CHAPTER 7
Public Goods

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Questions to keep in mind

- How do we determine the optimal level of public goods?
- When is the private sector likely to provide the optimal level of public goods?
- What are the major issues in public provision of public goods?

In the Republic of Lebanon, if you bought a home with a beach view, you may now have a house that instead has the view—and the smell—of garbage. Lebanon has never had a national, comprehensive waste management system. As the country urbanizes and people move to cities, waste production has increased, creating a crisis. In 2015, Lebanon's trash garnered international attention when one of the country's largest landfills closed, causing trash to pile up in the streets of Beirut, Lebanon's capital and largest city. The trash inspired widespread protest. Eventually, the government got the trash out of Beirut, largely through the creation of temporary dumps.

On average there is one dump per 6.5 miles[1] in Lebanon. Many of these dumps are improperly run and pose serious health threats to people and the surrounding environment. Seaside landfills let waste runoff into the ocean. Coastal resort towns, especially around Beirut, have seen their economies collapse as tourism declines due to the mountains of refuse on the beaches and in the water. Additionally, many dumps solve space constraints by openly burning waste, which is linked to asthma, obstructive pulmonary disease, and respiratory irritation. "It's like there's fog across the whole town," said a resident living near a burning site, "We are coughing all the time, unable to breathe, sometimes we wake up and see ash in our spit."[2] A recent study found that this open-air waste burning led to a 50–120% rise in premature and low-birth weight births.[3]

Given these enormous problems, why don't the residents of Beirut simply hire a private trash collection system to come collect their trash and haul it away? In this way, the free market might solve the problem. The trouble is that private trash collection, financed by a voluntary fee paid by neighborhood residents, faces the classic *free rider problem* introduced in Chapter 5: any resident could continue to throw their trash into the streets or onto dumps and then refuse to pay their share of the trash collection fee, with the hope that their neighbors would pick up the costs for them. If their neighbors cover the cost of collection, the free riders get all the benefits of trash collection but pay none of the costs. Yet, if some in the neighborhood free ride, others will feel exploited by paying to have their nonpaying neighbors' trash picked up; these residents might decide not to pay either. Eventually, the number of free riders might grow large enough that the town would not be able to raise sufficient funds to finance the trash collection from a private company.

The problems faced by Lebanon illustrate the difficulties of effectively addressing the free rider problem through a private mechanism. Goods that suffer from this free rider problem are known in economics as *public goods,* and they are the focus of this chapter. We begin by defining *public goods* and determining the optimal level of their provision. We then turn to the first question of public finance and ask if the government should be involved in the provision of public goods. We show that the private sector is, in fact, likely to underprovide public goods due to the free rider problem. Sometimes, however, private actors successfully provide public goods, so we discuss the factors that make private provision successful.

We then discuss the public provision of public goods. In principle, the government can simply compute the optimal amount of a public good to provide and then

provide that level. In practice, however, the government faces several difficulties in providing the optimal level of public goods. First, when private parties are already providing the public good, government provision may simply *crowd out* this private provision so that the total amount of the public good provided does not rise. Second, the optimal mix of public and private provision of the public good can be difficult to determine. Third, measuring the actual costs and benefits of public goods (which is required for determining optimal public goods provision) is difficult. Finally, determining the public's true preferences for public goods, and aggregating those preferences into an overall decision on whether to pursue public goods projects, raises a variety of challenges.

This chapter begins our section on public goods provision. Chapters 8 and 9 provide details on the problems of measuring the costs and benefits of public projects (*cost-benefit analysis*), and on the difficulties of effectively translating voters' preferences for public projects into public policy (*political economy*). Chapter 10 discusses the local provision of public goods and raises the important question of whether competition across localities can solve the public goods provision problems raised in Chapters 7–9. Finally, Chapter 11 focuses on one of the most important public goods provided in the United States: education.

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7.1 Optimal Provision of Public Goods

Goods that are **pure public goods** are characterized by two traits. First, they are **non-rival in consumption**; that is, my consuming or making use of the good does not in any way affect your opportunity to consume the good. Second, they are **non-excludable**; even if you want to deny someone else the opportunity to consume or access the public good, there is no way you can do so. These are fairly strong conditions, and very few goods meet these conditions in practice. Most of the goods we think of as public goods are really **impure public goods**, which satisfy these two conditions to some extent but not fully.

pure public goods
Goods that are perfectly non-rival in consumption and are non-excludable.
non-rival in consumption
One individual's consumption of a good does not affect another's opportunity to consume the good.
non-excludable
Individuals cannot deny each other the opportunity to consume a good.
impure public goods
Goods that satisfy the two public good conditions (non-rival in consumption and non-excludable) to some extent, but not fully.

Table 7-1 shows possible combinations of public good characteristics. Goods that are both excludable and rival are pure private goods. Private goods such as ice cream are completely rival (once you eat an ice cream cone, I cannot consume that ice cream cone at all), and they are completely excludable (you can simply refuse to sell me an ice cream cone).

TABLE 7-1 Defining Pure and Impure Public Goods

		Is the Good Rival in Consumption?	
		(Yes)	**(No)**
Is the Good Excludable?	**(Yes)**	Private good (ice cream)	Impure public good (TV streaming)
	(No)	Impure public good (crowded city sidewalk)	Pure public good (national defense)

Whether a good is private or public depends on whether it is rival and excludable. Pure private goods such as ice cream are both rival and excludable. Pure public goods such as national defense are neither rival nor excludable. Goods that are rival but not excludable, and vice versa, are impure public goods.

There are two types of impure public goods. Some goods are *excludable, but not rival*. The best example here is TV streaming services: the use of these services by

others in no way diminishes your enjoyment of TV programs and movies, so consumption is non-rival. It is, however, possible to exclude you from consuming streamed programs: the streaming service can simply refuse to allow you access. Other goods, such as walking on a crowded city sidewalk, are *rival but not excludable*. When you walk on a crowded city sidewalk, you reduce the enjoyment of that walking experience for other pedestrians, who must now fight against even more foot traffic. Yet it would be very difficult for any city to exclude individuals from using the sidewalk! These types of goods are often known as "common goods," referring to public lands or "commons" on which local residents once fed their livestock.

Pure public goods are rare because there are few goods that are both not excludable and not rival. A classic example of a pure public good is national defense. National defense is not rival because if someone builds a house next to yours, that action in no way diminishes your national defense protection. National defense is not excludable because once an area is protected by national defense, everyone in the area is protected: there is no way the government can effectively deny you protection because your house is in a neighborhood with many other houses. Other classic examples of pure public goods include lighthouses and fireworks displays.

It is helpful to think about a public good as one with a large positive externality. If you set off fireworks high into the sky, it benefits many more people beyond yourself because many people will be able to see the display. You are not compensated for other people's enjoyment, however—you can't exclude others from seeing the fireworks, so you can't charge them for their enjoyment. It is also helpful to recognize that public goods often have high fixed costs and large economies of scale. It doesn't make sense for one house to have its own missile defense system since the fixed costs of setting up that system are so large relative to the budget of any one house.

Optimal Provision of Private Goods

Before we model how to determine the optimal quantity of public goods to provide, let's review the conditions for optimal provision of private goods. Imagine that there are two individuals, Ben and Jerry, who are deciding between consuming cookies and ice cream, two pure private goods. For simplicity, suppose that the price of cookies is $1.

Quick Hint

A convenient modeling tool in economics is the **numeraire good**, a good for which the price is set at $1. This tool is convenient because all choice models are technically written about the choice between goods, not the choice of a particular good. As a result, what matters for modeling the demand for any good (such as ice cream) is its price relative to other goods (such as cookies), not the absolute level of its price. By setting the price of cookies to $1, we make the analysis easier by making the absolute and relative price of ice cream equal.

numeraire good
A good for which the price is set at $1 to model choice between goods, which depends on relative, not absolute, prices.

Once again, a mathematical exposition helps clarify the mechanism underlying this result. The marginal missile is worth $MRS^B_{m,c}$ to Ben and $MRS^J_{m,c}$ to Jerry, so its total value to society is $MRS^B_{m,c} + MRS^J_{m,c}$. The social marginal benefit (*SMB*) of the next missile is the sum of Ben and Jerry's marginal rates of substitution, which represent their valuation of that missile. The social marginal cost (*SMC*) is the same as earlier: the marginal cost of producing a missile. Thus, the social-efficiency-maximizing condition for the public good is:

$$(3)\ MRS^B_{m,c} + MRS^J_{m,c} = MC$$

Social efficiency is maximized when the marginal cost is set equal to the *sum of the MRSs* rather than being set equal to *each individual's MRS*. For private goods, it is optimal for firms to produce until the marginal cost equals the benefit to the marginal consumer, which is the private competitive market outcome. For public goods, however, it is socially optimal for firms to produce until the marginal cost equals the benefit to *all* consumers combined because the private good is rival; once it is consumed by any one consumer, it is gone. The public good is non-rival; because it can be consumed jointly by all consumers, society would like the producer to take into account the sum of all consumers' preferences.

7.2 Private Provision of Public Goods

We have now developed the conditions for the optimal provision of public goods: public goods should be produced until the marginal cost for producers equals the sum of the marginal rates of substitution for all consumers. With this finding in mind, the first question to ask (as always) is the following: Does the private sector get it right? If the private sector provides the optimal quantity of goods at the market price, then there is no market failure, and there is no potential role for the government in terms of improving efficiency.

Private-Sector Underprovision

In general, the private sector in fact *underprovides public goods* because of the **free rider problem** discussed in Chapter 5: because your enjoyment of public goods is not solely dependent on your contribution to them, you will contribute less to their provision than is socially optimal. It's due to this problem that we end up with too much uncollected trash in places like Lebanon.

free rider problem
When an investment has a personal cost but a common benefit, individuals will underinvest.

Let's consider this problem in the context of an example. Suppose that Ben and Jerry live by themselves far away from others. It is July Fourth, and they want to have a celebration. For this celebration, they care about only two consumption goods: ice cream cones and fireworks. The price of each of these goods is $1, so for every firework they buy, they forgo a serving of ice cream. Ice cream is a private good here, but fireworks are a pure public good. Fireworks are non-rival because both Ben and Jerry can enjoy them without impinging on the other's enjoyment, and fireworks are non-excludable because they explode high in the sky for both Ben and Jerry to see. Neither Ben nor Jerry cares about who sends up a firework, as long as it's up in the sky for them to see. Both Ben and Jerry benefit equally from a firework sent up by either of them; what matters to them is the *total amount of fireworks.* To further simplify the example, suppose that Ben and Jerry have identical preferences over different combinations of fireworks and ice cream.

If left to their own devices, Ben and Jerry will choose to consume combinations of fireworks and ice cream cones identified by the points at which their indifference curves are tangent to their budget constraints. The slope of the budget constraints is 1 because fireworks and ice cream cones are each $1 per unit. The slope of the

indifference curves is the *MRS*, or the ratio of marginal utilities. So both Ben and Jerry will set their marginal utility as $MU_F/MU_{ic} = 1$ or $MU_{ic} = MU_F$. This equivalence will determine the quantities of fireworks and ice cream cones consumed.

The optimality condition for public goods is that the marginal cost of the good should be set equal to the *sum* of marginal rates of substitution. Optimal consumption of fireworks would therefore occur at the point at which $MU_F^B/MU_{ic}^B + MU_F^J/MU_{ic}^J = 1$. Because Ben and Jerry's preferences are identical, this is equivalent to saying that $2 \times (MU_F/MU_{ic}) = 1$ or $MU_F = 1/2 \times MU_{ic}$.

Recall that marginal utilities diminish with increasing consumption of a good. In a private-market equilibrium, fireworks are consumed until their marginal utility equals the marginal utility of ice cream (because the prices of both goods are $1). But the optimality calculation shows that fireworks should be consumed until their marginal utility is *half* the marginal utility of ice cream; that is, more fireworks are consumed in the optimal public goods outcome than in the private outcome.

This result is exactly what we would expect from the free rider problem. Ben and Jerry each have to forgo a serving of ice cream to provide a firework, but both Ben and Jerry benefit from each firework that is provided. There is a clear and strong positive externality here: Ben's or Jerry's provision of the firework greatly benefits the other person. As we saw with positive externalities earlier, this situation leads naturally to underproduction. Thus, the free rider problem leads to a potential role for government intervention. (The appendix to this chapter works out a formal mathematical example of the free rider problem, illustrating how the private market underprovides the public good.)

APPLICATION

The Free Rider Problem in Practice[4]

The free rider problem is one of the most powerful concepts in all of economics, and it applies to everything from your everyday interactions to global politics. Some everyday examples, and interesting solutions, include the following:

- The state of Victoria in Australia faced an important free rider problem in the provision of fire services. Until 2013, fire services were financed by a tax on home fire insurance policies. This meant that when individuals did not insure their homes against fire, they still got the services

of the fire department, and it was paid for by those who did insure their homes. This raised the price of insurance and, in turn, led more and more individuals to drop insurance and rely on the payments of neighbors to support fire services. Recognizing this problem, in 2013, Victoria moved to financing its fire services through property taxes to ensure that everyone contributed to the services that they might need to use.

- Museums and other public art institutions that do not charge for admission face a significant free rider problem. Since 1970, the Metropolitan Museum of Art in New York city has had a "recommended" donation instead of an admissions fee. For years, the Met tried to solve its free rider problem by putting "recommended" in much smaller letters than the rest of the sign, but after a lawsuit in 2013, they had to change the sign to make it clear that the donation was recommended and not required.[5] When they did, the share of visitors paying the full $25 charge fell from more than half to only 17%. To address this free rider problem, the Met has decided to start charging admission to out of town visitors.[6]
- By the end of 2018, Dropbox, an online file hosting service, was facing a major free rider problem. Dropbox had 500 million users at the time with only 12 million users paying for the service. That means over 488 million users were free riding! Facing pressure from new competitors and a slowing revenue growth, Dropbox limited the number of devices linked to an account to three in March of 2019, forcing many individuals and businesses to pay the $9.99/month subscription fee. Since then, an additional 2.3 million users have started paying for the service.[7]

Can Private Providers Overcome the Free Rider Problem?

The free rider problem does not lead to a complete absence of private provision of public goods. Many of us grew up in towns where there were privately financed fireworks displays, parks, and even garbage collection. Indeed, one of the most famous counterarguments to the necessity of public provision of private goods was made for the case of lighthouses. Lighthouses seem to fit the definition of a pure public good: one ship's use of the light does not affect another's, and ships cannot be excluded from seeing the light when they are at sea. Indeed, for many generations, economists pointed to lighthouses as a classic example of a public good that would be underprovided by the private sector. Philosopher John Stuart Mill was the first to argue that government should build lighthouses because "it is impossible that the ships at sea which are benefited by a lighthouse should be made to pay a toll on the occasion of its use." The great economist Paul Samuelson, in his classic text *Economics,* agreed that lighthouse building was "government activity justifiable because of external effects."[8]

Nonetheless, in a famous 1974 article, Ronald Coase (of Coase's theorem) conducted historical research showing that British lighthouses had been successfully provided by private interests long before the government ever took over the task. Private

by private interests long before the government ever took over the task. Private individuals, sensing a profitable opportunity, obtained permission from the government to build lighthouses and then levy tolls at the ports where the ships anchored. These individuals would determine how many lighthouses the ship had passed on its route and then charge them accordingly. Thus, lighthouses were successfully provided by the private market until 1842, by which point the British government had purchased all private lighthouses to publicly provide this particular good.[9]

Thus, it appears that the private sector can, in some cases, combat the free rider problem to provide public goods. The following policy application shows another example of privately financing public goods through such user fees—and the problems that such an approach can face.

APPLICATION

Business Improvement Districts

The quality of city streets is another example of a public good. Residents all want clean, safe spaces in which to walk, but it is infeasible to charge pedestrians a fee for using the streets. For this reason, cities use tax revenues to publicly provide police departments for safety, sanitation departments for cleanliness, and public works departments to decorate the public spaces.

Unfortunately, public provision of these services does not always work effectively. Take, for example, New York City's Times Square, an area of midtown Manhattan that, by 1980, was infested with muggers, pickpockets, heroin dealers, and stores selling pornography and various kinds of weapons. The city government spent ten years attempting to clean up Times Square but eventually gave up on the area once described as "dirty, dangerous, decrepit and increasingly derelict."[10]

Then, in 1992, a group of local businessmen decided to start a Business Improvement District (BID), a legal entity that privately provides local security and sanitation services and funds these services with fees charged to local businesses. In theory, BIDs should fail because of the free rider problem: each business will simply hope that other area businesses will pay for the services from which they all will benefit. The New York law, however, is structured so that if the BID organizers can get more than 60% of the local business community to agree to join, then the BID can levy fees on all local businesses. In the Times Square case, 84% of local businesses agreed to pay fees to fund the BID's services.

The Times Square Alliance has been a resounding success. Now with a budget greater than $23 million, the BID has 200 employees, half of whom do sanitation duties such as sweeping, emptying trash cans, and removing graffiti, while the other half work as unarmed "public safety officers" in conjunction with the police.[11] Crime has dropped significantly, the area is cleaner and more attractive, and, as a result of these improvements, business and tourism are once again booming. As the former head of the BID describes it, "What BIDs are able to do is to devote an intense effort to a small place that the city itself could never afford. It's a way of localizing much of the functions of government and concentrating your community effort."[12] The BID's power to levy fees on local businesses allows

seemingly public goods (safety and cleanliness) to be provided through private channels. Another successful example is the Los Angeles BID; Brooks (2008) and Cook and MacDonald (2011) provide in-depth analyses of the Los Angeles BID, and they show that it provided crime reductions much more efficiently than did the private sector.

Whether a BID works well depends strongly on the form of the law allowing BIDs to form in the first place. In Massachusetts, for example, BID laws allow local businesses to opt out of paying the required fees within 30 days of approval of the BID by the local government. The opt-out approach discourages businesses from pursuing plans for BIDs because of a fear that, after all the groundwork for the plans has been laid, businesses will withdraw from the program at the last minute rather than pay their fee for BID costs. As a result of the provision, only 9 BIDs have successfully formed in Massachusetts; the rest of the nation has more than 1,000 scattered throughout the states.[13]

When Is Private Provision Likely to Overcome the Free Rider Problem?

While the free rider problem clearly exists, there are also examples in which the private market is able to overcome this problem to some extent. Under what circumstances are private-market forces likely to solve the free rider problem, and under what circumstances are they not? In this section, we review three factors that are likely to determine the success of private provision: differences among individuals in their demand for the public good, altruism among potential donors to the public good, and utility from one's own contribution to the public good.

Some Individuals Care More Than Others

Private provision is particularly likely to surmount the free rider problem when individuals are not identical and when some individuals have an especially high demand for the public good. For example, let's assume that Ben has more income than Jerry, but total income between the two is the same as the previous example, so that the social optimum for fireworks is the same as when their incomes are equal. As we show mathematically in the appendix, in this case, Ben would provide more fireworks than Jerry: if the income differential is large enough, the total number of privately provided fireworks rises toward the socially optimal number of fireworks. We obtain a similar outcome if Ben and Jerry have the same income, but Ben gets more enjoyment from fireworks; even though they are a public good, Ben will still provide more of them.

The key intuition here is that the decision about how many fireworks to provide for any individual is a function of the enjoyment that the individual gets from total fireworks, that is, the net of their cost. If a person gets a lot of enjoyment or has a lot

fireworks, that is, the net of their cost. If a person gets a lot of enjoyment or has a lot of money to finance the fireworks, he will choose to purchase more fireworks, even though he is sharing the benefits with others: as enjoyment net of costs gets very large for any one individual, the provision of the public good starts to approximate private good provision.

Consider, for example, a driveway that is shared by a mansion and a run-down shack. In principle, there is a free rider problem in plowing the driveway when the costs of plowing are borne by one party, but both residences benefit from a clean driveway. Despite this, the mansion owner may nevertheless hire someone to plow the driveway, allowing the owner of the shack to free ride because the mansion owner has more money and perhaps benefits more from having a clear driveway.

Higher incomes or stronger tastes for the public goods can mitigate the free rider problem to some extent, but they are not likely to solve the problem. Even when one individual provides all of a public good, the individual still does not take into account the benefit to other individuals, and so the public good is usually still underproduced. Thus, while the owner of the mansion may end up plowing the driveway, they may not bother to plow as close to the shack as the shack's owner would like.

Altruism

Another reason that private agents may provide more of a public good than our model would predict is that the model assumes purely selfish utility-maximizing agents. In fact, there is much evidence that individuals are **altruistic**—that is, they care about the outcomes of others as well as themselves. If individuals are altruistic, they may be willing to contribute to a public good even if the free rider problem suggests they should not. In terms of our model, this would be equivalent to Ben caring not only about the costs of fireworks to himself but the cost to Jerry as well, so that he is willing to contribute more to lower Jerry's burden.

altruistic
When individuals value the benefits and costs to others in making their consumption choices.

Under the **warm glow model**, individuals care about both the total amount of the public good *and* their particular contributions. Perhaps they get a plaque with their name on it from making contributions, or maybe their contributions are known publicly so that their friends praise them for their generosity, or maybe they get a psychological benefit that is directly related to how much they give. If individuals get utility from their particular contributions for any reason, the public good becomes like a private good, and individuals will contribute more than predicted by our original model (in which they care only about the total public good quantity). Warm glow does not fully solve the underprovision problem, however, because individuals still do not account for the positive benefits to others of their public goods provision.

warm glow model
A model of the public goods provision in which individuals care about both the total amount of the public good and their particular contributions as well.

7.3 Public Provision of Public Goods

The discussion in Section 7.2 highlights that the private sector will generally underprovide public goods so that government can potentially improve efficiency by intervening. In principle, the government could solve the optimal public goods provision problem previously presented and intervene to achieve that outcome.

In practice, however, governments face some significant issues when they attempt to solve the free rider problem in the provision of public goods. In this section, we discuss four of those issues: private responses to public provision, or "crowd-out"; the question of reliance on public versus private actors to resolve the free rider problem; the difficulty of measuring the costs and benefits of public goods; and the difficulty of determining the public's preferences for public goods.

Private Responses to Public Provision: The Problem of Crowd-Out

In some instances, public goods will not be provided at all by those in the private sector unless the government tells them they must provide the good. In other cases, as we noted, the private sector is already providing the public good to some extent before the government intervenes, and this private provision will react to government intervention. In particular, public provision will to some extent **crowd out** private provision: as the government provides more of the public good, the private sector will provide less. This decrease in private provision will offset the net gain in public provision from government intervention.

crowd-out
As the government provides more of a public good, the private sector will provide less.

The extent of such crowd-out depends on the preferences of the private individuals providing the public good. Let's continue to explore the fireworks example and make three assumptions:

1. Ben and Jerry care only about the total amount of fireworks provided; there is no warm glow from giving.
2. The government provision of fireworks will be financed by charging Ben and Jerry equal amounts.
3. The government provides fewer fireworks than Ben and Jerry were providing beforehand.

In this case, as we show mathematically in the appendix, *each dollar of public provision will crowd out private provision one for one.* That is, the government's intervention will have no *net effect* on the quantity of fireworks provided.

This outcome illustrates the fundamental *robustness of economic equilibria:* if a person starts from their individual optimum, and the market environment changes, and if the person can undo this change to get back to that optimum, they will do so. The private equilibrium is the preferred outcome for Ben and Jerry. If they can undo any government intervention to get back to that preferred outcome, they will do so; what was optimal before the government intervention remains optimal after government intervention given our three earlier assumptions.

For example, suppose that in the pre-government optimum, Ben and Jerry were each providing 10 fireworks, at a cost of $10 for each person. The total private provision is, therefore, 20 fireworks, but let's say the social optimum is 30 fireworks. To reach the social optimum, the government decides to take $5 each from Ben and from Jerry and use the $10 raised to buy 10 more fireworks.

Ben and Jerry each have $5 less, and they observe the government providing 10 fireworks. They simply cut their spending on fireworks by $5 each so that they spend the same ($5 on fireworks, $5 to the government) and see the same total fireworks (20). So they are exactly where they originally wanted to be, and the government intervention has done nothing. This is a case of full crowd-out.

Crowd-out is a classic example of the unintended consequences of government action that we first discussed in Chapter 1. The government intended to do the right thing by increasing fireworks to the social optimum. But, in fact, it ended up having no effect because its actions were totally offset by changes in individual actions.

Full crowd-out is rare. Partial crowd-out is much more common and can occur in two different cases: when noncontributors to the public good are taxed to finance provision of the good and when individuals derive utility from their own contribution as well as from the total amount of public good.

Contributors Versus Noncontributors

Suppose that some people contribute more for public goods than others—either because they are richer or because they have a stronger preference for the public good. In the extreme case, suppose that Ben contributes $20 to buy 20 fireworks, and Jerry contributes nothing, because Ben likes fireworks more than Jerry or because

Jerry contributes nothing, because Ben likes fireworks more than Jerry or because he is richer than Jerry. This is still below the social optimum of 30 fireworks, however.

Now, suppose that the government charges Ben and Jerry each $5 for firework contributions and then provides 10 fireworks in an attempt to bring the number of fireworks to the socially optimal level of 30. Jerry now spends $5 more on fireworks as he was providing nothing before. Ben, on the other hand, will not reduce his firework consumption by the full $10 (to offset government provision). Ben has effectively been made better off: there are 10 more fireworks that only cost him $5 in government-mandated contributions, rather than the $10 he would have spent if he had bought those 10 fireworks. This increase in Ben's effective wealth (the value of fireworks plus the value of other goods he can purchase) has a positive income effect on Ben's purchase of fireworks, so government intervention will not fully crowd out his spending. The total number of fireworks will rise above 20. By forcing Jerry to become a contributor, the government has increased total public goods provision.

Warm Glow

Alternatively, there may not be full crowd-out if you care about your own contributions per se, as in the warm glow model. If you get utility from your particular contributions for any reason, then an increase in government contributions will not fully crowd out your giving. For example, consider the extreme case where *all* you care about is how much you give, and you don't care about gifts from others. If the government increases contributions from others, these contributions have no offsetting effects on your giving because your giving is, from your perspective, a private good. In this extreme case, there may be *no* crowd-out of your contributions by government intervention. As long as there is some warm glow from your own contributions, then crowd-out will be less than one for one because part of your contribution is a private good.

EMPIRICAL EVIDENCE

Measuring Crowd-Out

A large number of studies consider how private spending on public goods responds to public spending on the same public goods. A classic example is Kingma's (1989) study of public radio. Public radio is supported partly by contributions from its listeners and partly by government contributions. Kingma collected data on how much governments contribute to public radio stations in different cities around the country. He then gathered data on how much individuals contribute to their public radio stations in those same cities. He found that for every $1 increase in government funding, private

contributions fell by 13.5¢, for only a very partial crowd-out. Other studies in this vein typically also find that crowd-out is fairly small.[14]

This is an interesting finding, but it potentially suffers from the bias problems discussed in Chapter 3: there may be reasons why areas with different government contributions to public radio might also have different tastes for private giving. For example, suppose that governments are more able to support public radio in high-income areas than in low-income areas (because the government raises more tax revenues in the high-income areas) and that individuals contribute more to charitable causes (like public radio) in high-income areas than in low-income areas. Then high-income and low-income areas are not good treatment and control groups to use for measuring the effect of government spending on individual giving. Such comparisons will be biased by the fact that high-income areas would have given more even in the absence of government intervention. In principle, regression analysis using controls for income can correct this bias, but in practice, as discussed in Chapter 3, controls are typically unable to fully correct this type of problem.

One way to approach this concern is to use laboratory experiments. The classic study using this approach is Andreoni (1993). He set up an experiment in which individuals contributed to a public good in a laboratory setting by contributing tokens they were given to a common fund. He set up the payoffs for this experiment so that each player, if acting as a free rider, should choose to contribute 3 tokens to maximize the player's likely return. This predicted contribution (3 tokens) was close to the level actually chosen by each participant (2.78 tokens).[15] Andreoni then made the following change to the laboratory game: using the same payment schedule, he instituted a 2-token tax on every player. This tax was then contributed to the public good. This change mirrors the full earlier crowd-out example, so without warm glow effects, players should have reduced their contributions by 2 tokens to 0.78 token to offset the government contribution plan. In fact, however, each player cut his or her contributions by only 1.43 tokens so that contributions fell only to 1.35 tokens. That is, crowd-out was less than full; each token of government contribution crowded out only 0.715 token of private contributions.

Another way to approach this concern is to find quasi-experimental variation in government spending and to then assess the impacts on private contributions to the same activity. The evidence from this approach is more mixed.

A series of studies by Andreoni and Payne (2011a,b) measure the crowding out of private donations to charities due to government grants to those same charities. They do so by looking at what happens to charitable giving to individual charities as the size of government grants to these charities vary. They find substantial crowd-out, with private donations falling by 73 cents to one dollar for every dollar of government grants. They show, however, that most of this crowd-out arises not from reduced individual contributions, which are close to zero, but from reduced fundraising efforts by the charities. On the other hand, a further study of U.K. charities by Andreoni, Payne, and Smith (2014) uses a different strategy, looking at charities who apply for government grants and score equally, so that a random lottery is used to break ties. They compare the winners and the losers of this lottery, who differ only in whether they received a government grant, and they find that there is actually evidence for crowd-in: those charities that won government grants actually see higher levels of private contributions over time. They argue that part of the difference across these studies may be differences in the size of charities; smaller charities in the U.K. study see much larger crowd-in.

Other studies have applied quasi-experimental approaches to studying the response of religious charities to government spending. Hungerman (2005) studies the response of Presbyterian Church spending on charitable activities to changes in federal transfer programs. As discussed at length in Chapter 17, in 1996, the federal government introduced a major welfare reform that made a number

Chapter 17, in 1996, the federal government introduced a major welfare reform that made a number

of fundamental changes in cash welfare programs, one of which sharply restricted the eligibility of noncitizens for welfare programs. Hungerman compared the change in spending on charitable activities by churches in areas with a large number of immigrants (which saw the largest reduction in government transfer spending) to the change in spending by churches in areas with smaller numbers of immigrants (which saw smaller reductions). He found that after the reforms had been enacted, churches in the high-immigrant areas increased their charitable spending much more than the churches in the low-immigrant areas had. This finding is consistent with crowd-out: government transfers were reducing private church charity so that, when government transfers to immigrants declined, charity rose in those areas where immigrants were most likely to reside. The estimated crowd-out of charitable spending is relatively modest, however; such spending falls only by about 20 cents for each dollar in increased transfer spending. Hungerman and Gruber (2007) used a similar approach to show that church charitable spending fell in response to New Deal spending during the Great Depression; they found even more modest crowd-out with charitable spending falling by only 5 cents for each dollar in increased transfer spending.

Another area of focus for crowd-out analysis has been in the context of education. Dinerstein and Smith (2015) analyzed the impact of New York City's Fair Student Funding Reform on private and public school enrollment. By comparing public schools that received increased funding under the program to those that did not, the researchers demonstrated that increased funding led to an increase in student enrollment—and that 32% of those students came from existing private schools. Indeed, they find that private schools near public schools that received funding were 30% more likely to close in the subsequent six years. Bassok et al. (2014) find that the expansion of universal public pre-school programs in Oklahoma and Georgia induced even greater crowd-out, with 60–100% of the students in these programs coming from private preschools. On the other hand, Bastos and Straume (2016) conducted a similar study in Brazil and found that an increase in public preschool funding had a positive (or crowd-in) effect on private preschool enrollment. They argue that the difference across these studies may be attributable to differences in income inequality across the two nations, which leads to essentially separate demands for public and private preschools in Brazil.

The wide variety in estimated crowd-out effects highlights that sometimes empirical research cannot estimate a "general" parameter such as crowd-out, but that instead, the extent of crowd-out can vary significantly with the context being studied. This is illustrated nicely by Hungerman (2009), who finds that diverse communities may be more amenable to government intervention because of lower crowd out. By analyzing the impact of expansion of the Supplemental Security Income program (discussed in Chapter 17) on charitable spending of churches, Hungerman found that crowd-out was almost zero among diverse communities and 65% among homogenous communities, suggesting that diverse communities donate because of warm glow rather than for altruistic purposes, which leads to less crowd-out.

Evidence on Crowd-Out

How important is the crowd-out problem in reality? Unfortunately, the existing evidence on crowd-out is quite mixed. On the one hand, studies assessing how individual contributions respond to government spending suggest a very small crowd-out. As the Empirical Evidence box indicates, however, these studies suffer from many of the bias problems discussed in Chapter 3. On the other hand,

evidence from laboratory experiments suggest that crowd-out is large but less than full. Thus, while there is no evidence for full crowd-out, there is also no consensus on the size of this important individual response to government intervention.

The Right Mix of Public and Private

Even after establishing that the government should intervene, there remains the second question of public finance: How should the government intervene? In particular, while the private sector underprovides public goods on its own, private-sector actors may still play a useful role in achieving the optimal level of public goods provision. An important issue to be resolved is, therefore, the right mix of public and private actors in providing public goods.

There are a variety of options here, as highlighted in Chapter 1. At one extreme is provision entirely by the public sector, with management, workers, and financing all coming from the government. At the other extreme is subsidized or mandated private provision, with the government providing incentives for or mandating private actors to provide the optimal level of the public good. In between are various degrees of **contracting out**, an approach through which the government retains responsibility for providing the good or service but hires private-sector firms to actually provide the good or service. Governments can harness the forces of competition in this context through *competitive bidding*, asking a number of private firms to submit bids for the right to perform the service or provide the good. In principle, the government then grants the right to provide the good or service to the private entity that can provide the good most efficiently. Indeed, the application begins with an example that illustrates the success of competitive bidding for providing health insurance in Massachusetts.

contracting out
An approach through which the government retains responsibility for providing a good or service but hires private-sector firms to actually provide the good or service.

In practice, however, there are two problems with contracting out. First, the private sector's incentives may not align with public goals, leading to lower public costs but worse outcomes along other dimensions that policy makers may care about. Second, bidding in contracting out is often far from competitive. In many situations, government bureaucrats may exploit their power and award contracts not to the most efficient, lowest-cost bidder but to the one that assists them in maximizing their own power or, in the case of kickbacks and bribes, even their personal wealth. The application shows examples of both of these types of problems. Thus, whether

The application shows examples of both of these types of problems. Thus, whether contracting out is the best approach to providing a public good depends critically on the nature of the contract and the interests of both the contractor and the government.

APPLICATION

The Good and Bad Sides of Contracting Out

As highlighted in the text, contracting out public goods to private companies may or may not work to deliver public goods efficiently. In this application, we begin with a recent successful example of contracting out, followed by some more problematic cases.

The success story comes from contracting out to provide health insurance to low-income enrollees under the Massachusetts health care reform of 2006 (discussed in detail in Chapter 16). One central aspect of that reform was the establishment of a new program, Commonwealth Care, which delivered very low-cost health insurance to the poorest residents of Massachusetts. Rather than provide that health insurance through publicly paid providers, however, the state contracted with five different private "managed care organizations" (MCOs) to provide all of the poorest residents' medical needs for one fixed charge per month. Individuals could choose any of the five MCOs, and the government would pay most of the bill. Because the state was paying the premium for most participants in the MCOs, the MCOs had no market incentive to offer low rates to enrollees. To keep its expenditures down, therefore, the state had to figure out how to give the MCOs some incentive to offer their plans at low, competitive prices.

To mitigate this problem, the state used an innovative bidding mechanism. The state would "auto-assign" new enrollees to the MCO that provided the lowest cost bid to the state. These new enrollees were often the healthiest patients and were, therefore, the most profitable to the MCOs (because the MCO would receive the premium payment from the state but wouldn't have to pay out very much in medical costs). The desire to be the MCO to which the new, healthy enrollees were assigned led MCOs to bid competitively so that they could attract these low-cost patients. As a result of this aggressive bidding, costs in the Commonwealth Care Program rose by only 3.7% from 2007 through 2013; over roughly this same period, premiums for employer-sponsored insurance in Massachusetts rose by 30%. Even though premiums grew slowly, consumers were very satisfied with their plans; survey data indicated that 85% of Commonwealth Care consumers reported themselves to be very or extremely satisfied with their plans.[16]

Unfortunately, the health arena also provides some less positive examples of contracting out. Knutsson and Tyrefors (2020) compared the outcomes between private and public ambulances in Stockholm, Sweden. They found that private ambulances had lowered costs and performed better on contracted outcomes like response to dispatch calls and time taken to reach the patient. However, these better contracted outcomes appear to have come at a steep price in terms of the quality of services; the three-year mortality rate was 1.4% higher for private ambulances—the equivalent of about 400 people each year. The lower quality in private ambulances is most likely attributed to cost cutting methods that made working for a private ambulance less appealing and, consequently, decreased the quality of the staff. Indeed, the researchers found that private ambulance employees were more likely to be younger and have less experience.[17]

were more likely to be younger and have less experience.

Other less successful examples of contracting out come from the public safety arena. For example, Hart et al. (1997) compared private to public prisons. They found that private prisons are roughly 10% cheaper per prisoner but that those savings are achieved by paying lower wages to prison guards. The low pay led to staffing with lower-quality guards, which in turn resulted in higher instances of violence (and, in one case, a major riot). Thus, lowered costs were achieved at the expense of quality. A recent federal report confirmed that private for-profit prisons are more dangerous than public prisons, and the Department of Justice has announced that the federal government will stop relying on private prisons to house inmates.[18]

Another related example is New Jersey's experience with halfway houses for newly released prison inmates. Halfway houses, or residential reentry centers (RRCs), offer assistance to newly released inmates to ease the transition back into society. These privately run facilities are typically less expensive than prisons and so can in theory be a cost-effective means of transitioning prisoners out of the criminal system. In practice, however, an exposé of New Jersey RRCs found that they were poorly run and dangerous, with a 2009 study finding that these facilities had much bigger gang problems than prisons. A surprise drug test at one RRC found that 73% of residents tested positive for drugs, and a counselor even mentioned that some inmates wanted to go back to prison because they didn't feel safe at the RRC. These types of problems are not restricted to the United States; similar controversies have arisen in the United Kingdom around shocking negligence of private companies in maintaining homes for older adults and people with disabilities.[19]

Should the government undertake these highway improvements? That depends on whether the costs of doing so exceed the sum of the benefits to all drivers who use the highway, but measuring these costs and benefits can be complicated. Consider the costs of the labor needed to repair the highway. The budgetary cost of this labor is the wage payments made by the government for this labor, but the economic costs can be different. What if, without this highway project, half of the workers on the project would be unemployed? How can the government take into account that it is not only paying wages but also providing a new job opportunity for these workers?

Even more difficult problems face the government as it tries to assess the benefits of the project. What is the value of the time saved for commuters due to reduced traffic jams? And what is the value to society of the reduced number of deaths if the highway is improved?

These difficult questions are addressed by the field of *cost-benefit analysis,* which provides a framework for measuring the costs and benefits of public projects. Chapter 8 provides a detailed discussion of cost-benefit analysis, within the context of this highway example.

How Can We Measure Preferences for Public Goods?

In our discussion of optimal public goods provision, the government knows each individual's preferences over private and public goods. The government can, therefore, compute for each individual that person's marginal valuation of public goods (their marginal rate of substitution of the public for the private good), sum these valuations across all individuals, and set this equal to the marginal cost of the public good (relative to the marginal cost of the private good).

In practice, of course, there are at least three problems facing a government trying to turn individual preferences into a decision about public goods provision. The first is *preference revelation:* individuals may not be willing to tell the government their true valuation, for example, because the government might charge them more for the good if they say that they value it highly. The second is *preference knowledge:* even if individuals are willing to be honest about their valuation of a public good, they may not know what their valuation is because they have little experience pricing public goods such as highways or national defense. The third is *preference*

aggregation: How can the government effectively put together the preferences of millions of citizens to decide on the value of a public project?

These difficult problems are addressed by the field of *political economy,* the study of how governments go about making public policy decisions such as the appropriate level of public goods. In Chapter 9, we discuss the various approaches used by governments to address these problems and the implications each approach has for the ability of government to effectively intervene in problems such as the free rider problem.

HIGHLIGHTS

- Pure public goods are goods that are non-rival (your consuming or making use of the good does not in any way affect someone else's opportunity to consume the good) and non-excludable (even if you want to deny someone else the opportunity to consume or access the public good, there is no way you can do so).
- For pure public goods, the optimal level of provision is the point at which the sum of marginal benefits across all recipients equals the marginal cost.
- The private market is unlikely to provide the optimal level of public goods due to the free rider problem.
- In some cases, the private market can overcome the free rider problem, at least partially. A solution closer to the socially optimal one is more likely if there are individuals with high incomes or high demand for the public good, individuals who are altruistic, or individuals who derive a "warm glow" from their contributions.
- Public provision of public goods can lead to crowding out of private provision.
- Contracting out can be an effective means of integrating the private sector into public provision, but it has limitations as well.
- Additional problems with optimal public goods provision include determining the costs and benefits of public projects and effectively reflecting the public's demand for public goods.

QUESTIONS AND PROBLEMS

1. We add the demands of *private* goods horizontally but add the demands of *public* goods vertically when determining the associated marginal benefit to society. Why do we do this, and why are the procedures different for public and private goods?
2. The citizens of Balaland used to pave 120 miles of roadways per year. After the government of Balaland began paving 100 miles of roadways per year itself, the citizens cut back their paving to 30 miles per year, for a total number of roadway miles paved per year of 130 miles. What might be happening here?
3. Ryan's demand for hamburgers (a private good) is $Q = 21 - 6P$ and Madison's demand is $Q = 6 - 3P$.

a. Write down an equation for the social marginal benefit of hamburger consumption.

b. Now suppose that hamburgers are a *public* good. Write down an equation for the social marginal benefit of hamburger consumption.

4. Your neighbors pay annual dues to a neighborhood association. This association refunds neighborhood dues to selected home owners who do a particularly nice job of beautifying their yards.
   a. Why might the neighborhood association provide this refund?
   b. At the most recent neighborhood association meeting, home owners voted to end this practice because they felt that it was unfair that some people would not have to pay their share of the costs of maintaining the neighborhood. What is likely to happen to the overall level of neighborhood beautification? Explain.
5. Zorroland has a large number of people who are alike in every way. Boppoland has the same number of people as Zorroland, with the same average income as Zorroland, but the distribution of incomes is wider. Why might Boppoland have a higher level of public good provision than Zorroland?
6. Think about the rival and excludable properties of public goods. To what degree is *radio broadcasting* a public good? To what degree is a *highway* a public good?
7. Think of an example of a free rider problem in your hometown. How can your local government overcome this problem?
8. To determine the right amount of a certain public good to provide, the government of Wakanda decides to survey its residents about how much they value the good. It will then finance the public good provision by taxes on residents. Describe a tax system that would lead residents to underreport their valuations. Describe an alternative system that could lead residents to overreport their valuations.
9. e Why is it difficult to empirically determine the degree to which government spending crowds out private provision of public goods?
10. Why can the public good provision problem be thought of as an externality problem?

The e icon indicates a question that requires students to apply the empirical economics principles discussed in Chapter 3 and the Empirical Evidence boxes.

ADVANCED QUESTIONS

11. Suppose that you have a friend who works in fundraising at the public radio station in your town. One day they tell you excitedly that the station has just been selected to receive a large grant from the federal government. The marketing department at the station plans to feature details about the grant in an upcoming promotional email, hoping that the news will drive a wave of new donations.
    a. Using the theoretical tools of this chapter, discuss what would have to be true for your friend's idea for a promotional email featuring the new grant to be effective in increasing donations.
    b. As a budding experimental economist you are interested in the questions about crowd-out that emerged when speaking with your friend about marketing for the local public radio station. You suggest to your friend that this is a perfect opportunity to study crowd-out empirically. You suggest that the station run a small experiment, randomizing the recipients of the email into two groups—one group receiving an email promoting the new federal grant, and the other receiving an email highlighting the great work the station has done recently, but omitting mention of the grant. How would this improve on Kingma's 1989 study of public radio? What might be the pitfalls of such an approach?
12. Suppose 20 people each have the demand $Q = 20 - P$ for streetlights, and 5 people have the demand $Q = 18 - 2P$ for streetlights. The cost of building each streetlight is \$10. If it is impossible to purchase a fractional number of streetlights, how many streetlights are socially optimal?
13. Amy, Brooke, and Chelsea live in Minneapolis. Amy's demand for bike paths, a public good, is given by $Q = 24 - 4P$. Brooke's demand is $Q = 14 - P$, and Chelsea's is $Q = 5 - P/3$. The marginal cost of building a bike path is $MC = 18$. The town government decides to use the following procedure for deciding how many paths to build. It asks each resident how many paths she wants, and it builds the largest number asked for by any resident. To pay for these paths, it then taxes Amy, Brooke, and Chelsea the prices a, b, and c per path, respectively, where $a + b + c = MC$. (The residents know these tax rates before stating how many paths they want.)
    a. If the taxes are set so that each resident shares the cost evenly ($a = b = c$), how many paths will get built?

b. Show that the government can achieve the social optimum by setting the correct tax prices a, b, and c. What prices should it set?

14. The town of Springfield has two residents: Homer and Bart. The town currently funds its fire department solely from the individual contributions of these residents. Each of the two residents has a utility function over private goods (X) and total firefighters (M), of the form $U = 6 \times \log(X) + 2 \times \log(M)$ The total provision of firefighters hired, M, is the sum of the number hired by each of the two persons: $M = M_H + M_B$. Homer and Bart each have an income of \$100, and the price of both the private good and a firefighter is \$1. Thus, they are each limited to providing between 0 and 100 firefighters.
    a. How many firefighters are hired if the government does not intervene? How many are paid for by Homer? By Bart?
    b. What is the socially optimal number of firefighters? If your answer differs from (a), why?
15. The town of Musicville has two residents: Bach and Mozart. The town currently funds its free outdoor concert series solely from the individual contributions of these residents. Each of the two residents has a utility function over private goods (X) and total concerts (C), of the form $U = 3 \times \log(X) + 2 \times \log(C)$. The total number of concerts given, C, is the sum of the number paid for by each of the two persons: $C = C_B + C_M$. Both Bach and Mozart have income of 60, and the price of both the private good and a concert is 1. Thus, they are limited to providing between 0 and 60 concerts each.
    a. How many concerts are given if the government does not intervene?
    b. Suppose that the government is not happy with the private equilibrium and decides to provide eight concerts in addition to what Bach and Mozart may choose to provide on their own. It taxes Bach and Mozart equally to pay for the new concerts. What is the new total number of concerts? How does your answer compare to (a)? Have we achieved the social optimum? Why or why not?
    c. Suppose that instead an anonymous benefactor pays for eight concerts. What is the new total number of concerts? Is this the same level of provision as in (b)? Why or why not?
16. Consider an economy with three types of individuals, differing only with respect to their preferences for monuments. Individuals of the first type get a fixed benefit of 250 from the mere existence of monuments,

whatever their number. Individuals of the second type get benefits according to:

$$\begin{aligned} B_{\text{II}} &= 30M - 2M^2 \text{for} M < 2, \text{but} \\ B_{\text{II}} &= 200 + 30M - 2M^2 \end{aligned}$$

for $M \geq 2$. Individuals of the third type get benefits of

$$B_{\text{III}} = 150 + 90M - 4M^2$$

where M denotes the number of monuments in the city. Assume that there are 50 people of each type. Monuments cost \$3,000 each to build. How many monuments should be built?

APPENDIX TO CHAPTER 7: The Mathematics of Public Goods Provision

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In this appendix, we present the mathematics behind the analysis of the private provision of public goods and discuss how government intervention affects that provision. This analysis uses the tools of *game theory,* a method used by economists to solve problems in which multiple parties interact to make a decision.

Setup of the Example

Imagine that Ben and Jerry live by themselves far away from others. They choose between consuming a private good, X, with a price of \$1 ($P_x = 1$), and a public good, fireworks, with a price of \$1 ($P_F = 1$). They each have an income of \$100. Because fireworks are a public good, the total amount provided is the sum of the amount provided by each individual: $F = F_B + F_J$. Each individual (i) has a utility function of the form:

$$U = 2 \times \log(X_i) + \log(F_B + F_J)$$

which they maximize subject to the budget constraint:

$$X_i + F_i = 100$$

Private Provision Only

Initially, Ben and Jerry provide the public good on their own, with no government intervention. A question for modeling private provision is how Ben and Jerry will behave, given that each knows the other will also provide fireworks. Game theory models designed to answer questions such as these typically assume *Nash bargaining:* each actor solves for his optimal strategy given the other actor's

behavior, and an equilibrium exists if there is a set of mutually compatible optimal strategies. The *Nash equilibrium* is the point at which each actor is pursuing his optimal strategy, given the other actor's behavior.

Combining the equations for the utility function and the budget constraint, Ben solves a problem of the form:

$$\text{Max}\, U = 2 \times \log(100 - F_B) + \log(F_B + F_J)$$

Differentiating this expression with respect to F_B, we obtain:

$$-2/(100 - F_B) + 1/(F_B + F_J) = 0$$

which we can solve to generate:

$$(100 - F_B)/(2 \times (F_B + F_J)) = 1$$

and therefore:

$$F_B = (100 - 2F_J)/3$$

Note the free rider problem implied by this equation: Ben's contribution goes down as Jerry's contribution goes up.

We can solve a similar problem for Jerry:

$$F_J = (100 - 2F_B)/3$$

This yields two equations in two unknowns, which we can substitute one into the other to solve for F_B and F_J. Doing so, we find that $F_B = F_J = 20$, so the total supply of fireworks is 40.

Socially Optimal Level

How does this compare to the socially optimal level of provision? The social optimum is the quantity at which the sum of the individuals' marginal rates of substitution equals the ratio of prices (which is 1 in this example). Each individual's *MRS* is the ratio of his marginal utility of fireworks to his marginal utility of private goods, which we obtain by differentiating the previous utility function with respect to fireworks and then again with respect to private goods. So the optimal amount of fireworks is determined by:

$$(100 - F_B)/[2 \times (F_B + F_J)] + (100 - F_J)/[2 \times (F_B + F_J)] = 1$$

Using the fact that total fireworks $F = F_B + F_J$, we can rewrite this equation as:

$$(200 - F)/2F = 1$$

Solving this, we obtain $F = 66.6$. This quantity is much higher than the total provision by the private market, 40, due to the free rider problem. The public good is underprovided by the private market.

Different Types of Individuals

Suppose now that Ben has an income of $125, while Jerry has an income of only $75. In that case, Ben maximizes:

$$U = 2 \times \log(125 - F_B) + \log(F_B + F_J)$$

So Ben's demand for fireworks is:

$$F_B = (125 - 2F_J)/3$$

Jerry, in this case, maximizes his utility:

$$U = 2 \times \log(75 - F_J) + \log(F_B + F_J)$$

So Jerry's demand for fireworks is:

So Jerry's demand for fireworks is:

$$F_J = (75 - 2F_B)/3$$

Solving these two equations, we find that $F_B = 45$ and $F_J = -5$. Because individuals can't provide negative fireworks, this means that Jerry provides no fireworks, and the total supply is 41.66. This quantity is higher than the private quantity supplied when Ben and Jerry have equal incomes. Thus, having one actor with a higher income leads the outcome to be closer to the social optimum.

Full Crowd-Out

Suppose that the government recognizes that the private sector underprovides fireworks by a total of 26.6 in the original example. It therefore attempts to solve this problem by mandating that Ben and Jerry each contribute $13.30 toward more fireworks. Will this solve the underprovision problem?

In fact, it will not; such a mandate will simply crowd out existing contributions. Under the mandate, both Ben and Jerry now maximize their utility, which has the form:

$$\text{Max} U = 2 \times \log(X_i) + \log(F_B + F_J + 26.6)$$

Each maximizes that utility function subject to the budget constraint:

$$X_i + F_i = 100 - 13.3$$

Solving this problem as above, we find that the optimal level of fireworks provision for both Ben and Jerry falls to 6.7 each, so that total provision (public of 26.6 plus private of 13.4) remains at 40. By reducing their provision to 6.7, Ben and Jerry can return to the private solution that they find to be optimal, which is total spending of $20 each, and a total of 40 fireworks. As discussed in the chapter, however, full crowd-out is only one of a range of possible outcomes when government provides a good that is also provided by the private sector.

CHAPTER 8

Cost-Benefit Analysis

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Questions to keep in mind

- How do we appropriately measure the costs and benefits of public projects?
- What are the best methods for dealing with difficult-to-measure costs and benefits, such as the value of time and of human life?
- How do we compare costs and benefits to evaluate the optimality of public projects?

California's transportation system is under a lot of stress. As a result of the rapid growth in the state's population, travel on the state's highway system is increasing many times faster than its capacity. This problem will only worsen in the future: the state's population is expected to increase by about 10.5 million persons between 2019 and 2055.[1] To address this developing crisis, the state is going to build the first high-speed rail (HSR) system in the United States. It will cover the 800 miles from Sacramento to San Diego, will have the ability to reach speeds of over 200 miles per hour (thus cutting travel time from 8 1/2 hours to about 4 hours), and was projected to cost over $80 billion.[2] In 2008, California residents voted to pay for the HSR through a combination of state bonds, revenue from the state's sale of carbon dioxide permits, federal contributions, and private investment.[3]

California voters might never have approved the HSR project without the information from a study commissioned by the state that assessed the costs and benefits of such a project for the state.[4] The analysts first computed the project's expenditures, which consisted of capital costs (such as design, management, and land acquisition), operation costs (such as labor costs and electrical power costs), and maintenance costs (maintenance of tracks and signals). The analysts also addressed the nonmonetary costs of the project, such as air pollution and noise pollution (which, in turn, took into account the loss of sleep and the lower productivity that results from increased noise levels). The analysts concluded that all these costs would be more than offset by the project's benefits.

Benefits from the project came in many forms. In the most recent iteration of the project's report (published in 2020), analysts estimated that by the year 2040, the HSR would have 40 million riders. Those riders would save almost 180 million hours annually through reduced time spent sitting in traffic and through increased reliability of rail travel relative to airline travel. Productivity would also increase because people tend to get work done while on the train, which they could not do if they were driving a car. The 2020 report also predicted that the HSR would reduce gasoline consumption by approximately 213 million gallons each year. Other reports anticipate that it will cut oil consumption by $12.7 million per year by 2030. And, with fewer people on the road, the number of auto accidents would fall, so fewer people would suffer the lost wages and high medical expenses associated with auto accidents. The HSR would also reduce overall pollution, eliminating the gas emissions of 400,000 vehicles and 3,500 tons of pollutants, which would improve health (resulting in more medical expense savings) and lessen the social costs imposed by climate change. Lastly, congestion costs are expected to fall by about $20 billion annually upon the rail's implementation. Ultimately, in plans available in 2018, analysts concluded that the value of the train's benefits were about $259 billion (in 2020 dollars), while its total costs, including both monetary and nonmonetary costs, were $122 billion (in 2020 dollars), so that the project delivers net benefits of about $137 billion.[5] This large net benefit may help explain the broad support for the HSR project among California voters, despite the long-run increase in state tax revenues that will be required to pay off the bonds that finance the project. Recent cost overruns may challenge that support, although the rise in projected monetary costs to $80 billion still leaves the project with positive net benefits.

The discussion in Chapter 7 relied on the theoretical concepts of the marginal social benefit and the cost of public goods. For a government making decisions about how much of a public good to provide, however, these theoretical concepts must be

translated into hard numbers. To accomplish this translation, the government uses **cost-benefit analysis** to compare the costs and benefits of public goods projects to decide if they should be undertaken. In principle, cost-benefit analyses are accounting exercises, a way of adding up the benefits and costs of a project and then comparing them. In practice, however, cost-benefit analyses are rich economic exercises that bring to bear the microeconomic reasoning reviewed in Chapter 2 and a host of interesting empirical evidence.

cost-benefit analysis
The comparison of costs and benefits of public goods projects to decide if they should be undertaken.

This richness is clearly illustrated by California's HSR train example. Carrying out the cost-benefit analysis in this case required answering hard questions, such as: How do we value the time savings to commuters? How do we value the costs of noise and reduced visibility due to pollution? How do we value the benefits of increased safety? And how do we deal with the fact that many of these costs and benefits accrue not today, but far into the future?

In this chapter, we discuss the important set of issues that must be addressed to carry out cost-benefit analysis. In doing so, we explore how policy makers use the tools of this field to apply the theory developed in Chapter 7.

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8.1 Measuring the Costs of Public Projects

In this section, we introduce the example that will guide us through our discussion of cost-benefit analysis and then turn to the difficulties associated with measuring the costs of public projects. Although the principles discussed here are general, the best way to understand cost-benefit analysis is through an example.

The Example

Suppose that you are again working for your state government but that instead of working on health and human services issues, you are running the highway department. Your state turnpike is in poor shape, with large potholes and crumbling shoulders that slow down traffic and pose an accident risk. You have been charged by the governor with the task of considering whether the state should invest in repairing this road.[6]

As shown in Table 8-1, making the improvements will require the following inputs:

- 1 million bags of asphalt
- 1 million hours of construction labor (500 workers for 2,000 hours each)
- $10 million per year in the future for maintenance costs

TABLE 8-1 Cost-Benefit Analysis of Highway Construction Project

		Quantity	Price/Value	Total
Costs	Asphalt	1 million bags		
	Labor	1 million hours		
	Maintenance	$10 million/year		
			First-year cost:	
			Total cost over time:	
Benefits	Driving time saved	500,000 hours/year		
	Lives saved	5 lives/year		
			First-year benefit:	
			Total benefit over time:	
			Benefit over time minus cost over time:	

The renovation of the turnpike in your state has three costs: asphalt, labor, and future maintenance. There are two associated benefits: reduced travel time and reduced fatalities. The goal of cost-benefit analysis is to quantify these costs and benefits.

There are two main benefits to these road improvements:

- Driving time for producers (trucks) and consumers will be reduced by 500,000 hours per year
- The road will be safer, resulting in 5 fewer fatalities per year

Measuring Current Costs

8.2 Measuring the Benefits of Public Projects

Measuring the benefits associated with this project is more difficult than measuring the costs because it is more difficult to use market values to place a value on the benefits.

Valuing Driving Time Saved

The first benefit associated with this project is that both producers and consumers will save travel time. For producers, we can value the time savings in a straightforward manner. The benefits to producers arise from a reduction in the cost of supplying goods because it takes less time to transport them. The decreased costs lead to an increase in supply (a rightward shift in the supply curve), which raises the total size of social surplus. This increase in social surplus is the benefit to society from the lower cost of producing goods.

It is much trickier to measure the benefits of time saved for consumers: How do we value the benefits of being able to get from point to point more quickly? What we need is some measure of society's valuation of individuals' *time:* What is it worth to me to have to spend fewer minutes in the car? Economists have several approaches to answering this question. None are fully satisfactory, but by putting them together, we can draw some general conclusions about the value of time.

Using Market-Based Measures to Value Time: Wages

Suppose that we can show that the time individuals save by driving faster is spent at work. Suppose, moreover, that there is a perfectly competitive labor market that allows individuals to earn their hourly wage for each additional hour spent at work. Under these assumptions, we would use drivers' wages to value their time savings. Opportunity cost is the value of the next best alternative use, and the next best alternative use in this example is being at work. The value of time at work in a perfectly competitive labor market is the wage rate that could be earned during that hour. The average wage rate for workers in the United States was $24.64 per hour in 2020.[10]

What if the time savings is spent partly at work and partly in leisure? Once again, if we are in a perfectly competitive labor market in which individuals can freely choose how many hours they want to work, then the wage is the right measure *even if the time is spent on leisure*. This is because, in a competitive model, individuals set the value of their next hour of leisure time equal to their wage. If the marginal utility of leisure time were above the wage, individuals would work less and take more leisure (driving down the marginal utility of leisure by consuming more leisure). If the marginal utility of leisure time were below the wage, individuals would work more and take less leisure (driving up the marginal utility of leisure by consuming less leisure). Thus, in a perfectly competitive labor market with freely adjusting hours, the value of time is always the wage, even if the time is spent on leisure activities.

As you might expect, this theoretical proposition runs into some problems in practice:

- Individuals can't freely trade off leisure and hours of work; jobs may come with hour restrictions. Suppose that I'd like to work more than 40 hours per week at my current wage, but my employer will not let me because that would involve paying me a higher overtime wage. In this case, my value of leisure could be below my wage, but I can't drive them to equality by working longer hours. So the wage *overstates* the value to me of saving time.
- There may be nonmonetary aspects of the job. For example, in the summertime, my office at work is air conditioned, while my home is not. This means that I value time at work at more than the wage; I also value the fact that it is more comfortable. Thus, my total compensation at work is higher than my wage. The value of leisure is set equal to total compensation from work, not just the wage, so the wage *understates* the value to me of saving time.

These problems limit the value of the wage as a value of time, leading economists to consider a variety of other approaches to time valuation.[11]

Using Survey-Based Measures to Value Time: Contingent Valuation

Before you took any economics, if I had asked you to figure out the value of time to someone, how would you have proposed doing it? Most likely, you would have simply asked individuals what time is worth to them! That is, you could ask, "How much would you pay to save five minutes on your drive?" This approach is labeled by economists as **contingent valuation**, that is, asking individuals to value an option

they are not now choosing, do not have the opportunity to choose, or is not yet available to them.

contingent valuation
Asking individuals to value an option that they are not now choosing, that they do not have the opportunity to choose, or that is not yet available to them.

The advantage of contingent valuation is that, in some circumstances, it is the only feasible method for valuing a public good. Consider the difficulty of valuing efforts to save a rare species of owl. There is no obvious market price that you can use to value that species. But you can survey individuals and ask what it is worth to them to save the species. These preferences can then be aggregated (added up) to form a value of efforts to save the species.

The problems with contingent valuation, however, are daunting, as reviewed in the following Application.

APPLICATION
The Problems of Contingent Valuation

While contingent valuation seems the most straightforward means of valuing benefits such as time savings, critics contend that the results of contingent valuation studies prove their uselessness. Two of the leading critics of contingent valuation are economists Peter Diamond and Jerry Hausman, who point out that varying the structure of contingent valuation surveys can lead to widely varying responses.[12] Examples of this problem include the following:

- *Isolation of issues matters.* When asked only one question on how much they'd be willing to pay to improve visibility at the Grand Canyon, respondents gave answers five times higher than when that question was placed third in a list with other questions.
- *Order of issues matters.* When asked how much they'd pay to save seals and whales (in that order), respondents said that seals were worth $142 and whales $195. When the order was reversed, whales (first) were now worth $172 and seals only $85.
- *The "embedding effect" matters.* Asked to value preservation from logging of one, two, and three wilderness areas, respondents gave roughly the same values for all three scenarios, suggesting that the value reported was not for the task specified, but for the general value of preserving wilderness. Similarly, respondents placed roughly equal value on saving 2,000, 20,000, and 200,000 birds. ■

Using Revealed Preference to Value Time

The natural way for noneconomists to value time is to ask individuals what their time is worth, but this approach runs into the previously noted problems. The natural way for economists to value time is instead to use **revealed preference**: let the actions of individuals reveal their valuation. The mantra of economics is: people may lie, but their actions, which result from utility maximization, don't!

revealed preference
Letting the actions of individuals reveal their valuation.

Suppose we compare two identical houses, one of which is five minutes closer to the central city where most commuters work. If individuals are willing to pay more for the closer home, this implies that they value the time savings. We can therefore use the difference in sales prices between the two homes to assign a value to saving five minutes of commuting. This comparison provides a market-based valuation of their time that truthfully reveals the preferences of individuals.

While appealing in theory, this approach also runs into problems in practice. This example works if the two homes are identical. But what if the house that is closer to the city is also nicer? Then we would find that it sells for a lot more, and we would incorrectly assume that this implies that individuals value their time very highly. The problem is that the price of any good values the entire set of attributes of that good, but for revealed preference analysis, we are concerned with only one particular attribute (in this case, distance to the city). Because other attributes of the good differ, it is difficult to use revealed preference to distill the value of a particular attribute of the good, such as location.

EMPIRICAL EVIDENCE

Valuing Time Savings

The fundamental problem facing the revealed preference approach in practice is the type of bias that we discussed in Chapter 3. When doing revealed preference analysis, the treatment is a good with a certain attribute (such as being only ten minutes from the city), while the control is another good without that attribute (such as being ten minutes farther from the city). The problem is that the treatments and controls may differ in ways that lead to bias. Suppose that homes built closer to the city are smaller, or that they have smaller yards. This would lead their value to be lower, so that when one compared the prices of houses farther away and closer to the city, one might not find the expected decline in prices for farther-away homes. In the Boston metropolitan area, for example, the town of Everett is, on average, only 4 miles from downtown Boston, while the suburban town of Lexington is 11 miles away. Yet the median home price in Everett is $325,900, while the median home price in Lexington is about 2.7 times higher at $865,744.[13] This is because the houses in Lexington are typically much larger and have nicer attributes than those in Everett.

Many of these attributes are observable, such as the square footage of the house or the number of bathrooms. In such cases, we can try to control for these other attribute differences using cross-sectional regression analysis with control variables. Indeed, in this context, there is a name for such a strategy: *hedonic market analysis*. Hedonic market analysis proceeds by running a regression of house values on each of the bundle of attributes of housing: distance to town center, number of bedrooms, number of bathrooms, square footage, and so on. The notion is that if we control in a regression context for all of the attributes other than distance, we will essentially be comparing identical houses in different locations.

As we highlighted in Chapter 3, however, this is not likely to be a fully satisfactory approach. There are many differences between houses that are hard to observe, such as the perceived quality of the neighborhood or the care taken by the previous owner. If these things are correlated with distance to the town center, it will mean that the treatment group (close houses) and the control group (more distant houses) are not identical products, so our (biased) estimates do not give a true valuation of time differences.

In order to provide a more convincing estimate of the value of time savings, a quasi-experimental approach can be used. An example of such a study was done by Deacon and Sonstelie (1985). During the oil crisis of the 1970s, the government imposed price ceilings on the large gasoline companies, setting a maximum price that those companies could charge per gallon of gas. These low prices (relative to the true market price) led consumers to wait in long lines to get gas. These price ceilings did not apply to smaller, independently owned stations, so lines were shorter there. As a result, the amount of time that individuals were willing to wait at the stations owned by large gas companies (the treatment group) relative to independent stations (the control group) can be compared to the amount of money saved by going to the treatment stations instead of the control stations to form a value of time.

The authors compared Chevron stations in California, which were mandated to lower their prices by $0.54 per gallon (in 2020 dollars) below the price being charged by the control group of independent stations. Lines formed at Chevron stations for cheaper gas, forcing customers to wait an average of 14.6 minutes more at Chevron than at competing stations. The mean purchase was 10.5 gallons, suggesting roughly that people were saving $22.70 (in 2020 dollars) per hour they waited. That is, individuals revealed themselves to be willing to wait an hour for $22.70—very close to the average hourly wage in the United States.[14]

A more recent study by Goldszmidt et al. (2020) used a common source of time versus money tradeoff many of us face on a more regular basis: more expensive but faster rides through ride sharing services. This study ran a randomized trial with the ride sharing company Lyft, varying the amount of time individuals had to wait for rides and the associated prices that they paid. They found that individuals value time at roughly $19/hour, somewhat lower than the previous study but in the same range.

The ideal way to value time would be a controlled experiment, where we varied just the attribute of the good that we are trying to value: in this example, we could take the same house and move it five minutes closer to the city. This is clearly not possible in many cases. As reviewed in the Empirical Evidence box, however, a clever attempt to resolve this problem suggests that the value of an hour of time is remarkably consistent with the estimate from market-based measures.

Valuing Saved Lives

Returning to our highway example, the other major benefit of improving the turnpike is that repairing the road will improve safety and save lives. Valuing human lives is the single most difficult issue in cost-benefit analysis. Many would say that human life is priceless, that we should pay any amount of money to save a life. By this argument, valuing life is a reprehensible activity; there is no way to put a value on such a precious commodity.

This argument does not recognize that there are many possible uses for the limited government budget, each of which could save some lives. By stating that life should not be valued, we leave ourselves helpless when facing choices of different programs, each of which could save lives. By this logic, we would have to finance *any* government program that could save lives, at the expense of, say, education or housing expenditures. Alternatively, we could claim that virtually any government expenditure has some odds of saving a life; by improving education, for example, we may reduce crime, which will save lives. To escape the impotence that would be imposed by the "life is priceless" argument, one needs to be able to place some value on a human life.

APPLICATION
Valuing Life

A problem in valuing life in public policy debates is that "real lives" often count more than "statistical lives." When individuals are faced with the prospect of saving a particular individual's life, they have a much higher willingness to pay than when faced with expenditures that are likely to save a higher number of lives. Indeed, social experiments reveal that as the number of victims in a tragedy increases, willingness to pay decreases. There is even a drop off in willingness to pay to help when the number of victims in a situation increases from one to two![15] The sticky ethical problem of valuing life arises in many instances in public policy, as shown by these examples.

1. In 1993, consumer groups demanded that General Motors recall about 5 million pickup trucks that it had manufactured between 1973 and 1987. The gas tanks on these trucks were mounted on the outside of the vehicle. These groups claimed that the trucks' side-mounted gas tanks made the trucks more likely to explode on impact, causing 150 deaths over the period that the truck was manufactured. This recall would cost $1 billion and would, according to government calculations, save at most 32 more lives (because the trucks were slowly falling out of use). Using these estimates, the cost per life saved by the recall would have been $\$1\,\text{billion}/32 = \$31.25\,\text{million}$.

GM didn't want to spend this much money and instead managed to reach a settlement with the government, agreeing to provide $50 million to support education programs about seat belts and drunk driving, to undertake research into burn and trauma treatment, and to buy 200,000 child safety seats for low-income families. Consumer advocate Ralph Nader called the settlement "the most unprecedented buyout of law enforcement officials by a culpable corporation in regulatory history." But was it? The government estimated that the child safety seats alone would save 50 lives. If this were the only benefit (and it wasn't), the cost per life saved would be $\$50\,\text{million}/50 = \$1\,\text{million}$, much less than the $31.25 million per life saved that the recall would have cost. In other words, this alternative to the recall was saving more lives at a much lower cost. By this measure, the settlement was much better than the recall alternative, but it was only possible because the government was willing to set a value on human life.[16]

2. In October 1999, a commuter train crash at London's Paddington Station killed 31 people and prompted calls by an outraged public for more investment in rail safety measures. The public's anger was in part focused on the fact that British Rail, once a public entity, had recently been *privatized* (sold to a private-sector entity, a policy we discuss more in Chapter 9), so people assumed that the profit-seeking companies in charge of the system had skimped on safety measures to improve their profits. Emotions ran high at the time of the crash, and one government official promised that everything possible would be done to protect rail passengers, saying, "A billion is not a lot of money when safety is at stake."

   The government responded by requiring the rail companies to install the Train Protection and Warning System (TPWS), which, for $700 million (in U.S. dollars), would be able to quickly stop any train traveling under 75 mph if a dangerous situation were detected. But then a government investigation into rail safety recommended installing even more advanced technology, the European Train Control System (ETCS), which could stop trains traveling at any speed. Installing the ETCS would cost between $3 billion and $9 billion, save anywhere from one to three lives per year, and would last anywhere from 30 to 50 years. At best ($3 billion to save three lives per year for 50 years), this would mean spending $20 million per life saved; at worst ($9 billion to save one life per year for 30 years), it would mean $300 million per life saved.

   As critics noted the immensely high cost of the ETCS, government officials began to back down from promises to spend whatever it took to ensure rail safety. Furthermore, as opponents of the proposed safety measures noted, many more Britons are killed on roads than on rails, so that implementing the government's safety standards on Britain's roadways would save more lives, and at a cost of only $2 million per life saved. As a result, the government did not commit itself to installing the more expensive rail safety system.[17]
3. This debate over valuing life is vividly illustrated by the response to Covid-19, where governments faced a potential trade-off between limiting the harm of the disease and slowing economic activity. For some government interventions, there was essentially no trade-off. Cutler and Summers (2020) estimate that aggressive testing would cost $6 million per 100,000 people, but prevent 2,750 cases, including 14 deaths, and 33 severe cases—for an economic value of $176 million.

Other interventions, such locking down the economy, involved more of a tradeoff. Among those who strongly opposed such lockdowns, because of the consequences for economic activity, was President Trump, who in May 2020 said "We can't keep our country closed. We have to open our country … Will some people be badly affected? Yes."[18] Others called this argument unethical, including then-candidate Joe Biden, who a few months later said that he and running mate Kamala Harris would "do

whatever it takes to save lives."[19] But the right question to ask is not whether lockdowns are always or never the right thing to do, but rather whether their benefits are worth their costs. And it appears that they are.

Scherbina (2020) estimated that the cost of each additional week of stricter lockdown in the United States was $36 billion, but that the benefits of this additional week in terms of improved health was $72 billion. Thunstrom et al. (2020) estimated that social distancing measures (including limits on large gatherings and events, temporary school closures, travel restrictions, etc.) would have cost the United States $7.2 trillion in forgone economic output, but would save 1.24 million lives, for an estimated cost of $5.8 million per life saved, well below estimates we present later. A particularly challenging issue in evaluating these policies was the fact that most of the lives saved were elderly, raising the thorny issue of how to value lives of different ages; we return to this issue later. ■

Using Wages to Value a Life

As with valuing time, the market-based approach to valuing lives is to use wages: life's value is the present discounted value of the lifetime stream of earnings. While this seems like a logical approach, it presents a number of problems. One major problem is that using wages to value life doesn't value any time that isn't spent working. In a competitive markets model, we would want to add up not only the wages that are earned at work but also the leisure time that is valued at that market wage. Keeler (2001) calculated that a worker under 50 will spend 10 to 20% of their future hours working, so that, assuming they value leisure time at their wage rate, the value of their life is about 5 to 10 times their future lifetime earnings. Using data on employment, wages, and mortality rates, Keeler calculated that the average 20-year-old female will have future earnings of $700,000 (net present value in 2020 dollars) but will value her life at $4.44 million (in 2020 dollars). Men have slightly higher values because of higher earnings, while older people have lower values because they have fewer hours of life remaining.

This approach also faces the same problem as using wages to value time, which is that the market wage may not accurately reflect the value of leisure time. Moreover, life may mean more than just wages earned or corresponding leisure. For example, an individual may internalize the enjoyment derived by others from their being alive.

Contingent Valuation

The second approach to valuing a life uses contingent valuation. One way to do this is to ask individuals what their lives are worth. This is obviously a difficult question to answer. Thus, a more common approach is to ask about the valuation of things that change the probability of dying. For example, one such survey asked

participants how much more they would pay for a ticket on an airline with one fatal crash out of 500,000 flights, compared to the same ticket on an airline with two fatal crashes out of 500,000 flights. Another question asked how much less they would be willing to pay for a house in an area with environmental pollution that would reduce their life span by one year, compared to a house in an unpolluted area.

The problems of contingent valuation just raised will clearly haunt this analysis as well, however. Perhaps for this reason, contingent valuation studies have provided a very wide range of results for life values, ranging from $1.09 million to $31.45 million per life saved.[20]

Revealed Preference

As with valuing time savings, the method preferred by economists for valuing life is to use revealed preferences. For example, we can value life by estimating how much individuals are willing to pay for something that reduces their odds of dying. Suppose that a passenger air bag could be added to a new car for $350, and there is a 1 in 10,000 chance that it would save the life of the car passenger. This implies that the value of lives to individuals who buy airbags is at least $3.5 million.

Alternatively, we can value life by estimating how much individuals must be paid to take risky jobs that raise their chance of dying. Suppose that we compare two jobs, one of which has a 1% higher risk of death each year (e.g., a coal miner vs. a cashier in a retail store). Suppose further that the riskier job pays $30,000 more each year. This $30,000 is called a **compensating differential**. In this example, individuals must be compensated by $30,000 to take this 1% increased risk of dying, so that their lives are valued at $3 million ($30,000/0.01).

compensating differentials
Additional (or reduced) wage payments to workers to compensate them for the negative (or positive) amenities of a job, such as increased risk of mortality (or a nicer office).

There is a large literature in economics that uses these types of revealed preference approaches to valuing lives. The consensus from this revealed preference approach, as summarized by the renowned expert in the field, Kip Viscusi of Vanderbilt University, is that the value of life is roughly $10.5 million.[21]

This approach, however, also has its drawbacks. First of all, it makes very strong information assumptions. In doing this type of revealed preference approach, we assume that the coal miner knows that they have a 1% higher chance of dying each year than the cashier. This type of information is often not readily available. The

year than the cashier. This type of information is often not readily available. The

implied value of life from compensating differentials depends on individuals' perceptions of the risk, not the actual statistical risk, and these perceptions are often unknown to the researcher trying to estimate the value of life. Second, the literature on psychology suggests that, even armed with this information, individuals are not well prepared to evaluate these trade-offs. For example, a large experimental literature shows that individuals typically overstate very small risks (such as the odds of dying in a plane crash) and understate larger risks (such as the odds of dying on a dangerous job).[22]

The third problem with revealed preference studies was highlighted in the discussion about housing and time savings: the need to control for other associated attributes of products or jobs. For example, suppose that a coal miner faces a 1% higher chance of dying each year than does a cashier and also faces a 5% higher chance of being seriously injured. Then the $30,000 compensating differential incorporates both of these effects and cannot simply be used to infer the value of life. Moreover, because of the nature of the work, coal mining is considered a much less pleasant job compared to other types of work. Compensating differentials reflect both job risks and job "amenities" that determine the overall attractiveness of the job. The negative amenities of coal mining, along with other health risks, provide reasons why the compensating differential for that job overstates the value of life (because it incorporates the compensating differential for work injury and bad work conditions).

Fourth, there is the central problem of *differences in the value of life.* There is presumably not one common value of life in society but rather a distribution across individuals of different tastes. The revealed preference approach provides an estimate of the value of life for the set of individuals who are willing to take a riskier job or buy a safer product. This may not, however, provide a representative answer for the population as a whole.

For example, suppose that there are 10,000 people in society, 1,000 of whom don't much care about on-the-job risk (risk neutral) and 9,000 of whom are very worried about on-the-job risk (risk averse). Suppose that there are two types of jobs in society, a risky job with a 1% chance of dying each year and a non-risky job with no chance of dying. The risk-neutral workers require only $1,000 more each year to work in the risky job, while the other workers require $100,000.

If there are 1,000 risky jobs in this society, who will take them, and how much more

will they pay than the non-risky jobs? If the firms that offer those risky jobs pay only

$1,000 in compensating differential, the jobs will be filled by the 1,000 risk-neutral workers; the risk-averse workers would not take the job at that small compensating differential. Firms would like to pay the smallest possible compensating differential, so they will pay the $1,000 to get the 1,000 risk-neutral workers.

As a result, there will be a $1,000 compensating differential in equilibrium, implying a value of life of $100,000 ($1,000/0.01). Such a difference doesn't mean that life is worth only $100,000 for the average person in society, however; it is the value only for the risk-neutral individuals who take these jobs. This estimate would provide a very misleading answer for the overall social value of life. The importance of this distribution is highlighted by the study of Rohlfs et al. (2015), who looked at the willingness to pay for air bags in the 1990s and early 2000s. They found that the willingness to pay implies a value of life of roughly $10 million for the typical individual but that the valuation ranges from negative values up to $19 million.[23]

More generally, because risk-neutral individuals are always the first to take risky jobs, revealed preference pricing of risk will generally understate the value of life for the average person. This is because it is not an average person you are observing, but a person who (by definition) is more risk loving than average.

As the earlier application noted, a particular challenge in valuing lives in the context of fighting Covid-19 was the fact that most of the lives saved were among older adults. In theory, we should value life-years saved by interventions to reduce diseases like Covid-19, not just count lives. But in practice what makes this challenging is that studies of life valuation do not reveal a decline at older ages. In fact, Kniesner, Ziliak, and Viscusi (2006) find that when accounting for patterns of consumption, older adults actually have a higher implicit value of life than the young.

Government-Revealed Preference

Another approach to valuing lives is not to rely on how individuals value their lives but to focus, instead, on existing government programs and what they spend to save lives. One study reviewed 76 government regulatory programs that are designed to protect public safety and computed both the associated improvements in mortality and costs of the regulation to society (e.g., through higher costs to producers if imposing regulatory standards). The key conclusions from this study are summarized in Table 8-3, with costs updated to 2020 dollars. The costs varied from $146,000 per life saved for safety interventions, such as childproof cigarette lighters

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to $244 million per life saved from regulations for cattle feed. Of the 76 regulations, 45 had a cost per life saved below the $10.5 million figure that comes from studies of compensating differentials, but 31 of the regulations had a cost above that level.

TABLE 8-3 Cost per Life Saved of Various Regulations

Regulation Concerning ...	Year	Agency	Cost per Life Saved (millions, in 2020 dollars)
Childproof lighters	1993	CPSC	$0.14
Food labeling	1993	FDA	0.58
Reflective devices for heavy trucks	1999	NHTSA	1.29
Children's sleepwear flammability	1973	CPSC	3.17
Rear/up/shoulder seatbelts in cars	1989	NHTSA	6.33
Asbestos	1972	OSHA	7.91
VALUE OF STATISTICAL LIFE			**10.8**
Benzene	1987	OSHA	31.65
Asbestos ban	1989	EPA	112.21
Solid waste disposal facilities	1991	EPA	143.865
Cattle feed	1979	FDA	244.57

Data from: Morrall (2003), Table 2, updated to 2020 dollars.

Government safety regulations increase costs and save lives, and these costs and benefits can be compared to compute an implicit cost per life saved. These values range from a low of $140,000 ($0.14 million) per life saved for childproof lighters to a high of more than $143,865 million per life saved for solid waste disposal facility regulations.

The U.S. government does have an official value of life threshold that it uses in evaluating policies that save (or cost) lives. Strikingly, however, the values used are different in different agencies. In 2016, values used ranged from $9.6 million, used by the U.S. Transportation Department to value auto safety, to $9.5 million, used by the U.S. Food and Drug Administration (FDA) to value cigarette warning labels, to $10 million, used by the Environmental Protection Agency (EPA) to value pollution reductions.[24] It is unclear why lives saved in different ways by government policy should be worth such different amounts!

The fact that the government is willing to spend so much to save lives in many

public policy interventions suggests that the public sector values lives quite highly.

Another interpretation, however, is that the government is simply inconsistent and does not apply the same standards in some arenas as it does in others.

Discounting Future Benefits

A particularly thorny issue for cost-benefit analysis is that many projects have costs that are mostly immediate and benefits that are mostly long term. An excellent example of this would be efforts to combat climate change through reducing the use of carbon-intensive products (e.g., via a tax on the carbon content of goods). The costs of such efforts would be felt in the near term as consumers have to pay more for goods (such as gasoline) whose consumption worsens climate change. The benefits of such efforts would be felt in the very distant future, however, as the global temperature in 100 years would be lower with such government intervention than it would be without any such intervention.

These types of examples are problematic for two reasons. First, the choice of discount rate will matter enormously for benefits that are far in the future. For example, a dollar benefit in 100 years is worth 13.8¢ if the discount rate is 2% $[1/(1.02)^{100} = 0.138]$, 5.2¢ if the discount rate is 3%, and 2¢ if the discount rate is 4%. This sensitivity of benefit calculations to small changes in the discount rate places enormous importance on getting the discount rate exactly right.

Second, long-lived projects provide benefits not only to the generation that pays the costs but also to future generations as well. Should we treat benefits to future generations differently than benefits to current generations? Some would argue that we should just weight the benefits to the current generation, who are paying the costs. But what if the current generation cares about its children? In that case, the argument could be made to incorporate the children as well.

EMPIRICAL EVIDENCE

How Much Does It Cost to Avoid a Traffic Fatality?

One of the most important sources of mortality risk worldwide is traffic accidents; estimates suggest that each year nearly 1.3 million lives are lost worldwide due to motor vehicle accidents. Damages from accidents have been placed at $413.8 billion per year in the United States alone.[25] One of the most important policies to reduce traffic accidents is increased police enforcement of speed limits and other traffic laws. One study by DeAngelo and Hansen (2014) assessed what happened to traffic fatalities when the state of Oregon saw a large reduction in its police force. In particular, they asked what impact reduced policing had on driving safety and what it implied about the cost per life saved

what impact reduced policing had on driving safety and what it implied about the cost per life saved of additional policy enforcement.

In February 2003, there was a mass layoff of the Oregon State Police due to budgetary problems in the state. Thirty-five percent of state troopers were laid off, dramatically reducing the ability of the state police to enforce driving safety. Because they were less afraid of being caught, drivers drove more dangerously—average speeds rose by more than 0.5 mile per hour after the law changed. This may not seem like much, but that average included many safety-conscious drivers who would not speed excessively regardless of police presence. Thus, this increase in driving speed may reflect a small minority of drivers who drove much faster, and therefore more dangerously, because they were less likely to be caught.

To study the impact of this reduction in policing, DeAngelo and Hansen compared traffic injury and fatality numbers in Oregon to those in nearby Washington and Idaho, where there were no dramatic reductions in policing. The Oregon layoff set up a quasi-experiment on policing's effect on driving safety. The treatment group is drivers in Oregon who faced a lower risk of getting caught driving over the speed limit because there were fewer police to catch them; the control group is drivers in Washington and Idaho where nothing changed.

DeAngelo and Hansen (2014) found that not only did the reduction in police enforcement lead to faster driving, it also led to more traffic fatalities. Over the period 1979–2005, they estimated that had the state police workforce stayed at its original 1979 level, there would have been 2,167 fewer highway fatalities. The cost of maintaining troopers at their 1979 numbers would have meant paying for 5,445 more trooper-years of service at a annual wage of $123,000, for a total cost of $670 million. This finding implies that Oregon could have saved lives at a cost of $309,000 each, which is well below most estimates of both the value of a life and the cost to the government of saving lives in other ways. And this is not the only savings Oregon would have reaped: because of increased enforcement, and associated safer driving, nonfatal injuries would have fallen as well.

Cost-Effectiveness Analysis

Despite the list of clever approaches to valuing the benefits of public projects, in some cases society may be unable (or unwilling) to do so. This does not imply that the techniques of cost-benefit analysis are useless. Rather it implies that, instead of comparing costs to benefits, we need to contrast alternative means of providing the public good and choose the approach that provides that good most efficiently. This comparison is called **cost-effectiveness analysis**, the search for the most cost-effective approach to providing a desired public good. For example, society may decide to combat climate change even if it is impossible to put an estimate on the benefits of doing so (or if the benefit is hugely uncertain because it is so far in the future). Even so, as discussed in Chapter 6, there are many ways of combating climate change, and cost-effectiveness must be considered in choosing the best approach.

cost-effectiveness analysis

For projects that have unmeasurable benefits, or are viewed as desirable regardless of the level of benefits

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cost-effectiveness analysis
For projects that have unmeasurable benefits, or are viewed as desirable regardless of the level of benefits, we can compute only their costs and choose the most cost-effective project.

8.3 Putting It All Together

Table 8-4 shows the comparison of the costs and benefits of the turnpike renovation project that we discussed at the beginning of this chapter. The present value of the costs of this project is $253 million. The benefits are 500,000 reduced hours of driving time and five reduced fatalities per year. Let's assume that we can value both the increased time to producers and consumers at the same value, $22.70 per hour (which comes from the revealed preference study cited earlier). That would produce time savings benefits of $11.4 million per year. Let's also assume that we can value each of the five lives saved at the revealed preference average of $10.5 million per life. That would produce a value of life savings of $52.5 million per year. The total benefits would therefore be $63.9 million per year.

TABLE 8-4 Cost-Benefit Analysis of Highway Construction Project

		Quantity	Price/Value	Total
Costs	Asphalt	1 million bags	$100/bag	$100 million
	Labor	1 million hours	$10/hour	$10 million
	Maintenance	$10 million/year	7% discount rate	$143 million
			First-year cost:	**$110 million**
			Total cost over time (7% discount rate):	**$253 million**
Benefits	Driving time saved	500,000 hours/year	$22.70/hour	$11.4 million
	Lives saved	5 lives/year	$10.5 million/life	$52.5 million
			First-year benefit:	**$63.9 million**
			Total benefit over time (7% discount rate):	**$912.9 million**
			Benefit over time minus cost over time:	**$659.9 million**

The time savings from this project is most appropriately valued by the revealed preference valuation of time, which is $22.70/hour. The life savings is most appropriately valued by the revealed preference value of life, which averages $10.5 million. The present discounted value of costs for this renovation project is $253 million, while the *PDV* of benefits for this project is $912.9 million. Because benefits exceed costs by $659.9 million, the project should clearly be undertaken.

Applying the same 7% discount rate to benefits, these benefits have a present discounted value of $912.9 million, more than three times the cost of this project. Even if the value of both time and lives is half as large as those assumed here, the benefits would still significantly exceed the costs of this project. Thus, society benefits from these road improvements, and the government should provide them.

Other Issues in Cost-Benefit Analysis

While the previous discussion is complicated enough, there are three other major issues that make cost-benefit analysis difficult: common counting mistakes such as double-counting benefits, concerns over the distributional effects of public projects, and uncertainty over costs and benefits.

Common Counting Mistakes

When analyzing costs and benefits, a number of common mistakes arise, such as:

- *Counting secondary benefits:* If the government improves a highway, there may be an increase in commercial activity along the highway. One might be tempted to count this as a benefit of the project, but this new road may be taking away from commercial activity elsewhere. What matters in determining the benefits is only the total rise in social surplus from the new activity (the *net* increase in surplus-increasing trades that results from the improved highway).
- *Counting labor as a benefit:* In arguing for projects such as this highway improvement, politicians often talk about the jobs created by the project as a benefit. But wages are part of a project's costs, not its benefits. If the project lowers unemployment, this lowers the opportunity cost of the workers, but it does not convert these costs to benefits.
- *Double-counting benefits:* Public projects often lead to asset-value increases. For example, the fact that consumers save time driving to work when the highway is improved could lead to higher values for houses farther away from the city. When considering the value of this highway improvement, some may count both the reduction in travel times *and* the increase in the value of houses as a benefit. Because the rise in house values results from the reduction in travel time, however, both should not be counted as benefits.

Sometimes, these types of mistakes are made because of hasty or uninformed analysis. Other times, however, they are made on purpose by one side or another of a heated cost-benefit debate. The growing role of cost-benefit analysis in public

policy making has raised the stakes for avoiding this type of manipulation of what should be an objective exercise.

Distributional Concerns

The costs and benefits of a public project do not necessarily accrue to the same individuals; for example, when we expand a highway, commuters benefit, but those living next to the road lose from more traffic and noise. In theory, if the benefits of this project exceed its costs, it is possible to collect money from those who benefit and redistribute it to those who lose and make everyone better off. In practice, however, such redistribution rarely happens, partly due to economic problems (such as the informational requirements of carrying out such redistribution) and partly due to political problems of the type discussed in the next chapter.

In the absence of such redistribution, we may care specifically about the parties gaining and losing from a public project. For example, if a project benefits only the rich and hurts only the poor, we may want to discount benefits and raise costs to account for this. The problem, of course, is: How do we pick the weights? This will depend on the type of social welfare function we use, as discussed in Chapter 2.

Uncertainty

As should be clear from the previous discussion, the costs and benefits of public projects are often highly uncertain. The extent of such uncertainty, however, can vary from project to project and should be accounted for when comparing projects. For reasons that we discuss in great detail in Chapter 12, for any predicted outcome, individuals prefer that outcome be more rather than less certain. As a result, for any gap between costs and benefits, governments should prefer projects that have a more certain, rather than a less certain, estimate of the gap. Much as governments might prefer projects that have their greatest benefits for the poor, they also might prefer projects that deliver their benefits with more certainty.

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8.4 Conclusion

Government analysts at all levels face a major challenge in attempting to turn the abstract notions of social costs and benefits into practical implications for public project choice. What at first seems to be a simple accounting exercise becomes complicated when resources cannot be valued in competitive markets. One complication arises when markets are not in competitive equilibrium, so that the opportunity costs of resources must be computed. Another complication arises when benefits are not readily priced by the market, and approaches such as contingent valuation or revealed preference must be employed. Nevertheless, economists have developed a set of tools that can take analysts a long way toward a complete accounting of the costs and benefits of public projects.

Highlights

- Providing optimal levels of public goods requires evaluating the costs and benefits of public projects.
- The costs of inputs to public projects are appropriately measured by their opportunity cost or their value in the next best alternative use.
- If markets are in competitive equilibrium, the opportunity cost of an input is its market price; if markets are not in competitive equilibrium, however, the opportunity cost will differ from the market price, and some of the government spending may simply be transfers of rents.
- If costs are in the future, we must use a social discount rate to value those costs in present dollars.
- Measuring the benefits of public projects is difficult, and approaches range from using market values (such as wages to value time), to asking individuals about their valuation (contingent valuation), to using real-world behavior to reveal valuations (such as the compensating differentials for risky jobs to value life).
- Benefits are often in the future as well, which makes valuation very sensitive to the social discount rate chosen.
- Public project analysis requires considering the distributional implications of the project, the level of uncertainty over costs and benefits, and the budgetary cost of financing the project.

Questions and Problems

1. A new public works project requires 300,000 hours of labor to complete.
   a. Suppose that the labor market is perfectly competitive and the market wage is $20. What is the opportunity cost of the labor employed for the project?
   b. Suppose that there is currently unemployment among workers and that there are some workers who would willingly work for $12 per hour. What is the opportunity cost of the labor employed? Does this vary depending on the fraction of would-be unemployed workers hired for the project?
   c. If your answers to (a) and (b) differ, explain why.
2.

CHAPTER 9

Political Economy

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Questions to keep in mind

- How do different methods of aggregating preferences affect public good choice?
- To what extent does a representative democracy deliver the outcomes desired by the typical voter?
- What are the problems that can arise when a government isn't solely interested in maximizing the well-being of voters?

Arizona is the sunniest state in the country and has enormous potential for growth in solar energy.[1] In 2019, Arizona had the second most solar jobs per capita and the third highest solar capacity among all 50 states.[2] However, unlike other sunny states such as California, Nevada, or Hawaii, less than 7% of Arizona's total energy is generated from solar power, largely due to competing political tensions in the state.[3] Climate change, although a near and present threat for the rapidly warming Arizona deserts, is not an issue of policy focus for Republicans, who have historically constituted the majority of Arizona's political representatives. Opponents of clean energy initiatives have cited job loss and high utility prices, among other factors, as

reasons not to rush the transition to alternative energy sources. One such opponent was Republican Martha McSally. During her tenure as the representative for Arizona's Second Congressional District, McSally voted against a carbon tax in 2018, voted to repeal several restrictions on energy companies in 2017, and opposed President Obama's clean power plan in 2015, claiming it would "further burden Arizona's small businesses and farmers and harm those in poverty with increased utility bills."[4]

McSally stood in stark contrast to Kyrsten Sinema, the Democratic representative who had won a tight race for Arizona's Nineth Congressional District in 2013. Sinema has a lifetime score of 77% from the League of Conservation Voters, an environmental advocacy group, while McSally has a lifetime score of 7%.[5] Sinema began her political career as an activist and a spokeswoman for the Green Party, a party centered around environmental activism, and ran for local office as an independent twice before joining the Democratic party. She was elected to the Arizona House of Representatives as a Democrat in 2004.[6] During her tenure, she was named "Most Valuable Player" by Sierra Club, a prominent environmental group.[7]

In 2018, McSally and Sinema ran against each other in a tight race for a vacant seat in the U.S. Senate. Sinema won by slim margin, becoming the first Democrat to win a U.S. Senate seat in Arizona since 1988 and signaling Arizona's shift away from its position as a longtime Republican stronghold. In January 2019, however, Arizona's Republican governor appointed McSally to fill the state's other senate seat after the resignation of the interim senior senator. This meant that in November 2020, McSally would face another Democratic candidate in a special election. Both senators, previously at odds on many issues, were now in precarious positions, unsure of their re-election prospects and eager to showcase their bipartisanship to a rapidly changing electorate.

In October 2019, Sinema was one of only three Democrats to vote with McSally and the rest of the Republican party against the repeal of a Trump administration rollback on environmental protections for power plant emissions. The Trump rollback, also known as the "Dirty Power Plan," has been called "reckless and unlawful" by the Sierra Club—the same environmental group that had endorsed Sinema just years prior.[8] Her team cited the need for "bipartisan solutions that … provide flexibility and certainty for Arizona families,"[9] reflecting Sinema's efforts in recent years to reframe herself as a moderate. Later that month, when Sinema introduced the Solar Energy Research and Development Act of 2019 to the Senate

floor, it was McSally's turn to show bipartisanship. McSally co-sponsored the act, which recommended increasing government funding for solar research and development efforts, seemingly at odds with her prior positions on energy. McSally's LCV score in 2019 was 14%, double her lifetime score.[10] Despite her efforts to appeal to the Democratic voter base, McSally lost re-election in November 2020.

These moves toward the center by both senators as their state became less partisan highlight the key role that voter preferences play in determining the positions of their representatives. At the same time, these two senators still differed dramatically on many issues and appealed to different voters. For instance, while Sinema is the first openly bisexual U.S. senator and co-chaired the Congressional LGBTQ+ Equality Caucus while in the House, McSally has publicly supported anti-LGBTQ legislation, including an amendment to the U.S. Constitution that would ban same-sex marriage. So, what determines how politicians behave—and as a result what policies governments enact in the United States and around the world?

In Chapter 7, we learned how to determine the optimal level of public goods by setting marginal social costs and benefits equal; in Chapter 8, we learned how to use cost-benefit analysis to quantify the costs and benefits of public projects. In the real world, however, economists do not get to decide whether public policies are undertaken or not. Instead, such decisions are made in the context of a complex political system. In some countries, these decisions may be made by a single ruler or group of rulers. In others, the decisions are made by elected officials or by the direct votes of citizens. Do any or all of these mechanisms deliver the optimal interventions suggested by the theoretical analyses of this book? In some cases, they will, but in other cases, they will not.

This chapter discusses how government actually operates when it makes decisions about the economy, such as the provision of public goods. This chapter is the only place in the book that focuses specifically on the fourth question of public finance: *Why* do governments do what they do? We begin by discussing the best-case scenario in which a government appropriately measures and aggregates the preferences of its citizens in deciding which public projects to undertake. We then discuss the problems with this idealized scenario and turn to more realistic cases.

One more realistic case is that of *direct democracy,* whereby voters directly cast ballots in favor of or in opposition to particular public projects. We discuss how voting works to turn the interests of a broad spectrum of voters into a public goods decision. The second case is that of *representative democracy,* whereby voters elect

representatives, who in turn make decisions on public projects. We discuss when it is likely or not likely that representative democracy yields the same outcomes as direct democracy.

In the final section of the chapter, we move beyond models of voting behavior to talk in broader terms about the prospects for *government failure,* the inability or unwillingness of governments to appropriately address market failures. We discuss some of the implications of government failure and discuss evidence about its importance to economic well-being.

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9.1 Unanimous Consent on Public Goods Levels

Our discussion of political economy starts with the example of a government that is able to optimally determine the level of public goods to provide through the unanimous consent of its citizens. It does so through **Lindahl pricing**, a system by which individuals report their willingness to pay for the next unit of a public good, and the government aggregates those willingnesses to form an overall measure of the social benefit from that next unit of public good. This marginal social benefit can then be compared to the marginal social cost of that next unit of public good to determine the optimal amount of the public good, and the good can be financed by charging individuals what they were willing to pay. We then discuss the problems that governments face in implementing this solution in practice, to set the stage for discussing the more realistic mechanisms that governments use to determine the level of public goods.

Lindahl pricing
An approach to financing public goods in which individuals honestly reveal their willingness to pay, and the government charges them that amount to finance the public good.

Lindahl Pricing

This approach, as introduced by the Swedish economist Erik Lindahl in 1919, relies on using individuals' **marginal willingness to pay**, the amount that individuals report themselves willing to pay for an incremental unit of a public good. Recall from Chapters 2 and 5 that the demand curve for any private good measures the marginal willingness to pay for that private good. Lindahl suggested that we could similarly construct a demand curve for public goods by asking individuals about their willingness to pay for different levels of public goods.

marginal willingness to pay
The amount that individuals are willing to pay for the next unit of a good.

To illustrate Lindahl's procedure, suppose that we have a public good, fireworks, with a constant marginal cost of $1. This public good will be provided to two people, Ava and Jack. Remember the key feature of public goods from Chapter 7: the fireworks must be provided in equal quantities to both Ava and Jack. Lindahl's procedure operates as follows:

1. The government announces a set of *tax prices* for the public good, the share of the cost that each individual must bear. For example, the government could announce that Ava and Jack are each paying 50¢ of the cost of a firework or that Ava pays 90¢ and Jack pays 10¢.
2. Each individual announces how much of the public good he wants at those tax prices.
3. The government repeats these steps to construct a *marginal willingness to pay schedule* for each individual that shows the relationship between willingness to pay and quantity of public goods desired.
4. The government adds up individual willingnesses to pay at each quantity of public good provided to get an overall demand curve for public goods (D_{A+J}).
5. The government relates this overall demand curve to the marginal cost curve for the public good to solve for the optimal public good quantity.
6. The government then finances this public good by charging individuals their willingnesses to pay for that quantity of public good.

Preference Revelation Problem

The first problem is that individuals have an incentive to lie about their willingness to pay because the amount of money they pay to finance the public good is tied to their stated willingness to pay. Individuals may behave strategically and pretend that their willingness to pay is low so that others will bear a larger share of the cost of the public good. The incentive to lie with Lindahl pricing arises because of the free rider problem; that is, if an individual reports a lower valuation of the public good, he pays a lower amount of tax but he doesn't get much less of the public good. Suppose, for example, that Jack lied and said that his preferences were identical to Ava's. Following the procedure we used earlier, we find that at the Lindahl equilibrium, Jack and Ava will each pay 50¢, and 50 fireworks will be produced. Jack now pays $25 for the 50 fireworks, whereas in the previous example, he paid 75¢ for each of 75 fireworks, for a total of $56.25. Thus, Jack pays less than half the total he paid before but receives two-thirds as many fireworks; he is now free riding, while Ava pays a larger share. Ava used to pay 25¢ for each of 75 fireworks, or $18.75. Now, she pays more ($25) to get fewer fireworks (50 instead of 75)! Especially in large groups, individuals have a strong incentive to underreport their valuation of the public good and thus shift more of the costs to others.

Preference Knowledge Problem

Even if individuals are willing to be honest about their valuation of a public good, they may have no idea of what that valuation actually is. How would you answer the question of how much you value fireworks or national defense? It is very hard for individuals to properly value goods they don't shop for on a regular basis.

Preference Aggregation Problem

Even if individuals are willing to be honest and even if they know their valuation of the public good, there is a final problem: How can the government aggregate individual values into a social value? In our example, it was straightforward to keep asking Jack and Ava their willingness to pay to trace out their willingness to pay curves and find the correct level of public goods provision. Clearly, this will be considerably more difficult in reality. In the case of national defense in the United States, it is simply impossible to canvass each of 322 million U.S. citizens and ask them the value they place on the missiles, tanks, and soldiers that protect them.

Thus, the Lindahl pricing solution, while attractive in theory, is unlikely to work in practice. In the next two sections, we discuss more practical solutions to determining the optimal level of public goods. In particular, we focus on two questions. First, how can societies use voting mechanisms to effectively aggregate individual preferences? Second, how well do elected representatives carry out the preferences of individual voters?

9.2 Mechanisms for Aggregating Individual Preferences

In this section, we discuss how voting can serve to aggregate individual preferences into a social decision. We do not yet discuss the fact that voters elect representatives, who then make policy decisions. For now, we are considering only direct voting on policies, as discussed in the following application.

APPLICATION

Direct Democracy in the United States[11]

On February 11, 1657, the residents of the town of Huntington, New York, held a meeting and voted to hire Jonas Houldsworth as the first schoolmaster of their town. Almost 350 years later, a similar meeting held in the town of Stoneham, Massachusetts, rejected a $6 million plan to convert the local arena into a major sports complex. Through three and a half centuries, the tradition of *direct democracy,* whereby individuals vote directly on the policies that affect their lives, remains strong in America—and, indeed, has grown throughout the twentieth century.

At the local level, the town meeting remains an important venue for decision making in many New England communities. Bryan (2003) undertook a comprehensive study of meetings in 210 Vermont towns over the 1970–1998 period, encompassing 1,435 meetings attended by 63,140 citizens. On average, more than one-fifth of all Vermont residents participated in a town meeting. Other towns do not have a town meeting but have direct local voting on town budgets and other matters. For example, in 2015, almost 12,000 voters in Delaware's Red Clay School District turned out to vote on a proposal to increase property taxes in the area; the measure passed with 6,395 votes. In 2018, the neighborhood of Koreatown in Los Angeles held a vote on whether to split into Koreatown and Bangladesh Town. The voting was supposed to end at 8 p.m. but went well past 11 p.m. as both sides made their case; ultimately, voters kept the status quo.[12]

Direct democracy plays an important role at the state level as well. A state **referendum** allows citizens to vote on state laws or constitutional amendments that have already been passed by the state legislature. All states allow *legislative referenda,* whereby state legislatures or other officials place such measures on the ballot for citizens to accept or reject. Twenty-four states allow *popular referenda,* whereby citizens, if they collect enough petition signatures, can place on the ballot a question of whether to accept or reject a given piece of state legislation. The important feature of a referendum is that it is designed to elicit reactions to legislation that politicians have already approved.

referendum
A measure placed on the ballot by the government allowing citizens to vote on state laws or constitutional amendments that have already been passed by the state legislature.

Much more frequent than referenda are **voter initiatives**, which allow citizens, if they can collect enough petition signatures, to place their own legislation on the ballot for voters to accept or reject.

Twenty-four states allow such initiatives, the first two of which (concerning election reforms and alcohol regulation) made it to Oregon's ballot in 1904. Since that time, more than 8,000 initiatives have been filed by concerned citizens. More than 2,600 of them have made it to state ballots, and 41% of these have passed. Interestingly, 60% of all initiative activity occurs in six states: Arizona, California, Colorado, North Dakota, Oregon, and Washington.[13]

voter initiative
The placement of legislation on the ballot by citizens.

Initiatives were very popular early in the twentieth century with the rise of the Progressive political movement, and from 1911 to 1920, nearly 300 initiatives appeared on various state ballots. That activity had tapered off dramatically by the 1960s, when fewer than 100 initiatives made it to state ballots. In 1978, California voters passed Proposition 13, an initiative that amended the state constitution to severely limit property tax rates that local governments could impose (discussed in more depth in Chapter 10). The measure sparked a wider "tax revolt" throughout other states, and the initiative once again became a frequently used political tool. The 1990s saw nearly 400 initiatives on state ballots (a record high of 48% were approved); in 1996 alone, almost 100 initiatives were voted on. Since 1996, however, the rate of initiatives has tapered off, with only 39 on the ballots in the 2020 elections.[14]

Referenda and initiatives can be sparked by all kinds of issues. Early in the twentieth century, voters changed election rules, alcohol regulation, labor laws, and the administration of government. By the 1970s, voters were interested in tax reform, environmental issues, and nuclear developments. In recent years, public attention has shifted to the minimum wage, legalization of marijuana and other recreational drugs, gun regulation, reproductive rights, and campaign finance reform. ■

Majority Voting: When It Works

The Lindahl pricing scheme had a very high standard for setting the level of public goods—only when all citizens were *unanimously* in agreement did the government achieve the Lindahl equilibrium. In practice, the government typically does not hold itself to such a high standard. A common mechanism used to aggregate individual votes into a social decision is **majority voting**, in which individual policy options are put to a vote, and the option that receives the *majority* of votes is chosen. Yet even this lower standard can cause difficult problems for governments trying to set the optimal level of public goods.

majority voting
The typical mechanism used to aggregate individual votes into a social decision, whereby individual policy options are put to a vote, and the option that receives the majority of votes is chosen.

In this section, we discuss the conditions under which majority voting does and does not provide a successful means of aggregating the preferences of individual voters. In this context, success means being able to *consistently* aggregate individual

preferences into a social decision. To be consistent, the aggregation mechanism must satisfy three goals:

- *Dominance:* If one choice is preferred by all voters, the aggregation mechanism must be such that this choice is made by society; that is, if every individual prefers erecting a statue to building a park, the aggregation mechanism must yield a decision to build a statue.
- *Transitivity:* Choices must satisfy the mathematical property of transitivity; that is, if a large statue is preferred to a medium-size statue, and a medium-size statue is preferred to a small statue, then a large statue must be preferred to a small statue.
- *Independence of irrelevant alternatives:* Choices must satisfy the condition that if one choice is preferred to another, then the introduction of a third independent choice will not change that ranking. For example, if erecting a statue is preferred to building a park, then the introduction of an option to build a new police station will not suddenly cause building a park to be preferred to building a statue.

These three conditions are generally viewed as necessary for an aggregation mechanism to provide a successful translation of individual preferences to aggregate decisions. In fact, however, majority voting can produce a consistent aggregation of individual preferences only if preferences are restricted to take a certain form.

To illustrate this point, consider the example of a town that is deciding between alternatives for school funding. Schools, an impure public good (as discussed in Chapter 11), are financed by property taxes, so a higher level of funding also means higher taxes for the town's property owners. The town is choosing between three possible levels of funding: *H* is the highest level of funding (and thus the highest property taxes); *M* is a medium level of funding and property taxes; and *L* is a low level of funding and property taxes. There are three types of voters in this town, with equal numbers in each group:

- *Parents,* whose main concern is having a high-quality education for their children. This group's first choice is *H,* their second choice *M,* and their third (least-preferred) choice is *L*.
- *Elders,* who don't have school-age children and therefore don't care about the quality of local schools, so their main priority is low property taxes. This group's first choice is *L,* their second choice is *M,* and their third choice is *H*.

- *Young couples without children,* who do not want to pay the high property taxes necessary to fund high-quality schools right now but who want the schools to be good enough for their future children to attend. This group's first choice is *M,* their second choice is *L,* and their third choice is *H.*

9.3 Representative Democracy

In reality, people in most developed nations don't vote directly on public goods. Rather, they elect representatives who are supposed to aggregate the public's preferences and take them into account when voting on the appropriate level of spending on public goods. To understand outcomes in a representative democracy such as the United States, we therefore need a theory that explains how politicians behave. The most common theory that has been used in public finance is a version of the *median voter theory* just discussed for direct democracy: politicians will choose the outcome that is preferred by the median voter. In this section, we review the median voter theory for representative democracies, discussing the assumptions underlying it and presenting the empirical evidence for and against it.

Vote-Maximizing Politicians Represent the Median Voter

The median voter theory in the context of a representative democracy rests on a central assumption that all politicians care about is maximizing the number of votes they get. If this is true, then elected politicians will choose the outcome preferred by the median voter (as long as preferences are single-peaked). That is, with vote-maximizing politicians, the theory we used to explain direct democracy can be applied to representative democracy as well.

This point was illustrated by Downs (1957). With single-peaked preferences, we can model voters as being distributed along a line as in Figure 9-3. This line shows desired levels of defense spending as a percentage of the government budget, ranging from 0% on the left to 50% on the right. Suppose that voters are spaced evenly throughout this line so that the median voter would like the government to spend 25% of its budget on defense. Finally, suppose that voters vote for the candidate who most closely represents their views on this issue, that is, the candidate who is closest to the voter along this line.

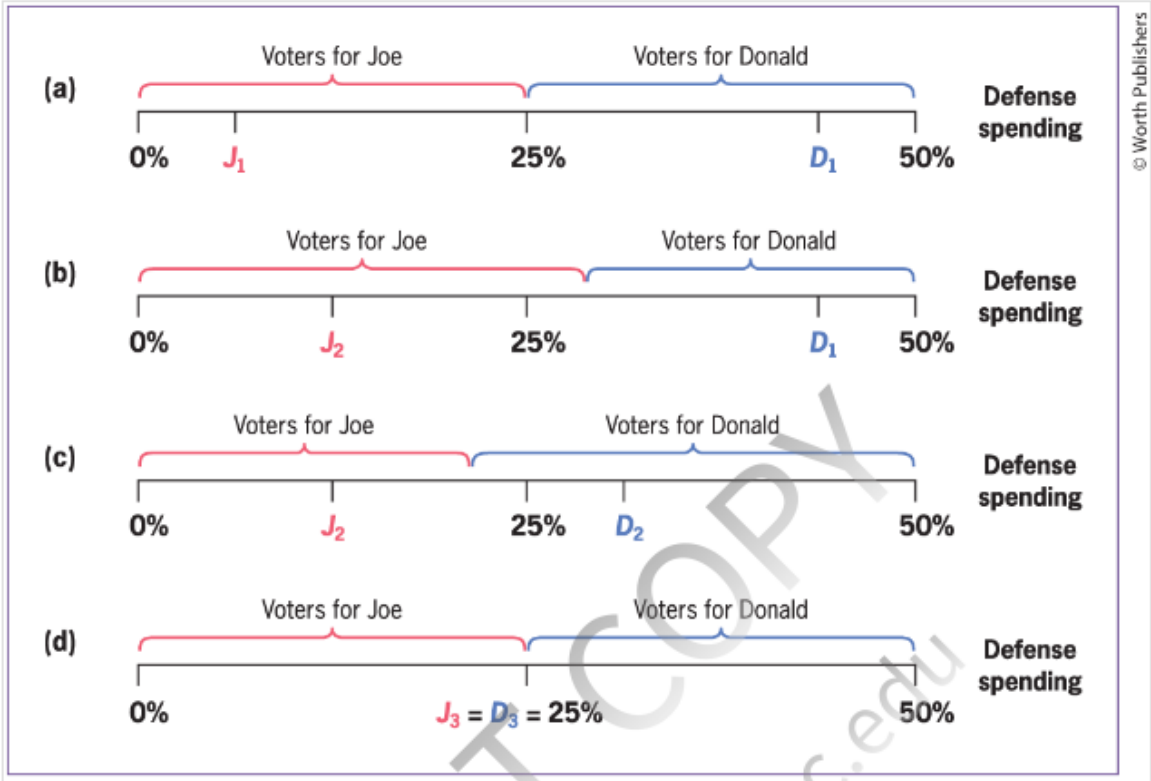

FIGURE 9-3 Vote Maximization Leads to the Median Voter Outcome • In panel (a), Joe favors small defense and Donald favors large defense, and they get an equal number of votes. In panel (b), Joe increases the level of defense spending he will support, and by doing so, he obtains more than half the votes. In panel (c), Donald then reduces the level of defense spending he will support, and by doing so, he obtains more than half the votes. This continues until, in panel (d), both politicians support the outcome preferred by the median voter and get the same number of votes.

Suppose now that two politicians, Joe and Donald, are running for office and vying to maximize their votes. Joe wants to appeal to those who don't want to spend much on defense, so he places himself initially at point J_1; Donald wants to appeal to those who want to spend a lot on defense, so he places himself initially at point D_1. In this case, the candidates will split the vote because they have equal shares of voters near them on the line, as shown in panel (a) of Figure 9-3.

What if Joe shifts his position to J_2, where he advocates for a somewhat larger defense? In that case, Joe would get more votes, as shown in panel (b) of Figure 9-3. He would continue to capture all those who want a small defense and would capture some of those who want a larger defense because he is closer to their preferences than is Donald.

What should Donald do in response to Joe's change in position? He should shift his position to D_2, as shown in panel (c), where he now favors a smaller defense than he

did previously. After this move, Donald would get the majority of votes, leaving Joe stuck with the now minority that favors a small defense. If these politicians are purely vote-maximizing, this jockeying back and forth will continue until both candidates support the position held by the median voter, which is 25% of budget on defense, as shown in panel (d). If either candidate advocates more or less spending on defense than the median amount, he will reduce the number of votes received, so there is no incentive for a candidate ever to deviate from the median.

In this context, as with direct democracy, the median voter model is a powerful tool. Politicians and political analysts need not know the entire distribution of preferences to predict vote outcomes in this model. All they need to understand is the preferences of the median voter.

Assumptions of the Median Voter Model

Although the median voter model is a convenient way to describe the role of representative democracy, it does so by making a number of assumptions. In this section, we review several of these assumptions and discuss why they may be violated, leading politicians to move away from the position of the median voter.

Single-Dimensional Voting

First, the median voter model assumes that voters are basing their votes on a single issue. In reality, representatives are elected not based on a single issue, but on a bundle of issues. Individuals may be located at different points of the voting spectrum on different issues, so appealing to one end of the spectrum or another on some issues may be vote-maximizing. For example, if the median voter on most issues happens to advocate a lot of spending on defense, then politicians may position themselves toward high spending on defense to attract that median voter on all the other issues.

At the same time, if voter preferences on different issues are highly correlated, voting may end up close to single-dimensional. That is, if all voters who want small defense spending also want more spending on education, more spending on health care, and greater benefits for the unemployed, and all voters who want large defense spending also want less spending on education, less spending on health care, and fewer benefits for the unemployed, then voting may in effect be single-dimensional even with multiple issues.

Only Two Candidates

Only Two Candidates

Second, the median voter model assumes that there are only two candidates for office. If there are more than two candidates, the simple predictions of the median voter model break down. If all three candidates are at the median, then moving slightly to the left or right will increase the votes of any one candidate (because that candidate will get all of one end of the spectrum), while the other two candidates split the other end. Indeed, there is no stable equilibrium in the model with three or more candidates because there is always an incentive to move in response to your opponents' positions. There is never a set of positions along the line where one of the politicians can't increase his or her votes by moving.

In many nations, the possibility of three or more valid candidates for office is a real one. In the United States, there are typically only two candidates, Republican and Democrat.

No Ideology or Influence

Third, the median voter theory assumes that politicians care only about maximizing votes. In practice, politicians may actually care about their positions and not simply try to maximize their votes. Moreover, in practice, politicians with ideological convictions may be able to shift the views of voters toward their preferred position. Ideological convictions could lead politicians to position themselves away from the center of the spectrum and the median voter.

No Selective Voting

Fourth, the median voter theory assumes that all people who are affected by public goods vote, but in fact only a fraction of citizens vote in the United States. In a typical presidential election year, only about half the citizens vote, and in nonpresidential elections, participation is usually even worse: only a little over one-third vote.[17] Even if the views of citizens on a particular topic are evenly distributed, it may be the most ideologically oriented citizens who do the voting. In that case, it could be optimal for a politician to appeal to likely voters by taking a position to the right or left of center, even if this position is not what is preferred by the majority of citizens (including both voters and nonvoters).

No Money

Fifth, the median voter theory ignores the role of money as a tool of influence in elections. Votes are the outcome of a political process, but there are many inputs into that process. One key input is resources to finance reelection campaigns,

advertisements, campaign trips, and other means of maximizing votes. Running for office in the United States has become increasingly expensive.[18] From 1990 to 2018, the cost of winning a seat in the House of Representatives more than doubled, from $810,000 to $2.09 million, while the cost of winning a seat in the Senate also more than doubled, rising from $6.3 million to $14.9 million.[19] Therefore, if taking an extreme position on a given topic maximizes fund-raising, even if it does not directly maximize votes on that topic, it may serve the long-run interests of overall vote maximization by allowing the candidate to advertise more.

Full Information

Sixth and finally, the median voter model assumes perfect information along three dimensions: voter knowledge of the issues, politician knowledge of the issues, and politician knowledge of voter preferences. All three of these assumptions are unrealistic. Many of the issues on which our elected representatives must vote are highly complicated and not well understood by the majority of their constituents—and often not by the representatives themselves.[20] Democratic senator Robert Byrd was once asked if he knew what was in a 4,000-page $520 billion omnibus spending bill passed by the House of Representatives. "Do I know what's in this bill?" he replied. "Are you kidding? Only God knows what's in this conference report!"[21] Moreover, even when voters understand an issue, it is difficult for politicians to gain a complete understanding of the distribution of voter preferences on the issue.

Lobbying

These problems of information and the advantages of money make it likely that elected representatives will be *lobbied* by highly interested and informed subgroups of the population. **Lobbying** is the expending of resources by certain individuals or groups in an attempt to influence a politician.[22] Politicians find it in their interest to listen to lobbies for two reasons. First, these groups can provide relevant information about an issue to an uninformed politician. When particular groups or subgroups have a strong interest in a complicated issue, they also typically have a thorough and deep understanding of it. Second, these groups will reward politicians who support their views by contributing to the politicians' campaigns and getting group members to vote for the politicians, which can help with overall vote maximization.

lobbying
The expending of resources by certain individuals or groups in an attempt to influence a politician.

In principle, lobbying can serve two useful roles: providing information and representing intensity of preferences. Given the potential inefficiency of the median voter outcome, some amount of lobbying is probably optimal. The problem that arises with lobbying is that when there is an issue that particularly benefits a small group and imposes only small costs on a larger (perhaps even majority) group, lobbying can lead politicians to support socially inefficient positions. Suppose, for example, there is a project that will benefit 100 U.S. citizens by $1 million each, but cost the remaining 259.9999 million citizens $100 each. Clearly, this project has negative overall social benefits (because $100 \times \$1{,}000{,}000 < \$100 \times 259{,}999{,}900$). If the interested group lobbies politicians, however, promising votes and campaign contributions, and if the remainder of the citizenry is not informed about the issue and so will not vote on it, the project could be accepted by self-interested politicians.

Evidence for both views of lobbying is provided by Bertrand et al. (2014). They looked at the connection between lobbyists of a particular expertise and politicians who may benefit from that expertise. On the one hand, they found that lobbyists "follow" politicians to whom they were initially connected by subject expertise even when the politician switches to another committee in a different subject area; this suggests that lobbyists are trading on connections, not expertise. On the other hand, they found that there are particular experts in complicated policy areas that politicians will listen to regardless of policy affiliation. Using data on lobbyist compensation, the authors argue that the former type of lobbyist role is more highly compensated, so that while expertise is valuable, connections are even more valuable.

The key point to recognize here is that large groups with a small individual interest on an issue suffer from a free rider problem in trying to organize politically; it is in no individual's interest to take the time to lobby policy makers over the lost $100. Small groups with large individual interest, however, may be able to overcome this problem, leading to a socially inefficient outcome. An excellent example of this result is farm subsidies, as discussed in the following application.

APPLICATION

Farm Policy in the United States

In 1900, 35% of workers in the United States were employed on farms. By the year 2019, this share had fallen to 1.3%, due both to increased farm efficiency and to imports of agricultural products.[23] Yet this small sector receives $22.4 billion in direct support from the federal government each year.[24] This support traditionally took two forms: *direct subsidy* payments to farmers of about $6 billion per year and *price supports,* guaranteed minimum prices for crops, which cost about $5 billion per year.[25] These price supports raised the average price of food products for American consumers and cost $16 billion a year in higher prices.[26] However, after the Farm Bill of 2014 passed, direct subsidies were cut and replaced with increased crop insurance programs, which protect farmers against loss of their crops due to natural disasters or declining prices and cost the United States an average of $8 billion between 2014 and 2019.[27] Funding farms costs each American household about $144 per year on average, and the average recipient of the federal assistance receives $15,736 annually in commodity programs and crop insurance, which is larger than the amount paid to many individuals who receive payments from the social insurance programs we discuss in Chapters 12–17.[28]

Why do American families pay such large costs to support the farm sector? The typical answer provided by public policy makers of all political leanings is that this financial support is necessary to preserve the American "family farm" from larger agriculture companies and foreign competitors. When President Bush signed into law a 2002 farm bill estimated to cost $190 billion over the following decade, he declared that the bill "will promote farmer independence and preserve the farm way of life for generations."[29] The problem with such justification is that it is completely at odds with the facts. Only 20 of the roughly 400 crops grown in the United States are eligible for subsidies, and the amount of subsidy increased with the amount of crop produced, so larger farms benefited more from the subsidies than did small farms. As a result, three-quarters of all subsidies accrued to 10% of recipients, most of whom earned more than $100,000 a year.[30] In 2019, the top 10% of farms received, on average, $560,000 per year while the bottom 80% received $8,014 per year.[31]

If farm subsidies are so expensive and their distribution is so at odds with their stated goals, how does this program survive? The answer is that the $144 total cost per year to the typical American family of farm subsidies is dwarfed by the enormous gain of $15,736 to the typical farm from insurance and commodity programs. These farms are able to effectively organize and lobby for the maintenance of the subsidy and price support programs, and the larger group of taxpayers hurt by these programs is not. Recognizing this imbalance, Senator Richard Lugar of Indiana, then the Agriculture Committee's ranking Republican, refused to attend Bush's signing of the 2002 farm bill, calling it "a recipe for a great deal of hurt and sadness, and at the expense of a huge transfer payment from a majority of Americans to a very few."[32] Furthermore, candidates in presidential primaries face their first trials in Iowa, the leading recipient of farm subsidies, so opposing farm subsidies can be perilous to a presidential candidate.

This example should not be taken to imply that large subsidies to farms are uniquely American phenomena. The European Union spends about $113 billion annually supporting its farmers.[33] The average European cow, for example, is supported by $2.33 a day of government spending. Japan spends more than $47 billion on its farmers, protecting them with measures such as rice tariffs of nearly 800%.[34] In total, the Organization for Economic Cooperation and Development (OECD) estimates that the developed world spends $319 billion annually directly supporting farmers.[35]

In some cases, massive corruption undermines farm subsidies. Farm subsidies form almost 40% of the European Union's expenditures each year. Intended to support hard-working farmers and rural communities, recent investigations have revealed that a large bulk of these subsidies are used to underwrite oligarchs, mobsters, and far-right populists. Because governments in Central and Eastern Europe determine how subsidies are distributed, leaders of these governments often use these

subsidies to advance their own political interests. The prime minister of the Czech Republic, for instance, was revealed to have given $42 million in European subsidies to his domestic companies and an additional $7 million to holdings in Germany, Slovakia, and Hungary. Victor Orban, the populist prime minister of Hungary, had given millions in land subsidies to his close friends and political allies.[36] The European Union has had little success in eliminating such abuses; those crafting policies are often receiving subsidies themselves. The "Babish Admendment," an attempt to prevent politicians who distribute European Union farm subsidies from receiving the subsidies themselves, failed to pass in spring of 2020 as half of the committee members had ties to the farm industry.[37]

It might seem that the power of ordinary U.S. citizens is no match for the powerful agricultural lobby, but the case of New Zealand shows that reform of farm subsidies is not impossible—and may not even be ultimately harmful to the farm sector. As is the case with the United States and other developed nations, New Zealand had a sizeable patchwork of subsidy programs for farming until the mid-1980s. These programs ranged from price supports and low-interest loans to subsidies to purchase fertilizer. Some experts concluded that these subsidies led to the oversupply of agricultural products and falling commodity prices, as well as byzantine policy contradictions. For example, farmers were paid to install conservation measures such as hedgerows and wetlands after having been paid to rip them out a generation earlier; of course, other farmers who had maintained such landscape and wildlife features all along got nothing.

When New Zealand weaned its economy off these large agricultural subsidies beginning in the mid-1980s, there were initially some dislocations. About 1% of farms were shut down, and sheep farmers (the most heavily subsidized group) saw particularly sizeable reductions in their incomes. But after a transition period that lasted roughly six years, land prices, commodity prices, and farm profitability stabilized. Today, New Zealand has about the same percentage of people employed in agriculture, and about the same number of people in New Zealand live in rural areas as lived there when farming was subsidized.[38]

The most recent ambitious reform of the U.S. farm subsidy program, the Agricultural Act of 2014, was presented as an effort to improve the efficiency of agricultural subsidies by replacing some direct payments to farmers with a subsidized crop insurance program. Indeed, the Congressional Budget Office (CBO) reported that this shift would save more than $23 billion in costs. But critics of the law have highlighted that it did nothing to reduce the increasing concentration of government subsidies to the largest farms. As one critic said, "People say it's helping family farms, but what it's doing is propping up really large operations."[39]

Evidence on the Median Voter Model for Representative Democracy

As we've seen, while the median voter model is a potentially powerful tool of political economy, its premise rests on some strong assumptions that may not be valid in the real world. A large body of empirical work in political economy has tested the median voter model by assessing the role of voter preferences on legislative voting behavior relative to other factors such as party or personal ideology. Consider, for example, a Democratic politician who has personally liberal views but who represents a very conservative congressional district in the South.

views but who represents a very conservative congressional district in the South.

The Median Voter Theorem would predict that this politician would have a very conservative voting record to maximize votes in the district, but other factors such as party or individual ideology could lead to a more liberal voting record.

Studies of this nature have provided mixed conclusions. On the one hand, the preferences of the median voter clearly matter; for example, when district boundaries are redrawn so that the district includes more conservative voters, the representative of that district starts to vote more conservatively.[40]

EMPIRICAL EVIDENCE

Testing the Median Voter Model

As noted, empirical evidence on the median voter model is mixed. Some studies find strong support for the model. For example, Stratmann (2000) studied the effects of redistricting on the voting patterns of affected legislators. Every ten years when census data become available, congressional districts are reshaped to reflect population movements over the past decade.

Routine redistricting can change the nature of a district's median voter. Stratmann compared the preferences of the new, redistricted constituency with the old by comparing differences in the patterns of voting for presidents across redistricted districts. He asked: When districts became more conservative through redistricting (as measured by voting more often for the Republican presidential candidate in 1988 and 1992) but were represented by the same politician, did the politician start to vote more conservatively? The answer was yes, confirming that median voter preferences matter to legislators. Confirmatory evidence is provided in Aidt and Shvets (2012), who found that when legislators faced a term limit (and therefore didn't have to care anymore about the median voter), they delivered fewer earmarks (federal spending for local projects that serve mostly to transfer federal dollars to a politician's constituents) to their districts.

At the same time, there is also clear evidence that "core constituencies," as opposed to just the median voter in a district, matter for legislator behavior. A particularly striking test is to compare two senators from the same state but from different political parties. Because the office of senator is statewide, both elected officials are appealing to the same set of voters. Thus, the median voter model would predict that they would take the same position on legislation. In fact, this is not at all true. As Levitt (1996) showed, when a state has one senator from each party, the senators vote very differently; in fact, they vote very similarly to senators from other states who are in their party. Similar evidence is provided by Lee et al. (2004) who focus on very narrowly elected members of the House of Representatives from both parties; such representatives should vote similarly, regardless of party, because they each come from a nearly equally divided electorate. In fact, they find that narrowly elected politicians vote in the same way as politicians who were elected with large majorities and who, therefore, should be responding more to one side or the other.

Direct evidence that ideology matters was also shown in a paper by Washington (2008). She compares legislators who have daughters to those with the same family size who have sons. Because a child's gender is random, two legislators with families of the same size—one of which has more daughters than the other—should form natural treatments and controls for assessing whether individual ideological factors matter for legislator behavior (they should be otherwise the same except for the

ideological factors matter for legislator behavior (they should be otherwise the same except for the gender mix of their children). She finds that as a larger share of a legislator's children are daughters, the legislator is more likely to vote in favor of women's issues such as reproductive rights (such as by opposing laws that restrict teen access to abortion) or women's safety (such as by supporting laws that increase the punishment for violence against women). Washington's findings strongly support the notion that personal ideology matters: politicians are responding to their own experience, not just to the demands of the voters.

A particularly interesting example of politicians responding to their voters arose in 2007. In an effort to fight pointless earmarks by politicians for their own constituents, the Democratic leaders of the House of Representatives added new rules to make earmarks more transparent and to clearly associate each earmark with its sponsor. The hope may have been to shame representatives into lowering their demand for earmarks, but the effect was exactly the opposite. As the *New York Times* wrote, "Far from causing embarrassment, the new transparency has raised the value of earmarks as a measure of members' clout. Indeed, lawmakers have often competed to have their names attached to individual earmarks and rushed to put out press releases claiming credit for the money they bring home." Earmark growth continued, with proposed projects such as $2.6 million for a new grape genetics research center at Cornell University, in New York State's wine-producing Finger Lakes region. Defending her own earmark request for $100,000 for a prison museum near Fort Leavenworth, Kansas, Representative Nancy Boyda said, "Democracy is a contact sport, and I'm not going to be shy about asking for money for my community."[41]

Congress went further and banned earmarks in 2011. But the ban didn't actually end earmarks—it just made the process less direct and, some might say, sneakier. Instead of securing funding for useless projects, Congress routes money through other departments, giving extra planes made by companies in their district to the Air Force.[42] President Trump called for an end to the earmark ban, arguing ending the ban will unlock the gridlock in Congress. Members of Congress on both sides of the aisle agree, and they point to earmarks as an important way they advocate for their districts, but the ban still stands today.[43]

Increasing Polarization in American Politics

An enormously consequential change in U.S. politics in recent decades has been rising polarization. McCarthy et al. (2006) have developed a measure of the ideology of politicians based on the votes that they cast and use this to compute a historical measure of the degree of polarization between the parties in the United States.

Figure 9-4 shows the results for the Senate and the House of Representatives, updated in 2020. The size of the gap between the two lines in each panel indicates the degree of polarity—the larger the gap, the greater the polarity. The U.S. political system was very polarized until the 1930s, but then went through a period of reduced polarization that lasted until the early 1950s. Polarization has grown rapidly in recent years, hitting historical highs in the House of Representatives. This trend is particularly strong in the Republican Party, whose polarization score in the House has more than doubled since the 1960s.

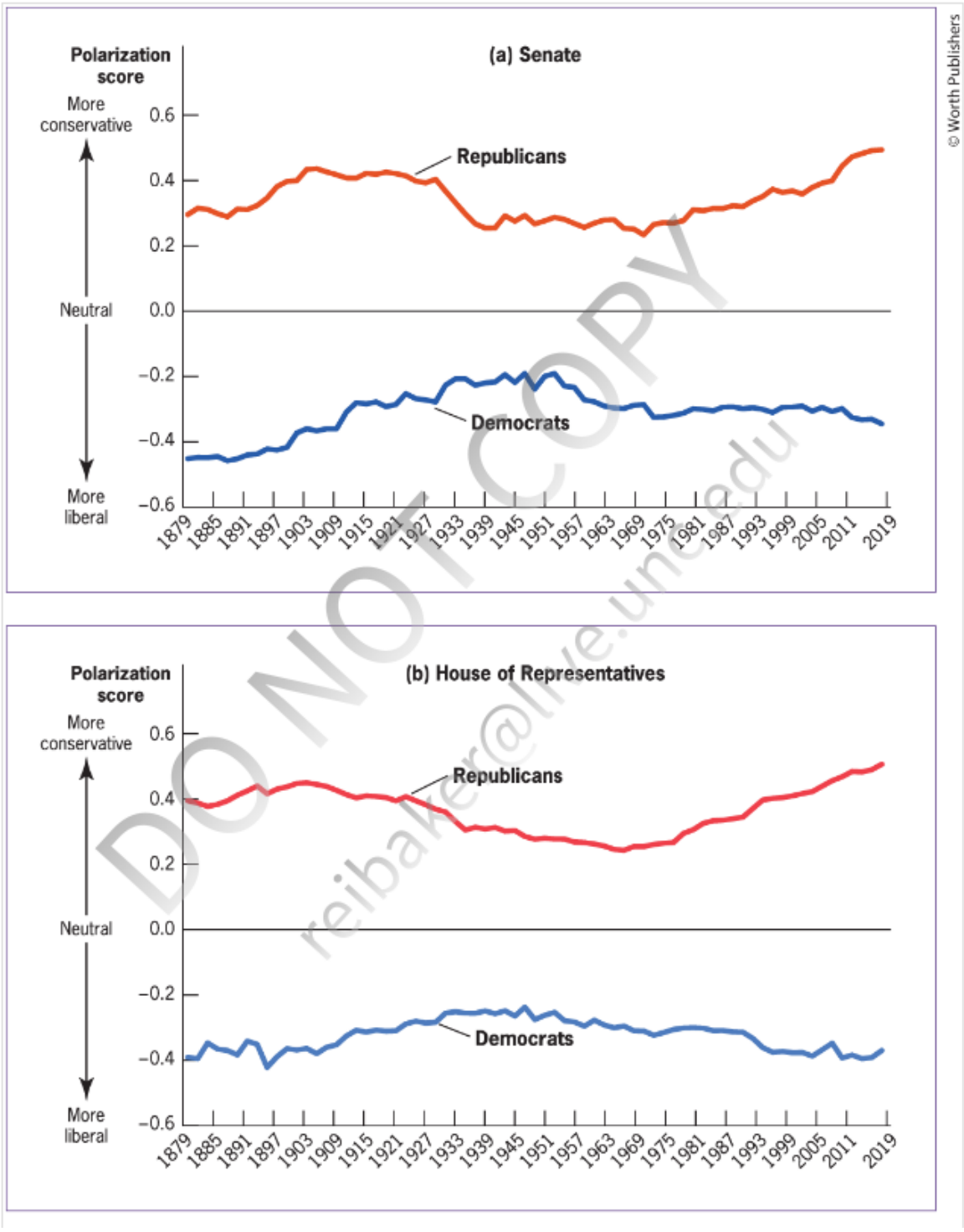

FIGURE 9-4 Political Polarization in the House and Senate, 1879–2020 • Panel (a) shows the trend in party polarization in the Senate. The two parties were most ideologically similar between the 1930s and early 1950s, after which polarization increased in each direction, but particularly so for Republicans, whose score almost tripled since 1970. Panel (b) shows polarization trends in the House of Representatives. Democrats became notably more conservative in the first half of the twentieth century and have slowly become more liberal in the second half of the twentieth century. Republicans had become gradually less conservative between the 1900s and the 1970s, but 1977 saw the beginning of an exponential increase in polarity, which has been ongoing in recent years. Polarity has reached an all-time high for both parties, and moderates are less common.

Data from: Lewis (2020).

In fact, among countries with developed democracies, the United States is the worst in terms of polarization. In a study that compared polarization in nine countries, the United States showed the greatest growth of polarization in the last four decades. Canada, Switzerland, and New Zealand also displayed positive, but slower, growth. The other five countries—Australia, Britain, Norway, Sweden, and Germany—had all experienced a decrease in polarization.[44] Perhaps even more alarming is that Republicans and Democrats no longer even agree on the severity of major problems facing the United States. Even when Covid-19 was ravaging the country, only 37% of Republicans believed that the outbreak was a very big problem compared to 73% of Democrats.[45] What is causing this rise in polarization in American politics? There are a wide variety of possible explanations, which can be roughly divided into four categories: voter polarization, media proliferation, the problem of gerrymandering, and other institutional changes. We'll now look at each.

Voter Polarization

The first category is changes in the polarization of voters themselves, or as Klein (2017) puts it, an increased "tribalism" among members of the different political parties where party identification trumps other measures of identity. For example, 10% of Americans report that they are opposed to their child marrying someone of a different race. Yet 49% of Republicans and 33% of Democrats are opposed to their child marrying someone of a different party. These percentages have risen from only 5% of Republicans and 4% of Democrats in 1960. A useful summary statistic on voter polarization comes from Haidt and Abrams (2015), who show that in 1972 there was only a fairly weak correlation between whether individuals identified themselves as liberal or conservative and the party they voted for. That correlation has grown dramatically since, so that liberal and conservative voting has become much more distinct. And an experiment done by Barber and Pope (2018) found that participants who identified as being conservative often followed President Trump's

participants who identified as being conservative often followed President Trump's stances on policies, regardless of whether or not his stances were in the more liberal or conservative direction.[46]

This type of negative feelings toward other political parties than one's own is often called "affective polarization." Affective polarization has risen dramatically in the United States in recent decades. In 1978, the average person rated those who shared their party 27 points higher on a "feelings thermometer" designed to assess relative feelings toward others. By 2016, that difference had risen to 46 points.[47] Importantly, this growth was much more rapid than in other developed nations, suggesting that it arises from changes in United States-specific factors and not international trends like globalization, the Internet, or growing income inequality.

Media Proliferation

Voter polarization has been facilitated by the second explanation, a growing divergence in where voters of different parties get their information. For the first few decades after World War II, Americans got the same news from the same limited set of sources, the national news networks. Then, as Haidt and Abrams (2015) put it, "All that changed with the advent of cable television in the 1980s and the Internet in the 1990s. Now Americans can choose from hundreds of partisan news sources, many of which care more about arousing emotions than hewing to journalistic standards. This proliferation of sources interacts with the most notorious problem in human cognition: the confirmation bias. People rarely seek out evidence on both sides before making a decision on moral and political matters. Rather, they begin with their initial belief and then seek out evidence to confirm it."

Going further, there is evidence that the partisan media environment isn't just confirming voter beliefs, but shaping them, leading to what Martin and Yorukoglu (2017) describe as a "polarizing feedback loop: an 'echo chamber' where partisans can reinforce and strengthen their initial biases." The usual poster child for such arguments is Fox News, which offers a generally conservative slant that has grown over time. Della Vigna and Kaplan (2007) found that in towns where Fox News entered the cable market, there was a significant shift toward Republican vote shares in subsequent elections. And Martin and Yorukoglu (2017) confirm this finding with a particularly clever methodology. They note that viewers are more likely to watch stations that are lower numbered in the channel system (due to "channel surfing" that starts at the bottom), so they use the essentially random placement of Fox News on the channel spectrum. They find that in locations where

Fox News has a lower channel number, it is more likely to be watched, and the vote share is more Republican.

In recent years, this "echo chamber" problem has been strengthened by an ongoing reliance on social media as a source of new information. In 2020, 71% of Americans reported getting at least some of their news from social media, and 89% get their news on a mobile device, which allows news providers to prioritize content and articles that readers are most likely to want to read—exacerbating the echo chamber.[48] The echo chamber has even shaped how voters perceive reality. Despite having true empirical counterparts, voters' perceptions of factual reality vary depending on the voter's political leanings. The polarization of reality is evident in perception of the Affordable Care Act. In a 2017 poll, respondents were asked whether the repeal of the Affordable Care Act would eliminate expanded Medicaid coverage and private insurance subsidies. Only 49% of Republicans correctly identified that this was the case, compared to 79% of Democrats—nearly a 30-point difference. These alternative perceptions in turn affect stances on policies (in this case health care policy), further increasing polarization between the left and right.[49]

The Problem of Gerrymandering

The third explanation for increasing polarization in the United States is the problem of gerrymandering. When you vote in a political race, you aren't just voting for the person who will create the best legislation. You are also voting for the politician who gets to draw the maps. In the United States, the party in power gets to define congressional districts. Ideally, politicians would adjust districts such that every American is equally represented. Unfortunately, redrawing maps often becomes an exercise for politicians in how to maximize their party's power. This process of manipulating maps so as to maintain or grow power is known as **gerrymandering**.

gerrymandering
The process of manipulating maps, on the part of the political party in power, in an effort to maintain or grow their power.

Gerrymandering can have immense effects on election outcomes. Take, for instance, the case of Pennsylvania. Prior to 2018, Pennsylvania was considered one of the most heavily gerrymandered states. In the 2016 election, Democrats in Pennsylvania had won 48% of the popular vote but only 23% of the state's House seats. The large discrepancy between the popular vote and seat percentages is a telltale sign of gerrymandering. But before the elections in 2018, the Supreme Court

telltale sign of gerrymandering. But before the elections in 2018, the Supreme Court forced Pennsylvania to redraw district lines in a more party-neutral fashion. The result? In the 2018 elections, Democrats won 53% of the popular vote and nearly half of the state's House seats.[50]

Gerrymandering relies on two tools: *cracking* and *packing*. Cracking divides the opposing party's constituents into multiple districts so that they lose each of those districts by a very narrow margin. Packing combines the opposing party's constituents into a few districts so that they win those districts by a large margin, while losing others. Basically, a gerrymanderer's goal is to produce *wasted votes* for their opponent. Every vote for a candidate that loses is a wasted vote, and each vote above 50% + 1 for the winning candidate is also a wasted vote. One metric for measuring gerrymandering is the **efficiency gap**: Party A's wasted votes minus Party B's wasted votes, divided by all the votes cast in the election.

efficiency gap
A metric for measuring gerrymandering: Party A's wasted votes minus Party B's wasted votes, divided by all the votes cast in the election.

The efficiency gap was the subject of a 2017 Supreme Court case challenging the partisanship of Wisconsin's congressional districts. The plaintiff, who accused Wisconsin of bias, brought witnesses to testify that the state's massive efficiency gap (around 12 percentage points) was not a matter of chance or political geography. Jowei Chen, a Michigan professor, used computer algorithms to illustrate this. He simulated different district maps for Wisconsin based on 200 different nonpartisan approaches to drawing districts, for example, based on geography. Using this sample, he was able to test how biased randomly generated districts were. Of the 200 computer-simulated maps, every single one had a smaller efficiency gap than the current map. In fact, the most biased maps were still more than 8 percentage points more equal than the existing map.

Even without active gerrymandering, however, the nature of the process by which senators and the President are selected is likely to lead to more partisan division because of demographic shifts. While congressional representatives are proportional to a state's population, each state gets two senators—but the American population is concentrated in a smaller number of states. Estimates suggest that by 2040, 30% of Americans who live in the 35 least populous states will choose 70 of our nation's 100 senators. These "over-represented" states are typically more White, more male, and more rural than the nation as a whole.

The electoral college imposes a similar bias on our presidential elections because every state gets at least 3 of the 538 electoral votes—so small states are over-represented compared to their populations. This means that a vote for President cast in Wyoming (population 579,000) counts nearly four times more in a presidential election than a vote cast by a Californian (California is our most populous state, with a population of nearly 40 million).

Other Institutional Changes

Laws that appear to be in place to maintain the integrity of our democracy are sometimes appropriated by political parties and end up having the opposite effect. Voter regulation is one example that tends to be split down party lines. Republicans often champion increased restriction and regulation for voters to ensure that there is no voter fraud. But by requiring that voters provide proof or identity, by limiting early voting, or by closing polls early, Republicans disproportionately limit access for low-income and minority Americans, demographics that tend to vote Democrats. Take, for instance, Florida, which requires voters to register prior to election day. Before the 2000 presidential election, Florida's secretary of state, a Republican, hired a private investigator who identified 100,000 ineligible voters in the state. It turned out that 66% of the allegedly ineliglble voters on the list were Black, and 12,023 of them had been misidentified as ineligible.[51] These misidentified voters could have changed the outcome of presidential election as George W. Bush, the Republican candidate, had only won by 537 votes.[52] On the other side of the aisle, Democrats advocate for elections in off-years, resisting efforts to streamline voting in local elections for boards of education, fire marshals, and other local positions. These off-year elections have very low voter turnout. But the voters that do show up tend to be very engaged and lean more Democratic than the nation as a whole.

Other institutional changes have played into growing polarization as well, as emphasized by Haidt and Abrams (2015). For example, the increasing role of money in the political process means that politicians take less time to form bipartisan political bonds and spend more time pleasing the (generally very partisan) donors who fund their party. Likewise, the increased nationalization of fundraising for local races, allows well-funded national groups with strongly held liberal or conservative views to target local politicians who do not hew to the party line. Changes in congressional rules have further increased polarization. For example, committee chairs in Congress used to be chosen by seniority, but are now assigned by party leadership, typically on the basis of party loyalty, making it less likely that members of Congress will deviate from the party line and partner with their colleagues on the other side of the aisle.

other side of the aisle.

Urbanization has also divided people geographically along party lines and political ideologies. Attracted by increasing opportunities and thriving economies, many liberal leaning, higher educated White people have chosen to leave rural areas in favor of denser, urban centers. As a result, rural areas are becoming increasingly conservative and economies in these areas have begun to stagnate. These tensions have further polarized the American people.[53]

To conclude, this growing polarization has important implications for the design of our political institutions and the functioning of our democracy. One approach to address them would be to try to "de-partisanize" the election process. A notable study that considers this possibility is Ash and MacLeod (2016). They study the "quality" of judges who obtain their office through various electoral mechanisms, measuring quality by the extent to which judges' opinions are cited by other judges in later cases (a sign of an important decision). They find that the lowest "quality" judges are those who are elected in a partisan process whereby judges run for office in affiliation with a political party. If, instead, the judges run for election unaffiliated to a particular political party, higher-quality judges are chosen for office. And if judges are selected by nonpartisan technical merit commissions, they have the highest measured quality of all.

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9.4 Public Choice Theory: The Foundations of Government Failure

The policy analysis in most of this book assumes a benign government intent on maximizing social welfare. Similarly, in this chapter, we have discussed the assumption that in both direct democracy and representative democracy, politicians typically strive to represent the will of the people. Starting in the 1950s, however, a school of thought known as **public choice theory** began to question this assumption. Begun by James Buchanan and Gordon Tullock (the former of whom won the 1986 Nobel Prize), public choice theorists noted that governments often do not behave in an ideal manner so that the traditional assumption of a benevolent government maximizing social welfare may not be appropriate.[54] In this section, we review some of the important sources of **government failure**, the inability or unwillingness of the government to act primarily in the interest of its citizens.

public choice theory
A school of thought emphasizing that the government may not act to maximize the well-being of its citizens.

government failure
The inability or unwillingness of the government to act primarily in the interest of its citizens.

Size-Maximizing Bureaucracy

Some of the earliest critiques of idealist conceptions of government began with the idea that **bureaucracies**, organizations of civil servants in charge of carrying out the services of government (such as the U.S. Department of Education or a town's Department of Public Works), might be more interested in their own preservation and growth than in carrying out their assigned missions efficiently. In 1971, William Niskanen developed the model of the *budget-maximizing bureaucrat*. In this model, the bureaucrat runs an agency that has a monopoly on the government provision of some good or service. For example, a town's Department of Public Works might be charged with collecting trash, maintaining the sewers, and so on. This bureaucracy is part of the larger town government, and the politicians running the larger government will decide on the bureaucrat's power and pay.

bureaucracies
Organizations of civil servants, such as the U.S. Department of Education or a town's Department of Public Works, that are in charge of carrying out the services of government.

Niskanen noted that while the private sector rewards its employees for efficient production, a bureaucrat's salary is typically unrelated to efficiency. In Niskanen's model, a bureaucrat's compensation (wages, benefits, status, quality of support staff, and so on) is based on the total measurable output of their bureaucracy. For example, the compensation of the director of the Department of Public Works rises as that department fixes more problems in the town. The goal of the bureaucrat is, therefore, to maximize the size of the agency they control and thus maximize its budget, not to choose the level of service that maximizes efficiency. Even if the larger town government knows that the bureaucrat is pursuing a self-interested, inefficient goal, it is hard to enforce efficient production in the agency because the bureaucrat knows much more than the town government knows about the true cost of the service they are providing.[55]

Leviathan Theory

Niskanen's theory assumes that individual bureaucrats try to maximize the size of their own agencies and that a larger government tries to rein them in. In contrast, Brennan and Buchanan (1980) see these two entities (bureaucrats and large government) as one monopolist (which they call "Leviathan") that simply tries to maximize the size of the public sector by taking advantage of the electorate's ignorance. Under this theory, voters cannot trust the government to spend their tax dollars efficiently and must design ways to combat government greed.

This view of government can explain the many rules in place in the United States and elsewhere that explicitly tie the government's hands in terms of taxes and spending. In Chapter 4, we discussed rules for limiting the size of the government budget. Likewise, a number of U.S. states have passed laws limiting the ability of local communities to raise property taxes (taxes imposed on the value of homes and businesses and the land they are built on). There is no reason to have these types of "roadblocks" if a benevolent government is maximizing social welfare, but with a Leviathan government, they may be a means of putting a brake on inefficient government growth.

Another way to combat the Leviathan tendencies of government is to ensure that politicians face electoral pressure to deliver public services efficiently, as suggested by a study by Besley et al. (2005). These authors studied the impact of the increased "political competition" in the southern United States during the twentieth century due to the enfranchisement of Black people and other groups. They measured political competition as the extent to which voters choose a fairly balanced slate of

candidates in local elections, as opposed to always voting for one party or another. They found that areas with more political competition had much faster economic growth (25% higher growth in the long run), partly because of lower taxes and higher quality jobs.

Corruption

The theory of size-maximizing bureaucrats and Leviathan governments describes how governments will take action to maximize their size and power in carrying out their legitimate functions. Even more problematic is **corruption**, the abuse of power by government officials seeking to maximize their own personal wealth or that of their associates. As the following policy application illustrates, corruption is an international phenomenon.

corruption
The abuse of power by government officials in order to maximize their own personal wealth or that of their associates.

APPLICATION
Government Corruption

Corruption can take many forms, but the common theme is government officials using their power to enrich themselves or their associates. Following are several examples.

- In December 2003, former governor of Illinois George Ryan was indicted by a federal grand jury for selling state contracts to his friends in exchange for cash, gifts, loans, and trips for his family. The scandal unfolded after it came to light that truck drivers routinely bribed officials at the office of then–Secretary of State Ryan to obtain driver's licenses and that at least 20 people had died in accidents involving these drivers. An investigation resulted in 70 indictments with more than 60 convictions. Many of the convicted were close friends and allies of Ryan who had kicked some of the bribe money into his campaign funds.
  In 2002, Ryan was replaced in office by Governor Rod Blagojevich, who campaigned for the office as a reformer who would clean up the corrupt state government. In fact, on December 9, 2008, Rod Blagojevich and his chief of staff were arrested on federal corruption charges for conspiring to sell the U.S. Senate seat left vacant after Barack Obama's election to the presidency to the highest bidder.[56] Furthermore, Blagojevich threatened to withhold state assistance to the Tribune Company in its sale of the Chicago Cubs unless the company fired members of the *Chicago Tribune*'s editorial board who were critical of him. Early in 2009, the Illinois senate voted unanimously to remove him from office and disqualify him from holding future public office in Illinois.[57] Two years later, Blagojevich was sentenced to 14 years in prison.[58]

- Former prime minister of Malaysia, Najib Rizak, was arrested in July 2018, after a multiyear corruption scandal and accusations of his misappropriation of state funds. Since 2015, the U.S. Justice Department had been investigating $4.5 billion stolen from a Malaysian government investment fund and laundered through U.S. corporations. More than $1 billion of that was spent on U.S. goods, which the Justice Department hopes to reappropriate.[59] Those goods include a 22-carat pink diamond necklace that cost $27.3 million and 27 gold necklaces and bracelets that cost $1.3 million, purchased by Rizak's wife. Meanwhile, his stepson's company produced the movie *The Wolf of Wall Street,* allegedly funding it, in part, with money Rizak stole from the Malaysian government. His stepson also gave extravagant gifts to Hollywood stars, including $12 million in art to Leonardo DiCaprio.[60]

"But how do you know for sure you've got power unless you abuse it?"

- Joseph Mobutu, however, may be the king of corruption. After taking over the Congo in 1965 (which he renamed "Zaire," a name dropped after he was deposed in 1997), Mobutu treated the resource-rich country as his personal fiefdom. The World Bank estimates that between 1967 and 1997, income per capita in the Congo *fell* by two-thirds while it grew rapidly in the rest of the world. At the same time, Mobuto became one of the richest men in the world, with a fortune estimated by some at $5 billion.[61]

Why does corruption exist? Some public choice theorists might agree with Lord Acton's famous observation: "Power tends to corrupt and absolute power corrupts absolutely." In this view, a government's monopoly power over some spheres of its citizens' lives is sufficient to explain corruption. Why shouldn't clerks at your local Department of Motor Vehicles ask for $10 to speed up your application for a driver's license? Don't they have complete power over who gets a license? Ultimately, of course, they are unlikely to ask for a bribe, in part because rampant corruption in the DMV might motivate voters to elect a politician who vows to clean up that particular department.

This view suggests that the only thing keeping corruption in check is *electoral accountability,* the ability of voters to throw out corrupt regimes. The notion that electoral accountability is a primary deterrent of corruption is supported by the evidence in Persson and Tabellini (2000), who measured the extent of government corruption using surveys of business leaders, the most direct victims of such corruption. They compared systems of government in which voters choose individual candidates, such as the United States, to systems with proportional voting where voters choose a party slate of candidates, such as the United Kingdom. They reasoned that in the latter type of

party state of candidates, such as the United Kingdom. They reasoned that in the latter type of

system, individual politicians are less accountable to the electorate because the voter votes only for the party and not for the individual. Indeed, they found that corruption was much more prevalent in systems with proportional voting.

Other evidence that corruption is responsive to votes comes from Ferraz and Finan (2008), who studied the introduction of a random audit of use (and abuse) of federal funds by municipalities in Brazil. They found that mayors who were found to be corrupt were significantly less likely to be reelected. Likewise, Campante and Do (2014) found that states in which the capital city is more isolated from the majority of the populace (and therefore less subject to public oversight and interest) had a higher level of corruption.

Corruption also appears more rampant in political systems that feature more *red tape*, bureaucratic barriers that make it costly to do business in a country. Djankov et al. (2002) examined data from 85 countries regarding the procedures for starting a business. The procedures varied widely, taking as few as 2 days in Canada and Australia to as many as 152 days in Madagascar. The costs of these bureaucratic procedures ranged from less than 0.5% of per capita GDP in the United States to greater than 460% of per capita GDP in the Dominican Republic. This study found that countries requiring entrepreneurs to go through numerous bureaucratic procedures to start a business tended to have higher levels of corruption. ■

The Implications of Government Failure

There is clear evidence that governments fail in some instances to benevolently serve the interests of their citizens. Do these failures have important implications? Or can citizens use policies such as property tax limitations to minimize the harm imposed by government structure? Some evidence suggests that government failures can have long-lasting negative impacts on economic growth, as reviewed in the following Empirical Evidence box.

EMPIRICAL EVIDENCE

Government Failures and Economic Growth

Several studies suggest that poor government structure can have long-lasting negative impacts on economic growth. One such study is Mauro (1995), which used data collected by a private firm whose agents in various countries rated the quality of government along various dimensions such as the amount of red tape involved in government procedures and the amount of corruption. Mauro found that nations with higher levels of corruption and red tape had slower growth rates and that these effects were large: if the most bureaucratically inefficient nation in his sample (Zaire) improved its efficiency to the level of the least inefficient nations (Switzerland, New Zealand, the Netherlands, or Singapore), his model predicts that Zaire's growth rate would be 4.9% per year higher!

The difficulty with studies such as Mauro's, however, is that the nations with high-quality governments (the treatment group) may differ from those with low-quality governments (the control group) for other reasons as well, biasing the estimates of the effect of government quality. Suppose, for example,

other reasons as well, biasing the estimates of the effect of government quality. Suppose, for example,

that the efficiency of a bureaucracy rises as the wages of government workers rise. Then slow-growing low-income nations who cannot pay their government workers well will have poorly functioning governments. But, in this case, slow economic growth may cause government failure, not vice versa.

An attempt to surmount this problem using a historical perspective was taken by Acemoglu et al. (2001). They denoted two sets of nations that were quite similar when they were colonized by the same set of European powers and, therefore, could be considered comparable treatments and controls, but for which colonization took very different forms. The treatment nations in the Caribbean, Central America, and Africa were governed from afar as their European colonizers focused solely on extracting from these countries as many natural resources (such as diamond, silver, and copper) as possible. The colonizers were not interested in setting up institutions in these nations to foster economic success (such as effective property rights or bureaucratic institutions). The control nations in North and South America, and Australia and New Zealand, were governed from within as the European colonizers moved to these nations in large numbers and set up institutions to foster economic success.

The reason for the lack of hands-on governing in the treatment nations was simple: the odds of colonists dying from infectious diseases such as malaria were much higher in these nations than in the control nations. In the nations of the Caribbean, Central America, and Africa, while native people were immune to local disease, settlers were not. So these nations were governed from afar with little long-term interest in settlement. In nations in North and South America, and in Australia and New Zealand, settlers were less likely to suffer from local infectious diseases, so they settled there in large numbers. In doing so, they set up institutions that would foster their success. The reason for this difference should not be otherwise associated with economic success because native people were immune to disease; these two sets of nations were comparable other than through the type of colonization.

Despite their precolonization similarity, these sets of nations have performed very differently in the postcolonial era. The treatment nations in the Caribbean, Central America, and Africa have grown much more slowly postcolonization than have the control nations in North and South America and Australia and New Zealand. These treatment nations appear to suffer from the long-run detrimental effects of inefficient government institutions. For example, the authors computed that if the quality of Nigeria's government institutions could be improved to the level of Chile's, Nigeria would see a sevenfold increase in per capita income.

Acemoglu (2003) made a similar "historical accident" argument with relation to North and South Korea, two halves of a region that had been a single region (Korea) under Japanese control until the end of World War II. There were no inherent differences between the northern and southern regions of Korea until World War II; they were culturally and economically very similar. After World War II, however, the Soviet Union occupied the northern half of Korea, which became a communist nation, and the United States occupied the southern half, which adopted a capitalist system. The results of this division of the nation into two different systems have been dramatic. Maddison (2001) showed that the two countries had similar income levels in 1950 of $850 per capita, and North Korea was actually more heavily industrialized than the south. More than 60 years later, North Korea had a per capita income of only $1,990, compared to South Korea's $39,400.[62]

The implications of political institutions for growth is not simply a historical issue. As discussed in Acemoglu et al. (2015), the Internet is one of the most important technologies available today. But a variety of countries, such as Bahrain, Iran, Saudi Arabia, and Uzbekistan, seriously curtail the use of the Internet or suppress online expression, in an effort to limit dissent and maintain political power. While this may be a successful short-run strategy for leaders in these nations, in the long run, the limited

availability of this key technology may lead to a lower growth rate for these nations.

A recent study even found that corrupt election practices can directly kill people. After 2007 election reforms curtailed vote-buying in Brazil, a fraudulent practice that commonly altered election outcomes, political competition increased. This in turn forced politicians to increase health care expenditures. In the three years following these reforms, health care spending increased by 10% each year, and, since 2011, the live birth rate has improved by over 12.5%, suggesting that political reform can have positive effects on not only the growth but also the health of nations.[63]

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EMPIRICAL EVIDENCE

Government Failures and Economic Growth

Several studies suggest that poor government structure can have long-lasting negative impacts on economic growth. One such study is Mauro (1995), which used data collected by a private firm whose agents in various countries rated the quality of government along various dimensions such as the amount of red tape involved in government procedures and the amount of corruption. Mauro found that nations with higher levels of corruption and red tape had slower growth rates and that these effects were large: if the most bureaucratically inefficient nation in his sample (Zaire) improved its efficiency to the level of the least inefficient nations (Switzerland, New Zealand, the Netherlands, or Singapore), his model predicts that Zaire's growth rate would be 4.9% per year higher!

The difficulty with studies such as Mauro's, however, is that the nations with high-quality governments (the treatment group) may differ from those with low-quality governments (the control group) for other reasons as well, biasing the estimates of the effect of government quality. Suppose, for example, that the efficiency of a bureaucracy rises as the wages of government workers rise. Then slow-growing low-income nations who cannot pay their government workers well will have poorly functioning governments. But, in this case, slow economic growth may cause government failure, not vice versa.

An attempt to surmount this problem using a historical perspective was taken by Acemoglu et al. (2001). They denoted two sets of nations that were quite similar when they were colonized by the same set of European powers and, therefore, could be considered comparable treatments and controls, but for which colonization took very different forms. The treatment nations in the Caribbean, Central America, and Africa were governed from afar as their European colonizers focused solely on extracting from these countries as many natural resources (such as diamond, silver, and copper) as possible. The colonizers were not interested in setting up institutions in these nations to foster economic success (such as effective property rights or bureaucratic institutions). The control nations in North and South America, and Australia and New Zealand, were governed from within as the European colonizers moved to these nations in large numbers and set up institutions to foster economic success.

The reason for the lack of hands-on governing in the treatment nations was simple: the odds of colonists dying from infectious diseases such as malaria were much higher in these nations than in the control nations. In the nations of the Caribbean, Central America, and Africa, while native people were immune to local disease, settlers were not. So these nations were governed from afar with little long-term interest in settlement. In nations in North and South America, and in Australia and New Zealand, settlers were less likely to suffer from local infectious diseases, so they settled there in large numbers.

In doing so, they set up institutions that would foster their success. The reason for this difference should not be otherwise associated with economic success because native people were immune to disease; these two sets of nations were comparable other than through the type of colonization.

Despite their precolonization similarity, these sets of nations have performed very differently in the postcolonial era. The treatment nations in the Caribbean, Central America, and Africa have grown much more slowly postcolonization than have the control nations in North and South America and Australia and New Zealand. These treatment nations appear to suffer from the long-run detrimental effects of inefficient government institutions. For example, the authors computed that if the quality of Nigeria's government institutions could be improved to the level of Chile's, Nigeria would see a sevenfold increase in per capita income.

Acemoglu (2003) made a similar "historical accident" argument with relation to North and South Korea, two halves of a region that had been a single region (Korea) under Japanese control until the end of World War II. There were no inherent differences between the northern and southern regions of Korea until World War II; they were culturally and economically very similar. After World War II, however, the Soviet Union occupied the northern half of Korea, which became a communist nation, and the United States occupied the southern half, which adopted a capitalist system. The results of this division of the nation into two different systems have been dramatic. Maddison (2001) showed that the two countries had similar income levels in 1950 of $850 per capita, and North Korea was actually more heavily industrialized than the south. More than 60 years later, North Korea had a per capita income of only $1,990, compared to South Korea's $39,400.[62]

The implications of political institutions for growth is not simply a historical issue. As discussed in Acemoglu et al. (2015), the Internet is one of the most important technologies available today. But a variety of countries, such as Bahrain, Iran, Saudi Arabia, and Uzbekistan, seriously curtail the use of the Internet or suppress online expression, in an effort to limit dissent and maintain political power. While this may be a successful short-run strategy for leaders in these nations, in the long run, the limited availability of this key technology may lead to a lower growth rate for these nations.

A recent study even found that corrupt election practices can directly kill people. After 2007 election reforms curtailed vote-buying in Brazil, a fraudulent practice that commonly altered election outcomes, political competition increased. This in turn forced politicians to increase health care expenditures. In the three years following these reforms, health care spending increased by 10% each year, and, since 2011, the live birth rate has improved by over 12.5%, suggesting that political reform can have positive effects on not only the growth but also the health of nations.[63]

9.5 Conclusion

In most of this book, and in most of public finance, the government is assumed to be a benign actor that serves only to implement the optimal policies to address externalities, to provide public goods and social insurance, and to develop equitable and efficient taxation. In reality, however, the government is a collection of individuals who have the difficult task of aggregating the preferences of a large set of citizens. Will governments operate to pursue policies in the ways suggested by the economic analyses presented in other chapters of this book?

The core model of representative democracy suggests that governments are likely to pursue the policies preferred by the median voter, which in most cases should fairly represent the demands of society on average. Yet, while that model has strong evidence to support it, there is offsetting evidence that politicians have other things on their minds. In particular, there are clear examples of government's failure to maximize the well-being of its citizens, with potentially disastrous implications for economic outcomes. The extent to which government serves or fails to serve the interests of its citizens is a crucial topic for future research in political economy.

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Highlights

- In theory, a government can efficiently finance public goods by simply asking individuals to pay their valuation of the good (Lindahl pricing).
- In practice, such a solution faces the problems of preference revelation (individuals not honestly reporting their preferences), preference knowledge (individuals not knowing their preferences), and preference aggregation (the government being unable to collect data on each individual's preferences).
- One way to aggregate preferences is through direct democracy, where votes are directly cast on particular issues. This voting mechanism will consistently aggregate preferences only if preferences are restricted to a particular form (single-peaked preferences).
- If preferences are single-peaked, the option chosen will be the one preferred by the median voter. This will not be the efficient outcome, however, if voters on one side or another of an issue have particularly intense preferences.
- Representative democracies will also support the policy preferred by the median voter if politicians are vote-maximizing and if other fairly restrictive assumptions hold. In practice, it appears that factors such as ideology, not just vote maximization, are important in determining legislator behavior.
- Public choice theory directly models the preferences of legislators and the government failures that can arise when legislators pursue their own interests rather than the common good. Government failures such as corruption can have serious negative ramifications for the economic well-being of societies.

Questions and Problems

1. In a study about endangered species protection, Americans stated that they were willing to pay $70 billion to protect all endangered species. They also stated that they were willing to pay $15 billion to protect a single species. Which problem with Lindahl pricing does this demonstrate? Explain.
2. The preference revelation problem associated with Lindahl pricing becomes more severe as the number of people in society increases. Why do you think this is true?
3. Matsusaka (1995) showed that states that provide for voter initiatives tend to have smaller government growth than do states without such a provision. Why might this be so?

4. Major League Baseball uses what is known as a 5–3–1 system to vote for the league's most valuable player (MVP) in each league. Each voter gets to vote for three different players they consider worthy of the award. Their first-place candidate gets 5 points, their second-place candidate gets 3 points, and their third-place candidate gets 1 point. Points are then added up across all voters, and the player with the most total points wins the award. Suppose there are three voters—Neyer, Law, and Phillips—and five potential candidates for the award—Alex, David, Raffy, Manny, and Mario. The following table shows how each voter ranks the candidates. In addition, note that candidate Raffy is embroiled in a substance abuse scandal. A verdict on his guilt or innocence will be made public one day before voting for MVP. A guilty verdict will nullify his votes.

Rank	Neyer	Law	Phillips
Best	David	David	Raffy
Second Best	Alex	Alex	Alex
Third Best	Raffy	Raffy	Manny
Fourth Best	Manny	Manny	Mario
Fifth Best	Mario	Mario	David

   a. Who will win the MVP if Raffy is found innocent?
   b. Who will win the MVP if Raffy is found guilty?
   c. What problem with consistent aggregation does this MVP example illustrate?
5. Research shows that when congressional districts are redrawn to include more older adults, members of Congress become more likely to take pro-elderly positions in congressional votes. Explain why the median voter model predicts this outcome.
6. Stratmann (1995) documented a condition of logrolling in Congress, in which members of Congress trade votes on one bill for votes on another. Is logrolling efficient, or does it entail costs that exceed its benefits? Explain.
7. A problem with the median voter outcome is that it does not take into account intensity of preferences. Suppose that the government decided to give every voter a fixed number of votes, which they may allocate freely across all questions on the ballot. Would this solve the problem? Why or why not?

8. When an energy company wants to raise the rate charged to their customers, it must first argue its case at a public hearing before a regulatory body. How does the free rider problem explain why energy companies are usually successful in getting permission to raise their rates?
9. Consider the positions of Kyrsten Sinema and Martha McSally on environmental policy and LGBTQ+ rights. How well does the median voter model explain their positions on each of these issues?
10. Every year, the World Bank publishes the Worldwide Governance Indicators, a report that assesses and ranks the quality of governance in more than 200 countries. The indicators measure six key dimensions of governance quality: voice and accountability, political stability and lack of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. Navigate to http://info.worldbank.org/governance/wgi/index.aspx and download the full dataset in Excel or Stata to answer the following questions.
    a. Which governance indicators in the report are most closely related to economic health and future economic growth and why?
    b. For each of the indicators you identified in part (a), identify the three countries where the quality of governance on these indicators has improved most significantly from 2000 to the present. Explain your answer.

ADVANCED QUESTIONS

11. After the 2016 election, economists Hunt Alcott and Matt Gentzkow (2017) experiment that attempted to gauge the impact of fake news stories on American voters. They asked voters about three kinds of highly partisan news stories they might have seen in various media (on TV, in print, on social media, etc.) before the election. The three types of news stories included: stories that were unambiguously true, stories that had been shared widely on social media but were unambiguously false, and a third category of "placebo" stories that were false and made up by the researchers for the purposes of the survey. Respondents were asked whether they had seen each news story during the election, and whether, given what they knew at the time, they had believed what they read.

    Alcott and Gentzkow found about 25% of respondents recalled seeing true news stories, and about 19% believed them. By contrast, about 15% of

respondents recalled seeing the false news stories that had been shared widely on social media, and 8% of them said they believed what they read. Interestingly, nearly the same percentage of respondents (14% and 8%) recalled seeing and believing the "placebo" stories that had been entirely fabricated by the researchers.

Consider this experiment in the context of the explanations for rising U.S. political polarization discussed in the chapter. What do the survey results indicate about these theories?

12. Consider the following "map" of a state with 49,000 residents, with the following geography: each square represents a precinct with 1,000 residents, and the color of the circle (gray or black) represents the partisan affiliation of the 1,000 residents, who predictably vote together as a uniform block in elections for the U.S. Congress (gray for Republicans, black for Democrats).