Tradeable pollution permits

The government issues a fixed number $N$ of pollution permits per year, each worth $M$ tons of pollution.

Firms sell and buy pollution permits. An equilibrium price of pollution permits is established.

When a firm emits the pollution, it turns in the permit to the government.

Advantages of pollution permits over a corrective tax

With full information, pollution permits can be made equivalent to a corrective tax.

When government does not have full information about the firms’ costs of reducing pollution, issuing pollution permits allows certainty about the amount of emissions, corrective tax does not.

Consider the following situations and state whether they involve an externality or a pecuniary externality (which is not an externality). For those that involve an externality, suggest possible methods of arriving at the efficient allocation.

1. A city in a developing country suddenly becomes a popular vacation spot for wealthy foreigners. This drives the housing prices in the city up.

2. An influential political TV show has recently started being broadcasted on Youtube for free. This raises the number of people voting for a particular candidate.

2. A new vaccine against the flu is developed.

Ways to arrive at the efficient solution when there is an externality

1. Private solutions

   a. moral codes, social sanctions – people enforce rules about externalities on themselves.

   b. private charities
c. integrating businesses – when both the creator of the externality and the party affected by the externality are businesses, the efficient outcome will be achieved by merging the businesses.

d. negotiation over the externality: Coase theorem states that when there are no bargaining or transactions costs, the affected parties to an externality will arrive at an efficient outcome without government intervention. Government’s only role is to assign property rights. The efficient outcome arrived at is independent of the prior distribution of property rights.

Caveats:

i. When number of affected parties is large (> 7) negotiation becomes difficult and may break down because coordination of the many agents is difficult.

ii. Possibility of extortion – if the cost of creating a negative externality is less than the compensating amount paid for not creating the externality, the externality-producing party may continually threaten to produce the externality unless paid. Here government intervention becomes necessary.

iii. Transaction or bargaining costs may prevent an efficient outcome from being achieved.

2. Public solutions

a. Corrective taxes/subsidies

If production or consumption of a good creates a negative externality, a tax per unit of good sold the size of the external effect will lead to the efficient outcome.

If production or consumption of a good creates a positive externality, a subsidy per unit of good sold the size of the external effect will lead to the efficient outcome.

Examples: Robert listens to extremely loud music in his dorm room at 5 am. What good should be taxed, and how much, to bring about the efficient outcome?

Person A owns a gun, increasing person B’s risk of being shot. What good should be taxed and how much to bring about the efficient outcome?
When a child is healthy, they attend school more often, getting more out of their education than if they are often sick. What good should be subsidized to bring about the efficient outcome?

b. Tradeable pollution permits

With perfect information, effect is similar to tax: Whatever the number of pollution permits issued, there is a tax that leads to the same amount of pollution being emitted – efficient level.

With imperfect information about the firms’ costs of pollution abatement, tradeable pollution permits may be better than a tax: The amount of pollution can be set by the government. With a tax and unknown cost of pollution abatement, the government will not know beforehand the amount of pollution to be emitted.

It must be possible to measure how much pollution a firm emits to use this method.
Comparison of corrective tax with tradeable pollution permits

In the case with the tax, supply curve for pollution rights is a horizontal line at the tax per unit size. Firms can pollute as much as they want at a price of the tax.

In the case with pollution permits, the supply curve for pollution rights is a vertical line at the number of permits (if each permit allows 1 unit of pollution).

Both pollution permits and a tax are better than command and control policies because they allow pollution to be reduced at a lower cost – the firms with a lower cost of pollution reduction will reduce more than the firms with a higher cost of pollution reduction. Under command and control policies, all firms must reduce by the same amount.
12. There are three industrial firms in Happy Valley.

<table>
<thead>
<tr>
<th>Firm</th>
<th>Initial Pollution Level</th>
<th>Cost of 1 unit pollution reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>70 units</td>
<td>$20</td>
</tr>
<tr>
<td>B</td>
<td>80 units</td>
<td>$25</td>
</tr>
<tr>
<td>C</td>
<td>50 units</td>
<td>$10</td>
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</tbody>
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The government wants to reduce pollution to 120 units, so it gives each firm 40 tradeable pollution permits.

a. Who sells permits and how many do they sell? Who buys permits and how many do they buy? Briefly explain why the sellers and buyers are each willing to do so. What is the total cost of pollution reduction in this situation?

b. How much higher would the costs of pollution reduction be if the permits could not be traded?

International trade

Assume the domestic country is small relative to the rest of the world. Then the entry of that country into the world market does not affect world prices.

When a country allows international trade for a good and the world price of that good is different than the domestic price of that good, total surplus increases. This is due to the principal of comparative advantage.

When the world price for a good is higher than the domestic price of that good, the country becomes an exporter of that good. Domestic price rises to equal world price. Consumer surplus decreases, producer surplus increases and total surplus increases.

When the world price for a good is lower than the domestic price of that good, the country becomes an importer of that good. Domestic price falls to equal world price. Consumer surplus increases, producer surplus decreases and total surplus increases.
The effects of a tariff

When a country’s domestic price in autarky is higher than the world price, it may impose a tariff on imported goods to raise producer surplus.

The tariff has the effect of raising the world supply curve to equal world price plus the tariff. Relative to the free-trade, no-tariff situation, producer surplus increases, consumer surplus decreases, government revenue increases and total surplus decreases.

Arguments against free trade:

Jobs are lost when other countries can make a good more cheaply.

Yes, but more jobs are created in sectors that a country is comparatively better in.

National security may be at risk if a country does not produce vital goods itself – world situations may make it impossible to import these goods (such as food) at times when they are most needed.

This argument may be valid for some cases (like basic food), but is overused by other industries.

Infant industries may need the protection of a tariff to keep the prices of their goods high when they are starting out. Once they learn how to decrease their costs, the tariff can be removed.

This argument is not valid. If an industry thinks it can make profits in the long run, it can borrow to cover its costs when it is starting out, they pay back the loans when its costs become lower.

It is inefficient for the government to decide which firms are likely to be profitable, because it is costly to collect information about firms’ potential future costs. Firms themselves know this better than the government.

Other countries may be giving unfair competition. For instance a foreign country may subsidize its steel industry, thus allowing the industry to produce at a lower cost than the domestic steel industry. Then should the domestic country impose a tariff on steel imports to raise the price of foreign steel?
The benefit to consumers due to lower price of steel outweighs the negative effect on domestic producers due to the lower price of steel, regardless of whether the lower price is due to a subsidy or not. Total surplus is higher in the home country without a tariff than with a tariff, regardless of whether the foreign country is subsidizing its steel.

Protection could potentially be used as a bargaining chip. The home country could threaten to impose a tariff on foreign steel unless the foreign country removes a tariff on domestic wheat.

But imposing a tariff reduces domestic total surplus. So it is a bad idea to impose a tariff, and the threat of the tariff would be an empty threat.

Taxes

When there are no externalities, taxes cause deadweight loss unless one of the curves is perfectly inelastic (vertical). But when there is a negative externality a tax can remove the deadweight loss due to the externality.

Consider the case of no externalities.

The size of the deadweight loss due to a tax depends on the slopes of the supply and demand curves. If supply and demand curves have low slopes, the deadweight loss due to a tax of a given size is larger. If supply and demand curves have high slopes, the deadweight loss due to a tax of a given size is smaller.

The size of deadweight loss increases proportionally to the size of tax squared.

The amount of tax revenue increases, then decreases as the size of the tax increases. The curve graphing tax revenue as a function of size of the tax per unit is called the Laffer curve.

Showing the effects of a tax

The tax places a wedge between the amount paid by the buyer and the amount received by the seller. The amount paid by the buyer is higher than the amount received by the seller. The amount received by the seller is lower than the pre-tax equilibrium price, and the amount paid by the buyer is higher than the pre-tax equilibrium price.

The tax incidence on the buyer is the amount paid by the buyer minus the pre-tax equilibrium price. The tax incidence on the seller is the pre-tax
equilibrium price minus the amount received by the seller.

When supply curve is less elastic than demand curve, the tax incidence on the seller is greater than the tax incidence on the buyer. When demand curve is less elastic than supply curve, the tax incidence on the buyer is greater than the tax incidence on the seller. When one curve is perfectly inelastic, the entire tax incidence falls on that side of the market – the other side is unaffected by the tax.

In general, consumer surplus decreases due to a tax, producer surplus increases due to the tax, and government revenue increases, but not enough to make up for the decreases in producer and consumer surplus.

Price ceilings and price floors

A binding price ceiling is represented by a horizontal line below the equilibrium price. A binding price floor is represented by a horizontal line above the equilibrium price.

When a price floor binds, the amount demanded at that price is lower than the amount supplied at that price. Thus there is a surplus. An important example of a price floor is the minimum wage. For minimum wage jobs, there are more workers willing to work at the minimum wage than there are jobs available. The jobs must be allocated among the workers somehow. One problem that could arise is that the jobs are allocated in a discriminatory way. Another problem caused by a higher minimum wage is that more high-school students may drop out of school to take a minimum-wage job.

When a price ceiling binds, the amount demanded at that price is higher than the amount supplied at that price, creating a shortage. The scarce good must be allocated somehow among the many people who want it at that price. One way to do this is by lines (such as for gasoline). This wastes people's time waiting. Another way to allocate the goods is through some kind of discriminatory practice (like for apartments), which requires additional laws to ban that kind of practice.

Binding price ceilings and price floors create inefficiency which can be measured by deadweight loss. For binding price ceilings, this inefficiency is due to the good not going to those who value it most highly. For binding price floors, this inefficiency is due to the good not being produced by those who can do it at the lowest cost.