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Notebook



Glossary

Reading
assistance

The big picture

 2. Microeconomics / 2.6 Elasticity of supply

Real-world issue 1: How do consumers and producers make choices in trying to meet their economic objectives?

In the last 20 years, a number of clothing firms have established a reputation for supplying ‘fast fashion’. Fast fashion refers to a method of supply-chain management that uses improvements in technology and operations management to reduce the time it takes to move products from the design stage to sale. These firms have become very responsive to market signals and are able to quickly – and at low cost – adjust their supplies of clothing to changes in demand and price. We will address the environmental consequences of fast fashion in [subtopic 2.8 \(/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29875/\)](#).

Not all producers are this flexible. In this subtopic, we will explore the concept of elasticity of supply and the factors that affect the responsiveness of firms to price signals in a market.

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view



Figure 1. Zara, a 'fast fashion' store.

Source: "Zara Brisbane (https://en.wikipedia.org/wiki/File:Zara_Brisbane.jpg)" by Gpccurro is licensed under CC BY-SA 4.0 (<https://creativecommons.org/licenses/by-sa/4.0/deed.en>).

💡 Concept

Change

Change occurs when something transforms from its initial state or condition to a new state or condition.

Markets and economies are dynamic, complex systems where stakeholders are constantly reacting to external forces and feedback loops created from their own and others' actions. Uncertainty among stakeholders and technological innovation are two driving forces of change. Though we often identify equilibrium in our market analyses, most markets are likely experiencing dynamic change and are thus in disequilibrium.

Section In this subtopic, we explore how producers react to market price changes. We assume that producers' supplies have a positive relationship to price changes — that price increases cause producers to supply larger quantities to markets (as you have learned in [subtopic 2.2](#)). Here we go further, to examine how differing and changing conditions will cause a range of producer responses to price signals.

[Assign](#)

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To what extent do the generalisations about change made in this subtopic allow us to make accurate predictions about firms' behaviours?

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2. Microeconomics / 2.6 Elasticity of supply

Price elasticity of supply (PES)

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Definition and formula

Price elasticity of supply (PES) is a measure of how much the quantity supplied of a good changes when there is a change in *its own* price. PES can be calculated when there is a movement along the supply curve.

As we know, the law of supply says that firms are willing and able to offer more goods to the market when the price of the goods increases, *ceteris paribus* (all other things equal). The extent to which they will be willing and able to react to price changes depends on the value of the elasticity of supply of the product they sell.

Price elasticity of supply is usually calculated as the percentage change in the quantity supplied of a good divided by the percentage change in the price of that same good:

$$\text{PES} = \frac{\% \text{ change in the quantity supplied of good X}}{\% \text{ change in the price of good X}}$$

Using symbols, the formula is commonly written as:

$$\text{PES} = \frac{\% \Delta Q_s}{\% \Delta P}$$

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① Exam tip

Pay close attention to how you input quantity and price into the equation. In many examples, the price change is often mentioned first and the impact on quantity second. Students frequently make the mistake of putting the price change in the numerator instead of the denominator when price is mentioned first in an example.

 **Making connections**

The fundamental concepts, formula structures and reasoning pathways, are very similar for all types of elasticity. The benefit of this is that once you understand one elasticity, and know its formula, you can easily understand and remember all of them.

For example, the process for calculating PES from percentages or two points on a diagram is exactly the same as for price elasticity of demand (PED). The only thing that changes is a component of the formula: Q_s instead of Q_d . Apply the same steps proposed previously in [subtopic 2.5 \(/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29882/\)](#).

For example, imagine that the price of pencils increases by 10 per cent and the quantity supplied of pencils increases by 5 per cent . As the interactive **Figure 1** below shows: move P_1 to P_2 in the applet to see the movement along the supply curve and the resulting change in quantity supplied.

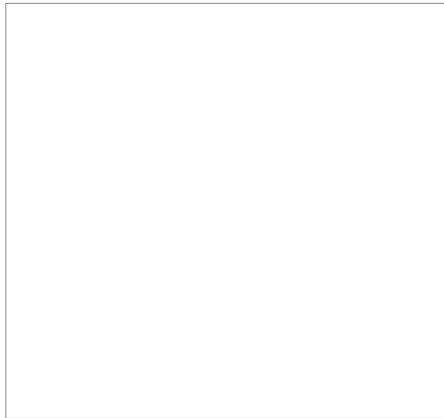


Figure 1. Elasticity of supply.

 More information for figure 1

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This graph illustrates the price elasticity of supply (PES) for pencils, showing the relationship between price and quantity supplied. The vertical axis represents price in dollars (\$), while the horizontal axis shows quantity supplied in thousands per week. The upward-sloping supply curve (S) reflects the direct relationship between price and supply. A key point, labelled P1, marks an initial price on the vertical axis, while Q1 denotes the initial quantity supplied on the horizontal axis. Dashed lines connect these points to the supply curve, forming an intersection that visually captures the concept of PES. The graph also highlights the calculated PES value of 0.5, which indicates that for every 1 percent change in the price of pencils, the quantity supplied changes by 0.5 percent.

Designed to be interactive, the graph allows us to simulate movements along the supply curve by adjusting price and quantity inputs. This feature helps deepen understanding of how changes in price directly impact supply, solidifying the theoretical explanation of PES and its applications in economic analysis.

$$\text{PES} = \frac{\% \Delta Q_s}{\% \Delta P} = \frac{5\%}{10\%} = 0.5$$

The price elasticity of supply of pencils is 0.5. This means that for every 1 per cent change in the price of pencils, the quantity supplied of pencils changes 0.5 per cent.

Worked example 1

Let's assume that the price for one minute of electric scooter use in Lima, Peru increases by 10 per cent and the quantity supplied of electric scooters increases by 15 per cent. Calculate the PES for electric scooters.

$$\text{PES} = \frac{\% \Delta Q_s}{\% \Delta P} = \frac{15\%}{10\%} = 1.5$$

Remember that the supply curve is upward sloping. There is a positive relationship between the quantity supplied of a good and its price, so the sign of the percentage change in quantity and price will be the same. When the price of a good increases, ceteris paribus, the quantity supplied of the good will also increase (and when the price decreases the quantity supplied also decreases). This means that mathematically PES is always a positive number.

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✓ Important

Price elasticity of supply (PES) is always a positive number because the price and

the quantity supplied always move in the same direction.



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Range of values of price elasticity of supply (PES) and diagrams

The possible values of PES range from zero to infinity. **Table 1** shows the range of values, the term for each value, how it is interpreted and the diagram that illustrates it.

Table 1. Possible values of PES.



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Values of PES	Terminology	What does it mean?	Diagram
PES > 1	<u>Price elastic supply</u>	<p>A change in price leads to a <i>proportionately greater</i> change in the quantity supplied. The quantity supplied is relatively responsive to price. Producers are relatively sensitive to price changes. Supply will be elastic if the curve passes through the vertical axis (<i>y</i>-axis).</p>	

Figure 2. Price elastic supply.

🔗 More information for figure 2

The graph illustrates price elasticity of supply for pencils. The X-axis represents the 'Quantity of pencils (thousands per week)' with marked points at Q1 and Q2, showing an increase by 15%. The Y-axis represents the 'Price of pencils (\$)' with marked points at P1 and P2, indicating a 10% price increase. The supply curve is labeled 'S', showing a linear upward slope, indicating that the price elasticity of supply (PES) is greater than 1. The diagram demonstrates how the quantity supplied is responsive to price changes.

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Values of PES	Terminology	What does it mean?	Diagram
$0 < \text{PES} < 1$	Price inelastic supply	<p>A change in price leads to a <i>proportionately smaller</i> change in the quantity supplied. The supply is relatively unresponsive to price. Producers are relatively insensitive to price changes. A supply curve will always be inelastic if it passes through the horizontal axis (x-axis).</p>	<p>The graph illustrates price inelastic supply. The vertical axis represents the price of pencils in dollars (\$), and the horizontal axis represents the quantity of pencils in thousands per week. A supply curve, labeled S_2, slopes upward. Two points on the vertical axis are labeled P_1 and P_2, with a vertical dashed line connecting them. The text indicates a 10% increase in price from P_1 to P_2. Two points on the horizontal axis are labeled Q_1 and Q_2, with a horizontal dashed line connecting them. The text indicates a 5% increase in quantity supplied from Q_1 to Q_2. The label $0 < \text{PES} < 1$ is placed near the top right of the graph area.</p>

Figure 3. Price inelastic supply.

🔗 More information for figure 3

The graph is titled "Price inelastic supply" and depicts the relationship between the price of pencils and their quantity supplied. The x-axis represents the quantity of pencils (thousands per week), and the y-axis represents the price of pencils in dollars (\$). Both axes start at zero.

A supply line (S_2) is shown, which slopes upwards steeply, demonstrating inelastic supply. The price elasticity of supply (PES) is indicated as being between 0 and 1. Two points, P_1 and P_2 , are marked on the price axis, with a vertical distance indicating a 10% increase in price. Correspondingly, two points, Q_1 and Q_2 , are marked on the quantity axis, suggesting a 5% increase in quantity supplied.

Dashed lines connect the points on the axes to the supply line, showing the movement from one equilibrium point to another as the price and quantity change.

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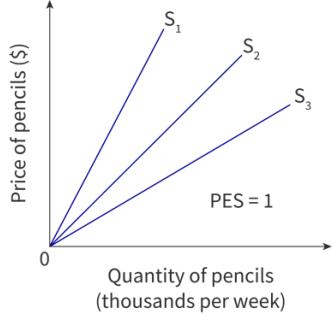
Values of PES	Terminology	What does it mean?	Diagram
PES = 1	<u>Unitary elastic supply</u> Any curve that passes through the origin (0,0) has a PES = 1.	A change in price leads to <i>an equal</i> change in the quantity supplied. Producers are proportionally sensitive to price changes. Therefore, the value for PES will be exactly equal to one.	

Figure 4. Unitary elastic supply.

 More information for figure 4

The image is a graph illustrating unitary elastic supply for pencils. The X-axis represents the 'Quantity of pencils (thousands per week)' and the Y-axis represents the 'Price of pencils (\$)'. There are three diagonal supply lines on the graph, each labeled as S1, S2, and S3. All lines originate from the origin (0,0) and diverge outwards, indicating different possible supply lines where the price elasticity of supply (PES) equals 1. This setup shows how quantity responds proportionately with price changes in a unitary elastic scenario for pencil supply.

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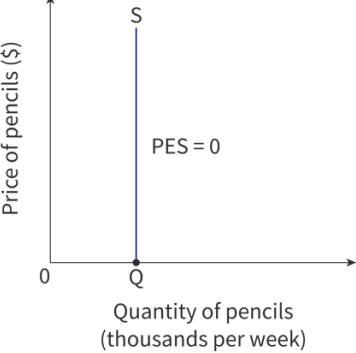
Values of PES	Terminology	What does it mean?	Diagram
PES = 0	<u>Perfectly inelastic supply</u>	<p>A change in price leads to <i>no change</i> in the quantity supplied. The supply is not responsive to price; producers of that good are not sensitive to price changes.</p> <p>In this case the value of PES is zero. The numerator of the formula is always zero, no matter the percentage change in price (the denominator). Zero divided by anything is zero.</p>	

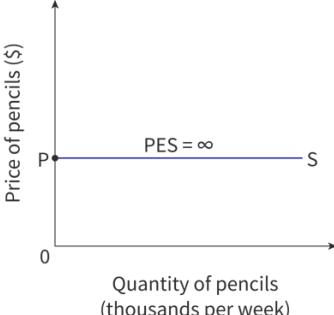
Figure 5. Perfectly inelastic supply.

🔗 More information for figure 5

This graph illustrates the concept of perfectly inelastic supply. The X-axis represents the 'Quantity of pencils (thousands per week)' and starts at 0. The Y-axis represents the 'Price of pencils (\$)' and also starts at 0. The supply line, labeled 'S', is a vertical line indicating that regardless of the price, the quantity supplied remains constant at point 'Q'. The graph also includes a label 'PES = 0', signifying that the Price Elasticity of Supply is zero, highlighting the immutable supply volume in response to price changes.

[Generated by AI]



Values of PES	Terminology	What does it mean?	Diagram
PES = ∞	<u>Perfectly elastic supply</u>	<p>A tiny change in price would lead to an <i>infinite change</i> in the quantity supplied. The percentage change in the quantity supplied is infinite.</p> <p>As shown in Figure 6, at the price level P the supply curve is a horizontal line. This means that a very small change in the price will lead to infinite changes in the quantity supplied.</p>	 <p>Figure 6. Perfectly elastic supply.</p> <p>More information for figure 6</p> <div data-bbox="1055 786 1483 1471" style="border: 1px solid #ccc; padding: 10px;"> <p>The graph represents a perfectly elastic supply. The X-axis is labeled 'Quantity of pencils (thousands per week)', and the Y-axis is labeled 'Price of pencils (\$)'. The graph features a horizontal line labeled 'PES = ∞', which starts at a point labeled 'P' on the Y-axis and extends to a point labeled 'S' on the X-axis. This line indicates that any change in quantity supplied does not affect the price, reflecting infinite price elasticity of supply. There are no other data points or curves.</p> <p>[Generated by AI]</p> </div>

⚠ Be aware

As in the case of price elasticity of demand (PED), the cases of perfectly elastic, perfectly inelastic and unitary elastic supplies are exceptional cases. Most real-life examples have elastic or inelastic supply curves.

Also, it is very important to remember that when you explain elasticity, you should use precise language. It is not enough to simply state that quantity increases or decreases by 'a little' or 'a lot' in response to a price change. You must make it

clear whether the percent change in quantity is proportionally more or less than the percent change in price.

Activity

Draw the summary table of the range of values of elasticity of supply and complete it using as much as you can from memory. Where there are gaps in your memory, review the material again.

Worked example 2

Suppose the price for a session of yoga in a Mumbai hotel increases from INR 1000 to INR 1250 (Indian rupees).

Calculate PES if the number of yoga sessions that the hotel offers increases from 60 to 90 a month.

$$\text{PES} = \frac{\% \Delta Q_s}{\% \Delta P}$$

Step 1: Calculate the percentage change in the price of the yoga session.

$$\% \Delta P = \frac{P_2 - P_1}{P_1} \times 100$$

$$\% \Delta P = \frac{1250 - 1000}{1000} \times 100 = \frac{250}{1000} \times 100 = 25\%$$

Step 2: Calculate the percentage change in the quantity of yoga sessions sold per year.

$$\% \Delta Q = \frac{90 - 60}{60} \times 100 = \frac{30}{60} \times 100 = 50\%$$

Step 3: Divide to find PES.

$$\frac{\% \Delta Q_s}{\% \Delta P} = \frac{50\%}{25\%} = 2$$



Result:

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PES = 2

Interpretation:

PES > 1. This means that supply is elastic, since the percentage change in quantity was greater than the percentage change in price. In this case, for every 1 per cent increase in price, there was a 2 per cent increase in yoga sessions produced. Producers are relatively sensitive to price changes.

Comparing PES of different supply curves

Price elasticity of supply (PES) varies along an upward-sloping linear supply curve (as in the case of price elasticity of demand (PED) and demand curves), except for the cases of unitary elasticity, perfectly inelastic supply and perfectly elastic supply. Therefore, when comparing PES of two different supply curves, this should be done only at a specific price range.

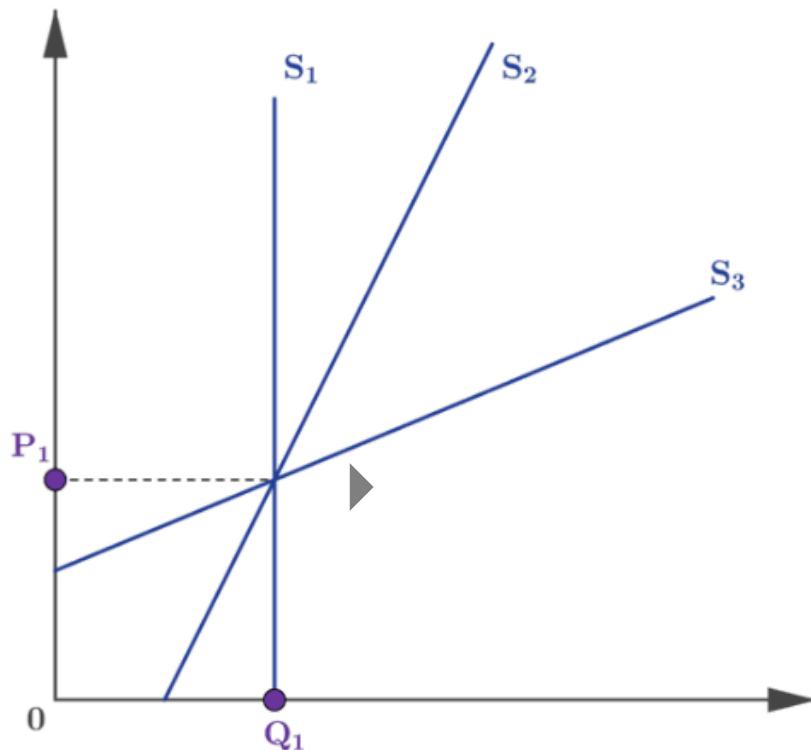
Because the price elasticity of supply (PES) is *not* the slope of the curve, comparisons of PES between any two supply curves in relation to their steepness can only be made from an intersecting point between the curves.



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Price of pencils (\$)



Quantity of pencils (thousands per week)

Figure 7. Comparing PES from intersecting supply curves.

More information for figure 7

The image is a graph depicting three supply curves labeled S_1 , S_2 , and S_3 , intersecting at a common point. The X-axis is labeled 'Quantity of pencils (thousands per week)', and the Y-axis is labeled 'Price of pencils (\$)'. At the intersection point, labeled (Q_1, P_1) , the three supply curves share the same price and quantity combination. S_1 is the steepest curve, followed by S_2 , and then S_3 , which is the flattest. The graph illustrates the comparative price elasticity of supply (PES) based on the curves' steepness.

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As shown on **Figure 7**, starting from the point (Q_1, P_1) , where all three supply curves S_1 , S_2 and S_3 share the same price and quantity combination, we can make conclusions about the comparative PES in each case by looking at the steepness of the supply curves.

A 5 per cent increase in price will produce zero change in the quantity supplied in S_1 , a 2.5 per cent increase in the quantity supplied in S_2 and a 10 per cent increase in the quantity supplied in S_3 . Therefore, $PES_1 = 0$, $PES_2 = 0.5$ and $PES_3 = 2$.

✓ Important

In the case of *intersecting supply curves*, the flatter the supply curve, the more elastic supply is at any given price.

3 section questions ▾

2. Microeconomics / 2.6 Elasticity of supply

Determinants of price elasticity of supply (PES)

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We have seen that the supply of a good can be more or less responsive to changes in its price, and we have also looked at the different values that PES can have. But what are the factors that give producers the ability to respond to changes in the prices of the goods they sell? What are the factors that make the supply of a good more or less elastic?

⚠ Be aware

It is important to distinguish between *factors that determine the elasticity of supply* and *factors that determine supply*.



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Factors that determine the elasticity of supply affect *how sensitive the quantity supplied of a good is to a change in its price*. Factors that determine supply are conditions that shift the supply curve.



The time period considered

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The time lag between the moment the price of a good changes and the producer's ability to adjust resources and production to respond to the price change is an important factor that affects the value of PES.

When there is a change in the price of a good, in the very immediate moment after the change, firms are unable to vary the level of supply very much. They cannot instantly increase or decrease the factors of production (amount of inputs) that they use. Therefore, the value of PES will be very inelastic or even perfectly inelastic ($PES = 0$) in the immediate moment after the price change.

For example, if soft drink firms have already planned their production of drinks for October (autumn in the northern hemisphere) and there is a sudden unusual heatwave that increases demand for soft drinks and increases their price, the quantity supplied of soft drinks will not likely change by much. The soft drinks firms will not be able to change their production levels instantly.



Figure 1. Tempting ice-cold soda for a hot day.

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view

Even if the firm has more stock, it would still take a couple of days to distribute it to retailers. Looking at **Figure 2**, comparing different intersecting supply curves, S_1 represents this situation. Even if price increases from P_1 to P_2 , quantity supplied does not change from Q_1 in the immediate period after the price change.

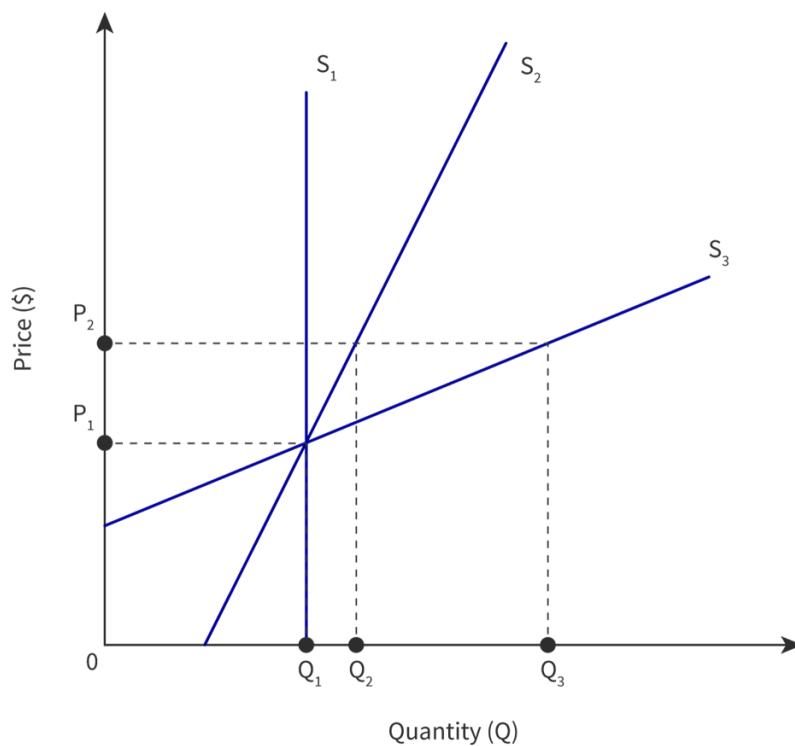


Figure 2. Time period considered and PES.

More information for figure 2

The graph illustrates three supply curves, labeled S₁, S₂, and S₃, on a chart with price (\$) on the Y-axis and quantity (Q) on the X-axis. The Y-axis marks prices P₁ and P₂, while the X-axis marks quantities Q₁, Q₂, and Q₃.

Supply curve S₁ is steep, nearly vertical, indicating that even if the price increases from P₁ to P₂, the quantity supplied remains constant at Q₁ in the immediate period after a price change. This reflects a scenario with very low price elasticity of supply.

Supply curve S₂ is moderately steep, showing that when the price rises from P₁ to P₂, the quantity supplied increases slightly from Q₁ to Q₂, reflecting a scenario where firms have some flexibility to increase supply.

Supply curve S₃ is less steep compared to S₁ and S₂, indicating that as the price rises from P₁ to P₂, the quantity supplied increases significantly from Q₁ to Q₃, representing a situation with higher price elasticity of supply.

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In the short or medium term, firms might be able to increase the quantity of some of the factors of production in some areas and readjust their production plans, giving them greater flexibility. This would be the case represented by S₂ on the diagram. If price rises from P₁ to

P_2 , quantity supplied may increase a little, from Q_1 to Q_2 . However, firms might not be able to increase, for example, the amount of machines they have or the size of the factory, areas which need a longer period of time for adjustment.

When the period of time is long, firms have complete flexibility to change their factors of production in order to respond to any price changes, so the value of PES will be much more elastic, as represented by S_3 in **Figure 2**. If price rises from P_1 to P_2 , quantity supplied may change by a large amount, from Q_1 to Q_3 , over a long period of time.

✓ Important

The *longer the time period considered, the more elastic the supply will be.*

❖ Theory of Knowledge

Let's create a thought experiment.

Imagine a firm that produces both copper saucepans and copper frying pans. Both copper saucepans and copper frying pans have identical inputs to production, they both require copper, and a heat proof handle. In addition, all workers are equally skilled at producing either copper saucepans or copper frysheets. All the machines can easily be recalibrated to produce copper saucepans or copper frying pans.

Let's take this thought experiment further and imagine that the factors of production held by the firm (copper, heat proof handles, labour and machinery) are perfectly substitutable. That means that they can switch out of producing copper saucepans and into producing copper frying pans perfectly.

According to the theory of the elasticity of supply, what is the responsiveness of the quantity supplied for copper frying pans, if the price falls?

The cookware firm can be responsive to price, and can adjust the production of copper frying pans very easily. Copper frying pans (under the very precise conditions of perfect substitutability in this thought experiment) are a supply elastic good.

Do such conditions ever exist in the real world? Is factor mobility a realistic determinant of price elasticity?

Explore Apple. They produce iPhones and iPads ↗
(<https://www.lifewire.com/features-ipad-vs-iphone-ipod-touch-1999857>) (amongst other products). In what ways are the factors of production for iPhones and iPads substitutable? What are the consequences on the elasticity of supply for Apple for these products?

Knowledge question: To what extent can we use economic theory to explore practical applications of theories like supply elasticity?

Mobility (flexibility) and cost of factors of production

When a firm is producing a certain product, it uses a specific combination of factors of production, some of which are more specialised or more costly than others.

Even though the price of a good increases, the firm that produces it may not be able to easily move or adapt resources to increase production of that good in response to a price rise. The resources may be large and immobile, or they may be costly, which increases the risks to the firm using them.

*The more mobile (flexible) its factors of production are, the more responsive a firm can be to changes in price by increasing or reducing the quantity supplied to the market, and therefore *the greater the PES*.*

For example, services such as hairdressing, housekeeping and gardening would have higher PES than primary commodities or heavy industrial goods. The resources needed for hairdressing or gardening are not as specialised and are less costly than those for producing oil, minerals or high-tech products. Firms in service industries can more easily hire additional workers or reduce the hours their employees work when demand changes. Therefore, the supply for these kinds of services tends to be more elastic.

✓ **Important**

The greater the mobility (flexibility) and lower cost of factors of production, the more elastic the supply will be.

Unused capacity

When firms are not using their production resources at their maximum capacity – for example, their workers are not working full-time or there is unused space in their factories – they can easily increase the production output of their product without increasing their



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costs significantly. In these cases, a firm's ability to increase its output and respond to an increase in price will be easier and therefore *PES will be greater*.

If, on the other hand, the firm is working at maximum capacity – its machines are working constantly, workers are all employed full-time and there is no room in the factory for extra equipment – it will be more difficult and costly to respond to a price increase. For example, increasing a factory's output by one more unit could require a whole new factory, which is costly, difficult and time-consuming to build, therefore *PES will be smaller*. Firms will be more reluctant to respond to price increases by increasing output.

✓ **Important**

The *greater the spare (unused) capacity, the more elastic the supply will be*.

Ability to store stock

If a firm has the capacity to store stock, which means keeping inventories of a good in a warehouse, the supply can be more responsive to a change in price.

Going back to the soft drink manufacturer example used earlier, if there is an unusually warm autumn and soda companies have stock of their drinks in storage, they can easily respond to an unexpected increase in demand, and price, by releasing the stock to the market quickly.



Student
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Figure 3. Soft drink stock.

Credit: membio Getty Images

 **Be aware**

Note that only non-perishable goods can be stored. Therefore, the PES for non-perishable goods is usually greater than for perishable goods.

 **Activity**

Imagine that a soft drink manufacturer wanted to make its supply more elastic.

What could it do to become more responsive to price changes in the market?

Hint: look over the determinants of elasticity of supply and use those to come up with ideas.

Option 1 — The soft drink manufacturer could increase its stocks so that it could release and sell more in the market when prices increase, and less when prices decrease.

Option 2 — The soft drink manufacturer could improve the technology used to produce the soft drinks, so that it could increase or decrease production output more quickly when prices change.

Option 3 — The soft drink manufacturer could find faster distribution methods — for example, transportation — to increase production output more quickly when prices increase.

Option 4 — The soft drink manufacturer could increase the capacity of its factories, so that there is more capacity to increase production when prices increase.

Option 5 — The soft drink manufacturer could find ways to reduce production costs, so that there is less risk associated with changing quantities supplied to the market when prices change.

Option 6 — The soft drink manufacturer could find ways to make its production technologies between different product offerings more flexible, so that production could be switched to the manufacturing of those products that are in more demand at any given moment.

3 section questions ▾

2. Microeconomics / 2.6 Elasticity of supply

PES of primary commodities compared with manufactured goods (HL)

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PES has many uses and applications. In this section, we will focus on commodities and manufactured goods. Implications for government policy will be examined in the next subtopic.

Most primary commodities have a lower PES (more inelastic supply) than manufactured products. This is because of the long time period or high levels of investment needed to increase production, which affects the ability of producers to react to price changes.



Student view

Figure 1. Oil, a primary commodity with high level of investment needed to increase production.

Credit: baona Getty Images

For example, firms in the oil industry need time to make the necessary investments in oil extraction sites to increase production. It is also very costly to seek out new sources of oil, so firms might wait before responding to price increases.

In the case of agriculture, farmers need at least one planting season to respond to price changes with changed production levels. In most countries, there is a limited amount of arable land to be brought into cultivation, and/or the soil quality may already be depleted by farming. The productivity of land may only be increased through improved technology in seeds, fertilisers and irrigation systems, or through long-term soil regeneration methods. Thus, it is difficult for farmers to react quickly to price changes, making supply quite inelastic, especially during a planting season.

✓ **Important**

Primary commodities tend to have relatively lower PES than manufactured goods because they require a longer time to increase production.

⚠ **Be aware**

Although the above statement is generally true, there are exceptions. For example, some heavy industries such as aeroplane manufacturing have relatively inelastic supply because the production time and investment needed to change production is very high.

Low PES and primary producers' revenues

⌚ **Making connections**

You have previously seen a discussion about the issues of price volatility of primary commodities in [subtopic 2.5 \(/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29882/\)](#).

The price volatility and revenue instability experienced by primary producers, such as farmers, is caused by inelastic supply as well as inelastic demand (as discussed in [subtopic 2.5 \(/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29882/\)](#)).

The diagrams in **Figure 2** show that shifts of the demand curve result in larger price changes when the supply is more inelastic (in diagram (a)), than when supply is more elastic (in diagram (b)).

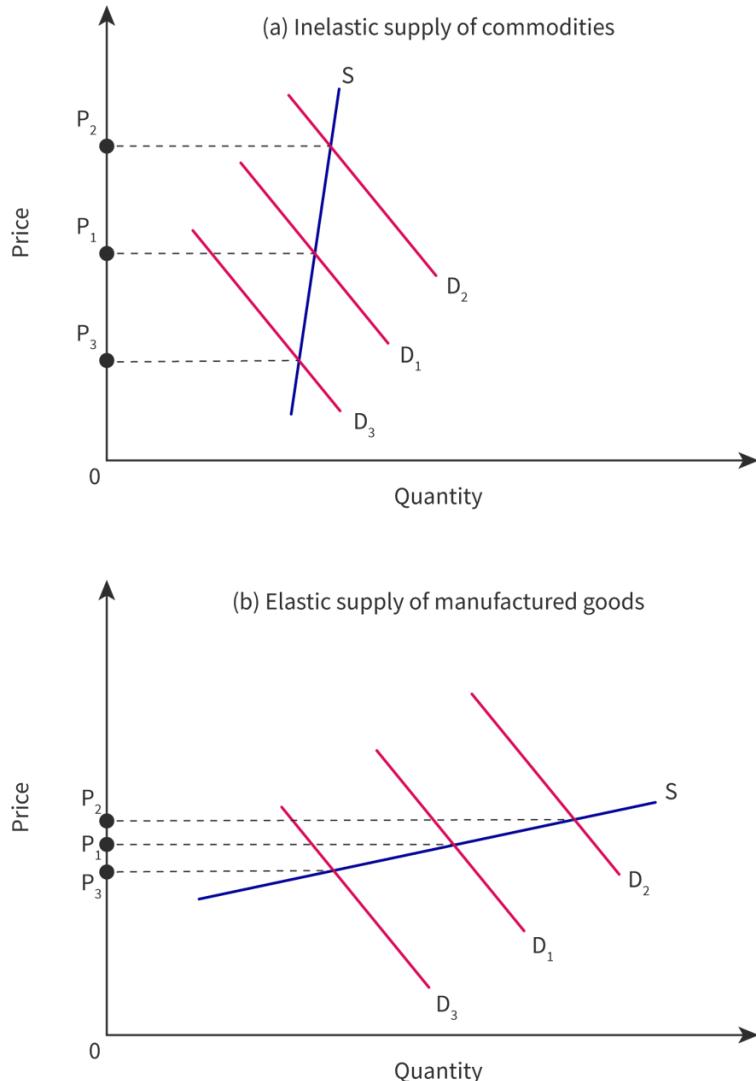


Figure 2. Comparing the effects of demand changes.

[More information for figure 2](#)

The image contains two diagrams labeled (a) and (b), each illustrating supply and demand curves. Diagram (a) shows an inelastic supply of commodities with a vertical blue supply curve labeled 'S', intersecting with three demand curves labeled 'D1', 'D2', and 'D3', which are gradually shifting down from left to right. The price axis is marked with three points 'P1', 'P2', and 'P3'. The quantity axis intersects at the origin.

Student view

Diagram (b) depicts an elastic supply of manufactured goods with an upward sloping blue supply curve labeled 'S', intersecting with three demand curves 'D1', 'D2', and 'D3', similarly shifting downwards. Here, the price axis is also marked with 'P1', 'P2', and 'P3', and the quantity axis is similar to diagram (a).



Both diagrams illustrate how shifts in the demand curve impact prices differently depending on the elasticity of supply, with larger price changes in the inelastic supply case (a) than in the elastic supply case (b).

[Generated by AI]

If we compare both diagrams, the same shifts of the demand curve in the case of manufactured goods produces a smaller change in the price than in the case of primary commodities.

For example, if there is an increase in demand from D_1 to D_2 , as shown in **Figure 2** diagrams (a) and (b), the price change for primary commodities of P_1 to P_2 in diagram (a) will be greater than the price change for manufactured goods in diagram (b).

Price fluctuations are substantially larger in the case of inelastic supply. Large price fluctuations mean large revenue fluctuations and therefore unstable total revenues for primary producers.

Activity

A recent report by Fairtrade International about incomes of cocoa farmers in Côte d'Ivoire made the following findings.

- The average cocoa farmer in Côte d'Ivoire does not earn a living income.
- The typical cocoa farming households are predominantly reliant on cocoa sales for income, but supplement with other activities.
- Cocoa farmers benefit from investments to improve productivity, particularly fertiliser use, although current inputs for production are relatively low.

A recent news article from Reuters pointed out that there are a number of solutions for the problem of low incomes for cocoa farmers that are being used or discussed. Among possible solutions are:



- Corporate sustainability programmes, like those of Mars, Inc., that aim to help farmers improve productivity on existing land, to raise incomes and prevent further deforestation
- Government guaranteed minimum prices, like recent proposals from the governments of Côte d'Ivoire and Ghana for a (voluntary) minimum price of USD 2600 per metric tonne
- Third-party certification schemes (like those from Fairtrade International and Rainforest Alliance) that command higher prices for farmers when they meet



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certain conditions, such as not using child labour or using sustainable farming practices

Explain how each of these policies could work to improve incomes of cocoa farmers.

Rank the policies in order of effectiveness, justifying your ranking using economic theory you may have learned to this point.

Compare your ranking with one or more students and discuss why your rankings may differ. Are you convinced by their arguments?

You may wish to consult the sources mentioned for more information.

Fairtrade International Report ↗ (https://www.fairtrade-deutschland.de/fileadmin/DE/01_was_ist_fairtrade/05_wirkung/studien/fairtrade_interna)

Reuters news report ↗ (<https://www.reuters.com/article/us-ivorycoast-ghana-cocoa/industry-doubts-remain-over-ivory-coast-ghana-cocoa-floor-price-idUSKCN1TY1BN>)

Mars, Inc. information on its sustainability plans ↗ (<https://www.mars.com/sustainability-plan/cocoa-for-generations>)

Rainforest Alliance Certified Cocoa ↗ (<https://www.rainforest-alliance.org/articles/rainforest-alliance-certified-cocoa>)

✓ Important

Resolving complex issues like poverty in farming regions around the world is likely to require international cooperation among local, regional and national governments, multinational corporations and non-governmental organizations. No one stakeholder or solution will suffice.

The short TED-Ed video below provides a brief history of chocolate.



Student
view



Video 1. A Brief History of Chocolate.

[More information for video 1](#)

2 section questions ▾

2. Microeconomics / 2.6 Elasticity of supply

Checklist

Section

Student... (0/0)

[Feedback](#)

[Print](#) (/study/app/pp/sid-186-cid-

754025/book/checklist-id-29883/print/)

[Assign](#)

What you should know

By the end of this subtopic **2.6 Elasticity of supply**, you should be able to:

- Define the following terms: price elasticity of supply (PES), price elastic supply, price inelastic supply, unitary elastic supply, perfectly elastic supply, perfectly inelastic supply, primary commodities/primary goods.
- Calculate PES using the following equation:

$$PES = \frac{\% \text{ change in the quantity supplied}}{\% \text{ change in the price}}$$
- Explain, using diagrams and PES values, the concepts of elastic supply, inelastic supply, unitary elastic supply, perfectly elastic supply, and perfectly inelastic supply.
- Draw and interpret diagrams of relatively elastic supply, relatively inelastic supply, unitary elastic supply, perfectly elastic supply and perfectly inelastic supply.

- Explain the determinants of PES, including: time, mobility of factors of production, unused capacity, the rate at which costs increase, and ability to store stock.
- Explain why the PES for primary commodities is relatively low and the PES for manufactured products is relatively high (HL).

2. Microeconomics / 2.6 Elasticity of supply

Investigation

[Section](#)[Student... \(0/0\)](#)[Feedback](#)[Print](#)[\(/study/app/pp/sid-186-cid-
754025/book/investigation-id-29884/print/\)](#)[Assign](#)

Real-world issue 1: How do consumers and producers make choices in trying to meet their economic objectives?



Student
view

Figure 1. Cocoa beans ready for export.

Credit: chang Getty Images

Overview
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 754025/)

Cocoa beans are traded on two international markets in London in British pounds (GBP) and in New York in US dollars (USD). Cocoa is an important cash crop for farmers in Côte d'Ivoire and Ghana, though the farmers see very little of the final price of cocoa on international markets. The price is largely determined by changes in supply and demand, but the markets are dominated by a few producers and sellers.

The top exporters and importers of cocoa are shown in **Figure 2**. Hover over the country to see the export and import values. You can also choose to view either continents or individual countries.

Exporters (2017)

Which countries export Cocoa Beans? (2017)

Total: \$9.43B



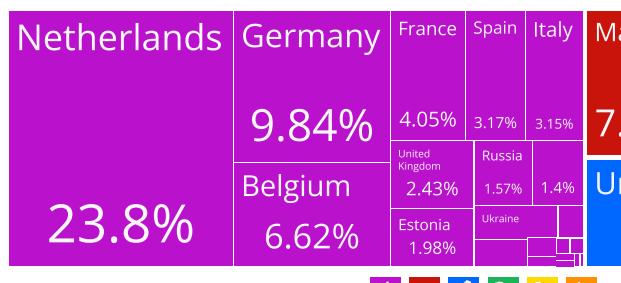
Interactive 1. Exporters of Cocoa Beans (2017).

[More information for interactive 1](#)

Importers (2017)

Which countries import Cocoa Beans? (2017)

Total: \$9.43B



x
 Student
 view

Figure 2. Importers of Cocoa Beans (2017).

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 More information for figure 2

Questions

Access data on cocoa prices from the [Trading Economics website](https://tradingeconomics.com/commodity/cocoa) (<https://tradingeconomics.com/commodity/cocoa>). Select the option to see 10 years of prices. This is located at the bottom of the graph.

1. What evidence is there for the price volatility of primary commodities discussed in the section above? Write a paragraph explaining what you see in the graph of cocoa prices, using theory about price elasticity of supply and data from the graph to support your ideas.
2. How might a cocoa farmer respond to the very low prices seen in some years? What impact might this have on the prices of cocoa in the following years? Consider the lag time (that is, the time from planting to production) in your response.
3. How might a cocoa farmer respond to the very high prices seen in some years? What impact might this have on the prices of cocoa in the following years? Consider the lag time (that is, the time from planting to production) in your response.
4. How do the choices cocoa producers make in response to price changes contribute to the volatility of cocoa prices over time?
5. Consider current prices for cocoa and the patterns from previous years. What might we see happen to prices several years from now? Use price data in your response.
6. Given that Côte d'Ivoire and Ghana produce more than half the market of cocoa beans, is there anything the two countries can do to affect market prices? Do a quick internet search to see what the two countries have agreed on recently.