Part 1

Introduction

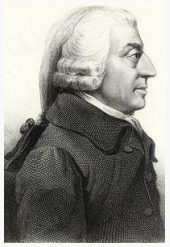
EE211

Principles of Microeconomics

Revision Aug 2020

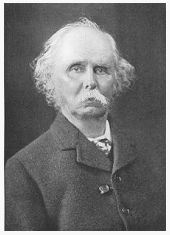
What is the definition of economics and to study economics?

Let's go back in time and see how focus has been shifting throughout the history of the *"science"* for the last 2 centuries.



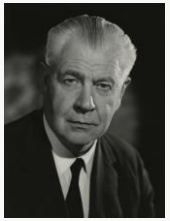
(1) Adam Smith - An Inquiry into the Nature and Causes of the Wealth of Nations, 1776

"A science which inquires into the nature and cause of wealth of nations"



(2) Alfred Marshall - Principles of Economics, 1890)

"Economics is a study of mankind in the ordinary business of life; it examines that part of individual and social action which is most closely connected with the attainment and with the use of material requisites of wellbeing"



(3) Lionel Robbins -An Essay on the Nature and Significance of Economic Science, 1932

"Economics is the science which studies human behavior as a relationship between ends and scarce means which have alternative uses"

What is the definition of economics and to study economics?

(4) Paul A. Samuelson - Economics: An Introductory Analysis, 1948

"Economics is the study of how men and society choose with or without the use of money, to employ the scarce productive resources which have alternative uses, to produce various commodities over time and distribute them for consumption now and in the future among various people and groups of society. It analyses the costs and benefits of improving pattern of resource allocation."

(5) A.C. Dhas - Modern Definition of Economics, 2011

"Economics is the of choice making by individuals, institutions, societies, nation and globe under conditions of scarcity and surplus towards maximizing benefits and satisfying their unlimited needs at present and future."

Wrapping up

- There are multiple definitions concerning different aspects of human and society.
- Interest and focus for economics has been shifting all the time. Nevertheless, some core issues remain.
- Let's be generous and welcome multiplicity of courses and economic methods to come.
- First and foremost, what do you think are main topics in microeconomics?

Assumption of scarcity

Resources are scarce.

Choices are available.

Decision are to be made.

Then we have **basic problems in economics.**

What to produce? (How do we know what are wanted in our society?)

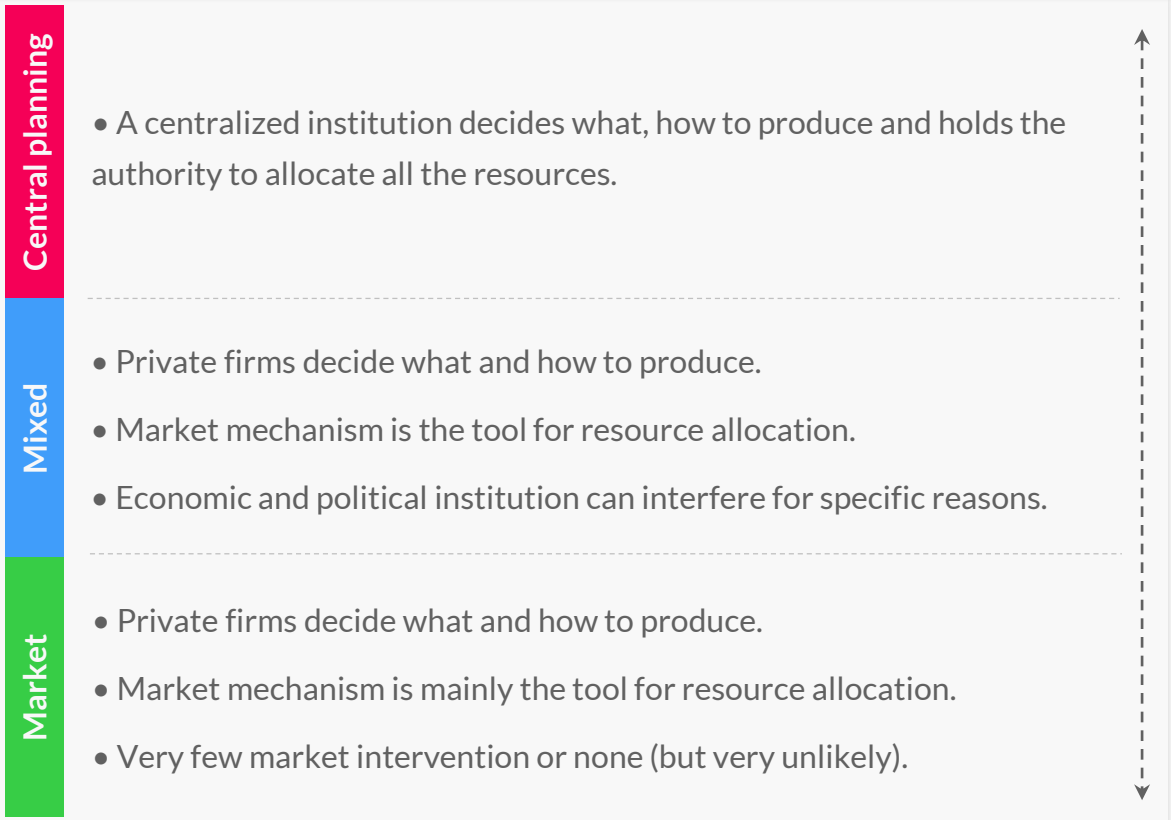
How to produce? (What is the incentive to produce?)

To produce for whom? (How are we distribute final product?)

Each society then needs to settle with **a tool** to accomplish these basic problems.

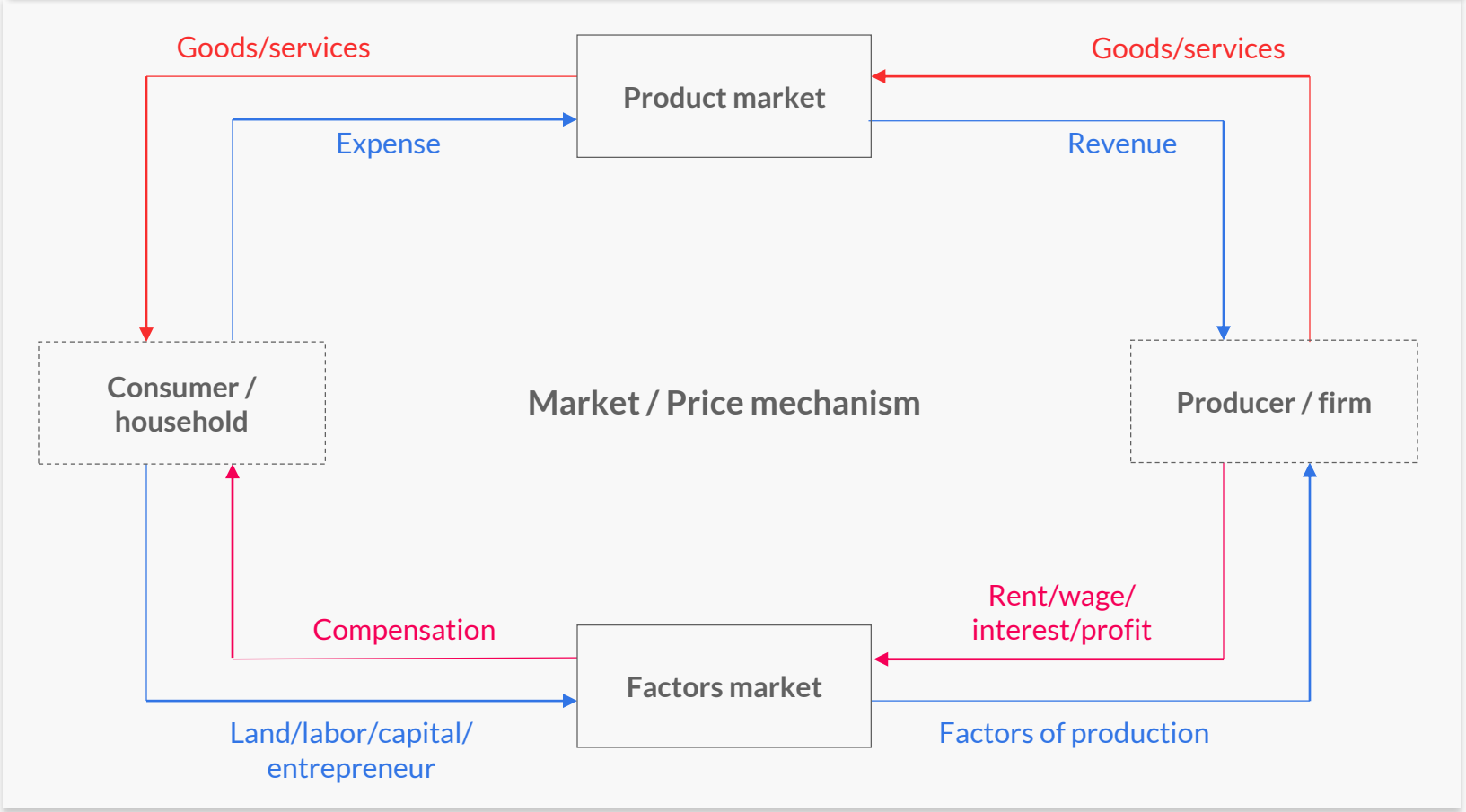
System of resources allocation

Figure 1.1 *Rough categorization for resource allocation systems*



System of resources allocation: market

Figure 1.2 Circular flow



Wrapping up again: what are we study this semester?

- Whole picture of **market**: meaning of demand, supply, equilibrium and applications.
- **Consumer**: how consumer chooses to consume to maximize his or her satisfaction and nature of consumption.
- **Producer**: what are the nature of production and how seller maximize its profit it each type of market structure.
- **Market structure**: different market structure affects how consumer and producer interact.
- Introductory concepts of **factor markets** and **market failures**.
- Main analysis method is called '**Marginal analysis**'.

Opportunity costs

If scarcity exists, a decision always costs something. Apart from '*explicit cost*', economics also highlights '*implicit cost*' as well. Consider these options' cost instead of other.

- Working instead of studying in a university.

- Playing games instead of reviewing economics.

- Seeing movies with boyfriend/girlfriend.

Definition 1.1

*The **opportunity cost**, or **alternative cost**, of making a particular choice is the value of the most valuable choice out of those that were not taken. When an option is chosen from alternatives, the opportunity cost is the "cost" incurred by not enjoying the benefit associated with the best alternative choice.*

Most economists today use '**model**' to express their point of view, or to explain social and economic phenomena. The **circular flow** is also considered a model. For opportunity cost, we usually portray the idea in a table below.

Opportunity costs

Example 1: a healthy boy			
Choices	**Activities**	**Benefit**	**Opportunity cost**
1	Having organic salad	320	
2	Having BBQ	200	
Example 2: an enjoy-eating boy			
1	Having organic salad	-50	
2	Having BBQ	150	
Example 3: a rich boy			
1	Study economics hard	35,000	
2	Practice programming	20,000	
3	Register with a life coach	5,000	
4	Study investment	10,000	

What else do we learn from this model?

If we extend this model that explores opportunity cost, we get another model to explain scarcity is called "**Production Possibility Curve**" (PPC) or "**Production Possibility Frontier**" (PPF).

Production Possibility Curve

Drawing a PPC with the given scenario

Let's study more of opportunity cost with this model.

Supposed that the government has tax revenue of 3 million baht, choices available are buying submarines which costs 300,000 baht each or provide welfare card which costs 300 baht each. Cost for both programs are perfectly substitutable.

- What would happen if this revenue decreases or increases.

- A society has multiple choices on or within a PPC. On the other hand, a PPC also illustrates impossible choices as well.

Production Possibility Curve

Drawing a PPC with the given scenario

Let's study more of opportunity cost with this model.

Supposed that the government has tax revenue of 3 million baht, choices available are buying submarines which costs 300,000 baht each or provide welfare card which costs 300 baht each. Cost for both programs are perfectly substitutable.

- What would the PPC look like if those two choices are not perfectly substitutable?

Functions of different models

It is also very important to understand that a model has its own aim. Some of them may not be able to convey other messages or implications. Here are some example what a model can do.

- To **describe** or systematize social phenomena.
- To grasp an **understanding** on social phenomena within a controlled environment.
- To **predict** what would happen in a society.
- To **establish** social policy in order to make an impact on a society.
- To **explain** what (e.g. a system of distribution) fits a society the most.

Summary

Main objectives of this course.

- To understand what "market" is and its composition.
- To follow the prove that market can be one of the "**most efficient**" mean to allocate resources in a society. By doing so, we will consider both consumer and producer's incentive within each market structure.
- Studying will employ "**marginal analysis**" all the way through.
- To study how can government intervene a market and how it will affect consumer and producer's welfare.
- To learn that **market fails regularly**, which would lead to inefficiency, and there are also some aspects that market failure cannot capture.
- I will note page(s) from Pindyck and Rubinfeld (2018) as a reference for further reading.

Part 2

Demand, Supply and Applications

EE211

Principles of Microeconomics

Revision Aug 2020

Definition of market

This section analyzes market as a whole before moving on to studying incentive analysis of each economic agent. Market must be firstly defined clearly.

Definition 2.1

***Market** is a context where trade occurs. Buyers (consumers), sellers (producers), good or service and price are mandatory components in a market.*

Each component, mentioned above, in a market should be clearly identified because it defines market structure. For instance, varieties of pineapple markets can be

- Pineapple (fresh from the field) market.
- Canned pineapple market.
- International pineapple market

Assumptions

Before we move on, some assumptions must be posed.

- **Static analysis**: We are studying only a single change at a time. No intertemporal chain-reaction effects to be included.
- "**Ceteris Paribus**": "Other things being equal". Meaning that other than a change we are focus on, other factors are kept constant.
- **Perfect competitive market**: General characteristics of a perfect competitive market is that there are many number of buyers and sellers, in which no single entity can take control over price or quantity. More information of perfect competitive market will be in the market structure section.

Problem statement and aims

- Understand the definition of demand, supply, and equilibrium.
- Learn the difference between individual and market demand and supply, also various types of demand.
- Be able to explain substitution effect and income effect.
- Acknowledge how demand, supply and equilibrium can alter from price, quantity, or external factors.
- Further reading can be found in Pindyck and Rubinfeld (2018) Part 1 and Part 3.

(1) Demand

Definition 2.2

Demand *refers to* ***quantity*** *or amount of good or service demanded by consumers at different prices in given period of time.*

To constitute demand, it takes both **want** and **affordability**. Demand can be expressed in form of **functions** or **table**.

- $q_a = f(P)$
- $q_a(P)$
- $q_a = 10 - 2P$

P	q_a
0	
1	
2	
3	
4	
5	

(2) Law of demand

Definition 2.3

Law of Demand *is a claim that when price of a goods or service rises, its quantity demanded will fall and vice versa, when all other factors that can affect demand are held constant.*

Drawing a demand line from the equation

Let's draw a demand line from the given demand function.

$$q_a = 10 - 2P$$

- Never forget to put label on each axis.

(3) Properties of demand

When price changes and affects quantity demanded, the result is called **price effect (PE)** which consists of two sub-effects.

- **Substitution effect (SE)** is the effect of relative price of substitutable good. For example, if A and B are substitutable and price of good A increases (decreases), good B will relatively become cheaper (more expensive) comparing to the relative price before price change.

- **Income effect (IE)** is the effect of consumers' real income. For example, if price of good A rises (drops), consumers are considered become poorer (richer) because they lose (gain) purchasing power.

Now let's come up with an example of price effect.

(4) Individual and market demand

Individual demands can be horizontally added as a market demand, as seen from an example in the table below.

P	q_a	q_b	Q
10	12	20	
20	10	16	
30	8	12	
40	6	8	
50	3	4	
60	0	0	

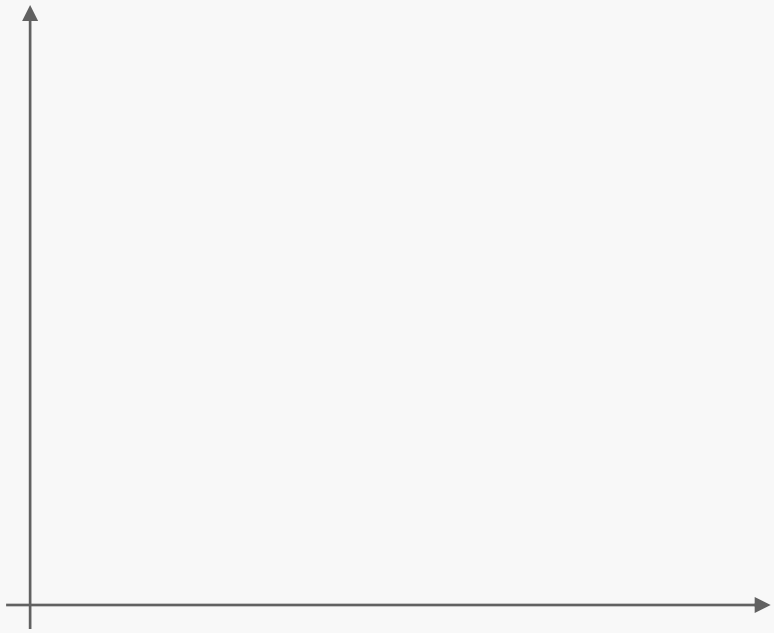
Plotting individual and market demand

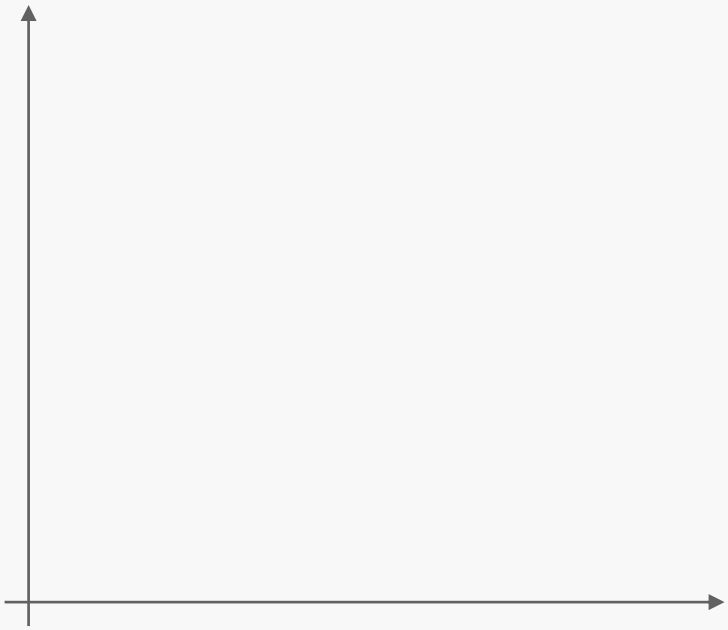
(5) Demand move and shift

Changes in demand can be divided into 2 cases.

- **Moving along the curve:** caused by changes in price.
- **Shifting demand:** caused by external factors that are not price.

Moving along and shifting demand





(6) Demand determiners

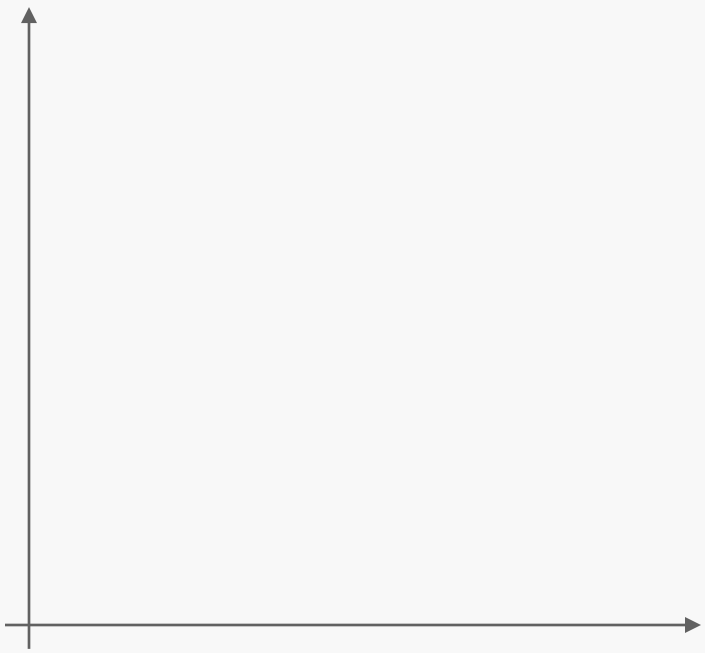
Demand increase

In which direction do these factors need to shift to in order to shift market demand to the right or increasing demand.

- Consumer income
- Consumer preference
- Price of complementary goods
- Price of substitutable goods
- Price speculation

(7) Other types of demand

Income demand



Demand can be plotted against other variables.

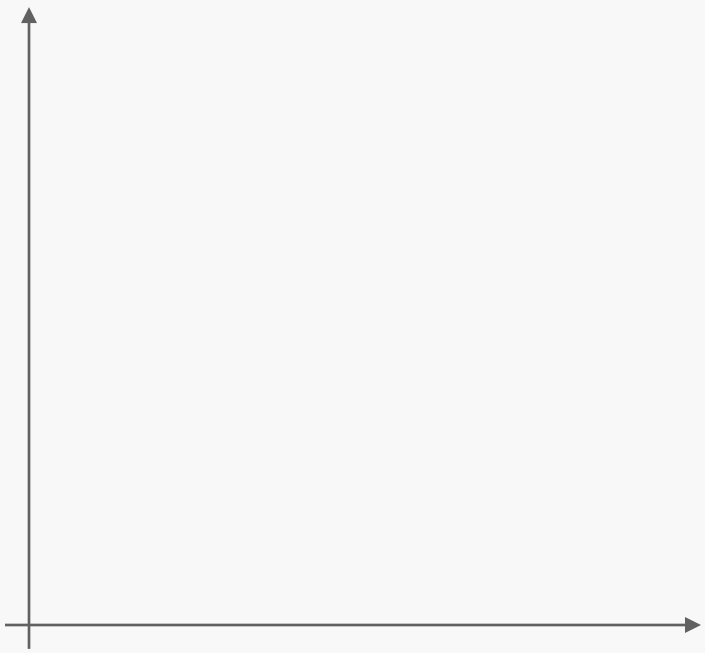
- If income replaces price, we call it **income demand**.
- How would the demand look like for **normal goods**?
- What about income demand for **inferior goods**?

Definition 2.4

Inferior goods *is a good whose demand decreases when consumer income rises (or demand increases when consumer income decreases), unlike normal goods, for which the opposite is observed.*

(7) Other types of demand

Income demand



Also demand of good A versus price of good B.

- This is called **cross-price demand**.
- How would this line look like if A and B are **substitutable**?
- What if A and B are **complementary**?

Definition 2.5

Substitute goods *a good that can be used in place of another, while* ***complementary goods*** *is a good whose appeal increases with the popularity of its complement.*

(8) Supply

Definition 2.6

***Supply** refers to **quantity** or amount of good or service supplied by producers at different prices in given period of time.*

Alike demand, supply can be expressed in many mathematical ways.

- $q_k = f(P)$
- $q_k(P)$
- $q_k = 4P$

P	q_k
0	
1	
2	
3	
4	
5	

(9) Law of supply

Definition 2.7

Law of Supply *is a claim that when price of a goods or service rises, its quantity supplied will also rises and vice versa, when all other factors that can affect supply are held constant.*

Drawing a supply line from the equation

Let's draw a supply line from the given demand function.

$$q_k = 4P$$

- Never forget to put label on each axis.

(10) Individual and market supply

Individual supplies can be horizontally added as a market supply, similarly to demand

P	q_k	q_l	Q
10	0	1	
20	3	3	
30	6	5	
40	9	7	
50	12	9	
60	15	11	

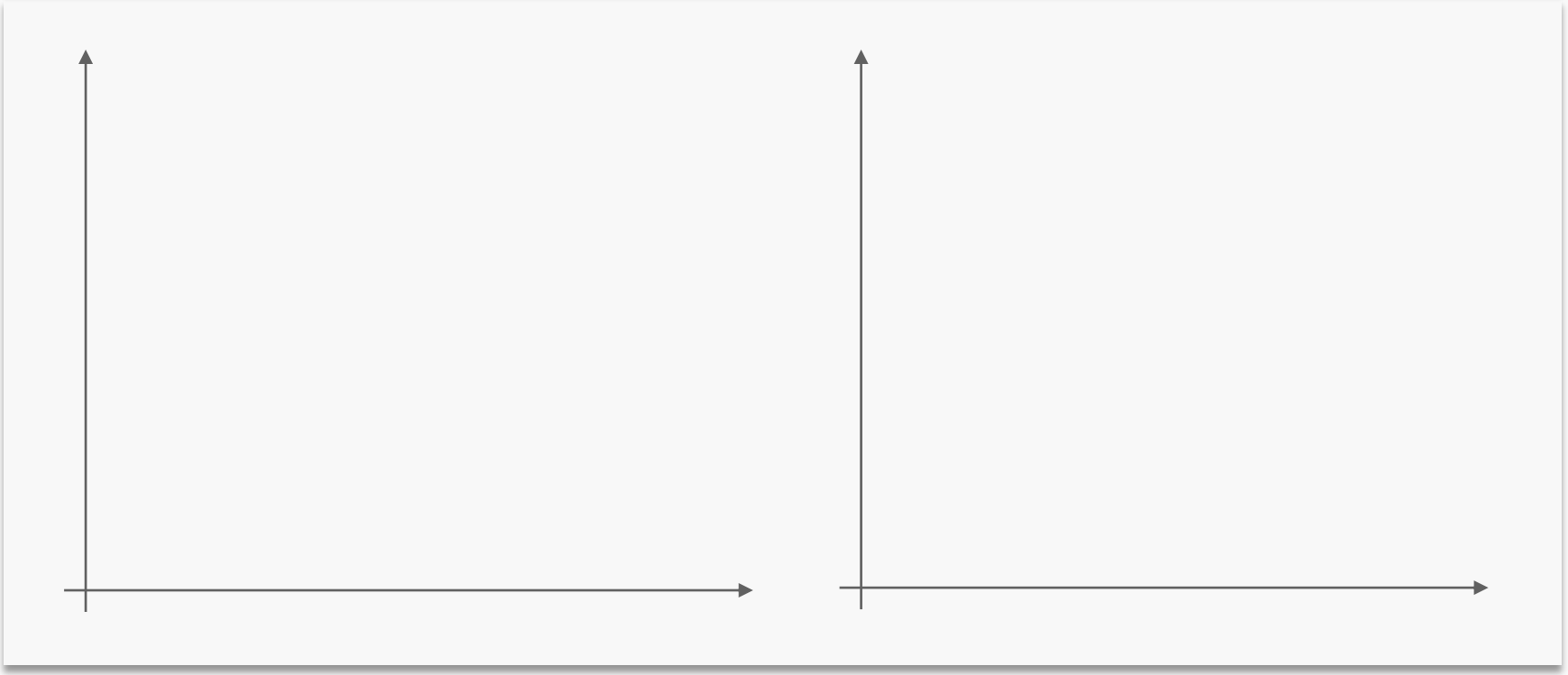
Plotting individual and market supply

(11) Supply move and shift

Changes in supply can be divided into 2 cases.

- **Moving along the curve:** caused by changes in price.
- **Shifting supply:** caused by external factors that are not price.

Moving along and shifting supply



(12) Supply determiners

Supply increase

In which direction do these factors need to shift to in order to shift market supply to the right or increasing supply.

- Factors of production price
- Technological progress
- Number of sellers
- Price speculation

(13) Equilibrium

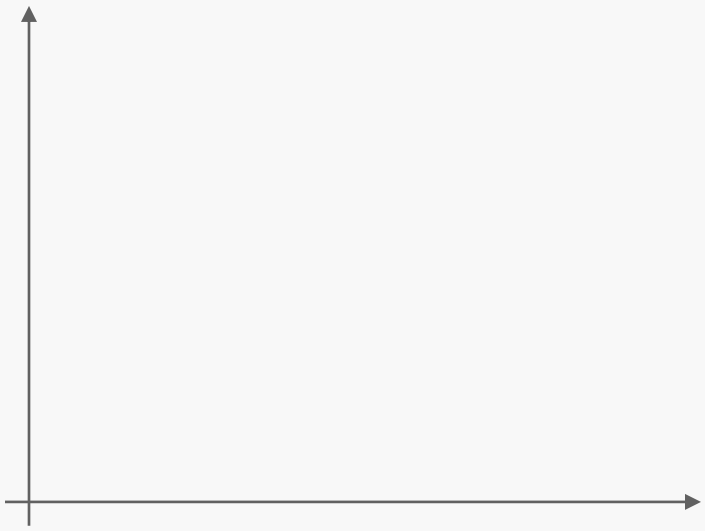
Definition 2.8

*There exists **equilibrium price and quantity** in a market, when quantity demanded and supplied are equal. Without exogenous force, equilibrium price and quantity remains stable.*

Solving for equilibrium price and quantity can be done with exact graph plot or demand and supply functions. Try solving this market equilibrium and plot both demand and supply to see the equilibrium point.

- $Q_d = 10 - 2Pf(P)$
- $Q_s = 4P$

Market equilibrium



(14) Excess demand and supply

If there is no external force driving demand or supply, this equilibrium quantity is the total amount of good or service bought and sold in this market at the equilibrium price.

Therefore, if price is temporarily fluctuated 'other things being equal', it may cause **excess demand or supply**, but the market would adjust itself and return to its original position.

Definition 2.9

***Excess demand (supply)** is the quantity demanded (supplied) exceeded equilibrium quantity at equilibrium price.*

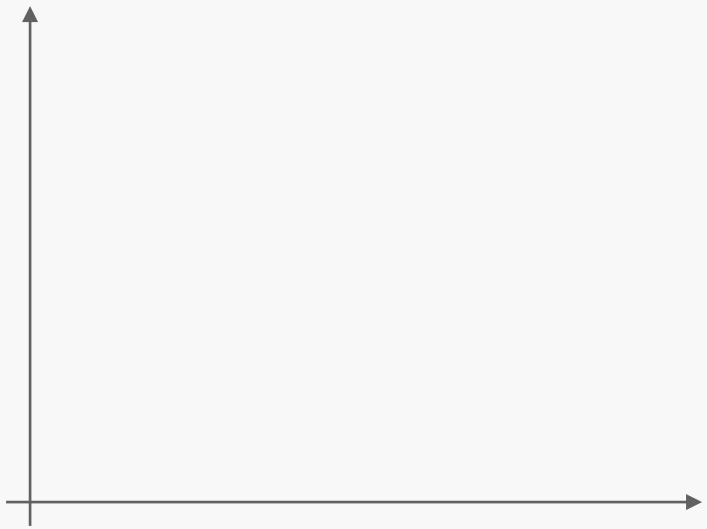
Excess demand/supply when price drops

Let's see what would happen when price drops.

- Will there be excess demand or supply?
- How would the market adjust and why?

(14) Excess demand and supply

Excess demand/supply when price hikes



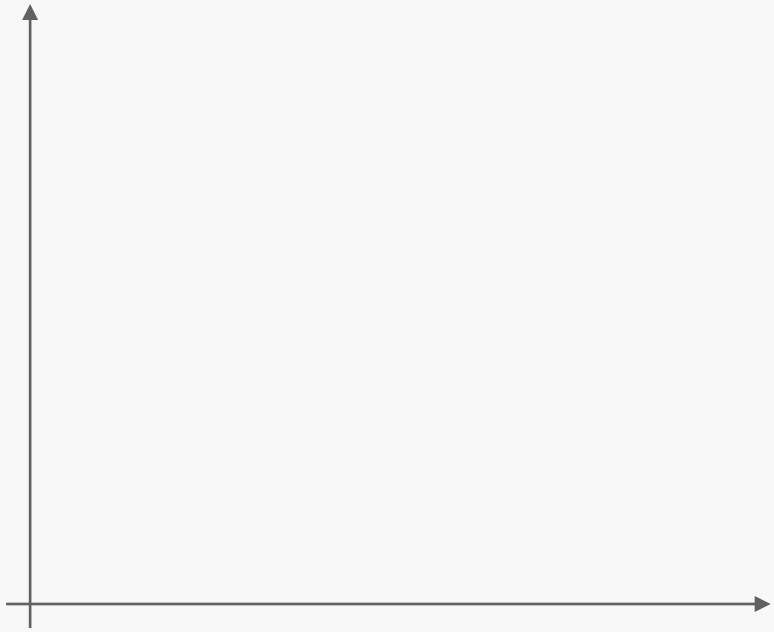
Let's see what would happen when price hikes.

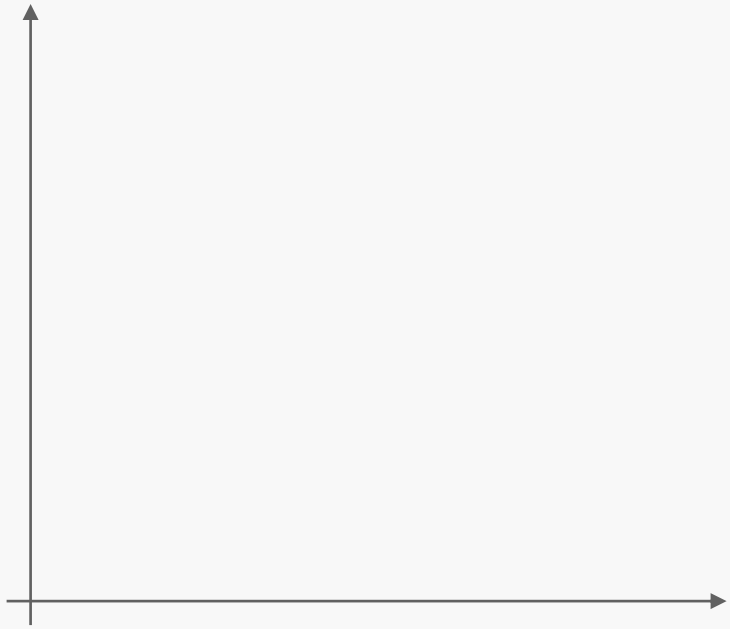
- Will there be excess demand or supply?
- How would the market adjust and why?

(15) Shifting the equilibrium

Now on the other hand if an external factor causes **demand shifts**, how would it affect equilibrium price when demand increase or decrease?

Demand shifts

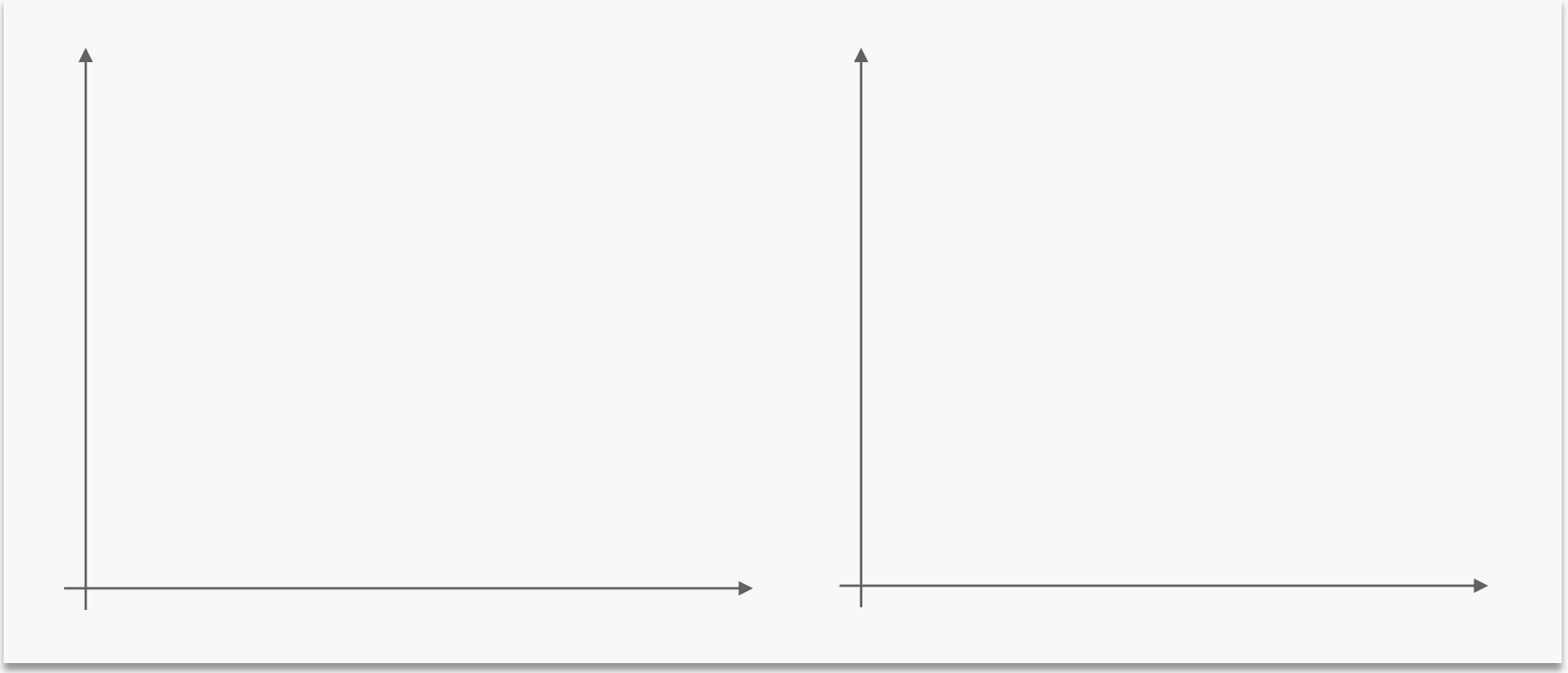




(15) Shifting the equilibrium

Now on the other hand if an external factor causes **supply shifts**, how would it affect equilibrium price when supply increase or decrease?

Supply shifts



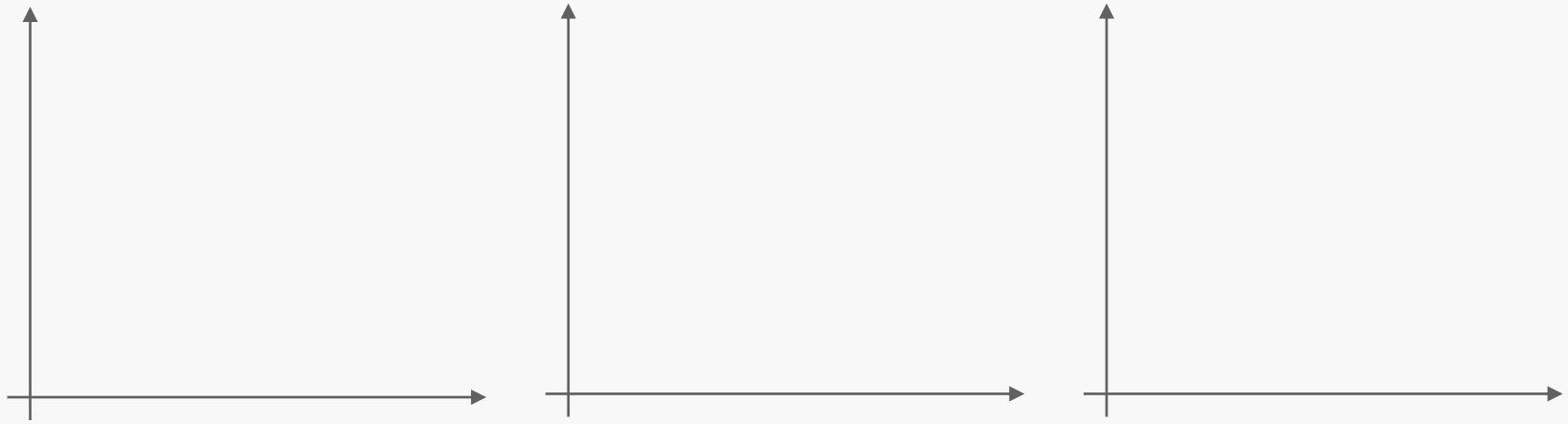
We have further scenarios which include

- Both demand and supply increase.
- Both demand and supply decrease.
- Demand surges but supply drops.
- Supply surges but demand drops.

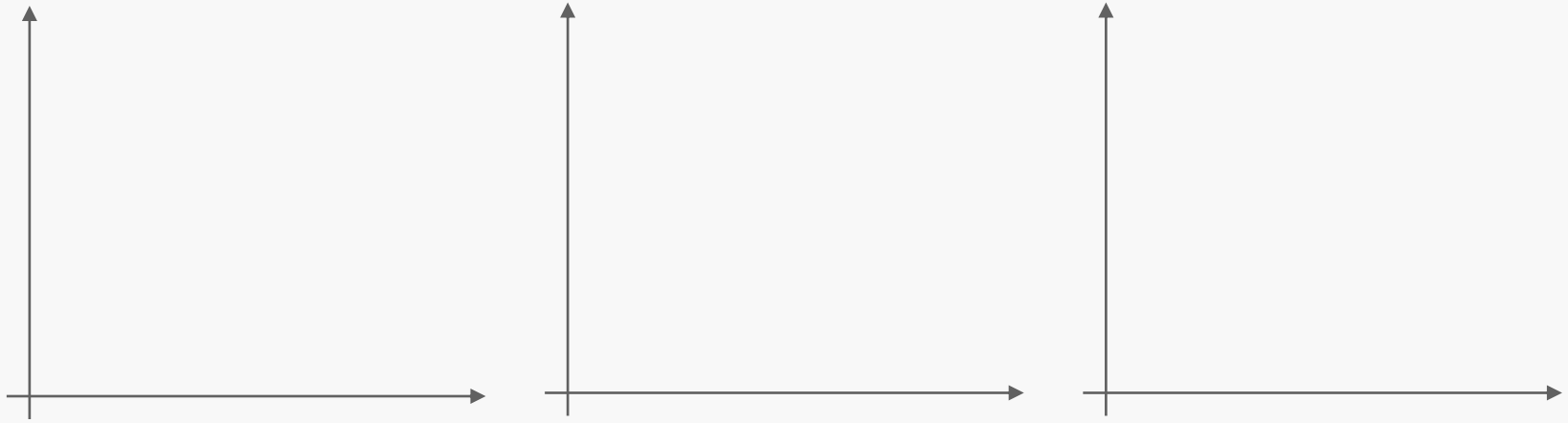
(15) Shifting equilibrium

Choose two of those scenarios and find the results.

Scenario #1 -



Scenario #2 -



Wrapping up

- Equilibrium price and quantity remain the same if there is no external factor shifting demand or supply.
- Some may suggest that external force can create excess demand or supply in the short-term while the equilibrium shifts toward a new permanent point.
- Shifting demand or supply can vary in multitude. Different results of equilibrium price and quantity may be expected.
- However, an economic logic that supports the shift must be correct!
- Further reading can be found in Pindyck and Rubinfeld (2018), page 43-54.

Problem statement and aims

55

Since economists mostly interested in price change and price determination from equilibrium, problems arise when they try to compare changes in different markets.

Supposed that there are two markets of interest, fuel oil and mobile phones market, both markets price drop 20 baht equally per unit. We can immediately see that quantity change in two markets would respond differently because there is a big gap in present prices between two goods.

Changes in quantity is also problematic. Fuel oil, in liter term, quantity maybe sold a lot more per day compared to mobile phone daily sales, in unit term.

- Understand what is an elasticity and also be able to apply your understanding to different scenarios.
- Learn what would be determiners that define demand and supply elasticity

Definition 2.10

Elasticity *is a measure of sensitivity of one variable variable to a change in another variable. General formula takes the form of*

$$\varepsilon = \frac{\%change\ in\ dependent\ variable}{\%change\ in\ independent\ variable}$$

(1) Price elasticity of demand

Definition 2.11

Price elasticity of demand *is percentage change in quantity demanded for 1 percent of price increase.*

$$\varepsilon_d = \frac{\%change\ in\ quantity\ demanded}{\%change\ in\ price} = \frac{\%\Delta Q_d}{\%\Delta P}$$

We can measure both **point elasticity** and **arc elasticity** of demand.

(1) Price elasticity of demand

Point elasticity

Note that **point elasticity** has a formula of

$$\varepsilon_d = \frac{P}{Q} \cdot \frac{\Delta Q}{\Delta P} = \frac{P}{Q} \cdot \frac{Q_2 - Q_1}{P_2 - P_1}$$

Using the same demand function

$$Q_d = 10 - 2P$$

now figure out **point elasticity** on each coordinate.

- $\varepsilon_{d(a)}$
- $\varepsilon_{d(b)}$
- $\varepsilon_{d(c)}$
- $\varepsilon_{d(d)}$

(1) Price elasticity of demand

Arc elasticity

Note that **arc elasticity** has a formula of

$$\varepsilon_d = \frac{P_2+P_1}{Q_2+Q_1} \cdot \frac{\Delta Q}{\Delta P} = \frac{P_2+P_1}{Q_2+Q_1} \cdot \frac{Q_2-Q_1}{P_2-P_1}$$

Using the same demand function

$$Q_d = 10 - 2P$$

now figure out **arc elasticity** on each interval.

- $\varepsilon_{d(ab)}$
- $\varepsilon_{d(bc)}$
- $\varepsilon_{d(ac)}$
- $\varepsilon_{d(bd)}$

(1) Price elasticity of demand

Some quick questions.

- We always incorporate $\frac{\Delta Q}{\Delta P}$ in the formula. What is this part?

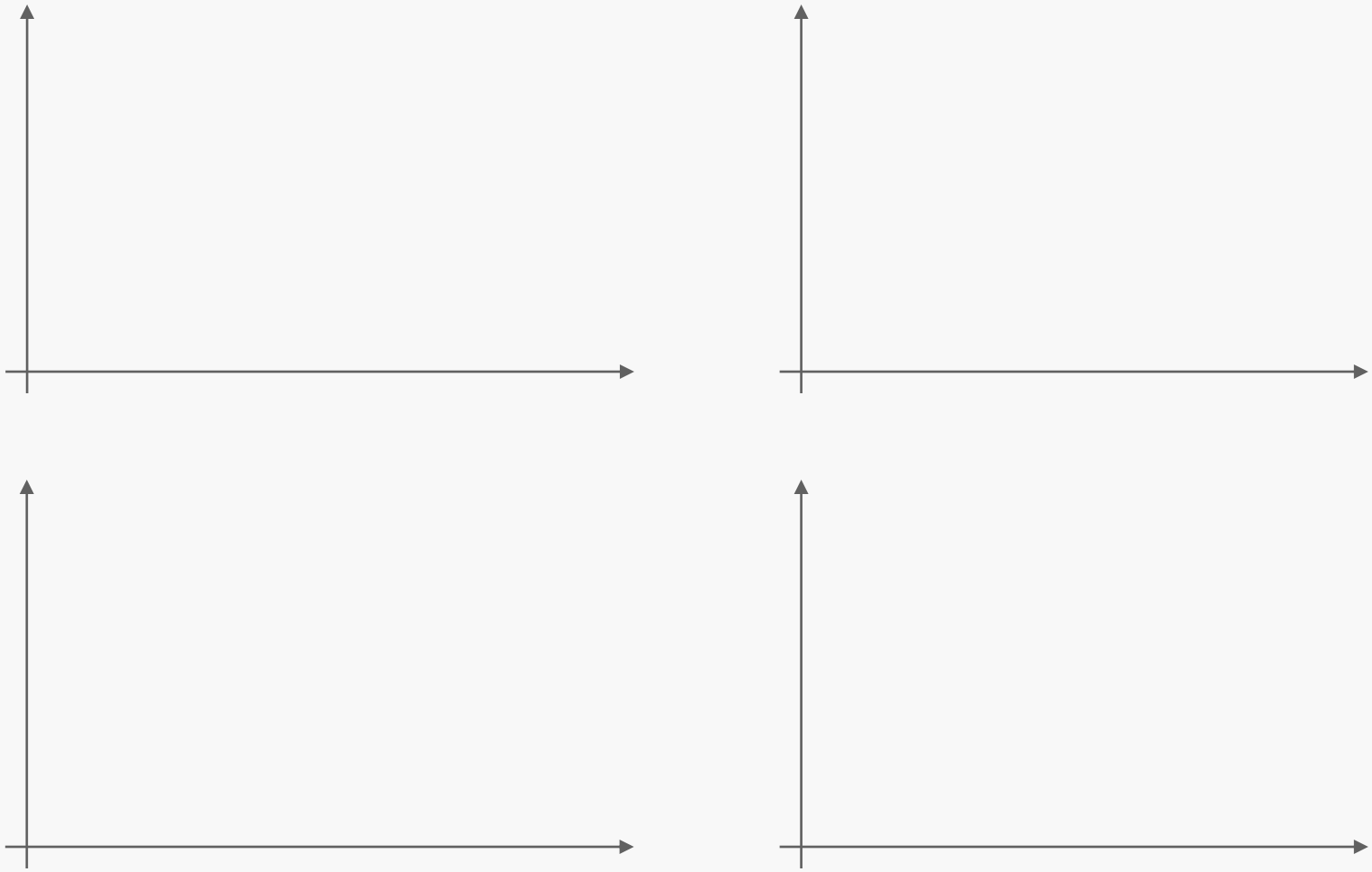
- What is the unit of elasticity?

- How much is considered elastic or inelastic?

(1) Price elasticity of demand

Relative elasticity of demand can be defined by slope.

Relative elasticity



(1) Price elasticity of demand

Example, determiners and applications

Goods/services	Elasticity
Cigarette	-0.06
Electricity (for accommodations)	-0.13
Rice	-0.15
Pesticide	-0.21
Express toll	-0.29
Fuel oil (imported)	-0.60
Rice whiskey	-1.31
Vehicle and components (imported)	-1.52

Which direction of these determiners make demand inelastic?

- Number of substitutable goods
- Necessity
- Time frame

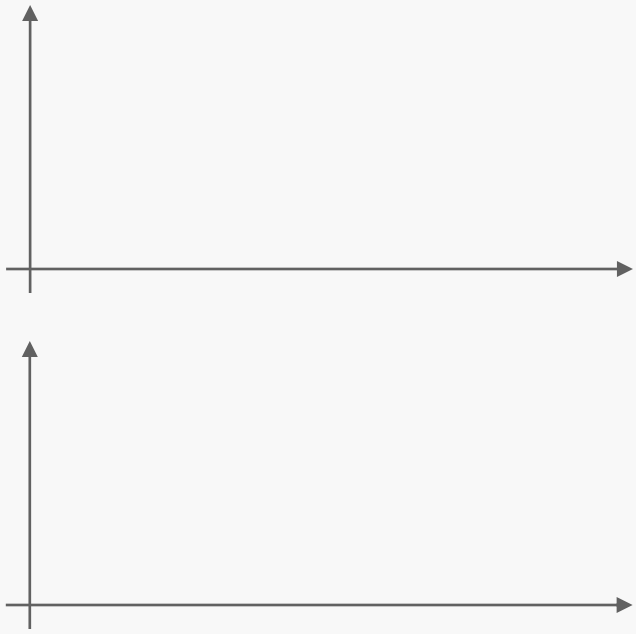
Applying price elasticity of demand

An economist is studying a perfectly competitive cigarette market. She has found that at the equilibrium, the price is at 100 baht per pack and the quantity is at 1.2 million packs per year. She estimates, at the equilibrium, the price elasticity of demand which is -0.5. If the government wants to reduce cigarette sold each year down to 1 million packs, how would she suggest a policy maker to set the price?

(1) Price elasticity of demand

Price elasticity of demand is also related to total revenue.

Relative elasticity



Mathematical proof

Now sum up all this proof into cases.

(2) Other demand elasticities

We can also apply this concept to other types of demand.

Definition 2.12

Income elasticity of demand *is percentage change in quantity demanded for 1 percent of consumers' income increase.*

$$\varepsilon_I = \frac{\%change\ in\ quantity\ demanded}{\%change\ in\ income} = \frac{\%\Delta Q_d}{\%\Delta I}$$

Therefore, the formula of point and arc income elasticity of demand becomes

- $\varepsilon_I = \frac{I}{Q} \cdot \frac{Q_2 - Q_1}{I_2 - I_1}$
- $\varepsilon_I = \frac{I_2 + I_1}{Q_2 + Q_1} \cdot \frac{Q_2 - Q_1}{I_2 - I_1}$

Definition 2.13

Cross-price elasticity of demand *is percentage change in quantity demanded for 1 percent of price increase of another commodity.*

$$\varepsilon_C = \frac{\%change\ in\ quantity\ demanded}{\%change\ in\ another\ commodity\ price} = \frac{\%\Delta Q_d^a}{\%\Delta P^b}$$

Therefore, the formula of point and arc cross-price elasticity of demand becomes

- $\varepsilon_C = \frac{P^b}{Q^a} \cdot \frac{Q_2^a - Q_1^a}{P_2^b - P_1^b}$
- $\varepsilon_C = \frac{P_2^b + P_1^b}{Q_2^a + Q_1^a} \cdot \frac{Q_2^a - Q_1^a}{P_2^b - P_1^b}$

(3) Price elasticity of supply

Definition 2.14

Price elasticity of supply *is percentage change in quantity supplied for 1 percent of price increase.*

$$\varepsilon_s = \frac{\%change\ in\ quantity\ supplied}{\%change\ in\ income} = \frac{\%\Delta Q_s}{\%\Delta P}$$

Therefore, the formula of point and arc income elasticity of demand becomes

- $\varepsilon_S = \frac{P}{Q} \cdot \frac{Q_2 - Q_1}{P_2 - P_1}$
- $\varepsilon_S = \frac{P_2 + P_1}{Q_2 + Q_1} \cdot \frac{Q_2 - Q_1}{P_2 - P_1}$

Point elasticity

Using the same supply function

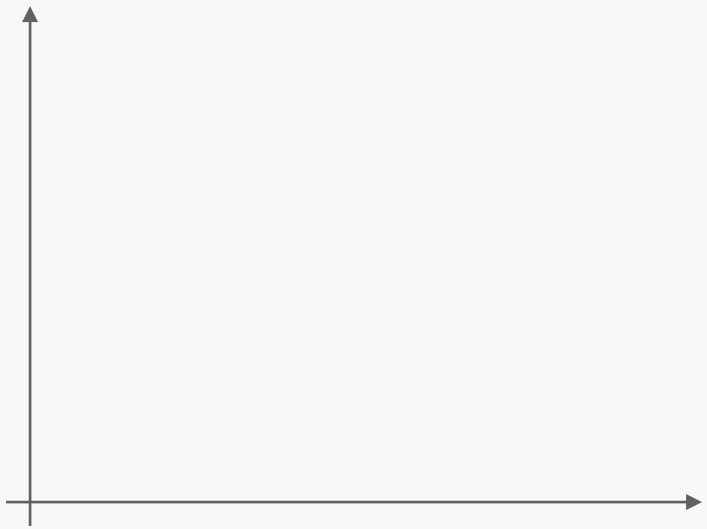
$$Q_s = 4P$$

now figure out **point elasticity** on each coordinate.

- $\varepsilon_{s(a)}$
- $\varepsilon_{s(b)}$
- $\varepsilon_{s(c)}$

(3) Price elasticity of supply

Point elasticity



Now try another supply function

$$Q_s = P + 2$$

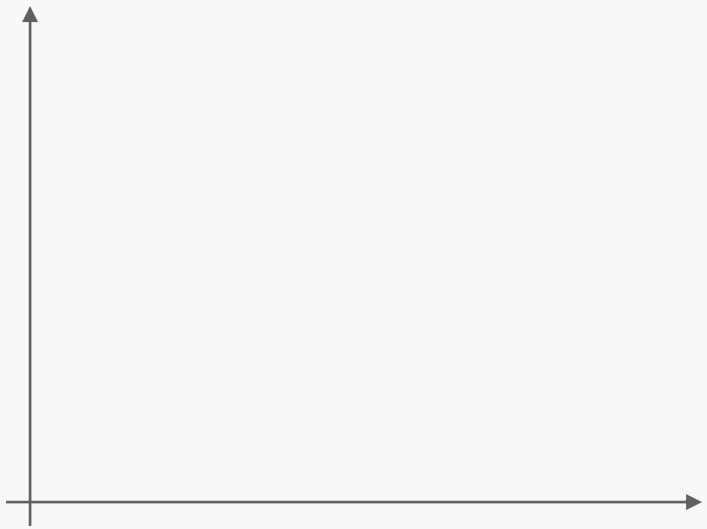
and figure out **point elasticity** on each coordinate.

- $\varepsilon_{s(a)}$
- $\varepsilon_{s(b)}$
- $\varepsilon_{s(c)}$

Can you generalize the characteristics of elasticity of this function?

(3) Price elasticity of supply

Point elasticity



Another one

$$Q_s = 4P - 2$$

figure out **point elasticity** on each coordinate.

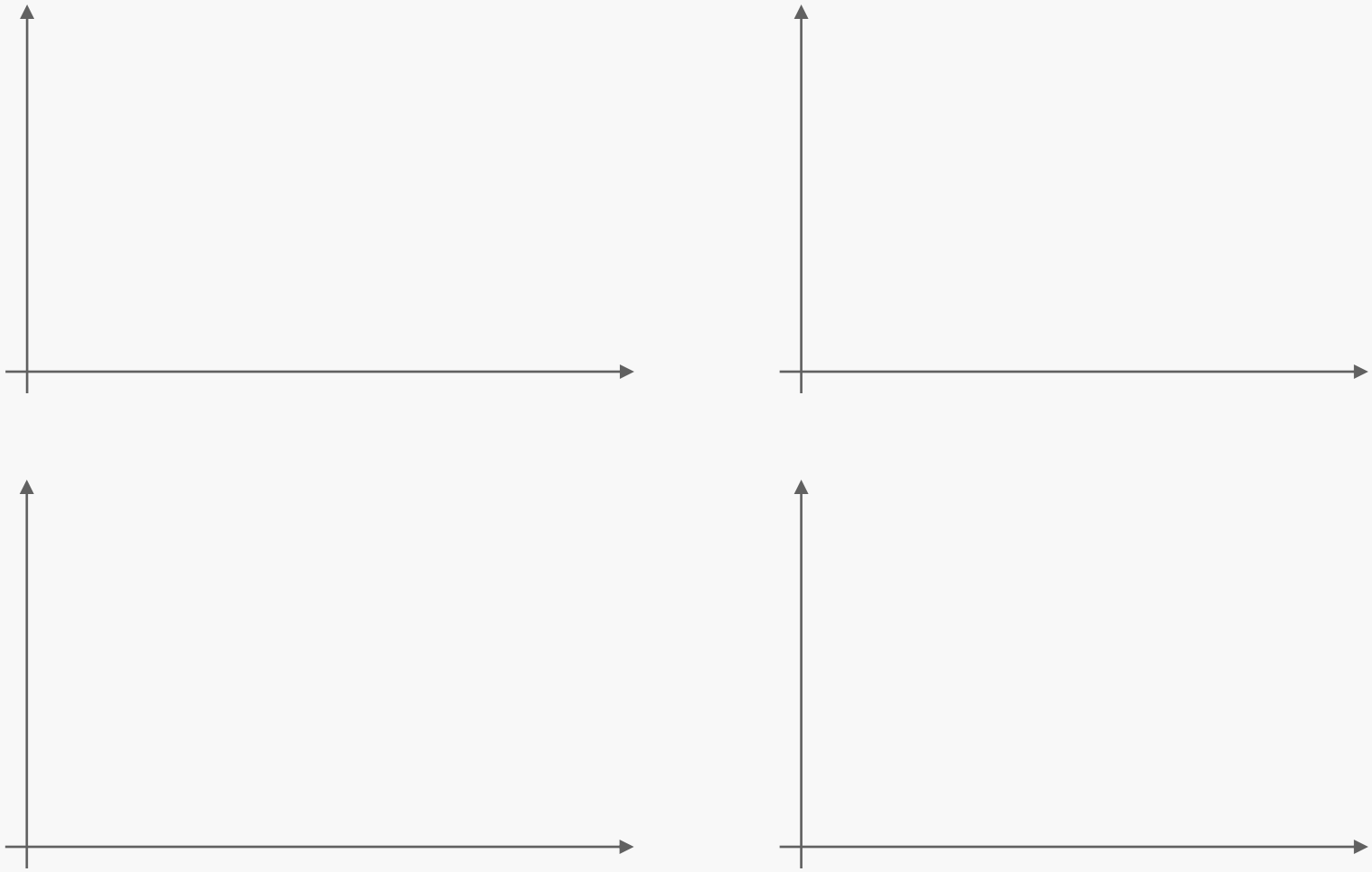
- $\varepsilon_{s(a)}$
- $\varepsilon_{s(b)}$
- $\varepsilon_{s(c)}$

Can you generalize the characteristics of elasticity of this function?

(3) Price elasticity of supply

Relative elasticity of supply can be defined by slope.

Relative elasticity



(3) Price elasticity of supply

Price elasticity of supply depends on goods or services features. Unlink demand, those characteristics are mostly related to production. What direction of these determiners make supply more elastic?

- Cost of production

- Duration of production

- Time frame

As you may have seen that economists are obsessed with change in price, quantity and equilibrium. They would not matter if we are not able to interpret what comes after those events. Therefore, we need another concept to identify gains and losses for each party in a market.

Surplus is a concept that measures "social welfare" from trade in a market, which is also used to imply "market efficiency" compared to undesirable scenarios, such as government intervention or monopoly.

In a market, there are many groups of buyers and sellers. Buyers' preference and sellers' cost vary while market price is singular

(1) Consumer surplus

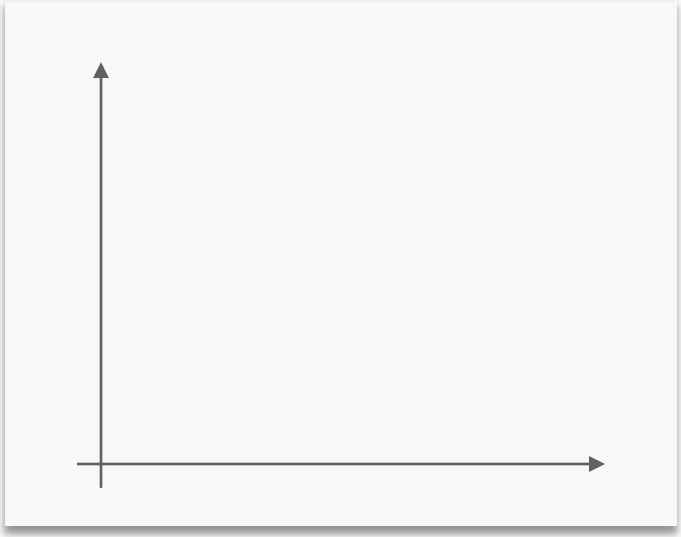
328

Definition 2.15

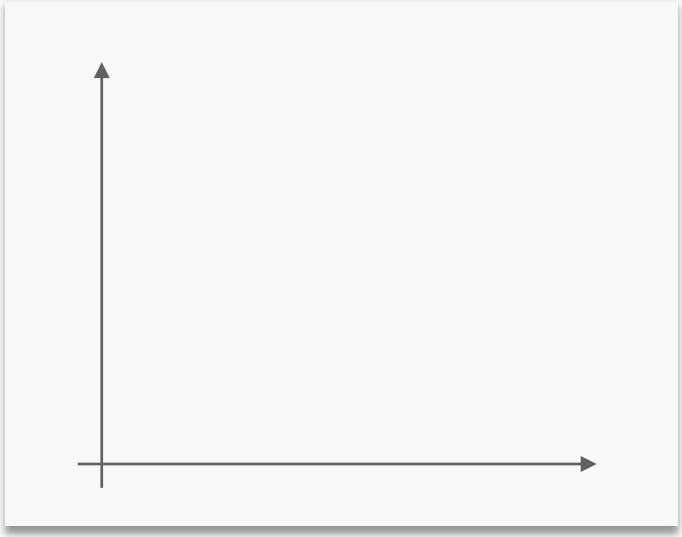
Consumer surplus *is net gain or benefit of all consumers in a market, defined by difference between willingness to pay and market price.*

Firstly, we need to define what is willingness to pay to understand surplus.

Willingness to pay



Consumer surplus



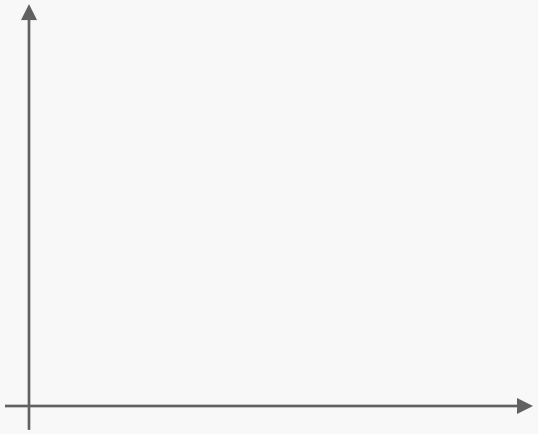
(2) Producer surplus

Definition 2.16

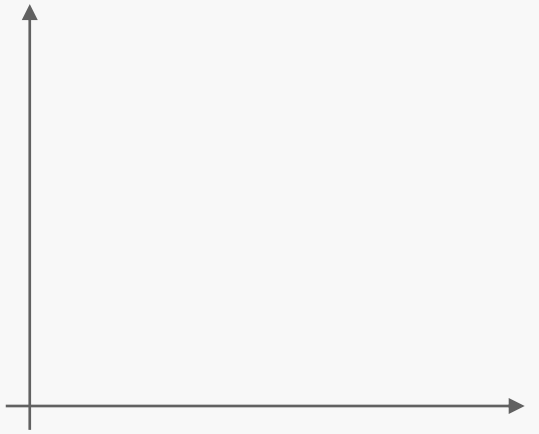
Producer surplus *is net gain or benefit of all consumers in a market, defined by difference between market price and willingness to sell.*

Similar to consumer, sellers also gain some surplus from trading in a market.

Willingness to sell



Producer surplus

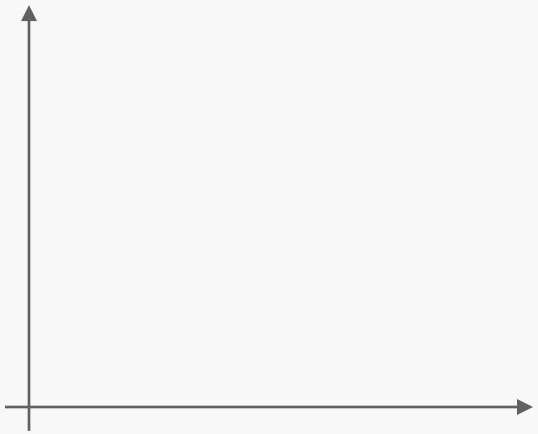


(3) Total surplus

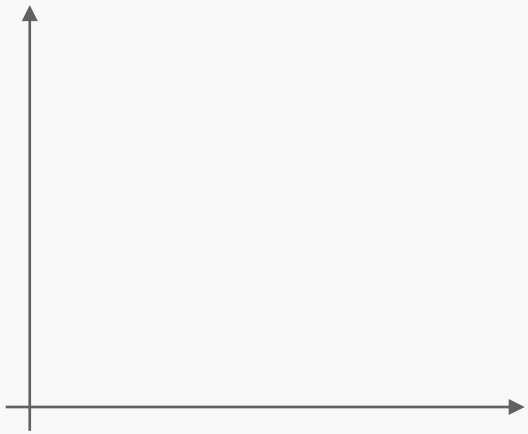
If the market is perfectly competitive, total surplus is sometimes referred as “social welfare”. This concept is used throughout the analyses when price, quantity or equilibrium shifts. Note that this “welfare” only means welfare gained from trade.

Now let’s consider total surplus and see how it would differ when price change.

Total surplus at the equilibrium



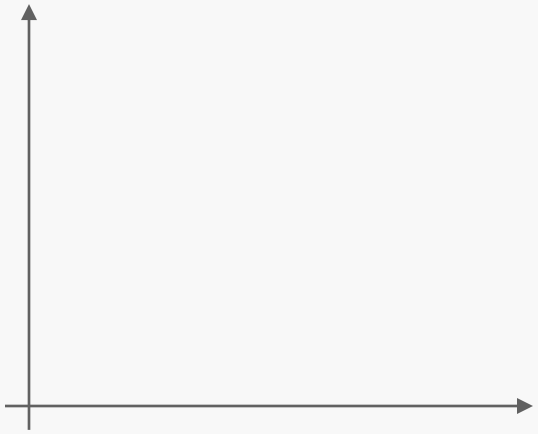
Price change



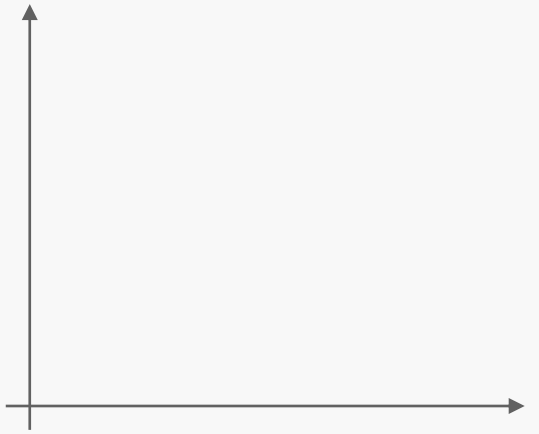
(3) Total surplus

Let's consider surplus change for each party from these cases when equilibrium shifts.

Demand surge



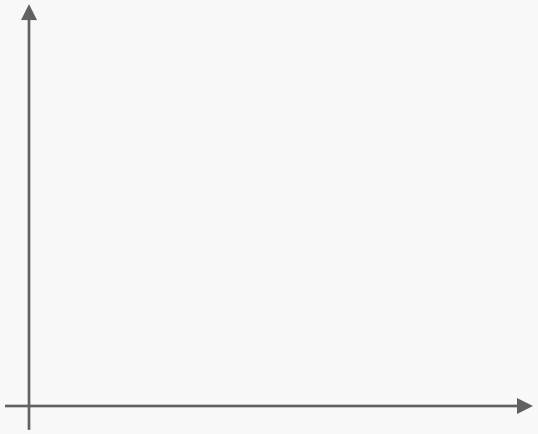
Supply drops



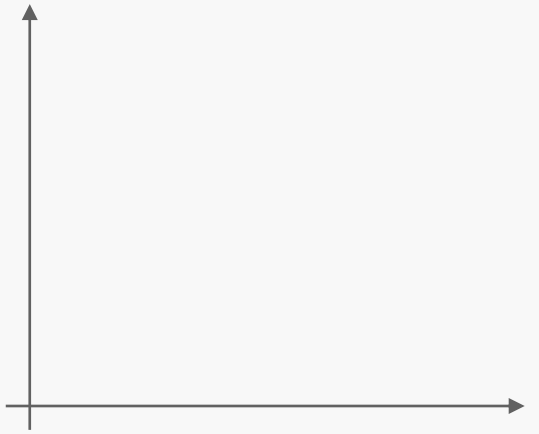
(3) Total surplus

Price elasticity also affects surplus for each party as well. See the cases below.

Inelastic demand



Elastic supply



Problem statement and aims

No such country relies solely on market for resource allocation. A central institution, most of the time is called “government”, or economic and political institutions are founded to intervene markets for many circumstances such as

- when market fails
- trying to stabilize price for essential commodities
- maintaining political and economic stability
- building infrastructures and public goods
- After this lengthy episodes, you should be able to understand each tools how they work and how they affect surplus for each party, and also the society as a whole.

There are many tools to intervene market such as price settings, government purchasing, taxing which we will analyze the consequences using surplus framework. The first one here is price setting.

(1) Price settings

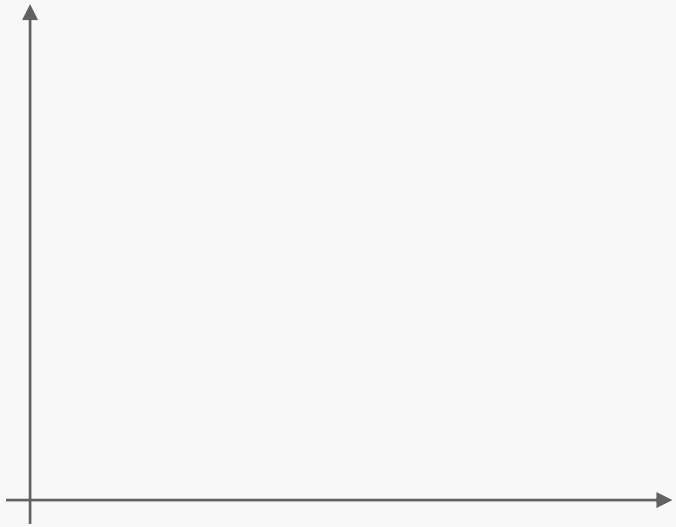
Definition 2.17

Ceiling Price *is set for any commodity not to be traded above set price. Such price is mostly set via legal channel or issued as a specialized policy.*

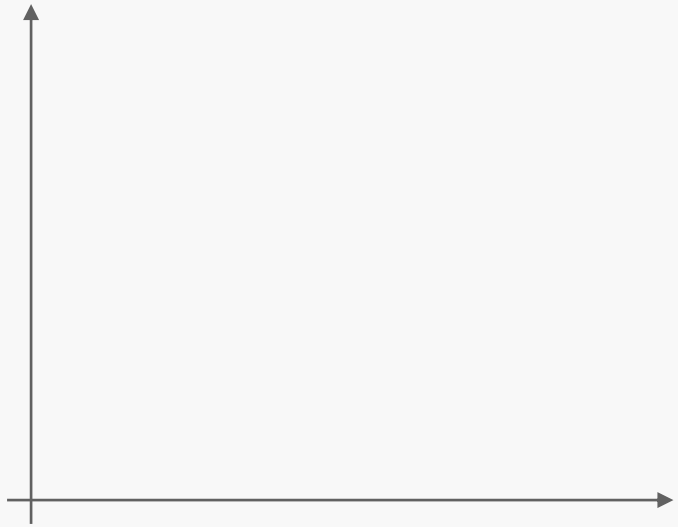
(1) Price settings

Let's analyze the effect of setting ceiling at different level

Set above market price



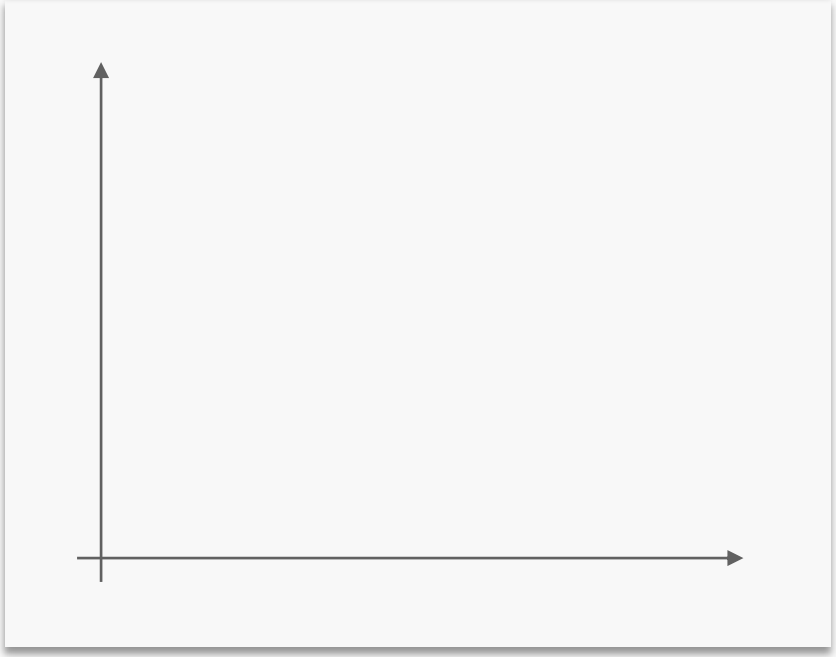
Set below market price



(1) Price settings

Now consider the surplus

Ceiling price



Surplus	Before	After	Diff.
CS			
PS			
Total			

As you can see, there is a part of surplus which is lost after the intervention, this part is called "**deadweight loss**".

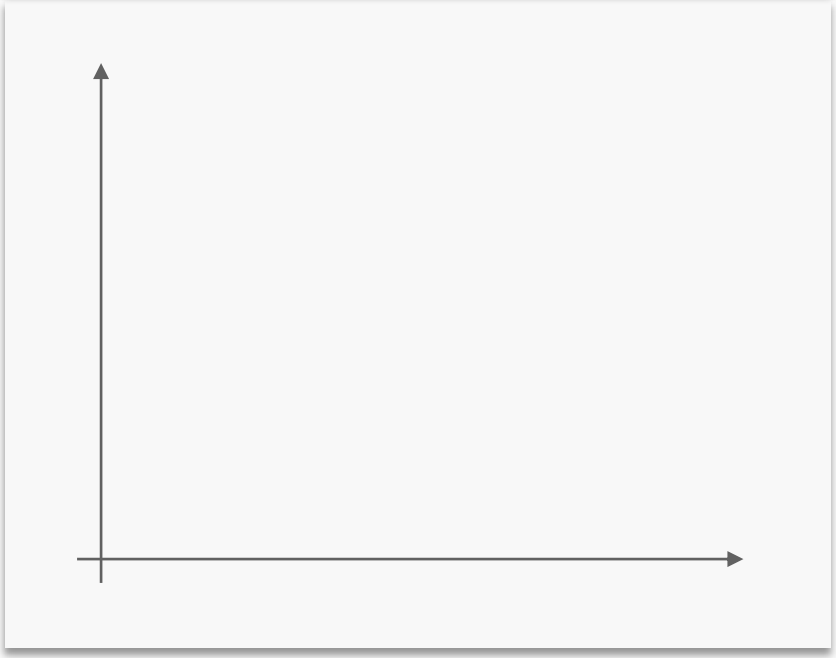
Definition 2.18

***Deadweight loss**, also known as excess burden or allocative inefficiency, is a loss of economic efficiency that can occur when the free market equilibrium for a good or a service is not achieved.*

(1) Price settings

Let's take a look who gain or lose more than another one.

Ceiling price on inelastic demand



Surplus	Before	After	Diff.
CS			
PS			
Total			

Next up, we consider the opposite one price ceiling policy.

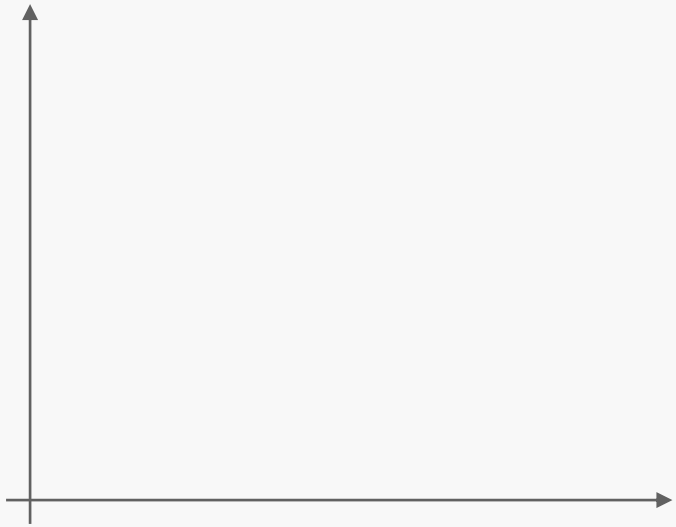
Definition 2.19

***Floor price** is set for any commodity not to be traded below set price.*

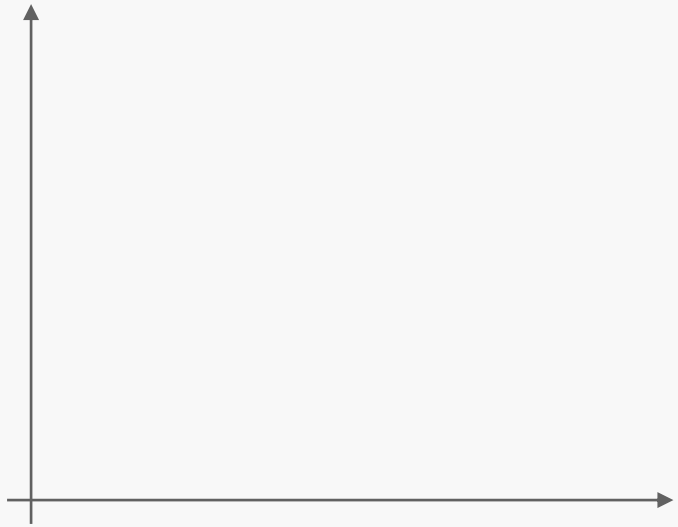
(1) Price settings

Let's analyze the effect of setting floor at different level

Set above market price



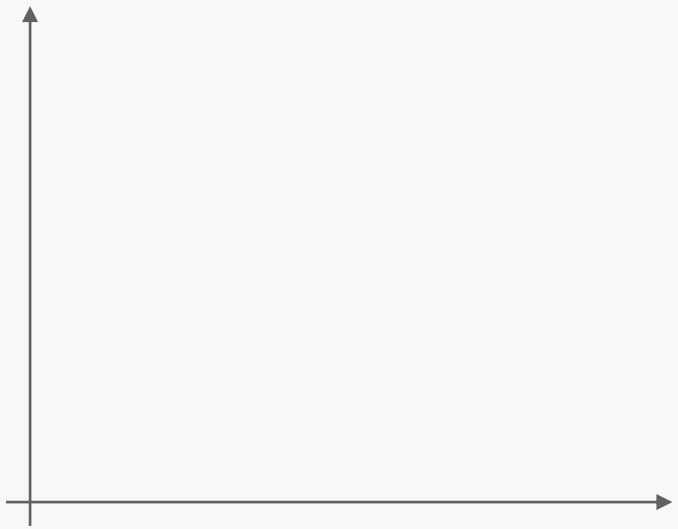
Set below market price



(1) Price settings

Now consider the surplus

Floor price



Surplus	Before	After	Diff.
CS			
PS			
Total			

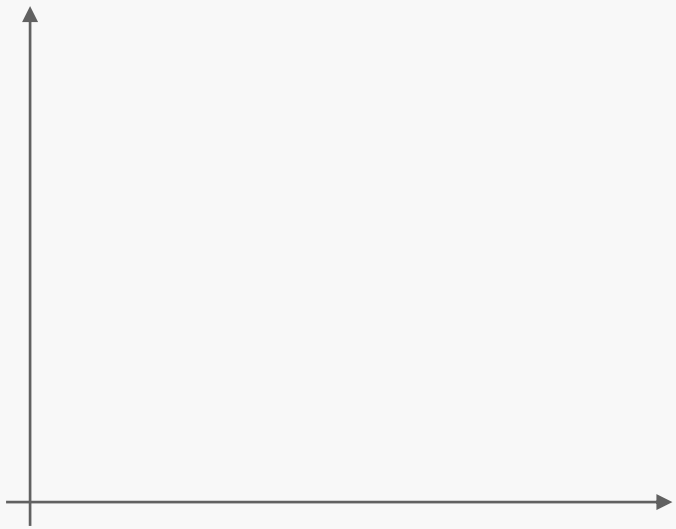
(2) Price support

Definition 2.20

Price support *is either a subsidy, price control or setting a production quota, with the intention to keep market price of a commodity higher than the competitive level.*

From the definition, it is any scheme that try to raise price above competitive market level. Each scheme has different assumptions that would differ government burden (expenditure) and surplus

Government purchasing program



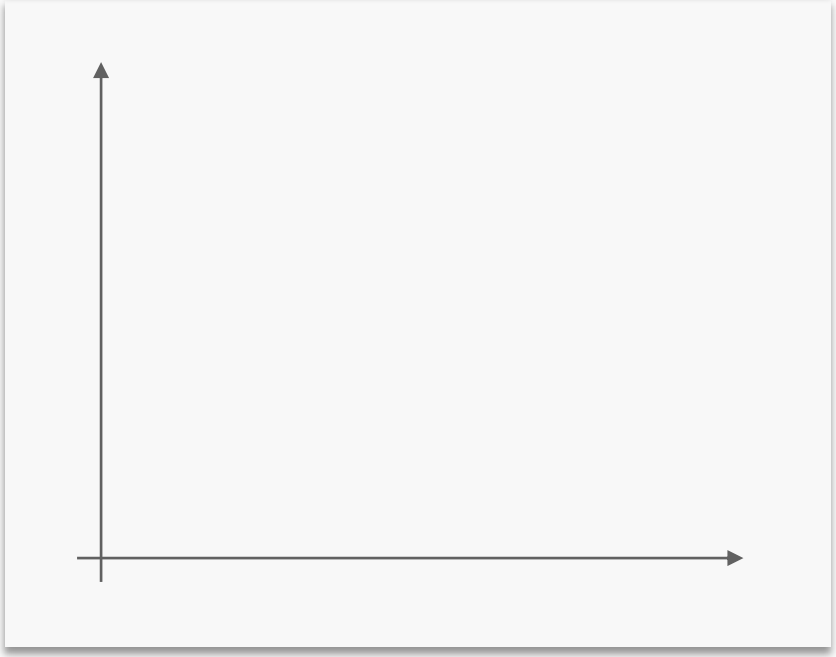
The first one is called "government purchasing program" which assumptions are imposed as follows.

- The government set floor price above market price, raising price upward.
- There is some excess supply in the market since producer see this opportunity.
- The government buys out all the excess supply.

Surplus	Before	After	Diff.
CS			
PS			
Gov. expenditure			
Total			

(2) Price support

Acreage limitation program (quota)



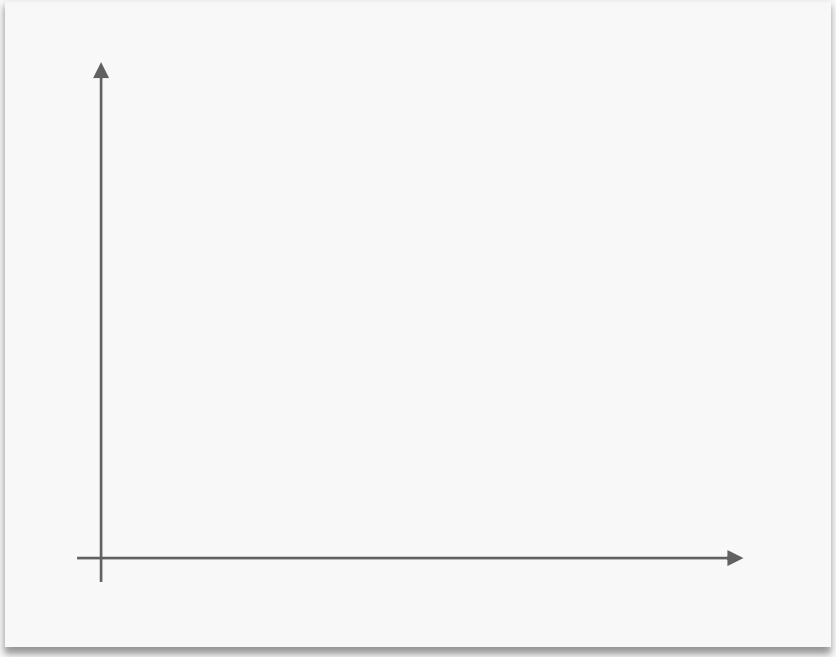
The second one is called “acreage limitation program” or “production quota” which assumptions are imposed as follows.

- The government chooses a limited quantity supplied, corresponding to the price level they want to raise.
- At this price, producers are signaled to produce more.
- The government pays the producers as if they can sell at that price to compensate lost surplus.

Surplus	Before	After	Diff.
CS			
PS			
Gov. expenditure			
Total			

(2) Price support

Deficiency payment



The third one is called “deficiency payment” which assumptions are imposed as follows.

- The government signal targeted price above market level.
- At this price, producers are signaled to produce more, leading to excess supply.
- Let the exchange be as the price set. Excess supply would eventually cause price drop.
- The government pays for deficiency to the producers as their compensation.

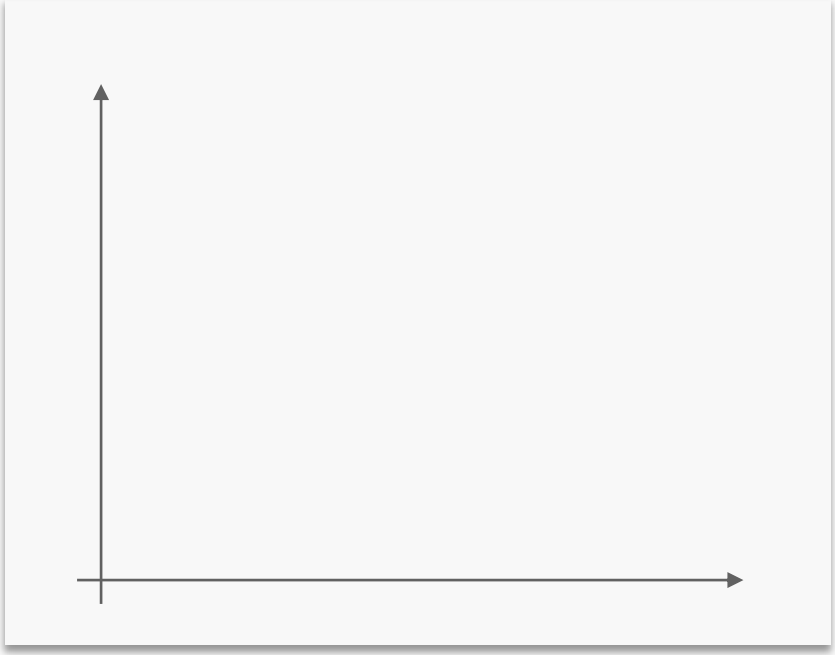
Surplus	Before	After	Diff.
CS			
PS			
Gov. expenditure			
Total			

(3) Tax and subsidy

Definition 2.21

Taxing *can be fundamentally divided into unit tax, which is collected equally on each unit sold in a market, and ad valorem tax, which its amount collected based on value of transaction in a market such as sales tax or value added tax. Taxing would discourage the party taxed but subsidy works another way around.*

Tax on producer

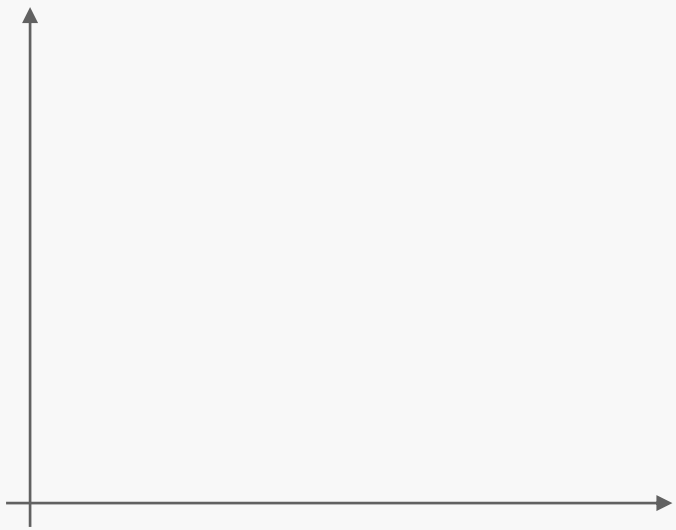


Introducing tax burden, each party would bear different level of tax burden in different scenarios.

Surplus	Before	After	Diff.	Tax burden
CS				
PS				
Government				
Total				

(3) Tax and subsidy

Tax on producer with inelastic demand

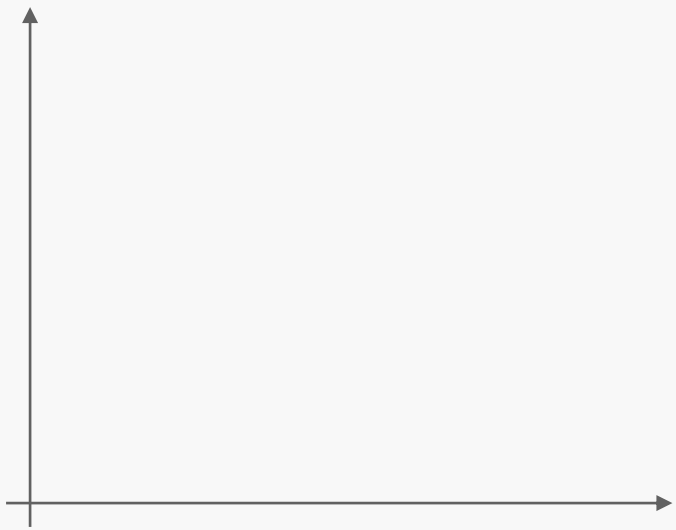


Let's see how different elasticity play which role in tax burden.

Surplus	Before	After	Diff.	Tax burden
CS				
PS				
Government				
Total				

(3) Tax and subsidy

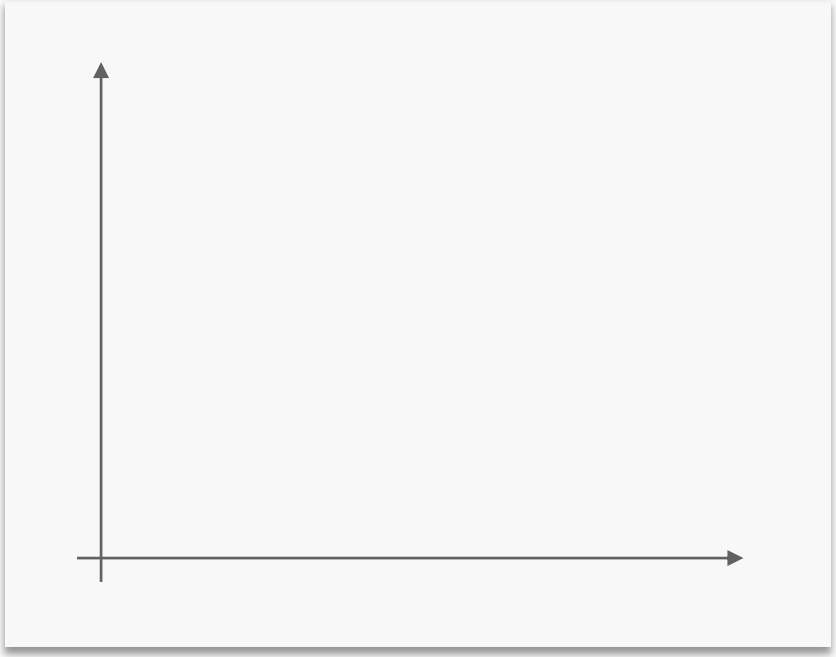
Tax on producer with perfectly elastic demand



Surplus	Before	After	Diff.	Tax burden
CS				
PS				
Government				
Total				

(3) Tax and subsidy

Tax on consumer

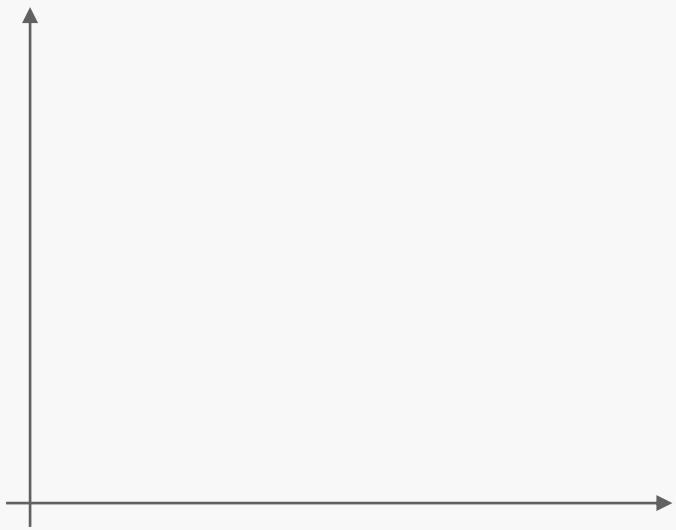


Now we turn the tax to consumer to see how it would differ.

Surplus	Before	After	Diff.	Tax burden
CS				
PS				
Government				
Total				

(3) Tax and subsidy

Tax on consumer with elastic supply

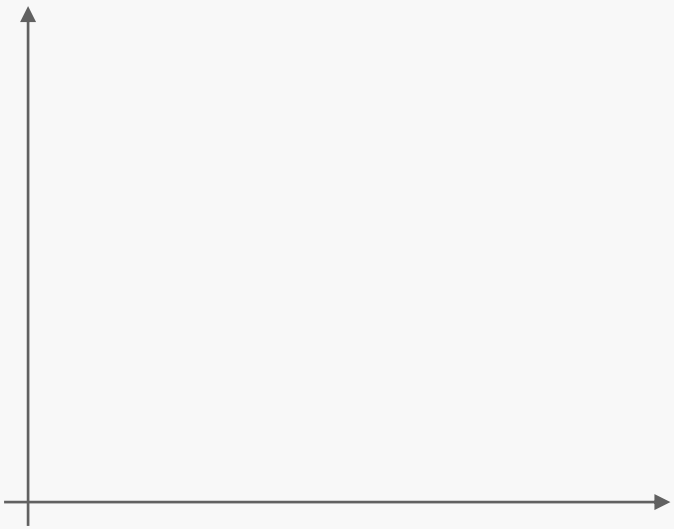


Let's see how different elasticity play which role in tax burden.

Surplus	Before	After	Diff.	Tax burden
CS				
PS				
Government				
Total				

(3) Tax and subsidy

Tax on consumer with perfectly inelastic supply



Surplus	Before	After	Diff.	Tax burden
CS				
PS				
Government				
Total				

Wrapping up

- Demand and supply elasticity plays an important role for gains and losses from market intervention.
- Surplus is affected by elasticity as well.
- Government intervention analyses based on multiple assumptions, which will determine the results. Taken many other factors into account for the real-world scenarios may yield other results and may reveal other interesting aspects.
- You should also study, on your own, about ad valorem tax and subsidy. The analyses would be very similar to what we have covered in class.
- Further reading can be found in Pindyck and Rubinfeld (2018), page 55-82 and 327-362

Consumer Theory

Part 3

EE211

Principles of Microeconomics

Revision Aug 2020

Problem statement and aims

Demand for consumption partly come from fundamental human need to consume goods or services in order to survive or gain a kind of well-being condition.

Acquiring various goods or services In order to meet consumers' need is according to resource allocation. For welfare states, it is mostly agreed that people should be fulfilled at two levels. Basic human right should be provided by the state, family or community. But people should also be able to seek from markets according to the satisfaction of each person because we prefer different things.

Mainstream economic theory focuses on the consumption in the market system. Therefore, this part is only a study of consumption behavior in the market system. The aims are.

- Getting to know the concept of what consumer seeks and how do we define them.
- Learning different approaches in order to study consumer behavior.
- Further extend our knowledge, utilizing , to understand what happens with consumer decision when price changes. Also, how it affect demand and market equilibrium respectively.
- Further reading can be found in Pindyck and Rubinfeld (2018) Part 2, Chapter 3-4.

Introduction

Figure 3.1 *Maslow's Hierarchy of Needs*

Consuming goods or services traded in a market system provides satisfaction and treats human needs through resource allocation, employing price mechanisms

Therefore, the first thing that economists need to define is what consumer receive from consumption.

Defining utility

Definition 3.1

***Utility** is defined as happiness or satisfaction that a consumer receives from consuming goods or services within a period of time.*

Quick question: From the definition, do you think that

- Consuming of the same product or service yields the same amount of utility for each person?

- Is utility the same or different from usefulness?

(1) Crucial assumptions

The study of consumers in economics is mostly divided into two broad approaches, **cardinal and ordinal** theory. Before we move on to study the cardinal approach, some assumptions must be posed.

- Consumers are rational with the aim to maximize utility from consumption.
- Utility is measurable, countable, and combinable with unit of 'util'.
- Goods or services that consumers choose share the same quality in every unit consumed. (homogenous product)
- Goods or services are assumed to be indefinitely separated into very small unit. (Continuous)
- If there is a budget constraint, consumers are not yet satiated. (Non-satiated)
- Ceteris paribus or 'other things being equal'. Meaning that other than a change we are focus on, other factors are kept constant.

(2) Marginal and total utility

If utility is defined as a measurable unit, consuming goods or services 1 unit obtains an amount of utility. The second unit also provides another amount of utility and so on. Each utility received from each unit is different, which they can be called "**marginal utility**".

Definition 3.2

Marginal Utility (MU) *is additional utility that consumer receive from consuming one more unit of goods or services*

For example, Mr. A has two dishes of meal which utilize 10 and 7 utils respectively. Combining all the marginal utility, we get **total utility**.

(2) Marginal and total utility

Definition 3.3

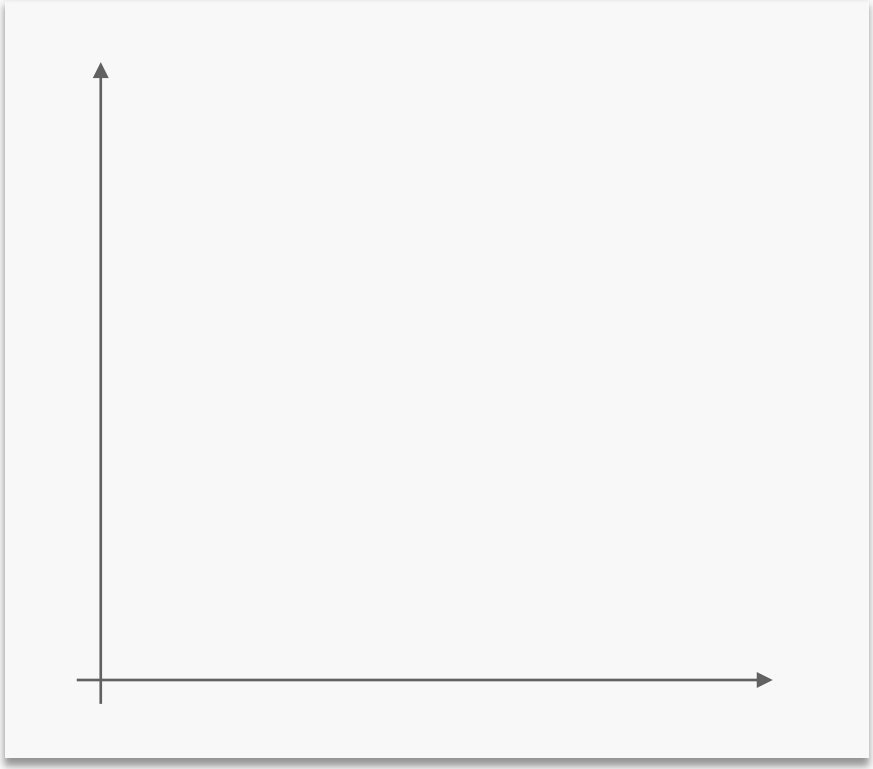
Total Utility (TU) *is utility that consumer receive from consumption n units of goods or service.*

Let's roughly look at these terms in numbers. x is defined as a commodity that can be consumed and provide utility.

Calculate marginal utility			Calculate total utility		
x	TU	MU	x	TU	MU
0	0	-	0	0	-
1	5		1		4
2	8		2		2
3	9		3		1
4	10		4		0
5	10		5		-1
6	8		6		-2

(3) Diminishing marginal utility

Total and marginal utility



Try plotting both on the same graph. Don't forget to indicate axis label.

Does this trend of diminishing marginal utility always occur? Does it apply to every consumer goods?

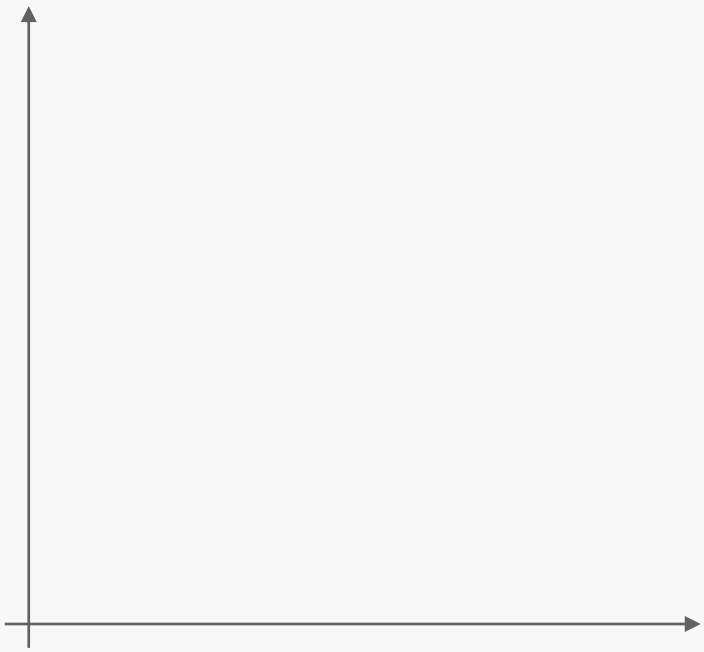
Definition 3.4

Law of Diminishing Marginal Utility *states that marginal utility from consuming a good or service within a period of time diminishes as the consumer keep consuming it.*

Therefore, studying consumer is **finding a condition that would maximize consumer's utility** under different circumstances, assumed that consumer is rational.

(4) Utility maximization

#1: Consuming a good without budget constraint



We have maximized utility condition, for this case, as

- $MU_x = 0$

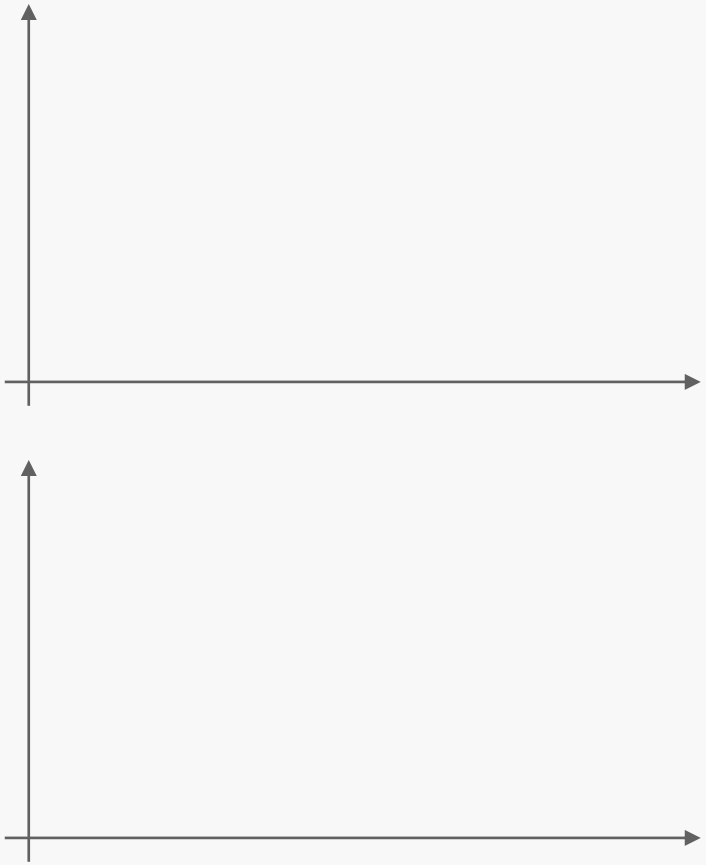
Given that a consumer receives utility from consuming x, utility received is shown in the table below.

Calculate marginal utility

x	TU	MU
0	0	-
1	5	
2	8	
3	9	
4	9	
5	8	
6	6	

(4) Utility maximization

#2: Consuming multiple goods without budget constraint



We have maximized utility condition, for this case, as

- $MU_x = MU_y = \cdots = 0$

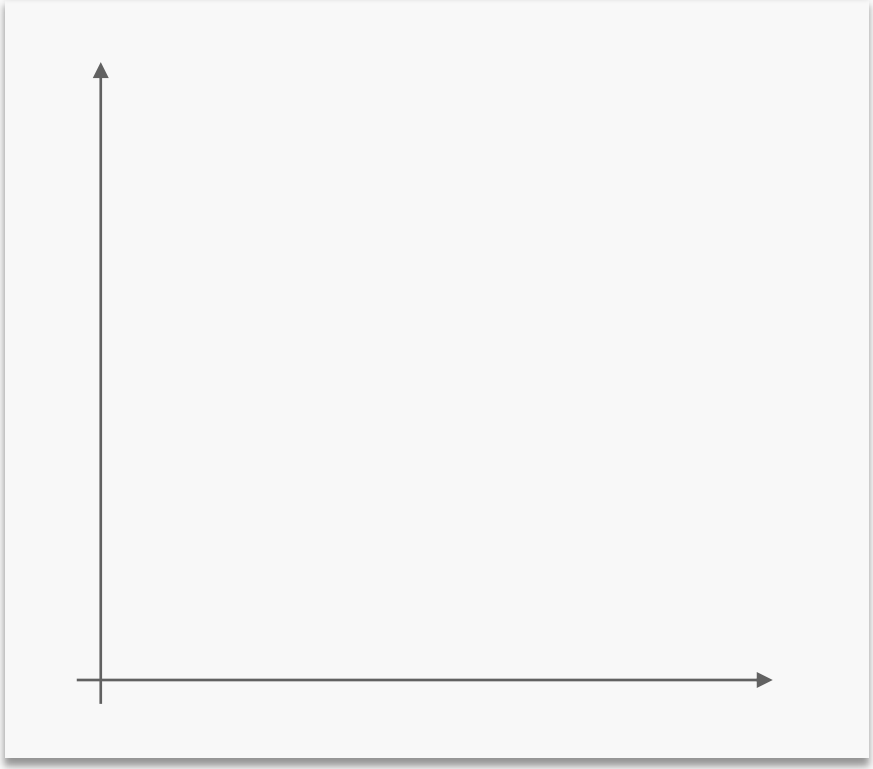
Given that a consumer receives utility from consuming x and y, utility received is shown in the table below.

Calculate marginal utility

x,y	TU_x	MU_x	TU_y	MU_y
0	0	-	0	-
1	5		10	
2	8		15	
3	9		18	
4	9		19	
5	8		19	
6	6		17	

(4) Utility maximization

#3: Consuming a good with budget constraint



Given that a consumer receives utility from consuming x but now he or she has limited budget, utility received is shown in the table below.

Calculate marginal utility if I = 24 and P_x = 8

x	TU	MU
0	0	-
1	5	
2	8	
3	9	
4	9	
5	8	
6	6	

We have maximized utility condition, for this case, as

- $\max_x U(x)$

$subject\ to\ \ P_x \cdot x \ \leq I$

What if the price goes up or down, what would happen to the consumer's equilibrium?

(4) Utility maximization

The final case would be too complicated to depict now. Let's take a look at the decision tale first.

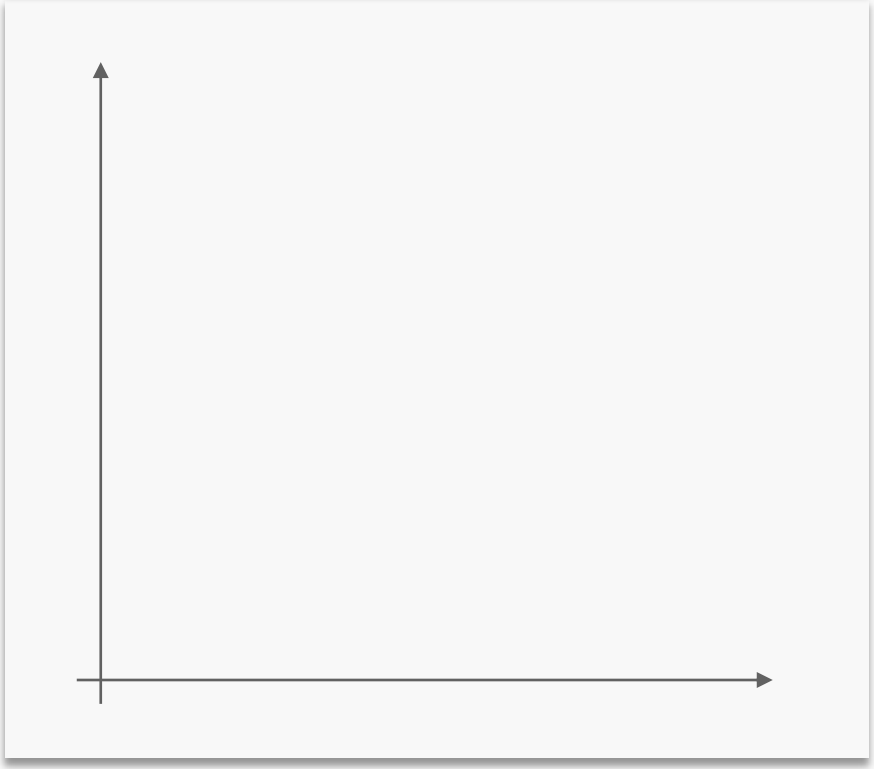
I	x,y	MU_x	P_x	MU_y	P_y	MU_x/P_x	MU_y/P_y	Choice	Decision	I
22	1	12	4	10	2					
	2	8		8						
	3	4		6						
	4	0		4						
	5	-4		2						
	6	-8		0						

We have maximized utility condition, for this case, as

- $\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \cdots = \frac{MU_k}{P_k}$

(4) Utility maximization

Understand the condition



To understand why the condition satisfies consumer's maximized utility, consider the graph on the left. Here it is assumed that every combination of (x,y), the budget is totally spent and prices are constant.

However, cardinal approach has a lot of drawback such as

• The measurement of utility is problematic due to the unit of utility is not uniquely defined. In other words, if two people are satisfied with the same goods and service but the defined level of utility may be different. For instance, Mr. A can define his satisfaction as 3 when Mr. B can define his satisfaction as 10 but they feel exactly the same.

• Adding up utility, therefore, lacks reliability.

As a result, there is another approach that can solve this problem without determining exact amount of utility as number.

(1) Crucial assumptions

- Consumers are rational with the aim to maximize utility from consumption.
- By being rational, it means that consumer can tell what product they prefer and they can **put them in order of preference**.
- Goods or services that consumers choose share the same quality in every unit consumed. (homogenous product)
- Goods or services are assumed to be indefinitely separated into very small unit. (Continuous)
- If there is a budget constraint, consumers are not yet satiated (Non-satiated). In other words, the analysis satisfies Walras' Law.
- Ceteris paribus or 'other things being equal'. Meaning that other than a change we are focus on, other factors are kept constant.
- The tools used for this ordinal theory are called **Indifferent Curve** (IC) and **Budget Line** (BL).

(2) Indifferent Curve

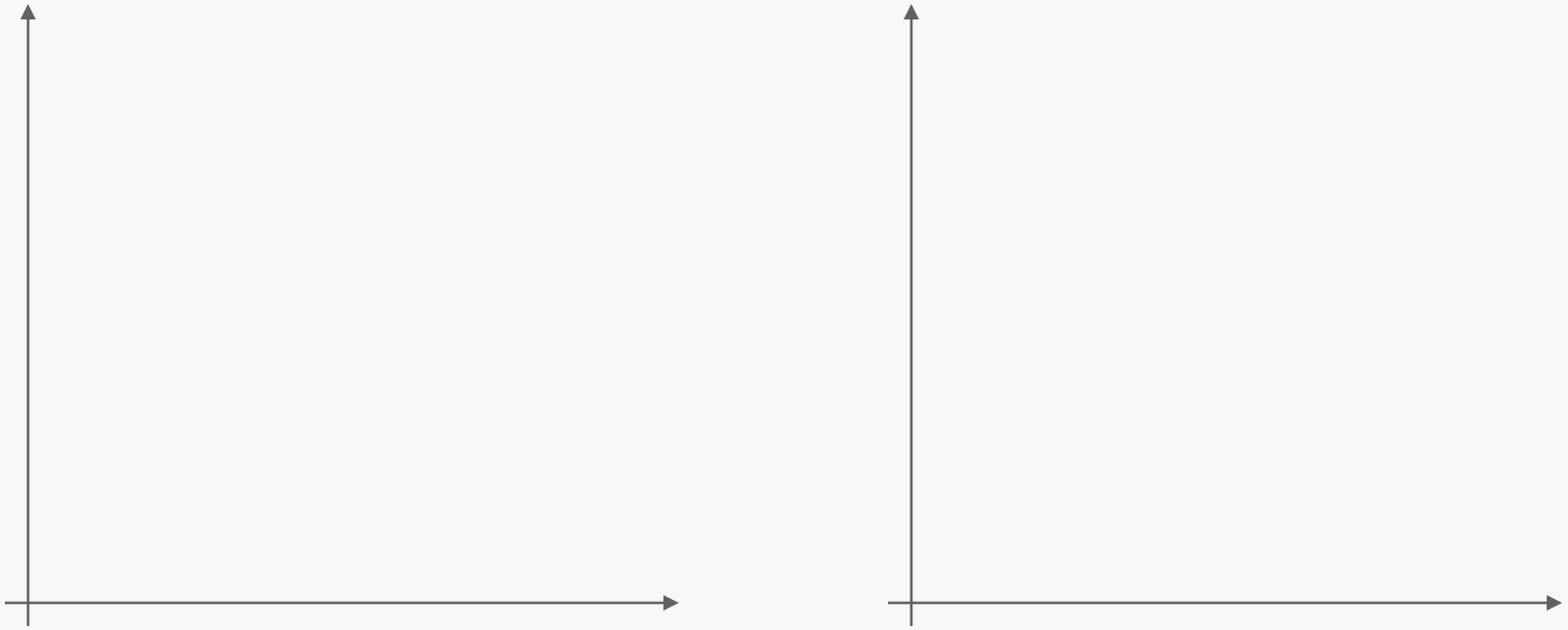
First of all, we need to create a setup for our analysis.

- Most of the time, we analyze a rational consumer, choosing a combination of (x^*,y^*) that would maximize his or her utility subject to a specific level of budget.
- x and y are substitute goods, but not perfectly. Although we can analyze perfectly substitutes and also complementary goods as well.

Before we can utilize an indifferent curve, we need to understand how we can come up with one.

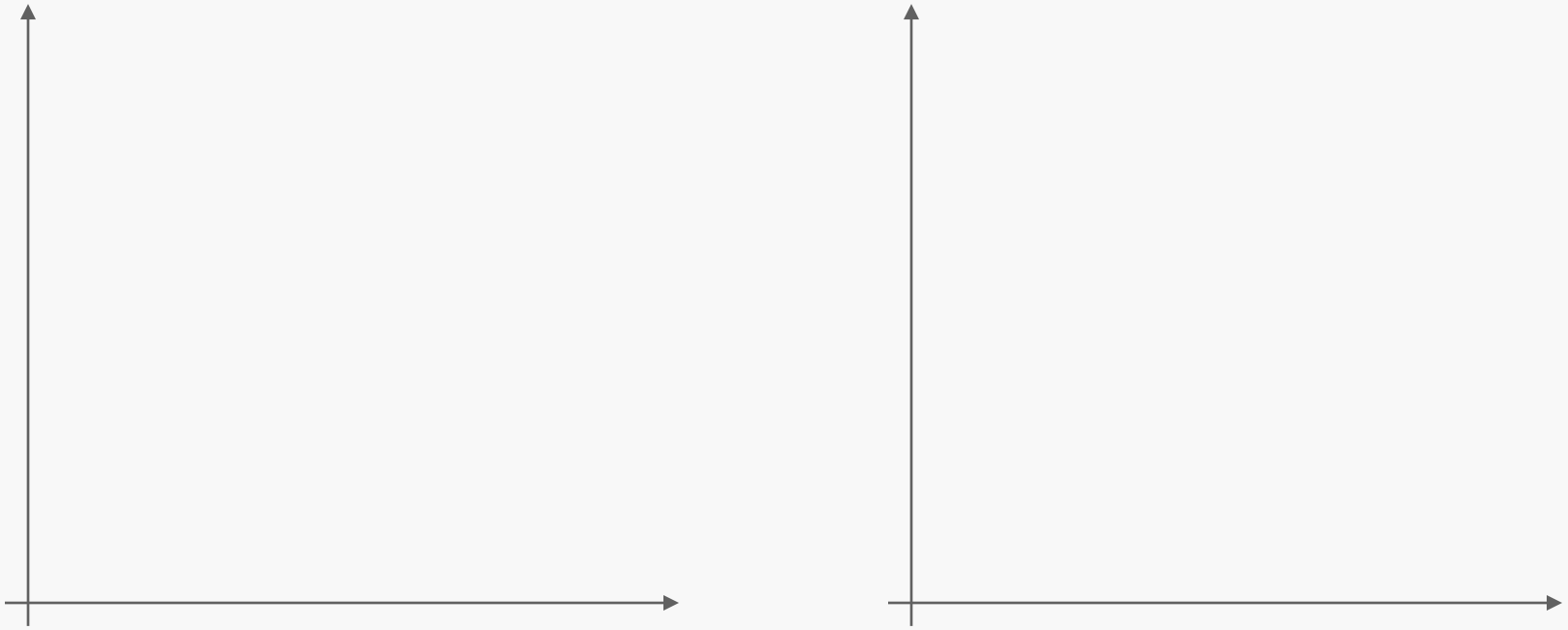
(2) Indifferent curve

Comparing consuming one and two substitute goods utility function



(2) Indifferent curve

Turn the function to the side and top view

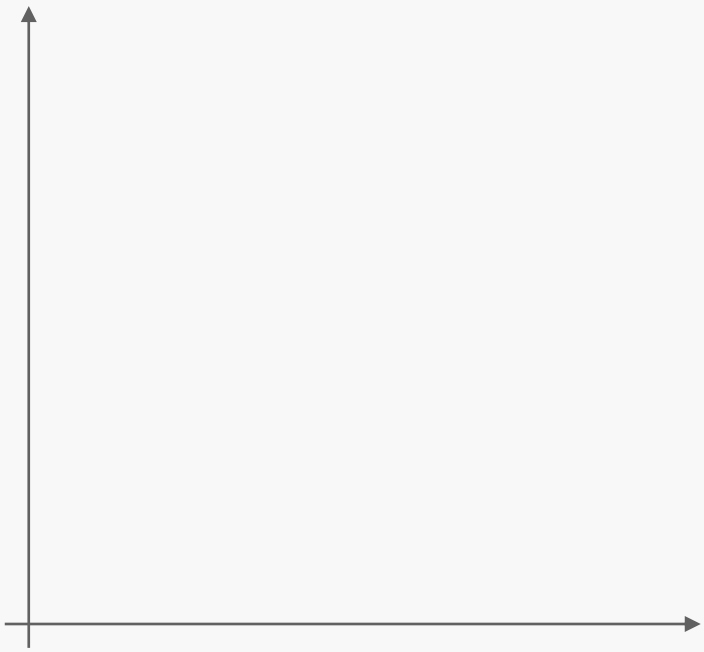


(2) Indifferent curve

Some parts are not to be studied

(2) Indifferent curve

An indifferent curve



Characteristics

- Consumption bundles.
- Level of utility.
- ICs cannot intersect.
- ICs have negative slope and convex to the origin.

Now if we consider one IC at a time. If every consumption bundle (x,y) yield the same amount of utility. Changing those bundles results in the same level of utility. However, moving from one point to another may differ throughout an IC.

Definition 3.5

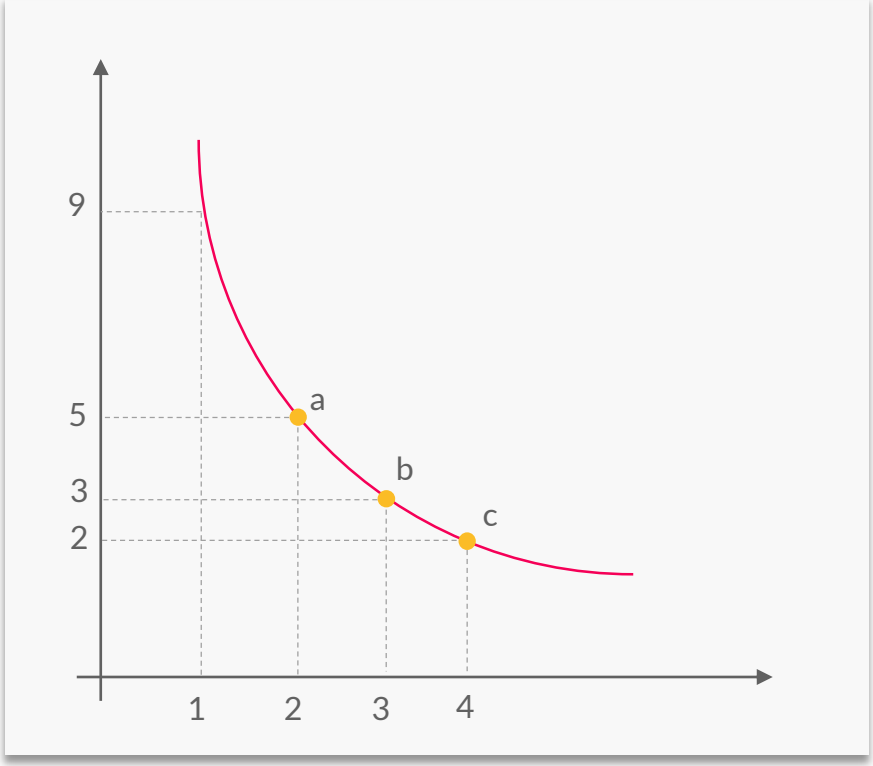
Marginal rate of substitution (MRS) *is a ratio of substitution of two goods at a point on IC curve that yields the same amount of utility.*

$$MRS_{xy} = \frac{\Delta y}{\Delta x}$$

Consider the MRS_{xy} on each point of an IC.

(2) Indifferent curve

Marginal rate of substitution



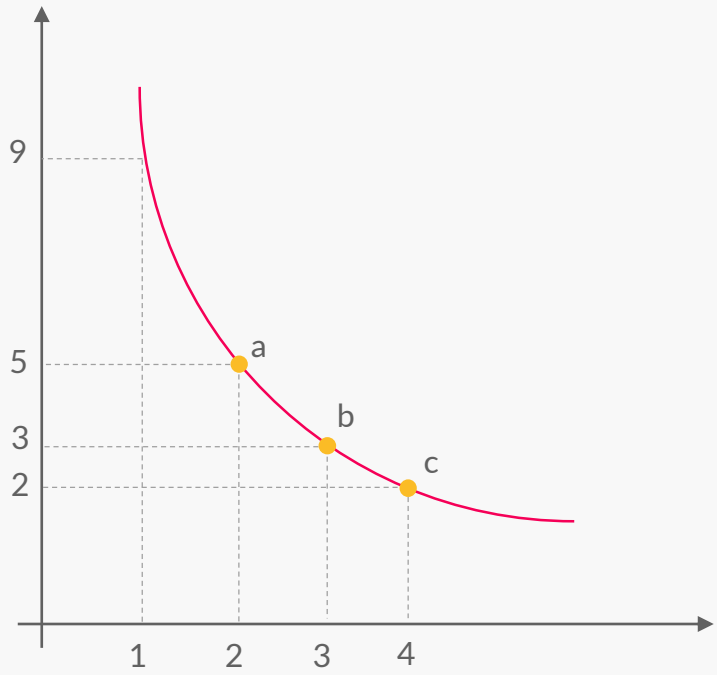
What does this ratio mean?

Figure out these MRSxy

- $MRS_{xy}(a)$ =
- $MRS_{xy}(b)$ =
- $MRS_{xy}(c)$ =

(2) Indifferent curve

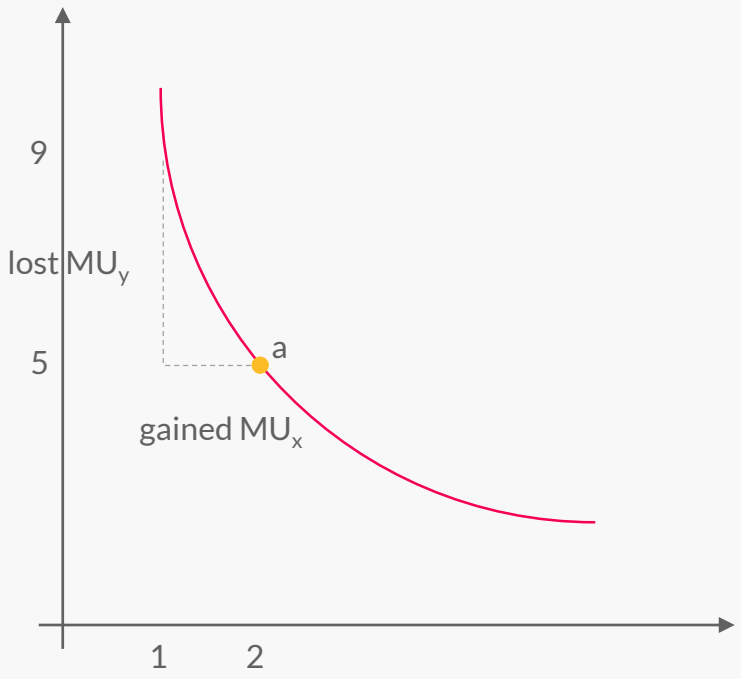
Marginal rate of substitution



Now take a look at these ratios closely again, why the (absolute) number of these ratios keep decreasing, comparing the upper left to the lower right.

(2) Indifferent curve

Marginal rate of substitution



As we learned that, in case of two substitutable goods, MRS is the ratio of substituting two goods in which resulting in the same amount of utility, it also means that.

- $|MRS_{xy}| = \left|\frac{\Delta y}{\Delta x}\right| = \frac{MU_x}{MU_y}$

Consider an example here.

- Supposed that the MRS at one point is -4, it means that this consumer is willing to give up 4 of y while receiving 1 unit of x and yield the same amount of utility. (Or it can be 16 of y and 4 of x which is the same ratio)

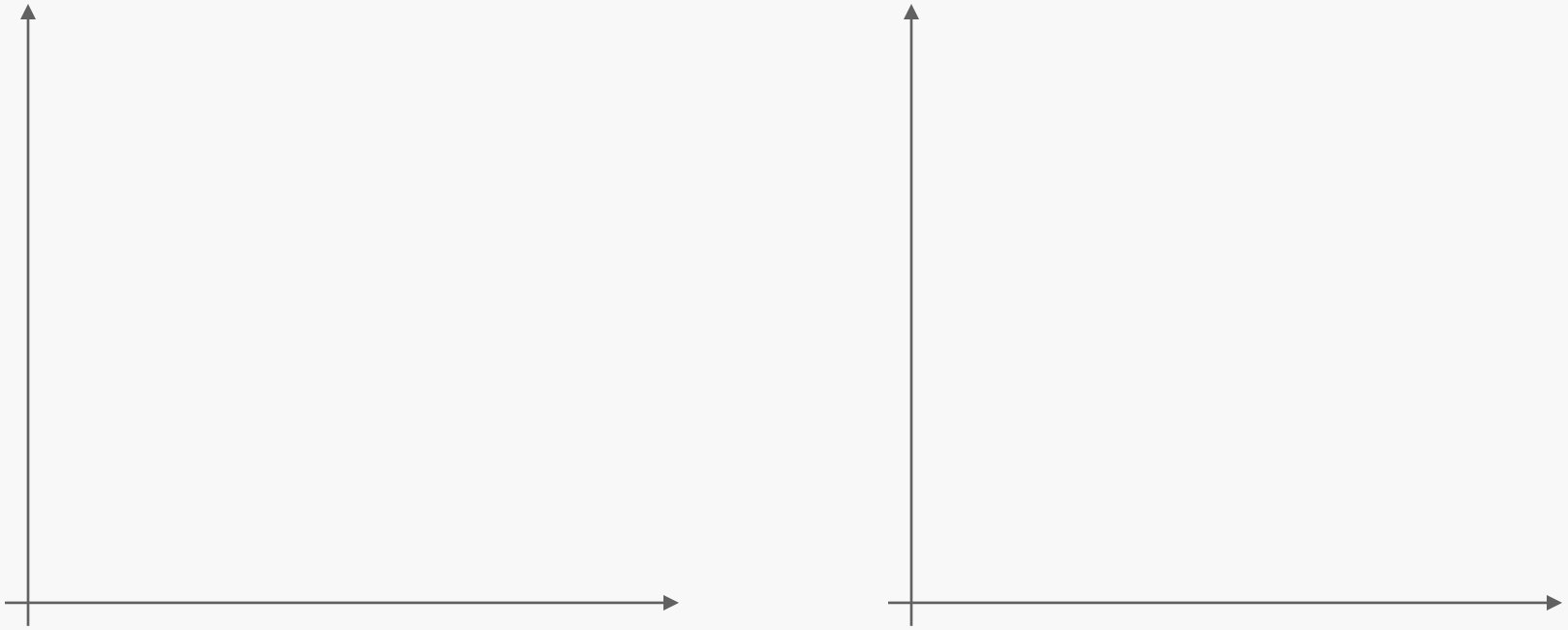
- When he/she gives up 4 of y, this consumer loses an amount of utility. We do not care how much it is but it is the marginal utility of that 4 y (MU_y)

- When he/she consumes 1 more unit of x, this consumer gains an amount of utility that was lost from Mu_y. Again we do not care how much but it is the marginal utility of that 1 x (MU_x).

(2) Indifferent curve

Given that torque or acceleration power (x) and cargo space (y) are two attributes that represent buyers' decision, how would you draw an Audi TTS owner's IC and a Subaru XV owner's IC?

Different preferences



(2) Indifferent curve

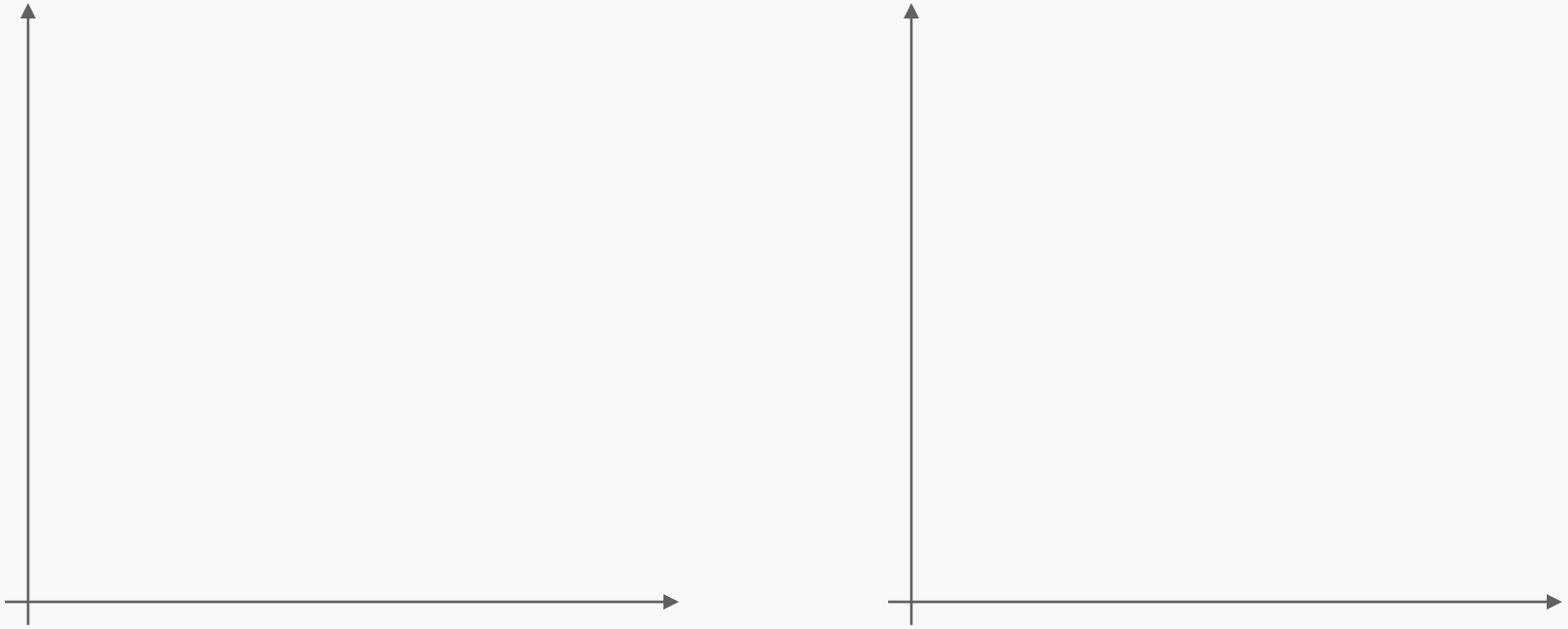
Given that fish (x) and pork (y) are two types of meet which are substitutable, how would you draw an IC of a person who likes either one of them and an IC of another person who feels more indifferent.

Rate of substitution

(2) Indifferent curve

There are also perfectly complementary and substitutable goods in the market as well.

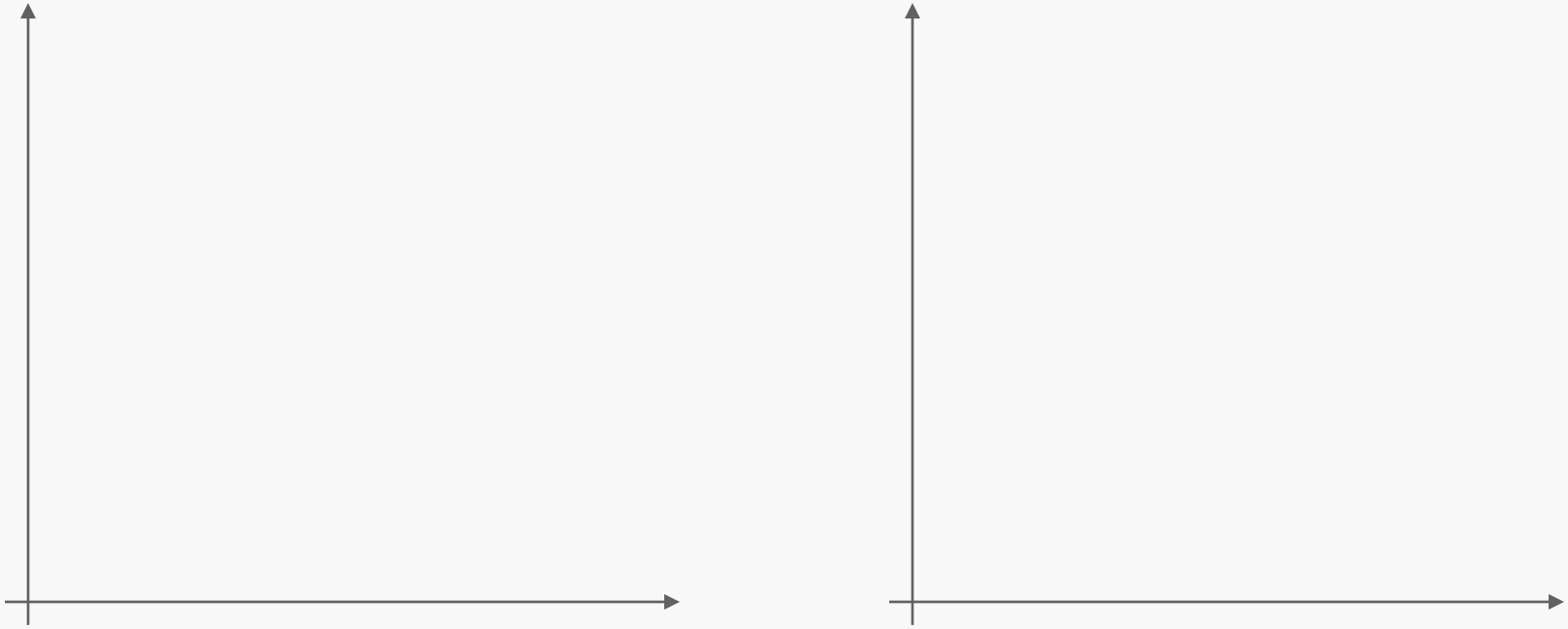
Perfect substitute and complement



(2) Indifferent curve

If any commodity is not wanted by consumer, it can also be considered as **bad**.

Goods and bad



(3) Budget line

Budget line

Budget line is derived from budget constraint, the boundary of consumption bundles that a consumer can choose under a premise of budget constraint. It can be represented in the form of

- $I = P_x \cdot x + P_y \cdot y$

Consider an example of a consumer who has 500 baht, price of goods x is 50 baht and price of goods y is 20 baht, draw the budget line.

Budget line has constant slope since price of goods are not according to how much goods are purchased and assumed to be fixed (for now). The slope of a budget line represents **relative price** of two goods.

Definition 3.6

Relative price *is the price ratio of two goods or services, which is actually the slope of budget line. Sometimes it can be referred to as the* ***Marginal Rate of Market Substitution*** *(MRMS).*

$$MRMS_{xy} = \frac{\Delta y}{\Delta x} = \frac{P_x}{P_y}$$

This price ratio reflects how pricey two goods comparatively. See how this ratio shifts when price change.

(3) Budget line

Draw a consumer budget line who has 400 baht on the left and 600 baht on the right. Price of goods x is 50 baht and price of goods y is 20 baht.

Budget line when income changes

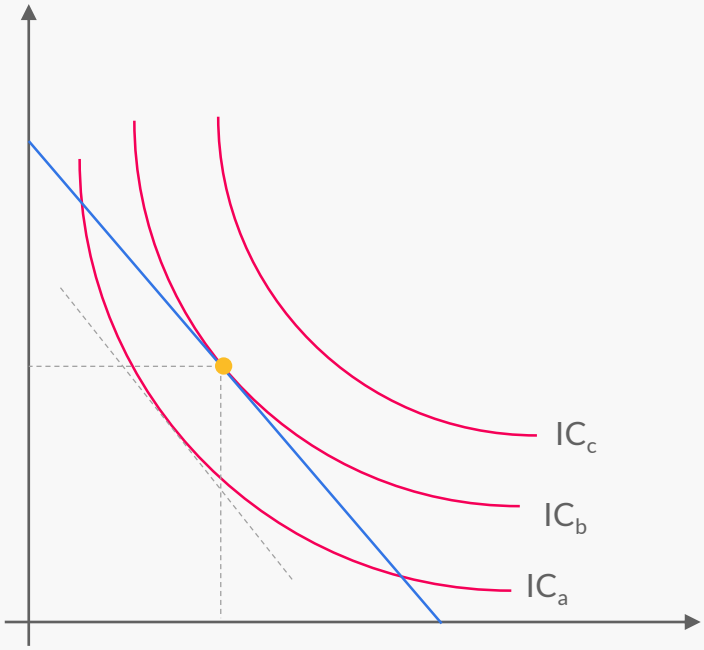
(3) Budget line

A consumer 500 baht. Initially, price of goods x is 50 baht and price of goods y is 20 baht. What would happen if price of x drops to 25 baht and price of y raises to 50 baht. Draw the budget line according to the change on the left and right respectively.

Budget line when price changes

(4) Consumer choice

The equilibrium



Consumer will maximize utility under budget constraint when consuming two goods or services when an IC is tangent to the budget line or

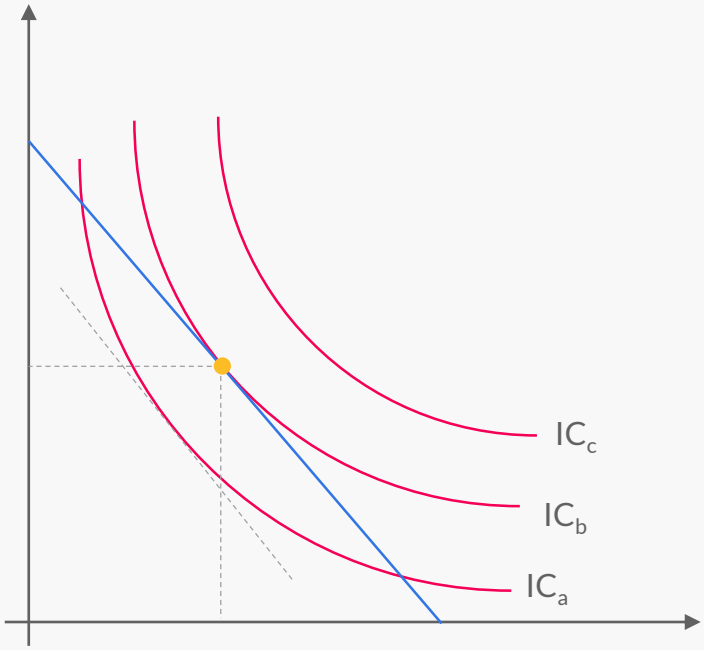
Quick questions

- Why the equilibrium cannot be on IC_c?

- What underlying assumption that prohibits an equilibrium on the dotted line, which is also tangent to IC_a?

(4) Consumer choice

The equilibrium



Reconsider the intersections on IC_a, then try to prove with math why they are not the equilibrium.

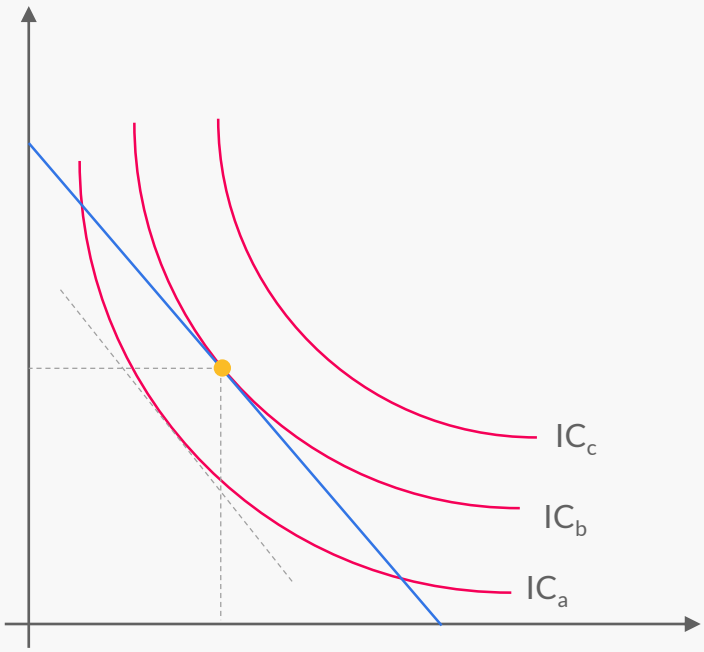
(4) Consumer choice

The equilibrium can reveal both how a consumer prefers and how the relative price is. Try illustrate both scenarios in the graphs.

Different preference and relative price

(4) Consumer choice

Example #1: substitute goods



The consumption bundle that this consumer chooses makes

$$|MRS_{xy}| = \frac{1}{5}$$

- If P_x = 50 and P_y = 100, does this consumer has his/her utility maximized?

- Assumed Walras' Law, where is the current consumption bundle and why?

(4) Consumer choice

Example #2: Perfect complements

A consumer needs 1 pan and 2 turner. Given a budget of 500 bath. Price of pan is 300 bath each and 100 bath for each turner.

- How many pans and turners this consumer buys?

- If the budget decreases to 400, how many pans and turners this consumer buys?

(4) Consumer choice

Example #3: Perfect substitutes

A consumer has budget of 200 baht (only one baht coins) and need to exchange to 20 baht or 100 baht note. For this consumer, one 100 baht note equals to five 20 baht notes.

- Draw his IC, BL and figure out his or her choice(s).

(4) Consumer choice

Example #3: Perfect substitutes

A consumer has budget of 200 baht (only one baht coins) and need to exchange to 20 baht or 100 baht note. However, this consumer doesn't like to carry lots of bank note. For this consumer, one 100 baht note equals to six 20 baht notes.

- Draw his IC, BL and figure out his or her choice(s).

(5) Hicksian's price effect

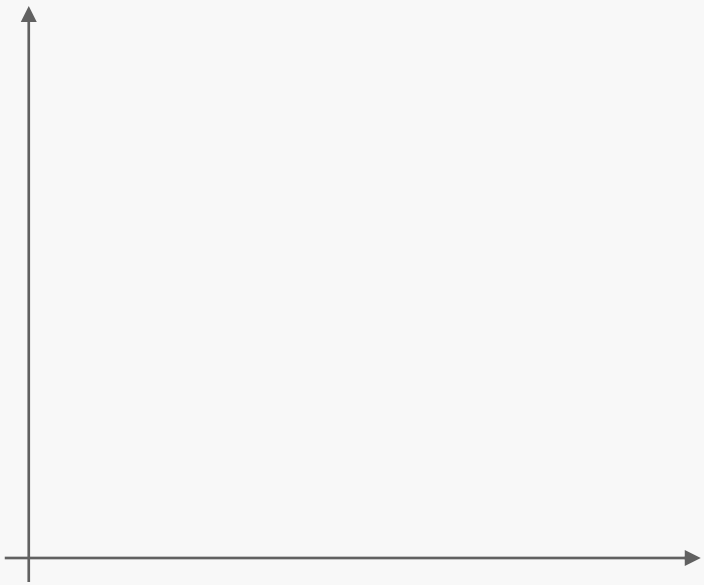
This is a little revision of price effect. When price changes and affects quantity demanded, the result is called **price effect (PE)** which consists of two sub-effects.

- **Substitution effect (SE)** is the effect of relative price of substitutable good. For example, if A and B are substitutable and price of good A increases (decreases), good B will relatively become cheaper (more expensive) comparing to the relative price before price change.

- **Income effect (IE)** is the effect of consumers' real income. For example, if price of good A rises (drops), consumers are considered become poorer (richer) because they lose (gain) purchasing power.

The reasons we study price effect are two folds: to understand how a consumer change his or her consumption bundle when some factors change, which leads to deriving a demand function.

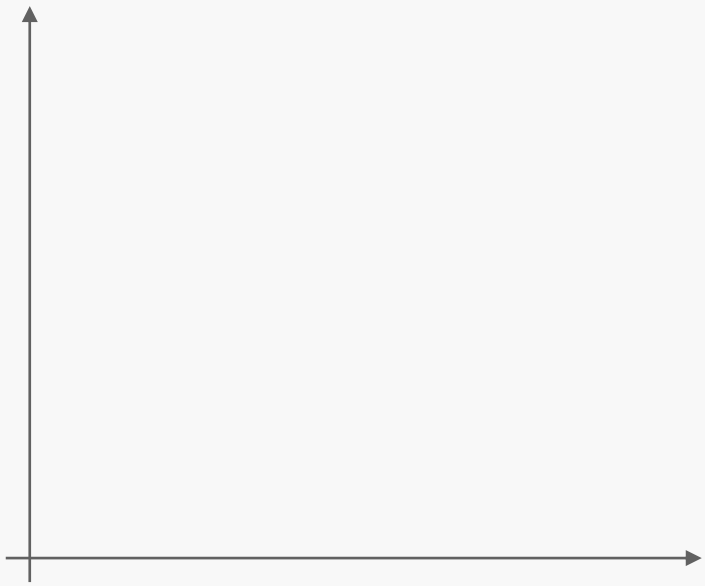
Shifting the equilibrium: price change



Consider when relative price of both x and y change but this consumer can still choose another bundle on the same IC, this is purely **SE**.

(5) Hicksian's price effect

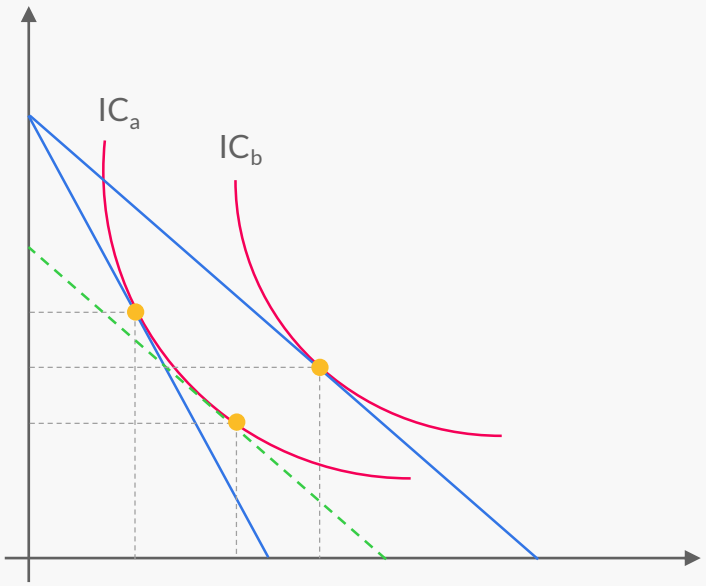
Shifting the equilibrium: income change



Consider when relative income changes, this is purely **IE**.

(5) Hicksian's price effect

Price effect disaggregated: normal good



	x	y
SE		
IE		
PE		

When price of x decreases. Both x and y are normal goods,

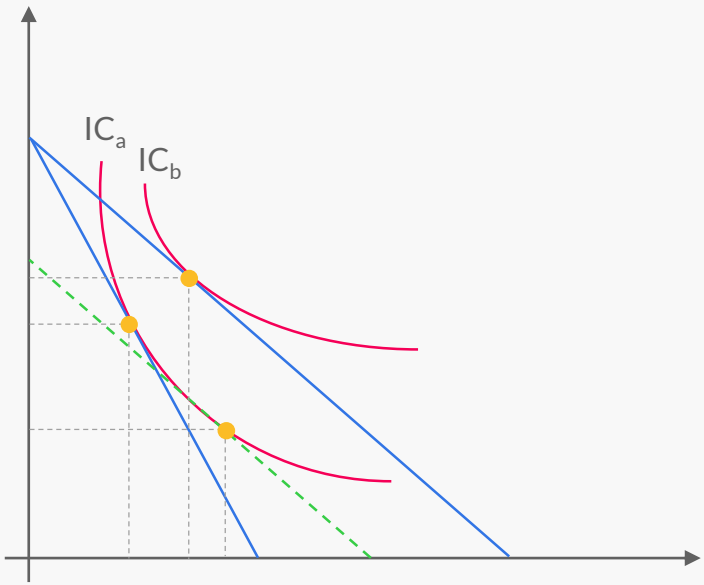
- Create a hypothetical BL, parallel to the new budget line (new relative price) and tangent to the same IC (keep real income the same) to see SE

- Shift the equilibrium to the new IC to see IE.

- From the initial equilibrium to the new one, that is PE.

(5) Hicksian's price effect

Price effect disaggregated: inferior good

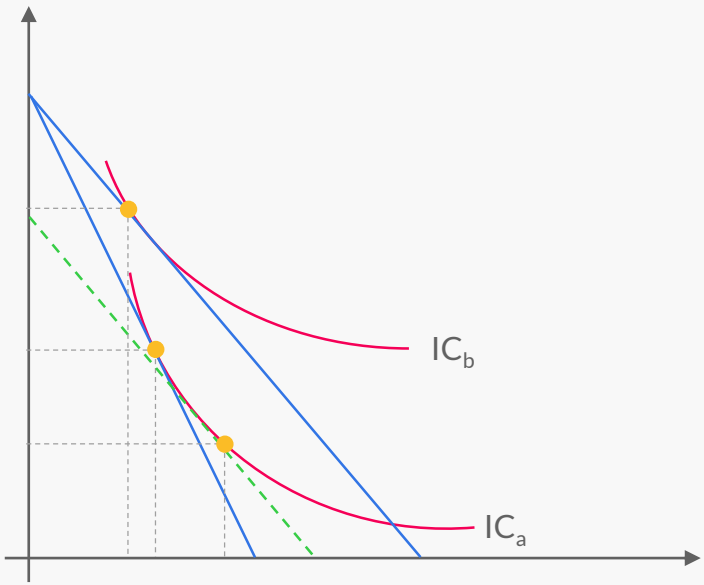


When price of x decreases, x is an inferior good while y is a normal good. Repeat the same steps.

	x	y
SE		
IE		
PE		

(5) Hicksian's price effect

Price effect disaggregated: Giffen good



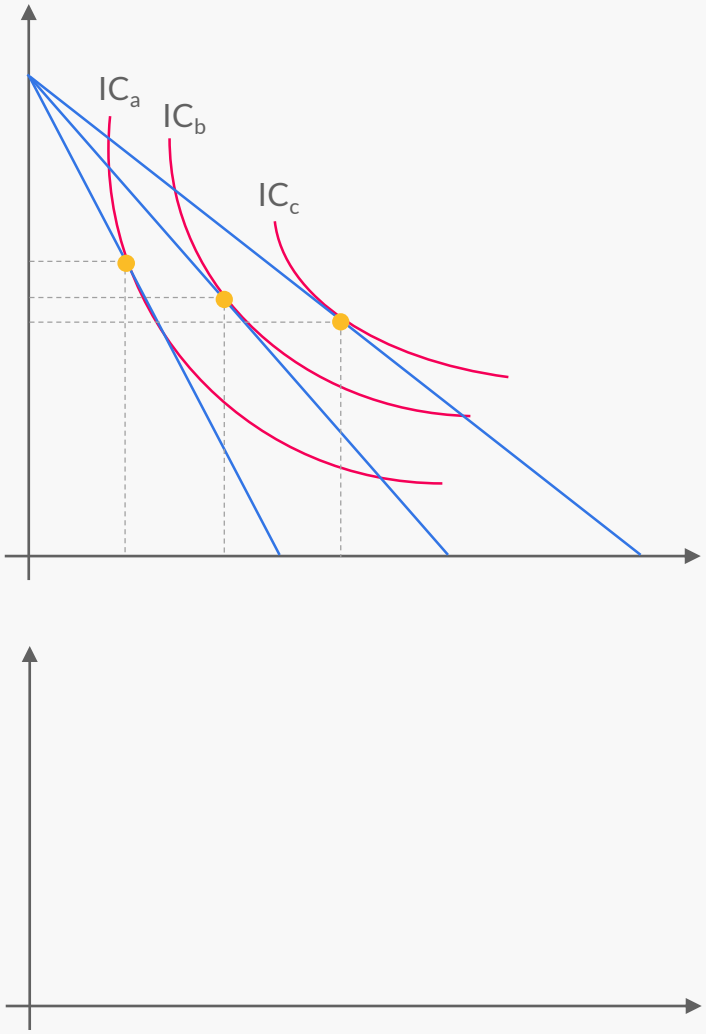
When price of x decreases, x is a Giffen good while y is a normal good. Giffen good's definition is that its IE is stronger than SE. Now try repeating the same steps.

	x	y
SE		
IE		
PE		

Up to this point, you should go back to the "pan and turner" and "100 baht and 20 baht" to see both when price changes and income changes and how the price effect looks like.

(5) Hicksian's price effect

From price effect to price demand

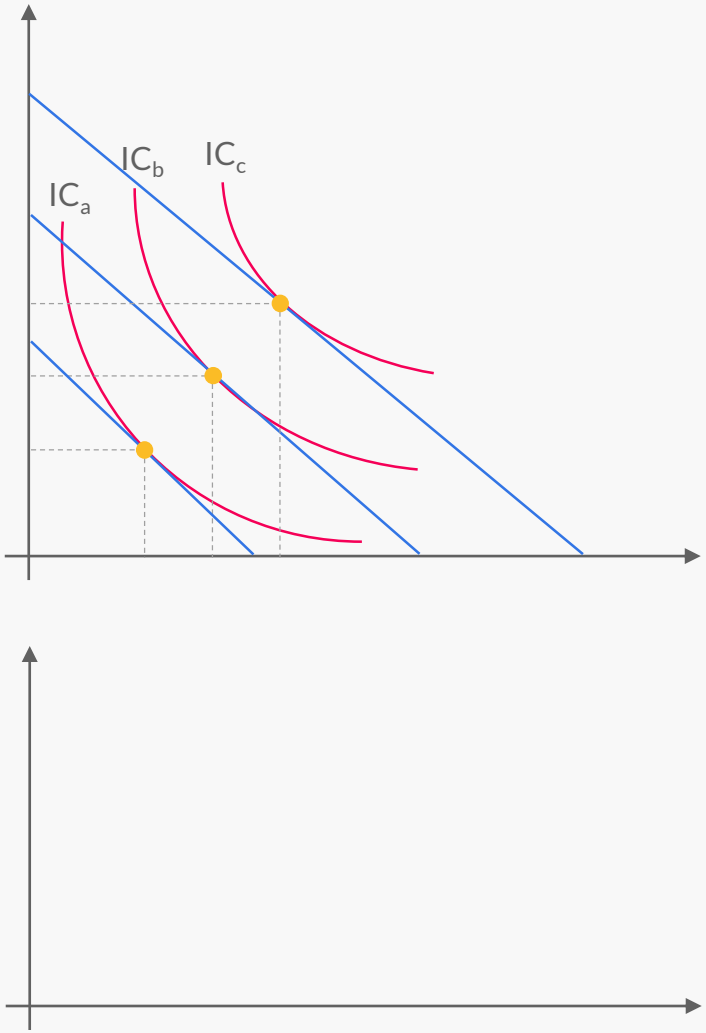


Assumed that price of x keeps decreasing, when we draw a curve through consumer equilibria, the curve is called **Price-Consumption Curve (PCC)**.

PCC slope indicate price elasticity of demand for x, which you will study this in other courses.

(5) Hicksian's price effect

From price effect to price demand



Assumed that consuming income keeps decreasing, when we draw a curve through consumer equilibria, the curve is called **Income-Consumption Curve (ICC)**.

ICC slope indicate types of goods x and y, which again you will study this in other course.