

Figure 1: Production possibility frontier of the Italian restaurant

Chapter 2 practice problem solutions

Elements of Microeconomics (discussion section 1)

Rudy Kretschmar

Question 1: PPF of a firm

Let's start an Italian restaurant that makes pizzas and sandwiches.

1. What will our production possibility frontier look like?
2. Why will it take the shape that it has?
3. How can we read the opportunity cost? Does it matter which part of the PPF we look at?
4. Why might the shape change over time?

1. I did not give you enough information to draw a function with specific values, but the important thing is that it should be concave (rounded) and look something like figure 1. I provide some example intercepts which I will use in part 4, but these could be any numbers and will depend on the cost to produce the pizzas/sandwiches. I'll use points A and B on this graph to answer part 3 of this question.

2. It takes this concave shape because of technology constraints: we face diminishing returns for switching production from one technology to another.

Consider the following allegory of Franco's Trattoria, a restaurant I worked in during covid. Pretend for now that Franco's makes pastas and salads. Back of house has two sections, one where salad is made and what is called the line. The salad prep area has a lots of flat countertop space for chopping vegetables, large refrigerator drawers to store cold salad ingredients, and Chris (Who was a pro at making salads). The line, where pasta is made, has different capital. Instead of large flat surfaces for cutting boards, it has a large stove top, small cutting surfaces for fine chopping, and is instead endowed with Big Rich (Who is okay at making salads, but isn't quite as quick as Chris. It is also doesn't have as much refrigerator space.

With this picture in mind, now fix a set of inputs (labor, ingredient supply, and time) and fix in mind the normal output of the restaurant, say 20 pastas and 20 salads. Compare this to using all of the resources available to make salads. Because the line doesn't have as much fridge space or cutting, we can't prep as many ingredients for salads in the line area as we can in the salad prep area. Moreover, Rich is slower at these tasks than is Chris. When some of the output is shifted back to pasta, sacrificing one salad in output is a big boost to our pasta making abilities. As we make more and more pastas from a 0 pasta baseline, this big boost will mellow, and eventually reverse when we need to adapt our salad making resources for pasta making ones.

3. Take any two points A and B and make up some numbers: suppose at A we produce 110 sandwiches and 80 pizzas, and at point B we produce 170 sandwiches and 50 pizzas. When we move from A to B, we are producing more sandwiches than before, and so we want to express the opportunity cost of that increased production in terms of pizzas we are no longer making:

$$\text{opportunity cost} = 80 - 50 = 30 \text{ pizzas}$$

We also might be interested in looking at the opportunity cost per sandwich. We can do this by adding the change in sandwiches produced into the denominator:

$$\text{opportunity cost} = \frac{80 - 50 = 30 \text{ pizzas}}{170 - 110 = 60 \text{ sandwiches}} = 2 \text{ pizzas per sandwich}$$

However, it is clear from the shape of the graph that it matters where we are on the PPF because the slope is not constant. To see this, check what the opportunity cost (on a per-unit basis) would be if we moved from producing *only* pizzas to producing *only* sandwiches. That would look like this:

$$\text{opportunity cost} = 100 - 0 = 100 \text{ pizzas}$$

or

$$\text{opportunity cost} = \frac{100 - 0 = 100 \text{ pizzas}}{200 - 0 = 200 \text{ sandwiches}} = \frac{1}{2} \text{ pizzas per sandwich}$$

4. Things that might change the shape of the PPF over time will be related to the production process: a new type of pizza oven that is more efficient, a change in the cost of labor, or a new technique for making 10 sandwiches at one time are all examples of a change in the production process. Let's think about a specific example, and use it to distinguish a change in the *shape* of the PPF.

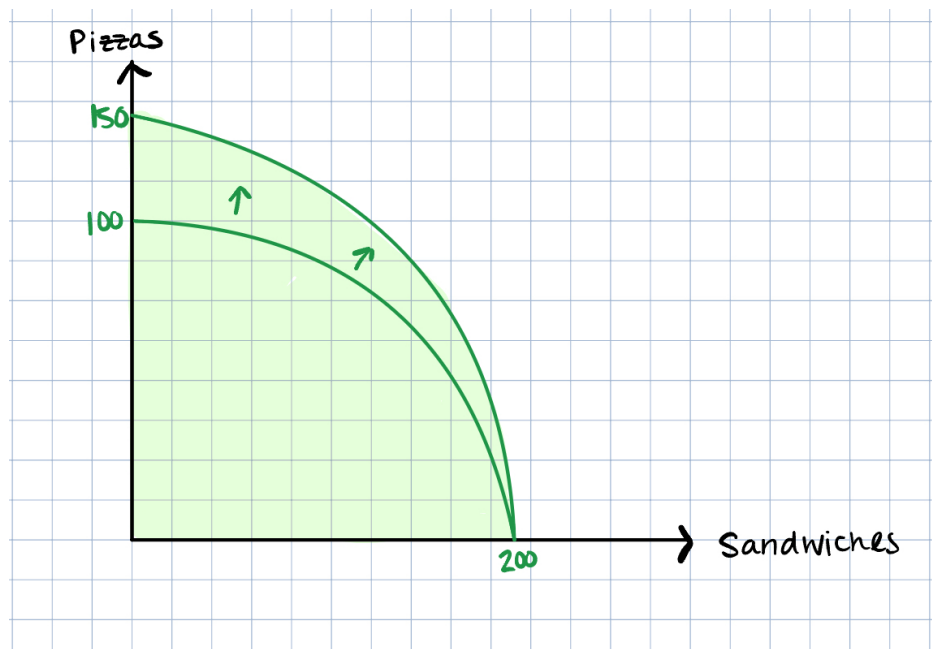


Figure 2: A change in the shape of the PPF

Suppose a new pizza oven makes us able to produce 50% more pizzas than we were before, holding the input (workers, ingredients, etc.) fixed¹. Instead of producing 100 pizzas when we are devoting all of our resources to pizzas, we can produce 150. However, nothing has changed for our ability to produce sandwiches, so we can still only produce 200 when we devote all of our resources to sandwiches. So the shape of our PPF has changed, illustrated in figure 2.

Now suppose that we have a new investor, and he has given us double the resources (staff, space, equipment, ingredients, etc.). Also assume that we have “constant returns to scale” for each product — this just means that twice the workers with twice the equipment can produce twice the pizzas. Now we haven’t changed anything about the technology itself, so the tradeoff between making pizzas and making sandwiches is the same as before, we can just now make twice as many of them. This means that the *shape* of our PPF is the same, it’s just moved further out in a uniform way, as shown in figure 3.

Question 3: CPF of a consumer

Now suppose we are *going* to the Italian restaurant with a group of friends, and we want to decide what to order. Pizzas are \$10, sandwiches are \$5, and we have \$100 to spend.

1. What will our consumption possibility frontier look like?
2. What is the opportunity cost of a pizza? Does it matter where on the CPF we are?
3. What will happen to the CPF if we have \$200 to spend?

¹This is a pretty magical pizza oven since we can make more pizza without using more ingredients.

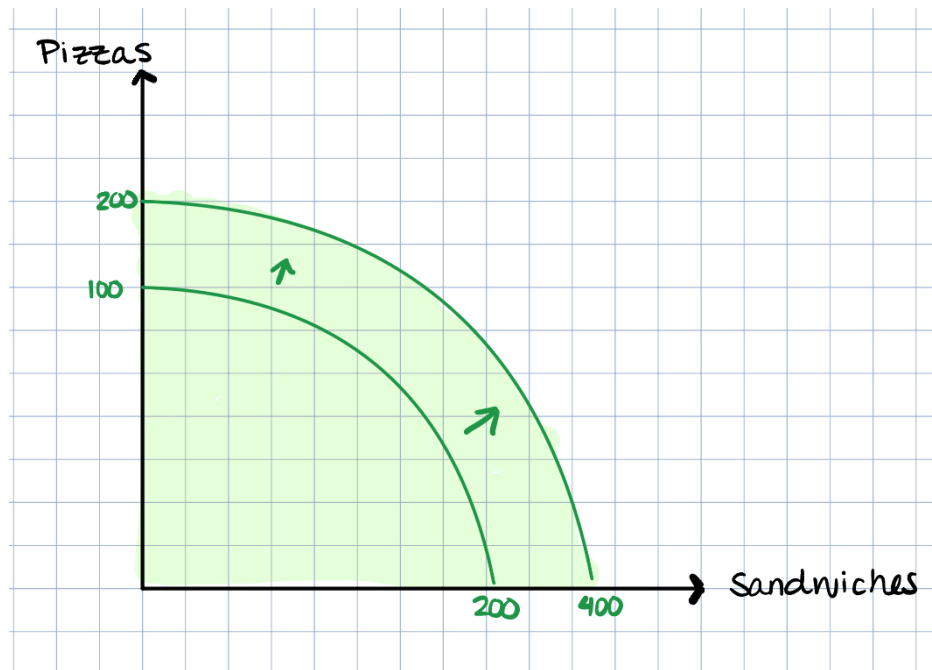


Figure 3: A shift in the PPF

4. What will happen to the CPF if the price of sandwiches increases to \$10?

Answer:

1. In this case, our CPF is just a straight line. Unlike with the PPF, there are no decreasing returns as we buy more sandwiches and fewer pizzas. The consumption set and consumption possibility frontier are shown in figure 4. The whole set of possible consumption combinations of pizza and sandwiches is represented by the blue shaded region, while the consumption possibility frontier is the darker blue line.

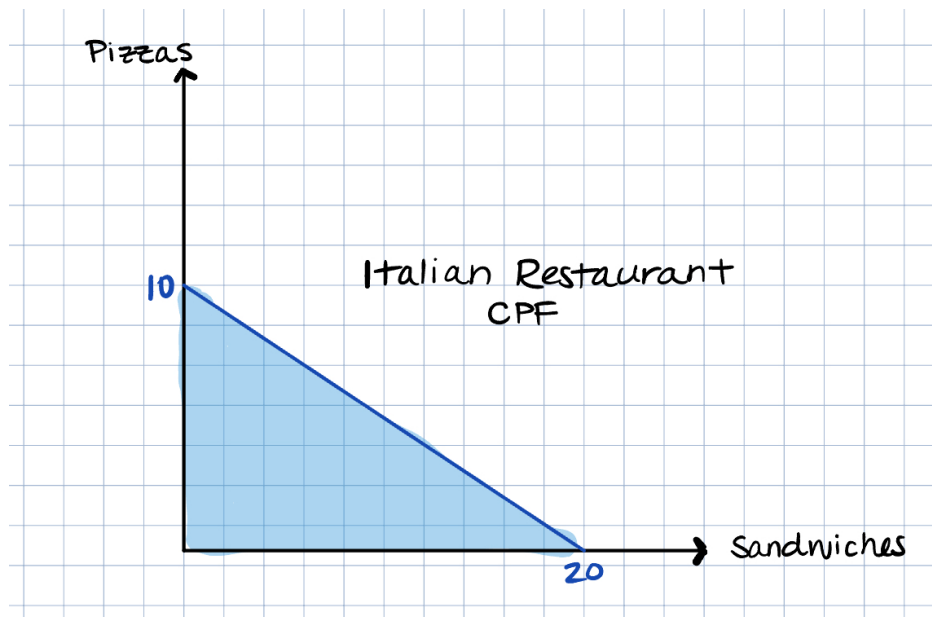


Figure 4: Consumption possibility frontier for Italian food

2. Since I provided specific numbers, we can actually draw the CPF (also called a budget line) and do some calculations. We have \$100 and pizzas cost \$10, so if we only buy pizzas, we can buy 10. Thus we put one point at 10 pizzas and 0 sandwiches. Alternatively, we can buy only sandwiches: since they are \$5, we can buy 20 of them if we buy no pizzas.

We know from algebra that two points on a straight line are all that we need to calculate its slope:

$$m = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{0 - 10}{20 - 0} = -\frac{1}{2}$$

We can also see that the line intersects the y (pizza) axis at 10. Recalling the formula for a line $y = mx + b$, where m is the slope and b is the y -intercept, we can describe the CPF with the equation:

$$y = -\frac{1}{2}x + 10$$

or alternatively

$$\text{pizzas} = -\frac{1}{2} \text{ sandwiches} + 10$$

To see this is true, just throw in one of our points and double-check that both sides agree.

So, what is the opportunity cost of pizza? Since the slope is constant, it doesn't matter which points we use to test this out, and we may as well use the end points of the line. If we start off with 0 sandwiches and 10 pizzas, and move to 20 sandwiches and 0 pizzas, our opportunity cost is $\frac{10 \text{ pizzas}}{20 \text{ sandwiches}} = \frac{1}{2}$ pizzas per sandwich.

3. With \$200 instead of \$100, we can now afford 20 pizzas and 0 sandwiches on the one end, or 40 sandwiches and 0 pizzas on the other. In other words, we have moved out our CPF and expanded the size of our possible consumption set. This is a shift in our CPF, but it does not change the shape of it (note that the slope is the same — check this!). Figure 5 depicts this shift in the CPF.

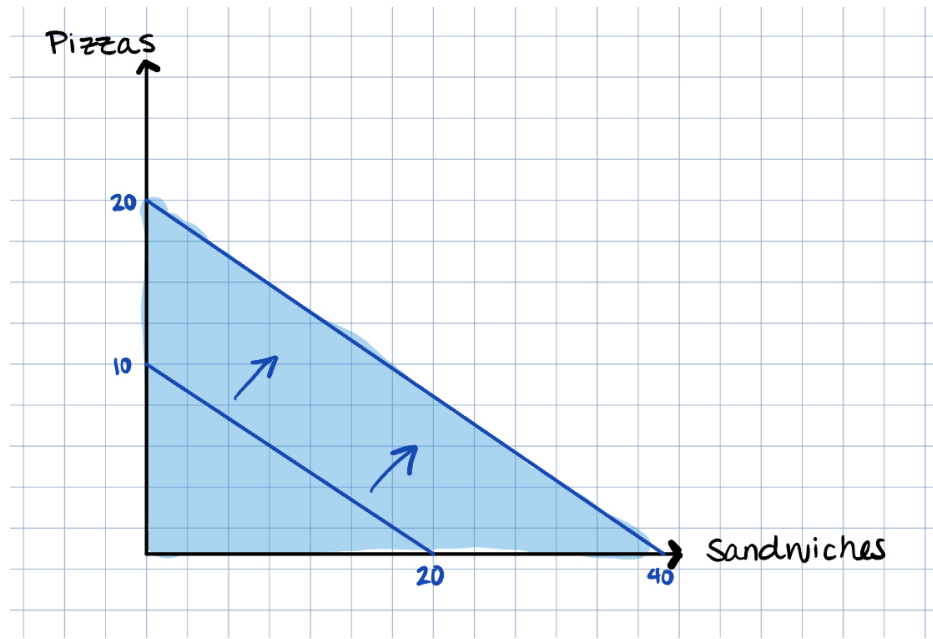


Figure 5: Consumption possibility frontier shift

4. Return to only having \$100 to spend. While we can still afford 10 pizzas and 0 sandwiches, with sandwiches costing \$10 we now can only afford 10 sandwiches and 0 pizzas. This causes a pivot to the left of the x-axis intercept, and our entire consumption set has shrunk. This actually changes the *shape* of the CPF, as opposed to the example in question 3. Figure 6 depicts this shape change.

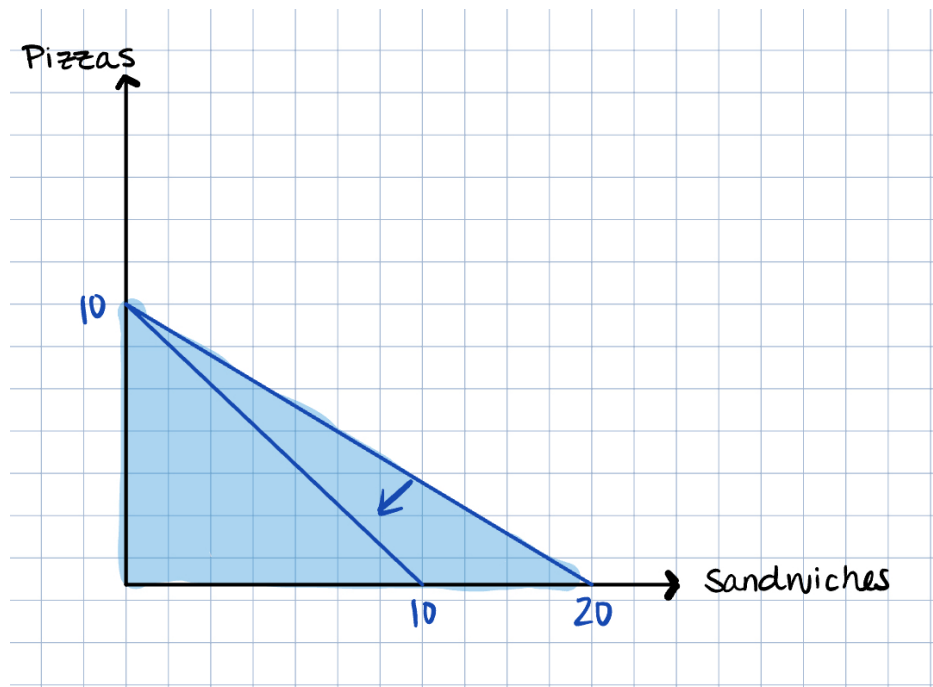


Figure 6: Consumption possibility frontier shape change

Question 4: Italian restaurant economy

Suppose the entire economy consists of Italian restaurants: during half of the week we work in one, and during the other half we buy food from them.

1. What does the circular-flow diagram look like?
2. What is missing from our model?

Answer:

Your circular-flow diagram might look something like figure 7.

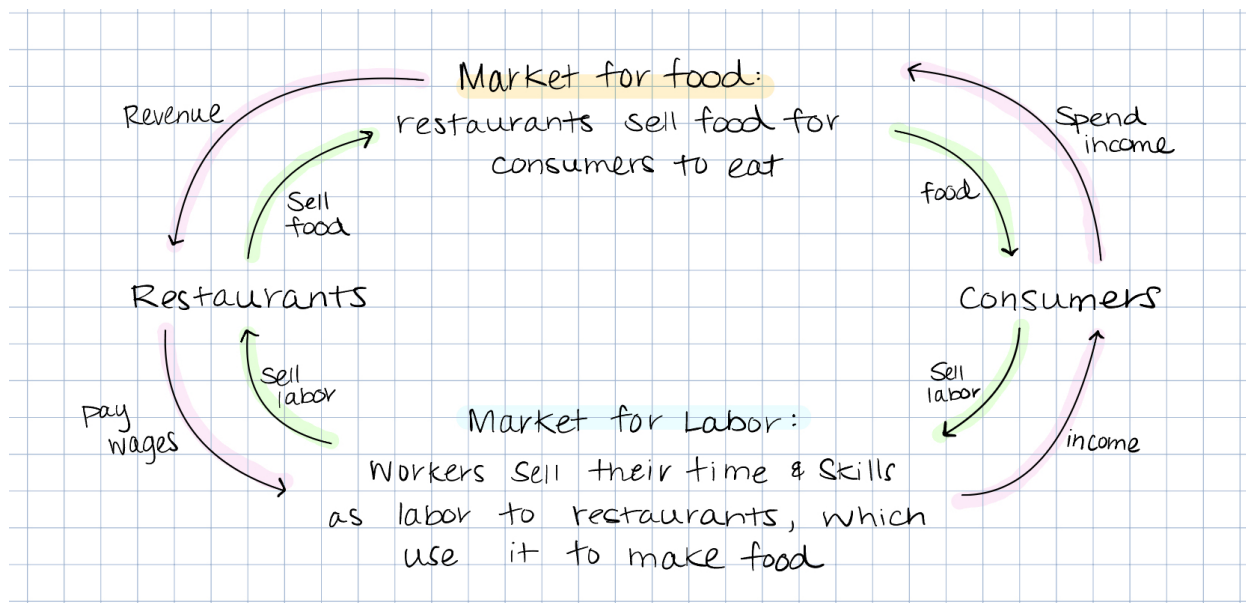


Figure 7: Circular-flow diagram of the Italian restaurant Economy

Of course this is an extremely simplified (“stylized” in economics-talk) model of the economy, and there are plenty of things you could mention that are left out. One obvious example would be a public sector; perhaps workers and firms pay taxes to a government, which in turn provides services to them. Another example would be household savings and a financial sector.

Question 5: Guiding Economic Policy

Economists are often asked to guide economic policy...

1. What are positive and normative statements?
 - (a) Can you give an example of each?
2. Why might two economists make different suggestions?
3. Why might a politician ignore an economist’s suggestions?

Answer:

1. A **positive** statement is one that is a fact and cannot be refuted. A **normative** statement is one of opinion and is not necessarily true. A quick and simple way to remember the meaning behind these two terms are as follows:

Positive statement: *You are **POSITIVE** the statement is true*

Normative statement: *This statement is **NORMALLY** true in my opinion*

This is how I remembered the meaning behind these two statements when I was taking this class!

(a) Example of a positive statement: We will celebrate 150 years of JHU in 2026.

Example of a normative statement: We ought to do more to help the poor.

2. Economists may have different hunches about the validity of conflicting economic theories, among other reasons.
3. Political success relies on more than just economic efficiency.