8: Monopoly

"He that withholdeth corn, the people shall curse him: but blessing shall be upon the head of him that selleth it."

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8.1. Choosing Price and Output to Maximize Profits

Monopoly is a classic source of market failure. Being the only firm in the industry means that the firm has market power, defined as the ability to increase the price without losing all its customers. All firms have this to some extent, but if market power is significant, the firm may decide to restrict output in order to drive up the price. In diagrams, we depict market power as a downward-sloping demand curve facing the individual firm, as opposed to a downward-sloping demand curve for the market as a whole.

Since the demand curve facing it slopes downward, a firm with market power can increase its producer surplus by reducing output and raising the price. This power is not value-creating in itself. It just shifts surplus from consumer to producer. Moreover, since the producer purposely foregoes some sales that would generate surplus, to push up the price, consumers lose more than producers gain. Still another problem is that producers may devote effort to acquiring market power, creating additional waste.[1]

A firm without market power simply takes the market price as given and to maximize profit compares the cost of output to that price. It increases output Q until the marginal cost equals the price: $MC(Q) = P$. A firm with market power needs to think about **marginal revenue**: the change in revenue from an increase in quantity. Marginal revenue equals the market price if the firm has no market power: sell one more unit, and revenue increases by the price. Marginal revenue is less than the price for a firm with market power: produce one more unit, and the price drops a little.

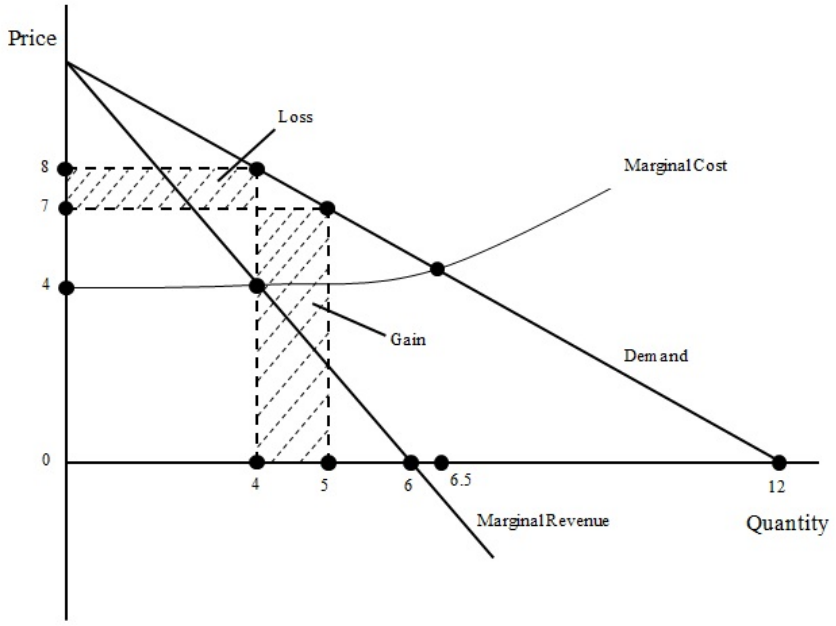
The firm's tradeoff is between (a) selling more quantity and (b) keeping the price high, as Figure 8.1 shows. If $Q = 4$ and $P = 8$ and the firm increases its output to $Q = 5$, revenue won't rise by 8, because the price will fall. The price falls from 8 to 7, so revenue only rises from 32 to 35, an increase of 3. The old 4 units are now sold at 7 instead of 8, so they are collecting 28 for the firm instead of 32, a loss of 4. The new unit is collecting the new price of 7, so it is adding 7. There is a net gain of 3 in revenue. That gain is the marginal revenue: the change in revenue when quantity rises.

The firm's marginal cost is 4 at $Q = 4$, however, so increasing output to 5 reduces producer surplus. To maximize surplus, the seller should set Q so that marginal revenue equals marginal cost. Since the marginal revenue curve lies below the demand curve, this means that the marginal revenue curve will hit marginal cost before the demand curve, so the MR=MC rule produces less output than the P=MC rule.

The simplest case is when the seller has zero marginal cost. Then its task is to set

[1] An important exception is effort in the form of innovation. If the inventor of a new product is given a monopoly on it, that actually raises surplus if he wouldn't invent the product otherwise, so it's worth providing him with profit as an incentive. If a firm in a competitive market puts effort into discovering a new market as yet unserved, so it has a monopoly, that too is innovation that deserves reward.

FIGURE 8.1
MARGINAL REVENUE



$MR = 0$, which means to maximize revenue because it picks quantity so that the slope of the revenue function (which is marginal revenue) is zero. An example is a stadium selling tickets to a football game. If the stadium is not filled up, the marginal cost of admitting an extra person is approximately zero. To maximize profit, however, some seats should be left unfilled. Increasing ticket sales would require a drop in price that would actually reduce revenue. The stadium example illustrates why market power leads to market failure: it would cost nothing to let more people enjoy the football game, but the seller keeps them out anyway.

We often use linear (straight line diagonal) demand curves in diagrams. When demand is linear, marginal revenue is linear too, with twice as steep a slope (as in Figure 8.1).[2] In drawing, remember that if the demand curve hits the quantity axis at $Q = 10$, then the marginal revenue curve hits at $Q = 5$. Also, though the demand curve becomes flat at $P = 0$, the marginal revenue curve keeps going down below the $P = 0$ axis. That is because marginal revenue can be negative, which just means that

[2]Calculus shows this. If demand is $P = a - bP$, then revenue is $R = PQ = (a - bQ)Q = aQ - bQ^2$, and marginal revenue is $\frac{dR}{dQ} = a - 2bQ$, just like demand but with a 2 so it descends twice as fast.

increasing output reduces revenue because the quantity rises by less than the price falls.

Another way to think of pricing with market power is using elasticities. The**price elasticity of demand** (which is easier to remember if you think of it as "price sensitivity of demand") is

$$Elasticity = \frac{\%\text{ change in quantity demanded}}{\%\text{ change in price}} \tag{1}$$

Iff the quantity demanded falls by 20% after the price rises by 10%, the elasticity of demand is -2. Economists often just say that the elasticity is "2", because the quantity demanded falls with price so we can assume the elasticity is negative. A firm with market power is trading off price against quantity, so the elasticity is relevant to its decision. If the elasticity is -1, marginal revenue is zero: if the firm increases output by 1%, the price falls by 1% and revenue is unchanged. We say that demand is **inelastic** if the price elasticity of demand is less than 1, in which case the quantity demanded falls less than the price rises. A monopoly never wants to choose a price and quantity where demand is inelastic, because reducing sales at that point by 1% would drive up the price more than 1% and thus raise revenue— and better yet, total production cost would because of the 1% reduction. Demand is **perfectly inelastic** if quantity demanded does not change at all when the price increases. If demand is perfectly inelastic, the demand curve is vertical and the elasticity is 0. A monopoly would want to raise its price if demand were perfectly inelastic. Demand is **perfectly elastic** if the quantity changes infinitely (to zero) as the price rises. Then, the demand curve facing the firm has an elasticity of $-$infinity and is perfectly flat, just as under perfect competition.

A general rule relating the monopoly markup of price over marginal cost to the elasticity of demand is the **Lerner Rule**.[3] It says that at the profit-maximizing price:[4]

$$\frac{P - MC}{P} = -\left(\frac{1}{Elasticity}\right) \tag{2}$$

Remember: at the optimal price, demand must have gotten elastic, more negative than -1. If the elasticity of demand is -2, the Lerner Rule tells us that the price is such that $\frac{P-MC}{P} = -\left(\frac{1}{Elasticity}\right) = -\frac{1}{-2}$, so $P - MC = \frac{P}{2}$ and $P = 2MC$. If the elasticity

[3]The original paper is Abba P. Lerner, "The Concept of Monopoly and the Measurement of Monopoly Power," *Review of Economic Studies*, 1: 157–175 (1934). A good verbal discussion of its modern use is Kenneth G. Elzinga, & David E. Mills, "The Lerner Index of Monopoly Power: Origins and Uses," *American Economic Review: Papers and Proceedings*, 101(3): 558–564 (2011).

[4]The rule $MR = MC$ can be written as $\frac{dP}{dQ}Q + P = MC$, so $-\frac{dP}{dQ}Q = P - MC$ and $-\frac{dP}{dQ}\frac{Q}{P} = \frac{P-MC}{P}$, but $Elasticity = \frac{dQ}{dP}\frac{P}{Q}$ and so we get the Lerner Rule.

of demand is -1.5, the price is three times marginal cost, by the same working out of the equation.

The Lerner Rule can be used in two ways. The firm can use it to help choose its price. The analyst can use it to estimate the elasticity of demand facing the firm. The expression $\frac{P-MC}{P}$ on the left-hand-side of equation (2) is known as the **Lerner Index** of market power. Its biggest possible value is 1 (if MC=0, so $\frac{P-MC}{P} = 1$) and its smallest possible value is 0 (if $P = MC$). An analyst who saw that a firm's price was 20 and its marginal cost was 15 could use equation (2) to conclude that the Lerner Index was $\frac{P-MC}{P} = \frac{20-15}{20} = .25$ and the elasticity of demand was -4. Thus, to find out the elasticity of demand facing the firm, the measure of market power we are after, we just need to know the price and the marginal cost.

8.2: Oligopoly and the Cournot Model

Price fixing is a form of **collusion**— firms agreeing on prices, outputs, or sales territories— and is *per se* illegal. Even if firms do not collude, however, prices and profits can still be above marginal cost if entry into the industry is difficult and the number of firms is small. If the cola industry has just two firms, then even if they never discuss prices with each other, they know that it is to their mutual benefit to keep prices high and that a price cut of one of them will be followed by a price cut of the other. Without communication between them, though, it is hard to agree on a price in the first place and even harder to monitor cheating than under a cartel. Thus, we expect prices in a two-firm industry— a **duopoly** — or a several-firm industry— an **oligopoly**— to be lower than in a monopoly or cartel, but higher than in a perfectly competitive industry. Note, however, that this depends on the **incumbent firms**— the ones already in the industry— being safe from **entrants**— new firms who start selling in the industry attracted by the high profits. If it is easy to start up a new business in the industry (**free entry**) then even a monopoly could not get away with earning high profits very long.

The **Cournot model** is the basic model economists use to explain why prices fall with the number of firms when there is not free entry. In the model, each firm chooses its output given its expectations about the other firms' outputs. The market price is determined by how much consumers will pay for the total output of all the firms.

Let's look at a specific example of a Cournot model. Let there be n firms, each firm producing its output q_i $i = 1, \ldots, n$ with no fixed cost and with a constant marginal cost of 20. Let market demand be

$$Q = 140 - P, \tag{3}$$

where Q is the total output: $Q = q_1 + q_2 + \ldots q_n$. Firm i's profit function is then

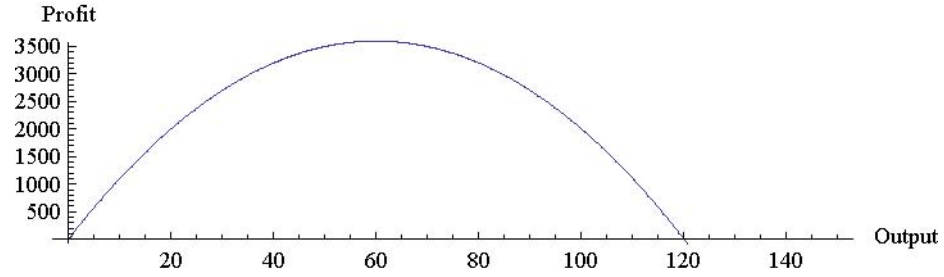
$$\pi_i = Pq_i - 20q_i. \tag{4}$$

One Firm: Monopoly

First, suppose $n = 1$, so Firm 1 is a monopoly. Then, $P = 140 - q_1$, so Firm 1's profit, shown in Figure 8.2, is

$$\pi_1 = (140 - q_1)q_1 - 20q_1 = (140q_1 - q_1^2) - 20q_1 \tag{5}$$

FIGURE 8.2
MONOPOLY PROFITS WITH ONE SELLER



To maximize the firm's profit, use a little calculus. Take profit's derivative with respect to q_1 and set the derivative equal to zero, the equation called the **first-order condition** for maximization. That yields

$$\frac{d\pi_1}{dq_1} = (140 - 2q_1) - 20 = 0 \tag{6}$$

which solving out for q_1 yields $q_1 = 60$. Then, using the demand function, $P = 80$, so $\pi_1 = (80)(60) - 20(60) = 3,600$.

This is the same result as we would get by setting marginal revenue equal to marginal cost, because the last equation can be rewritten as

$$\frac{d\pi_1}{dq_1} = (Marginal\ revenue) - Marginal\ cost = 0 \tag{7}$$

Recall that with linear demand,the marginal revenue curve slopes down twice as fast as the demand curve, so with $P = 140 - Q$, we get $MR = 140 - 2Q$. So calculus is a way to generate that rule.

Two Firms: Duopoly— The Asymmetric-Costs Case

So much for monopoly. Let's do the same thing for duopoly. We will start with an asymmetric case, in which Firm 1 has a cost advantage over Firm 2: Firm 1's marginal cost is $c_1 = 20$ and Firm 2's is $c_2 = 40$. As before, $P = 140 - (q_1 + q_2)$, so Firm 1's profit is:

$$\pi_1(q_1) = (140 - q_1 - q_2)q_1 - 20q_1 = (140q_1 - q_1^2 - q_2q_1) - 20q_1. \tag{8}$$

Take profit's derivative with respect to q_1 and set it to zero:

$$\frac{d\pi_1}{dq_1} = (140 - 2q_1 - q_2) - 20 = 0. \tag{9}$$

This gives us the **reaction function** or **reaction curve** for q_1 as a function of q_2. The more output Firm 1 expects from Firm 2, the smaller will Firm 1 choose its own output to be:

$$q_1(q_2) = 60 - \frac{q_2}{2}. \tag{10}$$

At the extremes, if Firm 1 thinks Firm 2 will set $q_2 = 0$, then Firm 1 chooses ("reacts with") its monopoly output of 60; but if Firm 1 thinks Firm 2 will set $q_2 = 120$ and drive the price down to marginal cost, then Firm 1 chooses to produce zero. Firm 1's reaction curve goes from 60 on the y-axis to 120 on the x-axis.

Now let's do the same for Firm 2. Firm 2's profit is:

$$\pi_2(q_2) = (140 - q_1 - q_2)q_2 - 40q_2 = (140q_2 - q_2^2 - q_2q_1) - 40q_2. \tag{11}$$

Take profit's derivative with respect to q_2 and set it to zero:

$$\frac{d\pi_2}{dq_2} = (140 - 2q_2 - q_1) - 40 = 0. \tag{12}$$

This gives us the **reaction function** for q_2 as a function of q_1. The more output Firm 2 expects from Firm 1, the smaller will Firm 2 choose its own output to be:

$$q_2(q_1) = 50 - \frac{q_1}{2}. \tag{13}$$

At the extremes, if Firm 2 thinks Firm 1 will set $q_1 = 0$, then Firm 2 chooses ("reacts using") its monopoly output of 50 (*not* Firm 1's monopoly output, which is 60—why not?). If Firm 2 thinks Firm 1 will set $q_1 = 100$ and drive the price down to Firm 2's marginal cost of 40, then Firm 2 chooses to produce zero. Firm 2's reaction curve goes from 100 on the y-axis to 50 on the x-axis.

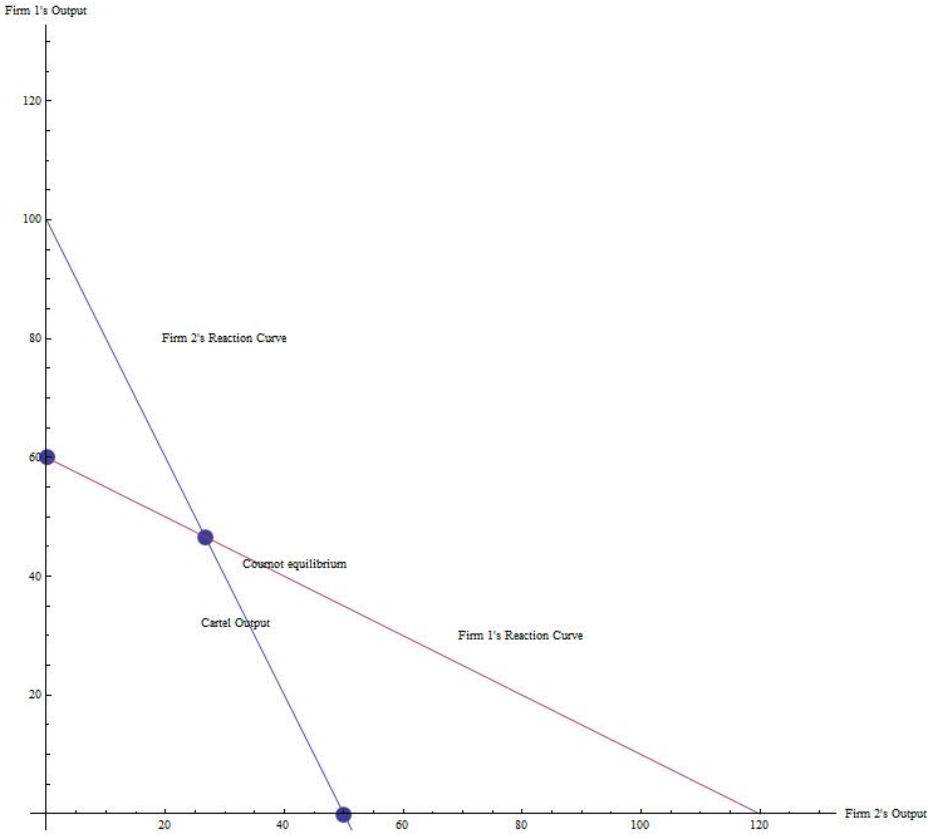
What is the value of q_2 that Firm 2 will actually pick? The two reaction equations give us two equations for two unknowns, q_1 and q_2. We can substitute to get:

$$q_2(q_1) = 50 - \frac{60 - \frac{q_2}{2}}{2} = 50 - 30 + \frac{q_2}{4} = 20 + \frac{q_2}{4}. \tag{14}$$

Solving this last equation yields $q_2^* = \frac{80}{3} = 26\frac{2}{3}$. We can substitute q_2^* into $q_1(q_2)$ to get $q_1^* = 60 - \frac{\frac{80}{3}}{2} = \frac{140}{3} = 46\frac{2}{3}$.

Using the demand function, $P = 140 - \frac{140}{3} - \frac{80}{3} = 67\frac{1}{3}$.

FIGURE 8.3
ASYMMETRIC COURNOT DUOPOLY REACTION CURVES



Two Firms: Duopoly— The Symmetric-Costs Case

Let's do the same thing for a duopoly in which both firms have the same cost curves. This is simpler than the asymmetric-cost Cournot duopoly, but its ease is deceptive, because it doesn't show so clearly how each firm is acting independently to maximize its own profits. As before, $P = 140 - (q_1 + q_2)$, so Firm 1's profit is

$$\pi_1 = (140 - q_1 - q_2)q_1 - 20q_1 = (140q_1 - q_1^2 - q_2q_1) - 20q_1 \tag{15}$$

Again take profit's derivative with respect to q_1 and set it to zero.

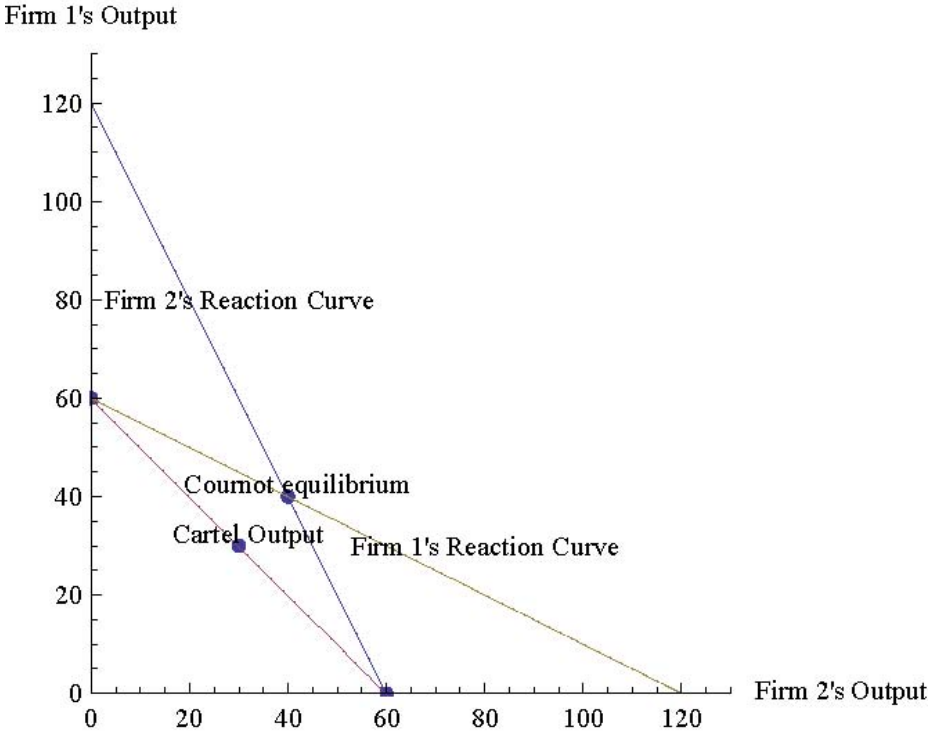
$$\frac{d\pi_1}{dq_1} = (140 - 2q_1 - q_2) - 20 = 0 \tag{16}$$

This gives us a reaction function (as shown in Figure 8.4) for q_1 as a function of q_2. The more output Firm 1 expects from Firm 2, the smaller will Firm 1 choose its own output to be.

$$q_1(q_2) = 60 - \frac{q_2}{2}. \tag{17}$$

At the extremes, if Firm 1 thinks Firm 2 will set $q_2 = 0$, then Firm 1 chooses ("reacts with") the monopoly output of 60; but if Firm 1 thinks Firm 2 will set $q_2 = 120$ and drive the price down to marginal cost, then Firm 1 chooses to produce zero. That is why Firm 1's reaction curve goes from 60 on the y-axis to 120 on the x-axis.

FIGURE 8.4
COURNOT DUOPOLY REACTION CURVES



What is the value of q_2 that Firm 2 will actually pick? If we were to set up the same problem for Firm 2's choice of q_2 to maximize profit and solve the two first order conditions together, it turns out that we would find that $q_1 = q_2$. Figure 8.4 shows Firm 2's reaction curve, and how it crosses Firm 1's reaction curve at $q_1 = q_2 = 40$. Rather than finding the equation for Firm 2's reaction curve, though, we can set $q_2 = q_1$ in

Firm 1's reaction curve, so

$$q_1 = 60 - \frac{q_1}{2}, \tag{18}$$

which solves out to $q_1 = 40$. As a result, $q_2 = q_1 = 40$ and $Q = q_1 + q_2 = 80$. Using the demand function, $P = 60$. Profits are $pi_1 = \pi_2 = (60)(40) - 20(40) = 1,600$ each. Duopoly industry profit is 3,200, which is below the monopoly industry profit of 3,600, but above the competitive profit of 0 that would result if $P = MC = 20$.

Figure 8.4 shows another line going from 30 on the y-axis to 30 on the x-axis, labelled "Cartel Output". This is the combinations of q_1 and q_2 that add up to 60, the monopoly output. Any combination on that line maximizes industry profit. The natural cartel outcome if collusion were legal would be $q_1 = q_2 = 30$, but if Firm 1 is better at bargaining and threatens to break up a cartel, it could get $q_1 = 32, q_2 = 28$. The price would be $P = 80$, so Firm 2's profit would be (80-20) (28) = 1,680, better than Firm 2 could get from Cournot duopoly if it refused Firm 1's offer. That kind of threatening and bargaining, though, is one reason cartels often do not form or form but break up as the result of bickering.

Three or More Firms: Oligopoly to Competition

The beauty of the Cournot model is that it can be extended to any number of firms. Now let there be n firms, so $P = 140 - (q_1 + q_2 + \ldots + q_n)$, and Firm 1's profit is

$$\pi_1 = (140 - (q_1 + q_2 + \ldots q_n))\, q_1 - 20q_1 = \left(140q_1 - q_1^2 - q_1(q_2 + \ldots q_n)\right) - 20q_1 \tag{19}$$

Again take profit's derivative with respect to q_1 and set it to zero.

$$\frac{d\pi_1}{dq_1} = (140 - 2q_1 - (q_2 + \ldots q_n)) - 20 = 0 \tag{20}$$

Firm 1's reaction curve is

$$q_1 = 60 - \frac{(q_2 + \ldots q_n)}{2}. \tag{21}$$

If there are 3 firms the reaction curves are actually reaction planes in 3-dimensional space. The equations are $q_1 = 60 - \frac{q_2+q_3}{2}$, $q_2 = 60 - \frac{q_1+q_3}{2}$, and $q_3 = 60 - \frac{q_2+q_3}{2}$.

Since the firms all are identical and solve the same kind of profit maximization problem, it turns out that $q_1 = q_2 = \ldots = q_n$, so $(q_2 + \ldots q_n) = (n-1)q_1$ and we can write

$$q_1 = 60 - \frac{(n-1)q_1}{2} = \frac{120}{n+1} \tag{22}$$

Table 8.1 shows what happens as the number of firms increases from 1 to 99.

TABLE 8.1
COURNOT INDUSTRY OUTPUT RISES WITH THE NUMBER OF FIRMS

Number of firms (n)	Output per firm	Profit per firm	Total output	Price	Industry profit
1	60	3,600	60	80	3,600
2	40	1,600	80	60	3,200
3	30	900	90	50	2,700
4	24	576	96	44	2,304
5	20	200	100	40	2,000
9	12	144	108	32	1,296
99	≈ 1	≈ 1	≈ 119	≈ 21	≈ 143

Table 8.1 shows that if the number of firms becomes large, the Cournot model predicts that the price will approach marginal cost and profits will approach zero. It is always true that as the number of firms increases, output per firm falls, industry output rises, and the price falls.

8.3: Price Fixing

Price fixing is the most frequent antitrust violation, and perhaps the most important. The two most common kinds of cases involve industries for homogeneous products that have few sellers and bidders in auctions, whether auctions to sell objects where the high bid wins or auctions for procurement contracts where the low bid wins. (A **homogeneous** product such as salt is the same whichever firm produces it; a **heterogeneous** of **differentiated** product such as perfume differs across firms.) Probably most cases go undetected because they are on a local scale and too small for federal authorities to intervene (though there do exist state antitrust laws as well). Even when there is little fear of punishment, however, cartels have a problem: making sure

members obey the cartel rules.[5]

TABLE 8.2
THE PRISONER'S DILEMMA

		Column	
		Not Confess	*Confess*
Row	*Not Confess*	-1,-1	-10, 0
	Confess	0,-10	**-8,-8**

Payoffs to: (Row,Column)

The cartel enforcement problem is a good example of the Prisoner's Dilemma. In the original Prisoner's Dilemma, illustrated in Table 8.2, two criminals, Mr. Row and Mr. Column, have been captured and accused of carrying out a crime together. They are kept in separate cells and each offered a choice: Confess or Not Confess. If neither confess, there is still enough evidence to sentence each to 1 year in prison. If both confess, they will each get 8 years in prison. But if one confesses and the other does not, the confessor gets off free and the nonconfessor is sentenced to 10 years. Clearly the best thing for the prisoners jointly is to Not Confess. For each one acting individually, however, Confess is a dominant strategy. Think of Prisoner Row's choice. If Prisoner Column confesses,Row gets 8 years in prison by confessing too, and 10 years if he chooses Not Confess, so he should confess. If Prisoner Column doesn't confess, Row gets 0 years in prison by confessing, and 1 years if he chooses Not Confess, so he should confess. Either way, Prisoner Row does better by confessing. And so they both

[5]By the way, the now-common practice of referring to drug gangs as drug cartels misuses the word completely. A cartel is a group of sellers that agree to all sell at the same price. If a group of gangs agree to all sell cocaine at a certain price, that is a cartel. If they compete ferociously using price cuts and automatic weapons, that is the opposite of a cartel.

confess and get a total of 16 years in prison.

TABLE 8.3
THE PRICE-FIXER'S DILEMMA

		Column	
		High Price	*Low Price*
Row	*High Price*	400, 400	200, 500
	Low Price	500, 200	**300, 300**

Payoffs to: (Row, Column)

Now consider price fixers Row and Column in Table 8.3. They have a constant marginal cost of $4 per unit for a differentiated product. If they each charge the cartel price of $8 that they have agreed upon each will sell 100 units (for a profit of $800 - $400 each), but if they both sell at the low, discounted price of $5 each will sell 300 units (for a profit of $1,500 - $1,200 each). If one sells at the low price and one sells at the high price, then the low-priced seller sells 500 and the high-priced seller sells 50. The product is differentiated, which is why even a high-priced seller still gets some sales.

If both price fixers charge high prices, they each will have profits of 400. If both choose low prices, they will each get 300. But if one prices high and the other prices low, the low-price firm has profits of 500 and the high-price firm has profits of 200. Clearly the best thing for the firms jointly is to price high. For each one acting individually, however, Low Price is a dominant strategy. Think of Row's choice. If Column prices high, Row's profits are 400 if he too prices high, but 500 if he prices low. If Column prices low, Row's profits are 200 if he prices high, but 300 if he prices low. Either way, Row does better by pricing low. And so both firms price low, and industry profits are 600 instead of the 800 they could be if both stuck to the cartel price.

If Row and Column could make a legal agreement to keep prices high, their task would be much easier, but the courts would not enforce such a contract even before the Sherman Act.[6] Because of the antitrust laws, they cannot even hire an accounting

[6]Courts in the common law countries of England the United States would not enforce cartel contracts,

firm to audit each other and find out if someone has been cheating on the cartel. To even detect cheating, price fixers have to rely on gossip from customers— who would like to stir up competition— and fluctuations in their own demand. If Row's sales go down, however, he cannot tell whether it is because Column has been making secret price cuts to steal customers or because of random fluctuations in market demand. For this reason, cartels tend to break down eventually.

I suggested earlier that industries with homogeneous products would have the most successful cartels. The reason will now be clearer: if the product sold by each firm is identical, it is easier to police a cartel and detect when one member is trying to undercut the others. Prices are most easily compared when the product is homogeneous: Row's salt should sell a pound of salt at the same price as Column, but if Honda and Toyota tried to fix prices, should a Honda Accord sell for the same price as a Toyota Camry, particularly if different sellers include different options such as leather seating? In addition, if products are heterogeneous, a seller can gain an advantage by increasing the quality of his product or giving the consumer a better version at the same price.

If there are few sellers, it is easier to come to an agreement. When there are many firms, one firm can stay out of the cartel and still profit from the high prices generated by the cartel's reduced output, so there is a free rider problem. If the good is sold by auction, then the cartel members can see who won and perhaps even see the price, depending on the auction rules. This aids in detecting who cheated on the cartel agreement. If Row wins the auction for a government contract this week, and Column was supposed to win, Row has some explaining to do. Thus, the structure of the market affects whether successful cartels form.

8.4: Regulating Monopoly: The History of Antitrust Law

What to do about market power has long been controversial. Perhaps the earliest discussion is in Aristotle's *Politics*,1.1259a, where he writes about Thales, the first philosopher, and a "man of Sicily".

> Thales, so the story goes, because of his poverty was taunted with the uselessness of philosophy; but from his knowledge of astronomy he had observed while it was still winter that there was going to be a large crop of olives, so he raised a small sum of money and paid round deposits for the whole of the olive-presses in Miletus and Chios, which he hired at a low rent as nobody was running him up; and when the season arrived, there was a sudden demand for a number of presses at the same time, and by letting them out on what terms he liked he realized a large sum of money, so proving that it is easy for philosophers to be rich if they choose, but this is not what they care about. Thales then is reported to have thus displayed his wisdom, but as a matter of fact this device of taking an opportunity to secure a monopoly is a universal principle

as being "against public policy" like contracts to commit crimes. Germany, on the other hand, did enforce cartel contracts, which were common. See Steven B. Webb "Tariffs, Cartels, Technology, and Growth in the German Steel Industry, 1879 to 1914," *Journal of Economic History* 40: 309-330 (1980).

> of business; hence even some states have recourse to this plan as a method of raising revenue when short of funds: they introduce a monopoly of marketable goods.
>
> There was a man in Sicily who used a sum of money deposited with him to buy up all the iron from the iron mines, and afterwards when the dealers came from the trading- centers he was the only seller, though he did not greatly raise the price, but all the same he made a profit of a hundred talents on his capital of fifty. When Dionysius came to know of it he ordered the man to take his money with him but clear out of Syracuse on the spot,6 since he was inventing means of profit detrimental to the tyrant's own affairs. Yet really this device is the same as the discovery of Thales, for both men alike contrived to secure themselves a monopoly.

Modern regulation of monopolies started in 1603, when Queen Elizabeth I of England granted her groom a legal monopoly on selling playing cards. A court voided the grant, saying that monopolies were counter to the common law. (*Darcy v. Allein*, 77 Eng. Rep. 1260 (K.B. 1603)) Another source of market power was **price-fixing agreements** or **cartels**: agreements between sellers to jointly keep their prices high. Forming a cartel was not a criminal offense, but the courts would not enforce an agreement "in restraint of trade" unless it could be shown that the agreement benefitted the public. An example of such a beneficial agreement would be if someone sold a law firm under the condition that he not start a new law firm in the same city and steal back his old clients.

Excluding cartels from the benefits of contract rights does have an effect, because members of a cartel are always tempted to cheat by reducing prices to increase the quantity they sell, at the expense of other members of the cartel.

In 1890, the Sherman Act was passed in the United States, and it remains one of the two most important antitrust laws. Section 1 of the Act, in its 2010 form (the fine limit has been increased from the 1890 version), says

> **Every contract**, combination in the form of trust or otherwise, or conspiracy, **in restraint of trade or commerce among the several States, or with foreign nations, is declared to be illegal.** Every person who shall make any contract or engage in any combination or conspiracy hereby declared to be illegal shall be deemed guilty of a felony, and, on conviction thereof, shall be punished by fine not exceeding $100,000,000 if a corporation, or, if any other person, $1,000,000, or by imprisonment not exceeding 10 years, or by both said punishments, in the discretion of the court. (U.S.C. Title 15, Chapter 1, §1)

Section 1 is aimed directly at price-fixing agreements. At least two parties must be involved, and they must make some definite agreement to restraint trade by such actions as directly restricting output or raising prices. It says:

> **Every person who shall monopolize, or attempt to monopolize,** or combine or conspire with any other person or persons, to monopolize **any part of the trade or commerce among the several States,** or with foreign nations, **shall be deemed guilty of a felony**, and, on conviction thereof, shall be punished by fine not exceeding $100,000,000 if a corporation, or, if any other person, $1,000,000, or by imprisonment not exceeding 10 years, or by both said punishments, in the discretion of the court. (U.S.C. Title 15, Chapter 1, §2, as of 2010)

BOX 8.1
AN INDIANA CEMENT CONSPIRACY

Gus B. (Butch) Nuckols of Builder's Concrete and Supply Co. agreed with another company, IMI, to fix cement prices from 2000 till 2004. Since cement is so heavy, competition tends to be local, high profits will not attract new entrants for some time. The FBI found that meetings were held at the Nuckols horse barn in Fishers, Indiana to discuss price, discounts, and conditions of sale.

IMI made $225 million from the conspiracy. In a plea bargain, Nuckols turned on his co-conspirators in exchange for a lighter sentence: a $50,000 fine personally, a 14-month prison sentence, and a fine of $4 million for his company.

Four executives of IMI pled guilty too. They received fines of one to two hundred thousand dollars, and went to jail for 5 months and the IMI itself was fined $29 million.

Section 2 is harder to interpret than Section 1. It is directed not just against agreements, but also at single parties who try to monopolize a market. What "monopolize" means is left unclear, and so has had to be interpreted by executive branch policy and by the courts. Early interpretation ruled that if firms merged to form a monopoly, that was not "monopolizing" and so was legal.

Courts treat Section 1 and Section 2 violations differently. Section 1 violations are **per se** illegal, meaning that they are illegal even if they do not cause any harm. If two gas stations agree on a minimum price, they violate Section 1 even if they can show that there are many other competing gas stations and they did not hurt any consumers. Section 2 violations, on the other hand, are subject to **the rule of reason**: if the defendant can show that his actions were not really intended to monopolize or did not have a bad effect, he can escape punishment.

Since "monopolizing" is a vague term, the Clayton Act was passed in 1914 to try to pin down monopolizing practices more clearly. One section, which incorporates amendments in the 1930's called the **Robinson-Patman Act**[7] attacks **price discrimination**:

> **It shall be unlawful for any person** engaged in commerce, in the course of such commerce, either directly or indirectly, **to discriminate in price between different purchasers of commodities of like grade and quality**, where either or any of the purchases involved in such discrimination are in commerce, where such commodities are sold for use, consumption, or resale within the United States or any Territory thereof or the District of Columbia or any insular possession or other place under the jurisdiction of the United States, and **where the effect of such discrimination may be substantially to lessen competition or tend to create a monopoly** in any line of commerce, **or to injure, destroy, or prevent competition with any person who either grants or knowingly receives the benefit of such discrimination, or with customers of either of them** . . . (U.S.C. Title 15, Chapter 1, §13)

Section 13 does not apply to every case where a seller charges different customers different prices, only to cases where the effect is to substantially lessen competition.

[7] For more on this, see Donald S. Clark, "The Robinson- Patman Act: General Principles, Commission Proceedings, and Selected Issues," http://www.ftc.gov/speeches/other/patman.shtm, June 7, 1995.

Predatory pricing is the best example of this: a monopoly charges below-cost prices in some markets to drive out competing firms and high prices in other markets where competitors do not operate.

Another section of the Clayton Act tackles special contractual provisions that could help a firm monopolize a market. One of these is **exclusive dealing contracts** or **total-requirements contracts** under which the buyer must buy the good exclusively from the one seller, even if his competitor offers a lower price:

> It shall be unlawful for any person engaged in commerce, in the course of such commerce, to lease or make a sale or contract for sale of goods, ... on the condition, agreement, or understanding that the lessee or purchaser thereof shall not use or deal in the goods, wares, merchandise, machinery, supplies, or other commodities of a competitor or competitors of the lessor or seller, where the effect . . . may be to substantially lessen competition or tend to create a monopoly in any line of commerce. (U.S.C. Title 15, Chapter 1, §14)

The most important part of the Clayton Act deals with mergers.

> No person engaged in commerce or in any activity affecting commerce shall acquire, directly or indirectly, the whole or any part of the stock or other share capital and no person subject to the jurisdiction of the Federal Trade Commission shall acquire the whole or any part of the assets of another person engaged also in commerce or in any activity affecting commerce, where in any line of commerce or in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly. (15 U.S.C. §18)

As with other Clayton Act provisions, this is subject to the rule of reason. Mergers are legal unless they substantially lessen competition. Merger regulation is the most active area of antitrust enforcement in the United States today. Businesses over a certain size which wish to merge are required to notify the Justice Department and the Federal Trade Commission, who scrutinize the merger for anticompetitive effects. Either agency may then challenge the legality of the merger in court. Ordinarily, if the agencies decide the merger would substantially reduce competition, the companies either drop the merger or change its terms in consultation with the agencies. If some cities are only served by two chain store chains, for example, a merger of those two chains might be required to sell some of their stores in the "captive" cities to a third chain to preserve competition. Occasionally firms that wish to merge think that the FTC and Justice are so unreasonable that they say they will merge anyway. In that case, the agency goes to a federal court and tries to persuade a judge to issue an injunction blocking the merger on the grounds that it would substantially lessen competition.

A major purpose of the Clayton Act was actually to reduce competition in one area of the economy: labor markets. The Sherman Act and the common law had been used to punish labor unions, which are cartels in which workers agree to sell their labor jointly at a price above the market level. These are heavily regulated by labor laws,

but are exempt from antitrust laws and much of labor law is devoted to encouraging workers to organize, to increase the price at which they sell their labor, and to be able to use exclusive-dealing contracts to shut out workers not in the union. The Clayton Act says:

> The labor of a human being is not a commodity or article of commerce. **Nothing contained in the antitrust laws shall be construed to forbid the existence and operation of labor, agricultural, or horticultural organizations, instituted for the purposes of mutual help, and not having capital stock or conducted for profit,** or to forbid or restrain individual members of such organizations from lawfully carrying out the legitimate objects thereof; **nor shall such organizations, or the members thereof, be held or construed to be illegal combinations or conspiracies in restraint of trade,** under the antitrust laws. (15 U.S.C. §17)

As one would expect, since labor cartels are legal, they are common. They are heavily regulated, however, by the National Labor Relations Board, which uses a multitude of rules to determine how a labor union may be organized, what happens if competing unions both wish to one company's workers, whether the union can require the firm to fire competing workers who refuse to the join the union, and so forth.

An example that shows the market power of a labor cartel can exercise is Local 1 of the International Alliance of Theatrical Stage Employees in New York City. Carnegie Hall has five stagehands, who hang the lights, move furniture around, and so forth. The highest-paid is the props manager, who earns $423,000 cash per year plus $107,000 in benefits and deferred compensation. The lowest-paid, an electrician, earns $403,000. Admittedly, the workweek can last up to 80 hours, during busy times during the heavy season, but the contrast to the incomes of aspiring musicians is amazing. Of course, Carnegie Hall pays especially well. Average stagehand compensation at Avery Fisher Hall and the Alice Tully Hall in Lincoln Center is only $290,000 per year. But a successful monopoly can do well even in a market with demand as seemingly fragile as classical music backstage labor.[8]

One of the most important things to note about antitrust law is that it does not make monopoly illegal. Rather, it makes **monopolizing** illegal. If a company grows to dominate its industry because it has low costs or good products, that is perfectly legal. Moreover, the firm can restrict its output by following the MR(Q) = MC(Q) rule and that is legal too. There is still market failure, but the potential for government failure in breaking up large, successful firms is too great to make a law against mere size a good idea. Letting the government control the firm's prices and practices is also too fraught with risk. Both sources of government failure are acute: the government would not know how to run the business, and the government might have the objective of favoring politically powerful groups. Thus, the law focuses on practices which add to a firm's market power for reasons that do not help consumers, practices such

[8] "For Backstage Labor, Rich Rewards," James Ahearn, *Northjersey.com* (November 1, 2009).

as practically all price- fixing agreements and some mergers. The law goes well beyond price-fixing and mergers to suspicious practices such as predatory pricing, tie-in requirements, and exclusive dealing, but those practices, while still monitored and sometimes punished, are not the focus of antitrust activity.

Antitrust Law in Europe

Article 101 (formerly article 81) of the Treaty on the Functioning of the European Union prohibits cartels and other "concerted practices," in a way comparable to the Sherman Act's Section 1.[9] Article 102 is like the Sherman Act's Section 2. It says, "Any abuse by one or more undertakings of a dominant position within the common market... shall be prohibited as incompatible with the common market insofar as it may affect trade between Member States."[10] The laws are enforced by the European Commission and by the antitrust authorities of each of the 20-plus nations of the European Union.

EU antitrust policy is administered by the **Competition Commissioner**, one of 27 commissioners of the **European Commission**. He is appointed by the **Council of the European Union** (informally, the **Council of Ministers**) which is composed of one representative of each EU country.[11] In addition, member countries continue to have their own antitrust agencies, e.g. the United Kingdom's http://www.competition-commission.org.uk/Competition Commission.

The European Union's main legislative branch is the **European Parliament**, which is elected directly by voters according to a country's population. **EU directives** are rules which member countries are supposed to implement by passing their own national laws and regulations in accord with the rule. **EU regulations** are rules which take effect immediately and bind every member country (note that "regulation" has a particular legal meaning here, contrasting with directives). The European Parliament does not make antitrust law, the rules for which are issued by the European Commission and the Council of Ministers.[12]

Regulations say that the Competition Commissioner can block any merger which "significantly impede effective competition," a standard similar to the Clayton Act's and equally open to widely varying interpretations.[13] The Commission has issued

[9]Treaty on the Functioning of the European Union (consolidated text), Official Journal of the European Union September 5, 2008,http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:115:0047:0199:EN:PDF.

[10]For more, see Baumgardner, Larry (2005) "Antitrust Law in the European Union The law is changing—but to what effect?" *Graziadio Business Report*, 11, 3. http://gbr.pepperdine.edu/2010/08/antitrust-law-in-the-european-union/.

[11]EU governance is confusing. There also exists a Council of Europe and a European Council, which are different from the Council of the European Union.

[12]European Parliament, "General Competition Policy and Concerted Practices,"http://www.europarl.europa.eu/parliament/expert/displayFtu.do?language=en&id=74&ftuId=FTU_3.3.1.html (September 2006).

[13]Council Regulation 139/2004 on The Control of Concentrations Between Undertakings (the EC

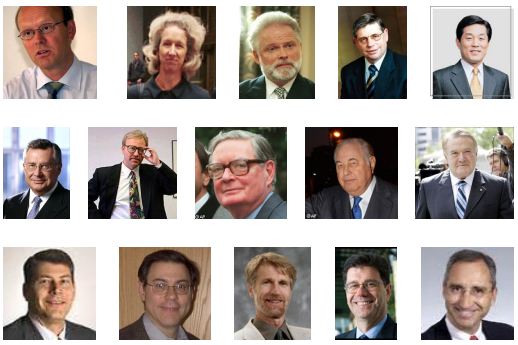
Merger Guidelines based on how many firms are in a market to let businesses know which kinds of mergers it is likely to challenge.[14]

In 2001 the EU blocked a merger of General Electric and Honeywell, even though American authorities had already approved it. GE's CEO said, "The European regulators' demands exceeded anything I or our European advisers imagined and differed sharply from antitrust counterparts in the U.S. and Canada."[15] The personal views of whoever is Competition Commissioner are extremely important. Another notable case involved Microsoft, which in 2004 was fined $600 million for anti-competitive tactics, a much more severe penalty than in its settlement with U.S. antitrust authorities.

Enforcement

The first way the antitrust laws are enforced is the same way as most federal laws are enforced: by the **Department of Justice**. One division of the Justice Department is the **Antitrust Division**, which has a staff of economists and lawyers ready to find and prosecute violations of the Sherman and Clayton Acts. The Justice Department can bring both criminal and civil actions.

BOX 8.2
A ROGUE'S GALLERY OF PRICE FIXERS, AND REGULATORS



Violations of the Sherman Act can be prosecuted as **criminal violations**. This means that the accused must be found guilty "beyond a reasonable doubt," and may be punished with prison time of up to 20 years (since Sarbanes-Oxley raised the limit in 2002) as well as fines. The **reasonable doubt standard** is a high hurdle. The government may prefer to bring the case as a **civil action**.[16]

There, the firm or person must be found to have done something illegal **by the preponderance of the evidence**; that is, more likely than not. A civil action can result in fines, and also in orders from the court called **injunctions** that can call for the firm to have special government oversight, to cease some business

Merger Regulation), art. 1, 2004 O.J. (L 24) 1.

[14]Guidelines on the Assessment of Horizontal Mergers under the Council Regulation on the Control of Concentrations between Undertakings, 2004 O.J. (C 31) 5.

[15]Andrew Ross Sorkin, "A Trustbuster's Song Is Ending, but a Coda Is Possible," *New York Times*, May 30, 2004, C3.

[16]Examples of complaints by the Justice Department and the FTC are: "Complaint: United States v. Apple Inc., Hachette Book Group, et al." United States District Court for the Southern District of New York" (April 12, 2011) and "TC Group-Riverstone-Carlyle-Kinder Morgan Complaint" (2007).

practice, or even to split up into smaller firms. Or, the government and the firm may settle a suit by a **consent decree**, an agreement enforced by the court under which the firm agrees to behave in a certain way.

The other agency that enforces antitrust law is the **Federal Trade Commission** or FTC, which was created in 1914 at the same time as the Clayton Act was passed. The FTC only brings civil cases, not criminal cases. If it brings a complaint, the complaint is judged by an FTC hearing overseen by an **administrative law judge** from within the FTC who recommends a course of action to the Commission's five members at the end of the hearing. The Commission then votes on a decision similar to a court injunction.

Besides the two agencies, private parties can enforce the antitrust laws through civil actions. The private party, typically a customer or a competitor of the company charged with wrongdoing, must show that it has been harmed, and by how much. Ordinarily if someone is found liable in a civil suit he must pay the party who brought the suit (the plaintiff) the damage the court decides he caused. (Punitive damages are possible, but unusual.) The antitrust laws, however, say that private parties can collect **treble damages**: that is, if the plaintiff can prove he lost $1 million dollars due to the defendant's monopolizing practices, he can collect $3 million from the defendant.[17] Defendants are rarely sentenced to prison time in antitrust cases and criminal and civil fines are low relative to the potential gains from violations, so the treble damages from private suits are perhaps the biggest punishment violators face. Often, private parties can wait until the government has proved a case and then pile on with private suits, much of the work having been done for them.

Who can sue for damages is an interesting legal question. The U.S. Supreme Court ruled in *Hanover Shoe, Inc. v. United Shoe Machinery Corp.* (392 U.S. 481 [1968]) that the direct purchaser of the overpriced product can sue for the price difference even if it resold the product and passed the cost on to its own customers. Thus, if a cartel of plastic companies sold plastic to bottle companies which then raised their prices to soft drink companies, the bottle companies could sue for the entire plastic overcharge. What about the indirect purchasers, the soft drink companies? The U.S. Supreme Court ruled in *Illinois Brick Co. v. Illinois* (431 U.S. 720 [1977]) that only the direct purchasers could sue, since otherwise there would be duplicative suits and it would be hard to track down all the indirect purchasers. Many states, however, have passed "Illinois Brick repealer" statutes that allow the indirect purchasers to sue in

[17] On the other hand, treble damages aren't always high. A jury agreed that the National Football League (NFL) did "willfully acquire or maintain monopoly power," but estimated the resulting damage to the rival United States Football League at only a nominal $1 (it would have been in financial trouble anyway). When trebled, that came to a measly $3 award. "The Award Was Only Token: The USFL Proved Part of Its Case against the NFL only to See the Jury Throw the Winners for a Loss,", Craig Neff, *Sports Illustrated* (August 11, 1986).

state court. [18]

Why have this threefold enforcement? We must go back to government failure and the principal- agent problem. Each of these three enforcers— the Justice Department, the FTC, and private parties— has different incentives. The Justice Department is headed by the Attorney- General, who is appointed by the President and who can be fired by him. Thus, the Justice Department is subject to political influence. This is not an entirely bad thing, because the President has, after all, been elected to execute the laws in a certain way, so if his degree of enforcement is more severe or more lax, that is the result of voter choice. There is potential, however, for favoritism in prosecutions.

Thus, when Congress established the Federal Trade Commission in 1914, they set it up as an **independent agency**. What this means is that although its five members are appointed by the President, they cannot be fired by him, and their seven-year terms are staggered so that when the Presidency changes parties, the President inherits the old Commission members appointed by his predecessor. He must wait for their terms to end before he can appoint his own people. Moreover, no more than three of the five members may be of the same political party.

If the Justice Department decides not to investigate a tying arrangement or challenge a merger, the FTC can do so instead, and vice versa. Moreover, if both of them are too reluctant to enforce the laws, private parties can bring treble-damage suits. Thus, the overlapping authority can overcome the problem of one agency, an agent for the voters as principal, is slack in its effort.

In practice there do not seem to have been important policy differences between the FTC and the Justice Department. They cooperate well, and they split investigation of proposed mergers so each can specialize in certain industries rather than duplicating effort.[19]

8.5: Mergers

Certain business action might be either surplus-increasing or surplus-reducing, and so are subject to the "rule of reason" in antitrust law. Section 1 of the Sherman Act makes illegal "every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade," while Section 2 makes it illegal to "monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize." Not only are there lots of monopolizing practices, but for each one we could talk about several surplus-increasing motivations and several surplus-reducing motivations and

[18] See Dennis W. Carlton, , "Does Antitrust Need To Be Modernized?" *The Journal of Economic Perspectives*, 21(3): 155–176 (Summer 2007); Edward D. Cavanagh,"Illinois Brick: A Look Back and a Look Ahead," *Loyola Consumer Law Review*, 17: 1–51 (2004).

[19] For more on the history and politics and anti-trust regulation, see "Antitrust and Regulation," Dennis W. Carlton & Randal C. Picker, a chapter in *Economic Regulation and Its Reform: What Have We Learned?* National Bureau of Economic Research (2011).

how common each of these is. This makes monopolizing a fun and important area for academic researchers, but it runs into diminishing returns. Prosecutors are not eager to bring complicated cases, and judges do not look forward to having to decide them, since the cases turn on difficult arguments being explained by expert witnesses using mathematics and game theory. This is not laziness, but rationality; prosecutors and courts have limited resources and if they can deal with five price-fixing cases in the time required to analyze one predatory pricing case, they should do it— particularly since they might end up punishing someone for predatory pricing when he actually was engaged in surplus-increasing severe price competition. In practice, by far the most important monopolizing practice regulated is merger, since unlimited merger would clearly hurt competition severely and the least justifiable mergers are easy to detect. The illegality of other practices is important, though, because they too are sometimes punished and the mere threat of government action curtails the most abusive behavior.

The most important suspicious practice is the merger of two or more firms. After it became clear that the courts would use the Sherman Act to punish cartels firms turned to merger, and **the Great Merger Wave** took place around 1900, mergers that involved a substantial fraction of U.S. manufacturing.[20] The hope was that the courts would interpret the Sherman Act to mean that although agreements between firms to raise prices were illegal, it would still be legal to merge the firms— in which case, as has been explained, it is not illegal for a firm to use its market power to raise its own prices unilaterally. In response, the courts began using the Sherman Act against mergers in 1904 in the *Northern Securities* case and in 1914 the Clayton Act clarified that mergers could be illegal monopolization, saying, you will recall, that:

> No person . . . shall acquire, directly or indirectly, the whole or any part of the stock or other share capital and no person. . . shall acquire the whole or any part of the assets of another person . . . where. . . in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly.(15 U.S.C. §18)

Mergers *can be*, not *are*, illegal monopolization. It is hard enough to think of surplus- maximizing reasons for competitors to agree with each other to raise prices that the law makes such agreements per se illegal. It is easy, though, to think of surplus-maximizing reasons for two competitors to agree to merge. The new merged firm might have lower costs, either because of economies of scale or because one of the firms has managers who are better at managing. On the other hand, with fewer firms in the industry, competition falls, so the new firm might have cost curves just the same or worse but be better able to raise prices, a bad motivation.

[20] See George Bittlingmayer, "Did Antitrust Policy Cause the Great Merger Wave?" *The Journal of Law and Economics*, 28: 77–118 (April 1985).

Concentration Levels

Since the number of firms matters to the amount of competition, it is useful to quantify the **concentration** of a market: how few firms sell in it. A simple measure is the **four-firm concentration ratio**: the percentage of market sales by the top four firms. Thus, if the firms in an industry have market shares of 30%, 25%, 20%, 15%, 5%, 4%, and 1%, the four-firm concentration ratio is 90%. That is rather crude, since it doesn't care about how evenly the top four firms split the market. The same level would be reached by an industry in which one firm had an 87% market shares and 13 other firms had shares of 1% each.

TABLE 8.4
CONCENTRATION RATIOS

Industry	NAICS Code	Estab's	No. of Firms 4	8	20	50	Herf. Index
Food Manufacturing	311	21,355	14	22	37	50	102
Sugar and Confectionery Product Manufacturing	3113	1,631	37	49	66	83	667
Sugar Manufacturing	31131	37	59	78	96	100	904
Beet Sugar Manufacturing	311313	12	81	98	100	100	x
Dog and Cat Food Manufacturing	31111	199	71	83	92	98	2,325
Retail Bakeries	311812	6,101	3	6	9	18	7
Accommodation and Food Services	72	634,361	5	10	17	23	x
Hotels (except casino hotels) and motels	72111	48,108	22	28	35	42	x
National Commercial Banks	5221101	46,809	55	69	83	90	x

Notes: http://factfinder.census.gov/. One company can have many establishments, e.g. Hilton hotels. For some industries the Herfindahl Index is not published.

A more sophisticated approach is the **Herfindahl Index**:[21] The Herfindahl is cal-

[21]The government and others call this the "**Herfindahl-Hirschman Index** " or "HHI" in documents, but that's too long a name, and in common practice government people and economists just say "Herfindahl Index"— Too bad for Professor Hirschman, a more important scholar than Herfindahl, but better for

culated by summing the squares of the individual firms' market shares, and thus gives proportionately greater weight to the larger market shares. Table 8.5 shows how that works out. Table 8.4 also has examples. When using the Herfindahl, the agencies consider both the post-merger level of the Herfindahl and the increase in the Herfindahl resulting from the merger. The increase in the Herfindahl is equal to twice the product of the market shares of the merging firms. [22]

TABLE 8.5
HERFINDAHL EXAMPLES

Industry	Computation	Herfindahl Index
Entirely monopolized	(100*100)	10,000
One firm has 70% of sales and the other has 30%	(70*70+30*30)	5,800
Two firms split the market evenly	(50*50 + 50*50)	5,000
One firm has 50% and 50 others have 1% each	(50*50+ 50*1*1)	2,550
Five firms split the market evenly	(5*(20*20))	2,000
Ten firms split the market evenly	(10*(10*10))	1,000
100 firms split the market evenly	(100*(1*1))	100

Thus, antitrust law allows mergers, but is suspicious of them. Federal law requires any two large firms that wish to merge to submit information to the FTC and the Justice Department on the likely effects on price. If the FTC or Justice object to the merger, they can try to block it.

Since the statute is not clear on what it means for a merger to substantially reduce competition, the agencies have to decide what mergers to block and the courts have to decide whether the agencies are interpreting the law correctly. Companies would like to know which mergers are going to be allowed, since setting up a merger only to have it blocked by the FTC results in a lot of wasted effort. Thus, the FTC and Justice have issued regulations declaring what kinds of mergers are likely to be blocked. A

everyone else.

[22]The Herfindahl Index does have a theoretical justification. If the firms are Cournot competitors with different marginal costs, they will have different market shares. The Herfindahl Index equals the weighted average of their market shares multiplied by the industry elasticity of demand (and multiplied by -10,000).

regulation called "Horizontal Merger Guidelines" was issued in 2010 for **horizontal mergers**, which are mergers between firms selling competing products.[23] An example would be a merger between Ford Motor Company and Toyota, which both sell cars. Another memo, "Non-Horizontal Merger Guidelines," not revised since 1984, covers vertical and conglomerate mergers. [24] **Vertical mergers** merge two companies when one company (the **upstream firm**) sells to another company (the **downstream firm** which in turn sells to consumers. An example would be a merger of U.S. Steel and with the Ford Motor Company. **Conglomerate mergers** merge companies that sell unrelated products, such as a merger of the Ford Motor Company with Pepsi. Horizontal mergers generally reduce competition, and the main question is whether they substantially reduce it. Conglomerate mergers do not reduce competition, since the two firms are in different markets and market concentration is unchanged by the merger. Vertical mergers are the most complicated to analyze, since they can reduce competition but in more subtle ways.[25]

The *2010 Horizontal Guidelines* try to inform businesses what mergers will be allowed without tying the hands of the antitrust agencies. The *Guidelines* talk about objective criteria for market concentration, for example, but they are also careful to say that if the Justice Department finds a memo saying "Of course, the main reason why we're merging is so we can increase prices and gouge consumers," the merger can be declared illegal. The *Guidelines* are written for companies trying to comply with the law in good faith. An unprincipled firm cannot say, "But the guidelines didn't say I couldn't do X!" and be excused.

The *Guidelines* establish that what the agencies really care about is whether the merger will raise prices, which is what economists focus on. Earlier antitrust policy focussed on a more legalistic definition of the market, trying to use a more objective and predictable measure of how concentrated the market was. An example of such an approach (not a real example— just a simple one for discussion) would be to say that two firms can merge if and only if they wouldn't have over 30% of the market after the merger. This rule would make for neither good economics nor good law.

The economic problem is that such a simple rule ignores whether the merger really affects market power or not. In one market, two firms with market shares of 16% would be forbidden to merge even though neither could raise price above cost because

[23] U.S. Department of Justice and the Federal Trade Commission, http://www.justice.gov/atr/public/guidelines/hmg-2010.html "Horizontal Merger Guidelines," (August 9, 2010).

[24] U.S. Department of Justice, http://www.justice.gov/atr/public/guidelines/2614.htm"Non-Horizontal Merger Guidelines," (June 14, 1984).

[25] One's first thought is that once the firms merge vertically, the upstream firm will stop selling to competitors of the downstream firm, so downstream competition will be reduced. The flaw in that reasoning is that if the upstream firm found it profitable to sell to all the downstream firms before the merger, it will still be profitable afterwards, so trying to stifle competition there would actually hurt the merged firm's profits. There are counter-arguments, but they would take too long to explain.

entry by new competitors is easy. In another market, two firms with market shares of 14% would be allowed to merger even though there exists only one other firm in the market (with the remaining 72% of sales) so a triopoly would be converted to a duopoly.

The legal problem is that the rule is not actually so simple. It depends completely on how one defines "market". Lawyers can spend endless hours arguing about that. In the Cellophane Case, was Dupont selling in the market for "cellophane" (of which it had a 75% market share) or "flexible packaging material" (of which cellophane was only 20%). *U.S. v. E. I. du Pont*, 351 U.S. 377 (1956). In the ReaLemon Case, was Borden selling in the market for lemon juice in plastic lemons or did the market include natural lemons too? (are ReaLemons like real lemons?) *Borden. v. Federal Trade Commission*, 674 F.2d 498 (6th Cir. 1982). In the 2000's, were Whole Foods and Wild Oats competing with "premium, natural, and organic supermarkets" or with "grocery stores and supermarkets"? *FTC v. Whole Foods Markets, Inc.*, 533 F.3d 869 (D.C. Cir. 2008).

The *Guidelines* use a different approach to decide what group of products makes up "a market" when trying to figure out how many firms currently are in the market of the proposed merger. The **Hypothetical Monopolist Test** asks whether if a single firm was the only seller of a group of products, it "likely would impose at least a small but significant and non-transitory increase in price (**"SSNIP"**) on at least one product in the market, including at least one product sold by one of the merging firms." A ten- percent increase counts as significant. So, perhaps would be a 4% increase. The Guidelines are vague on that point.

The *Guidelines* make use of the Herfindahl Index as a way to screen mergers. They say:

> The Agencies generally classify markets into three types:
>
> - Unconcentrated Markets: HHI below 1,500
> - Moderately Concentrated Markets: HHI between 1,500 and 2,500
> - Highly Concentrated Markets: HHI above 2,500
>
> The Agencies employ the following general standards for the relevant markets they have defined:
>
> - Small Change in Concentration: Mergers involving an increase in the HHI of less than 100 points are unlikely to have adverse competitive effects and ordinarily require no further analysis.
> - Unconcentrated Markets: Mergers resulting in unconcentrated markets are unlikely to have adverse competitive effects and ordinarily require no further analysis.
> - Moderately Concentrated Markets: Mergers resulting in moderately concentrated markets that involve an increase in the HHI of more than 100 points potentially raise significant competitive concerns and often warrant scrutiny.

- Highly Concentrated Markets: Mergers resulting in highly concentrated markets that involve an increase in the HHI of between 100 points and 200 points potentially raise significant competitive concerns and often warrant scrutiny. Mergers resulting in highly concentrated markets that involve an increase in the HHI of more than 200 points will be presumed to be likely to enhance market power. The presumption may be rebutted by persuasive evidence showing that the merger is unlikely to enhance market power.

Consider an example. One firm has 50% and 50 others have 1% each. The Herfindahl is 2,550 (50*50+ 50*1*1) so the industry is *concentrated*. Can 12 of the small firms merge? They would contribute 144 to the Herfindahl instead of 12, an increase of 132. Such a merger *often warrants scrutiny* because it is in a *concentrated industry* even tho it is small.

Concentration measures are not really what we're worried about, but they are numbers, and relatively objective numbers, and that tends to focus the attention of policymakers, lawyers, judges, and people generally. The subjective element gets shifted, but it doesn't disappear. In fact it is crucial. Where it goes is into the definition of "market" that you use to measure the market shares that go into the Herfindahl Index. If Microsoft's market is "software", its market share is moderate. If the market is "operating systems" its market share is huge. If the market is "perfectly Windows-compatible operating systems", it is an absolute monopoly.

Despite all of the details on measuring concentration, the *Guidelines* say not to rely too much on the Herfindahl Index:

> The purpose of these thresholds is not to provide a rigid screen to separate competitively benign mergers from anticompetitive ones, although high levels of concentration do raise concerns. Rather, they provide one way to identify some mergers unlikely to raise competitive concerns and some others for which it is particularly important to examine whether other competitive factors confirm, reinforce, or counteract the potentially harmful effects of increased concentration.

The Staples-Office Depot Merger

When Staples and Office Depot proposed to merge in 1997, they presented evidence to the FTC and the Justice Department that their costs would fall enough to increase total surplus. The two firms were by far the biggest office supply firms, though, so it was clear their market power would increase. The companies argued that the market should include anybody selling office supplies, including big-box companies like Wal-Mart and K-Mart, but this case was not decided by looking at concentration ratios.[26]

The companies said their joint costs would fall. The Justice Department let the FTC decide what to do, and the FTC was skeptical about how big the cost savings

[26]See Harrington et al,; and Federal Trade Commission, http://www.ftc.gov/opa/1997/04/stapdep.shtm"FTC Rejects Proposed Settlement in Staples/Office Depot Merger: Says Deal Would Still Violate Antitrust Laws and Lead to Higher Prices for Office Supplies," (April 4, 1997); John Broder, "Office Depot and Staples Merger Halted," *The New York Times* (July 1, 1997).

would be. The FTC said that average cost would fall by 1.4% and the merger would raise prices by 7.3%. Staples said that if there weren't any cost savings at all, prices would rise by 2.4%, but there would be cost savings, so the ultimate effect would be a 2.2% fall in prices.

What about total surplus, though? Obviously, if Staples were right it would rise because both consumer and producer surplus would rise. But what if the FTC was right?

Staples and the FTC went to court to decide whether the merger was legal. The judge ruled that it was not. He ruled that total surplus was not relevant, only consumer surplus, and that the merger would raise prices and so would violate the Clayton Act. Indeed, Professor Carlton reports that only New Zealand and Canada have antitrust laws which hold total surplus to be the goal, not consumer surplus.[27]

Thus, companies that want to merge have to show not only that their costs would fall but that costs would fall enough that even consumers would benefit. Most mergers can pass this test, but not all, as the Staples case shows.

8.6: Conclusion

The theme in this chapter has been that there are business practices such as merging with another firm that sometimes have good, surplus-increasing motivations and sometimes have bad, surplus-reducing (but producer-surplus-*increasing*) motivations. The enforcement agencies and the judges have to decide which is the real motive in a given situation. Knowing some economics is clearly helpful to figuring that out. A major purpose of antitrust law is to deter egregiously bad behavior, but to the extent that the law is successful, we would not actually observe that bad behavior, and in fact we do not. Cartels can be kept secret and still work, but mergers and predatory pricing cannot, so the cases most commonly brought involve secret price cutting.

Antitrust law addresses the market failure caused by market power. It does not address high monopoly prices directly. Having a monopoly is legal, and so is charging high prices using market power. Because of government failure, it would be imprudent for the antitrust authorities to try to regulate prices or to break up companies simply because they are large and successful. Rather, antitrust law addresses the creation of market power by means which do not create surplus, only redistribute it. In this chapter, we have looked at the behavior of firms with market power, whether in isolation as a monopoly or in strategic interactions with each other as a duopoly or oligopoly. We've also looked at how antitrust laws are enforced and at its first priority: preventing price fixing. In the next chapter we will look at other monopoly-creating behaviors such as mergers and predatory pricing.

[27] See p. 157 of Carlton, Dennis W., "Does Antitrust Need to Be Modernized?" *The Journal of Economic Perspectives*, 21: 155–176 (Summer 2007).

Review Questions

1. How does a firm with market power choose price and output to maximize profits?
2. How does the Prisoner's Dilemma describe the incentive problem of cartels?
3. What is the Cournot Model and how does one solve for its equilibrium price?
4. Under what conditions are mergers illegal in the United States?
5. How would you decide whether a merger would increase market power too much?
6. How has the law treated cartels in the 19th century and in the present?
7. How do the Sherman Act and the Clayton Act differ?
8. How is antitrust law enforced in Europe and in the United States?

Readings

1. "$54B Deal Will Spawn Daunting Anthem-Cigna, Expert Says," *Law360*.
2. " EU To Fine Truck Makers over Price-Fixing and Other Collusion: Total Fines of Around $3.3 Billion after a Probe by Antitrust Authorities," *The Wall Street Journal*.
3. "Canada's Maple Syrup 'Rebels' ," *The BBC*.
4. "The Scam Busters: How Antitrust Economists Are Getting Better at Spotting Cartels," *The Economist*.
5. "A Strike against Rent-Seeking," George Will, *The Washington Post*.