HOW INSTITUTIONS INFLUENCE THE BALANCE OF POWER IN INTERACTIONS AMONG ECONOMIC ACTORS, AND HOW THIS AFFECTS THE FAIRNESS AND EFFICIENCY OF THE ALLOCATIONS THAT RESULT

- Technology, biology, economic institutions and people’s preferences all matter as determinants of economic outcomes
- Interactions between economic actors can result in mutual gains, and also in conflicts over how the gains are distributed
- *Power* is the ability to do and get the things we want in opposition to others
- Institutions influence the power and other bargaining advantages of actors
- Outcomes may be judged according to their efficiency and their fairness
- Economics can clarify ways of applying the criteria of efficiency and fairness to evaluate economic institutions and outcomes
Perhaps one of your distant ancestors considered the best way to get money was by shipping out with a pirate like Blackbeard or Captain Kidd. If he had settled on Captain Bartholomew Roberts’ pirate ship The Rover, he and the other members of the crew would have been required to consent to the ship’s written constitution. This document (called The Rover’s Articles) guaranteed, among other things, that:


The Rover and its Articles were not unusual. During the heyday of European piracy in the late 17th and early 18th centuries most pirate ships had written constitutions that guaranteed even more powers to the crew members. Their captains were democratically elected, “the Rank of Captain being obtained by the Suffrage of the
Majority”. Many captains were also voted out, at least one for cowardice in battle. Crews also elected one of their number as the quartermaster who, when the ship was not in a battle, could countermand the captain’s orders.

If your ancestor had served as a lookout and had been the first to spot a ship that was later taken as a prize, he would have received as a reward “the best Pair of Pistols on board, over and above his Dividend”. Were he to have been seriously wounded in battle, the articles guaranteed him compensation for the injury (more for the loss of a right arm or leg than for the left). He would have worked as part of a multiracial, multi-ethnic crew of which probably about a quarter were of African origin, and the rest primarily of European descent, including Americans.

The result was that a pirate crew was often a close-knit group. A contemporary observer lamented that the pirates were “wickedly united, and articled together”. Sailors of captured merchant ships often happily joined the “roguish Commonwealth” of their pirate captors.

Nowhere else in the world during the late 17th and early 18th century did ordinary workers have the right to vote, or to compensation for occupational injuries, or to the protection of the kinds of checks on arbitrary authority that were taken for granted on The Rover.

Nor could workers in British textile mills and other industrial establishments claim such a large share of income. The prize-sharing system described in The Rover’s articles, if faithfully implemented, would have resulted in a Gini coefficient for the dividend of 0.06, far more equal even than our famously equal hunter-gatherer ancestors.

In contrast, when the Royal Navy’s ships Favourite and Active captured the Spanish treasure ship La Hermione, the division of the spoils among the captain, officers and crew of the two British men-of-war ships resulted in a Gini coefficient averaging 0.61 for the two ships: about the same as the Gini coefficient for income in some of the most unequal countries in the world today (shown in Figure 1.16). By the standards of the day, pirates were unusually democratic and fair-minded in their dealings with each other.

Another unhappy commentator remarked: “These Men whom we term... the Scandal of human Nature, who were abandoned to all Vice... were strictly just among themselves.” If they were Responders in the ultimatum game, by this description they would have rejected any offer less than half of the pie!
5.1 INSTITUTIONS: THE RULES OF THE GAME

The Rover’s articles were part of the pirate institutions that determined who did what aboard ship—whether your ancestor would serve as a lookout or as a helmsman, for example—and who would get what as a result of what each did, for example the size of his dividend compared to that of the gunner. Other aspects of their institutions were the unwritten informal rules of appropriate behaviour that the pirates followed by custom, or to avoid condemnation by their crewmates.

Using the terminology of game theory introduced in the previous unit, we could say that The Rover’s articles were the rules of the game, much as the rules of the ultimatum game specify who can do what, when they can do it, and how what each player does determines each player’s payoff.

The institutions provided both the constraints (no drinking after 8pm unless on deck) and the incentives (the best pair of pistols for the lookout who spotted a ship that was later taken). In this unit we use the terms institutions and rules of the game interchangeably.

**INSTITUTIONS**

*Institutions are written and unwritten rules that govern:*

- What people do when they interact in a joint project
- The distribution of the products of their joint effort

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**Figure 5.1 Inequality in the division of the spoils: Pirates and the Royal Navy.**
Experiments showed us in section 4.6 that the rules of the game affect:

- How the game is played
- The size of the total available to those participating
- How this total is divided

For example, the rules (institutions) of the ultimatum game determine who gets to be the Proposer; how much money the Proposer has when the game starts; and the fact that the Responder can refuse any offer, resulting in no payoffs for either player. In the standard ultimatum game, with a Proposer and one Responder, recall that the total to be divided may be zero for both players if the Responder refuses the Proposer's offer. Or, if the Proposer's offer is accepted, the Responder's share is the amount that the Proposer offers to share, while the Proposer gets what remains.

We also saw in section 4.10 that changing the rules changes the outcome: if there are two Responders in the ultimatum game rather than just one, the Proposer knows that at least one of the Responders is likely to accept a low offer. Each Responder knows this too. And because they cannot be sure that their rejecting a low offer will result in the proposer being punished (the other Responder may accept). Responders tend to accept low offers, which they would have rejected as unfair had they been the sole Responder. This means the Proposer has more bargaining power, and gets a larger payoff as a result. We will discover in Unit 7 and Unit 8 that, when people must purchase goods from a single business organisation, they have less bargaining power than when there are many sellers.

In the ultimatum game (and in the economy) the division of the payoffs depends on what is called bargaining power. A party’s bargaining power is the extent of their advantage when dividing the pie. The Proposer in the ultimatum game has the fortunate position of making the offer, and so is likely to get at least half of the pie, while the most the Responder is likely to get is half. Being the Proposer means having more bargaining power, but the power is limited. The Proposer's bargaining power is limited by the need to get the Responder to accept the offer.

The Proposer could have even more than this take-it-or-leave-it power: the rules might allow a Proposer simply to divide up the pie in any way, without any role for the Responder other than to take whatever he gets (if anything). In this case the Proposer has all of the bargaining power and the Responder none. There is an experimental game like this, and it is called (you guessed it) the dictator game.

The past, and even the present, provide many examples of economic institutions that are like the dictator game, in which there is no option to say no. Examples include today’s remaining political dictatorships such as North Korea, and slavery as it existed in the US prior to the end of the American Civil War in 1864. Criminal organisations involved in drugs and human trafficking would be another modern example.
Unit 2 showed that the pay people receive for their work depends on the rules of the game as well as technology. Remember from Unit 1 that productivity of labour started to increase in Britain around the middle of the 17th century. But it was not until the middle of the 19th century that a combination of shifts in the supply and demand for labour and new institutions, such as trade unions and the right to vote for workers, gave wage earners the bargaining power to raise wages substantially.

5.2 EVALUATING INSTITUTIONS AND OUTCOMES: PARETO EFFICIENCY

Whether it is fishermen seeking to make a living while not depleting the stocks of fish, or farmers maintaining the channels of an irrigation system, or two people dividing up a pie, we typically have social norms about what ought to happen. We describe these situations in two ways: what actually happens, and an evaluation of whether it is good by some standard. The first involves facts; the second involves values.

We call the outcome of an economic interaction an allocation.

For the ultimatum game the allocation describes the proposed division of the pie by the Proposer, whether it was rejected or accepted, and the resulting payoffs to the two players.

It is often important to go beyond a description of the allocation and to evaluate the outcome: how good is it? An allocation can be evaluated from two standpoints: efficiency and fairness.

For an engineer, efficiency means the most sensible way to go about achieving something, for example, producing electricity at the least cost or making the most of the use of some scarce resource. This is not what economists mean by the term. For any allocation, an economist interested in efficiency asks whether there is some other allocation in which all of the parties could be better off (each party prefers the allocation), or at least one of them could be better off and none worse off. If there is no allocation for which this is possible, we say the current allocation is Pareto efficient.

<table>
<thead>
<tr>
<th>PARETO EFFICIENCY</th>
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<tbody>
<tr>
<td>Named for Vilfredo Pareto, an Italian economist and sociologist, this describes an allocation with the property that there is no alternative allocation in which at least one party could be better and nobody worse off.</td>
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<table>
<thead>
<tr>
<th>ALLOCATION</th>
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<tbody>
<tr>
<td>An allocation is:</td>
</tr>
<tr>
<td>• A description of who does what</td>
</tr>
<tr>
<td>• Plus the consequences of their actions...</td>
</tr>
<tr>
<td>• ... including who gets what</td>
</tr>
</tbody>
</table>
If something is not Pareto efficient, naturally we call it Pareto inefficient. It’s clear that a Pareto inefficient allocation is not one that we would favour: there is, by definition, an alternative in which at least one party would be better off, and no one would be worse off.

**GREAT ECONOMISTS**

**VILFREDO PARETO**

Vilfredo Pareto (1848-1923), an Italian economist and sociologist, earned a degree in engineering for his research on the concept of equilibrium in physics. He is mostly remembered for the concept of efficiency that bears his name. He wanted economics and sociology to be fact-based sciences, similar to the physical sciences that he had studied at first.

His empirical investigations led him to question the idea that the distribution of wealth resembles the familiar bell curve with a few rich and a few poor in the tails of the distribution, and a large middle-income class. In its place he proposed what came to be called Pareto’s law according to which, across the ages and differing types of economy, there were very few rich people, and a lot of poor people.

His 80-20 rule—derived from Pareto’s law—asserted that the richest 20% of a population typically held 80% of the wealth. Were he living in the US in 2015, he would have to revise that to 90% of the wealth held by the richest 20%, suggesting that his law might not be as universal as he had thought.

In Pareto’s view, the economic game was played for high stakes, with big winners and losers. Not surprisingly, then, he urged economists to study conflicts over the division of goods, and he thought the time and resources devoted to these conflicts were part of what economics should be about. In his most famous book, the *Manual of Political Economy*, he wrote that:

“[T]he efforts of men are utilised in two different ways: they are directed to the production or transformation of economic goods, or else to the appropriation of goods produced by others.”

*Vilfredo Pareto, A Manual of Political Economy* (1906)
His lifelong interest was political and economic inequality, which he combined with a growing hostility towards socialism, trade unions, and government interventions in the economy, eventually leading before his death to some sympathies for the rising Italian fascist movement. He was a pioneer in economic theory, the combination of economics with insights from political science and sociology, and in the empirical estimation of economic quantities.

The difference between Pareto efficient and Pareto inefficient allocations is clear in the prisoners’ dilemma game played by Anil and Bala in Unit 4, shown in Figure 5.2. To determine if an allocation is Pareto efficient we draw a rectangle with a corner at the point in question, say the point \((I, T)\) at which Anil plays IPC and Bala plays Terminator. The rectangle covers the area to the north-east of the point. We ask: is there any feasible outcome in the rectangle? If there is no feasible outcome in this space, then no win-win change from the point \((I, T)\) is possible, and the allocation is Pareto efficient. Figure 5.2 shows you how to check Pareto efficiency for each of the four possible allocations.

**Figure 5.2. Pareto efficient allocations. All of the allocations except mutual pesticide \((T, T)\) are Pareto efficient.**

So Anil playing IPC and Bala playing Terminator is Pareto efficient. Anil may think this is unfair. Even Bala may think it is unfair. Pareto efficiency *has nothing to do with fairness.*

The same is true of the situation in which Anil uses Terminator and Bala chooses IPC \((T, I)\). And both doing IPC \((I, I)\) is also Pareto efficient. The only point that is not Pareto efficient is when both use Terminator \((T, T)\) because both could be better off if
they both used IPC: the point (I, I) is in the shaded rectangle whose corner is at (T, T). Some people might disapprove of outcomes in which free riding occurs, though both outcomes are Pareto efficient.

There are many Pareto efficient allocations that we would not evaluate favourably. In section 4.4 we saw in Figure 4.3 that any split of Anil’s lottery winnings (including giving Bala nothing) is Pareto efficient (to see this, choose any point on the boundary of the feasible set of outcomes, and draw the rectangle with its corner at that point, just as we have done in Figure 5.1: there are no feasible points above and to the right). Similarly, in the ultimatum game an allocation of one cent to the Responder and $99.99 to the Proposer is also Pareto efficient. There is no way to make the Responder better off without making the Proposer worse off.

The same is true of problems such as the allocation of food between people who are more than satisfied and others who are starving. A very unequal distribution of food can be Pareto efficient as long as all the food is eaten by someone who enjoys it even a little.

In contrast, imagine how an engineer might evaluate a situation in which some people had barely enough food to survive while others got fat. The engineer might say: “This is not a sensible way to provide nutrition. It is clearly inefficient”.

But the engineer would be using the everyday meaning of the term. Pareto efficiency has nothing to do with whether the outcome is sensible.

So while, in principle, Pareto inefficient allocations can and should be improved upon (by shifting to the allocation that is better for at least one and not worse for any). There may nevertheless be something wrong with many Pareto efficient allocations.

5.3 EVALUATING INSTITUTIONS AND OUTCOMES: FAIRNESS

For this reason we also evaluate allocations using the concept of justice: by which we mean, is it fair?

Suppose, in our ultimatum game, the Responder accepted an offer of one cent from a total of $100 (rather than refusing, and depriving the Proposer of $99.99). As we have seen in Unit 4 ultimatum game subjects in experiments around the world would typically reject such an offer, apparently because they judged it to be unfair. This would be the reaction of many of us if, instead of being subjects in the experimental
lab, we witnessed the two friends, An and Bai, walking down the street. Both spot a $100 bill, which An picks up and claims the right to distribute. An offers one cent to her friend Bai, and says she wants to keep the rest.

We might be outraged. But we might apply a different standard of justice if we found out that, though both An and Bai had worked hard all their lives, An had just lost her job and was homeless while Bai was well off. Letting An keep $99.99 might then seem fair. Thus we might apply a different standard of justice to the outcome of the game when we know all of the facts.

We could also apply a standard of fairness not to the outcome of the game, but to the rules of the game themselves. Suppose we had observed An proposing an even split, allocating $50 to Bai. Good for An, you say, that seems like a fair outcome. But if this had occurred because Bai had pulled a gun on An, and threatened that unless she offered an even split she would shoot her, we would probably judge the outcome to be unfair.

The example makes a basic point about fairness. Allocations can be judged unfair because of:

- How unequal they are: We measure this inequality along some dimension (such as income, or subjective wellbeing). These are substantive judgments of fairness.
- How they came about: Maybe by force, or by competition on a level playing field for example. These are procedural judgements of fairness.

**Substantive and procedural judgements**

The main difference between the two is that, to make a substantive judgement about fairness, all you have to know is the allocation itself. To make procedural evaluations we require knowledge of the rules of the game and other aspects of why this particular allocation occurred.

Two people making substantive evaluations of fairness about the same situation need not agree, of course. For example, they may disagree about whether fairness should be evaluated in terms of income or happiness. If we measure fairness using happiness as the criterion, a person with a serious physical or mental handicap may need much more income than a person without such disabilities to be equally satisfied with his or her life.
SUBSTANTIVE JUDGEMENTS

These are based on some measure of inequality in the allocation such as:

- **Income**: The reward in money, or some equivalent measure of the individual's command over valued goods and services
- **Happiness**: Measured by subjective wellbeing indicators, such as those introduced in Unit 1
- **Freedom**: The extent one can do (or be) what one chooses without socially imposed limits

DISCUSS 5.1: SUBSTANTIVE FAIRNESS

Consider the society you live in, or another society with which you are familiar.

1. How would you rate income, happiness and freedom as candidates for something that should be made more equal, to make the society fairer?
2. Are there other things that should be more equal to achieve greater fairness in this society?

PROCEDURAL JUDGEMENTS

These are based on an evaluation of the rules of the game that brought about the allocation including:

- **Voluntary** exchange of private property acquired by legitimate means: Were the actions resulting in the allocation the result of freely chosen actions by the individuals involved, for example each person buying or selling things that they had come to own through inheritance, purchase, or their own labour? Or was fraud or force involved?
- **Equal opportunity for economic advantage**: Did people have an equal opportunity to acquire a large share of the total to be divided up, or were they subjected to some kind of discrimination or other disadvantage because of their race, sexual preference, gender, or who their parents were?
- **Deservingness**: Did the rules of the game that determined how much each would get take account of the extent to which an individual worked hard, or otherwise upheld valued social norms?
DISCUSS 5.2: PROCEDURAL FAIRNESS

Consider the society in which you live, or another society with which you are familiar. How would your society score in the above procedural judgements of fairness?

Evaluating fairness in outcomes

We can use these differing judgements to evaluate an outcome in the ultimatum game. The experimental rules of the game will appear to most people’s minds as procedurally fair:

- Proposers were chosen randomly
- The game was played anonymously: Discrimination could not have been involved
- All actions were voluntary: The Responder could refuse to accept the offer, and the Proposer is typically free to propose any amount

When Responders rejected Proposers’ offers, they were objecting to the allocation itself: those who later said that a low offer was “unfair” were making a judgement about the outcome, and not about the rules of the game. This is a substantive, not a procedural judgement.

The rules of the game in the real economy are a long way from the fair procedures of the ultimatum game, and procedural judgements of unfairness are very important to many people, as we will see in Unit 19.

People’s values about what is fair differ. Some, for example, regard any amount of inequality as fair, as long as the rules of the game that determine the allocation are procedurally fair. Others judge an allocation to be unfair if some people are seriously deprived of basic needs, while others consume luxuries.

The American philosopher John Rawls (1921-2002) devised a way to think about these disagreements that may clarify these arguments, and may even sometimes lead us to find common ground on questions of values. We follow three steps:

1. *Fairness applies to all people:* For example, were we to substitute the positions of An and Bai in the above example, so that it was Bai instead of An who picked up the $100 and made the proposal, it would not alter whether the outcome is fair or not.
2. *Imagine a veil of ignorance:* Because of this we can think about justice as if we were evaluating the rules of the game and the resulting outcomes from behind what Rawls called a veil of ignorance. By this he meant that we do not yet know which
positions we would occupy in the society we are considering: we could be male or female, healthy or ill, rich or poor (or with rich or poor parents), in a dominant or an “excluded” ethnic group, and so on. In the $100 on the street game, we would not know if we were the person picking up the money, or the person responding to the offer.

3. **How does the veil of ignorance affect your evaluation?** When we are behind this veil of ignorance, Rawls argued, we would evaluate the constitutions, laws, inheritance practices, and other institutions of a society as an impartial outsider.

The advantage of Rawls’ veil of ignorance is that it invites you, in making a judgement about fairness, to put yourself in the shoes of a person who is quite different from who you really are. It does this by asking you to imagine that following your “choice” of a set of institutions, you would then become part of the society you have endorsed, but with an equal chance of having any of the positions occupied by individuals in that society.

---

**DISCUSS 5.3: THE VEIL OF IGNORANCE**

Suppose that behind a Rawlsian veil of ignorance you could choose to live in a society in which one (but only one) of the three procedural standards for fairness (voluntary exchange of property, equality of opportunity, and deservingness) would be the guiding principle for how the rules of the game are organised.

1. Which one would you choose?
2. Give reasons for your choice.

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Neither philosophy, nor economics, nor any other science, can eliminate disagreements about questions of value. But economics can clarify:

- **How the dimensions of unfairness may be connected**: For example how the rules of the game that give special advantages to one or another group may affect the degree of inequality.
- **The trade-offs between the dimensions of fairness**: For example, do we have to compromise some of the equality of income conception of fairness in order to implement more of the equality of opportunity conception?
- **Public policies that may address concerns about unfairness**: It can also evaluate whether these policies compromise other objectives.
In the remainder of this unit we explore situations in which we describe who produces what, who gains from the process, and what they gain. Like the experiments in Unit 4, we will see that both cooperation and conflict occur. As in the experiments, and in history, we will find that the rules matter.

To do this, recall the model in Unit 3 of the farmer, Angela, who produces a crop. We will use a simple economic model in which two characters appear in a sequence of scenarios:

1. Initially, *Angela works the land on her own*, and as in Unit 3, gets everything she produces.
2. *Next, we introduce a second person who does not farm—but would also like some of the harvest.* He is called Bruno.
3. Initially, Bruno *can force Angela to work for him*. In order to survive, she has to do what he says.
4. Later, the rules change: *the rule of law replaces the rule of force*. Bruno can no longer coerce Angela to work. But he owns the land and if she wants to farm his land, she must agree, for example, to pay him some part of the harvest.
5. Eventually, the rules of the game have changed again in Angela’s favour: Angela and her fellow farmers now have the right to vote and *legislation has been passed that increases Angela’s claim on the harvest*.

For each of these steps we will use an economic model to analyse the changes, analysing them from the standpoint of both efficiency and the distribution of income between Angela and Bruno. Remember that:

- Economics can tell you whether an outcome is Pareto efficient or not.
- But *economics cannot tell you if this outcome is fair*. This depends on your own analysis of the problem using the concepts of substantive and procedural fairness.

### 5.4 Mutual Gains and Conflict

Recall that Angela’s harvest depended on the amount of labour devoted to farming according to the production function. She worked the land, enjoyed the remainder of the day as free time, and consumed the grain that this activity produced. Recall also that the slope of the feasible consumption frontier is the *marginal rate of transformation* (MRT) of free time into grain.

Angela values both the grain produced and her free time, and the value that she places on each depends on how much of each she has. We represent these values, as we did in Unit 3, as indifference curves, giving all of the combinations of grain and
free time for which she does not prefer one to the other. Recall that the slope of the indifference curve is called the marginal rate of substitution (MRS) between grain and free time.

The steeper the indifference curve, the more Angela values free time compared to how much she values grain. You can see this in Figure 5.3 if you look at how steep the indifference curves are when she has 8 bushels of grain, and differing amounts of free time: as her free time increases (moving to the right) the curves become flatter. She values free time less.

We have drawn Angela’s indifference curves in Figure 5.3 as we did in Figure 3.21 so that as she gets more grain the marginal rate of substitution does not change. You can see this in the figure by noticing that, at 16 hours of free time the curves are equally steep when she has less than 8 bushels, exactly 8 bushels and more than 8 bushels (the three indifference curves we have drawn).

What this means is that she values grain some constant amount relative to free time, independently of how much she has. (Why might this be? Probably because she does not eat it all, she sells it and uses the proceeds to buy other things she needs.) This is just a simplification that makes our model easier to understand. Remember: when drawing the indifference curves for the model in this unit, simply shift them up and down, keeping the MRS constant at a given amount of free time.

Angela is free to choose her typical hours of work to achieve her most preferred combination of free time and grain.

![Figure 5.3](image_url). Farmer-owner Angela’s feasible frontier, best feasible indifference curve and choice of hours of work.
Figure 5.3 shows that the best Angela can do, given the limits set by the feasible frontier, is to work for 8 hours, which gives her 16 hours of free time and production and consumption of 9 bushels of grain. This is the number of hours of work at which the marginal rate of substitution is equal to the marginal rate of transformation. She cannot do better than this! (If you’re not sure why, go back to Unit 3 and check.) This Leibniz shows how to determine the best she can do using calculus, and our third Leibniz illustrates these quasi-linear preferences with specific utility and production functions.

But now, Angela has company. The other person is called Bruno, who is not a farmer but he will claim some of Angela’s harvest. We will study a number of different rules of the game that explain how much is produced by Angela, and how it is divided between her and Bruno. For example, in one scenario, Bruno is the landowner and Angela pays some grain to him as rent for the use of the land.

Figure 5.4 shows Angela and Bruno’s combined feasible frontier. The frontier indicates how many bushels of grain Angela can produce given how much free time she takes. For example, if Angela takes 12 hours free time and works for 12 hours, then she produces 10.5 bushels of grain. One possible outcome of the interaction between Angela and Bruno is that 5.25 bushels go to Bruno, and Angela retains the other 5.25 bushels for her own consumption.

The slideline demonstrates that each point in the figure is an allocation, showing how much work Angela did and how much grain she and Bruno got.

![Feasible outcomes in a bargaining problem](image)

Figure 5.4 Feasible outcomes in a bargaining problem.

Which allocations are likely to occur? Not all of them are even possible. For example point H (the last step in Figure 5.4) is an allocation in which Angela works 12 hours a day and receives nothing (Bruno takes the entire harvest), so Angela would not survive. Of the allocations that are at least possible, the one that will occur depends on the rules of the game.
**DISCUSS 5.4: USING INDIFFERENCE CURVES**

In Figure 5.4, point $F$ shows an allocation in which Angela works more and gets less, and point $G$ shows the case in which she works more and gets more.

Show how you could use Angela’s indifference curves (from Unit 3) to determine which of $E$, $F$ or $G$ she prefers.

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**Mutual gains and their distribution in Amazon Mechanical Turk**

To see how every economic interaction, and the distribution of the gains, among people can be analysed, consider an example. When you sign up to Amazon Mechanical Turk, the online “marketplace for work,” you may select one of more than 400,000 “human intelligence tasks”, or HITs. The HITs are offered by Requesters. These are businesses and individuals looking for individuals to complete tasks such as listing product preferences, writing product descriptions, choosing preferred images, or even naming their honeymoon destination. Each HIT is described, along with the qualifications required and the payment per selected task. As a Mechanical Turk worker (a *turker*), you complete the HIT you have selected, and you are then paid.

The allocation in this case is the time you spent, your product transferred to the requester (the completion of the HIT), and your pay. The table below compares Angela’s experience of farming with turking:

<table>
<thead>
<tr>
<th></th>
<th>FARMER</th>
<th>TURKER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXTENT OF MUTUAL GAINS REALISED</strong></td>
<td>Could both Angela and Bruno be better off if she worked fewer or more hours?</td>
<td>Is there a redesign of the HIT, the pay and other aspects so that both the requester and the turker could be better off?</td>
</tr>
<tr>
<td><strong>DISTRIBUTION OF MUTUAL GAINS</strong></td>
<td>Given her hours of work and his ownership rights in the land is the distribution of grain and her working time fair?</td>
<td>Is the pay a fair compensation for the effort and skills of the turker, given the benefit to the requester and their economic situation?</td>
</tr>
<tr>
<td></td>
<td>Is his ownership of the land fair?</td>
<td></td>
</tr>
</tbody>
</table>
**DISCUSS 5.5: AN ALLOCATION YOU HAVE KNOWN**

Think of another job that you, or someone you know, has done (for example a barista or an office clerk). Using the analysis of the farmer and the turker above:

1. Identify the allocation associated with the job you have chosen.
2. Is the allocation Pareto efficient?
3. Is the allocation fair?

**5.5 TECHNICALLY FEASIBLE ALLOCATIONS**

Initially Angela could consume (or sell) everything she produced. Now Bruno has arrived, and he has a gun. He has the power to implement any allocation that he chooses. He is even more powerful than the dictator in the dictator game (in which a Proposer dictates how a given pie is to be divided). Why? Bruno can also determine the size of the pie, as well as how big his and Angela’s slices are going to be.

Unlike the experimental subjects in Unit 4, in this model he is entirely self-interested. He wants only to maximise the amount of grain he can get from Angela. Angela, we will also assume, is similarly interested only in her own free time, and the grain she gets (as described by her indifference curves).

We now make another important assumption. If Angela does not work Bruno’s land, he gets nothing (there are no other prospective farmers that he can exploit). What this means is that Bruno’s reservation option (what he gets if Angela does not work for him) is zero. As a result, Bruno thinks about the future and he will not take so much grain that Angela will die. He has to impose some allocation that keeps her alive.

First, we will work out the set of technically feasible combinations of Angela’s hours of work and the amount of grain she produces. By *technically feasible* we mean, the outcomes that are possible if the only limits on what can occur are the technology (the production function) and biology (Angela’s need to get at least enough nutrition to carry out the work tasks of the allocation and survive).
How do we determine what is technically feasible? We already know from the feasible frontier in Figure 5.4 that the total amount consumed by Bruno and Angela combined cannot exceed the amount produced, which in turn depends on the hours that Angela works.

But we have also seen there are some combinations of grain and free time that would leave Angela so undernourished or overworked that she would not survive—for example point H in Figure 5.4 is biologically infeasible.

Angela’s minimum nutrition requirements depend on how much she works. In Figure 5.5 we show the minimum amount of grain that would allow Angela to survive for each amount of work that she does. If she does not work at all, then she needs two bushels and a half to survive. If she expends energy working she needs more food; that’s why the curve rises from right to left as her hours of work and higher expenditure of calories increase. This is the biological survival constraint. Points below it are biologically infeasible, while points above the feasible frontier are technically infeasible. The slope of the biological survival constraint is the marginal rate of substitution between free time and grain in securing Angela’s biological survival.

![Figure 5.5](image)

**Figure 5.5** Technically feasible allocations.

Note that there is a maximum amount of work that would allow her barely to survive (because of the calories she burns up working). As we saw in Unit 2, throughout human history people crossed the survival threshold when the population outran the food supply. This is the logic of the Malthusian population trap. The productivity of labour placed a limit on how large the population could be.
**DISCUSS 5.6: A GOOD HARVEST**

Try shifting one or both of the curves in Figure 5.5 to represent the effects of a good harvest, or of population growth as in the Malthusian model in Unit 2. For example, how would you represent the Irish famine? Identify the allocation associated with the job you have chosen.

In Angela’s case, however, it is not only the limited productivity of her labour that might jeopardise her survival, but also how much of what she produces is successfully claimed by Bruno. To see the difference note in Figure 5.5 that, if Angela could consume everything she produced, (the height of the feasible frontier) and if she could choose her hours of work, her survival would not be in jeopardy. The reason is that the biological survival constraint is below the feasible frontier for a great many hours of work and free time that she might choose. The question of biological feasibility arises because of Bruno’s claims on her output.

In Figure 5.5, the boundaries of the feasible solutions to the allocation problem are formed by the feasible frontier and the biological survival constraint. This lens-shaped shaded area gives the technically possible outcomes. We can now ask what actually happens—which allocation occurs, and how does this depend on the institutions governing how Bruno and Angela interact?

**5.6 ALLOCATIONS IMPOSED BY FORCE**

With the help of his gun, Bruno can choose any point in the lens-shaped technically feasible set of allocations. But which will he choose?

He reasons like this:

**Bruno**  For any number of hours that I order Angela to work, she will produce the amount determined by the feasible frontier of the production function. But for that amount of work I’ll have to give her at least the amount shown by the biological survival constraint. I get to keep the difference between what she produces and what I need to give her, so that I can continue to exploit her. Therefore I should find the hours of Angela’s work for which the vertical distance between the feasible frontier and the biological survival constraint (Figure 5.6) is the greatest.
Remember the amount that Bruno will get if he implements this strategy is his economic rent, in this case meaning the amount he gets over what he would get if Angela were not his slave (which, in this model, we set at zero).

Bruno first considers letting Angela continue working 8 hours a day, as she did when she had free access to the land. At that time she produced 9 bushels. If she works for 8 hours she needs 3.5 bushels of grain to survive. So Bruno could now take 5.5 bushels without jeopardising his future opportunities to benefit from Angela's labour.

Bruno is studying Figure 5.6 and asks for your help. You have worked out that the MRS is less than the MRT at 8 hours of work:

**You** Bruno, your plan cannot be right. If you forced her to work a little more, you wouldn’t have to let her have much more grain because the biological survival constraint is relatively flat at 8 hours of work. But the feasible frontier is steep, so while you’d have to let her have a little more so that she would have the energy to work longer, she’d produce a lot more if you imposed longer hours..

You demonstrate the argument to him using the slideline in Figure 5.6, which indicates that the vertical distance between the feasible frontier and the biological survival constraint is the greatest when Angela works for 11 hours. If Bruno commands Angela to work for 11 hours then she will produce 10 bushels and Bruno will get to keep 6 bushels for himself. We can use Figure 5.6 to find out how many bushels of grain Bruno will get for any technically feasible allocation.

Look again at the last step in Figure 5.6. We have plotted the grey arrows showing the amount of grain that Bruno gets in the lower panel. You can see that the amount he gets falls when Angela works for more or less than 11 hours. By joining up the points we see that the amount Bruno gets is hump-shaped, and peaks at 11 hours of work and 13 hours of free time.

How can you calculate Angela's hours of work to give Bruno the greatest amount of grain, consistent with Angela surviving? Find out how to do this mathematically in this unit’s Einstein section.
5.7 POWER AND THE DISTRIBUTION OF ECONOMIC RENTS

Once we move from studying a situation of coercion to one in which there is a legal system that prohibits Angela's enslavement and protects private property and the rights of landowners and workers, it is necessary to define new concepts.

In Unit 1, we defined private property as the right to use and exclude others from the use of something, and the right to sell it (or to transfer these rights to others). Bruno owns the land and

Figure 5.6 Coercion: The maximum technically feasible transfer from Angela to Bruno.
can exclude Angela if he chooses. But how much grain he will get as a result of his private ownership of the land still depends on his power over Angela, just as it did when he was able to use force.

Power in economics takes two main forms:

- Setting the terms of an exchange by making a take-it-or-leave-it offer (as in the ultimatum game).
- Imposing or threatening to impose heavy costs, unless the other acts in a way that serves the advantage of the person with power (as in Bruno’s use of force).

The Proposer’s advantage in the ultimatum game is a form of power called bargaining power. The Proposer makes a take-it-or-leave-it offer. The Responder could instead have been the lucky one, having the power associated with being Proposer, and going home with a half or more of the pie. In experiments the assignment of the role of Proposer or Responder, and hence the assignment of bargaining power, is usually done by chance.

In real economies, as in the case of Angela and Bruno, the assignment of power is definitely not random.

Those who own a factory or other business are the ones proposing the wage and the hours of work. Those seeking employment are like Responders, but with a difference: typically more than one person is seeking to land a job, so if one of them rejects the employer’s proposal the employer can move to the next potential worker, just as in the ultimatum game when there are two Responders. There is another difference. Because the place of employment is the employer’s private property, the employer can exclude the worker by firing her unless her work is up to the specifications of the employer.

We will see in the next unit how the labour market, along with other institutions, gives both kinds of power to employers. In Unit 7 we explain how firms selling goods sometimes have the power to propose take-it-or-leave-it offers to consumers, and in Unit 11 how the credit market gives power to banks and other lenders over people seeking mortgages and loans.

As we have seen in the previous section, power can be used in less subtle ways too. Perhaps the reason that Bruno is able to coerce Angela to work is that Angela’s family was displaced from the land by force. In this case Bruno gained his power to make take-it-or-leave-it offers because he exercised a more overt form of power: physical coercion.

But, in a capitalist economy in a democratic society, most economic interactions are not conducted at the point of a gun. They are usually the result of individuals pursuing their objectives as best they can, given the property available to them, and given the power they exercise under the institutions of that economy. Recall from
Unit 4 that people bargain over their economic rent. Rents are also sometimes called *gains from exchange*, because they are how much a person gains by engaging in the exchange compared to not engaging.

When people participate voluntarily in an interaction, the sum of the rents is termed the *surplus* (or sometimes the *joint surplus*, to indicate that it’s the sum of all of the rents).

Each person involved has to receive at least some rent, or otherwise they would have no incentive to participate. Angela, in the previous example, was coerced to farm Bruno’s land. Next we look at the situation where she can simply say no. Angela is no longer a slave. Bruno has lost the power to coerce her, but not the power to make a take-it-or-leave-it offer, just like the Proposer in the ultimatum game.

5.8 BARGAINING POWER AND THE DISTRIBUTION OF THE SURPLUS

We check back on Angela and Bruno, and immediately notice that Bruno is now wearing a suit, and is no longer armed. He explains that this is no longer needed because there is now a government with laws administered by courts, and professional enforcers called the police. Bruno now owns the land, and Angela must have permission to use his property. He can offer a contract in which she can farm the land; in return she gives him part of the harvest. Alternatively, she can refuse the offer.

Bruno: It used to be a matter of power, but now both Angela and I have property rights: I own the land, and she owns her own labour. The new rules of the game mean that I can no longer force Angela to work. She has to agree to the allocation that I propose.

You: And if she doesn’t?

Bruno: Then it’s no deal. She doesn’t work on my land, I get nothing, and she gets barely enough to survive from the government.

*Just like the ultimatum game*, you think.

You: So you and Angela have the same amount of power?

Bruno: Certainly not! I am the one who gets to make a take-it-or-leave-it offer. I am like the Proposer in the ultimatum game; except that this is no game. If she refuses she goes hungry, and I have plenty of grain from other farmers.
You: But if she refuses you get zero?

Bruno: That never happens.

Why does he know this? Bruno knows that Angela, unlike the subjects in the ultimatum game experiments, is entirely self-interested (she does not punish an unfair offer). If he makes an offer that is just a tiny bit better for Angela than not working at all and getting subsistence rations, she will accept it.

Now he asks you a question similar to the one he had asked earlier:

Bruno: In that case, what should my take-it-or-leave-it offer be?

You had answered by showing him the biological survival constraint. Now the limitation is not that the offer is such that Angela survives, but rather that she agrees. Over years of interacting with Angela and people like her he knows that she values her free time, so the more hours he offers her to work, the more he is going to have to pay.

You: Why don’t you just look at Angela’s indifference curve that passes through the point where she does not work at all and barely survives? That will tell you how much is the least you can pay her for each of the hours of free time she would give up to work for you.

Point Z in Figure 5.7 is the allocation in which Angela does no work and gets only survival rations from the government (or from her family). This is her reservation option: if she refuses Bruno’s offer she has this option in reserve. Use the slideline to see Angela’s reservation curve: the curve giving all of the allocations that are just as highly valued by Angela as the reservation option. Below or to the left of the reservation indifference curve she is worse off than in her reservation option. Above and to the right she is better off.

The set of points bounded by the reservation indifference curve and the feasible frontier is the set of all economically feasible allocations, once Angela has to accept agree to the proposal that Bruno makes. Bruno thanks you for this handy new tool for figuring out the most he can get from Angela. You remind him that what you showed him is exactly the same as Angela’s reservation indifference curve in Unit 3.

The biological survival constraint and the reservation indifference curve have a common point (Z): at that point, Angela does no work and gets subsistence rations from the government or her family. Other than that the two curves differ. The reservation indifference curve is uniformly above the biological survival constraint. The reason, you explain to Bruno, is that however hard she works along that frontier, she barely survives; and the more she works the less free time she has, so the unhappier she is. Along the reservation indifference curve, by contrast, she is just as well off as at her reservation option, meaning that being able to keep more of the grain that she produces compensates exactly for her lost free time.
DISCUSS 5.7: BIOLOGICAL FEASIBILITY

Using Figures 5.5 and 5.7:

1. Explain why a point on the biological survival constraint is higher (more grain is required) when Angela has fewer hours of free time. Why does the curve also get steeper when she works more?

2. Explain why the biologically feasible set does not have to be equal to the economically feasible set.

3. Explain (by shifting the curves) what happens if a more nutritious kind of grain is available to Angela.

4. Explain (by shifting the curves) what happens if there is a famine due to a bad harvest.

5. What happens in Figure 5.5 when there is population growth as in the Malthusian model from Unit 2?

We can see that both Angela and Bruno may benefit if a deal can be made. The reason is that their exchange—allowing her to use his land (that is, not using his property right to exclude her) in return for her sharing some of what she produces—makes it possible for both to be better off than if no deal had been struck. Both benefit from a deal:
• As long as Bruno gets some of the crop he will do better than if there is no deal.
• As long as Angela’s share makes her better off than she would have been if she took her reservation option, taking account of her work hours, she will be also benefit.

This potential for mutual gain is why their exchange need not take place at the point of a gun, but can be motivated by the desire of both to be better off. All of the economically feasible allocations that represent mutual gains are in the last step of Figure 5.7.

Of course the fact that mutual gains are possible does not mean that both Angela and Bruno will benefit equally. It all depends on the institutions in force. If Bruno has the power to make a take-it-or-leave-it offer, subject only to Angela’s agreement, he can capture the entire surplus (less the tiny bit necessary to get Angela to agree). Bruno knows this already.

Once you have explained the reservation indifference curve to him, Bruno knows which allocation he wants. He maximises the amount of grain he can get consistent with Angela farming the land at the maximum height of the lens-shaped region. This is the maximum vertical distance between Angela’s reservation indifference curve and the feasible frontier, which will be where the MRT on the feasible frontier is equal to the MRS in Angela’s reservation indifference curve. Figure 5.8a shows that this allocation requires Angela to work for fewer than she did under coercion.

Figure 5.8a Bruno’s take-it-or-leave-it proposal when Angela can refuse.

So Bruno would like Angela to work for 8 hours and give him 4.5 bushels of grain. How can he implement this allocation? All he has to do is to make a take-it-or-leave-it offer of a contract allowing Angela to work the land in return for a land rent of 4.5 bushels per day. If Angela has to pay 4.5 bushels (CD in Figure 5.8a) then she
will choose to produce at point C, where she works for 8 hours. You can see this in the figure; if she produced at any other point on the feasible frontier and then gave Bruno 4.5 bushels she would have lower utility—she would be below her reservation indifference curve. But she can achieve her reservation utility by working for 8 hours, so she will accept the contract.

Since Angela is on her reservation indifference curve, only Bruno benefits from this exchange. The entire surplus goes to Bruno. His economic rent (equal to the land rent she pays him) is the surplus.

Notice that Angela chooses the same hours of work under this contract that she did when she could work the land without paying rent. Why does this happen? However much rent Angela has to pay, she will choose her hours of work to maximise her utility, so she will produce at a point on the feasible frontier where the MRT is equal to her MRS. And we know that her preferences are such that her MRS doesn’t change with the amount of grain she consumes, so it will not be affected by the rent. This means that if she can choose her hours, she will work for 8 hours irrespective of the land rent (as long as this gives her at least her reservation utility).

Figure 5.8b shows how the surplus varies with Angela’s hours if she is on her reservation indifference curve, in comparison with the case of coercion, when she was on her biological survival constraint. Bruno should make an offer where Angela has to pay him 4.5 bushels to rent the land. As we can see, she will work for 8 hours and keep the difference between the total amount she produces and the rent that she paid to Bruno. We can see that the amount of grain Bruno gets falls as Angela works more or less than 8 hours. Again, if we join up the points we can see that the amount Bruno gets is hump-shaped. The peak is lower than when Bruno has the power to order Angela to work, because he needs Angela to agree to the proposal.

**DISCUSS 5.8: TAKE IT...**

1. Why is it Bruno, and not Angela, who is in a position to make a take-it-or-leave-it offer?
2. Are there conditions under which the farmer, not the landowner, might have this power?
DISCUSS 5.9: … OR LEAVE IT

We have assumed that Angela would accept anything that made her better off than her reservation position, irrespective of how unfair she thought the division of the surplus was. But suppose that Angela was like the players in the ultimatum game experiment who preferred to give up their rent entirely, rather than participate in an unfair division of the surplus with the Proposer.

What would her new reservation indifference curve look like?
5.9 THE PARETO EFFICIENCY CURVE FOR DIFFERING DISTRIBUTIONS OF THE SURPLUS

Remember that Angela chose to work for 8 hours, producing 9 bushels of grain, when she had to pay rent and when she did not. In both cases there is a surplus of 4.5 bushels: the difference between the amount of grain produced, and the amount that would give Angela her reservation utility.

The two cases differ in who gets the surplus: when Angela had to pay rent to Bruno, he took the whole of the surplus; when she could work the land for herself she received the surplus herself. But both allocations are Pareto efficient:

- They are Pareto efficient because, at both, the MRT on the feasible frontier is equal to the Angela's MRS.
- Any allocation where the MRT is not equal to the MRS would not be Pareto efficient, because Angela's hours could be then changed to make her better off without affecting what Bruno gets.

Figure 5.9a shows that there are many other Pareto-efficient allocations for which Angela works for 8 hours but the surplus is distributed differently. Point C is the outcome when Angela is an independent farmer. Use the slideline to compare this with Bruno’s take-or-leave-it offer, and to see the other Pareto-efficient allocations.

Figure 5.9a Pareto efficient allocations and conflicts of interest.
What is true of $C$ and $D$ is true of each point between them: the distribution of the surplus differs but the allocations are Pareto efficient. All of the points that are Pareto efficient make up what is called the Pareto efficiency curve. (You will also hear it called the contract curve, even in situations where there is no contact, which is why we prefer the more descriptive term Pareto efficiency curve.) Points $C$, $D$, and the points in between are thus on the Pareto efficiency curve.

**Pareto Efficiency, and the Pareto Efficiency Curve**

We know that a Pareto efficient allocation is:

- An allocation with the property that there is no alternative technically feasible allocation in which at least one person would be better off, and nobody worse off.
- The set of all such allocations is the Pareto efficiency curve. It is also referred to as the contract curve, even in social interactions in which there is no contract.

In Figure 5.9b, we look at a hypothetical allocation where Angela shares in the surplus by getting grain over and above her reservation indifference curve.

In such an allocation, Angela’s economic rent is $GD$ and Bruno’s is $CG$: the sum is the surplus, $CD$. Because $MRT = MRS$ at this point (like at points $C$ and $D$), the allocation is Pareto efficient.

![Figure 5.9b](image)

**Figure 5.9b** Angela’s economic rent, the land rent she pays to Bruno, and Bruno’s economic rent along the Pareto efficiency curve.
Both Bruno and Angela prefer Point $G$ to their reservation option, point $Z$ in Figure 5.7, in which Bruno gets zero and Angela gets 2.5 bushels and 24 hours of free time. This is true of every point in the dark shaded lens-shaped area shown in the last step of Figure 5.7. Each point in this space is called a Pareto improvement over point $Z$ (the mutual reservation option) and is said to Pareto dominate point $Z$.

The Pareto efficiency curve between points $C$ and $D$ is important because it gives all of the points that are both a Pareto improvement over the “no deal” reservation option, and are Pareto efficient. If Bruno and Angela are going to bargain over who gets what, they obviously should be thinking about settling on a point on the line $CD$. If they end up anywhere else, as we will soon see, they both could do better if they kept on bargaining.

5.10 Politics: Sharing the Surplus

Bruno thinks that the new rules, requiring him to make an offer that Angela will not refuse, are not so bad after all. Angela too is better off than she had been when she had barely enough to survive. But she would like a share in the surplus.

She and her fellow farm workers agitate for a new law that limits the work time that can be imposed to 4 hours a day, while requiring that total pay is at least 4.5 bushels. They threaten to not work at all unless the law is passed.

Bruno    Angela, you and your colleagues are bluffing.

Angela    No we are not: we would be no worse off at our reservation option than under your contract, working the hours and receiving the small fraction of the harvest that you impose!

Angela and her fellow workers win, and the new law limits the working day to 4 hours.

How did things work out?

Angela had been working for 8 hours and getting 4.5 bushels of grain, before the short hours law (when Bruno was charging maximum rent). This is point $D$ in Figure 5.10. The new law implements the allocation in which Angela and her friends now work 4 hours, getting 20 hours of free time as a result and the same number of bushels. Since they have the same amount of grain and 4 more hours of free time, they are better off. Figure 5.10 shows they are now on a higher indifference curve.
What Angela gets

Bushels of grain

Angela's reservation indifference curve, IC₁

IC₂

C

E

D

What Angela gets

FF: Angela and Bruno combined

Figure 5.10 The effect of an increase in Angela’s bargaining power through legislation.

You can see that Angela is better off at F than at D. She is also better off than she would be with her reservation option, which means she is now receiving an economic rent. The size of Angela’s rent is a measure in bushels of grain units of how much better off she is at the new situation (F) than at her reservation option (on IC₁). It can be described in a number of ways:

- **The vertical distance between her reservation indifference curve and the indifference curve she is able to achieve under the new legislation**, measured in grain. In Figure 5.10, this is the vertical distance between indifference curves IC₁ and IC₂.
- **The maximum amount of grain per year that Angela would give up to live under the new law rather than in the situation before the law was passed.**
- (Because Angela is obviously political) **the amount she would be willing to pay so that the law passed**, for example by lobbying the legislature or contributing to election campaigns.

Bruno is not happy. You try to cheer him up:

**You** Next time they threaten to quit working, saying they have nothing to lose, they really will be bluffing. They have their economic rent to lose. Remember, Bruno, Angela’s economic rent is for her the opportunity cost of telling you to get lost: now she will not be tempted to walk away.

Bruno can see that this rent will be useful later. We will return to it in the next unit, and later in the course.
5.11 BARGAINING TO A PARETO-EFFICIENT SHARING OF THE SURPLUS

Angela and her friends are pleased with their success. She asks what you think of the new policy.

You Congratulations, but your policy is far from the best you could do.

Angela Why?

You Because you are not on the Pareto efficiency curve! Under your new law, Bruno is getting the amount of bushels shown by $EF$ and cannot make you work more than four hours. So why don't you offer to continue to pay him the same amount of bushels that he is now getting, in exchange for agreeing to let you keep anything you produce above the amount you have given to him? Then you get to choose how many hours you work.

The small print in the law allows a longer work day if both parties agree, as long as the 4-hour day is the workers’ reservation option if no agreement is reached.

You now redraw Figure 5.10 and use the concepts of the surplus and the Pareto efficiency curve from Figure 5.9 to show Angela how she can get an even better deal.

You Look at Figure 5.11. The surplus is largest at 8 hours of work, just like in Figure 5.8b. When you work for 4 hours the surplus is small, and you pay most of it to Bruno. If you increase the surplus you can pay him the same amount, and your own surplus will be bigger—so you will be better off. Use the slideline to see how.

The move away from point $D$ (at which Bruno had all the bargaining power and experienced all the gains from exchange) to a point where Angela is better off consists of two distinct steps:

1. From $D$ to $F$, the outcome imposed by Angela’s legislation. This was definitely not win-win: Bruno lost because his economic rent at $F$ is less than the maximum feasible rent that he got at $D$. Angela benefitted.

2. Once at the legislated outcome, there were many win-win possibilities open to them. They are shown by the segment $GH$, on Pareto efficiency curve. Win-win alternatives to the allocation at $F$ are possible by definition, because $F$ was not Pareto efficient.
Bruno wants to negotiate. He is not happy with Angela's proposal of $H$.

**Bruno**  I am no better off under this new plan than I would be if I just accepted the legislation that the farmers passed.

**You**  But Bruno, Angela now has bargaining power, too. The legislation changed her reservation option, so it is no longer 24 hours of free time at survival rations. Her reservation option is now the legislated allocation at point $F$. I suggest you make her a counter offer.

**Bruno**  Angela: I’ll let you work the land for as many hours as you choose if you pay me half a bushel more than $EF$.

They shake hands on the deal.

Because Angela is free to choose her work hours, subject only to paying Bruno the extra half bushel, she will work 8 hours where $MRT = MRS$. Because this deal lies between $G$ and $H$, it is a Pareto improvement over point $F$. Moreover because it is on the Pareto efficient curve $CD$, we know there are no further Pareto improvements to be made starting from any point on the line segment $GH$. This is true of every other allocation on $GH$—they differ only in the distribution of the mutual gains, as some favour Angela while others favour Bruno. Where they end up will depend on their bargaining power.
5.12 A POLICY TO REDISTRIBUTE THE SURPLUS AND RAISE EFFICIENCY

Angela and Bruno live in the hypothetical world of an economic model. But real farmers and landowners face similar problems.

In the Indian state of West Bengal, landless farmers rent land from landowners, and give them a share of the crop as payment. A farmer working under this kind of contract is called a sharecropper, or a *bargadar* in the Bengali language.

The contractual arrangements throughout this vast state—home to more people than live in Germany—varied little from village to village, with virtually all bargadars giving half their crop to the landowner at harvest time. This had been the norm since at least the 1340s, when Ib’n Battuta had visited Bengal on his travels.

But, like Angela, in the second half of the 20th century many thought this was unfair, because of the extreme levels of deprivation among the sharecroppers in West Bengal: in 1973, 73% of the rural population lived in poverty, one of the highest poverty rates in India. In 1978 the newly-elected Left Front government of West Bengal adopted new laws, called *Operation Barga*. This stated that:

- Bargadars could keep up to three-quarters of their crop.
- Bargadars were protected from eviction by landowners, provided they met this 25% quota.

Both provisions of Operation Barga were advocated as a way of increasing efficiency. There are certainly reasons to predict that the size of the pie would increase, as well as the incomes of the farmers:

- *Bargarders had a greater incentive to work hard and well*: Keeping a larger share meant that there was a greater reward if they grew more crops.
- *Bargarders had an incentive to invest in improving the land*: They had confidence that they would farm the same plot of land in the future, so would be rewarded for their investment.

West Bengal enjoyed a subsequent dramatic increase in farm output per unit of land, as well as farm incomes. By comparing the output of farms before and after the implementation of Operation Barga, economists concluded that both effects—improved work motivation and investment—occurred: one study suggested that the Operation Barga was responsible for around 28% of the subsequent growth in agricultural productivity in the region. The empowerment of the bargadars also had positive spillover effects as local governments became more responsive to the needs of poor farmers.
Operation Barga was later cited by the World Bank as an example of good policy for economic development.

But the limitation on the crop share that bargaders needed to give up lowered the incomes of some landowners. Therefore the change in policy was not a Pareto improvement.

Even though it was not Pareto efficient, by increasing the income of the poorest people in West Bengal, we might judge that Operation Barga was fair. We can assume that many people in West Bengal thought so, because they continued to vote for the Left Front alliance. It stayed in power from 1977 until 2011.

We can study the effect of land reform on the distribution of income using the Lorenz curve introduced in Unit 1 to compare inequalities among people earning varying incomes. We do not have detailed information for Operation Barga, but we can consider inequalities in a hypothetical village with just two groups of people: sharecroppers and landowners.

Imagine there are 10 landowners, each owning 10 hectares, and 90 others who farm the land as sharecroppers, but who own no land. The Lorenz curve for the distribution of land is given by the lower boundary of the shaded area in Figure 5.12, indicating that the poorest 90% of the population own none of the land, while the remaining 10% own all of the land.

If instead each member of the population owned one hectare of land—perfect equality in land ownership—then the Lorenz curve would be a line at a 45-degree angle (indicating that the “poorest” 10% of the population have 10% of the land, and so on, but we say “poorest” in inverted commas because if everyone had one hectare, then everyone is equally poor, and equally rich).

Figure 5.12 The Lorenz curve and Gini coefficient for wealth ownership.
In the economy depicted in Figure 5.12, the Gini coefficient for land ownership is 0.9.

Figure 5.13 *How a land tenure reform in West Bengal, India reduced the Gini coefficient.*

To see how Operation Barga worked, recall that farmers are paying a rent of 50% of their crop to the landowner. Operation Barga raised the farmer’s crop share as shown in the figure, so that the farmers now received 75% of the crop. As a result, the Gini coefficient of income was reduced from 0.4 (similar to the US) to 0.15 (well below that of the most equal of the rich economies, such as Denmark).

5.13 CONCLUSION

When the pirates on Captain Roberts’ *The Rover* agreed unanimously to a constitution, they accepted a set of rules of the game—that is, institutions—that would determine who did what on the ship and how the spoils were to be divided. The same is true for requesters and turkers who sign up for Amazon Mechanical Turk.

When two or more people voluntarily come together to undertake a common project, whether pirates, turkers, or Angela farming Bruno’s land (when Bruno’s proposed terms were at least minimally acceptable to Angela), their cooperation results in
the possibility of mutual gains from exchange. They are potentially both better off having engaged in a common project than they would have been otherwise, because otherwise they gain only their reservation utility.

The same is true when people directly exchange, or buy and sell, goods for money. If you have more apples than you can consume, and your neighbour has an abundance of pears, the same logic applies. The apples are worth less to you than they are to your neighbour, and the pears are worth more to you. So there must be some rate of exchange under which you are happy to exchange some apples for some pears.

This logic applies to land and labour, or requesters with tasks and would-be turkers with time on their hands. When people with differing needs, property and capacities meet, there is an opportunity to generate gains for all of them. That is why people often like to come together in markets, online exchanges or pirate ships. The mutual gains are the pie.

Whether they are able to mutually benefit depends on technology and biology. If Bruno’s land had been so unproductive that no amount of labour would have produced enough to compensate Angela for her time, then there would have been no deal that they could strike. Amazon Mechanical Turk is successful because people around the world (many of them with abundant free time and little income) can work on the projects of comparatively rich, but busy, requesters in the US.

Figure 5.14 Institutions, mutually beneficial interactions and distribution.

Among the set of allocations that are technically feasible, the ones that we observe through history are largely the result of the institutions, including property rights and bargaining power, that were (or are) present in the economy. The institutions answer two questions (summarised in Figure 5.14):
• **Who does what**, so that mutual gains are possible?
• **Who gets what**, or how are the mutual gains distributed among the parties to the exchange?

Figure 5.15 summarises the two ways to evaluate the allocations introduced in sections 5.3 and 5.4. Of course, the Pareto efficiency and fairness of the allocation are not the only values we might use to evaluate economic interactions. If we value the freedom of the participants we might also be concerned about the process: could they refuse to participate without fear of physical harm or other substantial costs? We might also value interactions that help people learn and adhere to other values that society holds to be important, such as tolerance, honesty and generosity.

Our imagined story of Angela and Bruno, and the true story of the Bengali bargadars, teach three lessons, to which we will return in subsequent units when we discuss policies to try to implement Pareto efficient outcomes with distributions that are considered to be fair by most people.

Figure 5.15 *Efficiency and fairness.*

- **When one person or group has power to dictate the allocation, subject only to not making the other party worse off than in their reservation option, the powerful party will capture the entire surplus.** They will implement an allocation that makes their gains as large as possible, subject only to the other party not being worse off than with no exchange at all. If they have done this, then there cannot be any way to make either of them better off without making the other worse off. So the result must be Pareto efficient!
Those who consider their treatment unfair often have some power to influence the outcome through legislation and other political means, and the result may be a more fair distribution in their eyes or ours, but one that is not necessarily Pareto efficient. So societies may face trade-offs between Pareto efficient but unfair outcomes, and fair but Pareto inefficient outcomes.

If we have institutions under which people can jointly deliberate, agree on, and enforce alternative allocations then there may be outcomes that make both parties better off, and that are also fairer than the status quo. Angela and Bruno managed this. Starting from a very uneven distribution of the benefits of exchange (only Bruno benefitted), legislation was passed increasing Angela's bargaining power, and then the two privately agreed on a win-win outcome that was Pareto efficient. When this is possible, we need not accept the trade-off between Pareto efficiency and fairness. A combination of legislation and private bargaining resulted in a Pareto efficient allocation, along with redistribution of rents towards the least well off.

These lessons make it clear that institutions are important for determining both the efficiency and the fairness of economic allocations. Aside from the government and families, the most important institutions of a modern economy are markets and firms. In the next unit, we study how firms (business organisations) address questions of allocation. We need to know how they work, and how well they work.

In the units that follow we study markets. Some have single firms selling to many buyers; others have large numbers of buyers and sellers. We investigate how they may implement allocations that allow mutual gains from exchange, and how they influence how those gains are distributed among buyers, sellers, and others. We also study the combination of markets and firms that make up the modern capitalist economy, and ask how successfully this set of institutions allows for Pareto efficient allocations and fair distributions.

In later units we will ask what we can do to make the results closer to being Pareto efficient—and also more fair.
## Key points in Unit 5

### Technically feasible
Technology and biology limit the allocations that are technically feasible.

### Economically feasible
Actors’ reservation options, their preferences and economic institutions determine the subset of technically feasible allocations that are economically feasible.

### Power
Two forms of power are the ability to set the terms of an exchange and to get others to act in one’s interest by imposing (or threatening to impose) penalties if they do not.

### Institutions affect power
Economic and political institutions (the rules of the game) affect actors’ power and the allocations that result from social interactions.

### Pareto efficiency
Pareto efficiency provides a valuable but incomplete evaluation of economic outcomes.

### Substantive and procedural justice
The fairness of both allocations and the rules of the game that produced them may be evaluated using substantive and procedural concepts of justice.

### Efficiency and fairness
Both public policies and private bargaining among economic actors can contribute to outcomes that are Pareto efficient and also fairer.
**Angela’s hours of work**

How can you figure out Angela’s hours of work that gave Bruno the greatest amount of grain, consistent with Angela surviving? To the right of 13 hours (more free time for Angela), the biological survival constraint is flatter than the feasible frontier. That means the marginal rate of transformation of hours of labour into output is greater than the marginal rate of substitution of hours of labour into subsistence nutrition requirements. So moving to the left (Angela working more) results in an increase in production (her marginal product) that is greater than the increase in her subsistence needs. So Angela working more increases what Bruno gets, which you recall is his economic rent. To the left of 13 hours of free time (Angela working more), the reverse is true. Bruno’s surplus is greatest at the hours of work where the slopes of the two frontiers are equal. That is:

\[
\text{marginal rate of transformation of work hours into grain output} = \text{marginal rate of substitution work hours into subsistence requirements}
\]

\[
MRT = MRS
\]

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**Bibliography**


