Expenditure and Welfare
Equivalent and Compensating Variation

- measures derived from the expenditure minimization problem, expressed in monetary terms
- three important applications to using data to obtain welfare estimates
  1. Inflation indices
  2. Deadweight loss of (commodity) taxation
  3. Welfare gain from new products
Equivalent and Compensating Variation

- measures derived from the expenditure minimization problem, expressed in monetary terms
- compensating variation:

\[ CV = E(p_1, u_0) - E(p_0, u_0) \]

- equivalent variation

\[ EV = E(p_0, u_1) - E(p_0, u_0) \]
• from compensating demand to welfare measurement:

\[ CV = E(p_1, u_0) - E(p_0, u_0) \]
\[ = \int_{p_0}^{p_1} \frac{\partial E(p, u_0)}{\partial p} dp \]
\[ = \int_{p_0}^{p_1} h(p, u_0) dp \]

• welfare loss, deadweight loss, Harberger triangles, \( p, h(p, u) \) diagram

• “The Valuation of New Goods under Perfect and Imperfect Competition” Jerry A. Hausman in T.F. Bresnahan and R.J. Gordon: The Economics of New Goods

• the 1989 introduction of Apple Cinnamon Cheerios, and an estimate from the introduction in terms of CV is 66.8 million $.
Inflation Indices

- Laspeyres Index:
  \[ I_L = \frac{p_1 x_0}{p_0 x_0} \]

- Paasche Index:
  \[ I_P = \frac{p_1 x_1}{p_0 x_1} \]

- Laspeyres index overestimates the living cost expenditures
  \[ \frac{p_1 x_0}{p_0 x_0} \geq \frac{E(p_1, u_0)}{E(p_1, u_0)} \]

- Paasche index underestimates the living cost expenditures
  \[ \frac{E(p_1, u_1)}{E(p_0, u_1)} \geq \frac{p_1 x_1}{p_0 x_1} \]
The Deadweight Loss of Taxes: Commodity Taxes

- we consider lump sum taxes versus commodity taxes
- with lumpsum taxes $T$ we would need income $I$:
  \[ I = E(p_x, p_y, U) + T \]
- with commodity taxes we would need
  \[ I = E(p_x + t, p_y, U) \]
  and we would generate revenue
  \[ R = th(p_x + t, p_y, U) \]
- we want to compare whether we can raise revenues, $T$ or $R$ cheaper
Deadweight Loss, Triangles and Taylor Expansion

- we extend it around \((p_x + t, p_y, U)\)
- we have

\[
I - T = E(p_x, p_y, U)
\]

\[
\approx E(p_x + t, p_y, U) - t \frac{\partial E}{\partial p_x} + \frac{1}{2} t^2 \frac{\partial^2 E}{\partial p_x^2}
\]

\[
= E(p_x + t, p_y, U) - \underbrace{th(p_x + t, p_y, U)}_{< 0} + \frac{1}{2} t^2 \frac{\partial^2 E}{\partial p_x^2}
\]

\[
\leq I - R
\]

- and thus we find that \(R \leq T\)
- hence we can raise less revenues by commodity taxation than through lump sum taxation
- the difference is the deadweight loss of taxation.
- plot \(p_x, h(p_x, p_y, U)\)
Data and Welfare: The Deadweight Loss of Taxes