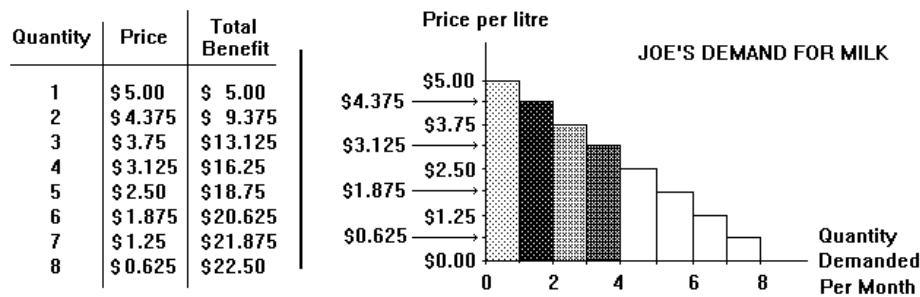


## STUDY GUIDE—RENTS AND EXTERNALITIES

### 1. The Benefit From Consumption: Consumer Surplus

We begin by developing the idea that the gross benefit to an individual from consuming a commodity is the area under the demand curve to the left of the quantity consumed. This represents the amount of other goods that the consumer is willing give up, measured in dollars, to consume that quantity of the good. The opportunity cost of consuming that quantity is the total amount spent—price times quantity—and the excess of the gross benefit over the amount spent is the consumer surplus or **consumer rent**. The last unit consumed will have a value equal to the price paid—this is the marginal benefit—and a marginal cost that is also equal to the price paid. This is shown in Figure 1.1 The consumer thus adds to her consumption of the commodity to the point where the marginal benefit from consuming it equals the marginal cost.

FIGURE 1.1:

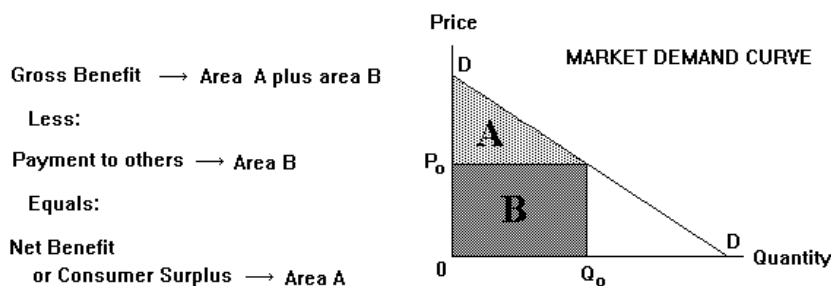


- The marginal benefit of each unit equals its price indicated on the demand curve.
- The total benefit is the sum of the marginal benefits of all units consumed.
- The total benefit is thus the area under the demand curve up to the quantity consumed.

When we horizontally add the demand curves for all consumers we obtain a market demand curve. The area under this curve to the left of the quantity consumed represents the gross benefit to all consumers from consuming this quantity, the area representing price time quantity is the alternative opportunity cost and the area under the demand curve and above the price paid equals their consumer surplus. The situation for the aggregate of consumers is portrayed in Figure 1.2.

It must be noted here that the size of these areas will depend on the distribution of income among consumers—if we were to redistribute income from consumers who like this good a lot to consumers who like it less, the quantity demanded will decline at each price (assuming the good is a normal good) as will the area under the demand curve and the consumer surplus. While consumer surplus thus provides a good qualitative picture of the social benefit from consuming a commodity the actual quantitative magnitudes must be viewed cautiously.

FIGURE 1.2:

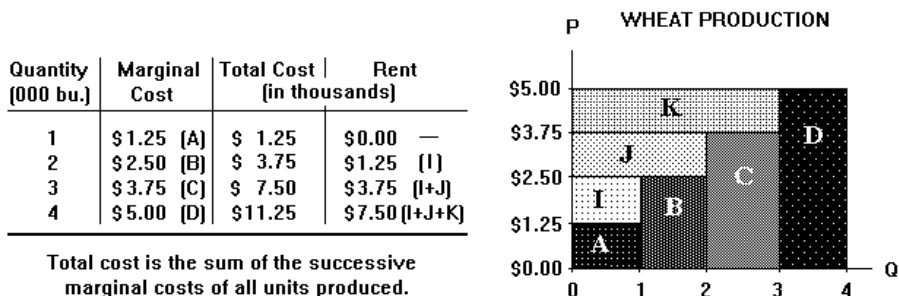


It also should be noted that the benefits represented by the area under the demand curve are the benefits solely to the individuals consuming the product. People not consuming the product may feel worse off or better off because other people are consuming it—examples might typically be heroin and bibles. These benefits, positive or negative, are not measured by the area under the demand curve and are called **consumption externalities**.

## 2. Opportunity Costs and Rents

The total revenue received by producers can be divided into two parts—opportunity costs and rents. This is illustrated for the case of an agricultural product in Figure 2.1.

FIGURE 2.1:

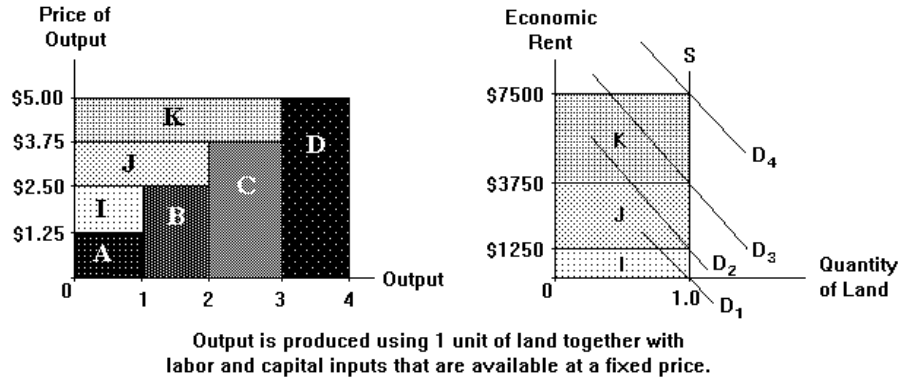


Because of **diminishing returns** in the application of labor and capital to land, successive increments of output require increasing quantities of labor and capital inputs and are therefore produced at increasing cost. The marginal cost is the cost of adding one unit to output. The total cost of a given level of output is the sum of the marginal costs of producing the successive units and is therefore represented by the area under the supply curve to the left of the quantity produced. This area represents the alternative opportunity cost of producing the specified quantity of output—the dollars worth of labor and capital used and hence the dollar amount of other goods that could have been produced by using this labor and capital elsewhere in the economy. Since the price must be high enough to induce producers to produce

the last unit, it will be above the costs of producing the intramarginal units. The difference between the total revenue (price times quantity) and total cost (sum of the marginal costs) is **economic rent** to the fixed quantity of land. Economic rent is the area over the supply curve and under the price received by producers.

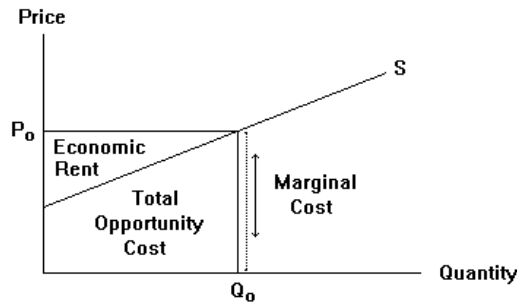
The rent to a fixed quantity of land can also be shown on a graph representing the supply and demand for land as in the right panel of Figure 2.2.

**FIGURE 2.2:**



Economic rent can be taxed away without affecting production of the good—as long as the producer receives a price for each unit sufficient to cover the marginal cost of that unit, the unit of output will be produced. The results thus far are summarized in Figure 2.3.

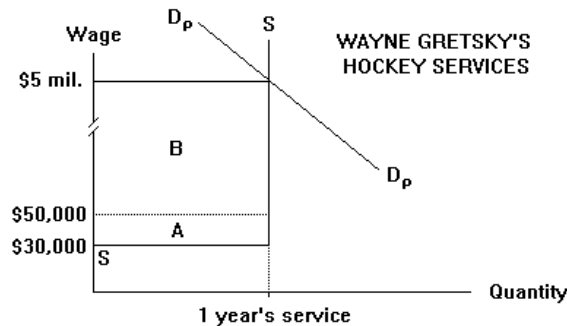
**FIGURE 2.3:**



It must be noted that rents can be received for other inputs than land. For example, famous musicians and athletes will typically be able to earn more from using their talents in music and sports than from using them in their next-best-paying occupation. This difference is economic rent because, assuming that these people find music and sports no more odious than other occupations, it could be taxed away without affecting their behavior—it is excess over what is necessary to get them to perform the activity, just as the rent from intramarginal units of land is unnecessary to get the land-owner to use it in production.

An example constructed with reference to hockey-player Wayne Gretsky is presented in Figure 2.4.

**FIGURE 2.4:**



It is assumed that Wayne’s next best alternative to having a hockey career is sales, paying an income of \$50,000 and that he loves the game so much that he would be willing to play professionally rather than work elsewhere for \$30,000. Yet the demand for Wayne’s services as a professional hockey player is such that his equilibrium wage under free bidding of teams for his services would be \$5,000,000. The interesting issue is whether Wayne gets the rents for his services or these rents are captured by the team that “owns” his rights.

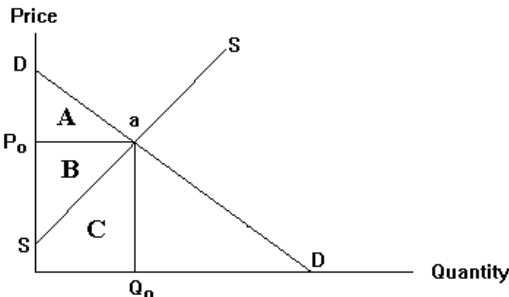
The strikes and strike-threats of players’ associations in professional sports are typically the result of fights with team-owners over who gets the rents from players’ services.

### 3. Putting It Together: The Gain From Trade

On the question of what level of output is socially optimal, the economist is limited to commenting on issues of efficiency. Though economists can often say something about how a particular development will affect the distribution of income, economics provides no information on whether a particular distribution of income is good or bad—this requires value judgments.

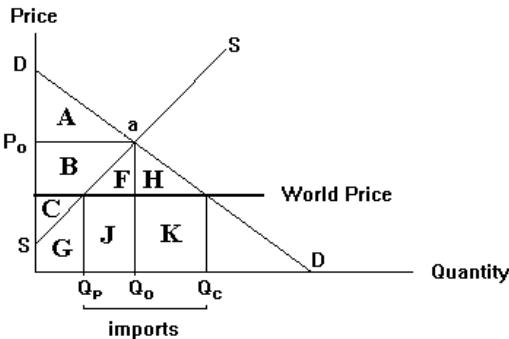
The efficiency gain from consuming a particular product can be analyzed with reference to Figure 3.1. The socially efficient level of output is that quantity that maximizes the sum of the consumer and producer surpluses. It is the most efficient output level because the marginal social benefit of producing and consuming another unit equals the marginal social cost. There is no guarantee, however, that as output is increased to the efficient level from below everyone in the society gains—all that can be said is that with appropriate distribution of the consumer and producer surplus, everyone **can** gain.

**FIGURE 3.1:**



Now consider the possibility that the residents of a country or local area can purchase and sell the commodity on the world market at a fixed price. This situation is analyzed in Figure 3.2.

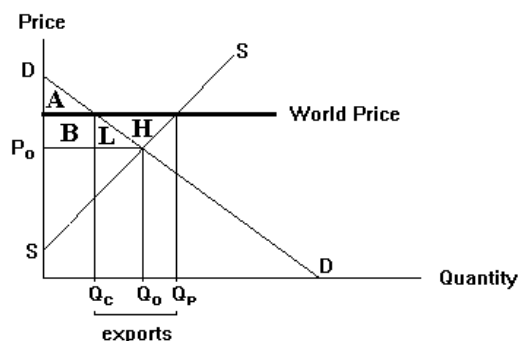
**FIGURE 3.2:**



There is an efficiency gain by reducing domestic production and increasing domestic consumption, importing the difference from abroad. Taking advantage of this opportunity leads to a loss to domestic producers that is more than offset by a greater gain to domestic consumers.

An efficiency gain also results when the world price is above the domestic free market price, as shown in Figure 3.3. In this case, however, consumers lose and producers gain, with producers gaining more than consumers lose.

**FIGURE 3.3:**



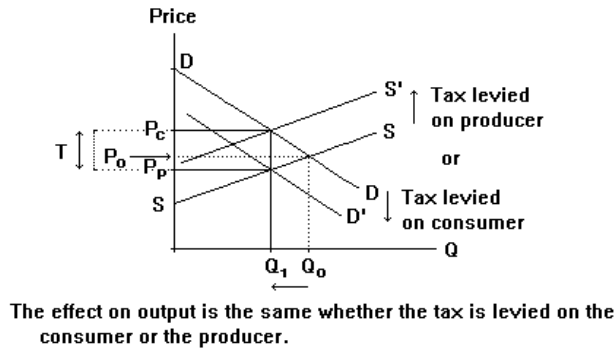
Consumption externalities aside, it is always possible for the community to gain from moving to free trade from a no trade situation. Everyone gains, however, only when appropriate compensation is made. Since the losers are rarely compensated in these situations we cannot say that free trade is unambiguously beneficial without making value judgments about income distribution. **Rent seeking** invariably occurs as the gainers and losers try to convince the government and the general public that trade enhancements or restrictions are in the public interest. When imports displace domestic production, the losers are typically a small group of resource owners each of whom loses substantially while the gainers are a large group of consumers who each gain a tiny amount. Producers have a strong incentive to form a trade association and fight while consumers probably don't even know that they gain from free trade in the commodity. When domestic production expands for export at high world prices, and domestic consumers are forced to pay those higher prices, a small group of producers gain large amounts and a large group of consumers each lose small amounts. Again there is a payoff for producers to organize but not for consumers.

Potential efficiency gains and losses appear everytime technological change occurs and everytime the government does something, whether or not trade is expanding or contracting. If the government were to stop, or try to stop, all changes in the economy from which someone loses the result will be paralysis, with no improvements through time from the growth of technology. On the other hand, if all efficiency gains are relentlessly pursued without compensating the losers a large fraction of the public will gain more from the improvement of overall efficiency than they lose from the the elimination of those particular inefficiencies that benefit them. Nevertheless some will suffer net losses. What course to follow is a choice that must be made through the political system.

#### 4. The Incidence of Commodity Taxation

To finance its expenditures the government must levy taxes. Sometimes it is useful to tax the production, consumption, or sale of particular commodities. We now show that, despite superficial appearances, it makes no difference whether a given tax is levied on the consumers or producers of the particular commodity. The analysis is conducted with reference to Figure 4.1. The tax can be viewed as driving a wedge between the price paid by the consumer and the price received by the producer.

**FIGURE 4.1:**



The proportions of the tax revenue ultimately paid by consumers and producers out of their respective rents depends on the slopes of the demand and supply curves for the commodity. This is shown in figures 4.2, 4.3, 4.4 and 4.5. In all cases where either the demand curve or the supply curve is not vertical there will be an efficiency loss from the tax.

**FIGURE 4.2:**

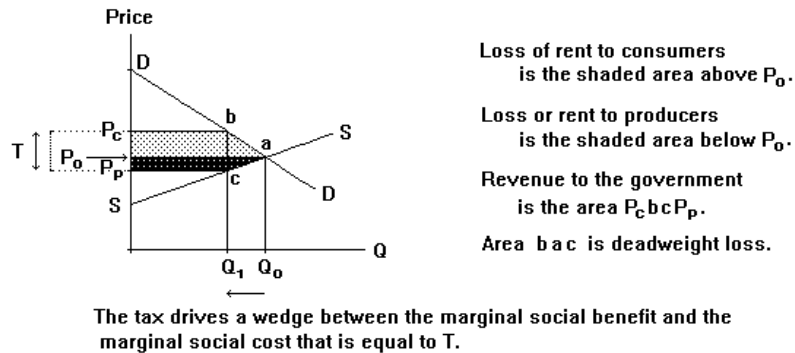
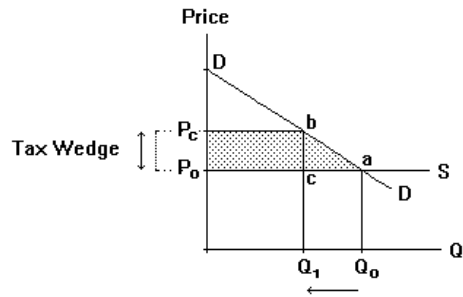


FIGURE 4.3:

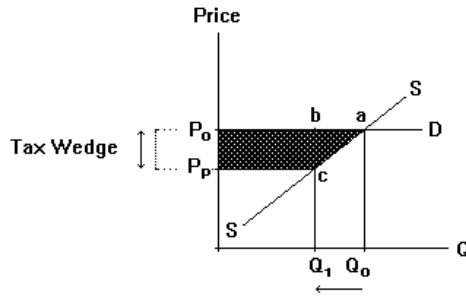


The entire burden of the tax is shifted up onto consumers, who lose the shaded area.

The government obtains the revenue  $P_c b c P_0$ .

The deadweight loss is the area  $b a c$ .

FIGURE 4.4:

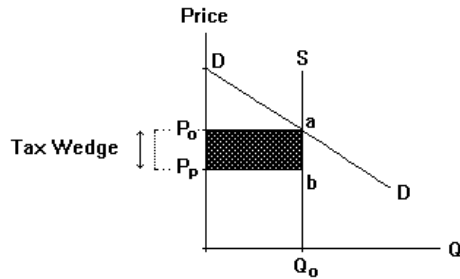


The entire burden of the tax is shifted down onto producers, who lose the shaded area.

The government obtains the revenue  $P_0 b c P_p$ .

The deadweight loss is the area  $b a c$ .

FIGURE 4.5:



The entire burden of the tax is shifted down onto the producer, who loses the shaded area.

The government obtains the revenue  $P_0 a b P_p$ .

There is no deadweight loss—all the producers' revenue is rent.

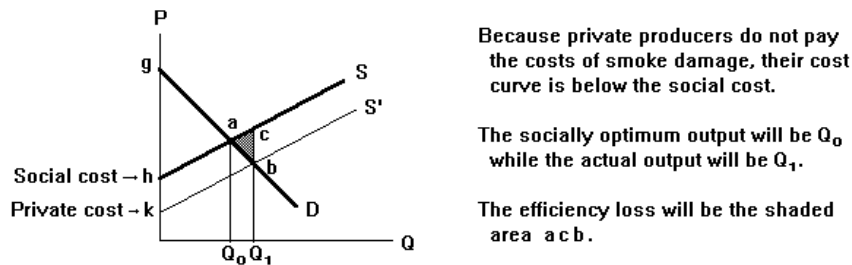
Commodity taxes are inferior to **neutral taxes**—those that have no efficiency effects. But every tax that can, in practice, be levied has an efficiency effect of some kind and is therefore non-neutral.



## 5. Externalities

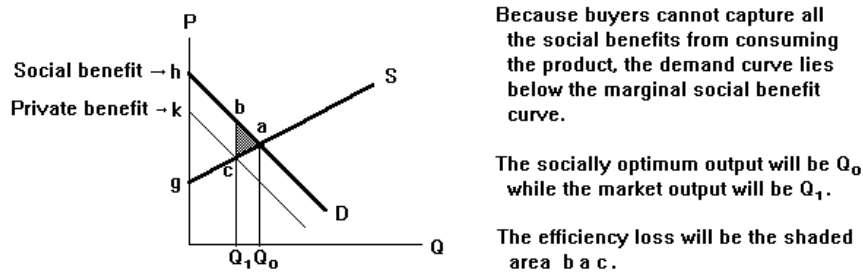
**Consumption externalities** arise when individuals feel better or worse off because someone else is consuming a good. The magnitude of these external benefits or costs would have to be added to the area under the demand curve and over the supply curve to obtain an efficiency measure. These externalities are hard to quantify because they exist only in people's minds. **Production externalities** are easier to quantify. The classic case is smoke from industrial chimneys, analyzed in Figure 5.1. Because of the environmental effects of the smoke emissions, the costs of which are not borne by the industry emitting the smoke, the social costs of production exceed the private costs.

**FIGURE 5.1:**



Production externalities can also take the form of a divergence between the private and social benefits from consuming a good. The classic example here is police protection. A generic externality on the demand side is illustrated in Figure 5.2.

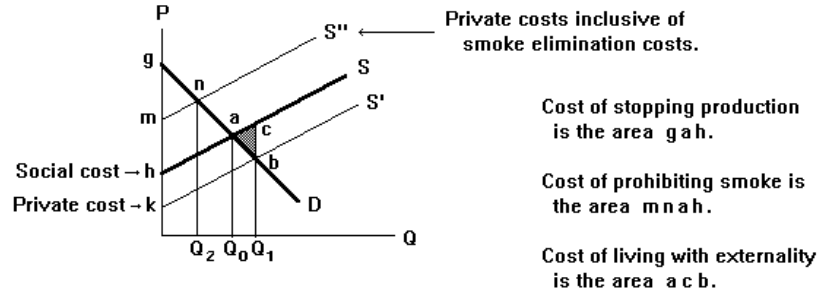
**FIGURE 5.2:**



The question arises as to what to do about these externalities. The case of smoke emissions is analyzed in Figure 5.3. It is clear that a simple prohibition of smoke emissions is not necessarily the most efficient action and one would imagine that stopping production of the offending commodity would frequently be more costly than living with the externality. The

important issue is whether the private costs plus the costs of eliminating the smoke emissions exceed the social cost inclusive of the effects of those emissions.

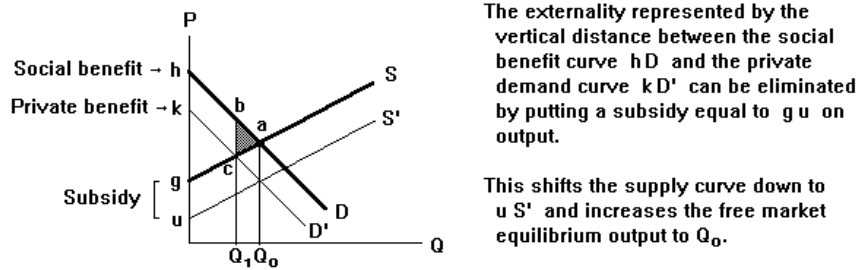
**FIGURE 5.3:**



A policy of simply levying a tax at each point in time on firms that pollute the environment equal to the damage they are doing at that point in time will in most cases be the most efficient way to handle the problem—to the extent that firms end up emitting smoke, the social benefits from doing so will exceed the costs, subject of course to the usual caveats about distribution effects. The difficulty, of course, lies in measuring the environmental costs.

In cases where the social benefits exceed the private benefits from consuming a commodity, production of the commodity can be subsidized, as shown in Figure 5.4

**FIGURE 5.4:**



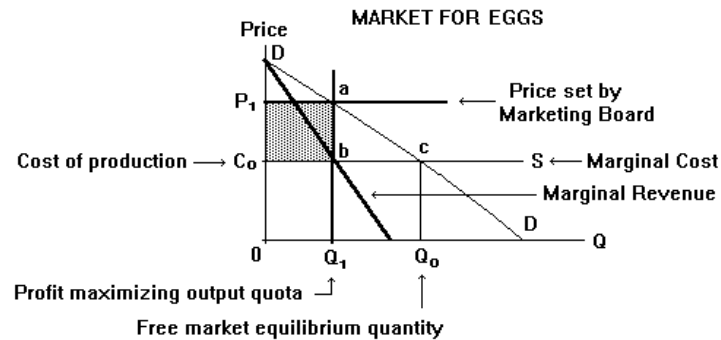
External benefits from policing and the dispensing of justice cannot typically be handled by subsidization of private police forces because the government must ultimately be charged with these matters—private police forces will necessarily act in the interests of those hiring them when those interests conflict with the social interest.

## 6. Collusion Among Suppliers

Competitive pricing is an essential feature of supply and demand analysis. The supply curve gives the minimum price at which producers will supply the product. This minimum results from competition among sellers. We now examine the effects of collusion among suppliers for purposes of controlling output and, hence, the price paid by consumers. Such collusive arrangements are usually illegal and not enforceable in the courts, except when created by the government in order to subsidize producers in industries favored by the political process. There are, of course, many impediments to competition in a typical economy—a full consideration of these is relegated to subsequent lessons.

A classic example of a government engineered collusive arrangement is the Egg Producers' Marketing Board. It is analyzed in Figure 6.1.

**FIGURE 6.1:**



The Board, acting on behalf of its members with the support of the government, will limit output quotas of its members to the point where the profits of the industry—the excess of revenue over cost—are maximized. This will be where the marginal revenue from producing another unit equals the marginal cost. Because the marginal revenue of egg production by the group is less than the marginal benefit of eggs to consumers, production will occur where the marginal social benefit of another unit exceeds that unit's marginal social cost, so the output level will be socially inefficient. The right to have a quota is valuable in that it enables the sale of eggs at a price above their cost of production. This right constitutes an asset which can normally be bought and sold. Egg producers who receive the quotas when the program is instituted thus obtain all the benefits from the program—when they retire or leave the industry they can sell their quota rights to new entrants for their full present value. New entrants are thus no better off than they would have been in the absence of the program.

An alternative is to prohibit the sale of quotas. A producer leaving the industry has then to relinquish her quota so that the Marketing Board can give it to someone else. This raises the issue of the criteria under which these relinquished quotas are to be allocated to potential new entrants.

The efficiency losses from collusive arrangements such as this one can be avoided by giving cash subsidies to producers instead of allowing them to “tax” consumers by restricting

output. A difficulty of this approach is that the existence of the subsidy is more obvious to those paying it. Political support is also weakened because an argument can no longer be made that the producer in the subsidized industry is “earning” his subsidy rather than simply receiving a handout.

## 7. Welfare Economics

This last section considers in more detail what economists can and cannot say about the efficacy of particular government policies. Economists can give useful guidance on matters of economic efficiency but their value judgments on distribution matters are no better than anyone else’s.

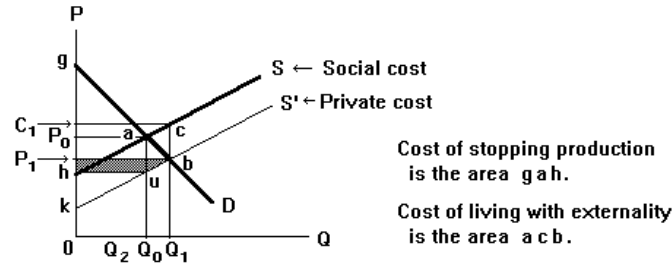
An improvement in economic efficiency means that it is *possible* to make everyone better off. A more conventional way of stating this is to say that it is possible to make one person better off without making anyone else worse off. When all gains from increased efficiency have been obtained, and it is no longer possible to make one person better off without making someone else worse off, we say that **Pareto-optimality** has been achieved—that resource allocation in the economy is **Pareto-efficient**. This means that rents to producers and consumers combined are maximized.

When the distribution of income changes the mix of goods produced and consumed changes. There is still an allocation of resources that will be Pareto-optimal but this will be a different allocation than under the previous income distribution. There is thus a different Pareto-efficient allocation of resources for each different distribution of income. Which of these Pareto-optimal allocations to choose is dependent on which income distribution is desirable—this involves value judgments and is beyond the scope of economics. But the community *can* be made better off at any income distribution by having a Pareto-efficient allocation of resources as opposed to a Pareto-inefficient one.

When there is **perfect competition**—that is, many buyers and sellers, none of whom can significantly influence the price—and **no externalities**, all supply curves will represent the social as well as private costs and all demand curves will represent the social as well as private benefits. Perfect competition will thus lead, in the absence of externalities, to a Pareto-optimal allocation of resources. This is the **First Theorem of Welfare Economics**. Again, the perfectly competitive and Pareto-efficient allocation of resources will be different for each different distribution of income. Economic efficiency involves getting to one such equilibrium—picking the distribution of income that is socially desirable, and hence the particular Pareto-efficient allocation of resources that will be socially optimal, involves value judgments.

If there are no transactions costs, the gainers from any given move toward Pareto-efficiency will bribe the losers and the gain in efficiency will occur naturally. This is the **Coase Theorem**. It can be illustrated in the case of environmental damage from industrial smoke with reference to Figure 7.1.

**FIGURE 7.1:**



If the law (system of property rights) gives producers the right to pollute as they choose, consumers will bribe producers by the amount  $P_1 b u h (= C_1 c a P_0)$  to induce them to produce the quantity  $Q_0$  at a net price of  $u Q_0$ . (Producers will charge the price  $P_0$  and rebate their profits at that price,  $P_0 a u h$ , back to consumers.) Instead of the loss from pollution given by the area  $h c b k (= C_1 c b P_1)$  consumers will lose only the amount  $C_1 c a P_0$ , the bribe to producers, plus the consumer surplus area  $P_0 a b P_1$ , leaving them better off by the area  $a b c$ . If the law says that no one has the right to pollute the atmosphere without the consent of those affected, producers will pay consumers the amount  $h a u k$  for permission to produce the output  $Q_0$  (rather than no output at all) and sell it at the price  $P_0$ . Their gain will be the area  $P_0 a h$ . In either case, the efficient amount of pollution will occur.

The problem is, of course, that transactions costs are not zero. It is nearly always impossible to get the agreement of everyone in a group on a matter of compensation because the costs of pollution will be hard to measure and different for different individuals. Because of the difficulty of verifying costs some individuals invariably will behave strategically, holding out for an outrageous share in return for allowing the agreement to go forward. The importance of the Coase Theorem is in its delineation of the role of property rights and transactions costs in enabling or preventing the achievement of Pareto-optimality.

When transactions costs prevent Pareto-optimality from being achieved through private transactions, the government can often induce it. For example, the socially efficient amount of pollution can be achieved in Figure 7.1 by levying a tax of  $u a$  per unit of output. Producers will lobby against the tax and environmental groups in favor of it.

The policies of government will often be determined by the relative effectiveness of the rent-seeking activities of the gainers and losers. This will be determined, in turn, by whether transactions costs of within-group agreement are lower for the gainers than for the losers.

## STUDY QUESTIONS

1. Suppose that the demand curve for marijuana, measured in kilos, in a region is

$$Q = 10000 - 20P$$

and that the plant grows wild in useable form. Show how you would go about calculating the social benefit from the legalization of marijuana use. Should the use of marijuana be legalized in this case?

2. Demonstrate that economic rents can be taxed away without affecting Pareto-efficiency.
3. Land and other natural resources are freely available to society, created when the earth was created. The economic rent to these resources can be taxed away by the government without affecting the allocation of resources and, hence, without efficiency costs. Why, then, should society allow individuals to own these resources? Or, if individuals are free to own them, why shouldn't the government tax away all economic rent? Should the same argument apply to the rents earned from the talents of Tom Hanks, Frank Sinatra, Stevie Wonder and other star performers?
4. During the past few decades substantial efforts have been made through international negotiations to reduce the tariffs countries levy on each others' goods. Most of the bargaining in these negotiations has taken the form of countries granting concessions—lowering their tariffs and quotas and allowing foreign goods to enter in competition with domestic production—in return for the agreement of other countries to let domestic goods enter in competition with their home production. This “I'll let you export to me if you'll let me export to you” focus seems strange in view of the fact that countries benefit by importing as much as possible in return for giving up as few exports as possible. The focus of bargaining should presumably reflect a willingness to export only in return for a better deal on imports or, “I'll let you import more from me if you'll let me import more from you”. How can you explain this seeming contradiction?
5. Consider an egg marketing board given the right to set the quantity and price of eggs. Show that setting price and quantity so as to maximize the profits of egg producers has an effect on economic efficiency equivalent to that of a tax imposed on egg production that maximizes the tax revenue to the government. Demonstrate further that it makes no difference whether the tax is imposed on the production or consumption of eggs.

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