MICROECONOMIC ANALYSIS

- Introduction (today)
- Overview and Revision(next two lectures)
- Consumers $\rightarrow$ demand side
- Firms $\rightarrow$ supply side
- Market structures
- Pricing strategies
- Markets for inputs
- Normative economics – “ought”
  $\Rightarrow$ policy

Issues in Microeconomics

- How can bad weather help farmers?
- How do borrowing and lending help smooth consumption over years?
- What impact does a fall in discount rates have on this pattern?
- Why do some people choose not to work?
- Why do some people choose not to work longer when their wage rates increase?
- Why is there a greater reliance on machinery in Australian construction than in Chinese construction?
- When will higher tax rates raise tax revenues, and when will such revenues fall?
- Why do some firms go out of business?
- Why do some resturants offer “weekday specials”?
- Why do high interest rates discourage investment?
- Why might price controls result in queuing?
- How could minimum wage laws result in lower employment?
- When might governments use quotas (which raise no revenues) rather than tariffs (which, as taxes on imports, do raise revenues)?
- How can growing demand for computers accompany lower prices for computers?
- How best should governments allocate scarce resources, such as the electro-magnetic spectrum?

- When is a monopoly not a monopoly? (Or, should Alan Fels and the Australian Competition and Consumer Commission care that there is only a single manufacturer of Coca Cola in Australia?)
- Are Australian CD prices too high?
  If so, why, and what could the Government do to reduce them?
- Why have slide rules disappeared from sale?
- Why does Telstra charge a monthly amount, plus an amount per call?
- How could Telstra change its billing, and how would subscribers' behaviour change?
- What methods do firms use to reduce loafing on the job?
- Why are employee-owned firms rare?
- What is the difference between a firm's average cost and marginal cost? And does it matter?
- What information does the firm need to calculate both costs?
- How do decision makers respond to future uncertainty?
- What if advertising were prohibited?
- What if coffee drinking (or cigarette smoking) were prohibited?
- What is Gresham's Law and why is it important in times when the *quality* of items is not easily observed before purchase?
- How should the *Encyclopædia Britannica* counter the threat of Microsoft's *Encarta* on CD-ROM?

What is *Micro-economics?*

The study of the way ***resources*** are ***allocated*** among ***competing*** uses to satisfy human ***wants***.

Wants are the ends of the process

(There is no intrinsic value.)

Resources are ***scarce***

(Not all wants can be met at once, and
so there must be sacrifices and trade-offs.)

Subject to technology, or production knowledge—

1. *allocate* resources (inputs — eg?)
2. determine the *composition* of outputs
   (goods and services — eg?)
3. *distribute* the products or outputs to households.

Modelling

What is a model?
What is a good model?

A simplified picture of a part of the real world.
Has some of the real world's attributes, but not all.
A picture simpler than reality.

We construct models in order to explain and understand.

Three Rules for Model Building:

- Think "process".
- Develop interesting implications.
- Look for generality.

Judge models using: truth, beauty, justice.

Interplay between the real world, world of æsthetics, world of ethics, and the model world.

Prices, Costs, and Values → Profits

We use verbal, graphical, and algebraic models of how consumers, firms, and markets work.

We assume rationality: that economic actors (consumers and firms) will not consistently behave in their worst interests.

Not a predictive model of how individuals act, but robust in aggregate.

OVERVIEW & REVISION

(next two lectures)

1. *Maximization:* How individuals, households, and firms choose their bundles of consumption goods and services or their production levels.

2. *Prices:* What are nominal prices, real prices, inflation, and price indices (such as the CPI)? How are these related to real and nominal income?

3. *Demand:* What factors determine demand? What effects do relative price changes have? What effects do changes in nominal income have? What are complements and substitutes? What are normal and inferior goods?

4. *Supply:* What can we say about supply and price at this stage?

5. *Elasticity:* A dimensionless measure of the sensitivity of a dependent variable to an independent variable.

6. *Equilibrium:* How do supply and demand interact in the market to result in equilibrium price and quantity?

1. Maximization

– individual, “consumer”

maximizes his or her “utility” or satisfaction
subject to constraints

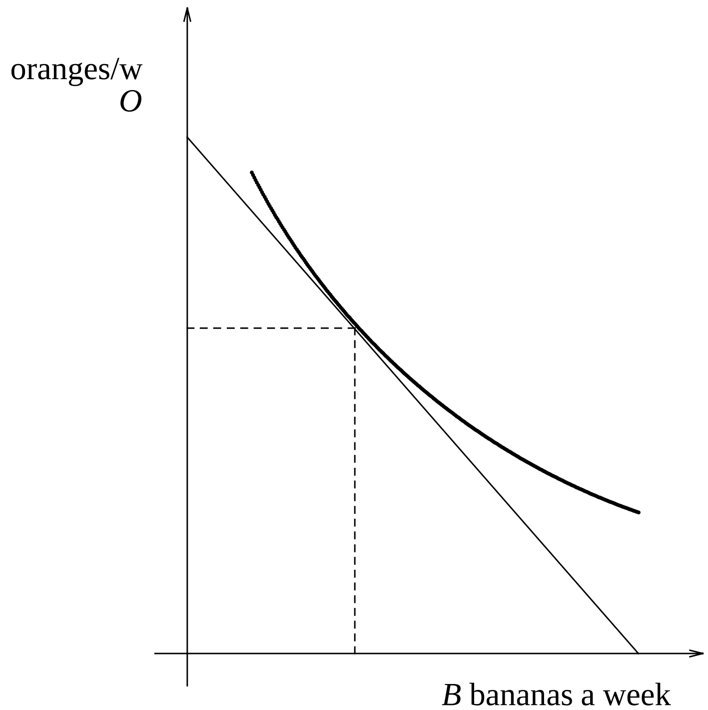
- prices
- income (a *flow*, \$ per unit time)
- availability
- (budget?)

– individual firm

maximizes its profit (a flow)
subject to constraints

- competition
- price of output
- costs and availability of inputs —
  labour, materials, etc.
- government regulations (for externalities)
- technology

Question: What if you have a “fruit budget” of \$10/week, bananas cost \$2.99/kg and oranges cost 10¢ each?



$$\begin{aligned} \text{income} &= \text{price of oranges} \times \text{no. of oranges} + \\ &\quad \text{price of bananas} \times \text{amount of bananas} \\ I &= P_O \times O + P_B \times B \\ 10 &= 0.10 \times O + 2.99 \times B \\ \therefore\ O &= 100 - 29.9 \times B \text{ (equation of the Budget Line)} \end{aligned}$$

Flow of goods : units of amount per period
Stock : units of amount (NB: no time element)
Utility: a function of amounts of bananas and oranges eaten
Concepts: utility, indifference curves, bliss point, satiation, feasible set, utility function, choice point, budget line.

$$U = f\,(O,\ B)$$

Consumer's problem:

to *maximize* $U(x, y \cdots)$, the *utility* function

subject to the income constraint:

$$I \geq x P_x + y P_y + \cdots$$

Utility U is a function of many things:

where	x	amount	of	one	good	bought	(oranges) at P_x
	y	"	"	another	"	"	(bananas) at P_y
	z					•	
	a					•	
	b					•	
	c					•	
	•					•	
	•					•	

Maximization problem

constrained maximization

(use Lagrange Multipliers
to solve that) — ***not for exam***

→ to derive 1st order, necessary conditions for max., and to describe their economic meaning.

examples: $U = x + 2y$, $U = x^2 y^3$

Each *indifference curve* corresponds to a particular level of utility $U_1, U_2, \ldots$ "Contours of utility on a hill of satisfaction."

Maximizing

Two assumptions:

- consumers maximize "utility"
- producers (firms) maximize "profit"

Mathematically— (chose vector **x**)

$$\max_{\mathbf{x}} \; F(x_1, \cdots, x_n)$$

or $F(\mathbf{x})$, where $\mathbf{x} \equiv (x_1, \cdots, x_n)$

subject to the constraint $f(\mathbf{x}) = a$,
(e.g., purchases within budget)

(for example, $p_1 x_1 + p_2 x_2 + \cdots p_n x_n = a$)

where **x** are the decision variables,

$$\mathbf{x} > \mathbf{0}, x_i \geq 0.$$

We can solve the maximization problem using the method of *Lagrange Multipliers*. — ***not for exam***

2. Prices

Prices do several things at once:

1. reward the seller

2. ration the good by

   • consumer's willingness to pay
   (• consumer's ability to pay)
   • supplier's willingness to sell

3. signal the costs and values throughout the system (decentralised information)

   e.g. Eastern Europe

Nominal or Money **Income** is a flow of money or goods or services, measured in *dollars of the day*, so that through time with *price inflation* the value of an amount (say, $100) of money—as measured by its *power to purchase*—falls.

Real **Income** is a *flow* of purchasing power *in constant dollars*.

Now let $\bar{P}$ be a *price index* (e.g., the Consumer Price Index or CPI), a weighted average of n prices, where $\bar{P}$ is defined as the weighted sum over the n prices P_i.

$$\bar{P} \equiv \sum_{i=1}^{n} \alpha_i P_i = \alpha_1 P_1 + \alpha_2 P_2 + \cdots + \alpha_n P_n \qquad (1)$$

The weights, α_i, are non-negative and sum to 1, and have been chosen to mirror the proportions in the Statistician's average basket of consumer goods and services. (See the weighting pattern of α_i in the Table.)

$$(\text{ where } \sum_{i=1}^{n} \alpha_i = 1, \quad \alpha_i \geq 0,)$$

$$\text{so that } \Delta\bar{P} = \sum_{i=1}^{n} \alpha_i \, \Delta P_i, \qquad (2)$$

where $\Delta\bar{P}$ is the *change* in $\bar{P}$.

Then I (real income) is defined by *deflating* (normalising) the money income M:

$$I \equiv \frac{M}{\overline{P}} \tag{3}$$

from which can be derived (by taking logs and differentiating — *not for exam*):

$$\frac{\Delta I}{I} = \frac{\Delta M}{M} - \frac{\Delta \overline{P}}{\overline{P}}, \tag{4}$$

where $\Delta \overline{P} \,/\, \overline{P}$ is the rate of *inflation*.

That is, *the proportional growth in real income I equals the proportional growth in money income M minus the proportional growth in the price index* $\overline{P}$, which is nothing other than the rate of inflation, if the weights α_i truly reflect the proportions in the average household's purchases of goods and services.

So if inflation is 10% p.a. ($\frac{\Delta \overline{P}}{\overline{P}} = 10\%$ p.a.),

and if there is no change to money income ($\Delta M = 0$),

then real income will be falling by 10% p.a. ($\frac{\Delta I}{I} = -10\%$ p.a.).

Now, the weights α_i measure the effect on the index $\overline{P}$ of a change in the ith price P_i:

$$\frac{\partial \overline{P}}{\partial P_i} = \alpha_i, \text{ (where } \partial \Rightarrow \text{ partial differentials)}$$

so $P_i \uparrow \;\rightarrow\; \overline{P} \uparrow \;\rightarrow\; I \downarrow$

That is, if *any* price rises, real income falls,

ceteris paribus *or* other things equal

NB: the *partial* differential keeps other things equal.

Question: If the minimum weekly wage in 1911 was £2/2/- (or 42/- or \$4.20), *what money income in 1988 would give the same purchasing power?*

Answer: Since £1 → \$2 in the conversion from old currency to new, £2/2/- would have been \$4.20. Constant purchasing power is equivalent to constant real income, so the question is asking what money income in 1988 would equate real incomes in that year and 1911, given a money income of \$4.20 in 1911.

Let M_{1911} = \$4.20. From the table $\bar{P}_{1911}$ = 53 and $\bar{P}_{1988}$ = 1,594. Using equation (3)

$$I \equiv \frac{M}{\bar{P}}$$

the answer is simple. Equating I_{1911} and I_{1988}, we get

$$\frac{M_{1911}}{\bar{P}_{1911}} = \frac{M_{1988}}{\bar{P}_{1988}}$$

which results in

$$M_{1988} = \$4.20 \times \frac{1{,}594}{53} = \$4.20 \times 30.08$$

$$= M_{1911} \times \frac{\bar{P}_{1988}}{\bar{P}_{1911}} = \$126.32$$

In words, a weekly income in 1911 of \$4.20 should have given equal purchasing power as a weekly income of \$126.32 in 1988.

3. Demand

The quantity demanded is a function of:

- the price of the good ("*own price*") P_X
- the *prices of related goods* P_Y ....
- one's *income* I
- the *tastes* of the consumer T
- the *wealth* of the consumer W
- her *expected* future prices P_X^e
- the expected future *availability*

Examples?

We can write this algebraically:

$$X^D = \text{function}(\underset{(-)}{P_X}, P_Y, I, T, W, P_X^e) \qquad Y \neq X$$

The Law of Demand is $\dfrac{\partial X^D}{\partial P_X} \leq 0$,

that is, in response to a price increase, demand *never* increases, and response to a price fall, demand *never* decreases. (Note: partial differentiation ⇔ ceteris paribus condition.)

Let's relax the ceteris paribus assumption (and consider the *comparative statics*):

let's ask — how does the demand curve respond to *changes* in

(1) P_Y the prices of related goods?

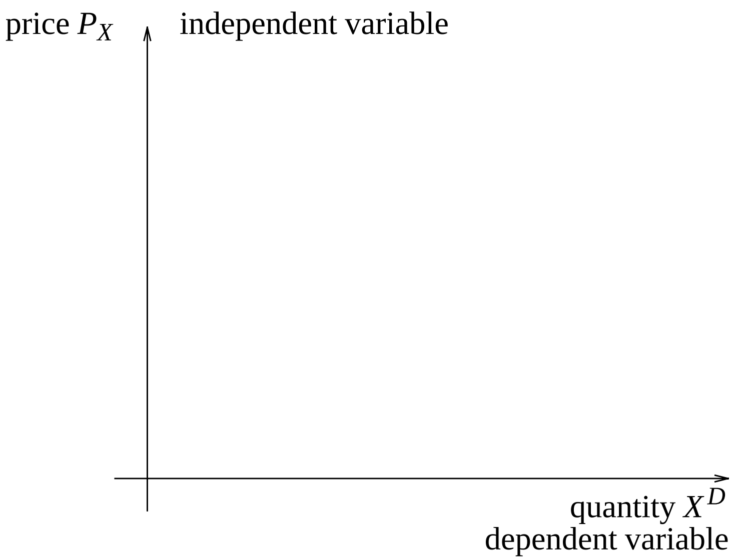
(2) I the income? etc.?

3.1 The Law of Demand

The lower the price, **ceteris paribus**, the greater the quantity of the good desired to be bought (per time period).

(ceteris paribus = keeping everything else the same)

Plot: price as independent variable and quantity as dependent variable



$$X^D = X^D(P_X)$$

That is, the amount of good X demanded, X^D, is a function of the price of good X, P_X.

The **Law of Demand**:

$\dfrac{\partial X^D}{\partial P_X} \leq 0$, ceteris paribus, that is, a *negatively sloped* demand curve.

Exceptions to Law of Demand?
(i.e. higher price → higher quantity demanded?)

1. Prestige goods **?** Not really
2. Dynamic expectations?
3. mythical “Giffen” goods (e.g. Irish potatoes in the famine)

substitution effect (prices change)
versus
income effect (real income changes)

if the income effect > substitution effect
then *perhaps* rise in price of potatoes
→ rise in consumption of potatoes

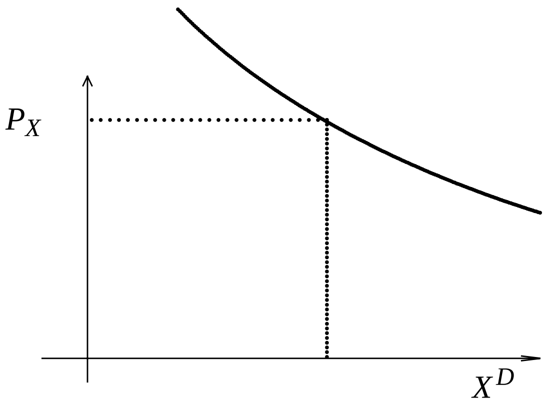
Question: How does demand change with income?

Demand and income: not so clear cut as price

Define	**“normal” goods**	$\dfrac{\partial X^D}{\partial I}$	≥ 0	ceteris paribus
	“inferior” goods		< 0	ceteris paribus
				(all else equal)

examples: ?

Note:



Let's distinguish between:

- movement *along* the demand curve as price changes, cet. par.
- *shifts* in the demand curve as changes occur in:
  ☞ the price of related goods
  (price of "substitute" P_Y rises) red
  (price of "complement" P_Y rises) green
  ☞ tastes
  ☞ disposable incomes
  ☞ expectations of price, availability

"inferior" good	$I\uparrow$	green
	$I\downarrow$	red
v. "normal" good	$I\uparrow$	red
	$I\downarrow$	green
substitute's price	P_Y	green
complement's price	P_Y	red

4. The Supply Curve

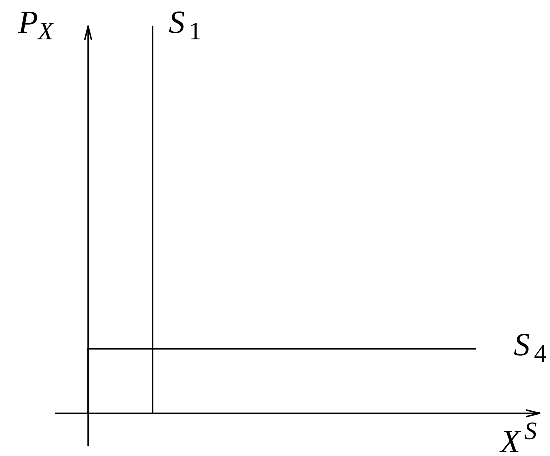
The quantity supplied (made and offered for sale) is a function of the price

$$X^S = f(\text{price}),$$

ceteris paribus, that is, holding these constant:

- technology (*Tech*)
- supply curves of inputs (*Supp*)
- taxes & subsidies (*Gov*)
- regulation
- the state of nature (*Nat*)
- the period of adjustment, or lag

$$X^S = X^S(P_X, \overline{Tech}, \overline{Supp}, \overline{Gov}, \overline{Nat})$$
$$= X^S(P_X), \text{ ceteris paribus}$$



⇒ There is **no** law of supply.

5. Elasticity

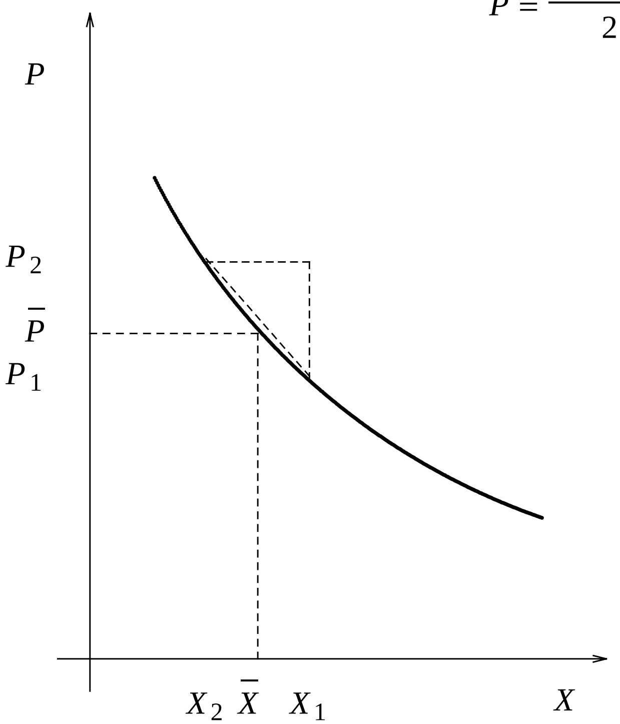
— a dimensionless measure of the sensitivity of one variable to changes in another, cet. par.

Def. The *price elasticity of demand* is the percentage change in the dependent variable X^D divided by the percentage change in the independent variable, P.

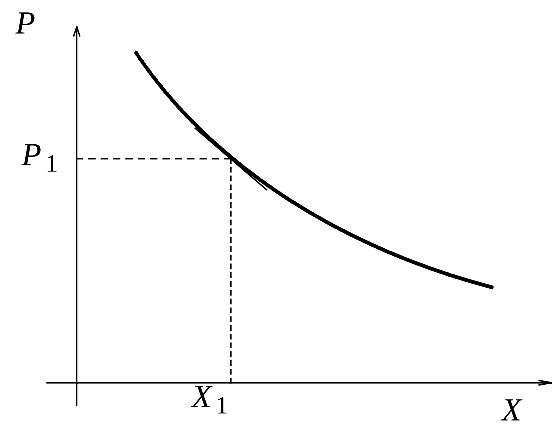
So the price elasticity of demand is given by the measurements:

arc: $$\eta_P \equiv \frac{\Delta X / \bar{X}}{\Delta P / \bar{P}} = \frac{\bar{P}}{\bar{X}} \frac{\Delta X}{\Delta P} \leq 0$$

mid-point: $$\bar{P} = \frac{P_1 + P_2}{2}$$



point: $$\eta_P \equiv \frac{P_1}{X_1} \frac{\partial X}{\partial P}$$ (by convention, use $|\eta_P|$)

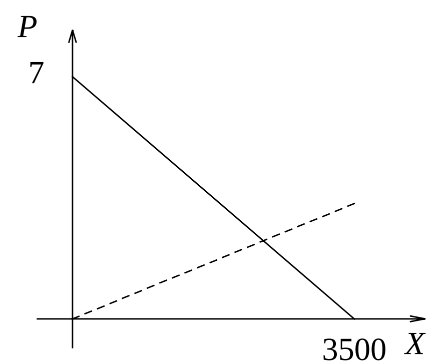


e.g. demand $X^D = 3500 - 500P$

$$\therefore \frac{\partial X^D}{\partial P} = -500 = \frac{1}{\text{slope}}$$

(point) $$\therefore \eta_P = -\frac{P}{X^D} \times 500$$

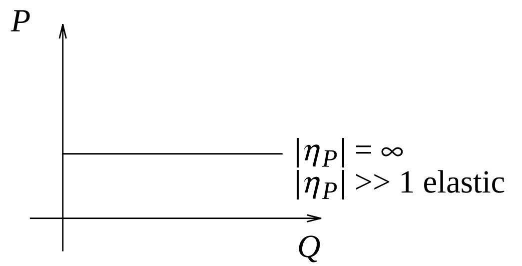
(NB: elasticity ≠ the slope! — a frequent trap)

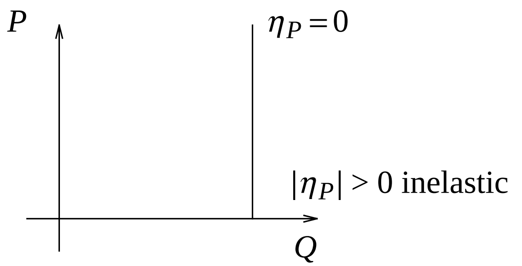


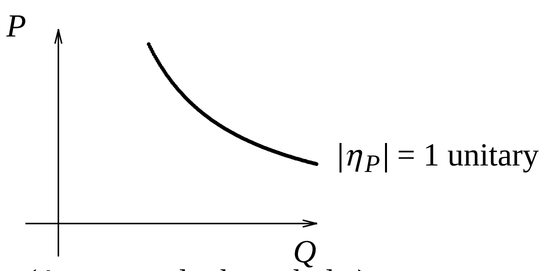
Elasticity at point = $\dfrac{\text{the slope of the ray through the origin}}{\text{the slope of the demand curve}}$

The expression $|\eta_P|$ is the absolute value of the elasticity: never negative.

When $|\eta_P|$ > 1 we speak of **elastic** demand
= 1 we speak of **unitary elastic** demand
< 1 we speak of **inelastic** demand
= 0 we speak of **perfectly inelastic** demand
$\rightarrow \infty$ **perfectly elastic**







(A rectangular hyperbola.)

A property of price elasticity of demand: η_P

Expenditure = Revenue $R = P \times X^D = P \times X^D(P)$,
where $X^D(P)$ is a demand function.

How does revenue change in response to a change in price?

Diff. totally:

$$\frac{dR}{dP} = P\frac{\partial X^D}{\partial P} + X^D = X^D\left(\frac{P}{X^D}\,\frac{\partial X^D}{\partial P} + 1\right) = X^D\left(\eta_P + 1\right)$$

So:

$\eta^P = -1$	unitary	$\lvert\eta_P\rvert = 1$	$\Rightarrow$	$\frac{dR}{dP} = 0$
$\eta^P < -1$	elastic	$\lvert\eta_P\rvert > 1$	$\Rightarrow$	$\frac{dR}{dP} < 0$
$\eta^P > -1$	inelastic	$\lvert\eta_P\rvert < 1$	$\Rightarrow$	$\frac{dR}{dP} > 0$

$\therefore$ Taxes on what?

To summarize:

	$\lvert\eta_P\rvert$	Price	Total Expenditure (Revenue)
Elastic demand	> 1	Up	Down
		Down	Up
Unitary elasticity	= 1	Up	Constant
		Down	Constant
Inelastic demand	< 1	Up	Up
		Down	Down

The Effects of Price Elasticity of Demand

5.2 Cross-Price Elasticity of Demand:

is the effect on the demand X^D of a price change P_Y of good $Y \neq X$, but where X and Y are *related* goods, ceteris paribus.

$$\eta_{X,Y} \equiv \frac{\Delta X^D}{\bar{X}^D} \Bigg/ \frac{\Delta P_Y}{\bar{P}_Y} \qquad \text{(arc)}$$

$$\eta_{X,Y} \equiv \frac{\partial X^D}{\partial P_Y} \frac{\bar{P}_Y}{\bar{X}^D} \qquad \text{(point)}$$

$$\Delta X^D = X_1^D - X_2^D$$

$$\Delta P_Y = P_{Y1} - P_{Y2}$$

$$\text{midpoint convention: } \bar{X}^D = \frac{X_1^D + X_2^D}{2}$$

$$\bar{P}_Y = \frac{P_{Y1} + P_{Y2}}{2}$$

If $\eta_{X,Y}$ > 0 then X and Y are **substitutes**

< 0 then X and Y are **complements**

= 0 then X and Y are **unrelated**

Examples?

of substitutes?
of complements?

$$\eta_P = \frac{\partial X^D}{\partial P_X}\frac{P_X}{X^D} = \frac{\partial X^D}{X^D} \bigg/ \frac{\partial P_X}{P_X}$$

A good's *own-price elasticity of demand* is seen to depend on:

1. more substitutes $\rightarrow$ $|\eta_P| \uparrow$
2. a larger proportion of budget: $|\eta_P| \uparrow$
3. the higher the price: $|\eta_P| \uparrow$

(These properties do not follow from the axioms and definitions; they have been observed in the market.)

5.3 Income Elasticity of Demand ε

Defn. The proportional *change in the amount demanded* in response to a 1 percent *change in real income.*

Or algebraically:

(arc) $\varepsilon \equiv \frac{\Delta X^D}{X} \bigg/ \frac{\Delta I}{I}$

(point) $\varepsilon \equiv \frac{\partial X^D}{\partial I}\frac{I}{X}$ > 0 **"normal" good**

< 0 **"inferior" good**

"luxuries"	ε	high > 1	> 0
"necessities"	ε	low < 1	> 0

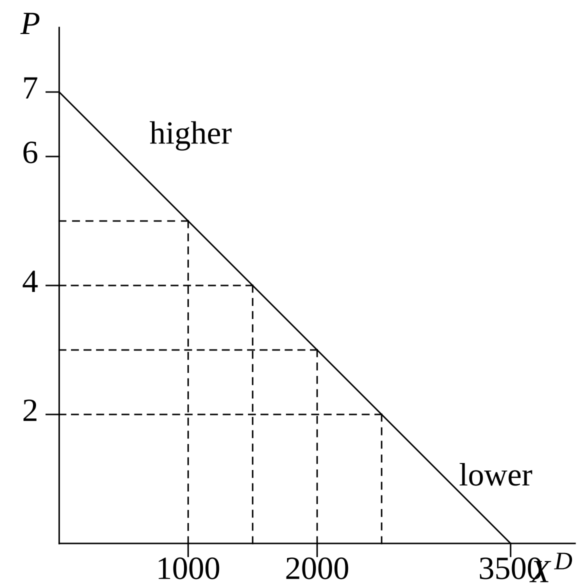
both "normal" $\because$ ε is positive

Examples?

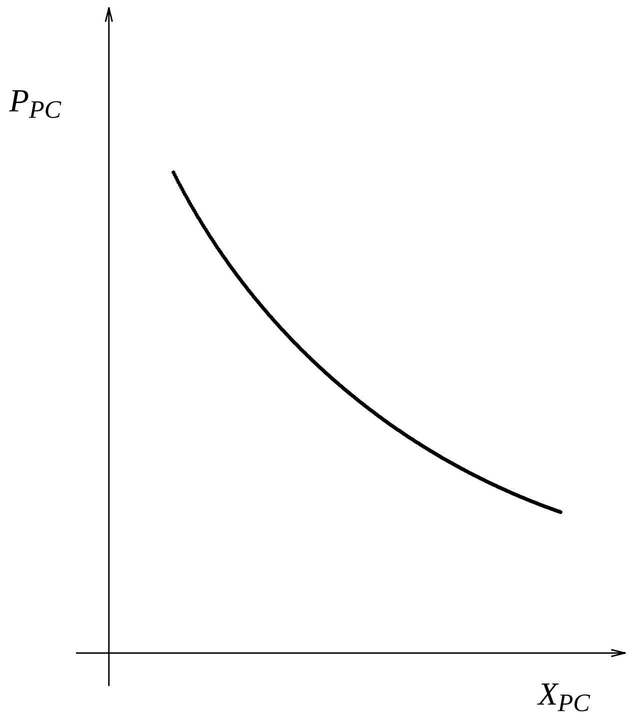
Elasticity is not equal to the slope of the demand curve. Indeed, we can calculate the price elasticities along a linear demand curve. (*Arc elasticities*, midpoint convention.)

Price ($/t)	Purchase (tonnes)	Value of Sales ($)	$\lvert\eta_P\rvert$ Elasticity
2	2500	5000	
			5/9
3	2000	6000	
			1
4	1500	6000	
			9/5
5	1000	5000	

$$\text{eg.} \frac{5}{9} = \frac{(2{,}500 - 2{,}000)/2{,}250}{(3-2)/2.5} = \frac{\Delta X/\bar{X}}{\Delta P/\bar{P}}$$



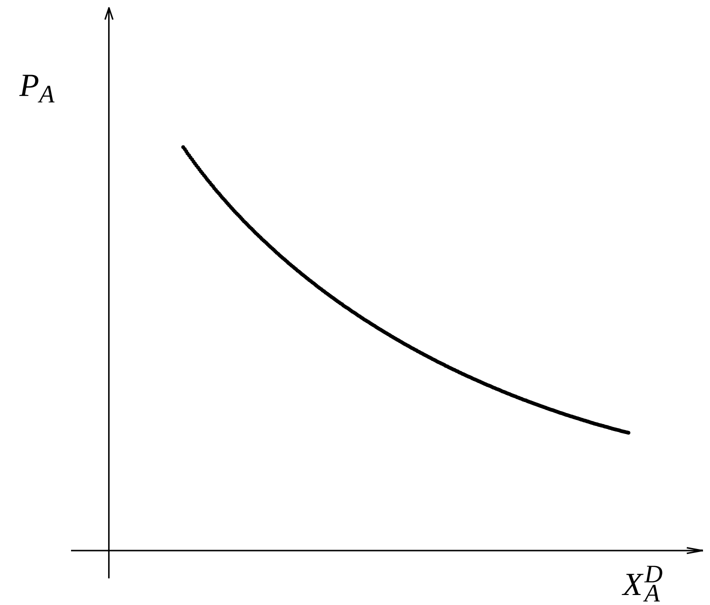
$X^D = 3500 - 500P$
elasticity ≠ slope



An increase in the price of Polaroid film P_{PF}

$\rightarrow$ left-ward shift in the demand for Polaroid cameras X^D_{PC}

$$\frac{\partial X^D_{PC}}{\partial P_{PF}}, \quad \frac{\partial X^D_{PF}}{\partial P_{PC}} < 0 \ \text{complements}$$

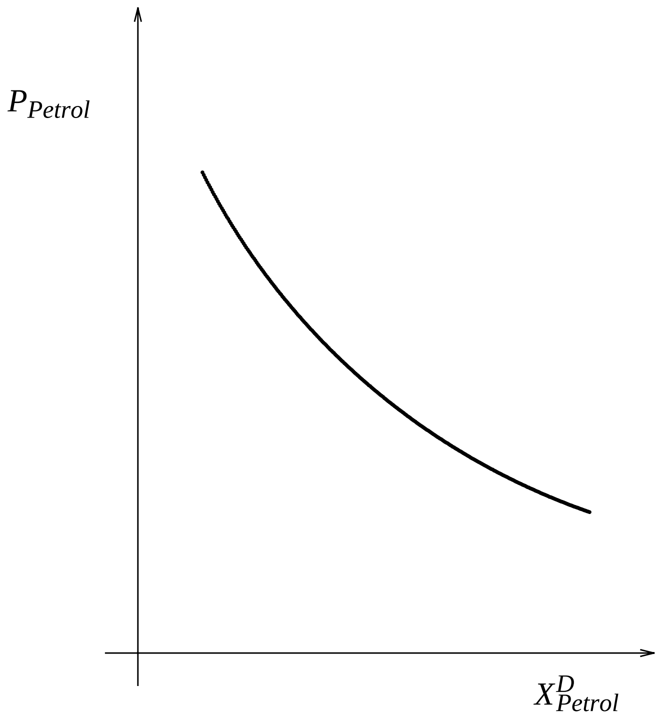


"*normal*" goods: increased income I $\rightarrow$ increased demand

"*inferior*" goods: increase in income I $\rightarrow$ fall in demand

$$\frac{\partial X^D_A}{\partial I} < 0$$

e.g. public transport
ground mince
living in Western Suburbs (?)

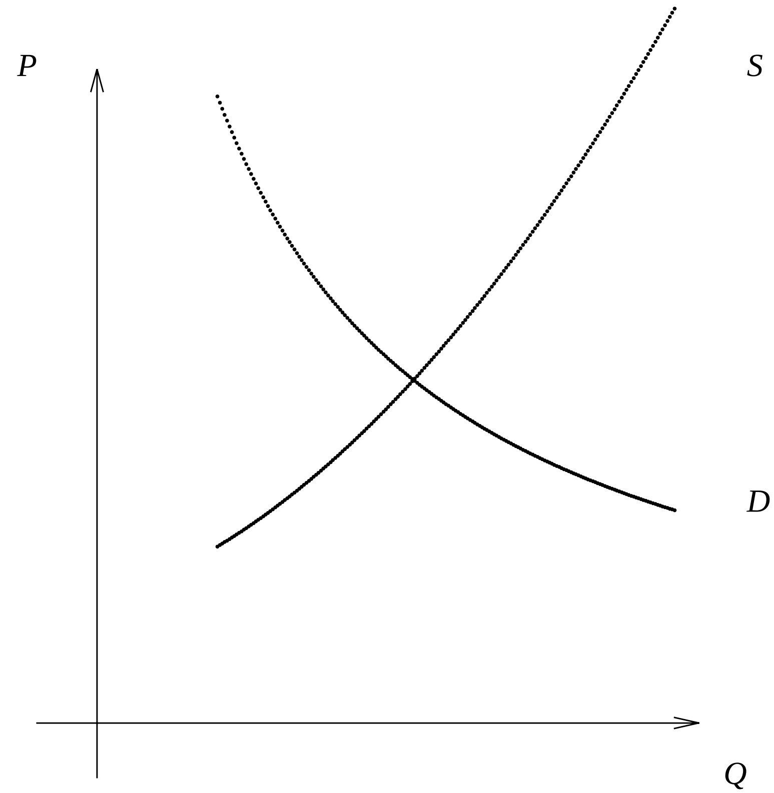


An increase in the price of public transport

⇒ right-ward shift in the demand for petrol

$$\frac{\partial X^D_{Petrol}}{\partial P_{Public\ Transport}} > 0$$

Petrol & Public Transport are *substitutes*.



A *glut* occurs when:	$S > D$
A *shortage* occurs when:	$D > S$
A *buyer's market* occurs when:	$S > D$
A *seller's market* occurs when:	$D > S$
Sellers are on the *long* side when:	$S > D$
Sellers are on the *short* side when:	$D > S$

CPI Insert

Summary:

The introduction has looked at six broad aspects of micro-economics, in a study of the way in which economic agents (individuals, households, firms) choose among scarce alternatives. We have considered:

1. *Maximisation*, as a revision of the principles underlying the assumed behaviour of *utility-maximising individuals* and *profit-maximising firms*. (Note that it's not necessary that such a theory be able to predict all choices of every such agent, just that it be better than the next theory at prediction, especially of aggregate behaviour, which it is.)
2. *Prices*, as motivation for the sellers, and sacrifices for the buyers, and signals for everyone. Inflations, real, nominal (or current-year), prices indices.
3. *Demand*, as an outcome of utility-maximising behaviour of buyers; substitutes, complements, "normal" goods, "inferior" goods.
4. *Supply*, as a function of price.
5. *Elasticity*, as a measure of the sensitivity of one variable to another, in this case quantity demanded to price or income.
6. And determination of *equilibrium*, market-clearing price and quantity, when supply equals demand, and buyers and sellers are all *price takers*.

H&H: Chapters 1 and 2.