

## Elasticity

The Theory and Application
of the Economic Elasticity

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## Elasticity

## Elasticity: Change in sales due to a change in price.

Elasticity is normally negative because Price and Sales go in opposite directions:
I increase the price, I sell less; I decrease the price, I sell more.
Elasticity of -1 (unit elasticity) means the same (negative) change.
Therefore if the price increases by $10 \%$, sales fall by $10 \%$.
If the price decreases by $10 \%$, sales increase by $10 \%$. $E=-1$.
A product with many competitors in the market is likely to have a high degree of negative elasticity. Buying oranges at the market: if there are several stalls selling the same type of orange, the elasticity is high since even a small price difference might lead to a high sales difference. Cheaper than the others - sell more; more expensive than the others - sell less.

A product with less competition (Airbus) will be more inelastic.

## Elasticity of Demand

My seedpacks I sold in Portugal (Jardins Rees Lda) were inelastic because there was no similar product as competition, (except for other tourist holiday presents)
therefore I could maintain a high profit margin (100\%).


## Elasticity of Demand. Example

You need to fill up your car with petrol. The price of petrol has gone up across the country. Petrol is inelastic because the alternative is not using your car, and finding another method of transport.
If petrol prices increase by $50 \%$, and consumption decreases by only $10 \%$, then the elasticity of demand is $10 / 50=-0.2$.

We should use the negative sign - to indicate that this is negative elasticity, therefore the answer is

$$
E=-0.2
$$

## Example - the Elasticity of Petrol Supply

Now, where do you buy your petrol? You probably want the cheapest petrol, rather than saying "Oh, I just love Total petrol!".

Therefore, especially when prices are high, the supplier of petrol is very elastic. I live near Leclerc. When the sign goes up that Lecerc is selling at cost price (no profit margin), then the petrol might be a few cents cheaper than at Intermarché or Carrefour, and there are long queues of cars waiting to fill up and save a few euros at Leclerc.

Therefore, although petrol is inelastic, the supply of petrol is elastic.
Let's imagine that Leclerc's petrol is $5 \%$ cheaper than the other suppliers and that sales increase by $20 \%$.

$$
\text { In this case } 20 / 5=4 \text {, so } E=-4 \text {. }
$$

See https://clinlawell.dyson.cornell.edu/gas_price_volatility_paper.pdf for more details on petrol elasticity.

## Elasticity and Brand Confidence

If I prefer Camel cigarettes from other cigarettes, then even if Camel is more expensive than Marlborough, I might continue to smoke Camel, so brand loyalty creates inelasticity.

How elastic is smoking?
Let's imagine that the government increases tobacco tax, and the price of cigarettes (in general) increases by 10\%. How many people reduce the number of cigarettes smoked, or simply stop smoking?

We use empirical evidence to find the result. The average result from data in many countries is that $E=-0.4$. (In France it's -0.7 ) Therefore, a $10 \%$ increase in price will lead to a $4 \%$ reduction in smoking. Smoking is therefore inelastic.

See

## Positive Elasticity

Elasticity can be positive.
Therefore, when the price goes up, sales go up, and when the price goes down, sales go down.

This seems strange, but exists for certain goods.
This can relate to luxury goods - the higher the price, the higher the prestige of owning this wonderful handbag etc.

## Positive Elasticity



A Gucci handbag at around 2,000€

353bn€ sales in Gucci luxury leather goods in 2023 (Statista)

## Positive Elasticity

## Example

You go to the supermarket to buy some meatballs for dinner. The average price (for the same weight / quantity of meatballs) is $3 € 50$.
There is one brand that only costs $1 € 50$. Do you buy it?
Maybe not, since you might suspect that it is highly inferior in quality or even dangerous.
In this case a lower price might lead to lower sales - therefore positive elasticity.

## English / French

- For the next exercise, be careful. The punctuation for numbers are different in English and French!

In English, the decimal point is . Thousands are indicated with a comma ,

In French the decimal point is, and usually there is no indication, or perhaps a space, to indicate thousands.

Therefore in English: 12,357,243.908 (12 million, 357 thousand, 243 point nine o eight)
in French: 12357243,908 (12 millions, 357 mille, 243 vergule neuf cent huit)
NB. Sales cannot be less than one unit ! What is the value of half an
I-Phone ?!

## Elasticity Exercise

| Elasticity | Sales (S) | Price (P) | Revenue <br> (R) | Price <br> change | New <br> Price | New Sales | New <br> Revenue |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| E = -1 | 150 | $35 €$ |  | $+10 \%$ |  |  |  |
| E = -2 | 3,500 | $12,000 €$ |  | $+5 \%$ |  |  |  |
| E $=0.5$ | 25 | $8,350 €$ |  | $-15 \%$ |  |  |  |
| E = +1 | 2,200 | $165.5 €$ |  | $+12 \%$ |  |  |  |

## Elasticity Exercise Answers

| Elasticity | Sales (S) | Price (P) | Revenue (R) | Price change | New Price | New Sales | New Revenue |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $E=-1$ | 150 | $35 €$ | $\begin{aligned} & 150 * 35 \\ & =5,250 € \end{aligned}$ | $+10 \%$ | $\begin{aligned} & 35+3.5 \\ & =38.5 € \end{aligned}$ | $\begin{aligned} & 150-10 \% \\ & =135 \end{aligned}$ | $\begin{aligned} & 135 * 38.5 \\ & =5,197 € \end{aligned}$ |
| $E=-2$ | 3,500 | 12,000€ | $\begin{aligned} & 3,500 \text { * } \\ & 12,000= \\ & 42 \mathrm{~m} € \end{aligned}$ | $+5 \%$ | $\begin{aligned} & 12,000+ \\ & 600= \\ & 12,600 € \end{aligned}$ | $\begin{aligned} & 3,500-5 * 2 \\ & (10) \% \\ & =3,150 \end{aligned}$ | $\begin{aligned} & 3,150 * \\ & 12,600 \\ & = \\ & \mathbf{3 9 . 6 9 m} € \end{aligned}$ |
| $E=-0.5$ | 25 | 8,350€ | $\begin{aligned} & 25 * 8,350 \\ & = \\ & \mathbf{2 0 8 , 7 5 0 €} \end{aligned}$ | -15\% | $\begin{aligned} & 8,350- \\ & 1,252= \\ & 7,098 € \end{aligned}$ | $\begin{aligned} & 25-15 / 2 \% \\ & =25+2 \\ & =27 \end{aligned}$ | $\begin{aligned} & 27 * 7,098 \\ & = \\ & 191,646 € \end{aligned}$ |
| $\mathrm{E}=+1$ | 2,200 | $165.5 €$ | $\begin{aligned} & 2,200 ~ * \\ & 165.5= \\ & 364,100 \end{aligned}$ | +12\% | $\begin{aligned} & 165.5+ \\ & 19.86= \\ & 185.36 € \end{aligned}$ | $\begin{aligned} & 2,200+ \\ & 12 \% \\ & =2,464 \end{aligned}$ | $\begin{aligned} & 2,464 * \\ & 185.36= \\ & 456,727.04 € \end{aligned}$ |

## Cross Elasticity

The cross elasticity of demand is the change in sales of one good when the price of another good changes.
This measurement is calculated by taking the percentage change in the quantity demanded of one good and dividing it by the percentage change in the price of the other good.

Exy $=$ \% change in Sales of $x$ divided by the \% change of Price of $y$

## Cross Elasticity example

Beer demand is unit elastic $(E=-1)$. Cider demand is elastic ( -1.3 )
(see https://www.ncbi.nIm.nih.gov/pmc/articles/PMC3991422/).
I increase alcohol tax on beer but not on cider.
Beer prices increase by $10 \%$, and with $\mathrm{E}=-1$, sales will decrease by $10 \%$.
Cross-elasticity means that those people drinking less beer will find a substitute such as cider, and therefore cider sales will increase.

Therefore, when considering elasticity, remember to think of what is the overall 'market'.

- The price of oranges increases. Sales go down according to the elasticity of oranges, but consumers might switch to other fruits which will then increase their sales. Cross-elasticity is low for some products like petrol. If petrol prices go up, it is unlikely that consumers will change to diesel cars, at least not in the shortterm.


## Elasticity and Taxation

## Elasticity and Taxation

When changing taxes, the government needs to consider the elasticity of the product / service being taxed, and the effect on government revenue.
It is no surprise that the government can more easily increase revenue from an inelastic product like fuel (petrol and diesel; $\mathrm{E}=-0.05$ short term and -0.3 long-term)
see https://www.reed.edu/economics/parker/f10/201/cases/oil_demand.html
Fuel is the fourth largest source of income for France.

## Example

Tobacco. E = -0.7 in France. Revenue 2018 = 13bn€.
If I increase the price of tobacco by increasing tobacco duty (and hence the VAT) by 10\%, there will be a $7 \%$ reduction in consumption (excluding tax-drift and illegal importation).

Let us suppose that tax is $80 \%$ of the final price.
Consumption (and tax revenue) goes down by 7\% (new non-smokers). Revenue 13bn€-7\% = 12.09bn€

Revenue from the $93 \%$ of smokers increases by $10 \% \times 80 \%=8 \% .12 .09 b n+8 \%=12.09+$ $1.209=13.299 b n$.

The tax increase leads to a revenue gain of 299m€ for the government.
This tax increase would also lead to Cross-Elasticity. The use of electronic cigarettes (Puffs) would increase (with 20\% VAT for the government).

But, the increase of tax-drift (people buying from legal, cheaper sources like Spain) would increase (increasing revenue for Spain and a loss for France) as would the increase of illegal tobacco imports into France (the biggest importer of illegal tobacco in Europe - see https://www.pmi.com/our-business/illicit-trade-prevention/blog/kpmg-report-uncovers-europe-s-illicit-cigarette-marl )

## French tobacco duty revenue (EUCom)

$$
\text { — Cigarettes Co Cigars } \quad \text { Other Smoking Tobacco ——otal }
$$



# Increase in E-smoking after tobacco tax increases 

France E-Cigarette Market Overview


## Illicit tobacco trade in France <br> (Euromonitor International, European Commission)



## Elasticity and Exporting. Example

I produce lawnmowers in France (material and labour in Euros).
Half of my sales are to the Eurozone. Half of my sales are to the United Kingdom (£)
I keep the price of my product (lawnmowers) the same in Europe.
BUT, due to a $10 \%$ increase in the value of the Euro against the Pound (see https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/htm//e ) my products now cost $10 \%$ more in $£$.
The elasticity of my product is -2 . I lose $20 \%$ of export sales. Ow!
The Double Whammy! UK lawnmowers (from my competitor) are now 10\% cheaper in France and I also lose 20\% of my home market.
In real-life, you need to know the elasticity of the product and track the currency changes from your suppliers and export market. This often involves several different currencies.

## Income Elasticity

Income elasticity refers to a change in buying behaviour in relation to changes in your income.

What is sensitive to changes in income?
What do you buy less of if your salary goes down (or your taxes have gone up leaving you with less money). Heating, car-use, smoking, water, the barber won't change very much. Things like holidays and going to the restaurant will change much more, and therefore can be said to have high income elasticity.
Maybe you would buy less expensive food and avoid delivery.
The reverse is obviously also true. If your income goes up, do you smoke more (unlikely), drive more (unlikely) take more holidays or more exotic / expensive holidays (likely) and go to the restaurant more often (likely). Income elasticity also depends on your Marginal Propensity to Consume (MPC). The poorer you are, the more of your income you spend (high MPC)
The richer you are the higher your Marginal Propensity to Save (MPS) which means less of an effect on Income Elasticity.

## Elasticity Quiz 1

- 1. Elasticity is normally
- Negative
- Positive

2. Price increases $10 \%$, Sales drop $10 \%$. This is:

- Inelastic
- Elastic
- Unit elastic
- 3. Sales are 100. $E=-2$. I increase the price by $20 \%$. New sales are:
- 80
- 100
- 120
- 60


## Elasticity Quiz 1 answers

- 1. Elasticity is normally
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- Positive

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- 80
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- 60


## Elasticity Quiz 2

- 1. Which of these are inelastic?
- Tins of sweet corn
- Finding a plumber to mend a leak
- An IRM hospital scanner
- 

2. Car diesel is:

- Inelastic
- Elastic
- Unit elastic
- 3. Diesel sales from a petrol station are:
- Inelastic
- Elastic
- Unit elastic


## Elasticity Quiz 2 Answers

- 1. Which of these are inelastic?
- Tins of sweet corn
- Finding a plumber to mend a leak
- An IRM hospital scanner

2. Car diesel is:

- Inelastic
- Elastic
- Unit elastic
- 3. Diesel sales from a petrol station are:
- Inelastic
- Elastic
- Unit elastic


## Elasticity Quiz 3

- 1. Tax revenue in France from fuel (diesel and petrol) is:
- The biggest revenue for the government
- $10^{\text {th }}$ revenue for the government
- $4^{\text {th }}$ revenue for the government

2. An example of positive elasticity could be:

- Buying a house
- Buying a luxury good
- Buying a television
- 
- 3. Cross Elasticity is when:
- Elasticity is elastic and inelastic at the same time
- When the price change of one product effects the sales of another product
- When you get cross because you don't understand elasticity


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## Elasticity Quiz 4

- 1. Inceasing a tax can lead to:
- Higher tax drift
- Lower government revenue
- Higher government revenue
- All of the above

2. A double whammy is when:

I miss an economics lesson and get a Malus

- I get three aces in a game of poker
- I lose home market sales as well as export sales when my currency value increases
- 3. Someone with a high MPC is probably
- A student
- A bank manager
- A pop star


## Elasticity Quiz 4

- 1. Inceasing a tax can lead to:
- Higher tax drift
- Lower government revenue
- Higher government revenue
- All of the above
- 

2. A double whammy is when:

I miss an economics lesson and get a Malus

- I get three aces in a game of poker
- I lose home market sales as well as export sales when my currency value increases
- 3. Someone with a high MPC is probably
- A student
- A bank manager
- A pop star


## Congratulations

- You are now an expert elastic student!


