# EC 204 Micro II Note Week 4 L2 20/02/05

## 1. A Simple Bilateral Externality

Def. An externality is present whenever the well-being of a consumer or the product possibilities of a firm are directly affected by the actions of another agent in the economy.

- "direct" means the any effects that are mediated by prices are excluded. To see more check a *pecuniary externality* by Viner (1931)
- The setting:

partial equilibrium model. We consider two consumers, indexed by $i = 1, 2$, who constitute a small part of the overall economy. In line with this interpretation, we suppose that the actions of these consumers do not affect the prices $p \in \mathbb{R}^L$ of the $L$ traded goods in the economy. At these prices, consumer $i$'s wealth is $w_i$.

Additional assumption:

- each consumer has preferences not only over her consumption of L traded goods but also over some action h is in $R_+$ taken by consumer 1.
- $\partial u_2(x_{12}, \ldots, x_{L2}, h)/\partial h \neq 0.$

In what follows, it will be convenient to define for each consumer $i$ a derived utility function over the level of $h$, assuming optimal commodity purchases by consumer $i$ at prices $p \in \mathbb{R}^L$ and wealth $w_i$:

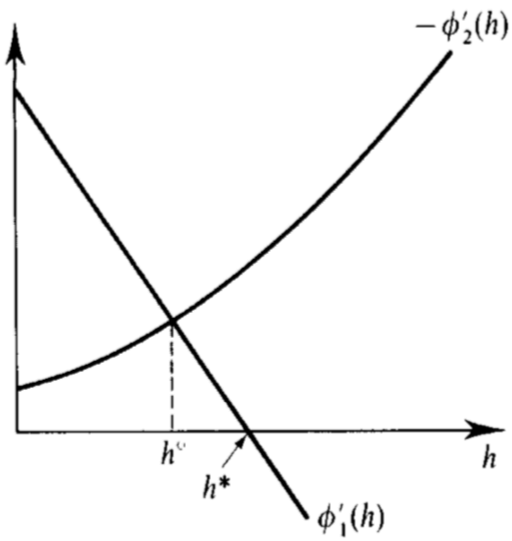
$$v_i(p, w_i, h) = \underset{x_i \geq 0}{\text{Max}} \quad u_i(x_i, h)$$
$$\text{s.t. } p \cdot x_i \leq w_i.$$

- Consumers' utility functions take a quasilinear form with respect to a numeracies commodity.

$v_i(\cdot)$ as $v_i(p, w_i, h) = \phi_i(p, h) + w_i$. (demand function is independent of wealth)

- $\phi_i(\cdot)$ is twice differentiable with $\phi_i''(\cdot) < 0$. Concavity

- Nonoptimality of the competitive outcome
  - If we are at a competitive equilibrium in which commodity prices are p, then it must be the case that consumer 1 chooses her level of h >= 0 to maximize $\phi_1(h)$.
    Thus, we have h* s.t
    $$\phi_1'(h^*) \leq 0, \quad \text{with equality if } h^* > 0.$$
    For interior solution, we have the equation equals 0
  - Think about a social planner's problem, the problem is to solve
    $$\underset{h \geq 0}{\text{Max}} \quad \phi_1(h) + \phi_2(h).$$
    The problem gives a $h^0$ s.t
    $$\phi_1'(h^\circ) \leq -\phi_2'(h^\circ), \text{ with equality if } h^\circ > 0.$$




    The graph shows a solution for a case in which h constitutes a negative external effect.

- Traditional solutions:
  - Quota and taxes: mandate that h to be no larger than $h^0$
  - Pigouvian Taxation, Pigou (1932)

Suppose consumer. 1 is made to pay of tax of $t_h$ per unit of h. The problem is to solve

$$\underset{h \geq 0}{\text{Max}} \quad \phi_1(h) - t_h h,$$

which has the necessary and sufficient first-order condition

$$\phi_1'(h) \leq t_h, \quad \text{with equality if } h > 0.$$

Given $t_h = -\phi_2'(h^\circ)$, $h = h^\circ$ satisfies condition (11.B.4) [recall that $h^\circ$ is defined by the condition: $\phi_1'(h^\circ) \leq -\phi_2'(h^\circ)$, with equality if $h^\circ > 0$]. Moreover, given $\phi_1''(\cdot) < 0$, $h^\circ$ must be the unique solution to problem (11.B.3). Figure 11.B.2 illustrates this solution for a case in which $h^\circ > 0$.

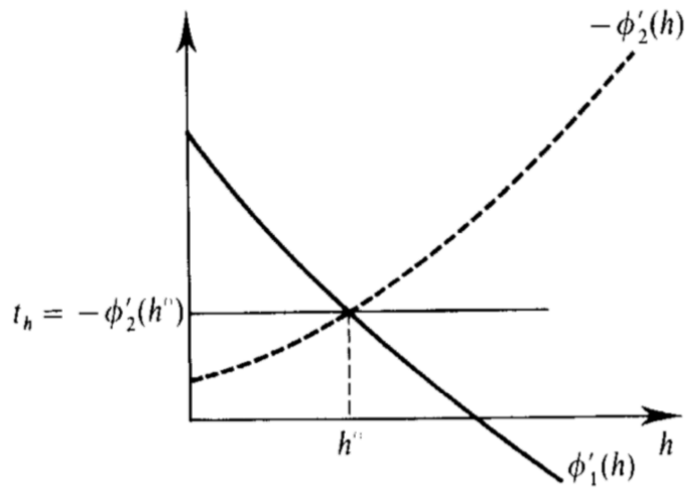



Figure 11.B.2 The optimality restoring Pigouvian tax

Notice that the optimality-restoring equal to the marginal externality at the optimal solution. **When faced with this tax. Consumer 1 is effectively led to carry out an individual cost benefit computation that internalizes the externality that she imposes on consumer 2.**

- A subsidy for the reduction of the externality combined with a lump-sum transfer can exactly replicate the outcome of the tax.
- It is essential to tax the externality-producing activity **directly**
- Big assumption: Government knows information about benefits and costs of the externality for the two consumers to set the optimal levels.