APEC 8001: Recitation notes 4*

Julieth Santamaria

September 28, 2017

1 EV, CV, DWL - Taxes

- Equivalent variation: Change in consumer's wealth that would be equivalent to the price change in terms of its welfare impact.

$$\begin{aligned} EV &= e(p^0, u^1) - e(p^0, u^0) \\ &= e(p^0, u^1) - w \\ &= \int_{p_1^1}^{p_1^0} h_1(p_1, \bar{p}_{-1}, u^1) dp_1 \end{aligned}$$

- Compensating variation: Net revenue of a planner who must compensate the consumer for the price change after it occurs, bringing her back to her original utility u^0

$$\begin{aligned} CV &= e(p^1, u^1) - e(p^1, u^0) \\ &= w - e(p^1, u^0) \\ &= \int_{p_1^1}^{p_1^0} h_1(p_1, \bar{p}_{-1}, u^0) dp_1 \end{aligned}$$

  If EV,CV < 0, the consumer will be worse off after the price change.

- Deadweight loss (DWL): It measures the extra amount by which the consumer is made worse off. When comparing taxation on one good compared to a lump-sum tax it is measured as follows:

  In terms of EV, the consumer is worse off under a commodity tax if $-T > EV$

$$\begin{aligned} DWL &= w - T - e(p^0, u^1) \\ &= \int_{p_1^0}^{p_1^0+t} \left[h_1(p_1, \bar{p}_{-1}, u^1) - h_1(p_1^0 + t, \bar{p}_{-1}, u^1) \right] dp_1 \end{aligned}$$

*Based on lecture notes and other material by Paul Glewwe. Some examples and exercises come from Mas-Colell, A., Whinston, M. D., and Green, J. R. (1995). Microeconomic theory. New York: Oxford university press.

In terms of CV, the consumer is worse off under a commodity tax if $-CV > T$

$$\begin{aligned} DWL &= e(p^1, u^0) - w - T \\ &= \int_{p_1^0}^{p_1^0+t} \left[h_1(p_1, \bar{p}_{-1}, u^0) - h_1(p_1^0 + t, \bar{p}_{-1}, u^0)\right] dp_1 \end{aligned}$$

Note, size of CV, EV and AV depend on the type of good

- Normal good: $EV > AV > CV$
- Inferior food: $EV < AV < CV$

Exercises:

1. Suppose the government is considering imposing a commodity tax of t on either x_1 or x_2, and the indirect utility function is

$$v(p, w) = \frac{w^{\alpha_1+\alpha_2}}{P_1^{\alpha_1} P_2^{\alpha_2}}$$

where $\alpha_1, \alpha_2 \in R_+$ and $\alpha_1 + \alpha_2 > 0$. Derive the conditions under which the consumer would be strictly better off with a commodity tax t on good 1 instead of good 2 using the Equivalent Variation (EV).

2. Consider a situation where the government is deciding between imposing a commodity tax of t on good 1 and imposing a lump-sum tax T on consumer's wealth that yields the same amount ot total tax revenue. Suppose the Hicksian demand function of good 1 is

$$h_1(p, u) = u \left(\frac{p_1}{\alpha}\right)^{\alpha-1} \left(\frac{p_2}{1-\alpha}\right)^{1-\alpha}$$

with $p_1, p_2, u > 0$ and $\alpha \in (0, 1)$. Derive the expression of the deadweight loss of commodity tax using the EV.