Lecture 10, Market failure

Varian 23 &24 (G & R 18).

When the conditions for existence of a competitive equilibria are satisfied, i.e., there is a complete set of markets, the production technology exhibits diminishing returns etc... , the first theorem of welfare economics ensures that this equilibrium is Pareto efficient. The assumption about a complete set of markets simplifies the analysis but is not always realistic. The absence of markets may in some cases give rise to serious economic inefficiencies.

Some causes of market failure

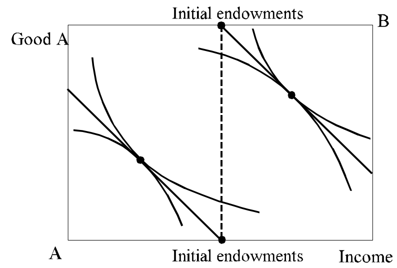
- imperfect excludability and non-transferability
- information and transaction costs
- costly bargaining

Imperfect competition may lead to inefficiency. However, efficiency is maintained with a perfectly discriminating monopolist. Inefficiency can be said to stem from an inability to price discriminate fully.

Similarly, the inefficiencies that can arise in the presence of positive or negative externalities can also ultimately be attributed to the factors mentioned above.

The Coase theorem

If bargaining is efficient parties can reach efficient allocations regardless of the initial allocation of endowments. Negotiations *between firms* will lead to the same allocation of the good with external effects no matter how property rights are assigned. Income levels will differ, however. For consumers the allocation of the externality good will be independent of the assignment of property rights only if there are no income effects. The graph below illustrates efficient bargaining outcomes with different property right allocations of good A (which is a bad for individual B).



In situations involving many parties efficient bargaining is unlikely and the government may intervene by imposing a tax or a subsidy that makes the decision maker bear the full social cost of her actions.

Externalities between firms - an example

$$\pi_1 = \max_x \; px - c(x)$$
$$\pi_2 = -e(x)$$

Optimization by 1: p = $c'(x)$

Social optimum: p = $c'(x) + e'(x)$

- If the firms have the same owner the effect is internalized.
- A Pigovian tax equal to the social mc also achieves efficiency.

The optimal level of x must be known to set the correct tax. If it is, a quantity regulation may be easier to implement.

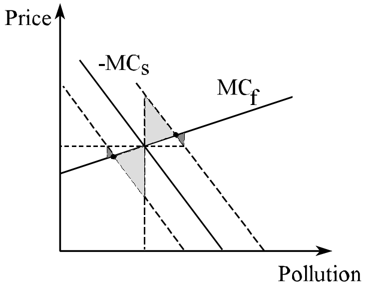
- Introduction of a market for the external effect leads to efficiency.

$$\pi_1 = \max_{x_1} \; px_1 + rx_1 - c(x_1)$$
$$\pi_2 = \max_{x_2} \; -rx_2 - e(x_2)$$

The FOCs for the firms' demand for x are: $p + r = c'(x_1)$ and $-r = e'(x_2)$. If the price r clears the market, $x_1 = x_2$, then $p = c'(x) + e'(x)$. (Here, $r < 0$ since x is a bad). The equilibrium allocation is independent of the assignment of property rights since there are no income effects here.

Inefficient allocation of abatement: Efficiency requires that all polluters face the same mc for abatement. Pigovian taxes and tradable permits ensure this.

Imperfect information: Welfare losses with price- and quantity-regulation when the mc of abatement is a linear function with uncertain intercept.



Here a quantity regulation yields the highest losses.

Public goods

Public goods (PG) are characterized by *non-rivalry* in consumption, i.e., one agent's consumption does not affect the availability for other agents. A PG is *optional* if agents can choose how much to consume otherwise, as in the case of pollution, it is *non-optional*.

Efficient provision: A discrete PG should be provided if the sum of the individuals willingness to pay exceeds the cost of providing the good.

Incentives to free ride on the contributions of others' may often make private provision of (discrete as well as continuous) PG inefficient.

Voting on the provision of a PG is one way of eliciting preferences. Voting can, however, give rise to cycles unless preferences are single peaked in which case the outcome is determined by the median voter. This outcome is efficient only if the median voter's marginal valuation equals the average marginal valuation in the population.

Continuous public goods

Non-rivalry in consumption implies that the total marginal willingness to pay for a PG is the sum of the individuals' *MRS* between the PG and all other goods. In an efficient allocation this must equal the *MC* for providing the PG. We can show this formally by noting that in a Pareto efficient allocation individual *i*'s utility is maximized s.t. given utility levels of others.

$$\max_{x_i, x_{-i}, G} u_i(x_i, G) \quad s.t. \; u_j(x_j, G) = \bar{u}_j \quad \forall j \neq i \qquad \sum x_j + c(G) = \sum w_j$$

$$L = u_i(x_i, G) - \sum_j \lambda_j (u_j(x_j, G) - \bar{u}_j) - \mu \sum_j (x_j + c(G) - w_j)$$

$$(1)\ \frac{\partial L}{\partial x_i} = \frac{\partial u_i}{\partial x_i} - \mu = 0$$

$$(2)\ \frac{\partial L}{\partial x_j} = -\lambda_j \frac{\partial u_j}{\partial x_j} - \mu = 0$$

$$(3)\ \frac{\partial L}{\partial G} = \frac{\partial u_i}{\partial G} - \sum \lambda_j \frac{\partial u_j}{\partial G} - \mu c'(G) = 0$$

$$(1) \Rightarrow \mu = \frac{\partial u_i}{\partial x_i} \qquad (2) \Rightarrow \lambda_j = -\frac{\mu}{\partial u_j / \partial x_j} \quad \textit{and}$$

$$(3) \Rightarrow \frac{\partial u_i}{\partial G} + \mu \sum \frac{\partial u_j / \partial G}{\partial u_j / \partial x_j} - \mu c'(G) = 0$$

Division by μ *yields*: $\sum MRS_j = c'(G)$

If $\sum MRS < MC$ and the supply of the public good is reduced by one unit then the cost reduction is more than sufficient to compensate all agents for the reduced supply of the public good.

Lindahl equilibrium

Each consumer i is assumed to truthfully report how much of the PG, say G, she would consume at the unit price t_i. Unless the reported Gs are equal the Lindahl mechanism raises the ts for agents with high G and reduces the ts for agents with low G. In equilibrium the ts are set so that all individuals demand the same G and the sum of the ts equals the marginal cost of providing the PG. Since agents choose G so that their marginal valuations equal the unit price the sum of the marginal valuation equals the marginal cost in equilibrium, i.e. efficiency obtains.

Problem: Agents have incentives to understate their valuation of the PG.

Preference revelation: The Clark-Groves-Vickers CGV mechanism

Agent i's valuation of PG provision is $v_i(G) = u_i(G) - s_iG$. Agents are asked to report their valuations as functions of G. The government then supplies G to maximize the sum of the reported valuations and pays each agent an amount equal to the sum of the other agents' valuations.

Since agent i chooses the report $b_i(G)$ to maximize

$$v_i(G) + \sum_{j \neq i} b_j(G)$$

the best he can do is to set $b_i(G) = v_i(G)$ in which case the government maximization problem coincides with i's.

To make the scheme less costly the government can tax agents. In order not to distort incentives the tax cannot depend on i's report. Let the tax equal the sum of all other agents' valuations measured at the G that would result if only their utility had been maximized. Thus, if the other agents' utility are not affected by i's report (which happens if i's report does not change G) this means that the side payment to i is withdrawn. If i's report hurts the other agents then i ends up paying the difference.

The scheme only works with quasi linear preferences. Otherwise payments influence the demand for the PG. Furthermore, since the proceeds of the taxation cannot be redistributed to the agents, for incentive reasons, they consume less than they potentially could.