2. Consumer´s demand analysis

Structure

- Factors influencing an individual demand
- The impact of disposable income change:
  - income consumption curve, Engel curves
  - income elasticity of demand
- The impact of the change of price of selected goods on the quantity demanded:
  - price consumption curve and demand derivation
  - substitution and income effect, Giffen paradox, price elasticity of demand
- The impact of the change of price of other goods on the quantity demanded:

  - cross substitution effect, cross income effect

  - cross elasticity of demand
- Relationship between demand elasticities, substitution elasticity
- Derivation of market demand

Characteristics of an individual demand

Individual demand = demand of the sole consumer...

...depends on:

➢ disposable income

➢ price of the selected goods

➢ price of other goods

➢ consumer´s preferences and expectations

The impact of the change of disposable income on the individual demand

- ➤ all other factors remain the same
- ➤ the change of disposable income moves the budget line... and the consumer´s equilibrium...
- ➤ ...↑I → BL (+consumer s equi.) moves rightwards, ↓I → BL (+consumer s equi.) moves leftwards
- ➤ ICC *(Income Consumption Curve)* = set of the consumer s equilibria upon different levels of disposable income *(or: IEP – Income Epansion Path)*

Income consumption curve – standard path
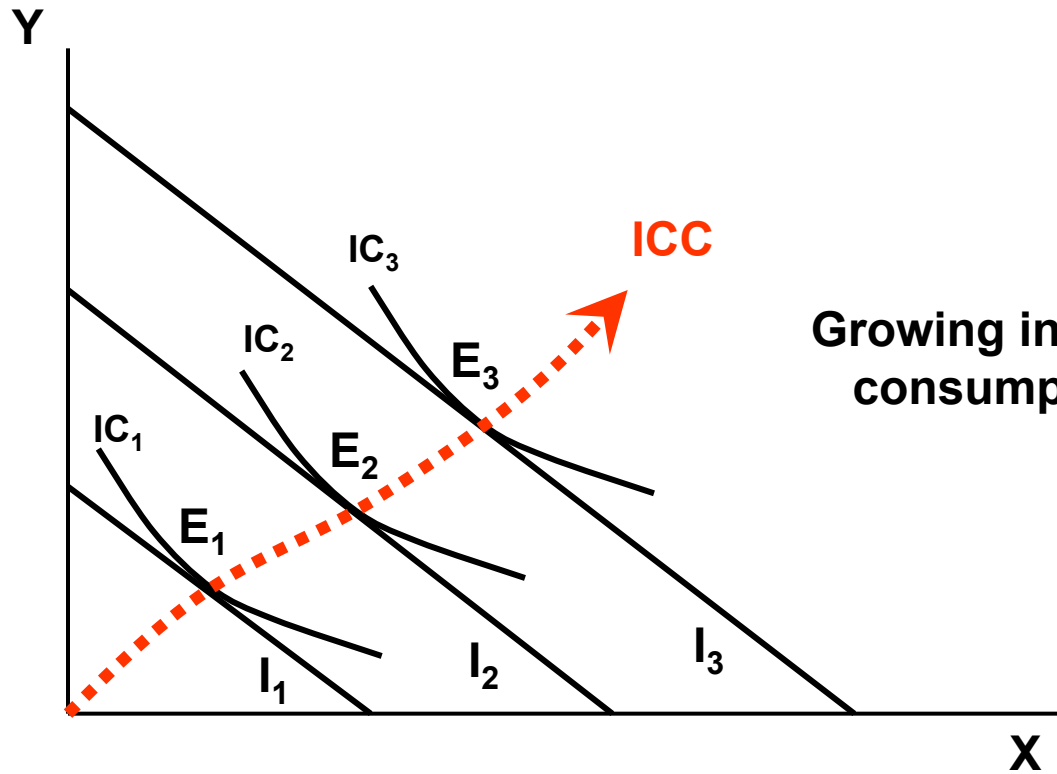
Growing income induces the growth of consumption of all „normal" goods

What is „normal" goods?

➢ ...if the growth of disposable income induces the growth of consumption of specific goods, we can say it is a „normal goods", and...

➢ ...if the decrease of disposable income induces the decrease of consumption of specific goods, so...

➢ ...$\uparrow I \rightarrow \uparrow Q$ or $\downarrow I \rightarrow \downarrow Q$

➢ **essential goods** – a subset of normal goods = if the growth/decrease of disposable income is relatively higher than the growth/decrease of the consumption: $\uparrow I > \uparrow Q$ or $\downarrow I > \downarrow Q$

➢ **luxury goods** – a subset of normal goods = if the growth/decrease of disposable income is relatively smaller than the growth/decrease of the consumption: $\uparrow I < \uparrow Q$ or $\downarrow I < \downarrow Q$

➢ the opposite of normal goods = **inferior goods –** the growth of disposable income induces the decrease of the consumption, and vice versa: $\uparrow I \rightarrow \downarrow Q$ or $\downarrow I \rightarrow \uparrow Q$

➢ it depends on consumer´s preferences which goods is normal, or inferior

Application: EKC – Environmental Kuznets Curve

- ➢ shows the relation between GDP per capita and the level of erosion of the environment

- ➢ shape of inverse „U"

- ➢ **explanation:** environment is a luxury good – when the GDP/cap. is relatively low, people prefer everything but the clean environment, but when the GDP/cap. reaches a critical level, the demand for clean environment rises faster than the GDP/cap. does
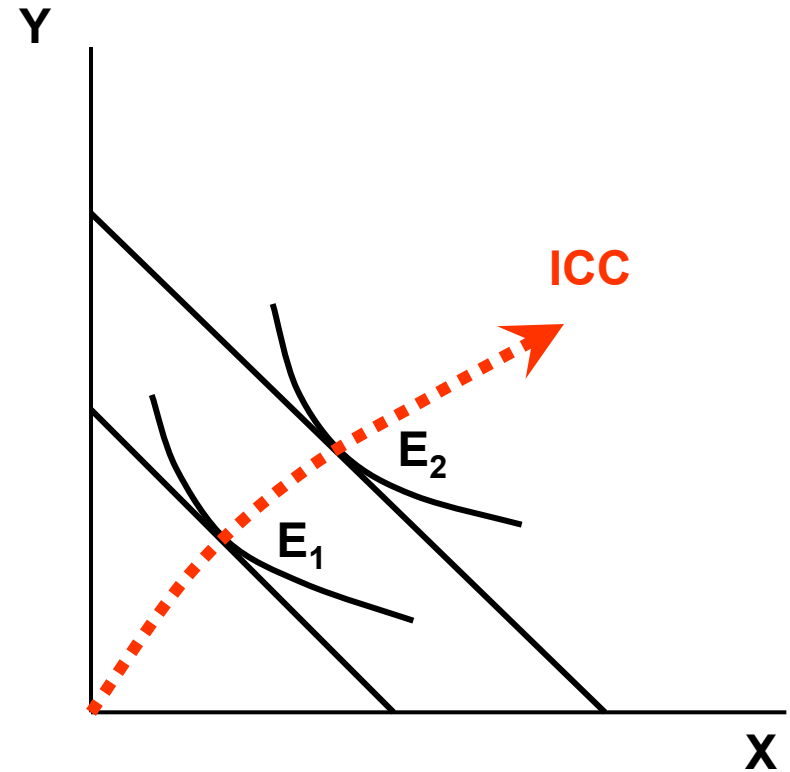
Application: EKC – Environmental Kuznets Curve
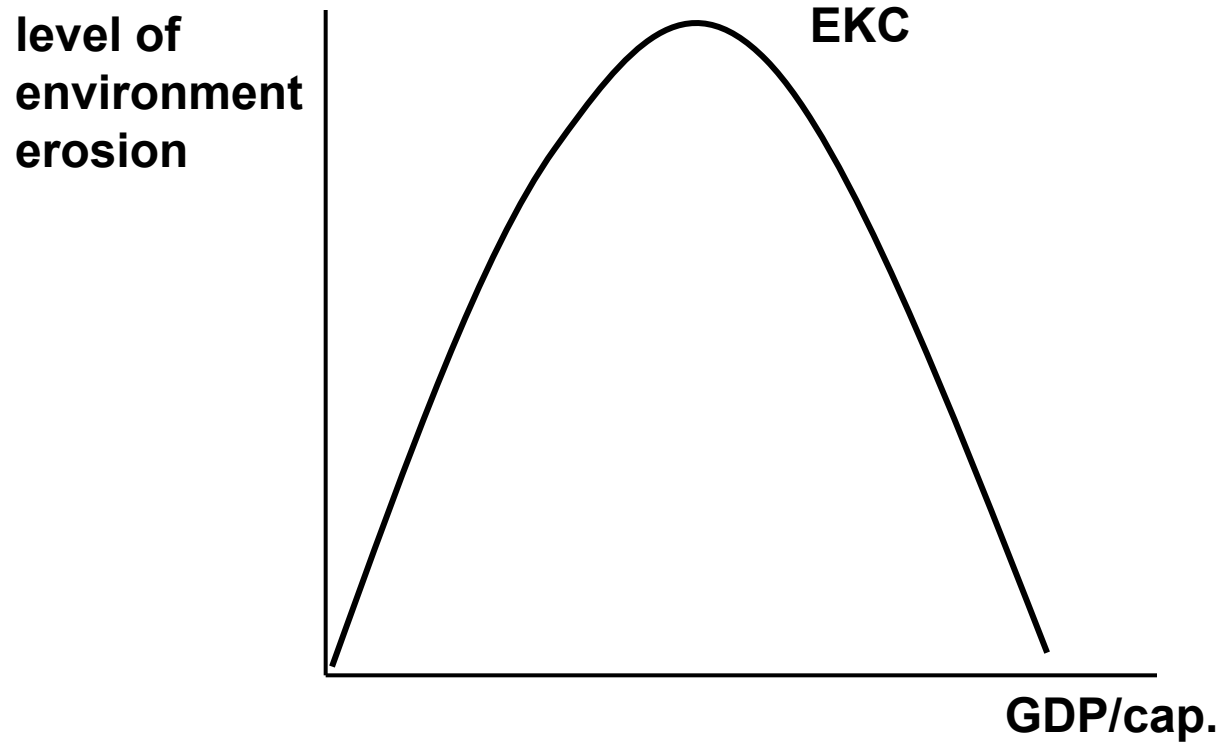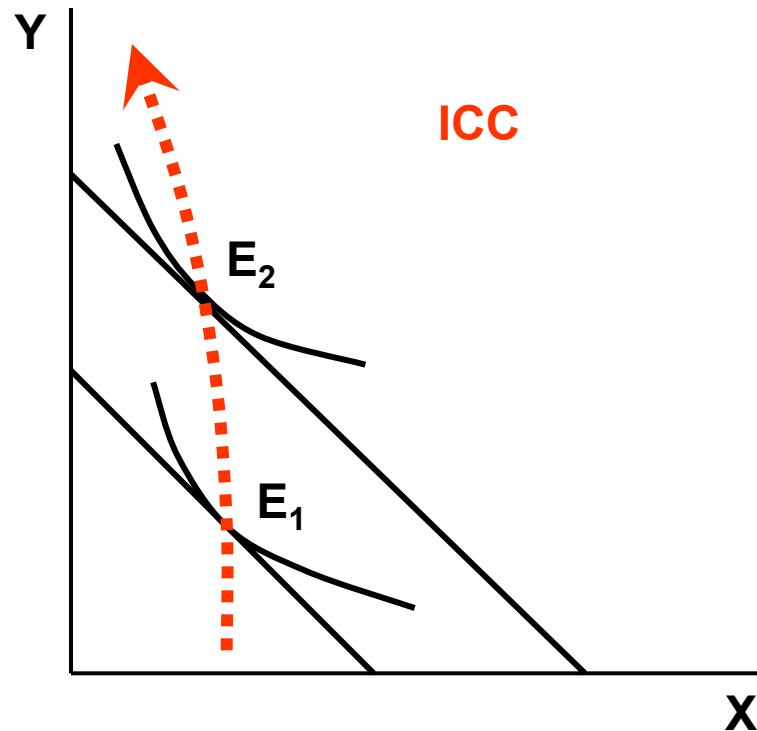
Income consumption curve – essential and luxury goods
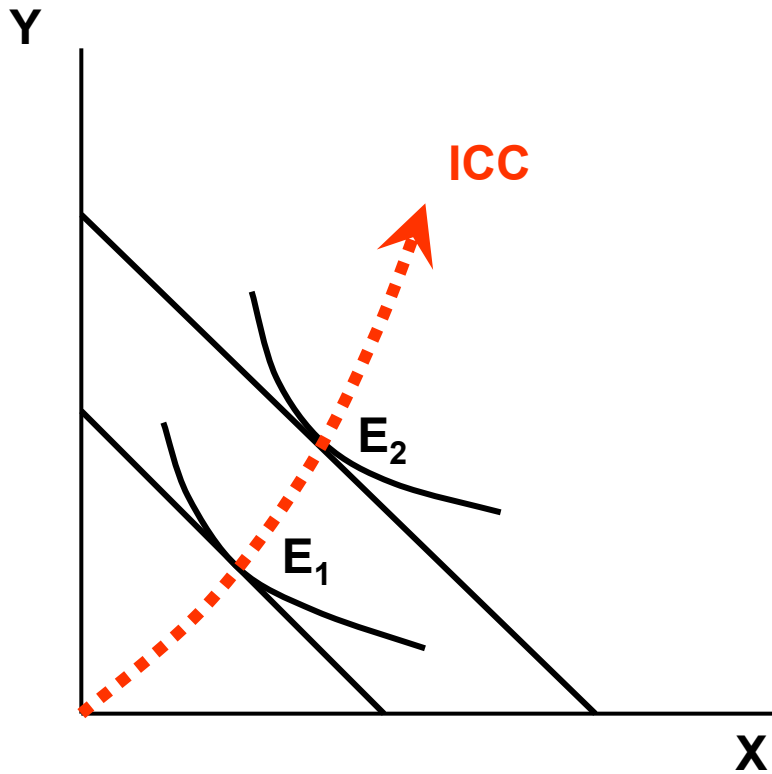
X is essential – its consumption grows slower than the disposable income

X is luxury – its consumption grows faster the disposable income
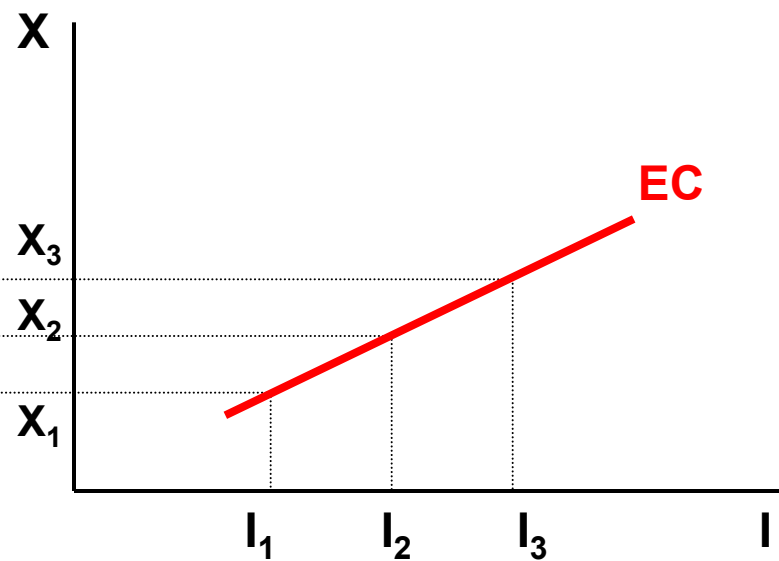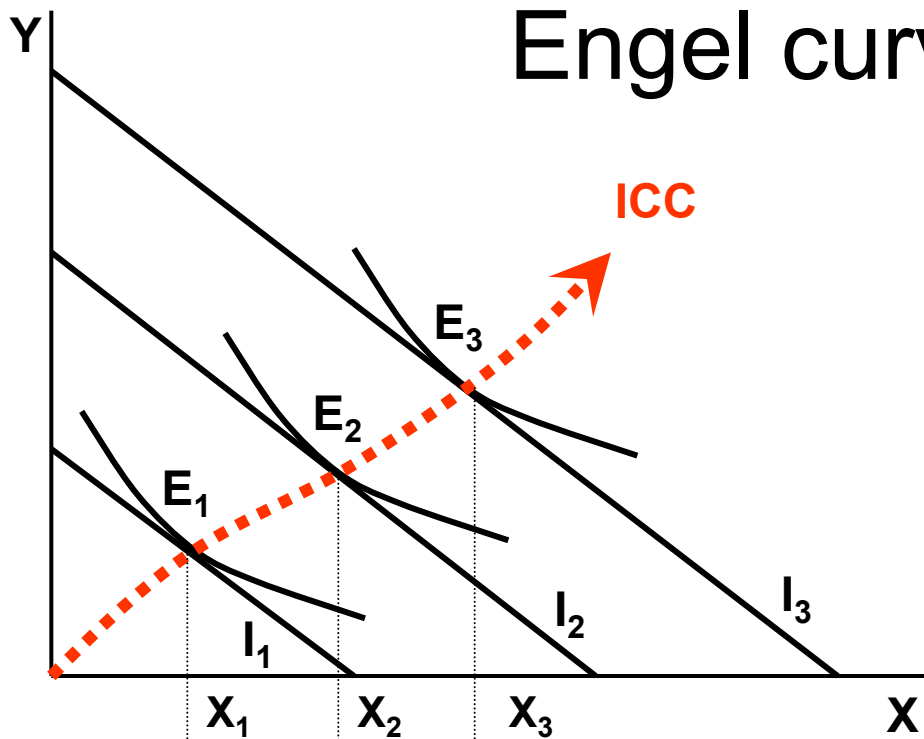
Income consumption curve – inferior goods

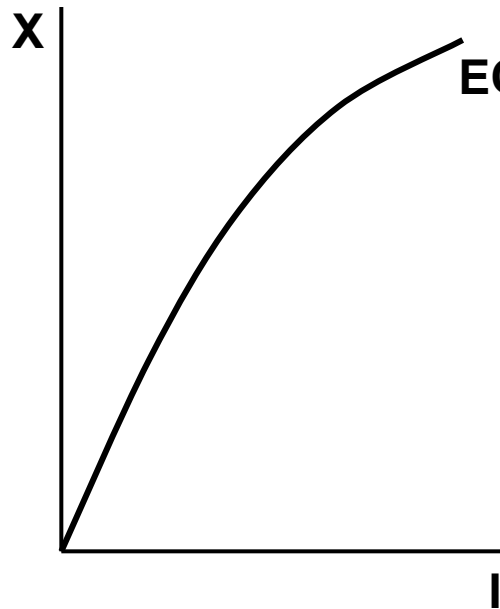**X is inferior – consumption decreases while disposable income rises**

Engel Curve - EC

➤ shows the relation between the volume of goods consumption and the disposable income
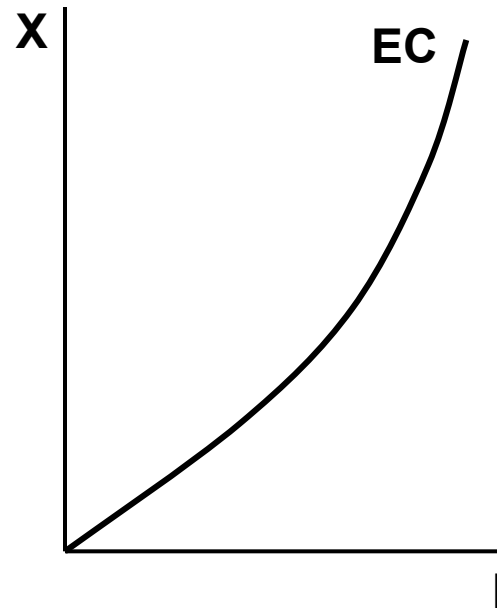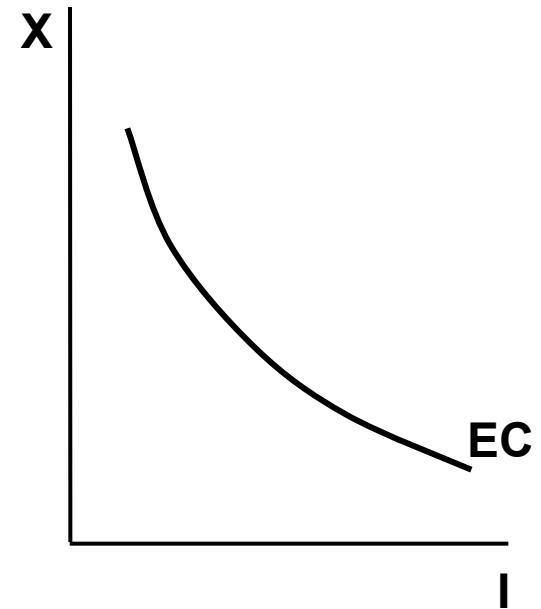
Engel curve - derivation

Engel curve for essential, luxury and inferior goods

X is essential – its consumption grows slower than the disposable income

**X is luxury – its consumption grows faster the disposable income**

X is inferior – consumption decreases while disposable income rises

Engel Expenditure Curve - EEC

- ➢ represents the relation between the disposable income and total consumer´s expenditures on specific goods...
- ➢ ... the relation between P.Q and I

Engel expenditure curve for essential, luxury and inferior goods
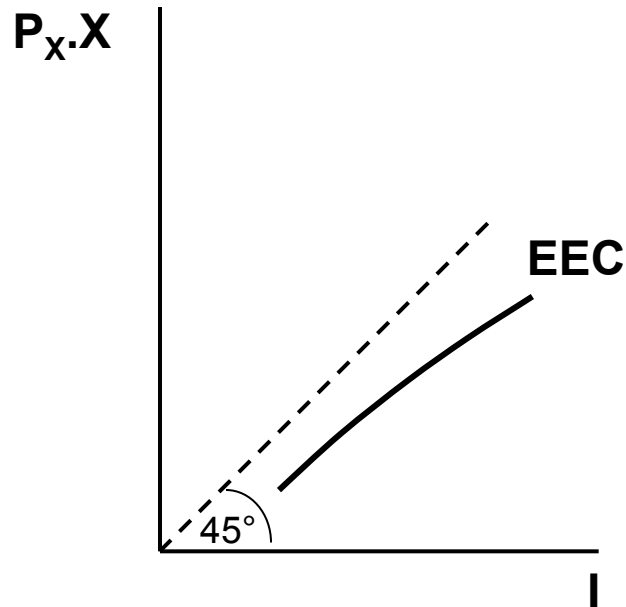
X is essential – expenditures on X grow slower than the disposable income
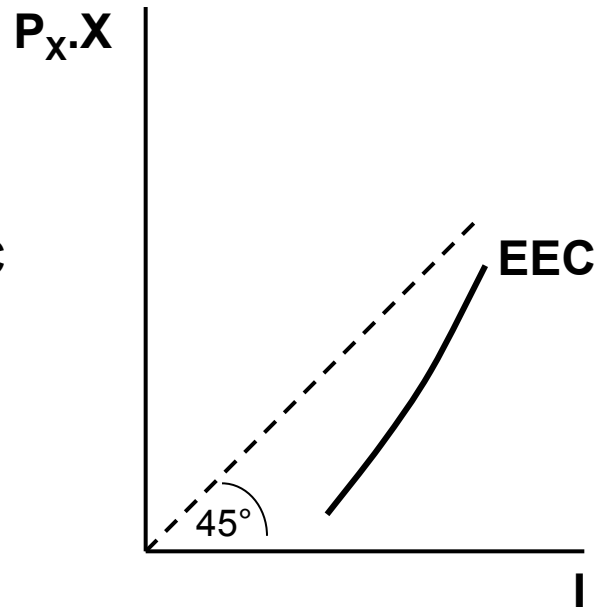
X is luxury – expenditures on X grow faster the disposable income
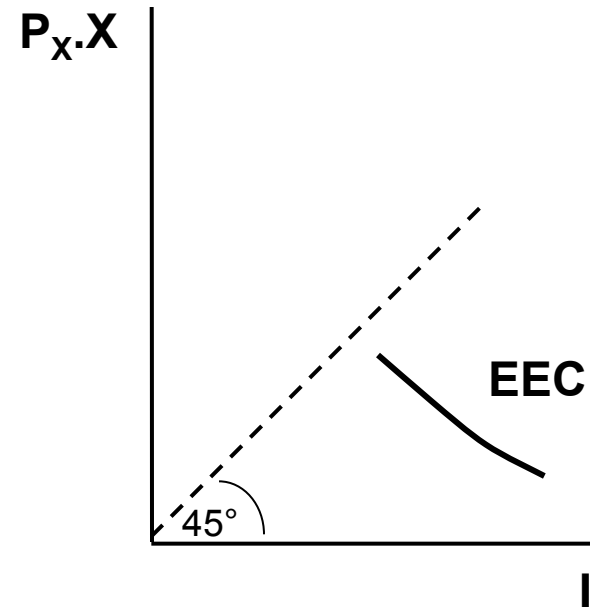
X is inferior – expenditures on X decrease while disposable income rises

Income elasticity of demand

➢ …reflects the sensitivity of consumer´s reaction to the change of disposable income and his/her consumption

➢ it is a relative change of quantity demanded induced with the change of disposable income

Income elasticity of demand

- $e_{ID} = (\Delta X/X)/(\Delta I/I)$ or $e_{ID} = (\partial X/\partial I/X/I)$
- $e_{ID} > 0$ for normal goods, $e_{ID} < 0$ for inferior goods
- $e_{ID} > 1$ for luxury goods, $0 < e_{ID} < 1$ for essential goods
- sum of income elasticities of all consumed goods multiplied with the ratio of each good in the commodity cage must equal to $1 \rightarrow \mu_X.e_{IDX} + \mu_Y.e_{IDY} = 1$, where:
- μ_X... ratio of X, μ_Y...ratio of Y
- $\rightarrow$ if we buy a luxury good, we cannot avoid buying an inferior good either

The impact of the change of price of specific goods on the quantity demanded

➢ we suppose the change of price of X, while everything else remains unchanged (price of Y and disposable income)

➢ if the price of X changes, the BL changes its slope (BL rotates clock-wise, or anticlock-wise)

➢ PCC *(Price Consumption Curve)*

Price consumption curve

PCC = set of consumer´s equilibria upon different prices of specific good
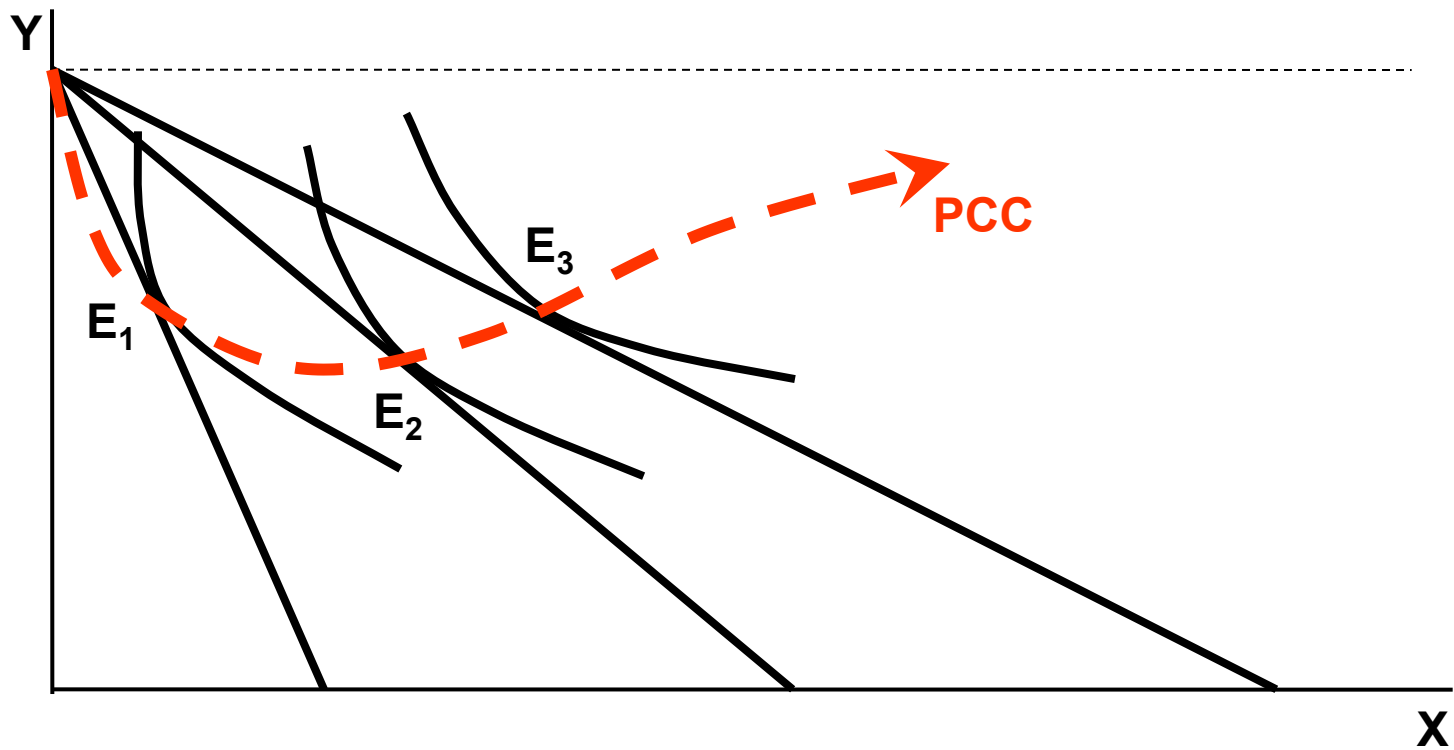
PCC and the derivation of individual demand curve
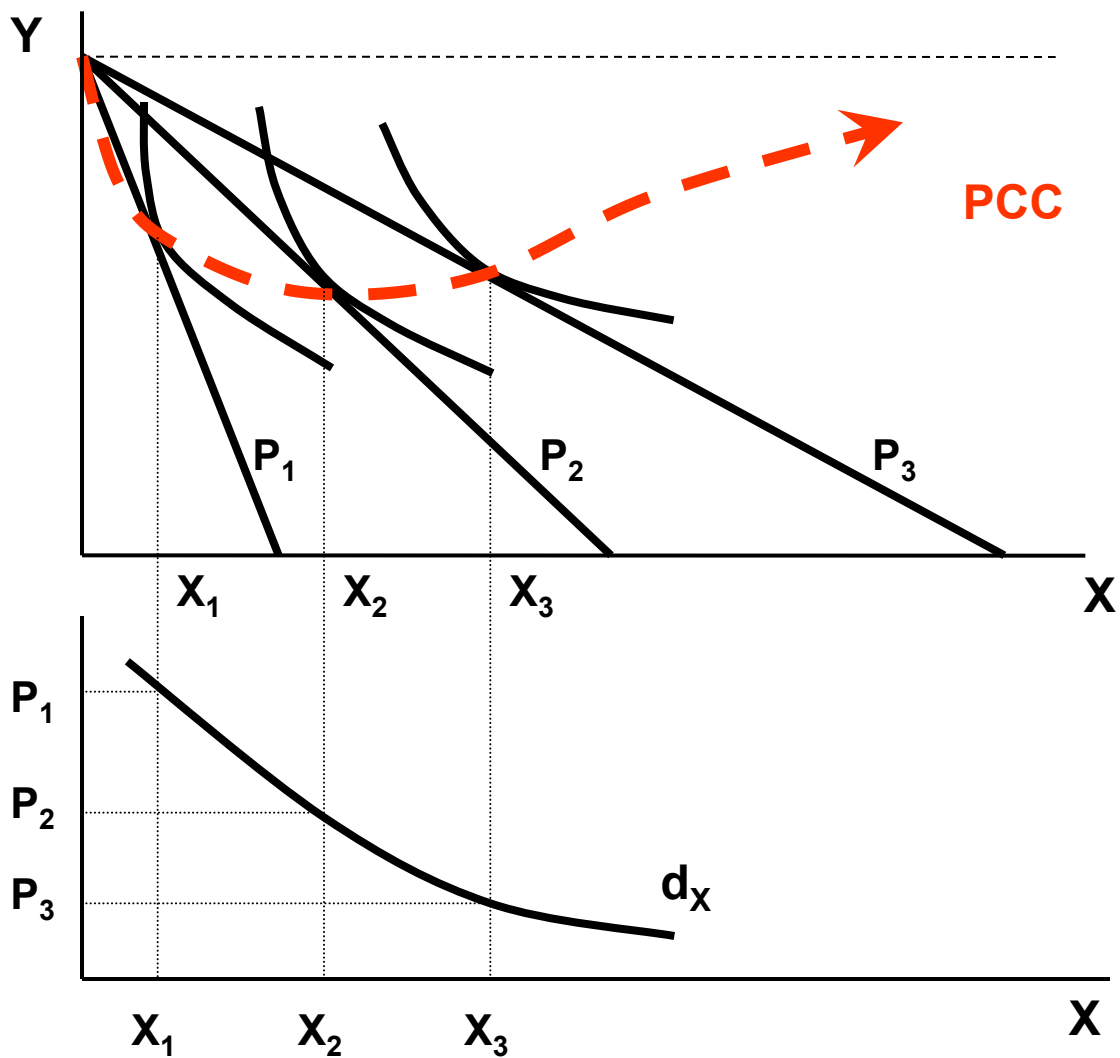
# Substitution and income effect – Hicks approach

- **Substitution Effect (SE)** = change of quantity demanded resulting from the substitution of relatively more expensive good with the relatively cheaper good – SE is always negative, which means: ↓P → ↑X and vice versa, consumer moves along the original IC

- **Income Effect (IE)** = change of quantity demanded resulting from the change of real disposable income – IE is negative for normal goods (↓P → ↑X and vice versa), and positive for inferior goods (↓P→↓X and vice versa), consumer moves to another IC

- *Note: IE increases the consumption of normal goods and decreases the consumption of inferior goods (in case of growing real income)*

- **Total Effect (TE)** = sum of SE + IE

Hicks decomposition on SE and IE – X is normal good

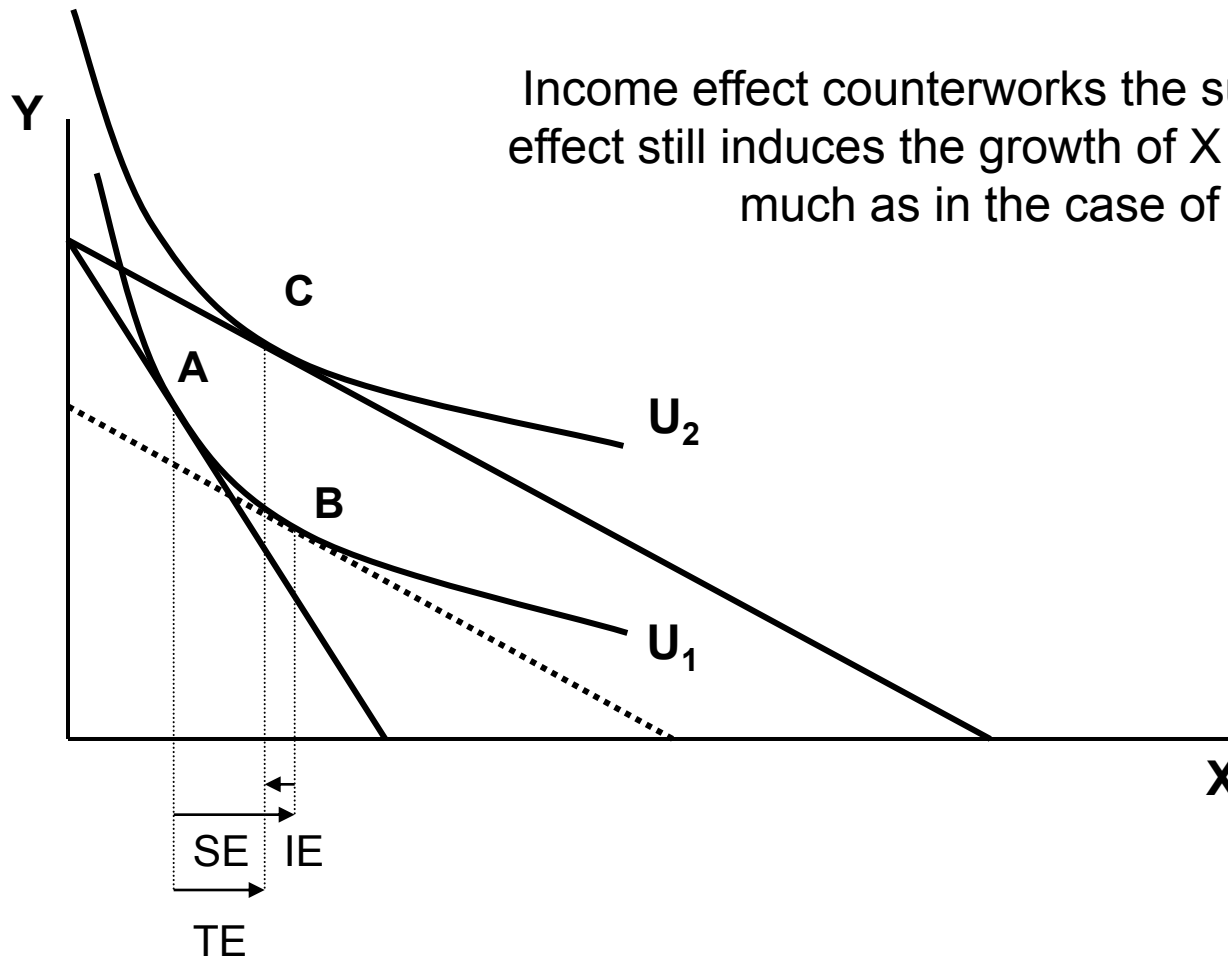Shift from A to B – substitution effect, the level of total utility remains constant

Shift from B to C – income effect, shift to higher IC (higher level of total utility)

Shift from A to C – total effect, sum of SE and IE
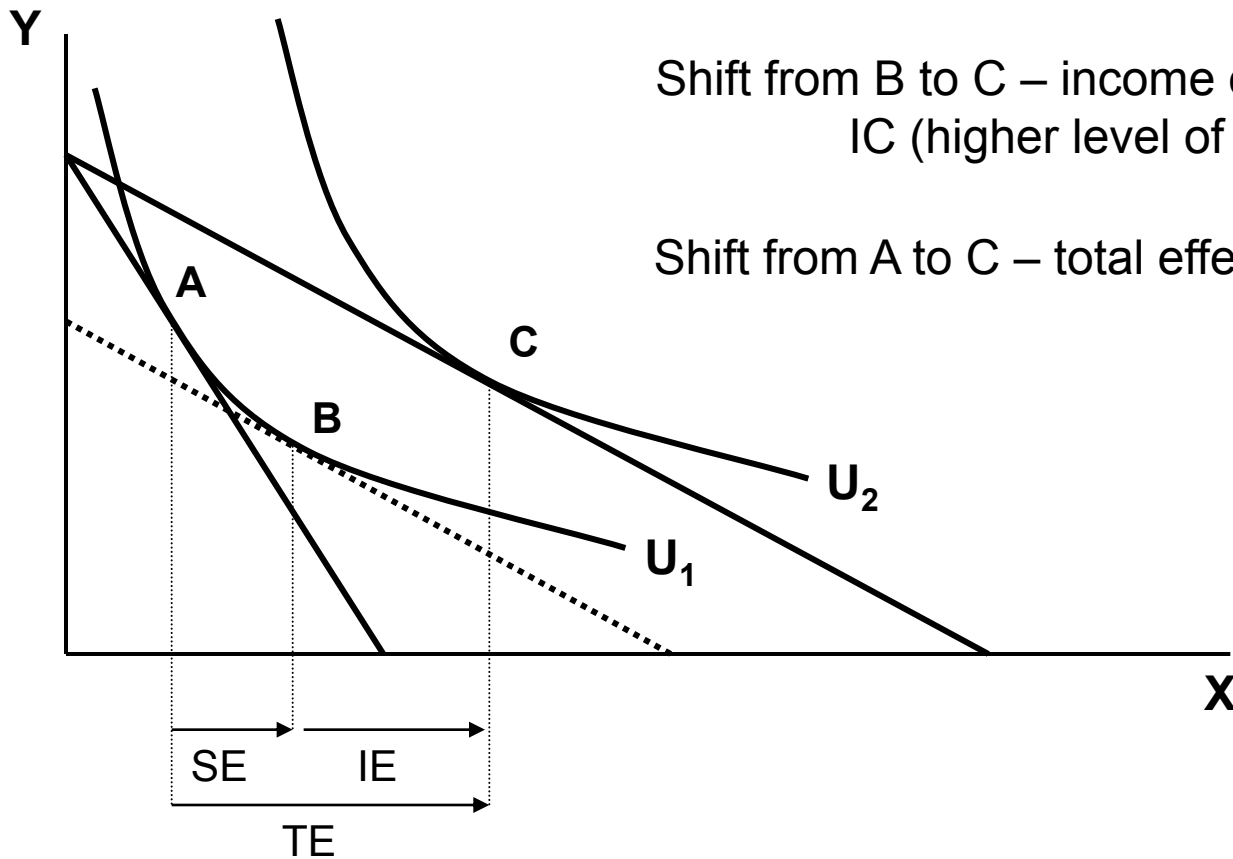
Hicks decomposition on SE and IE – X is inferior good

Income effect counterworks the substitution effect – total effect still induces the growth of X consumption but not as much as in the case of normal good

Giffen good (Giffen paradox)

➢ it is a subset of inferior goods

➢ the decrease of price induces the decrease of quantity demanded and vice versa → individual demand curve has a positive slope

➢ goods with relatively high ratio on total consumer s expenditures; fulfils basic needs; there are no close substitutes

➢ an important role of consumer s expectations

➢ i.e. basic food, fuel etc. during a crisis

Hicks decomposition on SE and IE – X is Giffen good

Income effect counterworks the substitution effect, and IE>SE – total effect implies that if the price of X decreases, the quantity of X demanded is decreasing
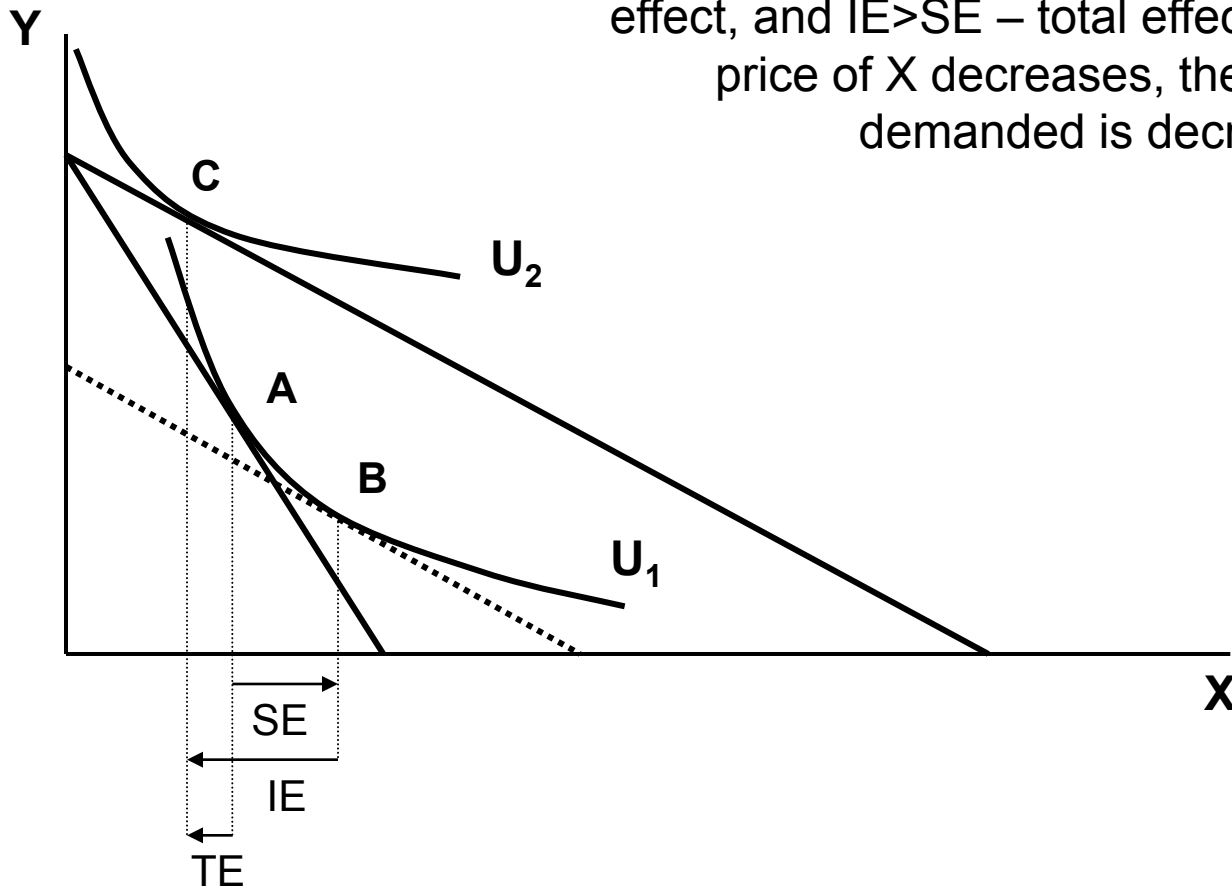
Slutsky approach to the SE and IE

➤ different approach to the substitution effect resulting from the change of price of goods

➤ Hicks SE – consumer is able to reach the constant level of total utility after the relative prices change

➤ Slutsky SE – consumer is able to reach the former commodity cage after the change of relative prices

➤ Slutsky´s SE includes some of the Hicks´s IE

Slutsky decomposition on SE and IE – X is a normal good

Shift from A to B – substitution effect, shift to the higher level of TU (broken lined IC)

Shift from B to C – income effect, shitf to the higher (final) level of TU (IC marked U_2)

Shift from A to C – total effect, a sum of SE and IE
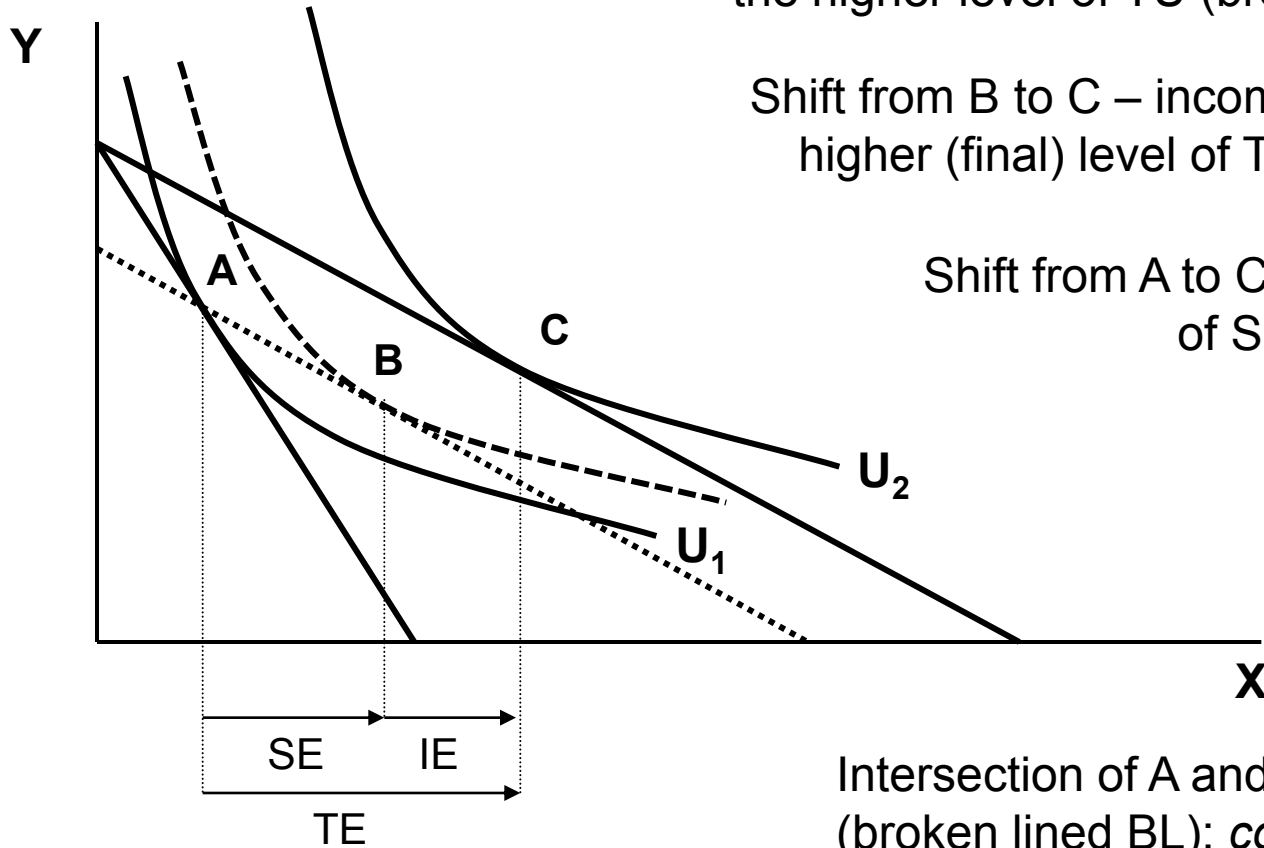
Intersection of A and subsidiary BL (broken lined BL): *consumer is able to reach the former commodity cage but for the new relative prices*

Price elasticity of demand

➤ reflects the sensitivity of consumer´s reaction to the change of relative price of good and his/her quantity demanded

➤ $e_{PD}=(\Delta X/X)/(\Delta P_X /P_X)$ or $e_{PD}=(\partial X/\partial P_X/X/P_X)$

➤ if $e_{PD}= -1$, then demand is unitarily elastic – relative change of quantity demanded is the same as the relative change of price

➤ $e_{PD}> -1$, then demand is inelastic – relative change of quantity demanded is lower than the relative change of price

➤ $e_{PD}< -1$, then demand is elastic – relative change of quantity demanded is higher than the relative change of price

➤ $e_{PD}> 0$, then we talk about the Giffen paradox (Giffen good) – quantity demanded increases with increasing price and vice versa

➤ *Note: we can you also elasticity of demand*

The impact of the change of price of specific goods on the other goods quantity demanded

➤ how the change of price of good X influences the quantity demanded of good Y, so:

➤ how the consumer reflects the change of price of substitutes or complements

➤ **Cross SE** – induces the substitution of relatively more expensive good with relatively cheaper good – is positive: $\uparrow P_Y \rightarrow \uparrow X$ and vice versa

➤ **Cross IE** – induces the change of quantity demanded resulting from the change of real disposable income – is negative: $\uparrow P_Y \rightarrow \downarrow X$

➤ **Cross TE** – a sum of cross SE and cross IE – the direction depends on the relationship between the goods (substitutes or complements?)
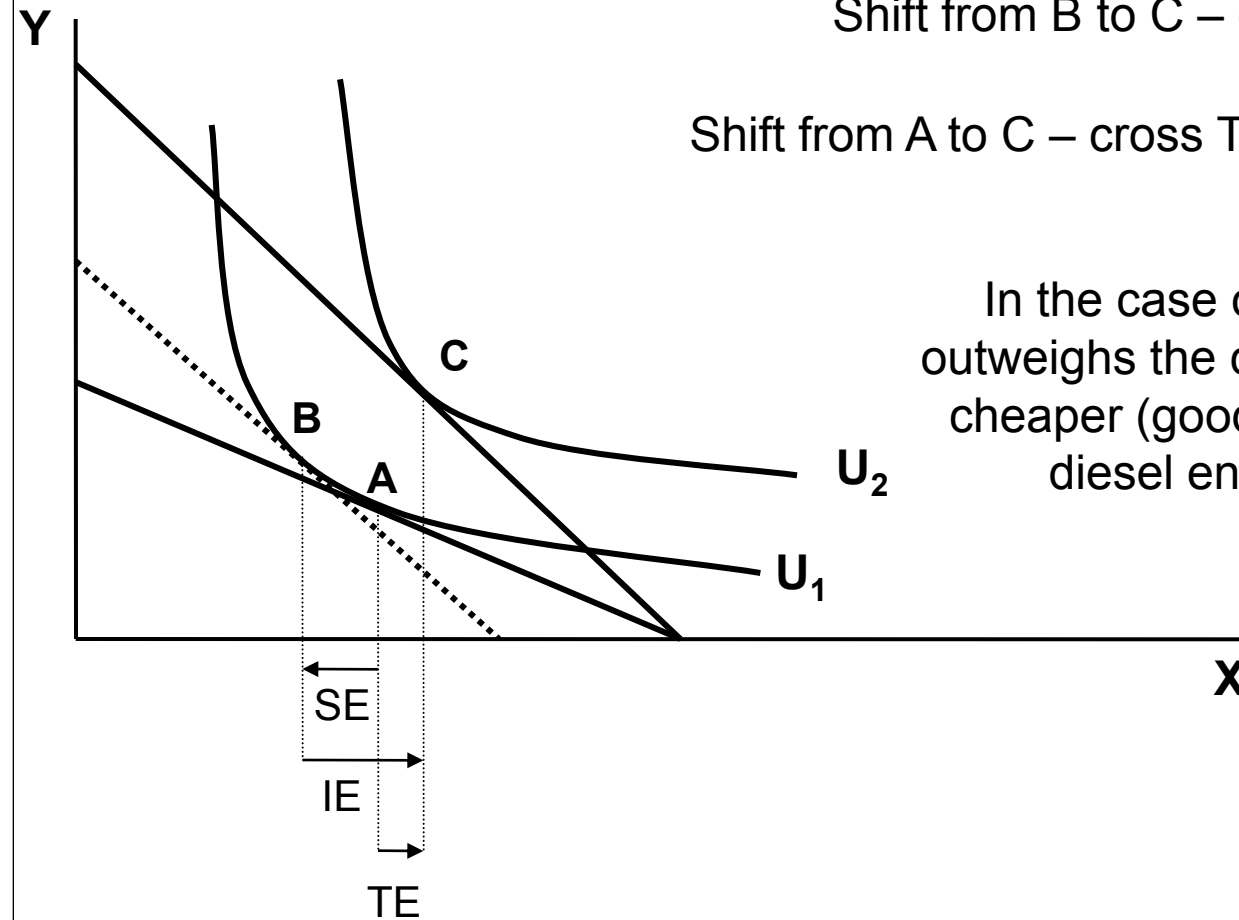
Decomposition on cross SE and IE - complements

Shift from A to B – cross SE

Shift from B to C – cross IE

Shift from A to C – cross TE, a sum of cross SE and IE

In the case of complements the cross IE outweighs the cross SE – i.e. if the diesel gets cheaper (good Y), the demand for cars with diesel engines (good X) increases
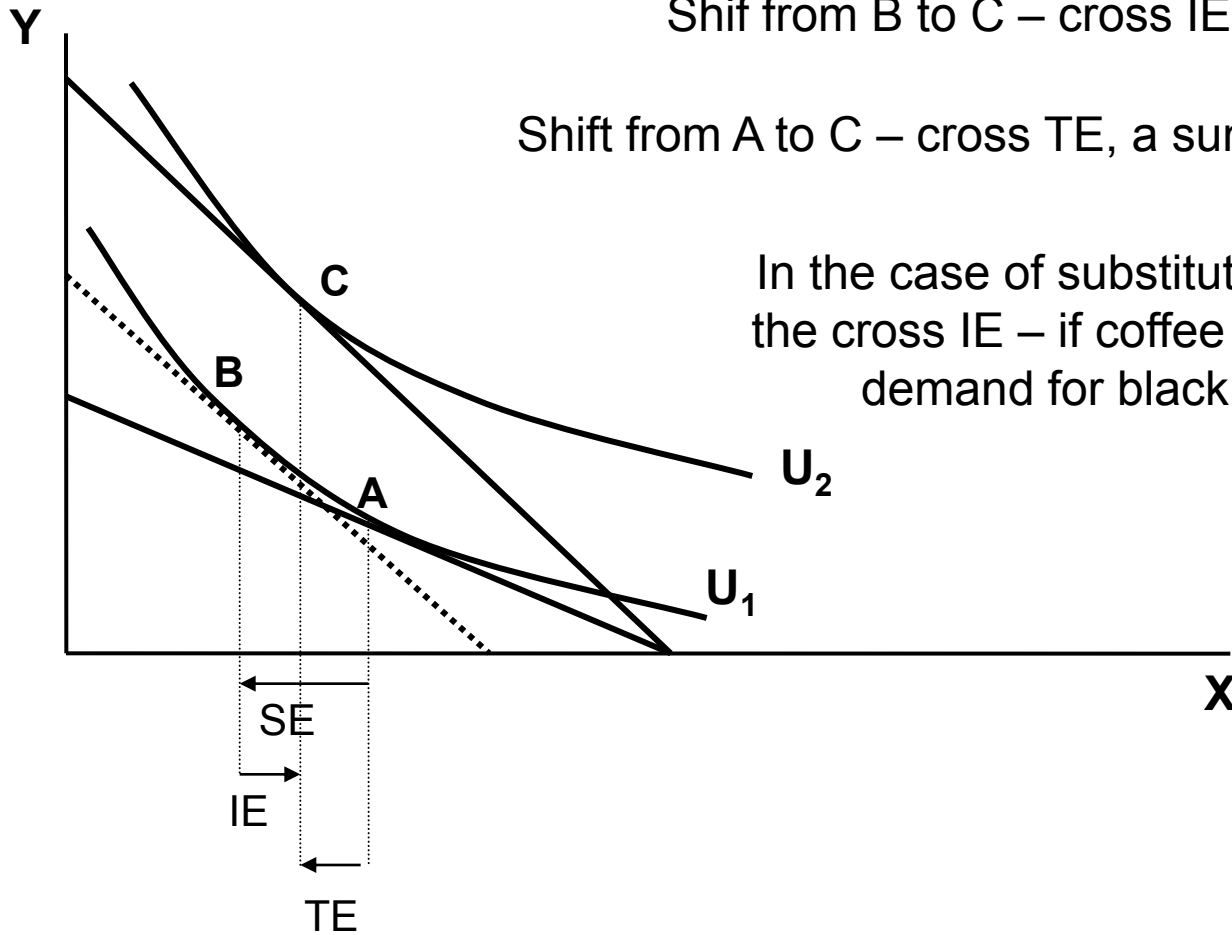
Decomposition on cross SE and IE - substitutes

Shift from A to B – cross SE

Shif from B to C – cross IE

Shift from A to C – cross TE, a sum of cross SE and IE

In the case of substitutes the cross SE outweighs the cross IE – if coffee gets cheaper (good Y), the demand for black tea (good X) declines

U_2

U_1

Y

C

B

A

X

SE

IE

TE

Task:

What are the cross effects in the case of perfect complements and/or perfect substitutes?

Cross elasticity of demand

➢ reflects the relative change of quantity demand of specific good (godd X) reulsting from the relative change of price of the other good (good Y)

➢ $e_{CD}=(\Delta X/X)\big/(\Delta P_Y/P_Y)$ or $e_{CD}=(\partial X/\partial P_Y\big/X/P_Y)$

➢ if $e_{CD} > 0$, then X and Y are substitutes

➢ if $e_{CD} < 0$, then X and Y are complements

➢ for the sum of all three kinds of elasticities stands:

$e_{ID} + e_{PD} + e_{CD} = 0$ ... why?

Elasticity of substitution

➢ reflects the relative change of the ratio of substitution of goods with each other...

➢ ...a variable that implies the shape of indifference curves

➢ $\sigma = \dfrac{\Delta(Y/X)}{Y/X} : \dfrac{\Delta(MRS_C)}{MRS_C}$

➢ $\sigma = \infty$ for perfect substitutes

➢ $\sigma = 0$ for perfect complements

Derivation of market demand

➢ market demand is the horizontal sum of all individual demands (demands of all consumers) for the specific good

Derivation of market demand

Individual demands of „green"
and „red" consumer
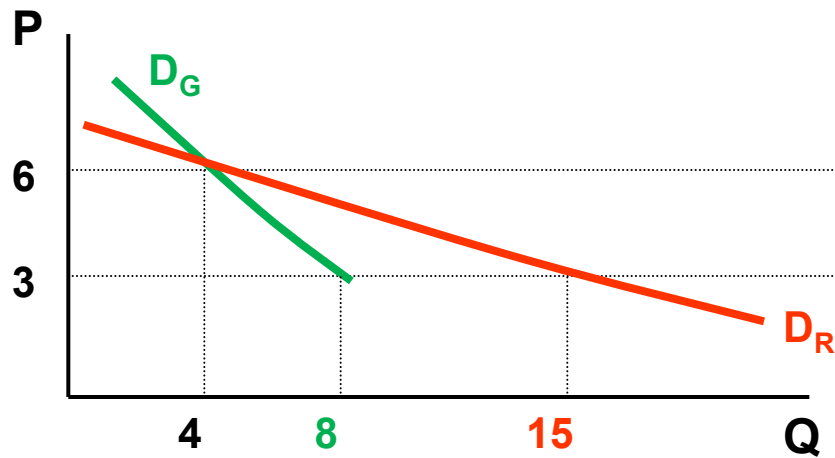
Market demand = demand of „green"
consumer + demand of „red" consumer