

Bilkent University
Econ 101 - Fall 2023
Chapter 7: Supply

A. Arda Gitmez Nuh Aygün Dalkıran

October 29, 2023

Contents

1	Supply Schedules and Firm Supply Curves	2
2	Market Supply Curves	3
3	Variables That Shift the Supply Curve	4
3.1	Costs of Inputs	5
3.2	Technological Change	6
3.3	Prices of Other Goods	6
3.4	Expected Future Prices	7
3.5	Number of Firms in the Market	7
A	Firm Supply Curve under “Eventually” Increasing Marginal Cost	8

In this chapter, we draw a **supply curve**. A supply curve is the second important element of a **market**. This chapter is the counterpart of Chapter 5 for the producer side, and we will be wrapping up our discussion on the **producer side** of the market with this chapter.

1 Supply Schedules and Firm Supply Curves

Just like a demand schedule, a **supply schedule** is an excel sheet of possible prices P and quantities supplied at these prices Q^* . Just like an individual demand curve, a **firm supply curve** is just the plotted version of this information, where P is on the y-axis and Q is on the x-axis. We construct graph by hypothetically going to the firm and asking the following question repeatedly, and plotting it:

“If the price of good you are producing is P per unit, what is the quantity you supply Q^* ?”

From the previous chapter, we know that the firm’s answer is the following:

“I supply the quantity Q^* such that $P = MC(Q^*)$.”

What does it mean, graphically? To get an intuition, consider Figure 1 which plots $MC(Q)$. If the price is P_1 , the firm chooses Q_1^* . If the price is P_2 , the firm chooses Q_2^* . If the price is P_3 , the firm chooses Q_3^* . You see where I am going? We are just tracking the $MC(Q)$ curve. Therefore, **the firm supply curve is the firm’s marginal cost curve**.

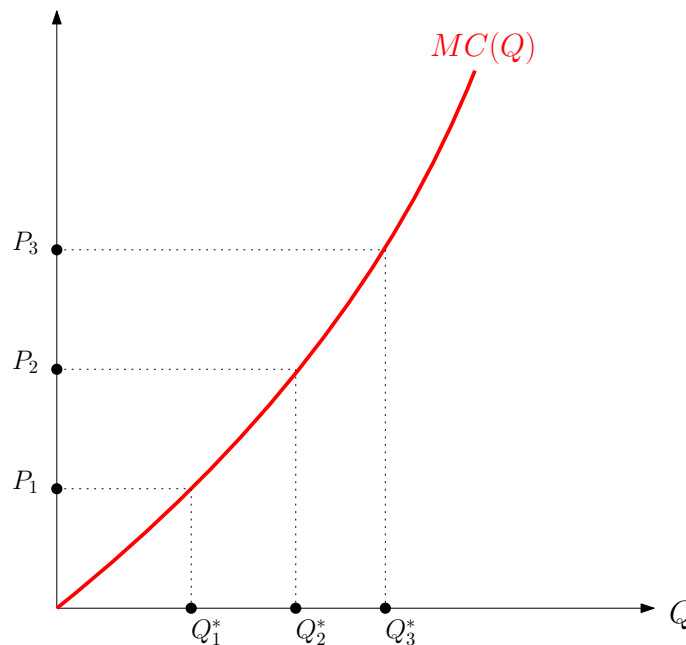


Figure 1: Firm Supply Curve when $MC(Q)$ is increasing.

Here is another way to think about why the firm supply curve is the same thing as the firm’s marginal cost curve. Just like the individual demand curve, a firm’s supply curve has two interpretations.

1. (From P to Q) It shows, at each price, the quantity supplied by the producer.
2. (From Q to P) It shows, at each quantity Q , the smallest price there needs to be for the firm to supply at least Q units.
 - But what should the consumers pay for the firm to supply the Q -th unit? Answer: The cost of supplying the Q -th unit, i.e., $MC(Q)$.

2 Market Supply Curves

You know what is coming next: just like we constructed a market demand curve from individual demand curves, we will construct a market supply curve from the firm supply curves of each firm in a market. To obtain the market supply curve, we add up the supply of every firm in the market. That is, at every single price, we add up the quantity supplied of each firm at the said price. Figure 2 is a representative figure where we add up two firm supply curves. For more than two firms, the process is the same.

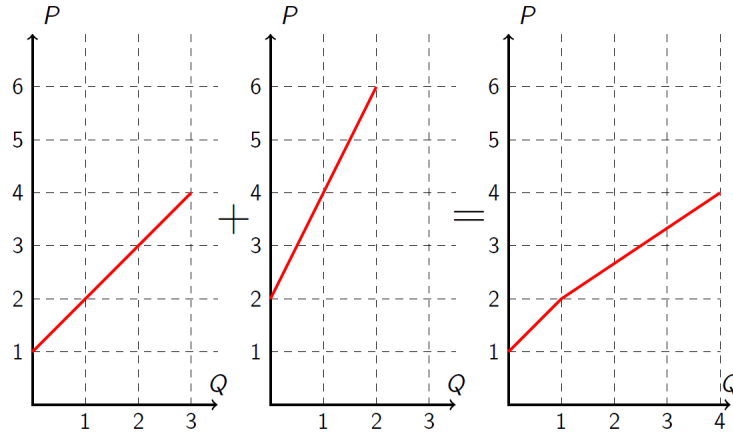


Figure 2: Addition of two firm supply curves.

So, if we add up every firm's supply curve, we end up with the market supply curve, or a **supply curve** as it is commonly called. Figure 3 illustrates a representative supply curve. We will use the letter S to label a supply curve, which stands for "Supply".

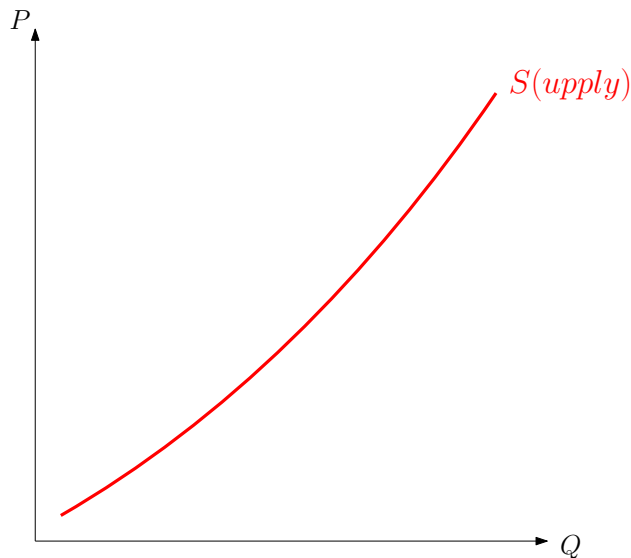


Figure 3: A representative supply curve.

A couple of general points about supply curves follow.

First, note that the supply curve is increasing. This is not surprising: a supply curve is the summation of

multiple firm supply curves. Because each firm's supply curve is increasing, their summation has to be an increasing curve!

You shouldn't be surprised to hear that economists call this a "law".

Law of Supply: holding everything else constant, when the price of a good rises, the quantity supplied rises.

I think it is better to understand which assumptions lead to this result, rather than blindly memorizing it as a law. Remember: we started by assuming that the firm's production function exhibits **diminishing returns**. This translates into an **decreasing marginal product of inputs**. This implies **increasing marginal cost**. But then, since the firm supply curve is the firm's marginal cost curve, **the firm supply curve is increasing**. Naturally, then, the market supply curve is increasing, and we end up with the **law of supply**. (This train of thought is also useful in illustrating the value of math in economic analysis: we can keep track of which assumptions lead to which conclusions!)

Second, a simple remark. Most economics textbooks (including ours) draw supply curves as lines, not curves. That is made for the sake of convenience, but that may be misleading sometimes. **A supply curve can be a line, but it does not have to be**. The only requirement we are imposing on the supply curve is being upward-sloping.

Third, just like a firm supply curve, a market supply curve also has a dual interpretation.

1. (From P to Q) It shows, at each price, the total quantity supplied by the producers in the market.
2. (From Q to P) It shows, at each quantity Q , the marginal cost of the producer that supplies the marginal unit of the good.

Finally, even though we derived the supply curve from each firm's profit maximization decisions, the general analysis also applies for the cases where the supply side of the market does not literally "produce" the good. They may just be the existing owners of some good who are considering selling the goods they own in a market. (If it helps, you can also imagine a bunch of warehouses that own the goods in their stock, and deciding on whether selling their stock in the marketplace.) The only requirement we impose is: at higher prices, more sellers must be willing to sell.

To capture the idea of "potential sellers deciding whether to sell a good they own", we can introduce the notion of a **reservation price**. The reservation price is the minimum price a seller is willing to sell the good she owns in a market. Consider a second hand car market. Literally every owner of a car is a potential seller: if the price in the second hand car market is high enough, they will decide to sell their cars. But to do that, the market price has to be sufficiently high: it must be higher than the valuation they assign to their cars. A car owner's valuation for the car, then, is her reservation price. Naturally, if the market price is higher, it is above the reservation prices of more sellers, which will result in a higher quantity supplied.

If you think about it, the reservation price plays the role of a marginal cost in a market where sellers do not literally engage in production. Well, that should not be surprising. Both the notion of "marginal cost" and "reservation price" are some measures of *opportunity costs* of sellers.

If the good under question is not produced, but merely owned by the sellers, we can reinterpret the supply curve:

1. (From P to Q) It shows, at each price, the total quantity supplied by the sellers in the market.
2. (From Q to P) It shows, at each quantity Q , the reservation price of the seller that supplies the marginal unit of the good.

3 Variables That Shift the Supply Curve

So, the *supply curve* of a good (or service) summarizes the relationship between possible prices of the good and the quantities supplied by the producers at these prices. It answers the following question: what happens to quantity supplied if the market price increases?

The issue is: there are other changes in the economy that would impact the quantity supplied *at each level of price*. We represent these changes with shifts in the supply curve, just like we did with the demand curve.

As an example, suppose the government decides to impose a sales tax of T on producers: for every unit of the good a producer sells, it has to pay an extra T TL to the government. This is effectively equivalent to an increase of T in the marginal cost: from the perspective of the firm, the cost of producing and selling the Q -th unit is $MC(Q) + T$ instead of $MC(Q)$. This change will be reflected as an upward shift in the supply curve. The exact amount of shift is not important, but the qualitative change matters: for every quantity, the smallest price for the firms to supply that quantity is higher. See Figure 4: at quantity Q , the new supply curve has P' rather than P . Of course, geometrically, this can also be called a shift to the left. For each value of market price P , the firms are willing to supply a smaller quantity of units because producing is effectively more costly. That is, at price P , the quantity supplied is Q' rather than Q . To be precise with what we mean, we will mostly refer to this as “a shift in the northwestern direction”.

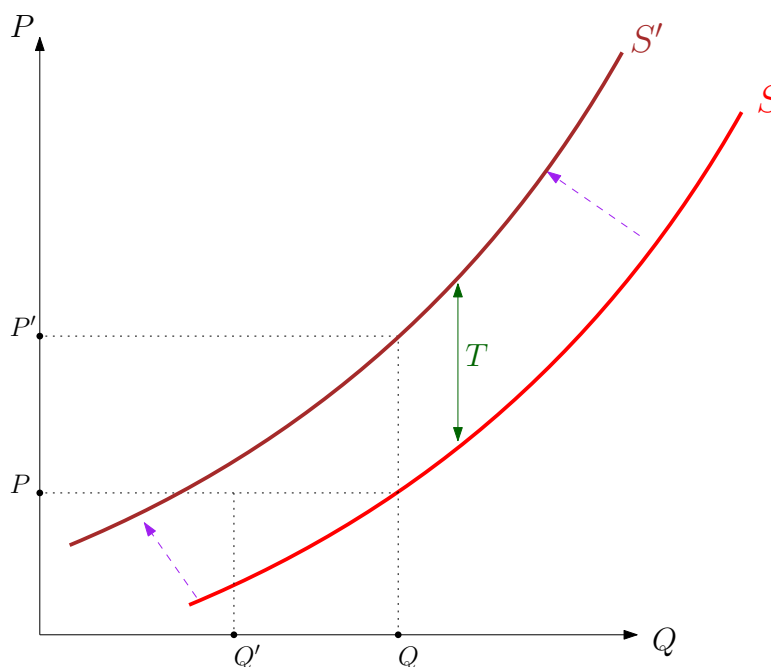


Figure 4: An upward shift in the demand curve. Some resources also call this a “shift left” or a “shift in the northwestern direction”.

Now, consider an alternative policy: the government gives a subsidy of T on producers: for every unit of the good a producer sells, the government pays an extra T TL. This is equivalent to an decrease of T in the marginal cost: from the perspective of the firm, the cost of producing and selling the Q -th unit is $MC(Q) - T$ instead of $MC(Q)$. This change will be reflected as an downward shift in the supply curve: for every quantity, the smallest price for the firms to supply that quantity is lower because the government is already partly paying to the firm. See Figure 5: at quantity Q , the new supply curve has P' rather than P . Geometrically, this can also be called a shift to the right. For each value of market price P , the firms are willing to supply a larger quantity of units because the government is subsidizing selling the goods. That is, at price P , the quantity supplied is Q' rather than Q . To be precise with what we mean, we will mostly refer to this as “a shift in the southeastern direction”.

Below is a discussion of several variables that may shift the supply curve.

3.1 Costs of Inputs

Just like taxes or subsidies, a change in the costs of inputs will change the marginal cost and therefore shift the supply curve.

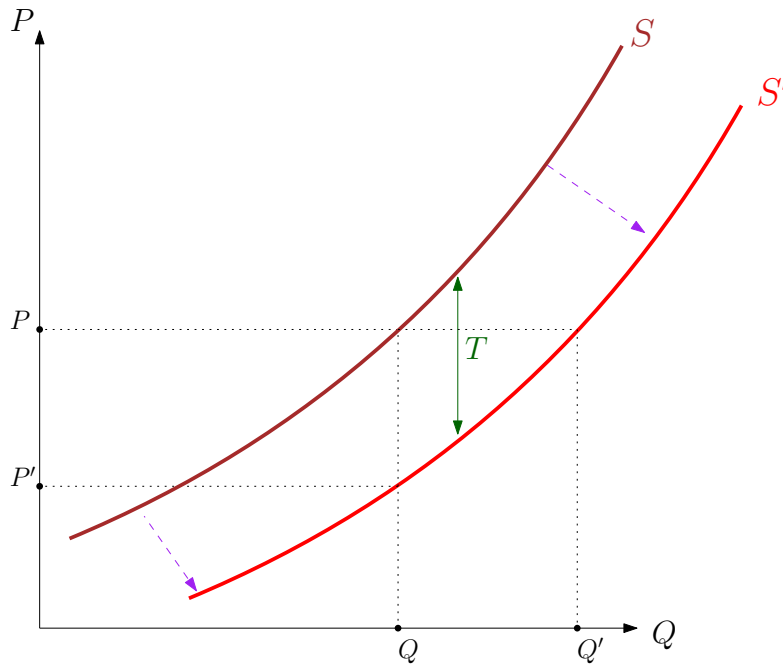


Figure 5: A downward shift in the demand curve. Some resources also call this a “shift right” or a “shift in the southeastern direction”.

- If the cost of an input increases, the supply curve will shift in the northwestern direction. This happens, for instance, if the wages increase due to an increase in minimum wage or due to a change in the labor market conditions.
- If the cost of an input decreases, the supply curve will shift in the southeastern direction. This happens, for instance, if one of the raw materials used in production becomes cheaper. (The market supply curve for air travel will shift in the southeastern direction if the price of oil, an input in the process of producing air travel, decreases.)

3.2 Technological Change

This covers the changes in production technology.

- If the firms find a much more efficient way of producing an output for a given set of inputs, they are willing to supply more at a given price. Thus, the supply curve will shift in the southeastern direction. This is the case, for instance, when a technological breakthrough in the industry occurs. (Steam powered engines, assembly lines, invention of computers etc. are all examples.) For instance, if oil producers figure out a way of extracting oil much more efficiently, the supply curve will shift in the southeastern direction.
- If the firms lose some technology necessary to produce a good or service, this will cause a shift in the northwestern direction. This is the case, for instance, if an earthquake happens and destroys a factory/the machinery necessary to produce a good.

3.3 Prices of Other Goods

Just like consumers, the producers can also switch to/from producing other goods. This will lead to shifts in the supply curve.

We say that two goods are **substitutes in production** if they can alternatively be produced by a firm. Think of smartphones and smartwatches: most firms can use the same set of inputs, machinery, factories etc.

they use to produce smartphones to use smartwatches as well. Therefore, a smartphone producing firm can alternatively produce smartwatches. If the price of smartwatches increases, some smartphone producers will switch to producing smartwatches. This will lead to a northwestern shift in the supply curve for smartphones. Alternatively, if the price of smartwatches decreases, some smartwatch producers will switch to producing smartphones. This will lead to a southeastern shift in the supply curve for smartphones.

In general, consider the demand curve for good X , and consider another good Y which is a substitute in production for good X .

- An increase in the price of good Y will cause a northwestern shift in the supply curve for good X .
- A decrease in the price of good Y will cause a southeastern shift in the supply curve for good X .

We say that two goods are **complements in production** if they can be produced together by a firm. For instance, goatherds produce both wool and goat cheese. (Once you start cattling goat, you can sell its wool, but also can produce goat cheese out of their milk.) If the price of goat cheese increases, goatherds will start cattling more goat. But then, they will also end up producing more wool. This will lead to a southeastern shift in the supply of wool.

In general, consider the demand curve for good X , and consider another good Y which is a complement in production for good X .

- An increase in the price of good Y will cause a southeastern shift in the supply curve for good X .
- A decrease in the price of good Y will cause a northwestern shift in the supply curve for good X .

3.4 Expected Future Prices

If the producers expect the price of a good to increase in the future, they will want to store some of their produced goods with the hope of selling them in the future for a higher price. This will result in a northwestern shift in the supply curve right now.

These type of changes are especially relevant for the markets where sellers are not literal “producers”, and they are merely existing owners that can sell the goods they own. Once again, think of the second hand car market. If the price of second hand cars is expected to increase in the future, fewer people sell their cars because they want to wait until the prices increase. Similarly, if the price of a second hand car is expected to decrease in the future, some people (those who are contemplating selling their car and buying a new one for themselves) are induced to selling their cars before the prices decrease, leading to the shift in the southeastern direction.

3.5 Number of Firms in the Market

Quite easily, if more firms enter the market, the supply curve will shift in the southeastern direction. Suppose, due to some unexplained mania, thousands of lokma producers start popping up everywhere in the city. The supply curve for lokmas will shift in the southeastern direction. When all those lokma producers start going bankrupt, the supply curve will shift in the northwestern direction.

Here is a picture of lokma for you to finish the lecture. Typing this paragraph made me hungry, and I thought: if I feel hungry, everybody should be. :) Good luck if you are reading this document in the middle of the night.



Figure 6: Lokma. <https://youtu.be/aPJWq3WPpko>

Appendix

A Firm Supply Curve under “Eventually” Increasing Marginal Cost

Before you read this section, you should revisit Appendix C of Chapter 6.

When the marginal cost is “eventually” increasing, the firm supply curve is:

- A vertical line for prices less than the minimal value of $AVC(Q)$.
- The marginal cost curve for prices larger than the minimal value of $AVC(Q)$.

For a further illustration, let's check Figure 7.

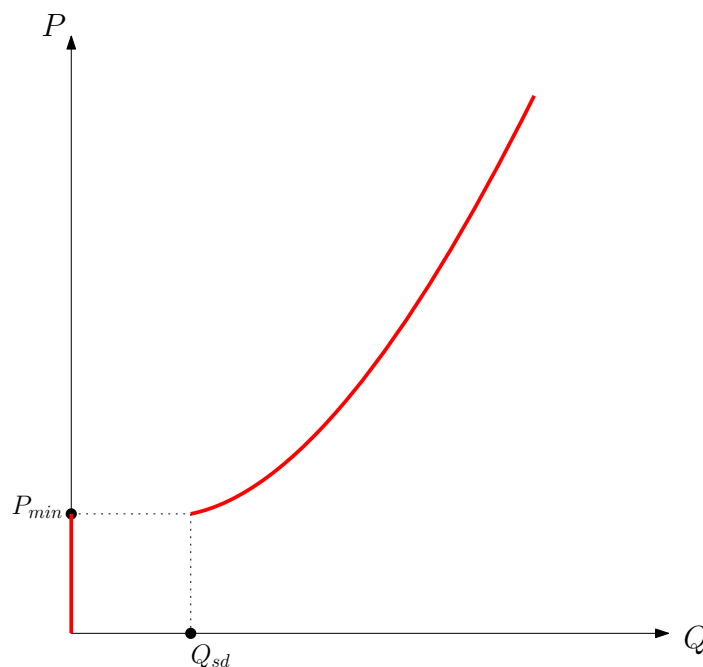


Figure 7: Firm Supply Curve when $MC(Q)$ is eventually increasing.

So, generally speaking, the firm supply curve is first a vertical line, and then it coincides with the marginal cost curve. But from now on, I will not really worry about the vertical part.

- First of all, the vertical part does not exist if $MC(Q)$ is increasing for all Q .

- But even if it exists, it exists for **very small** values of the price. Like, **unrealistically small** prices. Prices so small that the firms shut down rather than getting revenue! If prices remain that low for long, these firms would go bankrupt! But then, because some firms are swept away from the market, eventually the market price should increase. Therefore, such low prices cannot exist over long time periods.¹

So from now on, let's agree on saying that the firm supply curve is the firm's marginal cost curve.

¹Section 12.5 of your textbook is dedicated to formalizing this logic, mostly.