Consumer Surplus

- Welfare changes as a result of price changes
  - Fundamental policy question
  - What is the effect of a tax or a subsidy?
  - What is the effect of a change in relative prices?
  - What is the cost of monopoly pricing?
  - What is the welfare gain from innovation?

- Equivalent and compensating variation
  - Consumer's income is fixed at Y, prices change from $\mathbf{p}^O$ to $\mathbf{p}^N$.
    * Let $\overline{u}^O = V(\mathbf{p}^O, Y)$; let $\overline{u}^N = V(\mathbf{p}^N, Y)$.
    * Note: $E\left(\mathbf{p}^O; \overline{u}^O\right) = E\left(\mathbf{p}^N; \overline{u}^N\right) = Y$ by assumption that income is fixed.
  - How much would the consumer need to be paid to make her as well off as after the price change? Equivalent variation:

$$E\left(\mathbf{p}^O, \overline{u}^N\right) - E\left(\mathbf{p}^O; \overline{u}^O\right)$$

  - How much must the consumer be paid after the price change, to compensate her for it? Compensating variation:

$$E\left(\mathbf{p}^N, \overline{u}^N\right) - E\left(\mathbf{p}^N; \overline{u}^O\right)$$

  - More generally: how much money would it take to compensate the consumer for a change in prices, while keeping her on an arbitrary indifference curve?

$$E\left(\mathbf{p}^N, \overline{u}\right) - E\left(\mathbf{p}^O; \overline{u}\right)$$

– Ambiguity: which $\overline{u}$ to use? (Before or after?)

  * $\overline{u}^O$ answers: Suppose I was at old prices and then prices increased. How much would I need to be compensated to stay on same indiff. curve?
  * $\overline{u}^N$ answers: How much more would I have had to spend yesterday, to be as well off as I am today?
  * Each answers different question! Each valid.
  * Since $E\left(\mathbf{p}^O;\overline{u}^O\right) = E\left(\mathbf{p}^N;\overline{u}^N\right)$, using $\overline{u}^O$ gives negative of compensating variation, while using $\overline{u}^N$ gives negative of equivalent variation.

– Formal approach: The case where only one price changes.

  * Use Fund Theorem of Calculus:

$$E\left(\mathbf{p}^N,\overline{u}\right) - E\left(\mathbf{p}^O,\overline{u}\right) = \int_{p_1^O}^{p_1^N} h^1(p_1,\mathbf{p}_{-1};\overline{u})\,dp_1$$

  * Problem: h^1 is not observable. $D^1(\mathbf{p},Y)$ is observable.
  * Notice: $h^1(\mathbf{p}^O;\overline{u}^O) = D^1(\mathbf{p}^O,Y)$; $h^1(\mathbf{p}^N;\overline{u}^N) = D^1(\mathbf{p}^N,Y)$.

    * Then, area “beside” Marhallian demand is a good approximation to change in consumer surplus.

- The Case Where Many Prices Change: Price Indices
  - Motivation
    * Simple question: am I better off living in Palo Alto or Boston?
      · The “price” of biking over mountains to the beach, January jogging, good Mexican food, and outdoor swimming pools and hottubs is very high in Boston.
      · The “price” of not owning a car, getting to the airport, and accessing more than one or two major universities is very high in Palo Alto.
      · Where am I better off?
      · Key issue: I consume very different bundles in each place!
    * Measuring Inflation and Redistribution
      · Social Security, welfare, union contracts indexed to a public measure of inflation

- How much more money does a consumer need to be as well off today, as she was yesterday?
- Problems: As prices change, consumers make different choices. New goods enter the market.
- Change in retailing practices: superstores, discount stores, and the Internet.
- Major policy debate; major academic debate.

- Price Indices
  - BLS- determined prices of market baskets
  - Laspeyres
  - v. Paasche, others
  - A price index:

$$\frac{\mathbf{p}^N \cdot \mathbf{w}}{\mathbf{p}^O \cdot \mathbf{w}}$$

  - Question: What are the weights?
    * Laspeyres $\mathbf{w} = \mathbf{x}^O$ weight prices by what people were buying at old prices
    * Paasche $\mathbf{w} = \mathbf{x}^N$ weight prices by what people are buying at new prices
    * Ideal price index:

$$\frac{E\left(\mathbf{p}^N, \overline{u}\right)}{E\left(\mathbf{p}^O, \overline{u}\right)}$$

      - This is nice idea, but hard to observe!
      - And, what $\overline{u}$ to use?

* Take $\overline{u}^O$. Then:

$$\frac{E\left(\mathbf{p}^N,\overline{u}^O\right)}{E\left(\mathbf{p}^O,\overline{u}^O\right)}=\frac{\sum p_i^N\ h^i\left(\mathbf{p}^N,\overline{u}^O\right)}{\sum p_i^O\ h^i\left(\mathbf{p}^O,\overline{u}^O\right)}\neq\frac{\sum p_i^N\ x_i^O}{\sum p_i^O\ x_i^O}$$

– "<u>Substitution bias</u>"

$$\sum p_i^N x_i^O > E\left(\mathbf{p}^N,\overline{u}^N\right)$$

$$\frac{\sum p_i^N\ h^i\left(\mathbf{p}^N,\overline{u}^O\right)}{\sum p_i^O\ h^i\left(\mathbf{p}^O,\overline{u}^O\right)}<\frac{\sum p_i^N\ x_i^O}{\sum p_i^O\ x_i^O}$$

If I get a Laspeyres Price Index of 1, I wouldn't have to spend as much to be equally well-off.

* "Promotional Pricing" worsens substitution bias!

• <u>Other biases:</u>

– "New good" bias- ex. celluar phone on market for 5-10 years before BLS updates market. Index completely missed initial price drop.

– "Outlet" bias - more and more peole buying at discount stores over time.

– Retail stuff goes on sale!

– "Everyday low price". v. "High and Low" grocery stores.