Price Theory
Lecture 10: Theories of Market Failure

I. The Concept of Market Failure

The general term market failure is used to refer to situations in which the market, absent government intervention, leads to inefficiencies (specifically, losses in wealth, or Kaldor-Hicks inefficiencies). It is sometimes used to refer to any market outcome of which the speaker disapproves (such as income inequality), but that's a very imprecise use of the term.

There is an ambiguity in the term market failure. We usually evaluate efficiency relative to the perfectly competitive benchmark, because we know PC exhausts all opportunities for gain without any dead weight. The problem, of course, is that PC may be unattainable. If that's so, then by condemning a situation for failing to meet that benchmark, we're committing the Nirvana Fallacy. The Nirvana Fallacy is the error of condemning a situation because it fails to meet an impossible ideal.

So it's important to remember, when using the term market failure, that complete success may not be an option. A "failure" may still be the best of all possible worlds. To reach reasonable policy conclusions, it's necessary to engage in comparative institutional analysis, which looks at all the different options (market, various forms of government intervention) and compares them warts and all.

II. Imperfect Competition

As we've discussed extensively in previous sections, imperfect competition creates inefficiency (dead weight loss) relative to perfect competition. In general, the DWL results from price being set greater than marginal cost.

The usual remedy proposed for imperfect competition is antitrust regulation, under which the government prohibits and punishes cartelization and price setting, and sometimes even breaks up monopolies.

Of course, in making the decision about whether to inhibit greater concentration in an industry, the government considers (or should consider) the countervailing factors we talked about earlier -- specifically, that greater concentration may allow greater economies of scale. In addition, our discussion of game theory and strategic behavior indicates that collusion, when it occurs, is likely to be a transitory phenomenon.

III. Externalities

An externality is a cost or benefit for a party not directly involved in a transaction. Externalities can be negative, if a cost is imposed on a third party, or positive, if a benefit is accrued by a third party.
The prototypical negative externality is pollution, such as smoke emitted into the air or sewage poured into the water. To an economist, using air and water in this way is not necessarily a bad thing. Air and water are resources like any other, and sometimes their highest marginal value may come from using them in industrial processes. (If this is not apparent, imagine a world with no man-made pollution whatsoever -- it would also be a world with no industry.) So the question to an economist is whether these resources are being used optimally.

To assure optimal usage of a resource, it must be the case that a price is paid for it that covers its opportunity cost. For instance, if a car maker wants to use iron, it must purchase the iron on world markets, and the price on the world iron market reflects the value of the iron in other uses. What makes air or water different from other resources, like iron, is that air and water are typically not paid for.

When there is a factor of production that the firm does not have to pay for, that means the market supply curve does not represent the full marginal cost of production. (Remember that the firm's short-run supply curve is actually the same as its MC, so long as the price is high enough for the firm not to shut down.) We must therefore distinguish between private cost (as reflected in the market supply curve) and social cost. In general,

\[ \text{social cost} = \text{private cost} + \text{external cost}. \]

As with any other type of input cost, we are most concerned with its marginal effect. So we can also say,

\[ \text{marginal social cost} = \text{marginal private cost} + \text{marginal external cost} \]

\[ \text{MSC} = \text{MPC} + \text{MEC} \]

In general, the MPC is represented by the market supply curve. The MSC curve lies above the supply curve, representing the addition of external costs.

![Diagram](image-url)
The market level of output is inefficiently large. The units from $Q^*$ to $Q_{mkt}$ actually cost more to produce than consumers are willing to pay, because MSC is above D. This means there is a loss in wealth due to overproduction, akin to DWL; it is the triangle between S and D, to the right of $Q^*$, and to the left of $Q_{mkt}$, as shown by the shaded area below:

Possible solutions:

- The most commonly proposed solution is the **Pigou tax**. A Pigou tax would tax a polluter a per-unit amount equal to the marginal external cost of the $(Q^*)$th unit. That is, have a per-unit tax of $t = MSC - S$, at the quantity $Q^*$. The idea here is to internalize the external cost by charging for use of the unpriced factor of production. It's like having the government act like the owner of the air or water and charge firms for using it. The main difficulty here is an information problem: how can the government determine the appropriate size of the tax? Normally, we rely on the market to tell us the cost of an activity or resource -- but here, the problem is precisely that no market exists for the resource in question, so we can't really know how much it's worth to people.

- Another proposed solution is **pollution permits**. The government would set some maximum quantity of the polluting activity that could be done, and then allow the permits to be sold and traded on the market. This proposal has the advantage of allocating the right to pollute to those who value it most.

Example: If Firm A can reduce pollution by a certain amount at a cost of $1,000,000, while Firm B can reduce pollution by the same amount at a cost of $1,500,000, clearly Firm B would be willing to pay more for the right to pollute that amount. In an auction, Firm B would outbid Firm A for the pollution permit. (Or, if A already owned the permit, both firms could gain if A sold the permit to B for a price between $1 million and $1.5 million.) The result would be that Firm A, the firm that can reduced pollution at the lowest cost, will do so.
The main disadvantage of this approach is picking the right **quantity** of permits to create. This is simply the alternative to picking the right **price** (tax), and it poses many of the same informational difficulties.

- Finally, there is the possibility of **tort liability**. In this approach, people harmed by pollution (or other external effects) would sue polluters for the damage caused by their activities. The polluters would anticipate the damage awards and include them in cost calculations. One advantage of this approach is avoiding the problem of setting an overall pollution cap or setting an optimal tax. In addition, the damages would be paid to the actual victims, rather than the government. But the informational problem raises its head again here, because the courts would need to assess the damage done to each victim in monetary terms. Furthermore, there could be huge negotiation and coordination problems associated with large-scale class action suits.

Positive externalities occur when goods or services produce benefits for people other than the paying consumer. One often cited example is education: while the student certainly benefits, other people (society at large) also benefit because an educated person is, on average, less likely to rely on public welfare or become a criminal.

The question with positive externalities is not whether the good/service will be provided, but whether it will be provided optimally. Just as goods/services with negative externalities tend to be over-provided, those with positive externalities tend to be under-provided.

The existence of positive externalities implies that the market demand curve does not account for the whole dollar value of the good/service being provided, only the dollar value to the buyers. So we say the marginal social benefit is greater than the marginal private benefit:

\[
\text{marginal social benefit} = \text{marginal private benefit} + \text{marginal external benefit} \\
MSB = MPB + MEB
\]

We can represent this in a supply-and-demand graph with a MSB curve that is higher than the demand curve. The result is that the price is inefficiently low and the quantity is also inefficiently low.
While taxation is the usual proposed solution for negative externalities, subsidy is the usual proposed solution for positive externalities. Depending on whether the subsidy is given to the providers of the service (say, a subsidy given to schools based on number of students) or to the consumers (such as in a voucher program), the subsidy could shift either supply or demand. The effect is the same: quantity increases, hopefully to the optimal level. The amount of the subsidy should be equal to the difference between demand and MSB at Q*. (Does price go up or down? It will go down for the consumer, up for the producer, with a difference between them equal to the subsidy.)

Note that a subsidy is not the same as having the government produce the good or service. A public school system is not really a straight-up subsidy in the sense described above. Rather, it is a subsidy directed to particular schools (the government-run ones), giving them a cost-advantage over their private competitors.

IV. The Coase Theorem (or, why all of the above is wrong)

In a famous 1954 paper, Ronald Coase pointed out that much externality analysis essentially fails to consider opportunity cost. When we say that a third party is not a party to the transaction that creates an externality, the relevant question is, why not? If people are willing to pay money not to be exposed to an externality (and for the MSC analysis to be true, they must be), then whoever creates the externality is forgoing whatever payment they could receive. Remember that opportunity cost is more than just explicit costs -- it also includes forgone income, such as when a firm could rent out the capital equipment it owns to others. So by the same token, opportunity cost should also include forgone payments from people who wish to avoid external effects.

An example: Suppose a railroad passes by a parcel of farmland. Trains passing by throw sparks on the crops, causing $3000 in damage each year. It would cost $1000 per year to
install spark catchers on the trains. Clearly, it would be efficient for the catchers to be installed. So what happens?

- Legal Rule 1. The farmer has a legal right to full compensation if the railroad damages his crops. Then the railroad will install the spark catcher, because it's better to pay $1000 than $3000.
- Legal Rule 2. The railroad has a legal right to throw sparks without paying compensation. Then the farmer will be willing to pay as much as $3000 to the railroad to install the catcher, and the railroad will accept any payment of $1000 or greater to do so. So there are mutual gains from trade to be exploited, and the parties will exploit them.

Either way, the catcher gets the installed, regardless of the legal rule in effect. And since installation of the spark catcher costs less than the damage caused by sparks, that is the efficient outcome.

But what if I'd picked different numbers? Suppose that it actually costs $3500 to install a spark catcher. In that case, it's more efficient to throw sparks than to install the spark catcher. Under Legal Rule 1, where the farmer has a legal right to compensation for damages, the railroad will choose to pay the damages instead of installing the spark catcher. Under Legal Rule 2, where the railroad has a right to throw sparks, the farmer will not be able to offer the railroad enough to induce it to install the spark catcher, so the railroad will just throw sparks. Either way, the efficient outcome occurs.

Actual statement of the Coase Theorem: in an externality situation, agents will voluntarily negotiate to an efficient outcome privately, if three conditions hold:

- property rights are well defined (i.e., it's clear whether or not someone has a right to pollute and how much)
- property rights are transferable (i.e., you can pay for a right to pollute or pay someone not to pollute)
- transaction costs are zero or close to zero (i.e., it costs nothing to negotiate, write up, and enforce a contract specifying the terms of any transfer of rights).

The lesson of the Coase Theorem: just because an external cost is not an explicit cost doesn't mean it's not an opportunity cost. Under Legal Rule 2 in the example above (with the original numbers), the railroad would be foolish not to consider the opportunity cost of not installing the catcher, which is the forgone payment from the farmer. To the extent that external costs are real -- meaning they cause true reductions in wealth -- the people who experience them should be willing to pay not to experience them.

Note: The Coase Theorem shows that (under specified conditions) the distribution of legal rights is irrelevant to efficiency, but it is not irrelevant to the distribution of wealth. Who ends up with the saved wealth depends on the legal rights and the payments negotiated.

So, does the Coase Theorem imply that externalities are not a problem? No, because the conditions may fail.

- Property rights may not be well defined, if courts have not specified the rules clearly.
• Property rights may not be transferable, if (say) the courts will not enforce contracts like the ones we've talked about.
• Most importantly, transaction costs be large. Negotiations, contract-writing, etc., may be very expensive. Moreover, they become increasingly large as the size of the relevant population increases. Imagine having to arrange a contract among all those who suffer from air pollution and all those who create it! Thus, what the Coase Theorem really does is make us realize when externalities are most likely to be a problem: when transaction costs are large.

V. The Tragedy of the Commons

This term, coined by Garrett Hardin, refers to the fact that many situations of negative externalities and overuse of resources are attributable to the existence of an open-access resource, also known as a commons.

In many towns in New England, they used to have a common grazing area called the "commons" (as in "Boston Common"). Everyone could graze as many sheep on the commons as they wanted. This created an externality problem: if you put a sheep on the commons, you got all the benefits (more and fatter sheep) while the costs (in terms of the impact on the other sheep and the land quality) were spread out among all the other people of the town. This led people to keep on putting more sheep out to graze for long past the point at which the marginal benefits exceeded the marginal social costs. The result was massive overgrazing. The commons' condition was typically much worse than that of similar but privately owned land, where one person would experience all the costs and benefits.

The tragedy of the commons has the structure of a prisoners' dilemma. Consider the following stylized version of the problem, where the resource in question is a magic hat. There is $1000 in the hat. Whatever amount of money is left in the hat at midnight will increase by 50% (so if it's all left in there, it will increase to $1500). Two people each have the right, once per day, to reach in the hat and take as much as they can. If both reach at once, they split the money. The resulting game looks like this:

<table>
<thead>
<tr>
<th></th>
<th>Take</th>
<th>Wait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take</td>
<td>500, 500</td>
<td>1000, 0</td>
</tr>
<tr>
<td>Wait</td>
<td>0, 1000</td>
<td>750, 750</td>
</tr>
</tbody>
</table>

Notice that each person has a dominant strategy: Take. So the dominant strategy equilibrium is Take-Take. Yet both would be better off if they both waited.

This type of structure turns out to be very common in situations where valuable resources are commonly (instead of privately) owned.
• Fisheries
• Harvesting of ivory from African elephants. Why should a poacher set free a baby elephant instead of killing it for its tusks now? The benefits of killing it now are small but assured. The benefits of waiting are spread out among all the other
poachers who might capture this elephant as an adult. The result of these incentives has been dwindling elephant herds in all countries in Africa that have banned ivory hunting. The only nations with increasing herd sizes are those that have privatized elephant herds by vesting property rights in local tribes.

VI. Public Goods

A public good is a kind of extreme positive externality situation. Technically, a public good is characterized by two features:

- **Non-excludability:** non-payers cannot be excluded from consuming it. (E.g., once the nation's borders are protected, no one inside those borders can be excluded from that protection.)
- **Non-rivalry:** one person's consumption of the good/service does not diminish anyone else's consumption of it. (E.g., adding one more person inside the nation's borders does not cause the rest of us to get less protection.)

Together, these features create a situation in which we expect that the good/service will not be provided privately, or at least won't be provided optimally. We can see why by using, once again, a game theoretic approach. Consider the service of mosquito abatement in a neighborhood consisting of two people. Each $10 worth of treatment gives $7 worth of benefit to each person (for a total of $14 social benefit). Each person can choose whether to contribute $10 or not. Then we get the following game:

<table>
<thead>
<tr>
<th></th>
<th>Contribute</th>
<th>Don't</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribute</td>
<td>4, 4</td>
<td>-3, 7</td>
</tr>
<tr>
<td>Don't</td>
<td>7, -3</td>
<td>0, 0</td>
</tr>
</tbody>
</table>

(Each payoff represents private benefits from all spending on mosquito abatement, minus whatever payment one has made. For example, if both contribute, then you get $7 benefit from your contribution, plus $7 benefit from the other guy's contribution, minus your $10 contribution, for a net benefit of $4.) Here, we see that each person has a dominant strategy of not paying, so the dominant strategy equilibrium is don't-don't. We call this a free rider problem. When everyone free rides, none of the public good is produced; yet everyone would be better off if everyone contributed. (Notice that this is yet another economic situation with the form of a prisoners' dilemma.)

The existence of a public good is generally perceived as an argument that government should provide the good in question. It is not true, however, that public goods are never provided privately. Many public goods are provided by private organizations and businesses through contractual means -- e.g., seating areas, bathrooms, and A/C in a private mall, or security and mosquito abatement in managed housing developments. Such solutions are actually examples of the Coase Theorem in action, in a somewhat different way. People realize they are in a prisoners' dilemma, and they negotiate a contractual way around it to maximize the mutual gains.
As in the previous discussion of externalities and the Coase Theorem, the issue ends up being one of transaction costs. The instances above of privately provided public goods are cases in which the transaction costs were apparently low enough to allow a private solution. But it would be effectively impossible for a much larger population -- like that of a whole nation -- to organize in a similar way at low cost. Government is, of course, a way of providing public goods by non-private means. But government is costly, too, so this doesn't really escape the transaction cost problem. To make a fair comparison and avoid the Nirvana fallacy, we have to consider the costs and benefits of all different approaches to the problem.