

2: MARKET FAILURE

“Government can easily exist without laws, but law cannot exist without government.” (Bertrand Russell)



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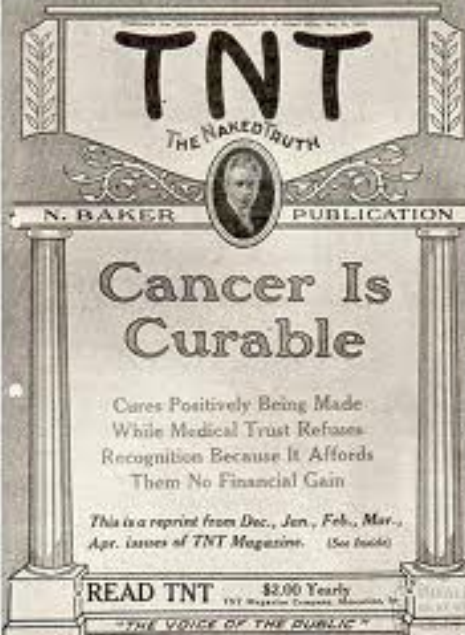
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August 24, 2018

2.1 Introduction: Markets Work Well

Markets work well. In competition with each other, businesses bid down prices to cost (given that we include normal profit— the payment to capital in a competitive market— as part of cost) and choose the quality that consumers want. Each firm's effort to maximize its own producer surplus and each consumer's effort to maximize his own consumer surplus leads to total surplus being maximized, as if an Invisible Hand pushed the price to just the right level, where the producer's marginal cost equals the consumer's marginal benefit. If the government uses regulation to impose a different price or quantity, it can help some people, but only by hurting others more. Rent control can help tenants, but only by costing landlords more than the tenants gain.

Our reasoning for why markets work depends, however, on assumptions that while roughly true for most markets are perfectly true for none and sometimes collapse completely. The reasoning that producers would bid down prices in competition against each other, for example, depends on there being more than one producer. If there is a monopoly, the price is not bid down and the reasoning fails. The reasoning that consumers buy from the firms that sell the most cost-effective quality depends on consumers being able to judge quality accurately. If they can't, high-quality producers will lose out to sleazy competitors. These are two examples of **market failure**: situations where the free market does not maximize surplus.

Let us return to Chapter 1's single-transaction case as a running example. Buyer Brown is willing to pay up to \$15 for a bottle of whisky and seller Smith is willing to accept as little as \$8. Our conclusion was that the government should allow the transaction to take place because it benefits both buyer and seller. In this chapter that story will be modified in a number of ways, even though our focus will remain on surplus maximization, rather than on more direct challenges to the equilibrium's optimality such as that Islam forbids the drinking of alcohol as contrary to God's will. Even if you accept surplus maximization, however, things can go wrong in the story of perfect competition, generating market failure and an opportunity for government action to increase total surplus.

2.2: Weak Property Rights and Contract Enforcement

A certain amount of government involvement is helpful, perhaps even necessary, for even laissez faire market transactions to take place. As Chapter 1 noted, if the government is completely hands-off, Brown faces no police if he steals the bottle of whisky from Smith instead of paying. Laws against theft are a form of regulation and a constraint on our liberty, but if Brown can steal the bottle easily he will steal it even if his value is less than Smith's, and surplus will not be maximized. Moreover, Smith uses time, energy and resources to prevent theft and Brown uses time, energy, and resources to overcome that prevention. Buying and selling create transaction costs too, as do the courts and police necessary to suppress theft, but not as high as theft. The

government's police are a useful supplement to Smith's private precautions against theft, and the mere threat of punishment reduces Brown's incentive to incur the effort of stealing. In practice we see a mix of ways property rights are enforced, both private precautions—locks, alarms, and handguns— and public precautions—police, courts, and prisons.

The government does more than provide police and courts: it literally “defines property rights.” Not only do courts decide who owns property in particular cases, but the law also provides standard terminology in the form of legal definitions. The definition may be simple when it comes to bottles of whisky, but definitions get more intricate when it comes to ownership of corporations, wild animals, and stolen goods. Even for simpler goods, standard definitions make life easier. The holder of a land title that says he owns it “in fee simple” can use the land for his entire life, leave it to heirs, or sell it in fee simple to someone else, without having to worry about what kinds of rights he has over the land. Rather than checking the fine print on the property deed, he can rest assured that he has bought the conventional package of rights.¹

Particularly important is that property rules award ownership to someone who creates something new. This is most obvious if someone creates a new physical good. If Smith distills whisky using his own labor and supplies, the natural property rule is to give him ownership of that whisky. Otherwise, he will not produce it. The government does not have to give Smith the right to 100% of the whisky he produces to give him reasonable incentives, however, and very few governments do. The usual rule is that Smith has the right to keep most but not all of what he produces, giving up some of it to the government as taxes.

The property rule for another class of goods is that the producer owns them, but only temporarily. This class is **intellectual property**: patent and copyright. If someone comes up with a new idea, rather than a new physical object, the government faces a quandary. If the person has complete and exclusive rights to his idea, he will overcharge others to use it—the problem of market power that we will discuss later. But if he has fewer rights, he has less incentive to come up with new ideas. The compromise is for the creator to own his creation for a limited period of time. A patent gives the inventor of an idea ownership for 20 years, but after that anybody can use it for free. Copyright gives the writer of a book exclusive rights for his lifetime plus 70 years.

¹For an economics-oriented discussion of how the government limits the types of property rights in land, see Thomas W. Merrill & Henry E. Brown, “Optimal Standardization in the Law of Property: The Numerus Clausus Principle,” *Yale Law Journal* (2000).

BOX 2.1

SELF-HELP IN PROPERTY RIGHTS

“As thugs have been burning, beating, and stealing their way through London, citizens of that disarmed society had little to defend themselves with as the police were completely overwhelmed.



Desperate Brits are resorting to shopping online for improvised weapons. They are buying Amazon.uk out of baseball bats, billy clubs, and folding shovels. Yesterday, billy clubs saw a 41,000%+ increase in sales, until the item was pulled. Shipping times on their most popular baseball bat (up over 36,000%) slipped to 4-6 weeks. Today, a folding shovel is their new Sports and Leisure top seller, with sales up 239,000% in the past 24 hours! . . .

During the Los Angeles riots . . . the police having been overwhelmed, the Korean community banded together to defend their stores and lives against the rioters, even though it was too late for many. Using Korean-language radio, they called for security volunteers.”^a

^a“London Rioters Ran Rampant over Disarmed Populace,” *Legal Insurrection* blog (2011) .

Still other goods are **common property**. This is different from **government property**. A parking place with a parking meter is government property that it leases out to private people for specified amounts of time. A parking place without a meter is common property. Anybody can use it, the rule being first-come-first-served. That is efficient, because in those locations, parking space is so abundant that it isn't worth the transactions cost to make it into private or government property. If, however, demand increases enough, it will become efficient to install parking meters and create property rights. This can even happen if just one person's demand increases enough. In Covina, California Mark Shoff kept five unregistered cars in his driveway plus 43 others in the surrounding streets as shown in Figure 2.1. His neighbors didn't like the looks of that

(the “externality” cause of market failure) or the loss of places to park. They sent him notes and circulated a petition. The county responded by assigning “street sweeping days” to some of the surrounding streets, with ticketing of cars parked over 72 hours. I don’t know what happened, but my guess is that Mr. Shoff was willing to drive his cars to new parking spots a block away. After all, it’s not good for a car never to be driven. But what regulation would maximize surplus? This was an unusual case, and it did need government intervention, but perhaps the unique response was better than writing a new rule.²

FIGURE 2.1
PARKING SPOT
PROPERTY



Property rights need to be established before buying and selling take place, but the trading process also needs laws. Suppose Smith would like for Brown to pay today for a bottle of whisky that Smith will deliver tomorrow. Without a law against breach of contract, Brown will be reluctant to hand over the money, since Smith could just keep it and not deliver. A law must say what happens if Smith violates his promise. The law could be that Smith must refund the money, or that he must deliver the bottle or be jailed, or that he must pay Brown enough to make Brown as happy as delivery would have. Which of these rules maximizes surplus is not clear, but any of them is better than no rule at all.

What matters most for surplus maximization is that there be clear rules about who owns what, and that there be high enough penalties for broken promises. Getting the exact rules right is less important, because people can adapt to imperfect rules. But if nobody is quite sure what the rules are, or who has the power to get what he wants, total surplus falls.

Some people have suggested that private organizations could replace government in defining and protecting property and contract rights. People could sign up with one of various competing “protective organizations” and pay the organization a yearly fee, a fee similar to taxes but a price rather than a tax.³ The idea is intriguing, but the result would be like having several governments simultaneously without clarity as to which organization’s law would prevail or what they would do with their power. While the yearly fees might start out being voluntary, what is to prevent a protective organization from using its police to make them compulsory?

²“Resident’s Car Collection Frustrates Covina Community: Residents Say One Neighbor Owns Nearly 50 Cars that Are Parked Everywhere,” *KTLA News* (2010).

³See David Friedman, *The Machinery of Freedom*, 2nd edition (1989) available on the web ungated.

BOX 2.2

THE WORLD BANK'S "DOING BUSINESS" PROJECT

The World Bank is an international agency to promote economic development in poor countries. One reason some poor countries stay poor while others grow out of poverty is whether property is protected and contracts enforced. The World Bank measured these things across 183 countries. Here is a sampling (1 best, 183 worst)

Country	All	Land Records	Investor Security	Contract Payment
Singapore	1	16	2	13
New Zealand	2	3	1	10
Hong Kong	3	75	3	3
U.S.A.	4	12	5	8
U.K.	5	23	10	23
Poland	72	88	41	75
Brazil	129	120	73	100
D.R. Congo	182	157	154	172

The rankings are based on the complexity, time, and cost of the various business activities. Below are some of the entries for contract enforcement.

Country	Procedures (number)	Time (days)	Cost (% of claim)
Iceland	26	417	6.2
United States	32	300	14.4
Germany	30	394	14.4
Malaysia	30	585	27.5
Kenya	40	465	47.2

Even in the United States, enforcing a contract is troublesome. If people know that the courts will enforce contracts at relatively low cost, however, they will keep their promises and actual lawsuits seldom occur.

If the government provides clear rules and enforces them honestly, its overwhelming power provides a background in which people will use voluntary trade instead of deceit or coercion. This benefits everyone in society, both the strong and the weak. The strong have more property to protect and trade, so they have a clear interest in

government protection. The weak have less property, but also less ability to protect what they do have, so they rely even more on government protection. Think about which neighborhoods call for police help most often— it the poor neighborhood that has the most victims in need of help. Both strong and weak know that law prevents them from stealing from others, but for both, the benefits of law outweigh the infringement on their liberty.

2.3: Monopoly and Market Power

Government's role in creating property rights and enforcing contracts is easy to accept. We so take it for granted that whoever produces something is the owner that we don't think rules against theft are intrusive. This form of government regulation is more like an essential part of a free market than a restriction. We now come to a different form of market failure, where surplus maximization requires the government to stop someone from freely deciding whether to sell his property. This form is market power.

A monopoly can capture more producer surplus, but at the expense of diminishing total surplus. Monopoly welfare losses arise from these inefficient attempts to capture surplus. The loss may arise either from the attempt to become a monopoly (as in the expense of lobbying the government for a monopoly), from the attempt to exploit the monopoly, as in the administrative costs of price discrimination, or from **the allocative inefficiency of monopoly**—the “triangle loss” since it shows up as a triangle on surplus diagrams.

The easiest way to think about market power is in terms of monopoly, but the problem is broader than that. A firm has **market power** whenever the demand curve facing that firm individually is downward sloping instead of flat. If firm with market power raises its price, it loses some but not all of its customers. In particular, it can raise its price above marginal cost, which is what creates inefficiency.

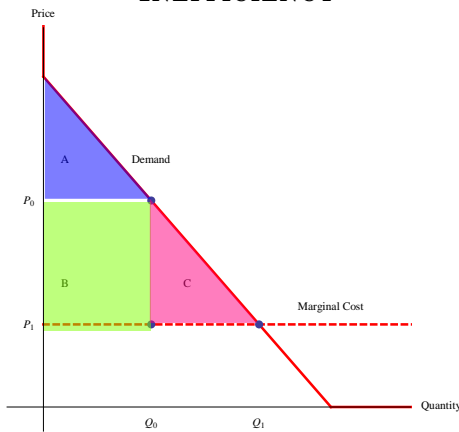
In a perfectly competitive market of very small firms selling an identical product, firms do not have market power. Any firm that raises its price will lose 100% of its sales—the demand facing it is **perfectly elastic**, perfectly price-sensitive. This is true even though the market demand curve slopes down and is not perfectly elastic. The reason is that the market demand curve shows what happens to quantity demanded when the market price rises, which happens when all sellers raise their price simultaneously. The demand curve facing one firm shows what happens to the quantity demanded from that one firm if only that firm raises its price. If just one firm raises its price and all the others do not, that firm loses all of its sales.

In the real world, almost all firms have market power in the short run, but if the demand facing the firm is sufficiently elastic—that is, sensitive enough to price—then the firm has so little choice over its price that we can ignore market power. If a firm would lose 90% of its sales if it raised its price 10% above its competitors' prices, then

that firm does not need to spend a lot of energy on optimal pricing strategies; it should focus on cost reduction and output decisions. If the firm has a distinct product or market niche, on the other hand, or if it is literally a monopoly, on the other hand, then it will think about manipulating the price and we have to worry about market failure.

Surplus analysis shows the size of a monopoly's allocative inefficiency. Figure 2.?? shows an industry with a flat supply curve and a downward sloping demand curve. We will use flat supply curves in this chapter for simplicity, returning to upward-sloping supply curves in later chapters. A flat supply curve is realistic for many industries, though by no means all. It is appropriate when most firms in the industry use the same technology,

FIGURE 2.2
MONOPOLY ALLOCATIVE
INEFFICIENCY



so as industry output rises, marginal cost does not. The flatness indicates **perfectly elastic supply** (perfectly price-sensitive supply): even a slight increase in the market price will elicit a tremendous outpouring of additional quantity, as the price comes to exceed the marginal cost of most suppliers, and even a slight price decline reduces the quantity drastically, as it makes production unprofitable. Real-world industries are not so extreme, but the flat supply curve is a good simplification for looking at any industry with drastic supply responses.

Figure 2.2 shows what happens when there are not many competing suppliers, just one: the monopoly. The supply curve is not a supply curve, properly speaking. It is the marginal cost curve of the one company. The company would be foolish to charge a price equal to marginal cost. Instead

it will choose a higher price, labelled P_0 here, resulting in the quantity Q_0 .

Consumer surplus is the triangle A above the price P_0 and below the demand curve. Producer surplus is the rectangle B that is above the supply curve but below the price P_0 .

$$CS_0 = A$$

$$PS_0 = B$$

$$TS_0 = A+B$$

The government can do better than the market by imposing the price ceiling P_1 . Producer surplus would fall to zero, since P_1 is the minimum price the monopoly would accept to sell its product. Consumer surplus would become the triangle A+B+C between the P_1 price line and the demand curve, Producers have

lost area B, but consumers have gained even more, area B+C.

tries so competitive that their survival depends on cost-cutting would have lower costs than a monopoly which can survive even if it is fat and lazy, but that logic has a catch. The catch is that a monopoly, like a competitive firm, prefers high profits to low profits, and so prefers low costs to high. Firms aren't literally "fat and lazy" as people are, and a monopoly's shareholders have no incentive to settle for low profits to save their employees effort. Thus, the cost disadvantage of monopolies is not clear.

Yet though the monopoly's desire for low costs may be just as great as the competitive firm's, its ability to control costs might be less. Consider how company executives are rewarded. Shareholders of a competitive firm can compare the company president's performance to presidents at other firms. A monopoly cannot. As a result, the competitive firm can punish or reward its executives more effectively than a monopoly.⁴

In addition, if different firms have different technologies or innovate in different ways, keeping all but one firm out of the market will restrict the opportunity for innovations to spread in the industry. A monopoly may owe its monopoly position not to its superior product and cost but to an accident of luck or to its talent for excluding other firms from the market. If several firms compete, on the other hand, any one of them with a cost advantage will tend to grow and ideas can diffuse from one firm to another.

The most important kinds of regulation justified by monopoly are public utility regulation and anti-trust laws. The technology of electricity distribution is such that it is best that one firm provide the service, but important to prevent it from doing so at such a high price the people are discouraged from using electricity. In other industries the technology makes the simultaneous operation of many firms feasible, but regulation is necessary to prevent firms from making agreements not to compete.

2.4: Poor Information

Economists have realized increasingly that solving information problems is central to a successful economy. The surplus maximization argument for free markets assumes that everyone in the economy is well-informed about the value of the goods being exchanged. Otherwise, the parties try to take advantage of their private information. As with market power, effort goes into extracting surplus from each other rather into producing new goods. In addition the wrong transactions may take place, not just too few transactions.

Information can be imperfect in many ways. Not all of them create market failure. We would not say that the American economy of 1900 had market failure because there was imperfect information on how to make personal computers. Even a well-functioning market is limited by available technology and information about future events. Imperfect information creates market failure when it interferes with the right

⁴See Farrell, Joseph, "Monopoly Slack and Competitive Rigor: A Simple Model," in *Readings in Games and Information*, Eric Rasmusen, ed., Oxford: Blackwell Publishing (2001) <http://www.rasmusen.org/GI/reader/farrell.pdf>.

transactions taking place, not when output is low because of poor technology. Such interference happens in many ways, and has been the subject of a vast scholarly literature.⁵

Asymmetric information about product quality is one important category of imperfect information. If Smith claims he is selling whisky, but Brown cannot tell in advance of the sale whether it is really whisky or is colored water, one of two problems arises.

First, if Brown buys colored water, his value is not \$15, but \$0, and surplus has not been maximized. To be sure, the colored water would have had zero value even if Smith had kept it, but they've incurred some transaction cost in making the worthless transaction, and since Brown bought the colored water instead of making a genuine surplus-increasing trade with someone else, the lost opportunity is a big cost.

Second, if Brown is more sophisticated, he will realize that Smith's whisky cannot be trusted because it might just be colored water. Brown will not buy at all because Smith's promises lack credibility. When there are no laws against fraud, honest merchants lose because consumers lack confidence in the market.

Starting a new business is always difficult, but especially if reputation is the only basis for consumer trust. In the absence of government regulation of fraudulent new products, innovation is stifled because consumers do not know whether it is safe and effective.⁶

A related obstacle is that consumers often do not know what they want exactly and would like to delegate this task. Delegating to a business is hazardous if the business makes a profit from selling the products it recommends. The government may have purer motives. Thus, the government requires technical safety features on cars, a minimum level of safety that consumers rely on.

Another large category arises from the difficulty of observing effort, choice of action, and performance. Recall that one of the problems of a monopoly was in getting an executive to make the right choices when the shareholders cannot compare him with executives at other firms. The asymmetric information is that the monopoly's president knows what maximizes profits, but the shareholders don't, and he will keep his information concealed to avoid some unwanted task such as firing mediocre but well-meaning mid-level executives. This is known as a **principal-agent problem**, because the principal (the shareholders) cannot control his agent (the president).

Still another category of imperfect information involves poor information about the markets themselves. Suppose a market has one hundred competing sellers but some consumers only know about one of them. Those consumers effectively face a monopoly, because the lucky seller can get away with raising its price despite being one of a

⁵ See Rasmusen, *Eric Games and Information: An Introduction to Game Theory*, 4th edition (2005, 1st edition, 1989) for references (partly available online).

⁶ See "Scores of TGI Fridays in New Jersey 'busted for selling caramel-colored rubbing alcohol as top-shelf scotch' in statewide crackdown dubbed Operation Swill," *Mail Online* (2013).

hundred. When consumers need to search for prices and learn about different sellers, they may end up buying from the wrong seller or buying the wrong product.

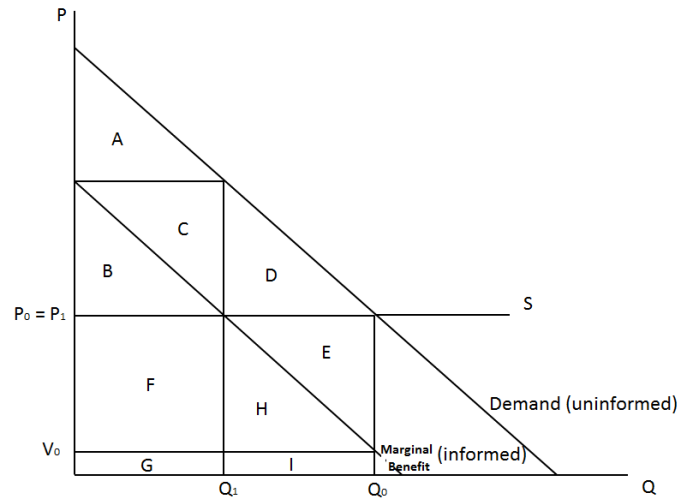
Imperfect information is also the category under which bad decisionmaking is usually placed. Does a consumer who buys a magical spell as a cure for cancer have poor information, or is he just foolish? Either way, his beliefs about the product are wrong and he pays more than his true value. Either way, government regulation could help. Whether unethical businesses take advantage of poor information or poor reasoning, penalties on their bad behavior raises surplus and protects ethical businesses from competition with the unethical. Exactly how to regulate, however, may depend on whether the problem is ignorance or stupidity.⁷ If someone is ignorant, informing him fixed his problem; if he is stupid, one may have to make the decision for him.

Exactly how to apply surplus analysis to poor information depends on the context. Let's go through one example. In Figure 2.3, vitamin pills are sold by a competitive industry with perfectly elastic supply. Information is poor. Consumers overestimate the value of vitamins, so the demand curve they use in their decisions has too high a willingness to pay. How valuable a good is to a consumer is partly a matter of personal taste and income, but in Figure 2.3 consumers' scientific knowledge is wrong and if they were better informed they would not pay as much. Someone willing to pay \$9/bottle based on his mistaken information would only pay \$6 if he were told the truth, someone who is willing to pay \$6 would only pay \$3, and so forth.

If consumers have good information, then their maximum willingness to pay is also their true value of the product. Thus, if they have good information their **demand curve**—their maximum willingness to pay—is the same as their **marginal benefit curve**—the value they receive from the product once they consume it, given their personal tastes and the other things they are consuming. When information is poor, we need to distinguish between the demand curve and the marginal benefit curve, because they differ. In Figure 2.3, the marginal benefit curve is always below the demand curve.

⁷My language is, of course, hyperbolic (*Hyperbole*: Saying something in an extravagant or exaggerate way without intending the listener to take it literally; a figure of speech.)

FIGURE 2.3
OVERESTIMATION OF QUALITY



$$CS_0 = B-E$$

$$PS_0 = 0$$

$$TS_0 = B-E$$

The effect of imperfect information is that we use the demand curve to find the equilibrium price, but the marginal benefit curve to calculate the surplus. The laissez faire price and quantity are P_0 and Q_0 in Figure 2.3 because that is where quantity supplied and quantity demanded equal each other. At the quantity Q_0 , however (remember, it is the quantity traded that is crucial for efficiency, not the price), the price on the marginal benefit curve is only V_0 , less than the P_0 consumers are paying. The true value of the Q_0 th vitamin pill bottle is only V_0 , and the consumer is buying it only because he is misinformed. His surplus is negative—it is $V_0 - P_0$. To find the total consumer surplus, keep in mind that we are looking for the excess of consumer value, given by the value curve, over the price paid, which is P_1 . For quantities in the interval between 0 and Q_1 , consumer surplus is positive—area B. For quantities in the interval between Q_1 and Q_0 , consumer surplus is negative—area -E, because consumer value is less than the price paid. Total consumer surplus under laissez faire is B-E. The consumer surplus does not include areas A+C+D+E. One might call that “imaginary consumer surplus,” because it is consumer surplus that the uninformed consumers expect to get but don’t actually receive because they’ve overestimated the value. What about producer surplus? Despite the fact that consumers are overpaying for vitamins, producer surplus is zero, because the price exactly equals the minimum sellers would accept. Seller volume and revenue is greater than it would be if consumers were well-informed, but seller profit is zero because sellers bid the price down

to marginal cost.

Suppose the government keeps the price the same (so $P_1 = P_0$), but reduces the quantity to Q_1 . The consumer surplus for the units in the interval from 0 to Q_1 is still B. No surplus, positive or negative, is earned for greater quantities. The producer surplus is still zero. Total surplus has increased by amount E, so government intervention has raised surplus.

$$\begin{aligned} CS_1 &= B \\ PS_1 &= 0 \\ TS_1 &= B \end{aligned}$$

That regulatory policy was to assign the quantity Q_1 and keep price at P_0 . There is excess demand, however, because consumers still are mistaken about the value of the vitamins and the government has kept the price at P_0 . Excess demand results in rationing—some consumers are able to buy and some are not.

If the rationing is efficient, that maximizes consumer surplus as just described. Under inefficient rationing some consumers with high values for vitamins would fail to find a seller but some with low values between V_0 and P_0 would succeed. In that case, the regulation would still result in inefficiency, possibly even more than under *laissez faire*, if it happens that high-value consumers with potential positive surplus can't buy, but low-value consumers with negative surplus can find a seller.

This shows why the particular policy remedy matters. If the government can somehow teach everyone the correct information, it does not have to regulate the quantity sold and the excess demand will disappear. Consumers will use the informed demand curve, and will naturally demand quantity Q_0 without the need for the government to force it on them.

This whole story of overestimation depends on consumers being fooled. Such mistakes are unlikely to last long. Soon, consumers will realize they can't trust producer claims and they will stop buying. This is still market failure, however, and perhaps even worse failure, because the market can completely dry up because of distrust. Consumers and producers alike will welcome government intervention if it can prevent false claims.

2.5: Externalities (Spillovers)

If someone takes an action which affects someone else but neither party can compel an exchange of money, we say the action **imposes an externality**. The classic example is when a company sells a product to consumers but generates pollution that hurts a third party who cannot force consumers or company to pay for the damage. A better word for the effect than “externality,” would be “spillover”, but “externality” has long been the established economic term. The motivation for the word “externality” is that the effect is external to the parties and transactions generating it.

Externalities could come up in our running example of Brown and Smith. Suppose that buyer Brown, after buying whisky from seller Smith for \$10 and drinking it, throws the bottle onto the sidewalk in front of third party Theodore's house, where it

shatters and cost Theodore \$20 to clean up.

The transaction between Brown and Smith has still created surplus of \$7 as far as those two are concerned—Brown’s value is \$15 so he gets \$5 surplus, and Smith’s is \$8 so he gets \$2 surplus. Consumer and producer surplus are not hurt by externalities, as they would be under monopoly or imperfect information. The problem is Theodore, the third party. External to the transaction, he suffers a value loss of \$20. This loss is a **negative externality** because it inflicts harm on the third party. The negative externality of \$20 more than wipes out the gains from trade of \$7, so the whisky transaction reduces total surplus.

Just because there is a harmful externality to other people, however, does not mean that a trade is inefficient. If Theodore’s loss had only been \$6, there would be a negative externality but the transaction would have been surplus maximizing anyway, since the externality would be less than the gains from trade. The usual effect of externalities is not that the entire market should be shut down, but that too many trades take place because even trades that add very little to consumer and producer surplus still harm third parties.

FIGURE 2.4
AN EXTERNALITY

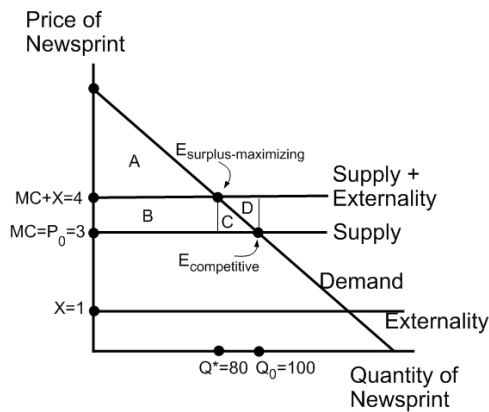


Figure 2.4 shows how output is too high when there are negative externalities. The supply of newsprint comes from a large number of competing paper mills, all with the same technology and costs, so the supply curve is flat. Paper mills are located on rivers, because they use a lot of water, and they return polluted water to the river. Making one unit of newsprint creates pollution that harms people downstream by amount $X = 1$, a negative externality. The **private cost** is $P_0 = 3$, but the **social cost** is $P_0 + X = 4$. The private cost is the cost to the suppliers; the social cost is the private cost plus any third-party costs.

The laissez faire equilibrium price and quantity are determined only by the behavior of buyers and sellers, not by the third parties affected by the externality, so they are $P_0 = 3$ and $Q_0 = 100$, where the quantity demanded of newsprint equals the quantity supplied. Consumer surplus is $A+B+C$, and producer surplus is zero (because of supply being perfectly elastic). We must go beyond consumer surplus and producer surplus to calculate the effect on third parties. The people downstream suffer harm of X per unit times the quantity Q_0 . Their surplus is thus $-X \cdot Q_0$, amount $-(B+C+D)$.

Now let the government regulate by assigning output limits to each firm that reduce industry output to Q^* . Consumers will bid the price up to $P_0 + X$, since there would

be excess demand at P_0 . You might wonder why there isn't excess supply at $P = P_0 + X$. The reason is that the government has limited the supply to the number of licenses issued, so at $P = P_0 + X$ every seller who is allowed to sell will find a buyer. Consumer surplus falls to A , and producer surplus rises to B . People downstream still have negative surplus of $-B$ because of the externality, but it has diminished because of the decline in output.

$$CS_0 = A+B+C$$

$$PS_0 = 0$$

$$\text{Third Party Surplus}_0 = -B-C-D$$

$$TS_0 = A - D$$

$$CS_1 = A$$

$$PS_1 = B$$

$$\text{Third Party Surplus}_1 = -B$$

$$TS_1 = A$$

Total surplus has risen because of the output licenses. The free market resulted in inefficiently high output, which government regulation corrected. It is unexpected that pollution regulation has ended up benefitting the paper mills, adding B to their surplus, but that is one of

the benefits of surplus analysis—it helps companies and consumers realize just what kinds of policies benefit them. I chose the particular pollution control policy carefully: output restriction rather than required pollution control equipment or fines for every ton of pollution released. In a later chapter we will look at such policies.

Externalities can be seen as a problem of weak property rights. In the whisky example, Brown shatters the bottle on Smith's sidewalk. A solution would be for the government to make it clear that although Brown does have the right to walk on Smith's sidewalk, he does not have the right to shatter glass there. The government would also have to enforce the right by making Brown fear the police too much to break the bottle or forcing him to pay compensation. If the people downstream of the paper mills owned the river or the right to clean water, they could make the paper mills pay for the privilege of polluting the water. Better enforcement of property rights is indeed a good solution to some externalities—broken glass on sidewalks, for instance. In the pollution example, however, having all the downstream victims enforce the property right is more cumbersome and other policies are more common.

Positive Externalities

Positive externalities are spillover effects that benefit third parties. Suppose Brown and Smith are neighbors. Brown is deciding whether to pay \$500 to plant a redbud tree in his yard. If Brown plants the tree, Smith receives a benefit of \$200—that is, he would be willing to pay up to \$200 to have the tree next door. That \$200 is a positive externality, a beneficial spillover.

Positive externalities create surplus. We would not make the world a better place by somehow eliminating the positive externality of Smith's enjoyment of Brown's tree. Paradoxically, however, positive externalities are both good in themselves and a source of market failure. The reason is that the market does not generate enough of them.

The problem is that Brown fails to take into account the entire benefit of the redbud tree when he makes his decision. If Brown would pay up to \$450 to have the tree, we say that his **private benefit** is \$450, the height of his demand curve. The **social benefit** is the private benefit plus any positive externalities, which sums to \$650 here. The private benefit of \$450 is less than the \$500 cost, so Brown will not plant the tree, but the social benefit of \$650 is greater than \$500, so surplus maximization says the tree should be planted.

Brown fails to plant the tree because he makes his decision in isolation, ignoring benefits external to himself. If he and Smith were to talk and make a deal, Smith would be willing to pay him an amount—say, \$150—that would make Brown plant the tree. Why not make the deal, then? Maybe Smith thinks Brown is bluffing when he says his value for the tree is less than \$500—that Brown will plant the tree anyway, even if Smith refuses to help pay. Or Brown may be too embarrassed to ask Smith for money, because that makes him look like a crass, selfish person who isn't willing to beautify his yard to please his neighbors.

There is a special terminology used for goods with positive externalities. We say that Brown's tree is a **nonexcludable** good because Brown cannot exclude Smith from enjoying it. We say that it is also a **nonrivalrous** good because when Smith enjoys it that does not impose any extra costs on Brown. A good that is both nonexcludable and nonrivalrous is called a **public good**. On a small scale, the tree is a public good. On a larger scale, national defense is the classic public good. If citizens everywhere in the rest of the United States except Kansas voluntarily contribute to hire an army to defend themselves against invasion, the Kansas citizens nonetheless get the benefits of the protection (so it is nonexcludable), though without increasing the costs of the others (it is nonrivalrous). Telling China it can invade Kansas but not the rest of the United States is simply not feasible. As a result, we do not expect to see the market maximize surplus. The rest of the United States must coerce Kansas to pay its fair share of national defense.

It can be hard to decide whether an externality is, on net, positive or negative, What of Figure 2.5? Vince Hannemann's "Cathedral of Junk," is one of the tourist sites of Austin, Texas. Tourist vans stopping by to see it, but the neighbors don't like it. After 21 years of gradual construction, the city threatened to demolish it in 2010 because of lack of a building permit. Whatever the law may be, would the demolition increase surplus, or reduce it?⁸

⁸"A Junk Pile Grows in Texas, but Is It Art? Austin Project Bugs Neighbors, Attracts Hoards of

FIGURE 2.5
THE CATHEDRAL OF JUNK
POSITIVE EXTERNALITIES, OR
NEGATIVE?



Real versus Pecuniary Externalities

The shattered whisky bottle, the water pollution, and the tree in the yard create **real externalities**: spillovers such that someone's action affects the utility of someone else directly rather than through prices. If the spillover results from prices, it is called a **pecuniary externality**.

If Smith has been regularly selling whisky at \$10/bottle to Brown, making a profit of \$2 per bottle, and then Anderson kills Smith's sales by selling at \$7/bottle, Anderson has inflicted a negative externality of \$2/bottle on Smith because he deprives Smith of that amount of surplus. Anderson has certainly hurt Smith, but it would be very strange if this were market failure, because competition is not market failure but the very process by which markets reach optimality. And in fact a pecuniary negative externality like this does not reduce surplus.

Suppose Anderson's cost is \$6 per bottle. Smith has indeed lost \$2 per bottle, but Brown has gained \$3 and Anderson has gained \$1, so total surplus has gone up, not down, as a result of Anderson's accidental harming of Smith. It has risen by \$2, the amount by which production has gotten cheaper when Anderson with his \$6 cost replaces Smith with his \$8 cost. A pecuniary negative externality indeed harms someone, but the harm is either exactly balanced by a gain to someone else or exceeded, as happened here. The losers from new competition are unhappy, and often call for regulation to exclude the competitors who are hurting them, but the harm does not reduce total surplus. In a well-functioning marketplace, pecuniary externalities are inevitable and desirable.⁹

Coordination and Network Externalities

A special type of externality arises when what one person does depends on what he expects others to do. When expectations matter, there may exist a number of stable configurations of behavior, each with its own set of expectations, and some of these equilibria may lead to better results than others.

Tourists," *The Wall Street Journal* (April 24, 2010).

⁹On pecuniary externalities, see R. Tresch, *Public Finance: A Normative Theory* (1981) p. 91; Jacob Viner, "Cost Curves and Supply Curves," 3 *Zeitschrift für National-Ökonomie* (1932), (reprinted in American Economic Association, *Readings in Price Theory*, (1952) (the origin, so far as I know, of the term "pecuniary externality"); Allyn Young, "Pigou's Wealth and Welfare," *The Quarterly Journal of Economics*, 27: 672–686 (August 1913).

BOX 2.3
A MEDIEVAL LAWSUIT

“This is like the case of 11 Henry IV, p. 47: one schoolmaster sets up a new school to the damage of an ancient school, and thereby the scholars are allured from the old school to come to his new; the action there was held not to lie. But suppose Mr. Hickeringill should lie in the way with his guns, and frighten the boys from going to school and their parents would not let them go thither, sure that schoolmaster might have an action for the loss of his scholars. 29 Edward III, p. 14. A man hath a market, to which he hath toll for horses sold; a man is bringing his horse to market to sell; a stranger hinders and obstructs him from going thither to the market; an action lies because it imports damage.”

Notes: “The action there was held not to lie” means the court rejected the lawsuit on the grounds that no one’s rights had been violated. “Toll for horses sold” is the commission the market owner charged to anyone who sold horses there.

If we look at the situation from before the whisky is produced, Smith will not spend \$8 to produce the whisky unless he expects Brown to buy it. But Brown will not waste time visiting Smith unless he thinks Smith has whisky to sell. In one equilibrium, the whisky is produced and traded; in a second equilibrium, with lower surplus, Brown stays home and no whisky is produced. This has been suggested as a cause of business cycles; people in the general economy will not produce goods unless they expect other people to produce goods for which to exchange them. One equilibrium has low production and low welfare; another has high production and high welfare. Government jawboning might shift the economy from one equilibrium to the other.

Pessimistic expectations also generate runs on banks. Each depositor is afraid the other depositors are going to try to withdraw their money first, leaving none for

him, so he runs to the bank to take out his money. When everybody does that, even an otherwise healthy bank does not have enough funds on hand. In one equilibrium, nobody expects a bank run, so withdrawals stay at a normal level and the bank is able to fund them. In a second equilibrium, everybody expects a bank run, so a run does happen and the bank cannot pay everyone. Government deposit insurance is intended to eliminate the bad equilibrium, although we have seen in more than one banking crisis that government bailouts introduce their own problems.

Expectations also matter when there are **network externalities**: a consumer gets more benefit from a good if more other people are using the same kind of good. Telephones are the paradigmatic example. Having the only telephone in the world is useless, because there’s nobody else to call. When more people buy telephones, they become more useful because there are more people to call. Software is another example: the fact that most people use the Microsoft Windows operating system makes it more attractive.¹⁰

Network externalities can generate market failure through multiple equilibria as bank runs do. Software product A might be better than product B, but if the expect-

¹⁰On network effects see Oz Shy, *The Economics of Network Industries* (2001).

tation is that everyone will use A, that expectation is self-fulfilling. Everyone might prefer a simultaneous shift to product B, but nobody wants to be the first to shift.

Compatibility between different companies' products can also create coordination problems. If two companies produce a product according to the same standard, sales of both can increase because of the interchangeability. The government can be helpful in setting a standard railway gauge or a standard technology for high-definition television.

Much of the coordination function of government is a background function, like protecting property rights, rather than requiring active and continual intervention. Money solves a coordination problem. People wish to trade with each other, but it is very inconvenient to have to figure out that value of the goods a person produces in terms of the value of every other good, and very inconvenient to carry around truckfuls of each thing produced for use in barter. I teach students and write books; would I have to carry books and students to the grocery store to exchange for pancake mix? Instead, the government provides money as a unit of account and medium of exchange.

2.6: Market Failure and Market Solutions

We have seen a number of sources of market failure, defects in the market that can result in total surplus not being maximized. We started with weak property rights and contract enforcement. An important function of government is to clarify who owns what and to protect property against theft and destruction. A second step is to enforce contracts so that people can trade property without worrying about whether the person on the other side of the trade will do what he promised.

The rest of the chapter was on the Big Three of market failure: market power, imperfect information, and externalities. A firm has market power if it can affect the market price by how much output it produces. A firm with market power can restrain its output to drive up the price, but in the process it hurts buyers more than it helps itself. Imperfect information can cause many different problems, but the simplest one is that if buyers cannot judge quality, sellers will be tempted to take advantage of them by selling shoddy goods. Externalities are spillover effects onto third parties who are not involved in a transaction. They cause markets to fail because the harm to third parties are involuntary. The third party cannot charge for the harm, and so the external cost of the transaction is ignored by the parties who make the decisions.

By now, you may think that Chapter 1's optimism about market efficiency was completely misplaced. Don't practically all sellers have at least a little market power? Maybe a farmer can't get away with raising the price of his corn, but every small shop can raise its prices and keep most of its customers for at least a while. Isn't information always imperfect? Sellers know a lot more about their products than buyers do, and buyers don't know all the prices of all the sellers in the market. Aren't externalities

pervasive? “No man is an island,” as John Donne said.¹¹ What I buy affects me, and thereby affects my friends and family; every extra ounce of fat imposes a negative externality on those who care about my survival. One extra ounce of fat is trivial, I may say as I buy my bag of potato chips (or as I buy my third bag of potato chips). But I must still concede that the market at least fails by a little bit to maximize surplus. Economists maintain their beliefs in the marketplace anyway, for two reasons.

First, there are market solutions to market failure. Market power is limited by entry of competitors. Poor information is limited by advertising. Externalities are limited by voluntary agreements to limit harmful behavior. We will look at these in detail in the various chapters.

The monetary character of economic transactions limits surplus loss, because where surplus is not maximized, there is profit to be made. The making of the profit will ameliorate the imperfection, though at a cost. It may not matter, for example, whether consumers can themselves test the quality of car bumpers, because either competing sellers will themselves try to demonstrate quality to obtain competitive advantage, or new businesses will enter (such as the many car magazines one can buy at supermarkets) to sell information to consumers at a small price. Similarly, the losses from externalities are limited by the possibility of the third parties making a deal with whoever is creating the externality. Before we impose government regulation, we should ask whether market failure is being solved by some market institution. Maybe we do not need the government after all.

The second reason not to give up on the market is a less happy one: the government might do even worse. This is particularly true if the market failure is small. Just as there is market failure, so there is government failure, and government failure, in fact, is the rule rather than the exception. Chapter Three will explain.

REVIEW QUESTIONS

1. What does market failure mean and what causes it?
2. Why are property and contract rights important?
3. How does market power cause market failure?
4. How does poor information cause market failure?

¹¹“No man is an island, entire of itself; every man is a piece of the continent, a part of the main. If a clod be washed away by the sea, Europe is the less, as well as if promontory were, as well as if a manor of thy friend’s or of thine own were. Any man’s death diminishes me, because I am involved in mankind; and therefore never send to know for whom the bell tolls; it tolls for thee.” John Donne, *Devotions upon Emergent Occasions*, Meditation XVII (1654), <http://isu.indstate.edu/ilnprof/ENG451/ISLAND/text.html>.

5. How do externalities cause market failure?

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5. “Well, Hush My Mouth: Congress Is Moving against LOUD Ads after Decades of Complaints, Law Makers Are Yielding to Popular Demand,” *The Wall Street Journal*.