European Macroeconomics
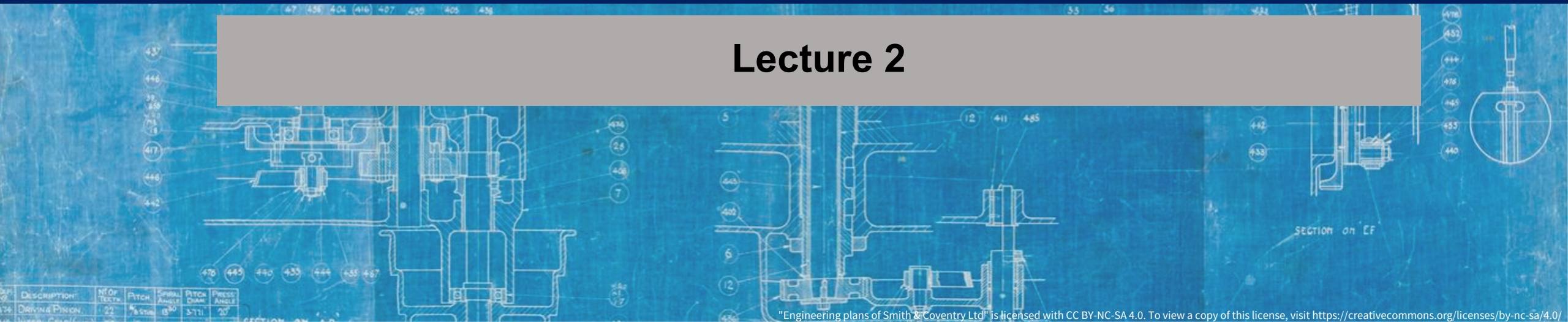
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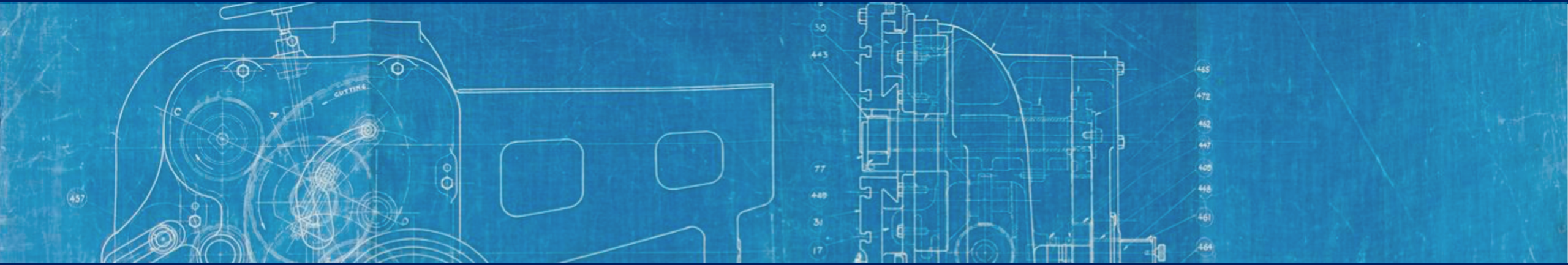
# II. The mechanics of the two core macroeconomic models

Lecture 2

Economic models (theories) matter a lot

John Maynard Keynes:

"The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist."
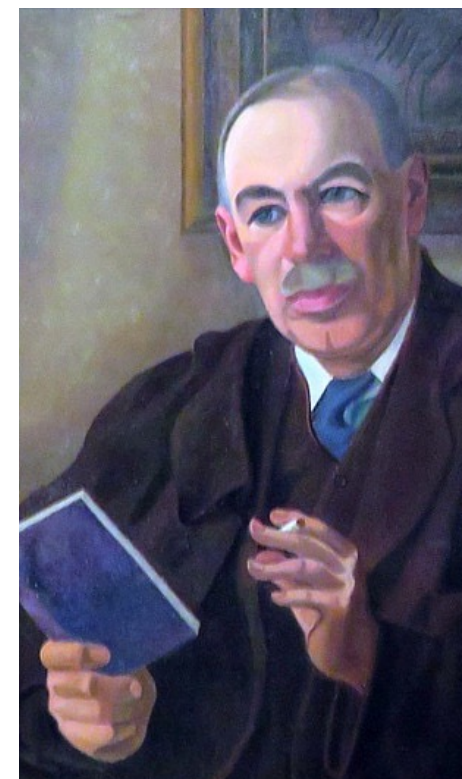
John Maynard Keynes
(1883-1946)

Models make it possible to identify relevant relationships by **reducing the complexity of reality**

Models are a problem if they do not represent reality but a phantasy world

The two core models used in macroeconomics

Classical/Neoclassical model

- **Key feature:** Theory of an economy with strong self-stabilizing mechanisms

- **Model design:** Only one all-purpose good (APG) is used for consumption, investment and as a means of finance („capital")

- **Financial system** is irrelevant („veil")

- Mainstream view: Model describes **long-term economic developments with flexible prices**

Keynesian model

- **Key feature:** Theory of an economy harboring dangerous instabilities

- **Model design:** Differentiation between consumption goods, investment goods, money, and bonds

- **Financial system** plays an important role

- Mainstream view: Model describes **short-term economic developments with rigid prices**

Joseph Schumpeter on the two model worlds (1945, p. 265)

Classical model
("Real Analysis")

- " (…) proceeds from the principle that all the essential **phenomena of economic life** are capable of being **described in terms of goods and services**, of decisions about them, and of relations between them.

- **Money** enters the picture only in the modest role of a **technical device** that has been adopted in order to facilitate transactions. (…) it **does not affect the economic process**, which behaves in the same way as it would in a barter economy: this is essentially what the **concept of Neutral Money** implies.

Keynesian model
("Monetary Analysis")

- (…) introduces **money on the very ground floor of our analytic structure** and abandons the idea that all essential features of economic life can be represented by a barter-economy model.

- **Money prices, money incomes**, and saving and investment decisions (…) **acquire a life and an importance of their own,** and it has to be recognized that **essential features** of the capitalist process may **depend upon the 'veil'** and that the 'face behind it' is incomplete without it."

Joseph A. Schumpeter
(1883-1950)

1. The classical model

Key assumption of the model:
all-purpose good (APG) that can be eaten, invested and borrowed

Robert Barro and Xavier Sala-i-Martin:

*"One way to think about the one-sector technology is to an analogy with **farm animals that can be eaten or used as inputs to produce more farm animals**. The literature on economic growth has used more inventive examples – which such terms as **smoohs, putty** or **ectoplasm** – to reflect the easy transmutation of capital goods into consumables, and vice versa."*

Photo: INET   Photo: salaimartin.com

Maurice Obstfeld and Kenneth Rogoff:

*"A unit of capital is created from a unit of the consumption good. This process is reversible, so that a unit of capital, after having been used to produce output, can be 'eaten.' **You may find these assumptions unrealistic,** but they help us sidestep some technical issues that aren't really central here."*

Photo: PIIE   Photo: IMF

How can we derive aggregate demand and aggregate supply for the all-purpose good?

- **Aggregate demand**: We assume that there is consumption and investment demand for the APG

- **Aggregate supply**: We assume that the supply is determined by the available amount of labour and capital

Consumption demand for the all-purpose good: Consumption today or tomorrow?

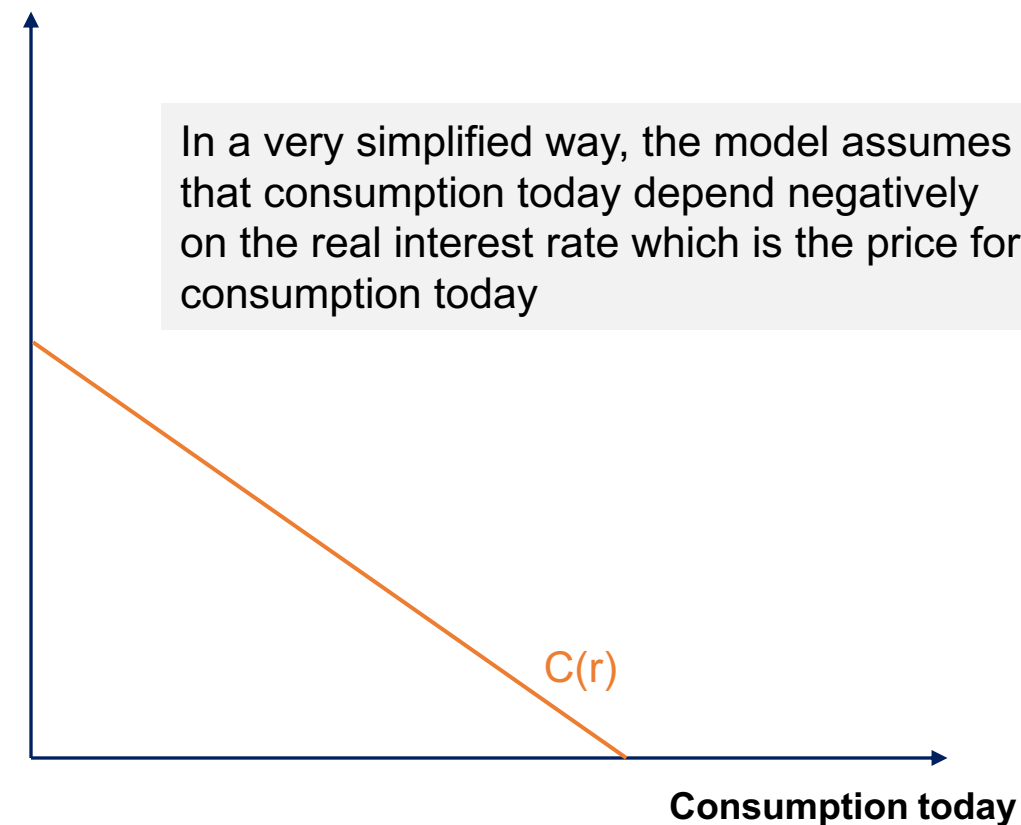**Consumption decision**: Do I consume the APG today or tomorrow?

- What are my **preferences** for consumption today and consumption tomorrow? Normally, people prefer consumption today over consumption tomorrow. But they might be willing to wait with today's consumption, if they can consume more tomorrow.

- If I do not to consume today, how much more can I consume tomorrow? This depends on the **real interest rate (r)** which is the price for consuming the APG today. The lower the real interest rate the more will I consume today. The real interest rate is:

$$\frac{Units\ of\ the\ APG\ tomorrow}{1\ Unit\ of\ the\ APG\ today} - 1$$

Example

- **Preferences**: Sue is indifferent between 100 units today and 105 units tomorrow.
- The real interest rate is 4 %. If Sue saves 100 units today, she will receive 104 units tomorrow. This is less than to make her indifferent → She will decide to consume **today**
- If the interest rate goes to 6 %, Sue will decide to consume **tomorrow**

Real interest rate

In a very simplified way, the model assumes that consumption today depend negatively on the real interest rate which is the price for consumption today

C(r)

Consumption today
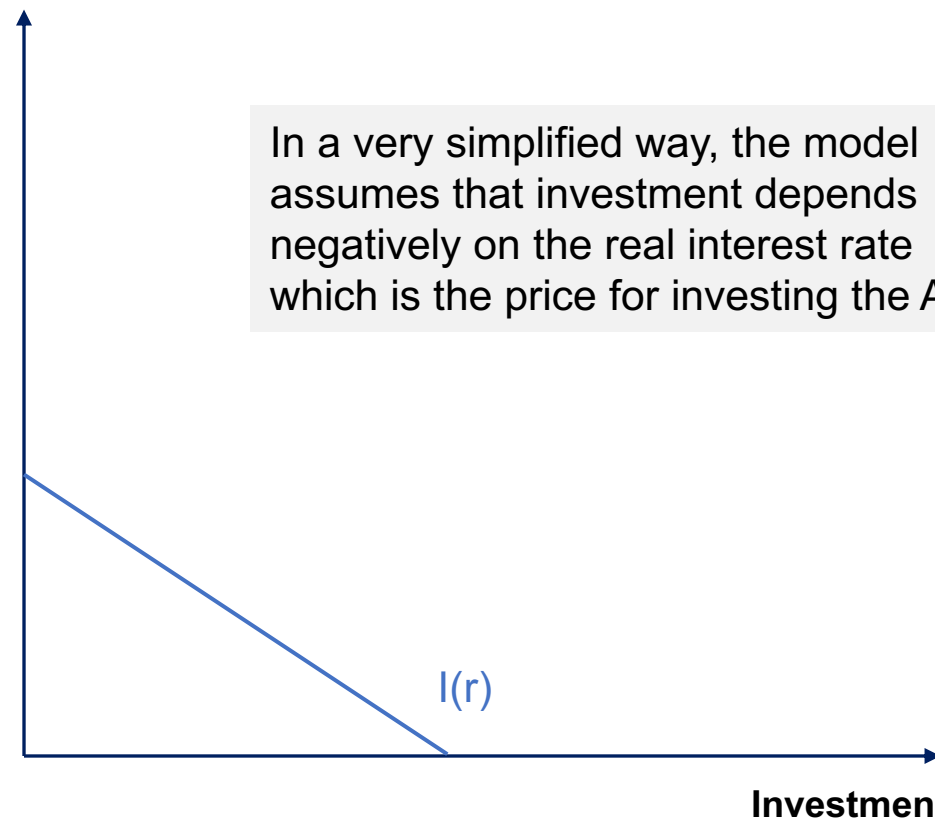
Investment demand for the all purpose good

Investment decision: How many units of the APG do I invest in today?

- **Return of the investment**: How many units will I obtain tomorrow if I invest one unit today?
- **Real interest rate**: The price of using corn as investment good today. If I borrow 1 unit of the APG from the savers, how many units do I have to give them back tomorrow?

Example

- **Return of investment**: Planting 100 units of corn today brings Jim a harvest of 106 units tomorrow
- **Real interest rate**: He has to pay 105 units corn to the saver Sue tomorrow for borrowing 100 units from her today
→ Jim will borrow and invest the APG
- If the **real interest rate** goes to 107, Jim will not invest

Real interest rate

In a very simplified way, the model assumes that investment depends negatively on the real interest rate which is the price for investing the APG

I(r)

Investment

Adding up consumption demand and investment demand gives aggregate demand

- In the neo(classical) model aggregate demand depends negatively on the interest rate

- With a lower interest rate people consume more and invest more

- Aggregate demand is derived by **horizontal aggregation** of the investment demand and the consumption demand

Real interest rate

I(r)   C(r) Y^D **(r)**
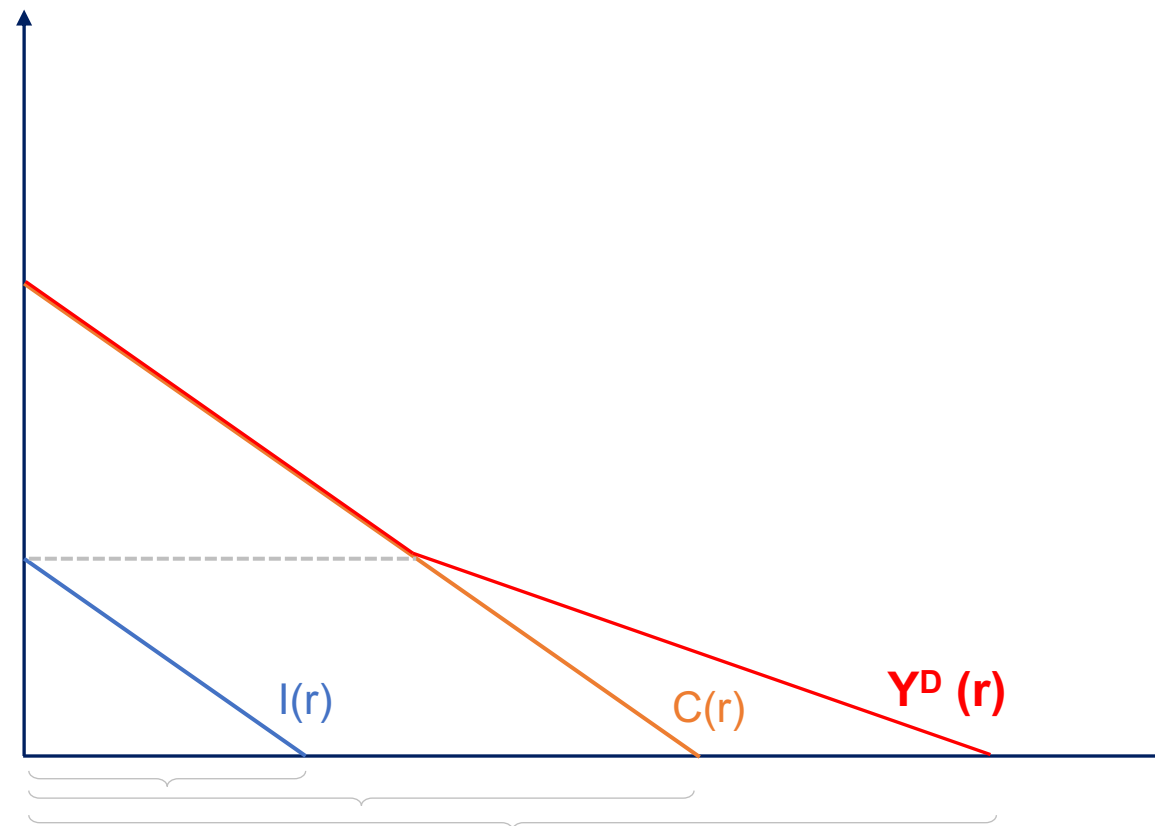
Aggregate demand, consumption, investment

Aggregate supply

- In the classical model aggregate supply is determined by the **labour force** and the **capital stock, i.e. the amount of the APG used for investment in the previous period**

- The **production function** describes the relationship between aggregate supply and the inputs of capital and labour

$$Y^A \equiv \text{Output} = f(\text{Capital, Labour})$$

- The model assumes that for a given capital stock, output increases with the labour input but with **diminishing returns of scale**: the additional output of an additional worker declines the more workers are already employed

- Originally, the model was developed for the agricultural sector where diminishing returns for labour can be observed

- The model assumes **full employment** so that aggregate supply can be derived for the full employment level

Production function for the classical model

Output (= Aggregate supply)

Production function $Y = f(L, \bar{\bar{K}})$

Y^S

Full employment   Employment
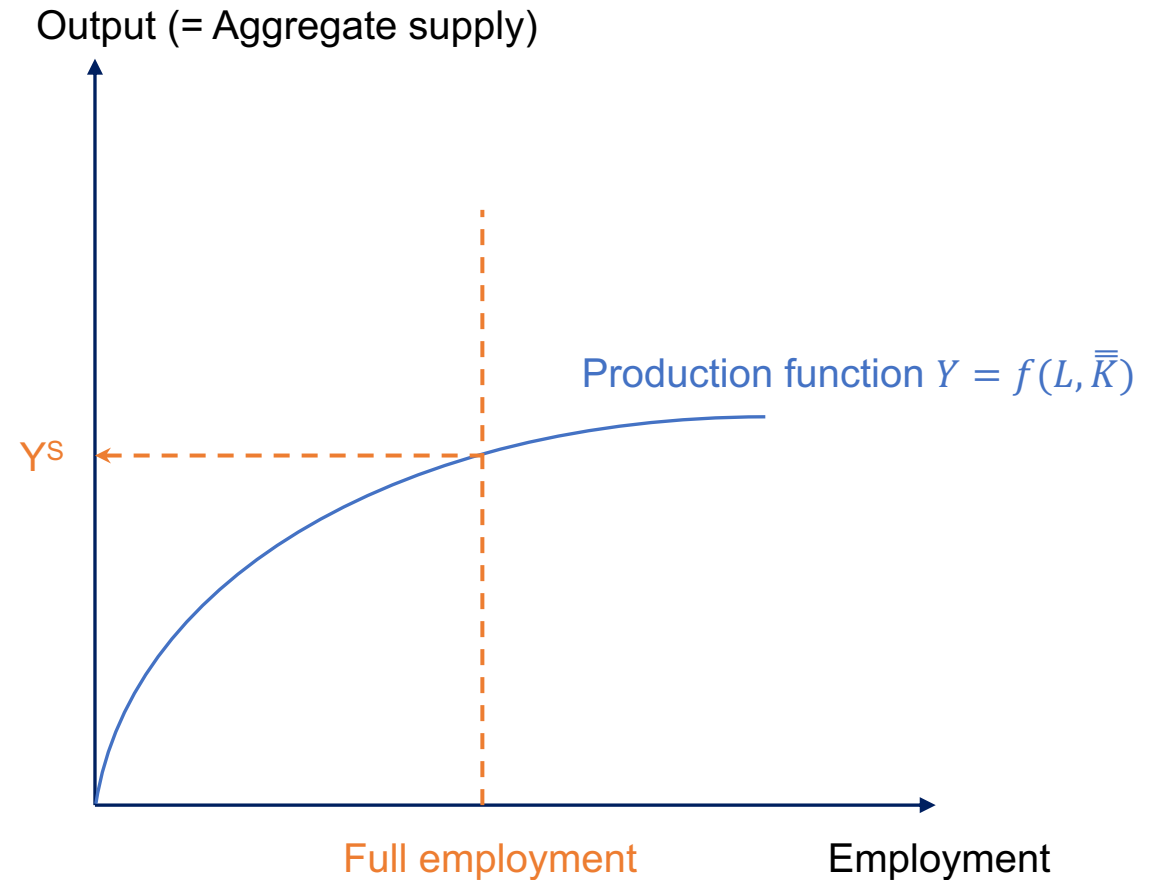
Aggregate demand and aggregate supply

- In equilibrium, the plans of the household to consume and the investors to invest are **compatible** with given supply of the APG

- If aggregate demand declines, i.e., because of a **lower preference of the households for consumption today**, aggregate demand shifts from Y^D_0 to Y^D_1. At the interest rate r_0 aggregate demand is lower than aggregate supply.

- The excess supply of the APG leads to a **decline in the interest rate**. It becomes cheaper to consume the GPG today and to borrow it for investment.

- The new equilibrium is reached by the **interest rate mechanism** which in this model always generates equilibrium between aggregate supply and aggregate demand

Real interest rate (r)

Y^S

Excess Supply

r_0

r_1

Y^D_0

Y^D_1

Full employment

Output (Y)
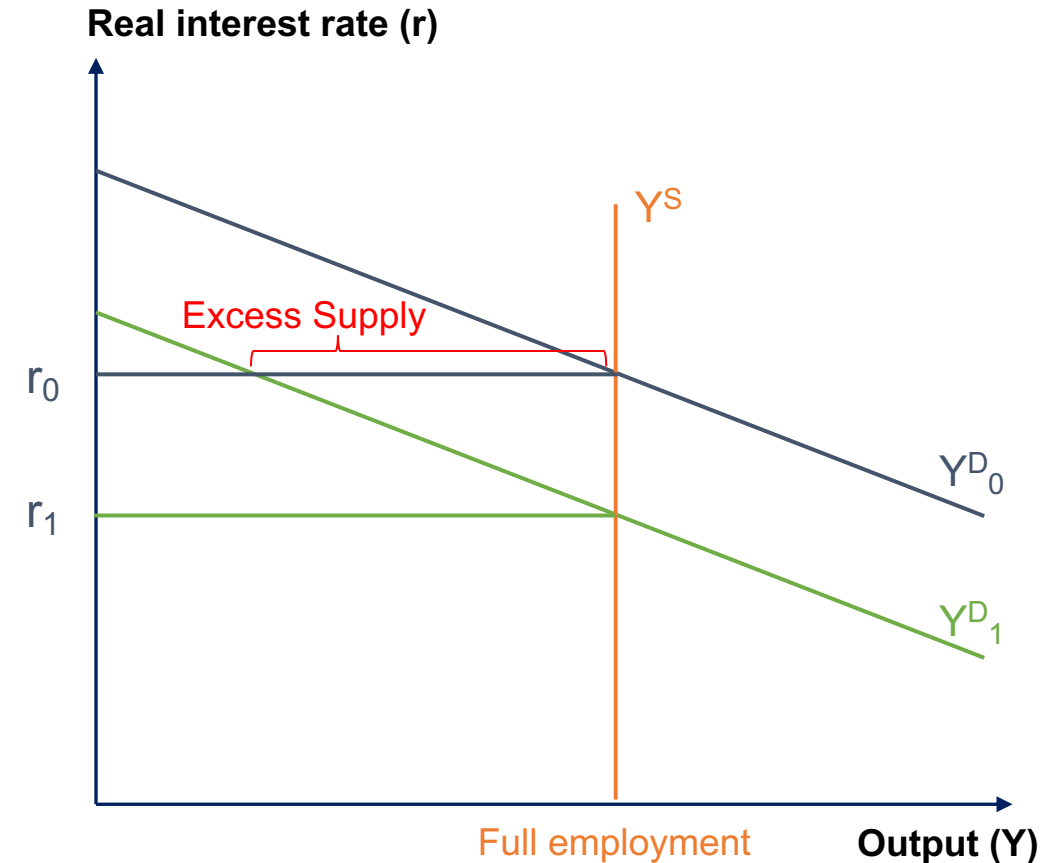
For simplicity we assume that the aggregate demand is linear

Consumption and Saving: a mirror image

- Household saving (S) is the mirror image of household spending. The decision not to consume a certain amount of the APG is identical with the decision the save the same amount of the APG

- Therefore, consumption (C) can also be represented by saving
(S = Y – C).The household's **decision not to consume** the APG today is **identical** with **the decision to save** it.

- As consumption declines with the real interest rate, **saving increases** with the **real interest rate.**

Real interest rate (r)

Aggregate Supply = Income

S(r)

C(r)

Output (Y)
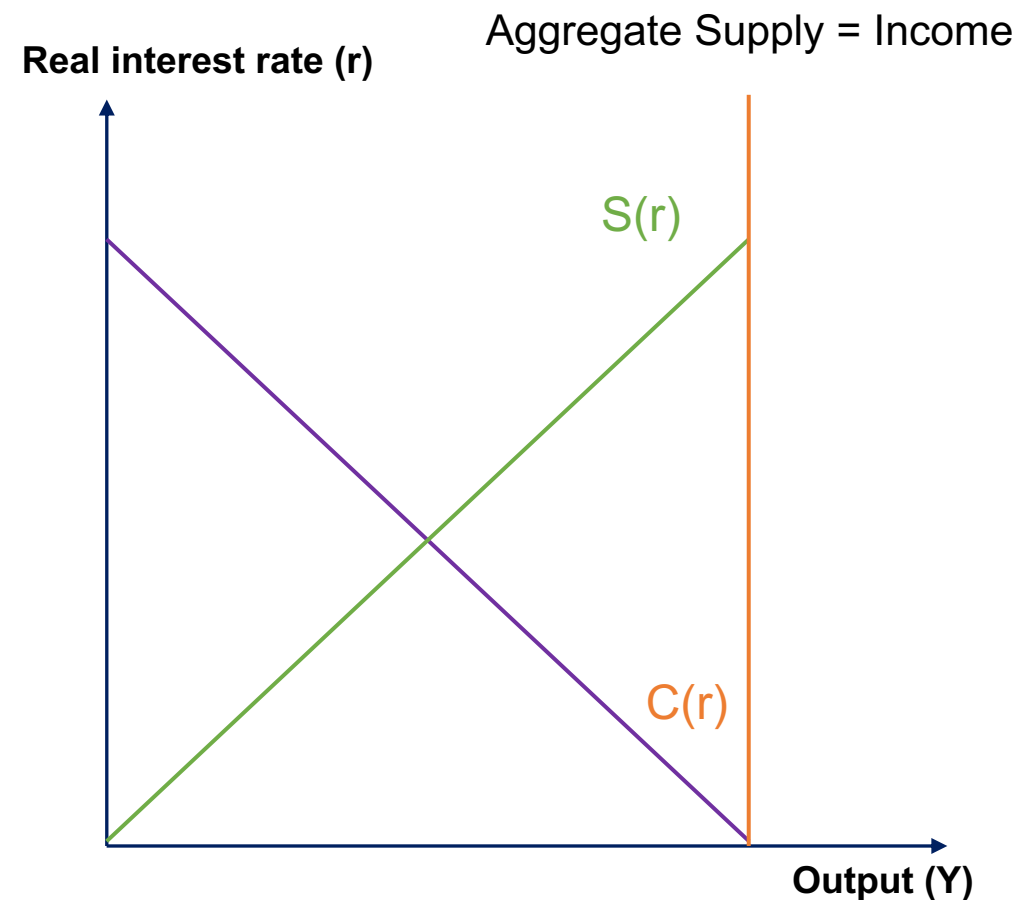
Saving and investment in the classical model

- The identity of the consumption decision with the saving decision leads to the standard textbook presentation of the classical model. It not presented as the goods market but as the "**capital market**" or "**market for loanable funds**"

- This is possible in the model, as it regards the APG not only as consumption and investment good, but also a „**capital**"or „loanable funds" which can be lent from households to investors.

- The identity of the goods market and the capital market is a key feature of the classical model. Financial decisions are identical with consumption or investment decisions.

- The real sphere is identical with the financial sphere. The financial sphere is **not a veil** over the real sphere, it is **the back of the same coin.**

The classical goods market presented as the capital market
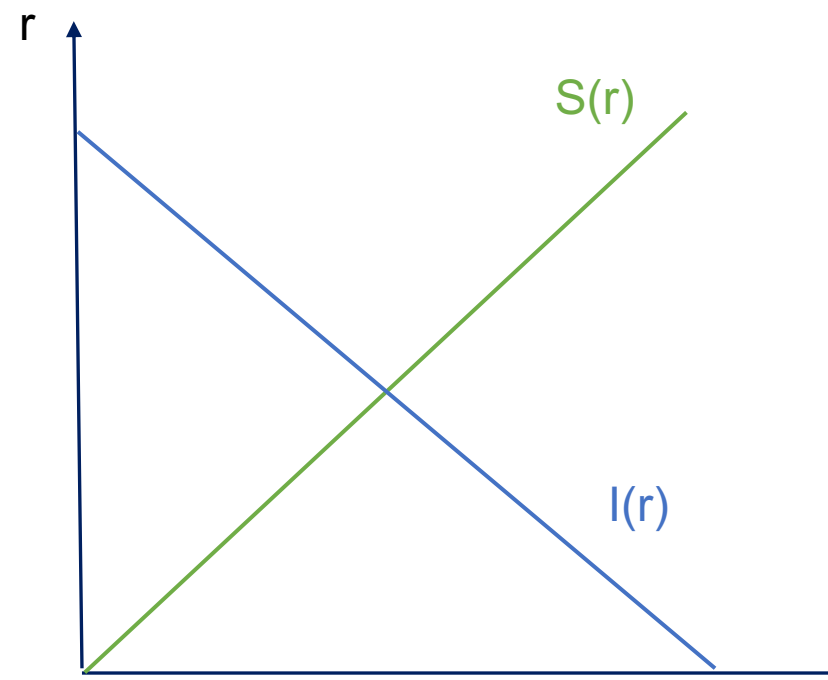
Many textbooks present this graph as the market for „**loanable funds**" and pretend that this is adequate representation of the capital markets in a world with money

The classical view is very dominant today

Source: http://larrysummers.com/

Larry Summers (2016):

- "Just as the price of wheat adjusts to balance the supply of and demand for wheat, it is natural to suppose that interest rates—the price of money—adjust to balance the supply of savings and the demand for investment in an economy.

- Excess savings tend to drive interest rates down, and excess investment demand tends to drive them up."

The interest rate as non-monetary phenomenon

Source: ECB

Philip R. Lane (Chief economist of the ECB):

"(…) there has been a **trend decline in the underlying equilibrium real interest rate** since the 1980s. The equilibrium real rate (typically labelled r*) is the rate required to match the desired levels of saving and investment.

The combination of slower population growth, rising life expectancy and an ageing population acts through multiple channels to **push up desired savings** and **reduce desired investment**.

A **reduction in desired investment** also reflects slower productivity growth and, possibly, shifts in the structure of the aggregate production function.

In the wake of the global financial crisis, **risk appetite** may also have diminished, which provides a **disincentive to invest, reinforces the precautionary saving motive** and encourages a portfolio shift to less risky assets, such as sovereign bond."

Source: https://www.bis.org/review/r200228a.htm

Key features of the classical model

- Its mechanics are determined by assumption of the **all-purpose good** (APG)

- If households do not to consume the APG as **consumption good**, it can be directly used as **investment good.** Saving is the source for the „funds" needed for for investment. By not consuming the APG households make it available for investment

- Therefore, the interest mechanism can always equilibrate aggregate demand and supply

- The **goods market** can be presented as the **capital market**. The APG which is transferred from households to investors is then regarded as **„capital" or „loanable funds"**

- The interest rate is a **real (or commodity) interest rate.** It is the price for consuming today and not tomorrow. It is expressed in units of the APG: $\frac{Units\ of\ the\ APG\ tomorrow}{1\ Unit\ of\ the\ APG\ today}$ - 1

- The financial market is **not a veil** over the goods market. Rather, the two markets are like **two sides of the same coin**

Let's have a break

2. The Keynesian model

A world with more assets

Model design

	Classical Model	Keynesian Model
Assets	- All purpose good - IOU	- Consumption good - Investment good - Money - Bonds

- The main analytical difference between the Keynesian and the classical model is the **number of assets**.

- In the **classical model,** there is only the all-purpose good. There must be also an IOU („*I owe you*", i.e. a piece of paper on which the debt is confirmed) which the investors give to the households when the borrow the APG. But this is not made explicit.

- In the **Keynesian model,** the following assets are used
  - **Consumption goods** and **investment goods** that are fundamentally different. Consumption goods cannot be used as inputs for the production process
  - **Money**, i.e. bank deposits and cash, for transactions and as a store value
  - **Bonds** as a store of value

What happens in reality if Ms. Smith decides to save?

- Ms. Smith planned to buy a new watch for 1.000 euro
- Due to the worsening labour market situation, she decides to save 1.000 euro instead
- Does this provide financial funds for the corporate sector which lead to more investment?

Effect on the **goods market**:

→ Reduced demand for watches leads to involuntary stockpiling at the retailer and to a lower demand for watch producers

Effect on the **financial system**:

→ Bank deposits of Ms. Smith are 1.000 euro higher

→ Bank deposits of retailer are 1.000 euro lower

→ Total amount of bank deposits (=money stock) remains constant

A first comparison of the two worlds

	Classical world	Keynesian world
Saving	Lower demand for the all-purpose good which can directly be offered on the capital market as „capital" and used as investment good	Lower demand for the consumption good which leads to involuntary stockpiling of retailers
Direct impact	**Goods/financial market**: Interest rate declines. Investment demand and consumption demand for the APG increase	**Goods market**: Involuntary stockpiling leads to reduced demand for producers of consumption goods **Financial market**: No direct impact on financial system as money stock remains constant. No direct impact on interest rates
Stabilization	Interest rate mechanism restores equilibrium	No automatic stabilizer for goods market

The elements of the Keynesian model of aggregate demand and aggregate supply

Aggregate supply

- Long-term supply: similiar to the aggregate supply in the classical model
- Short-term supply: determined by aggregate demand

Aggregate demand

- Consumption demand depends on income, not on the interest rate
- Investment demand depends on the interest rate

Key assumption of the Keynesian model:
Short-term aggregate supply is demand determined

- In the short-run, companies try to adjust their production as much as possible to the actual demand

- During the COVID pandemic in many countries, the instrument of **short-time work** (i.e. working time is reduced and the shortfall of wages is partially compensated by the government) has allowed a flexible adjustment of the labour inputs to the negative demand

- Therefore, the simplifying assumption of the Keynesian model that short-term aggregate supply is only determined by (expected) demand is not unrealistic

Germany: Production, exports and retail sales during COVID lockdown

The Keynesian model
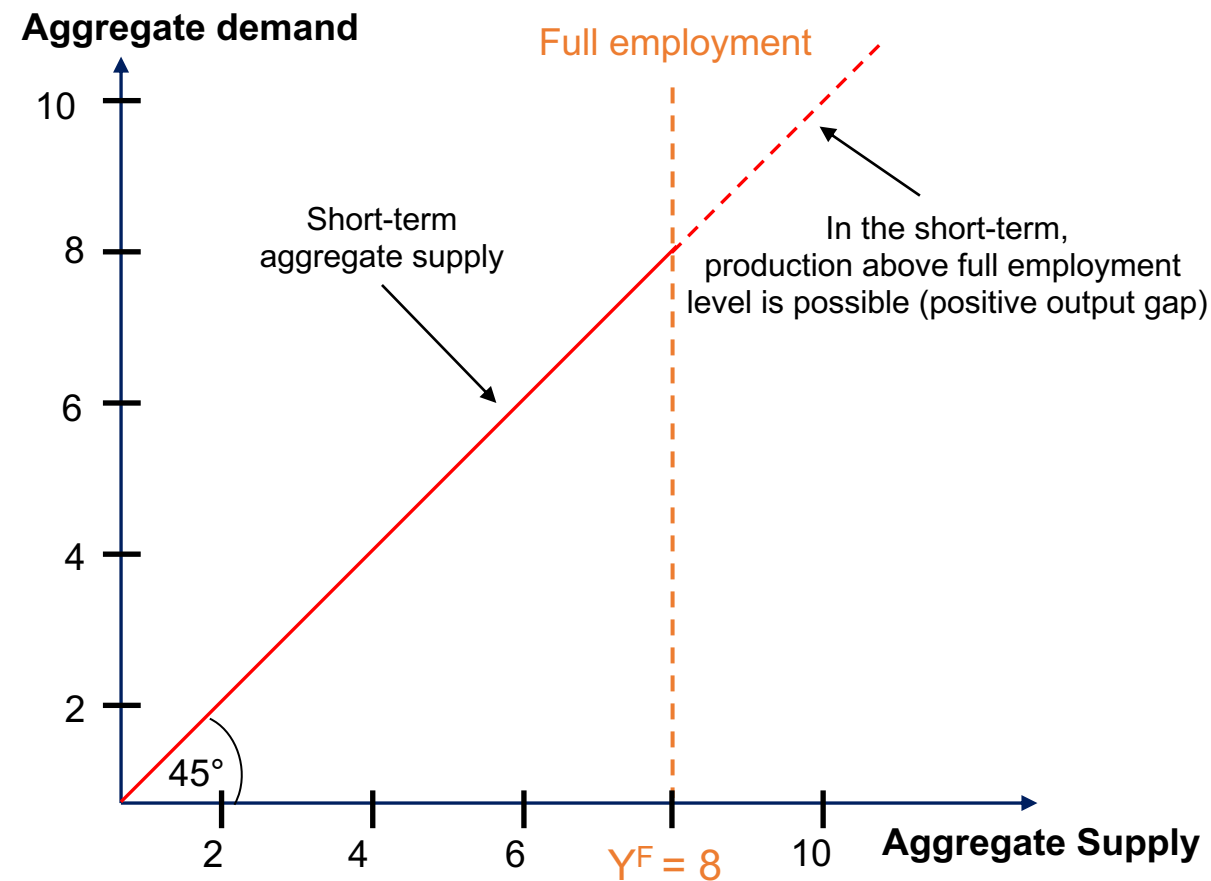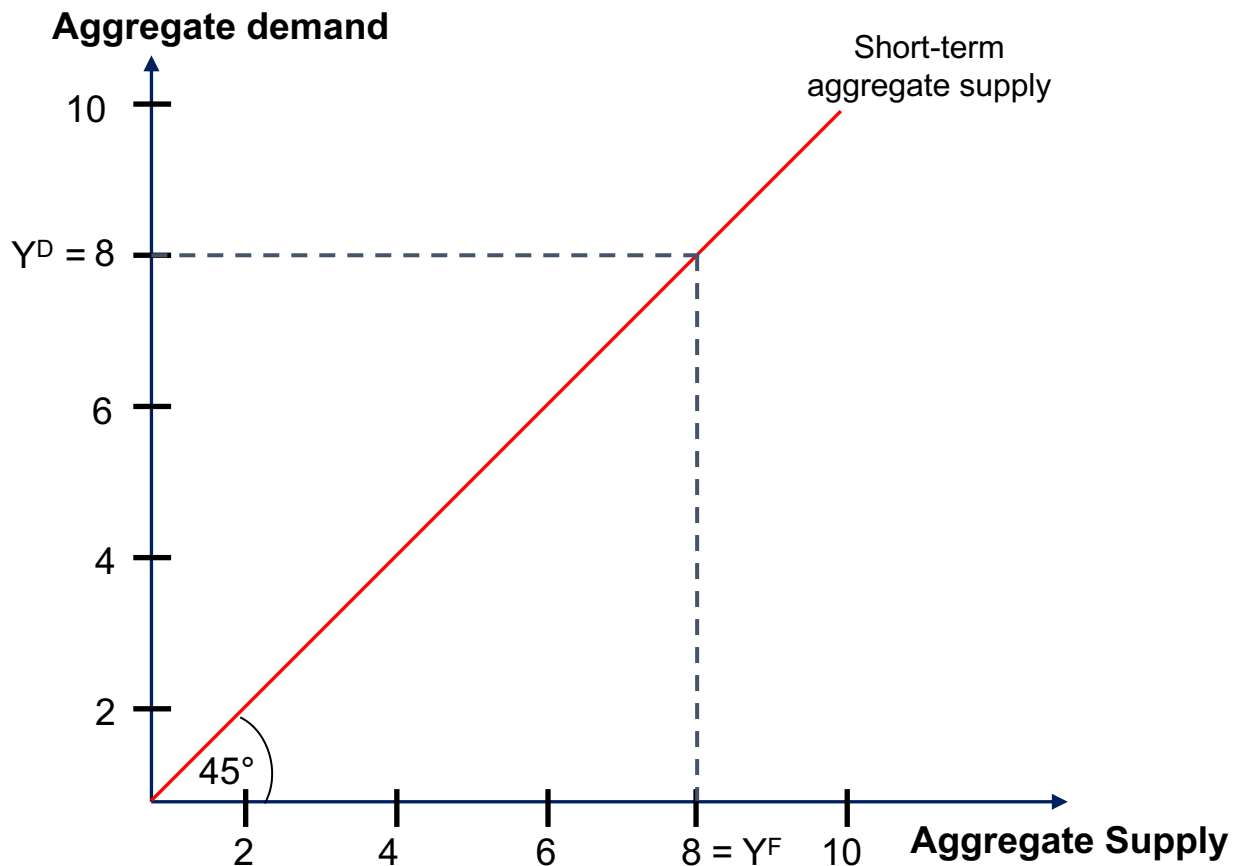
Short-term aggregate supply is represented by the 45° line. **Long-run aggregate supply** is assumed to be independent of demand and identical to the classical model.

# What are the main components of aggregate demand?

Components of aggregate demand

- Private consumption

- Government consumption

- Investment

- Changes in inventories

- External Balance = Exports and Imports

For the matter of simplicity our model focuses on
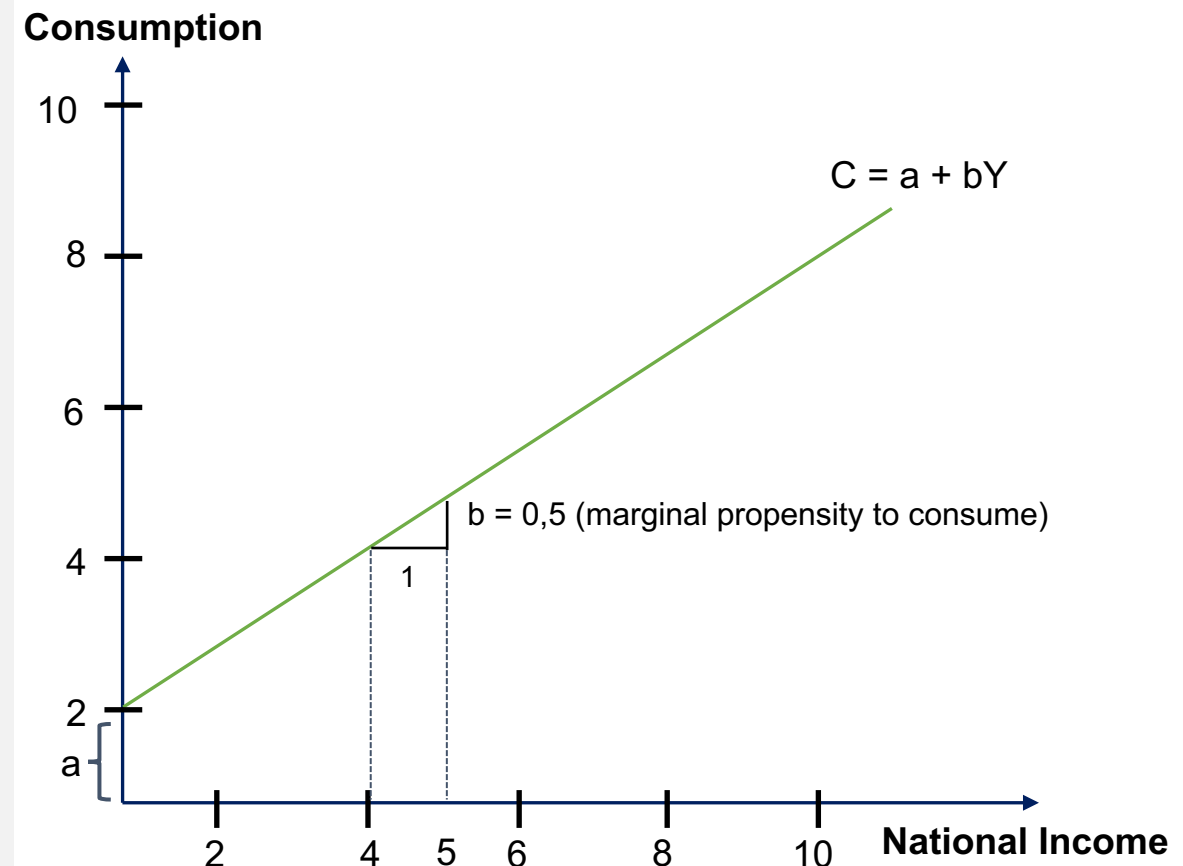
- Private consumption

- Investment

Euro area: Expenditure Components of GDP in 2019 (EUR billions)

- Private Consumption
- Government Consumption
- Gross fixed capital formation
- Change in inventories
- External Balance
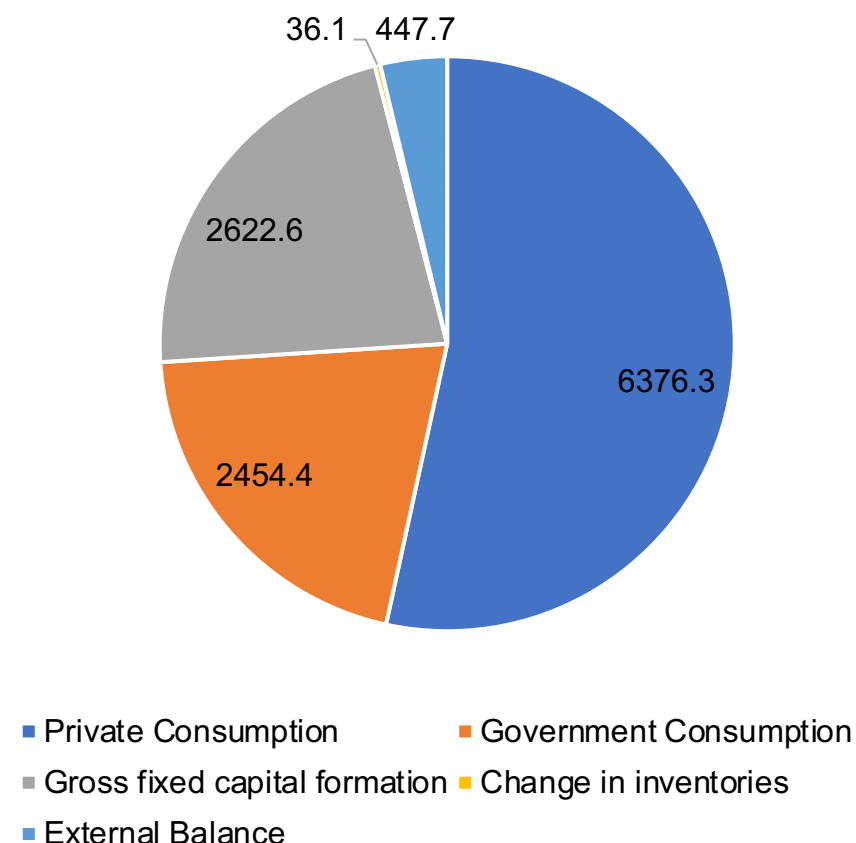
What determines private consumption in the Keynesian model?

- Private consumption (C) is determined
  - by **current income** (Y) which is generated in the production process ($Y=Y^S$): *absolute income hypothesis.*
  - by **autonomous consumption expenditures** (a), which are made regardless of the level of income (subsistence level)
- Consumption function:

  C = a + b Y

  → b = marginal propensity to consume, i.e. the percentage of income which is consumed and not saved

  → a = autonomous consumption expenditure
- Other determinants of consumption, such as interest rates (classical model) or expected income (*permanent income hypothesis*) are not taken into account.

The Keynesian consumption function

C = a + bY

b = 0,5 (marginal propensity to consume)

Saving and investment in the Keynesian model

- **Saving** of private households = income – consumption:

$$S = Y – C$$

- Saving function with C = a + bY:

$$S = Y – (a + bY)= – a + (1 – b)Y$$

- As a first approximation we assume that **investment** is constant: $I = \bar{I}$

- Implicit assumption of the model: Only households save, **firms do not save**. This is not in line with reality where firms save a lot. The saving of firms is identical with the profits minus dividend payments.
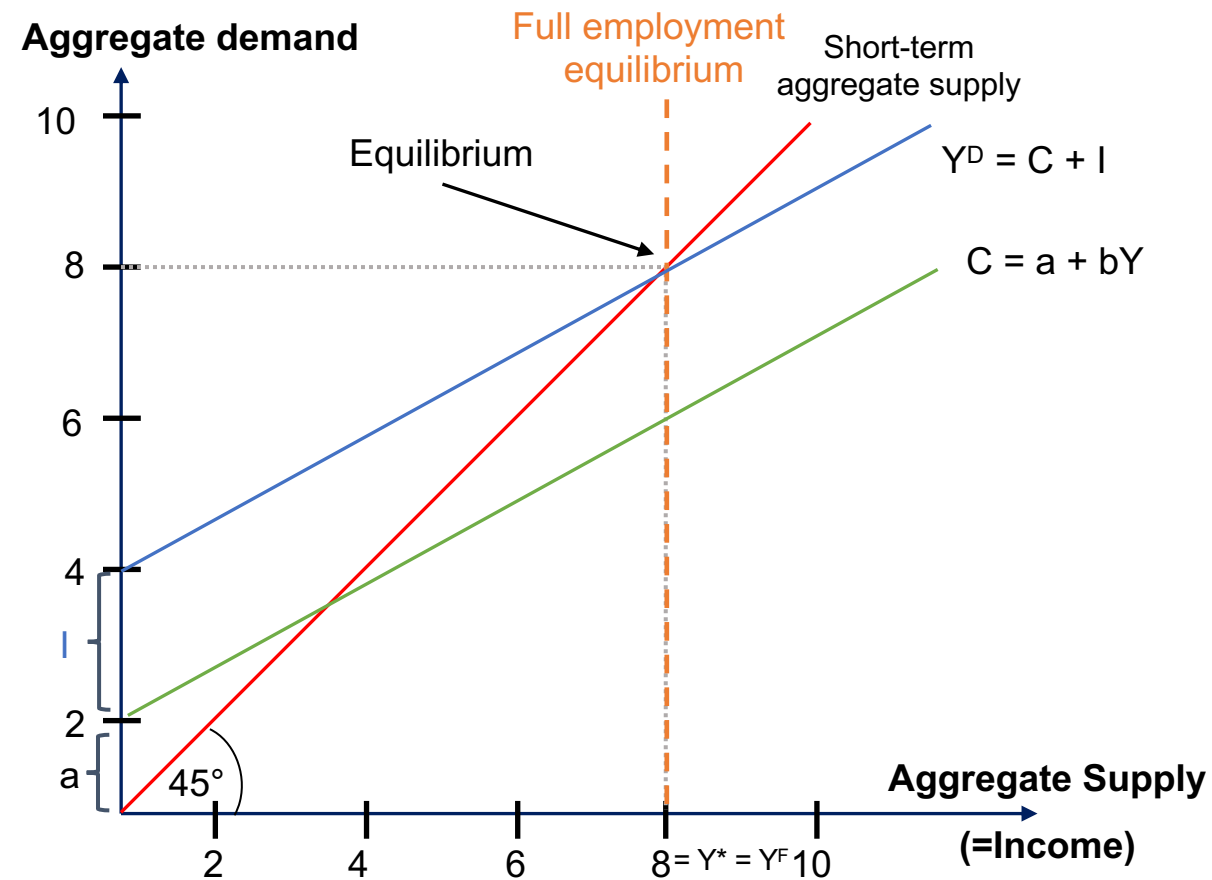
Aggregate demand and aggregate supply

**Aggegate demand is the sum of investment and consumption demand**
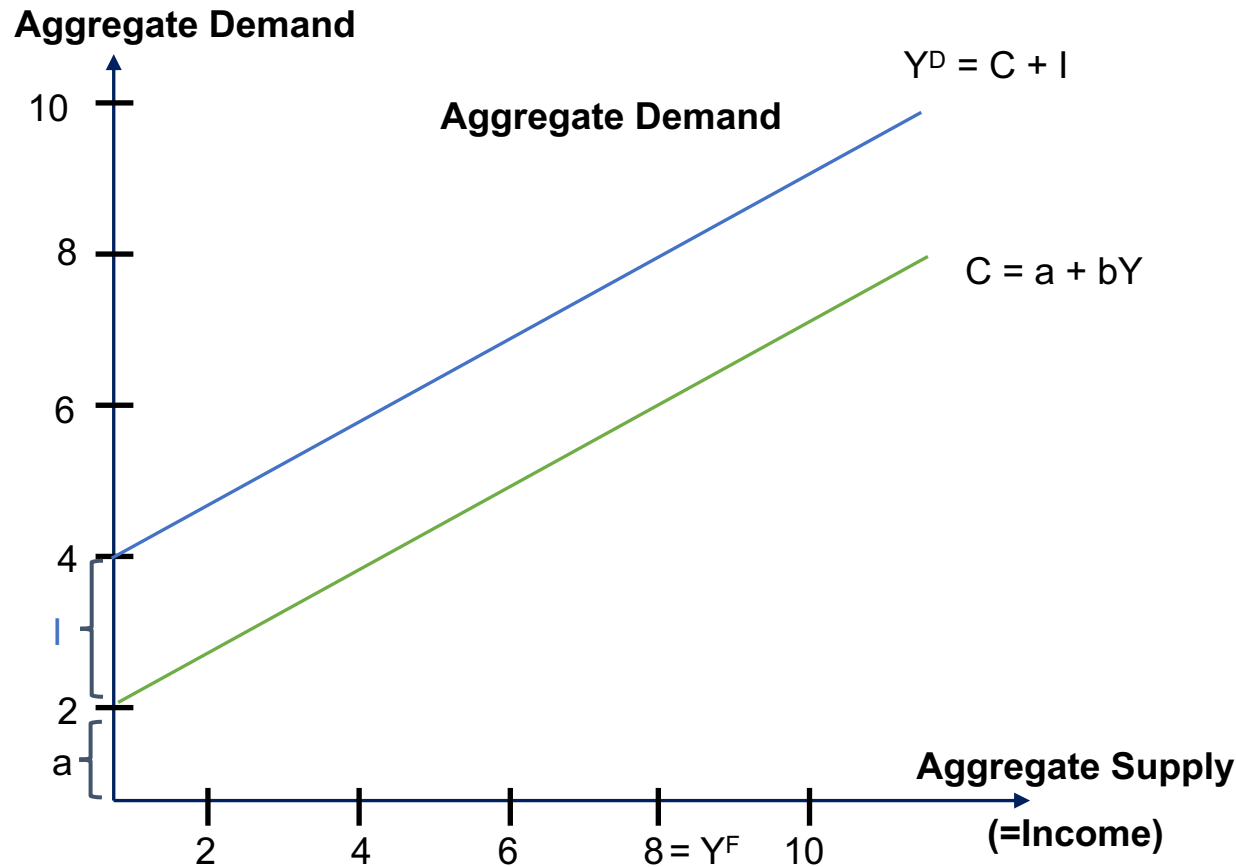
Equilibrium on the goods market: Intersection of short-term aggregate supply (45°line) and aggregate demand

How is the equilibrium on the goods market determined?

- In the model there is always an equilibrium (Y*) between *short-term aggregate* supply and aggregate demand. Grafically, this equilibrium is the intersection of Y^D (= aggregate demand) with 45°-line (=short-term supply)

- Key problem: The **equilibrium on the goods** market is not necessarily an a full employment **equilibrium Y^F**. The production level determing by aggregate demand can below the level full employment supply which is determined by other factors (capital stock, labor market, productivity)

- In the case of a **demand shock (I=1** instead of I=2**),** the goods market equilibrium is lower than the full employment level

- Core insight from the Keynesian model: there is always the risk of a **goods market equilibrium with unemployment**
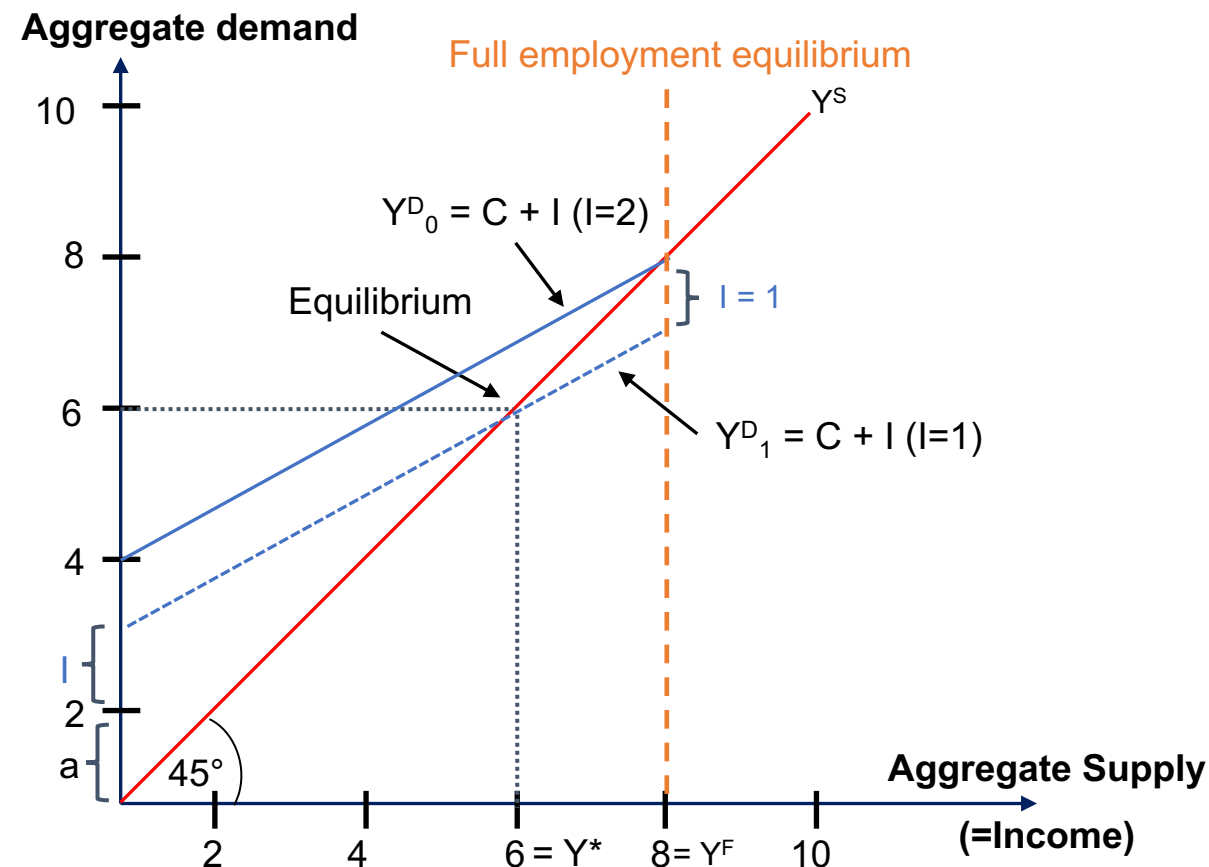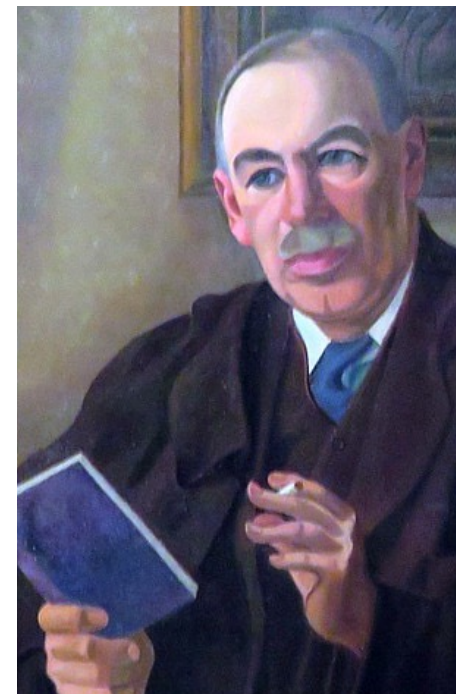
Is an equilibrium with unemployment possible?

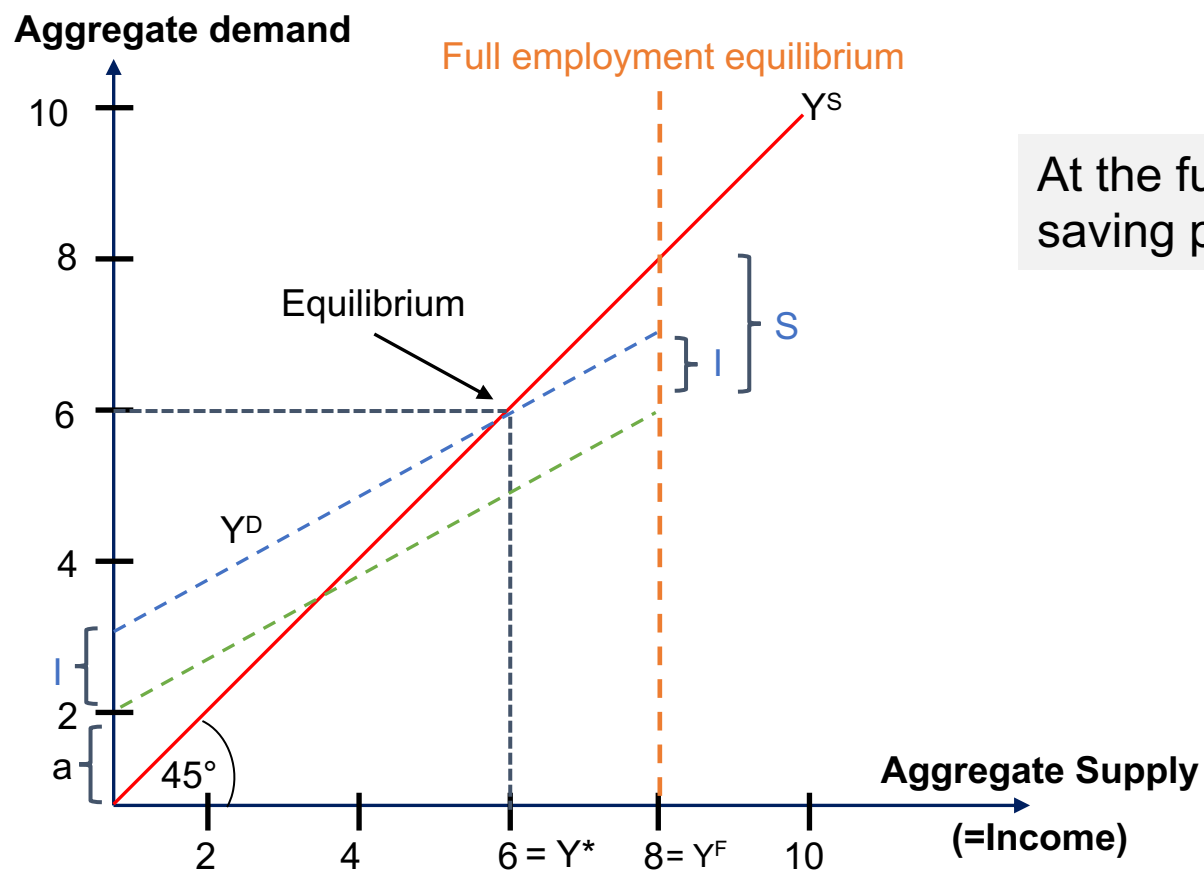„Classical" economists: Supply always creates sufficient demand ("Say's Law")

John Maynard Keynes: economy can remain in underemployment for a longer period of time, as short-term supply is determined by demand

Jean-Baptiste Say
1767-1832

John Maynard Keynes
1883-1946

What happens if firms produce more than the equilibrium output after a negative demand shock?

At the full employment level
saving plans exceed investment plans

The role of saving in the two models

John Maynard Keynes in the „General Theory"

"An act of individual saving means - so to speak - a decision not to have dinner today.

But it does not necessitate a decision to have dinner or to buy a pair of boots a week hence or a year hence or to consume any specified thing at any specified date.

Thus it depresses the business of preparing today's dinner without stimulating the business of making ready for some future act of consumption.

It is not a substitution of future consumption-demand for present consumption-demand, it is a net diminution of such demand."

→ Important: consumption good cannot be invested!

Source: Keynes (1937, (1973) p. 210)

Saving in the classical model

- The all-purpose good is not consumed

- It becomes available as a supply of "funds" ("capital") on the capital market

- The additional demand of funds leads to a decline in interest rates

- This increases the demand for the APG by investors who use it as input for the investment process

- In the next period more units of the APG are available