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Competition Economics

Johan Stennek

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Johan Stennek

Research Institute of Industrial Economics (IFN)

Johan.Stennek@ifn.se

www.ifn.se/JohanS/

Contents:

1	Introduction	3
2	What is Economics (of Competition)?	3
2.1	What is Competition?	3
2.2	What is Efficiency?	8
2.3	What is Positive Economics?.....	11
2.4	What is Normative Economics?	12
2.5	What is Competition Economics?	14
3	Agreements between Firms: Price Fixing.....	16
3.1	How can firms enforce their agreements?	16
3.2	When can firms fix prices?	20
3.3	Can firms be induced to self-report cartels?	23
3.4	Stylized facts about cartels	24
3.5	Summary	26
4	Abuse of Dominance: Predatory Pricing	27
4.1	What is predation?	27
4.2	Is Predatory Pricing Rational?	28
4.3	Problems in Fighting Predation	31
4.4	Summary	33
5	Merger Control: Horizontal Mergers	34
5.1	Anti-Competitive Effects of Mergers	34
5.2	Efficiency Gains from Mergers	38
6	Competition Economics – An Unfinished Business	45

1 Introduction

Imagine that you are advising a client on a planned merger with one of their competitors. Informal communication with the competition authority reveals that they are worried that the merger will reduce competition and harm the consumers. There is a clear risk that the whole project will be stopped. How could you help your client? How would you go about predicting the effects of the merger? Will price go up, as the competition authority fears, or is it possible that the merger will lead to lower prices instead? How could anyone know the effects in advance, before the merger has taken place?

No one can know for sure. But, economics provides a “toolbox” to help you analyze this and many other issues determining the outcome of competition policy cases. There are theoretical models to help you understand what the most important aspects of the problem are. It could for instance be that the merger is likely to reduce the merging firms’ costs, and that lower costs may lead to lower prices, and therefore benefit the consumers. But how much will lower costs reduce prices? To answer such questions, there are empirical methods to help you quantify the effects. If you could demonstrate that a 10 percent reduction of costs would be sufficient for the price to fall, and that such a saving is likely to occur, your client would clearly have a much stronger case.

The purpose of paper is to illustrate the nature of economic analysis, primarily to future practitioners specializing in competition policy, but without any previous knowledge of economics. Some key economic concepts like competition and efficiency are introduced in section 2. This section also spells out the basic economic foundation for competition policy: what is it good for? The subsequent sections illustrate how economic analysis can be useful in competition policy, including the analysis of agreements between firms in sections 3, abuse of dominance in section 4 and mergers in section 5. The lecture concludes by pointing out some limitations of the current status of economics, in section 6.

Due to the time constraint – the course requires about four 90 minutes lectures – economic analysis will only be introduced by means of a few simple examples. The ambition is not to cover the whole area of competition economics and not to go very deep into any particular area either. Hopefully this lecture will improve your ability to communicate with the economists involved in the case. They may be hired as experts by your client, or work at the competition authority, or they may act as expert judges in the court. In any case, you will do a better job with some understanding of economic analysis.

2 What is Economics (of Competition)?

2.1 What is Competition?

To illustrate what economists mean by competition, it is useful compare the same *hypothetical* market when there is one firm (monopoly) and two firms (duopoly) operating in the market.

Monopoly

Consider a market with 1000 identical consumers. They all consider the consumption of one unit of the good to be worth €10; consuming a second unit is not worth anything. There is only one firm producing the good, and the cost of producing one unit is €1.

The market operates in the following way. First, the firm decides what price to charge for the good, and then informs all the consumers about this price. Second, the consumers decide whether or not to buy the good at the announced price.

The question is now, what price will the firm set, and how much will the consumers buy? We start out by analyzing of consumer behavior. Since one unit of the good is worth €10, each consumer buys one unit of the good if the price is below €10. If the price is above €10 consumers do not buy the good at all. We have now derived the *demand* for the good. The demand describes how many units the consumers will buy for all possible prices that the firm might charge. If consumers conform to this behavior they are doing as well as they can, given their own values -- they are *maximizing utility*.

Next, we analyze the firm's behavior. When the firm sets its price, it will take into account how many units the consumers will buy at different prices. If the firm sets a price above €10 it will not be able to sell anything, and the profit will therefore be zero. Setting a price below €1 (the production cost) is even worse, since it will sell at a loss. If the firm sets a price below €10 but above €1, the firm can sell 1000 units and make a profit. The best—or *profit maximizing*—price for the firm to set is €10. Then the firm makes a profit of $9000 = (10-1) \times 1000$.

We conclude that the firm will set the price at €10, equal to the consumers willingness to pay for one unit of the good, and that the consumers will all buy one unit each.

Duopoly

Assume now that there are two identical firms producing the good. All consumers perceive the firms' goods as identical (homogenous). The market operates in the following way. First, the two firms simultaneously, but independently, decide on their prices. All consumers are subsequently informed about both firms' prices. Second, consumers decide whether to buy the good and, if so, from which firm to buy it from.

We start out by analyzing of consumer behavior. A consumer buys one unit of the good from the firm with the lowest price, if that price is below €10. If no firm has a price below €10 consumers do not buy any goods. If both firms charge the same price, consumers are indifferent, and economic analysis cannot predict which firm the consumers buy from. Instead, we simply make the reasonable assumption that half of the consumers buy from each firm.

Next, we analyze the firms' behavior. For the same reasons as in the monopoly case, firms will not set prices above €10 or below €1. Is it possible that the firms would choose the same price as the monopolist, that is €10? If they do, they will both sell to half of the consumers, and both will earn half of the monopoly profit, that is €4500.

Surely, this would be the best possible outcome from the firms' point of view. So, should we expect them to behave this way? No, we should not!

If one of the firms lowers its price by one cent, it will receive *all* customers, and make a profit of $\text{€}990 = (9.99 - 1) \times 1000$. A very small reduction in price gives a very large increase in the number of items sold. Hence, by undercutting the rival's price by one cent, a firm can take the whole market and make a larger profit. We can conclude that the two firms will not charge the monopoly price. If so, both would have an incentive to change its behavior.

Does this mean that the firms will both charge $\text{€}9.99$? Again, the answer is no. Whenever the competitor sets a price above cost, it is always more profitable for a firm to charge one cent less. The argument is exactly the same.

Only if both firms charge the price $\text{€}1$, equal to the production cost, they will not have an incentive to lower their prices. By lowering its price below cost, a firm could still "steal" all customers. But selling below cost would imply a loss. Since no firm has an incentive to change its behavior, we say that setting price equal to cost is the *equilibrium* behavior in this situation. Similarly, $\text{€}1$ is called the equilibrium price.

Exercise: Explain why no firm has an incentive to either increase or decrease price if both firms charge $\text{€}1.01$!

Actually the above analysis is not completely correct. There are two different equilibria. Either both firms charge $\text{€}1$, or both firms charge one cent more, that is $\text{€}1.01$. In both cases, no firm will have an incentive to change its price. In both cases the price is (almost) equal to the production cost, and profits are (almost) equal to zero. Even if economic theory cannot predict which of the two equilibria that will emerge, this indeterminacy is not much of a problem in this particular case, since the two equilibria are almost equivalent.

Equilibrium selection

The issue of how to make predictions when there are multiple equilibria is called equilibrium selection. In the present case, both firms charging $\text{€}1.01$ is the more plausible prediction. Charging the higher price ($\text{€}1.01$) gives a firm at least as much profit as charging the lower price ($\text{€}1.00$) independent of what the rival does, and if the rival charges $\text{€}1.01$ (or more) the higher price yields a higher profit. Still, however, both firms charging $\text{€}1.00$ is an equilibrium.

Comparing Monopoly and Duopoly - The effect of competition

In the monopoly case the firm charges €10, which is the highest price that consumers are prepared to pay for the good. In the duopoly case the two firms charge €1, which is the cost of producing the good.

The important message is the following *prediction* of how market price relates to market concentration: The more firms there are in the market, the lower is price.

The Empirical Picture

The prediction that competition lowers price is one of the most fundamental predictions of economic theory. But is it true? To answer this question we need to look at empirical studies. Actually, there are many empirical studies that seem to confirm (do not reject) the theoretical prediction. Comparing different geographical markets (within the same product market) with different numbers of firms, price is often lower in markets with more firms. Other studies have shown that a merger between two competitors may often increase the price in the market.

One empirical study examined the market for driving schools in Sweden. The study collected data from 250 municipalities, which were considered to be separate markets. The Stockholm area was excluded since it is questionable if the different municipalities can be viewed as separate markets. The number of driving schools varied from zero to thirteen in the different municipalities. The study found that all driving schools within a municipality charged approximately the same price. Between the different municipalities, prices varied a lot, however. In one municipality the price was SEK 4.50 per minute and in another it was 8.00 per minute. In all other municipalities the price was between the two extremes. The study then computed the average price among the municipalities with only one driving school and among municipalities with five driving schools. The price was found to be 0.30 higher in the monopolistic municipalities. The study also showed that this difference was unlikely to have arisen by “pure chance.” The conclusion, then, is that the data is consistent with the theoretical prediction. It should be said, however, that market concentration appears to have a rather modest effect on driving school prices.

Sources of Market Power

In the above theoretical illustration, competition is extremely fierce. With only two firms, price is brought down to cost, and profits to zero. The reason is that even if a firm undercuts the competitor’s price by just one cent, *all* customers will switch to the low-price firm. In reality, however, also duopoly firms are usually able to set price above cost, and earn a profit.

The ability to set price above (marginal) cost, without losing all customers, is called *market power*.

Marginal cost

Marginal cost is defined as the cost of producing one extra unit. In the illustration used in this lecture all units are equally costly to produce (such a production technology is said have constant returns to scale). In such a case marginal cost is simply equal to average cost.

Lerner index

Market power is often measured by the so-called Lerner index, which is the difference between price and cost divided by cost. In the illustration above, the monopoly firm's Lerner index is $9 = (10-1)/1$, indicating very high market power. A duopoly firm's Lerner index is $0 = (1-1)/1$, which indicates complete absence of market power.

The reason for why firms in many markets are not forced to set price equal to (marginal) cost is that, unlike the firms in the above illustration, they would not lose all their customers, even if a competitor would charge a (slightly) lower price. There are many reasons for why a high-price firm may keep its customers.

1. As already illustrated, firms may have more market power if there are only a *few firms* active in the market.
2. If *products are differentiated*, and if some customers prefer one firm's product to the other, they will continue to buy that firm's product even at a (slightly) higher price. As a consequence, a firm that attempts to poach its rivals' customers must reduce price quite a lot. Such a reduction in price would be less profitable. Hence, when products are differentiated, firms have less incentives to lower their prices.
3. If firms have *capacity constraints*, a single firm will not be able to sell to all customers. If a firm cannot supply more customers, it will not have an incentive to lower price to win over the competitors' customers.
4. If firms have *different costs*, a low cost firm will be able to charge a price above its own cost without losing all customers. As long as the price is below the competitors' costs, they will not have an incentive to undercut.
5. If *customers are not informed* of all firms' prices, they may continue to buy from their regular firm even if other firms would lower their prices. In such a case, a firm would not be able to attract many new customers by lowering its price. Hence, the incentive to lower price is reduced.
6. If customers must pay a *switching cost* in order to change supplier, firms will be able to charge higher prices without losing customers. An example of a switching cost is that consumers may have to learn how to use the competitor's product.

7. Firms may also have the ability to form a *cartel*, and thereby to set price above cost. This source of (joint) market power is discussed later in this lecture.

There are many dimensions of market power in addition to the number of firms. Additional dimensions are how *price sensitive* customers are, and how easy *entry* is to the market. Yet another important factor for what prices firms charge is how *frequently* and when firms revise their prices, and exactly what *information* they have about their competitors and the customers.

The concept of market power is important for competition law as well as for sector specific laws regulating particular industries such as telecommunications. However, in competition law, the term “market power” may not be used as frequently as in economics. Remember, however, that market power is the same as absence of competition (a term which is used often), and that a reduction in competition is the same as an increase in market power.

Exercise: Compare the criteria used by competition authorities for assessing dominance with the factors economic theory points out as the sources of market power.

Moreover, the legal term “dominance” can be viewed as a *high level of market power*, that is market power above some threshold level.

2.2 What is Efficiency?

One of the most important concepts in economics is efficiency. Despite its importance and frequent use, the idea of economic efficiency is typically not well understood outside the economics profession. To illustrate this concept, it is useful to again consider a hypothetical market.

Monopoly

Consider a market with 1000 consumers, of two different types. There are 500 consumers who value (one unit of) the good at €10. These consumers will be called high-value consumers. The other 500 consumers value the good at €5. These consumers can be called low-value consumers. There is one firm producing the good, and the cost of producing a unit is €1. The “rules” of the market are the same as before. First, the monopolist decides on a price, and all consumers are informed about this price. Second, consumers decide whether or not to buy the good.

We start out by analyzing the consumers’ behavior. By arguing in a similar way as above, consumer behavior can be summarized as follows. If the price is above €10, nobody buys the good. If the price is between €10 and €5, all 500 high-value consumers buy one unit of the good. If the price is €5 or below, all the 1000 consumers buy one unit of the good. That is, the following table describes the market demand (function):

<u>Price:</u>	<u>Quantity demanded:</u>
>10	0
10-5.01	500
<5	1000

The new thing about this case, compared to Illustration 1, is that market demand is “*downward sloping*.” That is, the lower is price, the more units the consumers will buy.

Next, we analyze the firm’s behavior: As before, the firm will not charge a price above €10 or below €1. Actually there are only two prices that the monopolist would consider, namely €10 and €5. If the monopolist charges €10, it will make profit €4500 = (10-1) x 500. If the monopolist charges €5, it will make profit €4000 = (5-1) x 1000. Hence, the monopolist will charge €10, and only sell to the consumers that have a high willingness to pay.

Exercise: Explain why the monopolist would not set the price €7 or €3?

Duopoly

Assume now that there are two identical firms producing the good. A consumer buys one unit of the good from the firm with the lowest price, if that price is below his willingness to pay (€10 or €5). If firms charge the same price, half of the consumers of both types buy from each firm. For the same reasons as in Illustration 1, the equilibrium price is €1.

Exercise: Work out the argument.

Market power as a source of inefficiency

Again we see that competition leads to a lower price. In the present case, when demand is downward sloping, a new phenomenon arises. In the monopoly case, when price is €10, only 500 units are traded on the market. In the duopoly case, when price is €1, 1000 units are produced and consumed.

Why does the monopolist choose not to sell to all the consumers, including those with a low willingness to pay? In order to sell to the low value consumers, the monopolist must lower its price also to the consumers with a high willingness to pay. As a result,

there is a trade-off between on the one hand a low price and high sales, and on the other hand a high price and low sales. This trade-off typically means that (monopoly) firms will choose not to sell to all consumers.

Limits to price discrimination

The monopolist cannot charge different prices from different consumers if it does not know exactly which consumer that has a high willingness to pay and which consumer that has a low willingness to pay. Even if the monopolist would have information about each customer's willingness to pay, it may not be able to set different prices if consumers could resell the good. If customers can resell the good, only low-value consumers would buy the good, and then resell it to high-value consumers, so-called arbitrage.

Note, in particular, that the monopolist chooses not to sell to low value consumers despite the fact that they are willing to pay €5 for each unit of the product while it only costs the monopolist €1 to produce each unit. The fact that monopolist does not produce the 500 units to the low value consumers is called a *dead weight loss*. A dead weight loss is a form of *social inefficiency*: All agents do as well as they can, given the behavior of everybody else. But if we consider the consumers and the firm as a group, the outcome could be improved.

Let us think about a benevolent dictator. If the dictator would order the monopolist to produce 500 units extra and to give these units to the low value consumers, society as a whole would gain. On the benefit side, the consumers would gain €2500 = 5x500. This is the value of each unit consumed times the number of units. On the cost side, the firms would lose €500. Hence, considered as a group, increasing production by 500 units would create a net benefit to society of €2000.

If the dictator would order the consumers to pay €5 for the good, the dictator could distribute the €2500 among the firm and the consumers in such a way that all parties are better off. First the dictator would have to give the firm €500. The remaining €2000 could be split in some way between the firm and the consumers. Another possibility would be for the dictator to order consumers to pay €3 for the good. Then again both consumers and the firm would be better off compared to the monopoly outcome.

In contrast to the monopoly outcome, the duopoly outcome is socially efficient. That is, it is not possible to increase or reduce production and thereby create a net benefit as in the monopoly case.

Another interesting difference between monopoly and duopoly is the distribution of wealth between the consumers buying the good (high value consumers) and the firm. In both cases the high value consumers buy one unit of the good each. In the duopoly case, consumers pay a price of €1 for a good that they value at €10. We say that each consumer's surplus is €9. That is, we measure a consumer's welfare by the so-called *consumer's surplus*, which is defined as the difference between what the consumer is willing to pay for the good and what the consumer actually has to pay. In this case, the producer surplus (profit) is zero. However, in the monopoly case consumers pay a price that is equal to value of the good, meaning that the consumer's surplus is zero. The firm on the other hand makes a profit of €9 per unit.

Summary

Economic analysis predicts that the more firms that compete in a market, the lower price will be. Also many empirical studies show a positive relation between market concentration and market price. Other dimensions of market power are product differentiation, capacity constraints, and consumer's lack of information.

The high prices associated with market power have two important effects. First, the high price induces some consumers not to buy the good, even though their valuation of the good is higher than the cost of producing the good—a social inefficiency. Second, a high price implies a transfer of wealth from the consumers buying the good to the firm.

2.3 What is Positive Economics?

Economics is a social science. It is concerned with describing the regularities of human behavior. That is, economists try to *predict how people behave* in different situations. The focus is often on situations that concern production, exchange and consumption of goods and services. The illustrations in the previous section gave an example of one regularity that has been established in economics, namely that the more firms that compete in a market, the lower is typically the price.

In predicting economic behavior, economists follow a rather uniform procedure. The first element of that procedure is to build an analytical framework, a *theoretical model* of the situation of interest. A model is a simplified description of the true world. In the illustrations above, a model of monopoly and duopoly was introduced. It was assumed that there is only one or two firm. In real-world concentrated market there might be a few very small firms as well. In one version of the model it was assumed that all consumers are identical. It was also assumed that the firms have full information about market demand, and that their only decision is to set price. In case of duopoly, it was assumed that prices are set simultaneously. Due to all these simplifying assumptions it was possible to predict how the consumers and the firms would behave.

The simplifying assumptions are a strength of the economic methodology. They are introduced because real-world markets are too complex to allow direct predictions. If that was not so, we would understand how markets function without any research.

The simplifying assumptions are also a weakness of the economic methodology. The drawback is that the simplifying assumptions normally are false descriptions of the

world. It is thus not obvious that the predictions generated in the models are true in the real world. To make up our minds we need common sense: Is it likely that the derived conclusions (e.g. more firms lead to lower prices) rely in some critical way on the assumptions (e.g. all consumers are identical)? We may also believe more in the predictions if the same predictions can be generated in many different models that are characterized by different simplifying assumptions. Actually, the prediction that more firms lead to lower prices has been established in many different models.

In predicting economic behavior, economists also rely on two more basic assumptions. The first assumption is that all actors are *rational*, which means that (1) they have some given objective, and that (2) they chose whichever behavior that best achieves that objective. In the illustrations in the previous section it was presumed that firms chose prices to maximize their profits. It was also assumed that each consumer buys the quantity of goods that maximizes his utility (or his consumer's surplus).

The second assumption is that of *equilibrium*. To understand this idea, consider the duopoly discussed above. The price that maximizes one firm's profit depends on the price charged by the other firm. In particular, as long as price is above cost, the best price for each firm is to undercut his competitor's price by one cent. Hence, it is not clear which price is rational for a firm to set. If the competitor charges 10, the best response is to set 9.99. But if the competitor charges 9.99, the best response is to set 9.98, and so on. A state of equilibrium arises when no one has an incentive to change his or her behavior, for example neither firm has an incentive to change its price. Both firms do as good as they can, given the price set by the competitor. The reason for why economists focus on equilibrium behavior is that non-equilibrium prices only can only be expected to prevail for short periods. If we want to study the *regularities* of behavior, it must be an equilibrium.

Finally, in order for a regularity to be established, it is required that the prediction arising from the theoretical analysis is consistent with what can be observed. Usually, economists collect data about different markets and use statistical procedures to test the theoretical predictions. However, lately also experiments in laboratories have become increasingly popular.

2.4 What is Normative Economics?

Economics does not only have this positive component—trying to predict human behavior—but also a normative component. Economists want to know if the way people behave leads to an outcome that is good in some sense. Economists often claim that one situation is better or worse than another situation. For example, in the illustrations above, the duopoly was said to be (socially) efficient while the monopoly was said to be (socially) inefficient. The duopoly is considered better than the monopoly. What is the basis for such value judgments?

Efficiency

Normative economics is built on two key concepts, namely (social) efficiency and distribution of wealth. The most basic notion of efficiency is *Pareto efficiency*. A situation is said to be Pareto efficient if it is impossible to change it – for example by increasing or reducing production – and thereby making at least one individual better

off, without making any other individual worse off. In contrast, a situation is Pareto inefficient if it is possible to change the situation in some way that benefits some individual(s) without hurting others. Moreover, a change is said to be a Pareto improvement if it makes at least one individual better off and nobody worse off. The strength of the ideas of Pareto efficiency and Pareto improvements is that most people, independent of ideology, probably would agree that a Pareto improvements are desirable.

The notion of efficiency normally used in competition economics is more controversial, however. This notion builds on the idea of the *compensation principle*. A situation is said to be inefficient if it is possible to change it in such a way that those who gain from the change could compensate those who loose. If the dictator orders the monopolist to produce 500 additional units and hand them over to the consumers, the consumers would be better off, but the monopolist would be worse off. This change is not a Pareto improvement. However, since the consumers gain €2500 and the monopolist only loses €1000, the consumers could compensate the monopolist in such a way that all individuals are better off. If the compensation would be paid out, the change would be a Pareto improvement. Relying on the compensation principle, however, it is not important whether or not the compensation is actually paid out. According to the compensation principle it is sufficient if there is a potential compensation.

Distribution

Whether or not the compensation should be paid out is a question of *distribution* of wealth. Many economists argue that if one cares about the distribution of wealth, then one should try to affect distribution directly using taxes and transfers. Competition policy, as well as many other policies, is a less efficient means to achieve the distribution of income that one might favor.

It is possible to include concerns for distribution into the normative analysis of markets. To do so, however, one must make precise how one values different individuals. Using the compensation principle one implicitly says that one extra Euro to person A (who might be a consumer) is equally valuable as one extra Euro to person B (who might be a firm owner). To introduce distribution concerns one must say how much more an extra Euro to person A is valued.

How can economists make political recommendations?

Economic policy advice builds on both positive and normative analysis. Economists often argue that competition is desirable, and advocate different policy measures to protect competition. For example, many economists argue that public authorities should block mergers of competitors, so that duopolies are not transformed into monopolies. The basis for giving such policy advice is some analysis (similar to the one in the above illustrations) showing that the market outcome will be better if the proposed policy is carried out. The above analysis indicates that a merger from duopoly to monopoly may create a dead weight loss: some consumers who should consume the good will not do that if competition is reduced.

But, the basis may also be a concern for distribution. Again positive and normative analysis is required. Less competition implies higher prices. Hence, there is a transfer

of wealth from those consumers who still consume the good to the firm(s). If consumers on average are less wealthy than firm owners, such a transfer may be unwanted.

As I see it, it is a strength that economics can be used to recommend public policies. There is an important caveat, however. We need to be clear on both the positive and the normative foundations of the analysis. How do we weigh different peoples' interests against each other?

2.5 What is Competition Economics?

Economic research has shown that markets work well – they are efficient – under some circumstances. In such cases, the only scope for public policy is if one is not satisfied with the distribution of wealth that the market generates. Distribution can be changed in the desirable direction by taxes and transfers.

Economic research has also shown that markets lead to inefficient outcomes under some other circumstances. We call these circumstances *market failures*. Market failures can sometimes be solved by public intervention.

A well-known example is firms polluting their environment. Pollution is often inefficient, since the polluter does not take into account the effect of pollution on others. Suppose it would cost the polluter €1m to clean the emissions. Then a profit maximizing firm would not do so by itself, even if the value to others is €2m. Then the market outcome with pollution is inefficient, and can in principle be improved for example by introducing a fee for pollution. If the fee is set above €1m, the polluter will start cleaning the emissions.

Another market failure is the inefficiencies that result from market power. To mitigate these inefficiencies we have competition policy (or antitrust policy), as well as sector specific regulations. The purpose of the economics of competition is to help answer several important questions.

1. What is the purpose of competition policy? Why is the market outcome not satisfactory and how can it be improved by public intervention?
2. Exactly how should the antitrust laws be designed to achieve the desired result?
3. How should the law be interpreted in a particular case?
4. How should markets be defined, market power be measured, and so on?

A part of the answer to these questions has already been discussed. We need competition policy to reduce the dead weight loss, and (if we care for distribution) to reduce the transfers of wealth from consumers to firm owners associated with monopolistic pricing. Knowing the purpose of competition policy may be helpful in interpreting the rules.

As indicated by the third question, economic analysis can also assist the parties in anti-trust cases to formulate what the relevant arguments in favor of their interests are. A competition authority may for example use economic theory to show that a certain

agreement between two firms restricts competition. The defendant firms may use economic arguments to show that the same agreement has positive effects that are more important than the anti-competitive effects. Informed application of economic arguments from both sides increases the possibility that competition policy will succeed to fulfill its goals.

Competition policy in the U.S. and in Europe can be divided into three areas, agreements between firms, abuse of dominance, and merger control. The following sections provide examples of economic analysis from each of these areas.

3 Agreements between Firms: Price Fixing

Competition for customers leads to lower prices and lower profits for the firms. If competition is very strong – as in the duopoly model analyzed above – competition may even force the firms’ prices down to cost and reduced their profits to zero. Clearly, if they could avoid it, firms would prefer not to compete with each other. It must therefore be tempting for them to make an agreement to stop trying to “steal” each others customers. There are many examples of such agreements. The firms may agree to charge a common price, to limit production or to stay out of each other’s geographical territories. Such agreements between competitors are often called horizontal agreements. We will focus on the first type, price-fixing agreements.

The best possible outcome from the firms’ perspective would be to agree to set the same price as a hypothetical monopolist would have set. Two duopoly firms could then serve half of the consumers and earn half the monopoly profit each.

The first problem with such an agreement is that each firm would have an incentive to cheat. Any firm believing that the competitor will stick to the agreement, and charge the monopoly price, will have an incentive to undercut the monopoly price by one cent. Then, the cheating firm would sell to all customers at (almost) the monopoly price, and would consequently earn (almost) the monopoly profit all by itself. The second problem from the firms’ point of view is that courts do not enforce price-fixing agreements.

Since both firms know that the other firm has an incentive to cheat, they may never even try to come to an agreement. If this was the end of the story, collusion would not be much of a problem. It would suffice not to provide enforcement of cartel agreements to completely deter even attempts to fix prices.

One of the key points of this lecture, however, is that firms sometimes can enforce collusive agreements themselves, without the help of courts (section 3.1). Such collusion is called self-enforcing. We will also discuss when – or rather under what conditions – firms can collude (section 3.2). As these conditions vary from market to market, they are essential knowledge for competition authorities.

3.1 How can firms enforce their agreements?

A key characteristic of the duopoly model discussed so far is that the market is assumed to exist only one period. In reality, most oligopolistic interaction takes place over long time spans. This means that firms have the possibility to *react* to each other’s past behavior. Firms may for instance be able to punish their competitors—for example by starting a price-war—if they cheat on the agreements. The ability to react on each others’ past behavior changes the competitive situation dramatically.

The strategy of cooperation – the “trigger strategy”

To understand the role of repeated interaction and punishments to foster cooperation we will consider the simplest possible type of behavior, the so-called “trigger strategy.” The trigger strategy prescribes the following behavior to a firm:

1. Start out by charging the monopoly price.
2. As long as no one has cheated (that is, charged a price lower than the monopoly price), continue to charge the monopoly.
3. If someone has cheated in the past, charge price equal to cost.

In short, firms cooperate until someone cheats, and then they fight a price war forever after.

If both firms for some reason would behave according to the trigger strategy, they would start out by charging the monopoly price and then continue to do so for as long as the market continues to exist. The punishment clause is just a threat that would never need to be used.

The question is if there is any reason to believe that both firms would follow the trigger strategy? The short answer is: Sometimes. If firm A behaves according to the trigger strategy, it may be in firm B’s interest to also stick to the same strategy. Since no firm has an incentive to change behavior, both firms behaving according to the trigger strategy is an equilibrium. That is, economic theory predicts that firms may sometimes behave according to the trigger strategy.

Proof

To prove that firm B has an incentive to follow the trigger strategy, if firm A does so, one has to show that B’s profit is higher if B does not cheat. Consider the numbers from the first illustration above.

- If B follows the trigger strategy and charges the monopoly price, B will earn half the monopoly profit in every future period. That is, his profit flow is: 4500, 4500, 4500, 4500, ...
- If B cheats, B will earn (almost) the whole monopoly profit in the first period. However, in all future periods, firm A will set price equal to cost, and hence B’s profit will be zero forever after. That is, his profit flow is: 8990, 0, 0, 0, ...

Which alternative is better, depends on the interest rate. If the interest rate is very high, firms become very “impatient.” Then, one Euro today is worth much more than one Euro tomorrow. In that case, firm B may prefer to cheat and earn a big profit immediately and nothing in the future. But if the interest rate is low enough, B will prefer to have half of the monopoly profit every period.

One may ask what the interest rate would need to be in order for cheating to be the better alternative. By following the trigger strategy the firm can pay 4500 as dividends every period. If the firm cheats and earns 8990 the first period and pays a dividend of 4500, it will have $4490 = 8990 - 4500$ to save in the bank. If the interest rate would be 5%, the firm would only receive $224 = 0.05 * 4490$ every period. The flow of

dividends would then be 4500, 224, 224, Clearly the firm and its owners would prefer to follow the trigger strategy. If the interest rate would be 50%, the firm would only receive $2245 = 0.5 * 4490$. If the interest rate would be 100% the dividends would be 4490, and still not sufficient. But if the interest rate would be 110% the dividends would be 4939, and the firm would prefer to cheat.

The key point is that firms under certain circumstances (e.g. low interest rates) can collude and fix prices, even without a legally enforceable contract. Hence, to stop collusion it is not sufficient to deny firms legal enforcement of price-fixing contracts. It is necessary to make collusion illegal, and punish firms that engage in such behavior. This is the economic rationale for competition policy rules against price-fixing agreements.

But many outcomes are possible

The above argument shows that collusion is a possibility. If firm A follows the trigger strategy, firm B has an incentive to also follow the trigger strategy, and vice versa.

Competition is also a possibility. If firm A follows the “competitive strategy” (the competitive strategy prescribes that a firm should charge price equal to cost in every period, independent of what the competitor has done in the past), then firm B has an incentive to also follow the competitive strategy, and vice versa.

Exercise: Prove that both firms following the competitive strategy is an equilibrium.

When firms interact over many periods, there are typically more than one equilibrium. Which behavior, collusion or competition, should economic theory predict that firms will follow? Unfortunately, at present, economics does not have an answer to this question. Still the theory is important since it shows that collusion is possible only under certain conditions. In the above analysis the role of the interest rate was mentioned. Knowledge of these conditions is important for competition authorities to direct their work. Only in markets where the conditions are satisfied, they need to worry about collusion. In the next sub-section, we will elaborate on the conditions that make collusion possible.

What is a strategy?

A strategy is a behavioral rule that prescribes a behavior to a firm for every possible contingency. We have discussed two different strategies here.

The trigger strategy is very simple since it only distinguishes between three possibilities. It distinguishes between the first date and all subsequent, and it distinguishes between the possibility that some firm has cheated in the past, and the possibility that no firm has cheated in the past.

The trigger strategy does not distinguish between (for example) undercutting the price by one cent or one dollar. Any undercutting is treated in the same way. Similarly, for the trigger strategy it does not matter if someone cheated yesterday or ten years ago. If someone has cheated in the past, there is “price war.”

In this lecture we study the trigger strategy because it is the simplest strategy enabling firms to collude without outside enforcement. The simplicity of the strategy makes it easy to understand.

The competitive strategy is even simpler: It prescribes firms to always set price equal to cost, independent of the situation.

Do the firms need to meet and talk?

Some economists argue that if collusion is possible in some situation, then it will arise. Actually, some economists argue that the firms do not even need to communicate, or to make an explicit agreement, to collude. Since both firms realize that collusion is in both firms' interest, both firms will, independently of each other, choose to follow the trigger strategy.

My personal view is that such silent (or tacit) collusion is a risk in some situations. It would probably be easy for firms to “agree” to continue to stay out of each others' national markets, if they have historically only served their own markets. Each firm would understand that entering the other market would be considered an aggressive act triggering a retaliatory entry by the competitor into the own market.

If silent collusion indeed is a possibility, competition authorities face serious problems. Exactly what is it that should be declared illegal? Should firms that have not communicated be considered to have reached an *implicit* agreement if they follow the trigger strategy? Unless one chooses to do so, silent collusion cannot be stopped.

But, even if silent collusion would be considered illegal, it would clearly be very difficult for competition authorities to prove. Probably for practical reasons, only overt collusion is in fact illegal.

In many situations silent collusion appears to be less of a risk. It would for instance probably be difficult to fix prices for identical goods, especially if the firms have thousands of different products and if costs are continuously changing over time.

Indeed, there are many reasons why colluding firms may need to communicate in such a situation. They may need to meet in order to select a price to collude on, since there are many possible candidates. If they have different preference about the ideal price, they may also have to negotiate before reaching an agreement. They may also have to meet to exchange information about their production costs and other market conditions to be able to find out which the best price would be. In addition, they probably have to meet repeatedly to take into account that demand and cost conditions may change over time. They may also have to meet and discuss if one of the firms appears to have cheated on their agreement.

Also in case firms do communicate, they will naturally tend to do so secretly.

To increase their possibilities of proving collusion, competition authorities have tried to prove collusion in more indirect ways. For example, in some cases, it has been argued that so-called *parallel behavior* is evidence that firms collude. Parallel behavior means that the firms keep changing their prices by the same amounts and at the same dates. The problem is that also competing firms can be expected to behave in a parallel manner in many situations. For example, in the duopoly model considered in the illustrations, both firms set price equal to cost. If production cost is changing by 10 percent from one period to another, both firms will change their prices by 10 percent at the same time.

3.2 When can firms fix prices?

We have seen that the possibility of collusion depends on the *interest rate*, and how patient firms are. But there are many other factors that are important for the firms' ability to fix prices.

The *number of firms* in the market affects the possibility of collusion. In the above example it was assumed that there are two firms in the market. Assume now that there are three firms instead. Then, if firms cooperate, they will earn a third of the monopoly profit each (that is €3000). Again, a firm that cheats, and undercuts the monopoly price by one cent, will earn (almost) the whole monopoly profit during one period (that is €990), and then zero forever after. Note that in the case of three firms, cheating is more profitable than in the case of two firms. The short-term gain is two thirds of the monopoly profit (that is €990 instead of €3000), and the long-term loss is one third of the monopoly profit (that is €0 instead of €3000). Hence, triopoly firms have stronger incentives to cheat, and collusion is less likely to be self-enforcing.

Another important factor is the *time horizon*. Most products have a limited life cycle. Usually the lifetime is unknown in advance but some products may be expected to have a short life, while others may be expected to have a long life. If the lifetime is expected to be short, cheating is relatively profitable. The short-term gain of defecting

is not affected by the expected lifetime. The cheating firm earns the whole monopoly profit, instead of just half the monopoly profit, during the first period. However, the long-term cost of cheating is not so large if the expected lifetime (the number of future periods) is short. If the expected lifetime is short, the cheating firm will only lose €4500 a few periods. However, the importance of the time horizon is much more complex than indicated here. These complications are discussed in some more detail in a technical note below.

In order to sustain collusion, firms must be able to *detect cheating*. That may be difficult. Normally firms do not observe the prices that their competitors charge in each transaction. Even if they can observe the price, firms can cheat by giving extra service or increase the quality of the product and so on. However, also if a firm cannot observe the competitors prices (or service levels) they can indirectly observe the competitors behavior by observing how many units they sell themselves. If the competitor cheats, the firm sells fewer units than expected. The problem is that sales may also fluctuate because of fluctuations in demand. A firm may thus not be able to tell if sales are low because the competitor has lowered his price, or because there are few customers in the market. As a result, one may expect that collusion is easier if firms can observe each other's behavior directly, or if market conditions, for example demand, are relatively stable.

In order to facilitate collusion, firms can exchange information. For example, if firms always report all their sales, including all terms, and substantiate the information by submitting the actual contracts, then cheating is made more difficult. It is important to note, however, that all forms of information exchange are not necessarily harmful.

Also the firms' *reaction time* is crucial. If a firm can detect that its competitor has reduced its price quickly, the length of the period during which the competitor can earn the whole monopoly profit is reduced, and the sooner the punishment can start. Hence, the shorter the reaction time, the less profitable it is to cheat on an agreement and the easier it is to sustain collusion.

Firms must be able to *punish* cheating rivals. In the example above, the firms punish by charging a low price in the future. Such a punishment can be very costly. If one firm deviates, the other firms cannot continue their cooperation. However, there may exist other ways to punish a deviator. For example by excluding the deviating firm from R&D joint ventures, standardization committees and so on.

If *entry is easy*, collusion is more difficult. The reason is that if firms collude on a higher price, they will trigger new entry into the market. Hence, they need to share their customers with more firms. The entrants may also be expected to be more aggressive in their pricing than the old firms since the entrants need to attract the customers' interests. The ease of entry varies between different markets. In some markets it may be difficult because it requires time and money for R&D. In other markets entry may be difficult because it requires much advertising.

In order to cooperate, firms must be able to *agree* on which price to collude on. If firms are very different, for example if they have different costs, they will have different preferences on which price to choose. Intuitively, such differences may make agreements more difficult.

The Importance of the Time Horizon: A Technical Note

The above discussion was vague about exactly how many time periods the market will persist. As it turns out, if we make an explicit assumption about the lifetime, a rather surprising result appears. At first, and in sharp contrast to the discussion above, it appears that collusion is not self-enforcing after all. However, as we shall see, the conclusion that collusion is self-enforcing in long-lived situations can be restored.

Assume that the market will persist for only two periods, and that the two firms know this. Then, collusion is not possible (that is: only competition is an equilibrium). In the last period, the firms find themselves in a situation exactly like the situation in Illustration 1 above. Hence, both firms will set their prices equal to cost. It does not matter what happened in period one; the firms will set prices equal to cost in period two. In period one, the firms can predict their own behavior in period two. Hence, they know that they, independent of what they do in the first period, will compete in the second. When the firms' behavior in period two is fixed, they cannot *react* on the outcome of the first period. In particular, they cannot credibly promise each other to reward collusive behavior, and they cannot credibly promise each other to punish competitive pricing. Both firms know that they will compete in the second period. As a consequence, the firms do not have any incentive to collude in the first period. Thus, both firms will set price equal to cost already in the first period.

If we assume that the number of periods is three, and that the two firms are informed about this, the same argument can be applied. In the last periods firms will compete, independent of what happened in the previous periods. Thus, firms are forced to compete also in the second to last period. Knowing that they will compete in the two last periods, independent of what happens in the first, the firms will compete also in the first period. It does not matter how many periods we assume that the market persist, if the firms are informed about this number, they will compete in all periods.

The prediction that firms are not able to collude, independent of the time-horizon is problematic. In reality, cooperation (also without outside enforcement) is possible in many situations. So, what went wrong in the theoretical model?

It is possible to change the theoretical model to make collusion self-enforcing. One common way is to assume that the market will persist forever (infinitely many time periods). Then, there is no last period in which cooperation necessarily breaks down. Thus, we cannot apply the logic that cooperation is impossible also in the second to last period, and so on. We are thus back to the conclusion that firms can cooperate if earning half the monopoly profit in all future periods is preferred to earning the whole monopoly profit today.

Interpreted literally, an infinite time-horizon is not a very realistic assumption; every market is bound to vanish at some point in the future. A better interpretation of the assumption is that the true lifetime is very long, and that the firms (falsely) perceive it to be infinitely long. The firms will, in that case, behave as if the time is infinite; in which case collusion is self-enforcing. One may suspect, however, that such false perception only is likely if the true time horizon is far away. Thus, collusion is only possible in long-lived situations.

Another way to change the theoretical model is to assume that the lifetime is not known. Instead, firms hold expectations about the probability that the market survives from one period to the next. For example, the firms may believe that the survival probability is 95 percent. In this case, there is a risk (5 percent probability) that the market will only persist one period. However, most likely (95 percent probability), the market will survive an additional period. Having survived two periods, it is likely that it will survive three periods. Having survived three periods, it is likely that it will survive four periods, and so on. Thus, assuming a fixed survival probability (above zero) it appears as if the market might continue forever. Again, there is no last period in which cooperation necessarily breaks down.

This second modification of the model is more appealing than the first. The reason is that, even though there does not exist any last period, the *expected* lifetime is finite. If the survival rate is 95 percent, the expected lifetime is 20 periods. If the survival rate is 99 percent, the expected lifetime is 100 periods.¹ As discussed above, if the market is expected to be long-lived (which is equivalent to a high survival probability) collusion is self-enforcing. If the market is expected to be long-lived, a duopoly firm that does not cheat can expect to earn half the monopoly profit in many periods. That alternative may be preferred to earning the whole monopoly profit during just one period.

3.3 Can firms be induced to self-report cartels?

Detecting and proving price fixing agreements are notoriously difficult tasks. Historically cartels have often been detected as a result of reports from customers or other parties with a good knowledge about the industry. More recently competition authorities have started to provide leniency to the first member of a cartel that self-reports and provides information to the authorities. Leniency means that the self-reporting firm will only have to pay a reduced fine for its participation in the cartel. Still, one may ask, why would any firm choose to report the cartel and pay the reduced fine instead of continuing to earn the cartel profit?

The key idea is that if firm A believes that firm B will self-report, then it will be better for firm A to report first. Paying a reduced fine is better than paying the full fine. The outcome is that both firms may race to the competition authority, hoping to get there first.

Using economic terminology, both firms self-reporting is an equilibrium. If they both believe that they will self-report, they will both have an incentive to do so. Their beliefs are thus justified.

A weakness with the leniency program, however, is that also not reporting is an equilibrium. If firm A believes that B will not self-report, it is better for A not to self-report either. By not self-reporting, the cartel will continue and A will earn its cartel profit. By self-reporting, A will not only lose the cartel profit but it will also have to pay the reduced fine.

¹ The expected lifetime is $1/(1-x)$ where x is the survival probability. Thus if the survival probability is 0.95 that is 95 percent, then the expected lifetime is $1/0.05 = 20$.

Economic theory does thus not give any clear predictions about what the likely effects of the leniency program are. Apparently some firms have self-reported and asked for leniency, which suggests that the leniency program works at least in some markets. But it is clearly impossible to tell how many cartels that have not chosen to self-report.

Beyond leniency

Economic reasoning suggests that the leniency program could be even more effective. If the first firm to self-report would not only escape the fine, but actually would be rewarded, the incentives to self-report would be even larger. If the reward would be larger than the cartel profit, the temptation to report would be very strong. Then reporting would be the better choice independent of what the other firm would do. By construction, A prefers the reward both to the fine (which is the relevant alternative if B also reports) and to the cartel profit (which is the relevant alternative if B does not report).

This analysis suggests that with sufficient rewards, cartel firms would always self-report. The result would be that no firms would ever dare to initiate a price-fixing agreement. Competition authorities would not have much work to do.

Unfortunately there are several problems with this idea. Many people would probably object to rewarding firms that have engaged in illegal activities. Another problem is that the competition authorities would need to compute the size of the reward. The reward must be at least as large as the difference between the cartel profit and the profit when firms are competing. Finally, oligopolistic interaction is repeated, and one cannot preclude that the cartel firms could punish the self-reporting firm. And if this is understood by the firms already from the beginning, a cartel agreement may still be possible to enforce.

3.4 Stylized facts about cartels

Since cartels are illegal it is clearly very difficult to collect information about real world cartels. Some information has been revealed, however, mainly as a bi-product of antitrust investigations and court cases, or since some cartels have been legal. It is clearly impossible to know if the detected and legal cartels are representative of all cartels. One may suspect that the cartels that have been caught are less well organized for instance. It is still important to investigate what we can learn from the cartels that we do have information about.

Cartel success and its determinants

One of the main lessons is that cartels differ. The variation in cartel success is enormous. Some cartels appear to push prices and profits to levels comparable to the levels enjoyed by monopoly firms. One of the most successful cartels operated in the American rubber industry during the 1920ies and was able to keep a margin of nearly 300 percent during a period of five years. Other cartels appear to have only a negligible effect on prices and profits. Some do not even succeed to raise prices above the firms' production costs.

Cartels also differ in how long they succeed to survive before breaking down. Some survive less than a year and others for more than hundred years (DeBeer's diamond cartel).

A well documented fact is that cartels appear to break down and emerge again in periods. When a cartel breaks down it is often because the participants have strong incentives to cheat and undercut the agreed prices. Even more common causes of failure is that new firms enter the market or that the market is hit by some shock, for instance new technological opportunities. Also negotiation problems hinder cartels to survive.

Also when it comes to the type of markets that are affected, variation is the main impression. But there is one important determinant for cartel activity: Markets with high concentration are more prone to cartelization than markets with many competing firms. The cartels also appear to be more profitable in highly concentrated markets.

The importance of organization

Cartel success also varies with their ability to organize their activities. Many successful cartels build up a hierarchical organization. A general agreement to cooperate may be implemented through weekly meetings at a lower level to determine the details of the cooperation. The weekly meetings make it possible for the cartel to adapt to unforeseen changes in demand or other changes in the market, without the need to initiate new complicated negotiations about the whole cartel agreement.

Another observation is that the most efficient organization to prevent cheating is to have a joint sales organization. But also trade associations may help the participants to collect and disseminate information about the prices and sales volumes. Another possibility is for cartels to buy such services from external providers. Several European cartels have bought the services from the Swiss company Fidel.

Cartels also create their own "courts" to settle disputes and determine whether some firm has cheated on the agreement. The "case law" will help the cartel to cooperate more efficiently over time. When someone has been found guilty of cheating, the "court" may decide on some punishment. Often the punishment will require the cheater to reduce its sales volumes in some market for some time. Other punishments include monetary payments or price wars.

Is deterrence sufficient?

To deter firms from forming cartels there must be a risk of detection and punishment. Only if the firms can expect to pay fines in proportion to the costs they inflict, will cartel activity be deterred. If the probability of detection is p and the fine is F the expected fine is $p * F$. For instance, if the fine is €200 and the probability of being detected is 30%, the expected fine is €60. Deterrence requires that the expected fine is at least as large as the cost, which may be denoted by C , that is

$$p * F > C.$$

Some studies indicate that a very rough estimate of the risk of detection for a cartel may lie in the range of 10 to 15% per year. This estimate is based on the lifespan of detected cartels, so the true risk may actually be even lower than that. Fines and damages in the US have been very roughly estimated to amount to about 115% of the costs created by the cartel. This estimate is based on assessments of much cartels succeed to increase their prices, and not only on hard evidence.

If these rough estimates would be correct, deterrence is insufficient by a wide margin. With a detection risk of $p = 15\%$, the necessary fine to cost ration would be $F/C = 666\%$, while the actual is only 115%. Reversely, with a fines to cost ratio of about $F/C = 115\%$, the necessary detection risk is $p = 87\%$ and not just 15%.

Even if the numbers must be taken with considerable caution, the available estimates nevertheless suggest that cartel deterrence is insufficient.

3.5 Summary

Economic analysis has shown that firms can engage in price-fixing even without writing legally enforceable contracts. Such cooperation is called self-enforcing. Hence, not enforcing price-fixing agreements is not a sufficient policy to deter cartels. This result constitutes an economic argument for active competition policy.

Without legal enforcement, price-fixing is fragile. There is always a temptation for a firm to undercut the agreed upon price and “steal” market shares from the other firms. Economic analysis has provided a list of conditions that must be fulfilled in order for price-fixing to be self-enforcing. For example, the market must be expected to be long-lived, and firm must be able to detect price cuts. Only in markets that satisfy these conditions, competition authorities need to worry about collusion. In order to build a convincing case that firms have fixed prices, competition authorities need to argue that these conditions are met in the particular case.

4 Abuse of Dominance: Predatory Pricing

In this section we will focus on one important example of how a dominant position can be abused, namely predation. The most well known example of predation is predatory pricing. The basic idea behind predatory pricing is that a firm charges a very low price, so that the competing firm starts to make losses and exits the market. Thereby, the predator gains a monopoly position and can raise its price in the future. As a consequence, a dead-weight loss is created.

The first theories of predation were quite simple, like the argument in the preceding paragraph. Later research shows that the full story is much more complicated, however. In fact, one of the important themes of this lecture is the difficulties in constructing an economically sound policy in this area.

4.1 What is predation?

Predation is a much broader phenomenon than predatory pricing. Price is not the only instrument that firms can use for predation. They may also lobby for regulations. For example, retailers in the city center may ask municipalities to hinder new firms from building new outlets on the outskirts of the city. National firms may ask the parliament to introduce tariffs to protect them from international competition. Another possibility is to use tying. That is, a firm that is a monopolist in one market may refuse to sell the monopoly good to a customer unless the customer also buys other goods from the same firm.

Predation need not have the purpose to induce exit. Firms can also engage in practices that put the competitor at disadvantage without causing it to leave the market. A tariff that raises the rival's cost, making it compete less vigorously, is also an instance of predation. A firm may also set a low price to deter potential entrants from entering the market.

A problem in defining and identifying predation is that many of the strategies such as low prices, capacity expansions, introduction of new products and promotions are difficult to distinguish from sound market rivalry. The whole idea with competition policy is that we want firms to reduce their prices, and to introduce new and better products. Normally such activities increase social efficiency. In fact, the problem to distinguish between "good" and "bad" price cuts, "good" and "bad" mergers, "good" and "bad" agreements is one of the fundamental problems of competition policy.

There are several definitions of predation in the economic literature and no consensus on which one to use. Without attempting to reach a final definition, some important dimensions of predation can be listed.

1. In order to be predatory, the behavior should be *overly* aggressive. To define overly aggressive, one needs some standard of normal competitive behavior. For example, the duopoly model above suggests that pricing at (or above) cost is a normal competitive behavior. Pricing below cost can therefore be said to be overly aggressive in many, but not all, situations.

2. In comparison to the normal competitive behavior, the aggressive behavior inflicts a cost on the *predator* in the short run. This cost can be viewed as an investment. For example, setting price below production cost is an investment since the firm will sell at a loss – a loss it could have avoided by setting a higher price.
3. In comparison to the normal competitive behavior, the aggressive behavior also hurts the competitor. For example, if one firm charges a low price, the competitors will lose customers and hence profits.
4. Because the competitor is hurt, it will be less able to compete in the future. For example, if the competitor makes losses for some time, the firm may become bankrupt and liquidated. *There must be a link between the short-run harm and the long-run ability to compete.*
5. Due to the competitor's reduced ability to compete, the predator can exercise more market power and earn higher profits in the long run.
6. In comparison to the normal competitive behavior, the aggressive behavior creates a net loss of efficiency or a net loss for the consumers. In the short run, the aggressive behavior (e.g. low price) may have positive effects on efficiency. But, the long run effect (e.g. high price) may be larger.

It may be worth pointing out that the legal and economic definitions of predation need not necessarily coincide. Economists may prefer a broad definition since many different behaviors are similar from the point of economic analysis. The legal definition, on the other hand, must take into account the problems of proving predation. More on this later.

4.2 Is Predatory Pricing Rational?

Some economists have argued that predatory pricing is (almost) always unprofitable. Then, it would (almost) never be rational for a dominant firm to engage in it. When we observe low prices it must be for some other reason, for example that the dominant firm is efficient. For instance, a large firm may set a lower price than its rivals simply because its costs are lower thanks to its larger scale of operation (so-called economies of scale). If predatory pricing would (almost) never be rational, there would be no need for competition policy in this area.

Indeed, competition policy may even be harmful. Firms may be afraid to compete by lowering their prices, if there is a risk that competition authorities believe that it is predatory pricing.

Actually, most economic analysis of predatory pricing is focused on exactly this issue: Can predation be rational? Only if the answer is yes, there is an economic rationale for a prohibition against predation.

4.2.1 Arguments and Counterarguments

There are at least four important arguments why predation is unprofitable and therefore not rational. But, to each argument, there are also counter-arguments.

First, it is typically the larger firms in the market that are being accused of predatory pricing. But as a low price will entail the largest loss for the firm with the largest sales, the predator may actually lose more than the prey. Predation may therefore not be an attractive strategy.

This argument neglects that the predator may often reduce its price selectively. The predator need only reduce its price in the geographical markets where the smaller rival is actually competing. Selective price cuts make predation cheaper and therefore a more attractive strategy.

Second, even if the prey leaves the market, it may re-enter as soon as the predator raises its price again. Alternatively, someone else may buy the prey's assets and enter. In any case, the predator will not be able to enjoy a higher profit. The investment to (temporarily) force the rival out of the market is therefore not a profitable one.

This argument neglects that both entering and exiting a market is costly. To enter the firm has to hire people and perhaps buy specialized machines. To exit the market the firm has to lay off people and sell the machines. Re-entry may therefore not be attractive, especially if that may be expected to trigger a price cut.

Third, according to one theory of predation, the predator can drive its competitor out of the market by a price war since the prey has less financial resources than the predator. The prey is not able to survive a long period of losses and will go bankrupt. The critiques of this theory argue that the theory should explain why the prey has weaker financial resources to provide a complete explanation. Why, for instance, could the prey not explain to its bank that it is the victim of predation and that if the bank would guarantee to temporarily cover its losses, then the predator would not be able to succeed.

This argument neglects that the bank could not make such a promise, unless it can verify that the losses are only due to predation and not due to mismanagement by the prey.

Fourth, even if predation would be profitable, there is usually an even more profitable way of monopolizing the market, namely to buy the prey instead. A merger would avoid the costly price war.

This argument neglects that the acquisition may encourage additional firms to enter the market, firms that would enter only in expectation of being bought as well. It also neglects that the price war may weaken the target and therefore reduce the acquisition price. Finally, a company contemplating merger to reduce competition should count on difficulties with the competition authorities.

4.2.2 Examples of Rational Predation

In recent years, economists have developed theoretical models demonstrating that predatory pricing can be profitable under certain circumstances. Much of the focus is to show how predatory pricing can reduce the target firm's future ability to compete. This research has come up with three types of explanations for predation, called the long-purse story, the signaling story, and the reputation story. All these explanations build on the idea that economic actors have incomplete information.

Long purse

The basic idea behind the long-purse story is that firms may have different financial strength. The strong firm may then start a price war which the financially weak firm cannot survive.

A crucial condition for the long-purse story is that the capital markets do not work perfectly. Assume that banks have perfect information about its clients. Then the weak firm could sign a contract with its bank. The contract should stipulate that the bank will grant the weak firm any loans that the firm needs to survive, if its profit is low as a result of predatory pricing. With such a contract, the weak firm becomes equally strong as its rival. And when both can survive a very long price war, predation is not profitable and will thus not occur. The bank will never need to actually fulfill its obligations; the promise to do so is sufficient.

The problem with this solution is that the bank probably has limited information about its client and the market. It would, for instance, be very difficult for the bank to assess if the client's profit is low as a result of predatory pricing or as a result of bad management. For this reason, banks will not be willing to lend the weak firm unlimited amounts of money. Rather they will only be prepared to lend the firm money in proportion to how much the owner invests in the firm. Only if the owner is willing to risk his own money, the bank can be confident that the owner will guarantee good management. Now, in this case, predation may be profitable. Predation will inflict losses on the weak firm and erode the owner's financial resources. Without own financial resources, the entrepreneur cannot commit to good management, and the bank is not willing to lend the firm more money.

This theory is applicable to situations of unequal financial strength. The predator need not necessarily be larger, enjoy lower production costs or have more experience in the market. There is no absolute link to most aspects of dominance; it is primarily financial strength that is used.

Signaling

The basic idea behind the signaling story is that the predator has better information than the prey about, for example, the costs of production or the level of demand. One reason may be that the predator is already in the market while the prey is only contemplating entering the market.

To be concrete, assume that that the incumbent could be either efficient and have a low cost of production or inefficient with a high cost, but that the prey is unsure about the incumbent's cost. There are only two periods. In the first period the incumbent retains its monopoly situation, but in the beginning of the second, the prey may enter.

Then, the prey may observe the incumbent's price during the first period, before deciding whether to enter or not. A high price is typically an indication that the incumbent has a high cost, and a low price suggests a low cost. The prey may therefore be more tempted to enter the market after having observed a high price, which would indicate that the incumbent is not such a difficult competitor.

Knowing that it is observed, the incumbent may change its behavior to fool the prey if it happens to have a high cost. The idea is simply to pretend to have a low cost by setting a low price.

The prey may understand that a high cost firm has this incentive. But the problem is that when the prey observes the low price, it simply cannot tell whether the incumbent actually has a low cost, or if it only pretends to have a low cost. The *risk* of meeting a low cost firm may be sufficient to deter the prey from entering the market.

Reputation

The basic idea behind the reputation story is that an incumbent firm can create a reputation for being very aggressive (having a preference for fighting even if that is unprofitable). Such a reputation can be built up by consistently fighting new entrants into the market with drastic price-cuts. Once the reputation has been established, new firm will not enter the market, and the incumbent need not fight.

4.3 Problems in Fighting Predation

Although the notion of predation is quite intuitive no one has yet succeeded to come up with an exact definition, suitable for economic and legal analysis. There are numerous conceptual and practical problems. In the end, the legal tests of predation must be viewed as compromises between an ideal policy (which remains to be defined) and these problems.

To be predatory is to be *overly* aggressive, for example to charge a too low price. The problem is to define the benchmark of normal and acceptable competition.

- One possible benchmark could be the price which would be optimal in the short run, and to consider all prices below the short-run price as predatory. The problem with this definition is that there are many acceptable business reasons for setting a low price today in order to increase profits tomorrow. A firm may set a low price today, for instance to encourage consumers to try the product in the expectation to build up a larger customer base.
- Another possible benchmark could be the price which would be optimal taking the competitor's presence in the market as given. A problem with this definition is that predation is not necessarily a question of complete exit. Also weakening the rival's ability to compete in the future may be considered predatory. Then, it is not clear where to draw the line. How much damage to the prey can we accept?

In addition to the conceptual problems, there are also immense practical problems. How would the competition authorities go about to compute the, say, short-run optimal price? Where would they get the necessary information about demand and technology? Such knowledge is typically not written down in any documents; it may not even be codifiable in principle – it may reside as “intuition” in the heads of the people with long experience of pricing.

Price-to-cost

Actual legal tests of predatory pricing appear to focus mainly on two issues. The first issue is if the predator sacrifices short-run profits. Typically this test amounts to comparing price with some measure of cost, and not with some notion of “optimal price.” The benefit may be that the legal procedure becomes more transparent.

It is still not clear, however, exactly which measure of cost that should be used. There are several possible alternatives, marginal cost, average total cost, average variable cost and average incremental cost. And, the problems of actually collecting the necessary information to compute the cost remain.

Independent of how cost is defined there are always other possible, legitimate business motives for setting the price below cost. Firms may sell a product below cost because demand turned out to be lower than expected. They may reduce price of one product to boost demand for a complementary product or service. They may reduce price to make consumers try a new product or a new variety. Unless these possibilities are addressed, there is a clear risk of over-enforcement which in the end would hurt the consumers.

The price-to-cost test may also lead to too little enforcement. A firm with an efficiency advantage may charge a price above its own low cost but below the rival’s high cost to drive a less efficient firm out of the market. Such predation may improve productive efficiency – all goods will be produced by the low cost producer in the future – but it may also reduce competition in the market and therefore to too little production. In the end, the consumers may lose. Protecting competition by inefficient rivals creates its own problems, however. Protecting inefficient firm may reduce the incentives of more efficient firm to enter the market.

Dominance

The second issue is if the predator’s market power is sufficient to make it likely that it is able to recoup the investment. In order for pricing below cost to be unlawful, the firm must be dominant, i.e. possess a high degree of market power.

Since dominance may be easier to assess than to undertake the price-to-cost test, the dominance test is typically done first.

Restricting the focus to dominant firms may have an additional benefit. Non-dominant firms may have more legitimate business reasons to set price below cost than dominant firms. A middle-sized firm may need to charge a low price to attract new customers to be able to exploit economies of scale, i.e. the lower costs associated with large scale operations. Such a low price may hurt smaller rivals.

Proof of predation may not need to include that the prey was actually hurt, that the predator was actually able to recoup the investment or that consumers were actually hurt in the end.

4.4 Summary

Economic research has demonstrated that predation can be rational under some circumstances. This result is important for two reasons. First, it shows that there exists a good reason for pursuing competition policy in this area. Second, the economic analysis of predation demonstrates conditions that must be fulfilled in order for predation to be rational. For example, the long-purse story is only relevant in markets where firms have different financial strength, and where it is difficult for banks and firms to write efficient financial contracts due to information problems. Such understanding can be used to judge the plausibility of alleged predation. Actual policy is to a large extent shaped by the conceptual and practical problems of identifying predatory behavior.

5 Merger Control: Horizontal Mergers

Mergers between competitors (so-called horizontal mergers) may have both desirable and undesirable effects. On the negative side, horizontal mergers reduce competition, which may give rise to certain forms of economic inefficiencies (e.g. dead-weight losses) and transfers of wealth from consumers to producers. Due to these negative effects, competition authorities in many countries may prohibit mergers under certain conditions. Economic analysis provides a rationale for such merger control, and may also be used to analyze how the control system should be designed in order to prevent competitive problems.

On the positive side, horizontal mergers may allow firms to exploit synergies such as cost savings related to firm size. Again, economic analysis may be used to analyze how merger control should be designed in order to take such efficiency gains into account.

5.1 Anti-Competitive Effects of Mergers

5.1.1 A Rationale for Merger Control

A merger between competitors is likely to increase the merging firms' market power for two reasons. (Remember market power is defined as the ability to increase price above marginal cost without losing all customers.) First, a reduced number of firms may increase the risk that the remaining firms can cooperate and fix prices. This effect is sometimes called coordinated effects. Second, even absent collusion, a reduced number of firms will typically reduce competition. The second effect can be called internalization or unilateral effect.

Coordinated Effects

Courts do not enforce agreements between firms to fix prices. In fact, such agreements even violate competition law and are thus illegal. To enforce price fixing agreements, firms must thus be able to detect and punish competitors that cheat on the agreement. One way to punish undercutting is to start a price war.

As a hypothetical example, consider an illegal price fixing cartel using the so-called trigger strategy described in a previous lecture. Assume that there are N firms in the industry, and that they wish to fix price at the monopoly level. Selling identical goods and charging the same price, every firm will capture $1/N$ of all customers. As long as the firms cooperate, every firm will also earn $1/N$ of the monopoly profit. If one firm undercuts the monopoly price, it will sell to all customers for some period of time. During this period, the deviating firm earns (almost) the whole monopoly profit by itself. After some time the competitors discover the reduction in their sales, conclude that one of the competitors have cheated on the agreement, and initiate a price war that will continue forever after. If the firms sell identical goods and if they do not

have any capacity constraints, firms will set prices at marginal costs during the price war. As a result, the firms earn zero profits during the price war.

The question is if such a cartel can sustain cooperation without any courts enforcing the agreement. If the threat of the price war is sufficiently strong, cooperation is possible. Assume that the monopoly profit is 30. Then, if a firm sticks to the agreement (assuming that also all other firms stick to the agreement), it will earn $30/N$ in every period. It is easy to show that if the interest rate is 10 percent (that is the discount factor is 90 percent), then the discounted sum of all future profits is equal to $300/N$.² If, on the other hand, the firm undercuts the price (assuming that all other firms stick to the agreement), it will earn almost the whole monopoly profit by itself during one period and then zero profits for ever after. That is, the sum of discounted profits is equal to 30. Thus, assuming that all other firms stick to the agreement, the firm will cooperate if, and only if, the value of not cheating is larger than the value of cheating:

$$\frac{300}{N} \geq 30 .$$

In other words, the firms will be able to set up a price fixing cartel if there are at most $N = 10$ firms in the industry. If there are more firms the temptation to undercut and steal all the other firms' market share during one period will be too large.

It follows immediately that if there are 11 firms in the industry, they will not be able to fix price at the monopoly level. However, if two firms merge there will only be 10 firms. As a consequence, the firms may enforce a cartel after the merger. This hypothetical example illustrates that a merger may increase the risk of price fixing.

There may also be other reasons for why a merger can facilitate collusion. Reducing the number of firms may make it easier to monitor and detect that the other firms actually honor the agreement. Mergers may also increase the symmetry between firms. In an industry where all firms sell two product varieties, except for two small one-product firms, a merger between the two small firms make firms symmetric. It may be easier to agree on a common price if all firms work under the same conditions.

Unilateral Effects

The unilateral effects (or internalization) is best described using a hypothetical example. Consider a market with two competing firms called A and B. When firm A contemplates increasing its price somewhat, it has to calculate with two negative effects on its sales. First, a price increase will induce consumers to direct more of their expenditures to other goods and markets. Second, a higher price will make consumers choose firm B's product, instead of firm A's product, more often than before. Firm A can be expected to set a price that balances the gains from a higher

² The sum of discounted profits (the discount factor $d = 0.9$) is given by

$$\frac{30}{N} + d \frac{30}{N} + d^2 \frac{30}{N} + d^3 \frac{30}{N} + \dots = \frac{1}{1-d} \frac{30}{N} = \frac{1}{0.1} \frac{30}{N} = \frac{300}{N} .$$

markup to the loss of sales. If firm A and B merge to form two divisions of the same firm, the trade off between high markups and low sales is altered. When division A contemplates a price increase, it must still calculate with a loss of sales. However, the loss of sales that is due to consumers switching to product B should not be considered a loss anymore. The loss of sales in division A is compensated by increased sales in division B. Thus, division A (and B) will tend to set higher prices than they did as independent firms.³

A Rationale for Merger Control

As a result of the increased price, a horizontal merger is likely to reduce efficiency (create a dead weight loss) and to transfer wealth from consumers to firm owners. These considerations constitute an economic rationale for the fact that competition agencies, in many countries, have the authority to block mergers.

5.1.2 Economic Analysis of the Dominance Criterion

Warning

Since the Lecture Notes were written the European Merger Regulation was changed in 2004, and some of the discussions in this section are therefore outdated.

The European Merger Regulation states that the European Commission shall prohibit a merger that “creates or strengthens a dominant position as a result of which effective competition would be significantly impeded”. This statement indicates that two requirements must be fulfilled in order for the Commission to prohibit a merger, namely that the merged firm will have a dominant position and that the merger reduces competition. In practice, however, it appears that only the dominance criterion is an important determinant of the Commission’s decisions.

Economic analysis, on the other hand, suggests that both dominance (= high level of market power) and reduction of competition (= increased market power) are important for how large the dead-weight loss will be. First, consider the importance of dominance. If two firms merge to increase price and reduce production, the dead-weight loss may be small unless the firms already have a high level of market power. The dead weight loss can be computed as the reduction in production and consumption multiplied by the markup. If the firms have only have little market power, the markup will be small. Second, if a large (and dominant) firm acquires a very small competitor, it is unlikely that the transaction will lead to substantial price

³ A drastic version of this effect is demonstrated by a comparison of the monopoly and duopoly models in Illustration 1 and 2 above (previous lecture).

increases. For this reason, the merger will not create substantial dead-weight losses or substantial transfers of wealth from consumers to firms. That is, not only the level of market power is important, but also the increase in market power.

U.S. merge control appears to be better aligned with economic reasoning, since competition authorities take both aspects into account. For example, the American authorities consider both the level of concentration as measured by the Herfindhal index (= level of market power) and the change in concentration (= change in market power).

The European Commission can only block a merger if the merged firm will possess a dominant position. Consider a market with three firms, one firm with 60 percent of the market and two smaller firms with 20 percent each of the market. If the two smaller firms merge, they will not be considered to have a dominant position (due to the existence of an even larger firm). Still, however, the merger may be prohibited if the merged entity and the large firm together can be said to have joint (or collective) dominance. According to some observers the joint dominance concept takes on a rather special meaning in merger control. The two firms will only be considered to possess joint dominance if they cooperate rather than compete after the merger. It thus appears that European merger control only can block mergers that increase the risk of collusion (unless the merged firm becomes the largest firm in the industry).

There is no economic rationale for this restriction. Consumers are hurt equally much by an increase in price that is due to internalization as they are hurt by an increase in price due to collusion.

Again, it appears that the U.S. merger control is more in line with economic reasoning. In the U.S., competition agencies can block mergers both if they raise price as a result of collusion (coordinated effects), and if they raise price as a result of internalization (unilateral effects).

5.1.3 Important Factors in Assessing Anti-Competitive Effects

Economic analysis does not only provide a rationale for merger control. Economic analysis can also provide guidelines for how to design a proper control system. Two examples were already given in the previous section. It was argued that the European dominance criterion may not successfully point out the mergers that create the problems (inefficiency and transfers of wealth) that we want to avoid by controlling mergers.

Economic analysis can be used even further, by indicating more precisely under what circumstances a merger may be expected to create a dominant position. Knowledge of these circumstances should help competition authorities to properly evaluate the effects of a merger on competition. The factors facilitating or hindering collusion were already discussed in a previous lecture and will not be discussed here.

Obviously, competition authorities should be extra careful when allowing a merger in an industry where collusion is likely. Likewise, economic analysis can provide a list of the circumstances under which mergers tend to create efficiency losses as a result of internalization. A few examples are:

1. If the merging firms produce very differentiated goods, the internalization effect is likely to be small. The reason is that increasing the price of one product only induces a small flow of consumers to the other product. In this case, firms do not compete much. Prices may be high (in relation to costs) already before the merger, but cannot be expected to be increased by much as a result of the merger.
2. When two firms merge and increase their prices, the demand for other competing firms' products will increase. As a result the "outsiders" will find it profitable to expand their production, or to increase their prices, or to make a combination of both actions. The exact mix between price increases and output expansion depends on how capacity constrained the outsiders are. If it is very costly to increase production, the outsiders will tend to increase their prices and not expand output. In such a case, the merging firms will increase their prices by more. The anti-competitive effect of a merger thus tends to be worse the more capacity constrained outsiders are.
3. If the merging firms' products are close substitutes to the products sold by other firms in the industry (e.g. since they have similar physical characteristics), the merged firm cannot increase price by much without losing many customers to their competitors. Thus, unilateral effects are small if competitors produce close substitutes.
4. It is not uncommon that the merging firms have an advantage over their competitors in a certain geographical area, for example in their own country. The advantage may come from the fact that there are tariffs or some technical trade barriers discriminating foreign firms. Another reason may be that foreign firms have not built up a network of service stations. In such a case, the merging firms may be expected to raise their prices relatively much, since the customers cannot easily switch to the foreign competitors.
5. A merger that reduces competition may trigger new entry into the market. New entry increases competition and reduces price. Hence, in the long run, the anti-competitive effects of a merger may be lower than in the short run. If entry is likely to occur quickly, the efficiency losses may be short-lived.
6. An increase in the price of housing by 10 percent hurts consumers much more than an increase by 10 percent in the price of matches. That is, if the affected market constitutes a small share of consumers' expenditures, a price increase is not as harmful to consumers and social efficiency.

5.2 Efficiency Gains from Mergers

Even though there are clear indications that horizontal mergers may increase market power and reduce efficiency, they are not illegal per se. The reason for this is that mergers also can be expected to generate efficiency gains.

5.2.1 Types of Efficiencies

The most commonly mentioned example is that mergers may reduce production costs. One may distinguish between five categories of cost-savings:

- (1) Rationalisation of production refers to cost savings from reallocating production across firms (or plants), without increasing the joint technological capabilities. For example, if the merging firms have different (marginal) production costs, then, after the merger, more production can be allocated to the plant with the lowest cost.
- (2) Economies of scale refer to savings in average costs associated with an increase in total output. Mergers may help firms to better exploit economies of scale. For example, a merger may make it possible to avoid the duplication of various activities. Instead of having two departments for purchasing raw materials, it may suffice with one. Another example is that future investments in new capital can be coordinated. Instead of building many new plants of small size it may be more efficient to build and operate one large plant.
- (3) Technological progress may stem from the diffusion of know-how or increased incentives for R&D. A merger may allow firms to pool their technological know-how. One firm may have cost-efficient solutions to some production problems, and the other firm may have cost-efficient solutions to other problems. If they share their knowledge, both plants will be able to produce at a lower cost. (As competitors, the firms may not have an incentive to share their knowledge.)
- (4) Purchasing economies refers to discounts that firms may receive as a result of buying large quantities of intermediate goods or raw materials.
- (5) Firms may differ in slack (also called managerial inefficiency or X-inefficiency). A merger may reduce slack if a more skilled or hardworking management team replaces a less productive team. Actually, the mere threat of acquisition may discipline management to perform better (in order not to trigger a so-called hostile takeover).

One should point out, however, that mergers might lead to higher costs. A merger between two already big firms might create a firm that is so large that there are dis-economies of scale. Such dis-economies may arise since the control problem may be more severe in large firms. Mergers may also increase x-inefficiency since it reduces competition. It is often argued that tough product market competition is an important factor in motivating management and employees to work hard and save on costs.

5.2.2 Importance of Efficiency Gains

Consider the following market. There are 3000 consumers, of three different types. There are 500 consumers who value (one unit of) the good at €15. These consumers can be called high-value consumers. There are 500 consumers who value the good at €10. These consumers can be called middle-value consumers. Finally, there are 2000 low-value consumers that value the good at €5. Thus, the following table describes

how many units of the good that the firms can sell at different prices, that is the market demand (function):

<u>Price:</u>	<u>Quantity demanded:</u>
>15	0
15-10.01	500
10-5.01	1000
<5	3000

The cost of producing a unit of the good is €9. When there are two firms in the market, competition forces them to charge a price equal to cost (since goods are identical and since there are no capacity constraints, and so on). Thus, high- and middle-value (but not low-value) consumers will buy the good. When there is only one firm in the market, the firm will charge €15 and only sell to the high-value consumers.

In this market, a merger from duopoly to monopoly would increase price from €9 to €15 and reduce output from 1000 units to 500 units, thereby creating a dead-weight loss of €500. On the cost side, the middle-value consumers would lose €5000 = 10x500 (the value of each unit times the number of units). On the benefit side, not producing the 500 units saves €4500 = 9x500 (the unit cost times the number of units).

Assume now that the merger also makes it possible to produce the good more efficiently than before. The reason may be that the two firms have differences in their technological know-how. When they pool all their knowledge they may be able to produce the good at unit cost €8.5 instead of unit cost €9 as before. In this case the merger implies that firms can realize a cost saving of €250 = 0.5x500 (reduction in unit cost times the number of produced units). This cost saving is an efficiency gain to society. Hence, the total effect of the merger on social welfare (using the compensation principle) is a loss of €250 = 500-250 (the dead-weight loss minus the cost efficiency). In this example, the net effect is still negative.

However, in other cases the net effect can be positive. In this case, social welfare would increase as a result of the merger, even though competition is impeded and prices are increased.

Exercise: Compute the net welfare effect of the merger when unit cost is lowered to €7 after the merger. Show that the dead weight loss is €500 and that the efficiency gain is €1000.

Mergers May Reduce Price and Increase Consumers' Welfare

The above analysis shows that some horizontal mergers increase social welfare as measured by the compensation principle. Still, however, the merger may make consumers worse off. Maybe, it is only the firms that gain. If we instead only care for

consumers (for example because consumers on average are poorer than firm owners, and because we care for how wealth is distributed between different individuals in society), the merger should be prohibited.

Actually, however, economic analysis has shown that a merger under some conditions can lead to a reduction in the price that consumers have to pay. In that case, a merger would benefit consumers.

The price that consumers have to pay can be thought of as consisting of two parts, namely the production cost and the mark-up on production cost. The size of the markup is determined by how competitive the market is. The more competition there is, the lower is the mark-up. A merger will lead to an increased mark-up since it reduces competition. (This is the same anti-competitive effect as we already discussed.) However, a merger may also reduce production cost. Typically firms set a lower price, the lower production cost is.⁴ Hence, a merger may also lead to a tendency to reduce price. If this second effect is larger than the first, the net effect of the merger is to reduce price.

Consider again the hypothetical market described above, and assume that unit cost is lowered from €9 to €1 after the merger. In this case the monopolist would set price €5 after the merger.⁵ Despite reduced competition (= increased market power = increased markup) price is reduced due to lower cost.

	Price	=	cost	+	markup
Duopoly	9	=	9	+	0
Monopoly	5	=	1	+	4

Thus, in this case a merger would lead to increased production and a reduction in price. Both the firms and the consumers would gain from the merger.

In order for a merger to reduce price, economic analysis has shown that the necessary cost reduction is substantial. Moreover, the empirical evidence indicates that the anti-competitive effect normally dominates the cost effect, so that mergers normally lead to increased prices. (However, the number of such studies is surprisingly small.) Nevertheless, the above analysis indicates that some mergers may reduce price. Such mergers are good for consumers, and probably good for firms. Hence, ideally they should be allowed. To do so, it is necessary that competition authorities take into account the cost savings of mergers, not only their anti-competitive effects.

⁴ When cost is lowered it becomes more attractive for the firm to produce a larger quantity at a given price. However, in order to sell the additional units to consumers, price must be lowered somewhat.

⁵ If price is set equal to 15, profit would be €7000; if price is set equal to 10, profit would be €9000; if price is set equal to €5, profit would be equal to €12000.

5.2.3 Efficiency Considerations in Merger Control

An important characteristic of merger control in for example the US and in Europe is that not all horizontal mergers are prohibited. Only mergers that reduce competition by much (or mergers that lead to a situation with very low competition) are blocked by anti-trust authorities. This is so despite the fact that probably all horizontal mergers reduce competition and lead to at least small dead-weight losses. The motivation for this limited intervention is that mergers are assumed to give rise to both positive effects (e.g. cost savings) and negative effects (e.g. dead-weight losses). Only if the negative effects are large, it is presumed that the net effect is negative. Thus, at least in an indirect way, merger control does acknowledge the importance of efficiency gains from mergers.

In some countries, for example the US, competition authorities go one step further than this. In cases when the anti-competitive effects of a merger are large, and can be presumed to dominate the positive effects, the authorities do not automatically prohibit the merger. Instead, they investigate if the positive effects in the particular case are large enough to dominate the anti-competitive effects. This procedure is usually referred to as an efficiency defense.

In the US the antitrust authorities (Federal Trade Commission and the Department of Justice) describe their merger policy in the so-called Merger Guidelines. The efficiency defense has the following features.

- *Types of efficiencies:* According to the guidelines a merger may generate efficiencies. Not only cost savings are mentioned but also improved quality, enhanced service, and new products. Cost savings that arise from reductions in output are not considered.
- *Merger specificity:* To be considered, efficiencies must be merger-specific. That is, the efficiencies must be (1) likely to be accomplished with the proposed merger, and (2) unlikely to be accomplished in the absence of either the proposed merger, or another means having comparable anti-competitive effects. This means that the efficiency claims will be rejected if equivalent or comparable savings can reasonably be achieved by the parties through other means without the merger's potential adverse competitive effects. Only alternatives that are practical in the business situation are considered. Examples of alternatives may be internal expansion, joint ventures, licensing or divestiture.
- *Verifiability:* The merging firms must substantiate efficiency claims so that the Agencies can verify (1) the likelihood and magnitude of each asserted efficiency; (2) how and when each would be achieved (and any costs of doing so); (3) how each would enhance the merged firm's ability and incentive to compete; and (4) why each would be merger-specific. It thus appears that it is the firms that have the burden of proving the existence of efficiencies.
- *Pass-on and magnitude:* The Agencies do not challenge a merger if efficiencies are of such a character and magnitude that the merger is

not likely to be “anti-competitive.”⁶ The efficiencies must be sufficient to reverse the merger’s potential to harm consumers, for example by preventing price increases. That is, the Guidelines require that the claimed efficiencies be passed on to consumers, rather than only benefit the parties to the merger. The greater the adverse competitive effect of a merger, the greater must be the efficiencies. Actually, efficiencies almost never justify a merger to monopoly or near-monopoly.

- *Net-effects*: Efficiencies are assessed net of costs produced by the merger or incurred in achieving those efficiencies.

Certain types of efficiencies are more likely to be *cognisable* (merger-specific, verifiable, and not arising from reduction in output) than others. The Guidelines give three examples.

1. Efficiencies resulting from *rationalisation and multi-plant economies of scale*, that is shifting production among facilities formerly owned separately, which enable the merging firms to reduce the marginal cost of production, are more likely to be susceptible to verification, merger-specific, and substantial, and are less likely to result from anti competitive reductions in output.
2. Efficiencies relating to *research and development* are potentially substantial but are generally less susceptible to verification and may be the result of anti competitive output reductions.
3. Efficiencies relating to *procurement, management, or capital cost* are less likely to be merger-specific or substantial.

In practice, efficiency considerations have played a minor role in the US, compared to the role played by market concentration and entry possibilities. One reason for this is that efficiencies are often difficult to verify.

In the EU efficiency gains are acknowledged indirectly since only mergers leading to dominance (a very high degree of market power) are prohibited. All other mergers are presumed to give positive net effects. It is not clear if the Merger Regulation also allows the Commission to take efficiencies into account in the form of an efficiency defense. The Regulation can be interpreted both to include and not to include an efficiency defense. Also the Commission’s decisions give a mixed picture of the role of efficiencies.

It may seem obvious that there should be an efficiency defense. If the Commission only considers efficiency gains indirectly they will probably make many mistakes. Some mergers that in fact generate very substantial efficiency gains will be prohibited since it is assumed that they only generate average gains. Other mergers that in fact do not generate any efficiency gains at all may be cleared since they are presumed to deliver average gains. If the Commission collects the necessary information in each individual case, as they do in the US, they will make fewer mistakes. The downside of

⁶ Anti-competitive is here not taken to mean an increase in market power.

an efficiency defense is that it is costly and takes additional time to collect the additional information.

6 Competition Economics – An Unfinished Business

It was argued in section 2.5 that the purpose of competition economics is to help answer the following questions: (1) What is the purpose of competition policy? (Why is the market outcome not satisfactory and how can it be improved by public intervention?) (2) Exactly how should the antitrust laws be designed to achieve the desired result? (3) How should the law be interpreted and what are the relevant arguments in particular antitrust cases? In later sections, a few examples of economic analysis of antitrust issues were given, at least one example from each of the three antitrust areas.

At this point, it should be emphasized that all the economic knowledge necessary for answering the three questions is (at least at present) not available. There are many reasons for this.

Economic theory often gives qualitative conclusions, but normally not quantitative conclusions. Economic theory indicates that a merger between two competitors is likely to increase prices, but not by how much.

Moreover, economic theory can often provide a catalogue over different “effects” and “mechanisms.” However, a general theory that can combine all these, often opposing, effects is lacking. A merger of competitors can increase the risk of collusion since a merger reduces the number of firms in the market. On the other hand, a merger may also make the firm more asymmetric and thereby reduce the risk of collusion. For competition authorities it is necessary to weigh all these effects and conclude on the net effect. Does the proposed merger make collusion more or less likely? Such weighting must then be done without close guidance from economics.

Furthermore, economic analysis is often based on conditions that are difficult to observe. For example, market power is usually defined as a firm’s ability to raise price above marginal cost without losing all its customers. Since marginal costs are difficult to observe, it is usually difficult to assess how much market power a firm has.

There are too few empirical studies. One example is the lack of studies of the effect of mergers on firms’ production costs and prices, and how these effects depend on observable market characteristics.

Lastly, economic research is often focused on demonstrating why the market cannot achieve an efficient allocation. It is much more rare that the most important next question is asked: How can competition policy, taking into account all the information constraints (e.g. problems of proving that firms meet to coordinate their actions), improve the market allocation?