Ch 5. Elasticity and Its Applications

Microeconomics for Students of Accounting, Finance, and Digital Application

---

Lyuben Ivanov, PhD

Fall Term 2024/2025

Faculty of Economics and Business, Sofia University

The Concept of Elasticity

Introduction to Elasticity

The most important thing [is] trying to find a business with a wide and long-lasting moat around it... protecting a terrific economic castle with an honest lord in charge of the castle

---

Warren Buffett

Elasticity

In economic analysis it is important to arrive at understanding of not only the direction of change in an economic variable, but of the relative size of the change.

To do this economists introduce the concept of elasticity, which is an indicator of the sensitivity of an economic indicator to changes in the factors determining it (its determinants).

Exact science = Theory + Mathematics + Data

Introduction to Elasticity

$$\text{Elasticity/responsiveness} = \frac{\text{Relative strength of the effect/response}}{\text{Relative strength of its cause}}$$

$$= \frac{\%\Delta\text{Effect/Response}}{\%\Delta\text{Cause}}$$

$$= \frac{\%\Delta Y}{\%\Delta X}$$

Another way to think about elasticity is the following:

$$\%\Delta\textbf{Cause} \times \textbf{Responsiveness} = \%\Delta\textbf{Response}$$

Price Elasticity of Demand

Price Elasticity of Demand

price elasticity of demand — Degree of sensitivity of quantity demanded to changes in the market price of the good, ceteris paribus

The price elasticity of the demand (PED) of eggs is 0.1, the PED of healthcare is 0.2, the PED of housing is 0.7, the PED for beef is 1.6, the PED for restaurant meals is 2.3, the PED for Mountain Dew is 4.4.

PED can not be measured directly, only estimated with econometric techniques, and the estimated values are context dependent (demand for eggs may be very price inelastic but the demand for the eggs YOU sell may be perfectly price elastic)

Determinants of Price Elasticity of Demand

Availability of close substitutes The easier it is to find alternatives to a given good, the more responsive buyers are to changes in its price because they can easily switch to substitutes if it goes up, or from substitutes if it goes down

🌎 It is more difficult to find substitute of eggs than to find substitute of Mountain Dew, hence the demand for eggs is less price elastic than the demand for Mountain Dew

⚖️ This determinant is valid on average, there are people who wouldn't substitute Mountain Dew for anything

Quick Question

Chocolate Chip Cookie Dough ice cream would tend to have very elastic demand because

A. it must be eaten quickly
B. the market is broadly defined
C. there are few substitutes
D. other flavors of ice cream are almost perfect substitutes

Quick Question

Chocolate Chip Cookie Dough ice cream would tend to have very elastic demand because

A. it must be eaten quickly
B. the market is broadly defined
C. there are few substitutes
D. **other flavors of ice cream are almost perfect substitutes**

Determinants of Price Elasticity of Demand

Necessities versus luxuries Buyers are more sensitive (responsive) to changes in prices of goods which are not necessary for survival and satisfy fundamental needs

When the price of a doctor's visit rises, people do not dramatically reduce the number of times they go to the doctor

Whether a good is a necessity or a luxury depends not on the intrinsic properties of the good but on the preferences of the buyer. For avid sailors with little concern about their health, sailboats might be a necessity with inelastic demand and doctor visits a luxury with elastic demand

Quick Question

If a good is a necessity, demand for the good would tend to be

A. elastic
B. horizontal
C. unit elastic
D. inelastic

Quick Question

If a good is a necessity, demand for the good would tend to be

A. elastic
B. horizontal
C. unit elastic
D. **inelastic**

Determinants of Price Elasticity of Demand

Definition of the market

Narrowly defined markets tend to have more elastic demand than broadly defined markets because it is easier to find close substitutes for narrowly defined goods

Food, a broad category, has a fairly inelastic demand because there are no good substitutes for food. Ice cream, a narrower category, has a more elastic demand because it is easy to substitute other desserts for ice cream. Vanilla ice cream, a very narrow category, has a very elastic demand because other flavors of ice cream are almost perfect substitutes for vanilla ice cream.

Quick Question

Demand for a good would tend to be more inelastic the

A. fewer the available substitutes
B. longer the time period considered
C. more the good is considered a luxury good
D. more narrowly defined the market is

Quick Question

Demand for a good would tend to be more inelastic the

A. **fewer the available substitutes**
B. longer the time period considered
C. more the good is considered a luxury good
D. more narrowly defined the market is

Determinants of Price Elasticity of Demand

Time horizon

The more time buyers have to adjust their behavior to changes in price, the more sensitive (responsive) they are to them

When the price of gasoline rises, the quantity of gasoline demanded falls only slightly in the first few months. Over time, however, people buy more fuel-efficient cars, switch to public transportation, and move closer to where they work. Within several years, the quantity of gasoline demanded falls more substantially.

Quick Question

Werthers candy tends to have an elastic demand because

A. the candy market is too broadly defined
B. there are many close substitutes for Werthers
C. Werthers are considered by some to be a necessity
D. it is usually eaten quickly and therefore the time horizon is short

Quick Question

Werthers candy tends to have an elastic demand because

A. the candy market is too broadly defined
B. **there are many close substitutes for Werthers**
C. Werthers are considered by some to be a necessity
D. it is usually eaten quickly and therefore the time horizon is short

Computing Price Elasticity of Demand at a Given Point

formula $\text{PED} = \frac{\%\Delta Q_d}{\%\Delta P} = \frac{\frac{\Delta Q_d}{Q_d} \times 100}{\frac{\Delta P}{P} \times 100} = \frac{\frac{\Delta Q_d}{Q_d}}{\frac{\Delta P}{P}} = \frac{Q_{d_2} - Q_{d_1}}{P_2 - P_1} \times \frac{P_1}{Q_{d_1}}$

🌎 If a 10 percent increase in the price of an ice-cream cone causes the amount of ice cream you buy to fall by 20 percent, $\text{PED} = \frac{\%\Delta Q_d}{\%\Delta P} = \frac{-20\%}{+10\%} = -2$

⚖ In this course, the emphasis is on the magnitude of PED not on the sign in front of the coefficient, therefore PED will be reported as *absolute value* (2 instead of -2). This method computes *point elasticity* and is suitable for very (infinitesimally) small changes of P and Q.

Quick Question

If a 20 percent increase in the price of an ice-cream cone causes the amount of ice cream you buy to fall by 50 percent, PED is

A. 2.5
B. -2.5
C. 20
D. -50

Quick Question

If a 20 percent increase in the price of an ice-cream cone causes the amount of ice cream you buy to fall by 50 percent, PED is

A. **2.5**
B. -2.5
C. 20
D. -50

Computing Price Elasticity of Demand Between Two Points

formula $\text{PED} = \frac{\%\Delta Q_d}{\%\Delta P} = \frac{\frac{Q_{d_2} - Q_{d_1}}{\frac{Q_{d_2} + Q_{d_1}}{2}}}{\frac{P_2 - P_1}{\frac{P_2 + P_1}{2}}} = \frac{Q_{d_2} - Q_{d_1}}{P_2 - P_1} \times \frac{P_2 + P_1}{Q_{d_2} + Q_{d_1}}$

🌎 If the price of an ice-cream cone increases from \$4 to \$6 and the amount of ice cream you buy per week falls from 12 to 8, $\text{PED} = \frac{8-12}{6-4} \times \frac{6+4}{8+12} = \frac{-4}{2} \times \frac{10}{20} = -1$ (PED is 1)

⚖️ Please note that I computed PED as -1 but reported it as 1. This method computes *arc elasticity* and is suitable to compute elasticity between *two points* on the demand curve.

Quick Question

If the price of an ice-cream cone increases from $6 to $8 and the amount of ice cream you buy per week falls from 8 to 4, PED is approximately

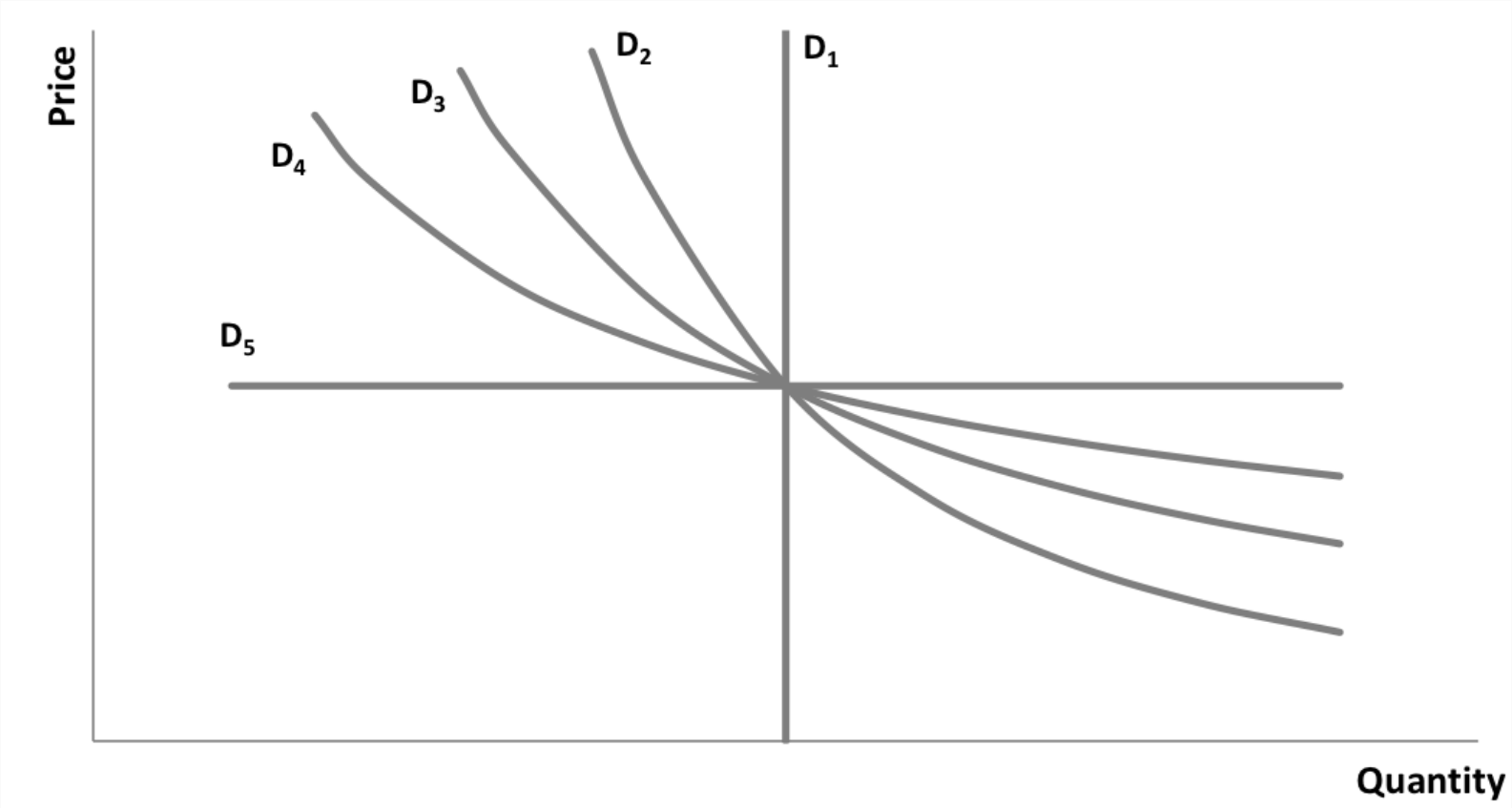
A. 0.4
B. -0.4
C. 2.3
D. -2.3

Quick Question

If the price of an ice-cream cone increases from \$6 to \$8 and the amount of ice cream you buy per week falls from 8 to 4, PED is approximately

A. 0.4
B. -0.4
C. **2.3**
D. -2.3

The Variety of Demand Curves



D_1 – perfectly inelastic demand

D_5 – perfectly elastic demand

Price Elasticity of Demand and Revenues

Total Revenue

total revenue — the amount paid by buyer(s) and received by seller(s) of a good, computed as the price of the good times the quantity sold

🌎 — in the 2020 financial year, Apple's revenue amounted to 274.5 billion dollars; in fiscal year 2020, Alphabet delivered 182.5 billion dollars in revenue; in fiscal year 2020, Tesla's revenue grew to 31.5 billion dollars

⚖️ — total revenue is one of the most important concepts in business because it shows the value of resources that flow from consumers to the business entity or an industry; however, the owner(s) of business(es) are ultimately interested in net income (profit)

Quick Question

Which of the four companies below had the biggest revenue in 2020?

A. Apple
B. Alphabet
C. Tesla
D. Microsoft

Quick Question

Which of the four companies below had the biggest revenue in 2020?

A. **Apple**
B. Alphabet
C. Tesla
D. Microsoft

Profit

profit whatever is left after the value of the resources that flow from the business(es) to the suppliers is subtracted from the value of the resources that flow from consumers to the business(es)

🌎 in the 2020 financial year, Apple's (accounting!) profit amounted to 57.4 billion dollars; in fiscal 2020, Alphabet delivered more than 40 billion dollars in (accounting!) profit; in fiscal 2020, Tesla's (accounting!) profit was 0.7 billion dollars

⚖ profitability is the ultimate (long-term) goal of business; a necessary (but not sufficient!) condition for profitability is the ability to generate revenue

Quick Question

Which of the four companies below had the highest accounting profit in 2020?

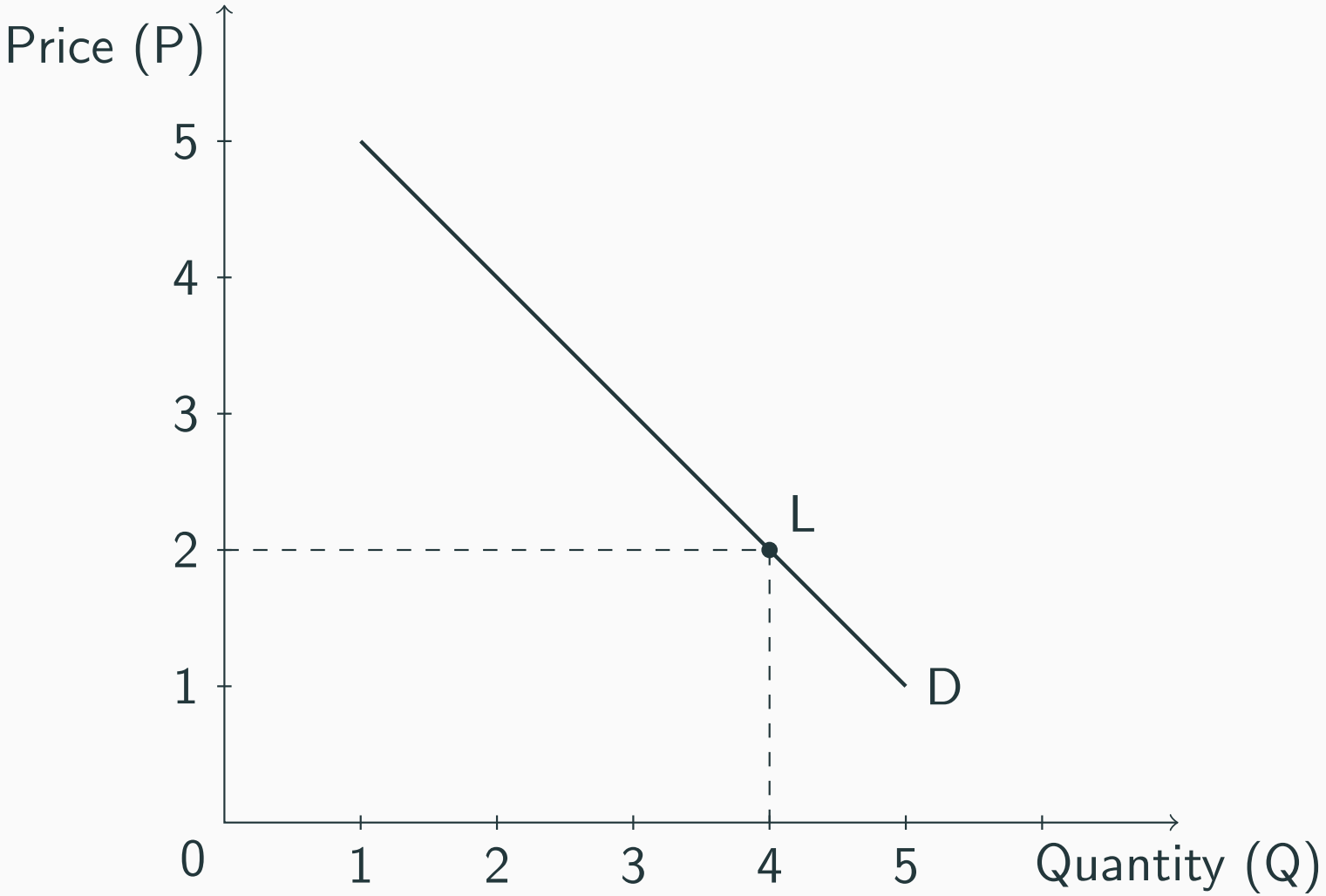
A. Apple
B. Alphabet
C. Tesla
D. Microsoft

Quick Question

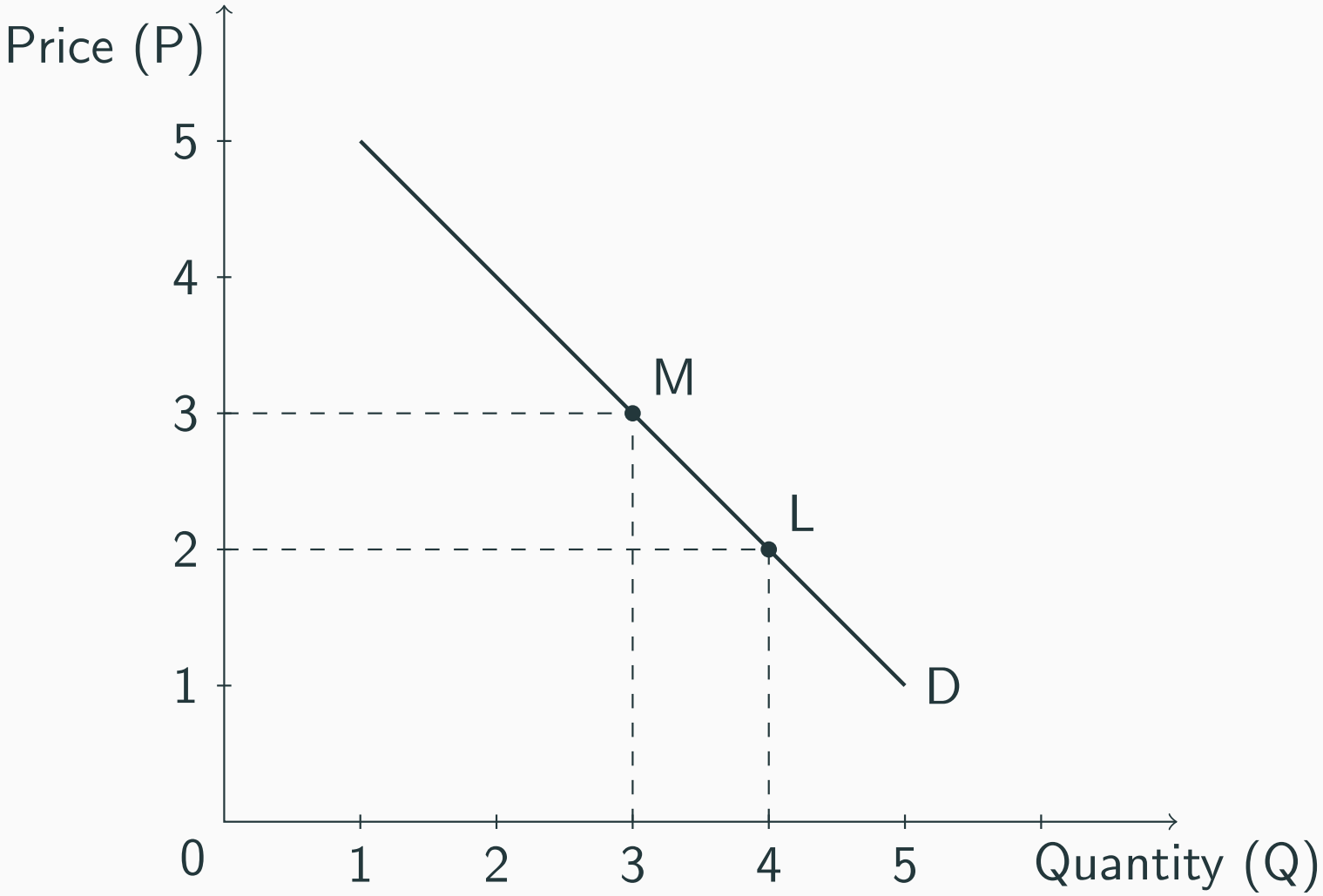
Which of the four companies below had the highest accounting profit in 2020?

A. **Apple**
B. Alphabet
C. Tesla
D. Microsoft

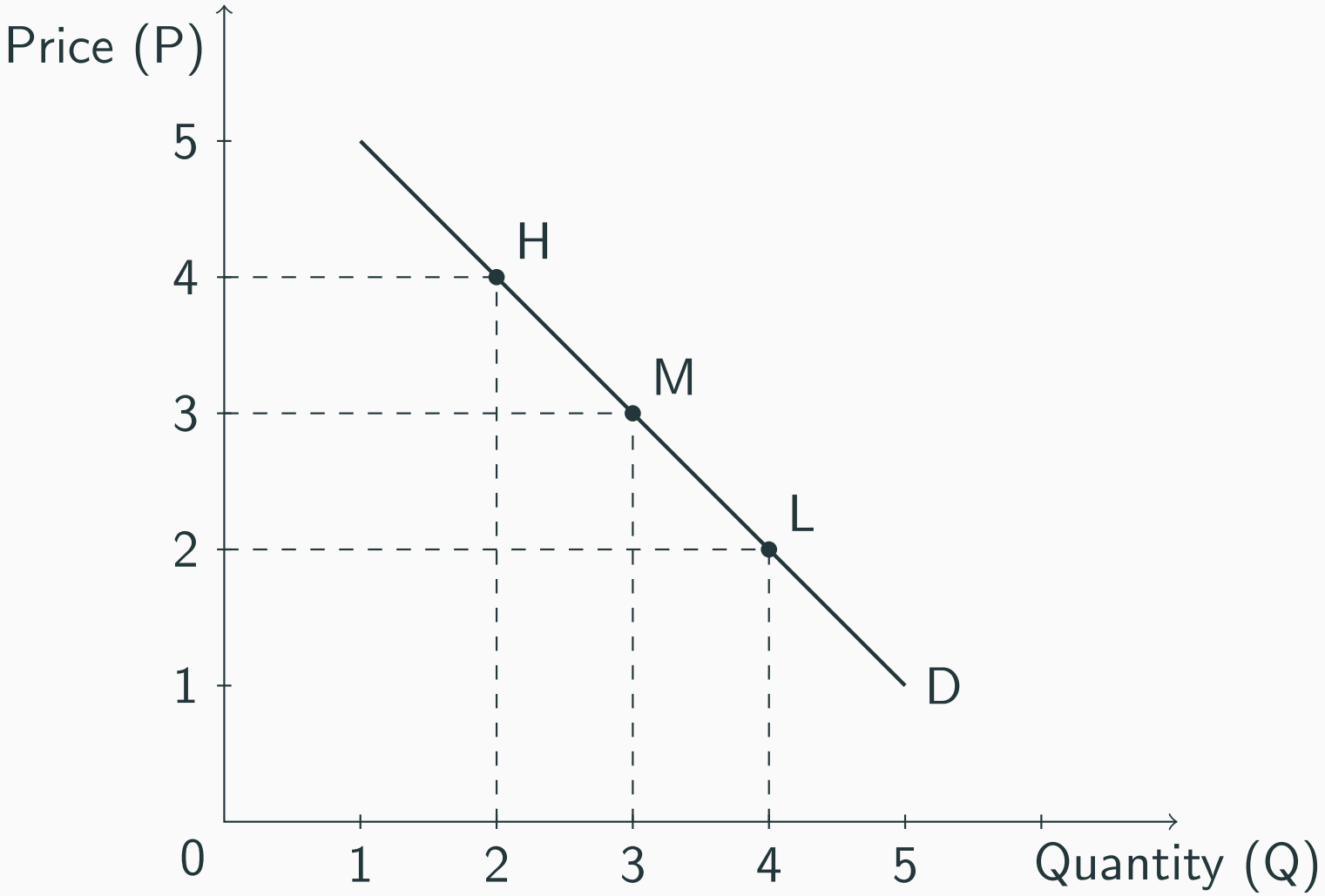
A Firm's Dilemma



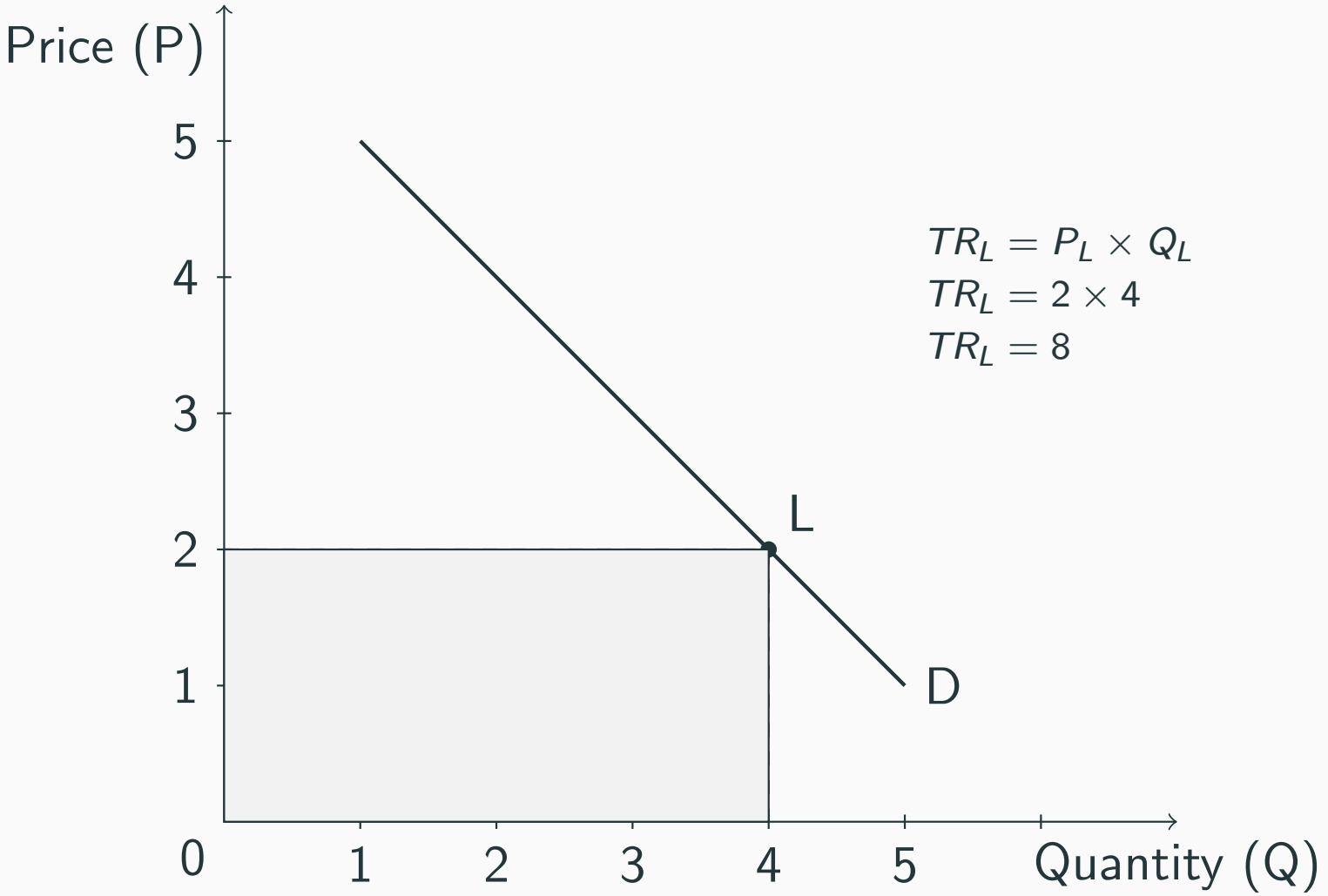
A Firm's Dilemma



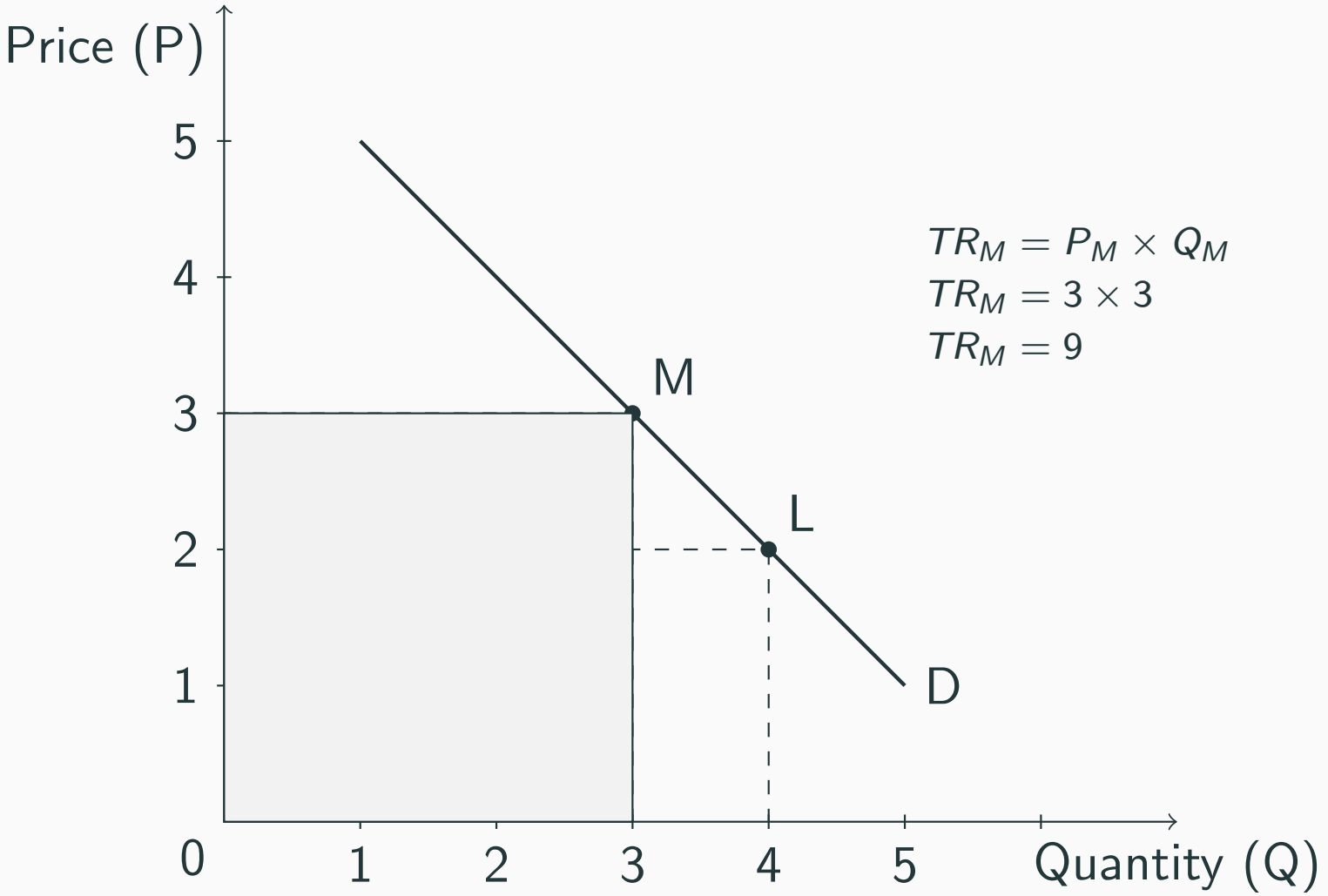
A Firm's Dilemma



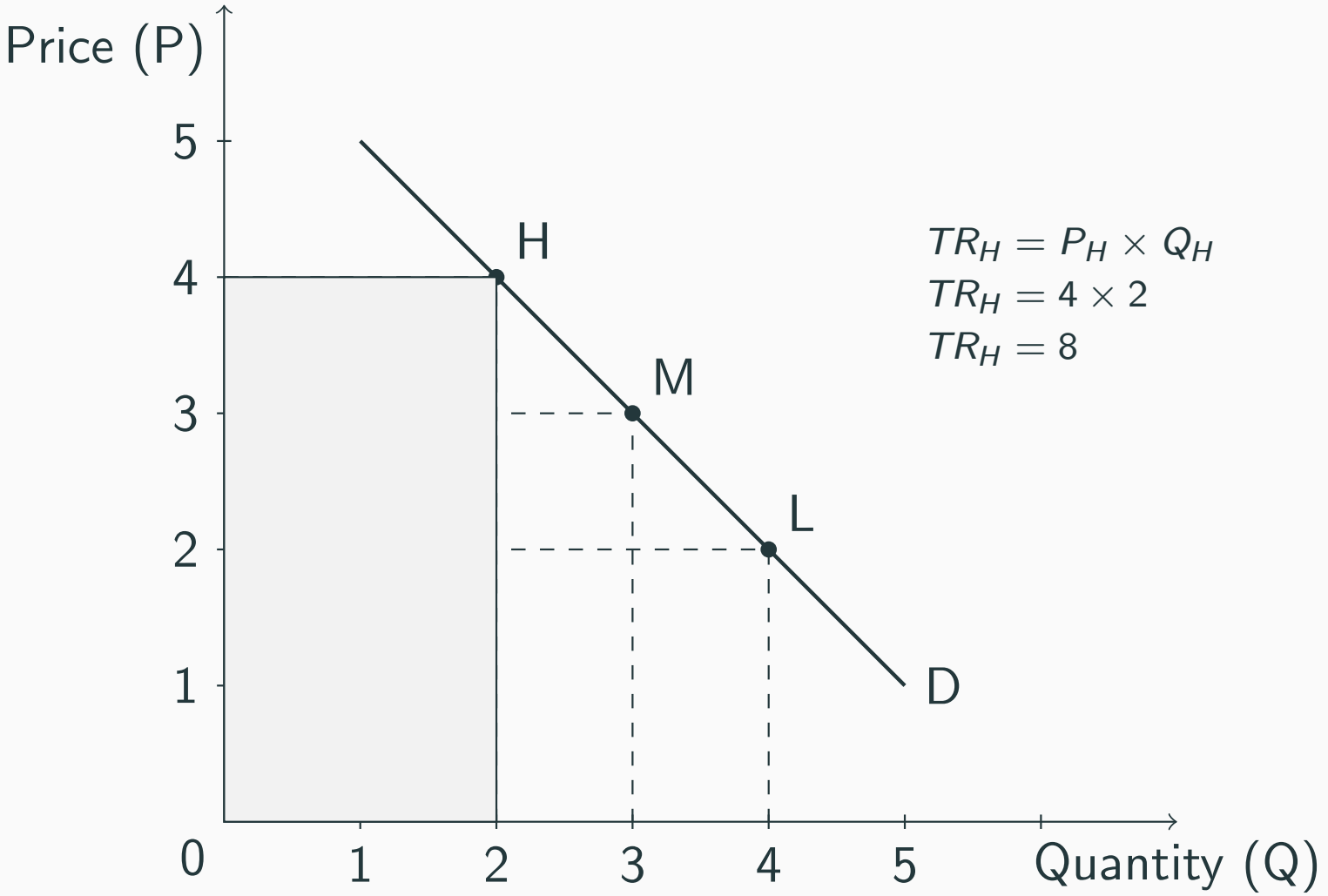
A Firm's Dilemma



A Firm's Dilemma



A Firm's Dilemma



Price Elasticity of Demand and Total Revenue

$$TR = P \times Q_d \quad \Rightarrow \quad \%\Delta TR \approx \%\Delta Q_d + \%\Delta P$$

$$P \uparrow \text{ and } PED > 1 \quad \Rightarrow \quad \%\Delta Q_d > \%\Delta P \quad \Rightarrow \quad \%\Delta TR < 0$$

$$P \uparrow \text{ and } PED < 1 \quad \Rightarrow \quad \%\Delta Q_d < \%\Delta P \quad \Rightarrow \quad \%\Delta TR > 0$$

$$P \uparrow \text{ and } PED = 1 \quad \Rightarrow \quad \%\Delta Q_d = \%\Delta P \quad \Rightarrow \quad \%\Delta TR = 0$$

Quick Question

If the demand for a company's product is inelastic (PED = 0.5) and it raises the price of the product with 5%, what will be the change in this firm's total revenue?

A. 0.5%
B. 5%
C. 2.5%
D. -0.5%

Quick Question

If the demand for a company's product is inelastic (PED = 0.5) and it raises the price of the product with 5%, what will be the change in this firm's total revenue?

A. 0.5%
B. 5%
C. **2.5%**
D. -0.5%

Quick Question

If the demand for a company's product is price elastic (PED $= 2$) and it raises the price of the product with 5%, what will be the change in this firm's total revenue?

A. -5%
B. 5%
C. 2%
D. -2%

Quick Question

If the demand for a company's product is price elastic (PED = 2) and it raises the price of the product with 5%, what will be the change in this firm's total revenue?

A. **-5%**
B. 5%
C. 2%
D. -2%

Price Elasticity of Demand and Revenues

Income Elasticity of Demand

Quick Question

The income elasticity of demand measures how responsive

A. buyers are to a change in income
B. sellers are to a change in price
C. buyers are to a change in price
D. sellers are to a change in buyers' incomes

Quick Question

The income elasticity of demand measures how responsive

A. **buyers are to a change in income**
B. sellers are to a change in price
C. buyers are to a change in price
D. sellers are to a change in buyers' incomes

Income Elasticity of Demand

income elasticity of demand

Degree of sensitivity of quantity demanded to changes in income of buyers, ceteris paribus. $YED = \frac{\%\Delta Q_d}{\%\Delta Y}$

The income elasticity of the demand (YED) of gasoline is 0.2, while the YED of automobiles is 3.0

These numbers were estimated for the United States and for a time period of 1 year after the income change. The fall in income is actually fall in GDP, with the assumption of ceteris paribus unlikely to hold. The sign of the YED coefficient does matter.

Quick Question

If the GDP falls by 1%, by how much is most likely the demand for gasoline to change?

A. -0.2%
B. 0.2%
C. 0.02%
D. -0.02%

Quick Question

If the GDP falls by 1%, by how much is most likely the demand for gasoline to change?

A. **-0.2%**
B. 0.2%
C. 0.02%
D. -0.02%

Quick Question

If the GDP rises by 5%, by how much is most likely the demand for automobiles to change?

A. -15%
B. 15%
C. 5%
D. -5%

Quick Question

If the GDP rises by 5%, by how much is most likely the demand for automobiles to change?

A. -15%
B. **15%**
C. 5%
D. -5%

Normal, Inferior and Luxury Goods

normal good	buyers demand more of it when their income rises
inferior good	buyers demand less of it when their income rises
necessity	buyers demand more of it when their income rises
luxury	buyers demand much more of it when their income rises

Quick Question

Which of these goods would most likely be classified as a normal good?

A. noodles
B. restaurant meal
C. second-hand clothes
D. bus ride

Quick Question

Which of these goods would most likely be classified as a normal good?

A. noodles
B. **restaurant meal**
C. second-hand clothes
D. bus ride

Cross-Price Elasticity of Demand

Quick Question

The cross-price elasticity of demand measures how responsive

A. buyers are to a change in income
B. sellers are to a change in the price of a good
C. buyers are to a change in the price of another good
D. sellers are to a change in buyers' incomes

Quick Question

The cross-price elasticity of demand measures how responsive

A. buyers are to a change in income
B. sellers are to a change in the price of a good
C. **buyers are to a change in the price of another good**
D. sellers are to a change in buyers' incomes

Cross-Price Elasticity of Demand

cross-price elasticity of demand

Degree of sensitivity of quantity demanded of a good to changes in the price of another good, ceteris paribus. $XED = \frac{\%\Delta Q_{d_A}}{\%\Delta P_B}$

🌎 If the price of smartphones falls, the quantity demanded of apps would likely increase. If the price of Samsung smartphones falls, the quantity demanded of Pixel phones would likely decrease.

⚖️ The sign of the XED coefficient does matter (if $XED < 0$ the goods are complements, if $XED > 0$ the goods are substitutes).

Quick Question

Which of the following pairs of goods are most likely to have $XED > 0$

A. Coca Cola and Pepsi Cola
B. PCs and PC software
C. printers and printer cartridges
D. Android OS and Google Play apps

Quick Question

Which of the following pairs of goods are most likely to have $XED > 0$

A. **Coca Cola and Pepsi Cola**
B. PCs and PC software
C. printers and printer cartridges
D. Android OS and Google Play apps

Price Elasticity of Supply

Price Elasticity of Supply

price elasticity of supply — Degree of sensitivity of quantity supplied to changes in the market price of the good, ceteris paribus

🌎 Beachfront land has an inelastic supply because it is almost impossible to produce more of it. Manufactured goods, such as books, cars, and televisions, have elastic supplies because firms that produce them can run their factories longer in response to higher prices.

⚖ PES can not be measured directly, only estimated with econometric techniques, and the estimated values are context (data) dependent.

Determinants of Price Elasticity of Supply

Time period

In most markets, a key determinant of the price elasticity of supply is the time period being considered. Supply is usually more elastic in the long run than in the short run.

🌎 Over short periods of time, firms cannot easily change the size of their factories to make more or less of a good. Thus, in the short run, the quantity supplied is not very responsive to changes in the price. Over longer periods of time, firms can build new factories or close old ones.

⚖️ Furthermore, over longer periods of time, new firms can enter a market, and old firms can exit.

Thank you!