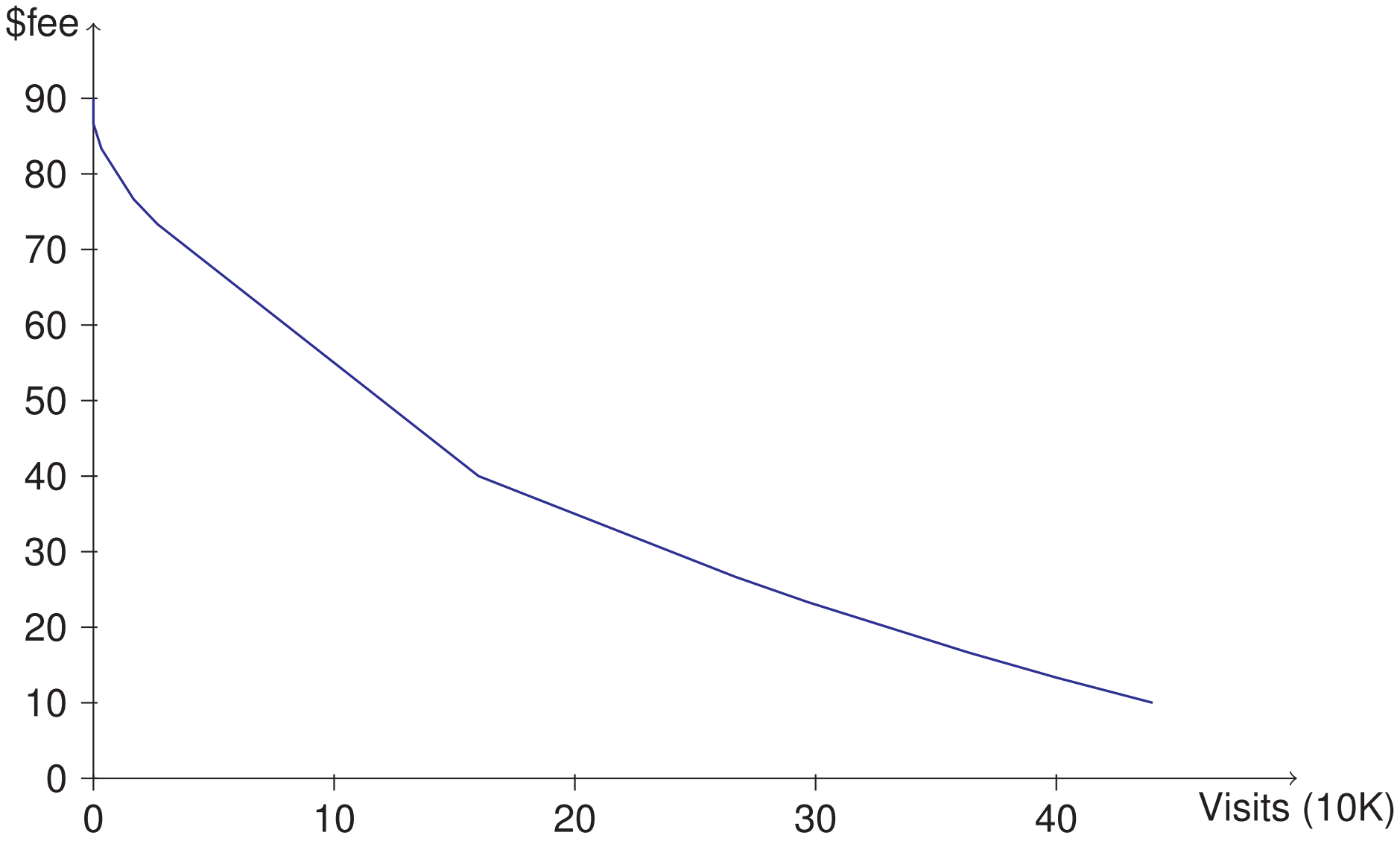
Infer demand curve

- **Status quo:** fee = $10
- **Get choke price per zone from total cost demand curve**
  - Zone A: fee = $85 chokes market (0 visitors)
  - **Can't have 0 visitors from a zone** $\implies$ $\forall$ fee levels

$$TV_z = max(0, POP_z * (19 - 0.2 fee - 0.2 TravelCost_z))$$

- **Sum** TV_z over all zones $\forall$ possible fee levels

Demand curve for public good given travel costs



Potential issues with travel cost method

- **Self-selection:** people choose where to live according to amenities close-by
- **Visits truncated/censored:** truncated/tobit regression
- **No info on specific feature:** (e.g. WTP for hiking trails out of all park)
  - Hedonic regression?
- **Travel cost:** not easy to get precise measure
  - Marginal cost of equipment use?
- **Multiple-purpose trips**
  - Journey itself may have value
- **Rational individual** (acknowledge $\nearrow$ in gas price $\nearrow$ cost)

Defensive expenditure method

- **Situation:** Potential damage provided
- **Examples:** Pollution, crime...
- **Basic idea:** Use WTP for protecting from damage
  - $\approx$ Trade-off method
  - WTP for increase in policy patrols = reduction in expenditure for alarms or surveillance guards
- **Simultaneous effect on supply:** quantity purchased increases
  - E.g. cheaper to clean windows or hiring guards (less risky)
  - **Underestimation of benefits/costs**