Engel Curves and Income Elasticities

Second application of the choice model: **Engle Curves**

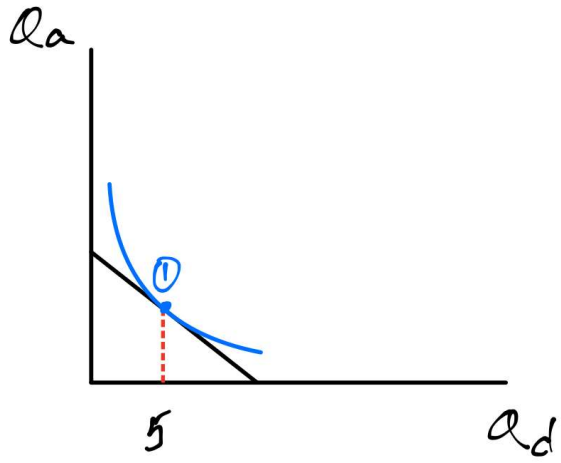
Change in demand in response to changes in *income* (M)

Example: DVDs (*d*) and all other goods (*a*)

Scenario 1, BAU:

$P_d = \$15$
$P_a = \$1$
$M = \$180$

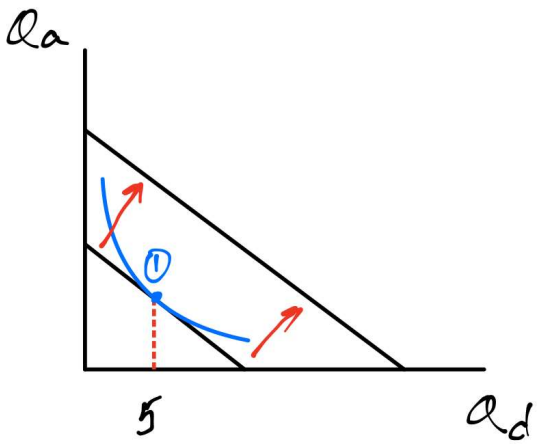
Suppose person chooses 5 DVDs under BAU:



Scenario 2, Policy:

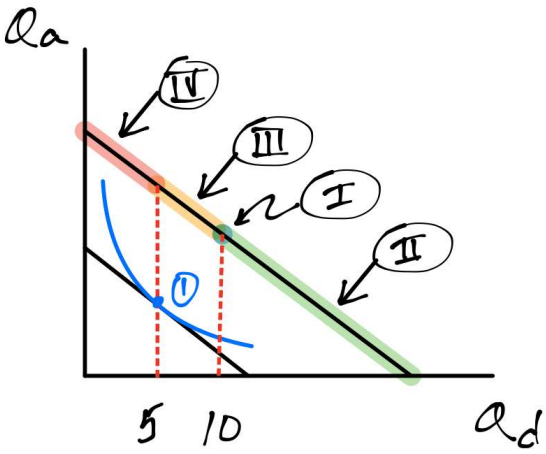
Same prices as BAU
Income rises to $M = \$360$

BC moves out:



Where will equilibrium 2 end up?

Four possible areas for the new equilibrium



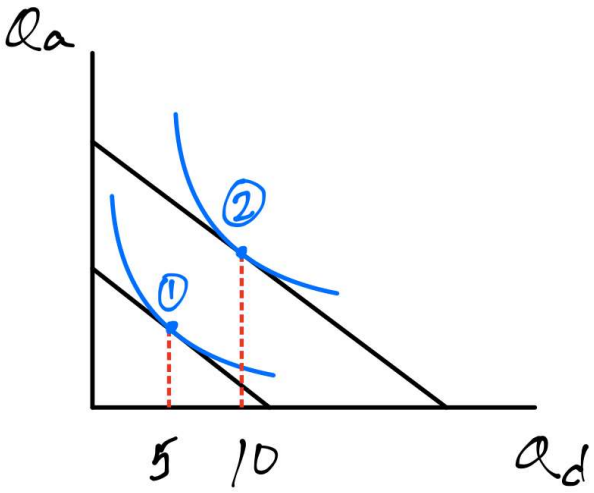
I) Q_d rises 100%

II) Q_d rises >100%

III) Q_d rises <100%

IV) Q_d falls

Example of Case I: Chooses 10 DVDs at new M



DVDs are proportional to income:

Doubling M ⇒ doubles Q_d

Define *income elasticity*:

$$\eta_m = \frac{\%\Delta Q}{\%\Delta M}$$

Applying to example:

$$\%\Delta Q = \frac{10 - 5}{5} = 100\%$$

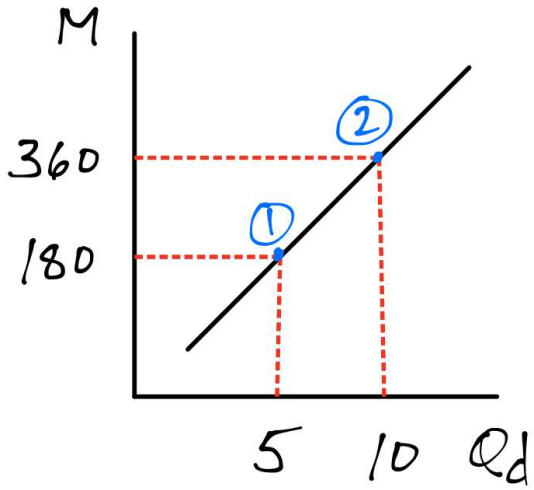
$$\%\Delta M = \frac{360 - 180}{180} = 100\%$$

$$\eta_m = \frac{100\%}{100\%} = 1$$

$\eta_m = 1$:

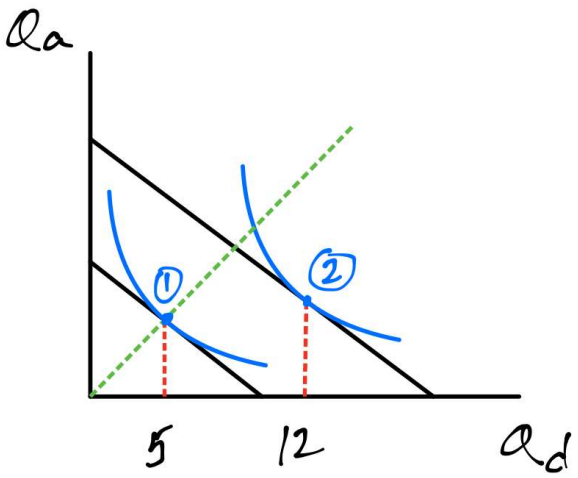
- Q_d rises **in proportion** to income: **unitary** elasticity

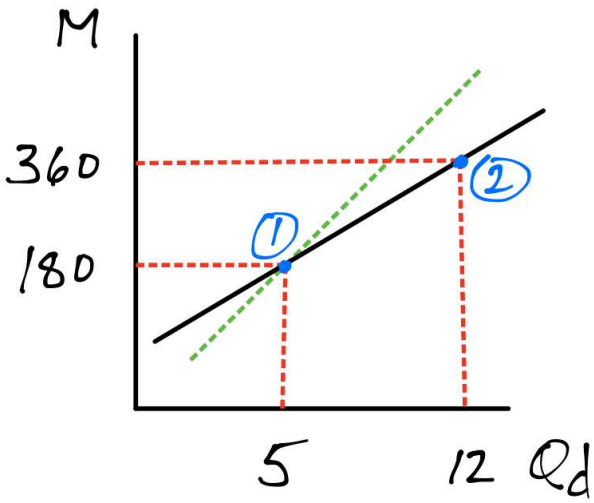
Graphing Person 1's Engel Curve:



Income on the Y axis
Quantity on the X axis

Example of Case II: Chooses 12 DVDs at new M





Dashed green lines show case I for reference ($\eta_m = 1$)

Income elasticity?

$$\%\Delta Q = \frac{12-5}{5} = \frac{7}{5} = 140\%$$

$$\eta_m = \frac{140\%}{100\%} = 1.4$$

$\eta_m > 1$:

- Q_d rises **more than** in proportion to income: "luxury good"
- Engel curve relatively **flat** (like large supply elasticity)

Important note: *share* of income spent on D *rises* with *income*:

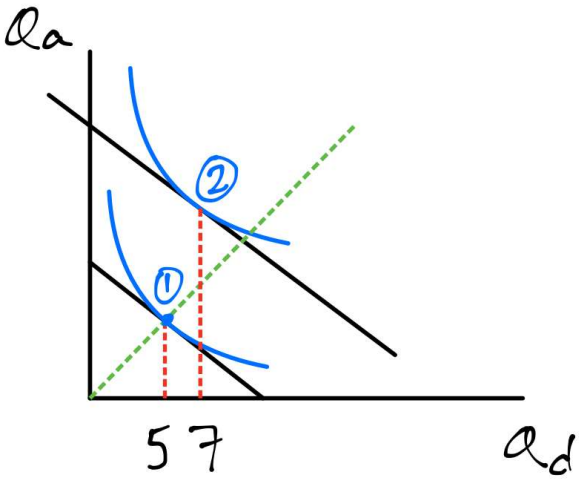
Income	Q_d	Share equation	Share
\$180	5	$\frac{P_d Q_d}{M} = \frac{\$15 * 5}{\$180}$	42%
\$360	12	$\frac{P_d Q_d}{M} = \frac{\$15 * 12}{\$360}$	50%

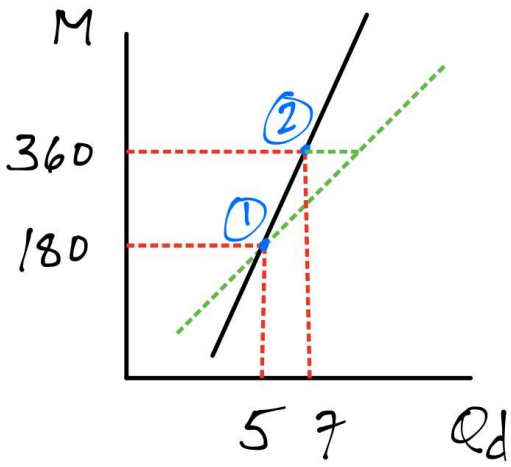
Taxing $\eta_m > 1$ goods will generally be *progressive*

Example: Suppose price includes \$1 tax burden T_d

Income	Q_d	Share equation	ETR
\$180	5	$\frac{T_d Q_d}{M} = \frac{\$1 * 5}{\$180}$	2.8%
\$360	12	$\frac{T_d Q_d}{M} = \frac{\$1 * 12}{\$360}$	3.3%

Example of Case III: Chooses 7 DVDs at new M





Income elasticity:

$$\%\Delta Q = \frac{2}{5} = 40\%$$

$$\eta_m = \frac{40\%}{100\%} = 0.4$$

$$1 > \eta_m > 0$$

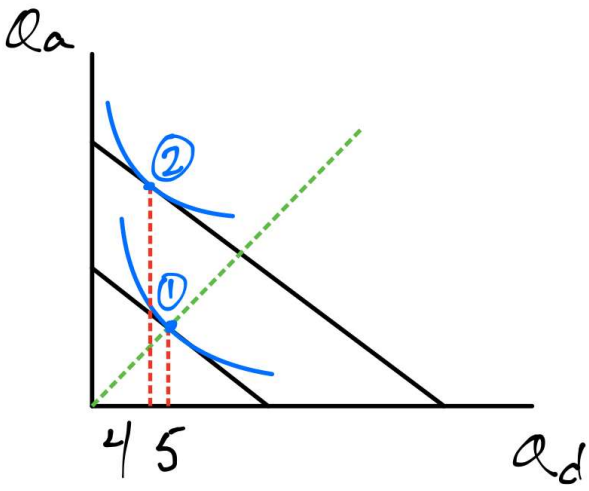
- Q_d rises, but **less than** in proportion to M: "necessity good"
- Engel Curve relatively **steep**

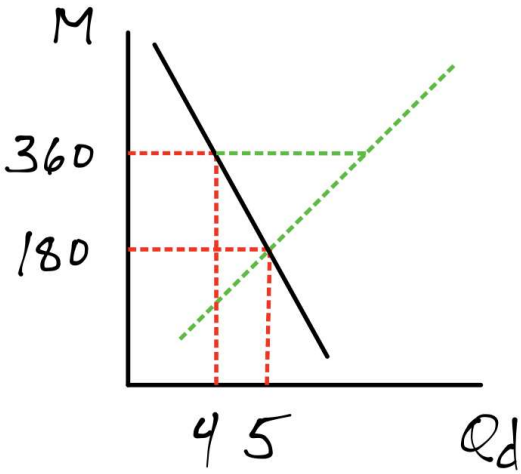
Budget *share decreases* with income:

Income	Q_d	Share equation	Share
\$180	5	$\frac{P_d Q_d}{M} = \frac{\$15 * 5}{\$180}$	42%
\$360	7	$\frac{P_d Q_d}{M} = \frac{\$15 * 7}{\$360}$	29%

Taxing $\eta_m < 1$ goods is generally *regressive*

Example of Case IV: Chooses 3 DVDs at new M





Income elasticity:

$$\%\Delta Q = \frac{-1}{5} = -20\%$$

$$\eta_m = \frac{-20\%}{100\%} = -0.2$$

$\eta_m < 0$:

- Q_d **falls** when income rises: "inferior good"
- Engel Curve **slopes backward**

Examples:

Buses, Kraft mac and cheese, ramen, Yugos …

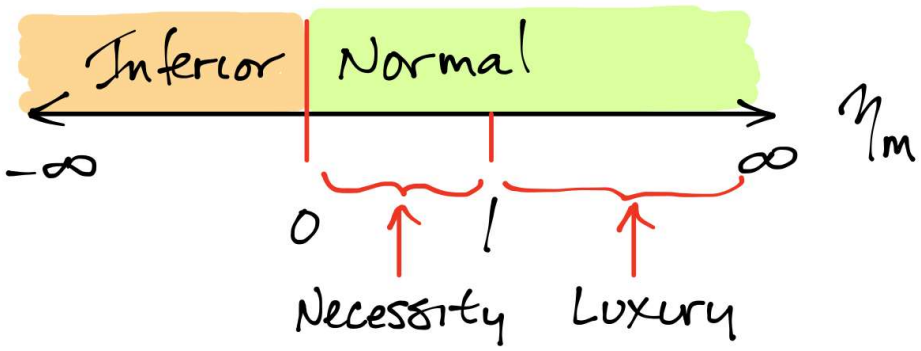
Classes of goods:

Main categories:

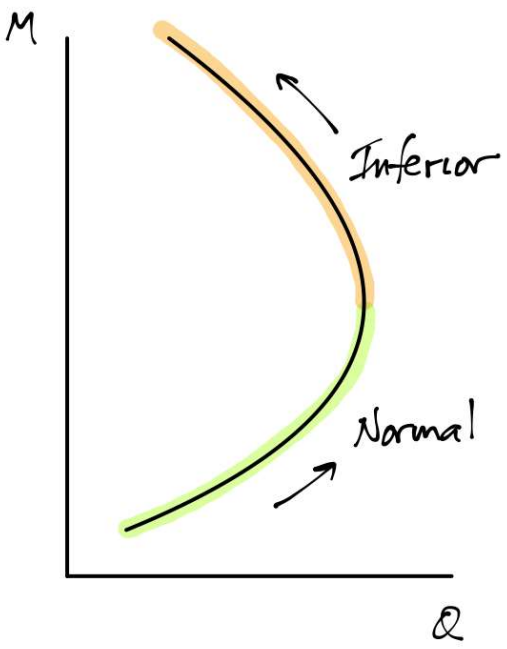
Normal: $\eta_m > 0$

Inferior: $\eta_m < 0$

Schematically:



Class can change as income rises:



Example: hamburger

High income:

Inferior

M ↑ causes Q ↓

Low income:

Normal

M ↑ causes Q ↑