

## Sizing up economy with GDP

### Macroeconomics and microeconomics.

#### Microeconomics:

- The study of the behavior of individual economic units.
- The outcomes of the behavior is affected by market structures and government policies.

#### Macroeconomics:

- The study of aggregate economic outcomes.
- In macroeconomics, the economy is a collection of many household and firms interacting in many markets.
- Macroeconomics is not just the total sum of individuals because of **the interdependence principle**

**Principle :** The principle of economic interdependence suggests that the decisions made by individuals, households, firms, and governments affect each other through a complex network of economic relationships. In essence, no economic agent operates in isolation, and each one's actions have a ripple effect on others in the economy..

When we think about an economy, we might be tempted to simply sum up the activity of each firm, household, and market to get a picture of the whole. However, this approach overlooks the fact that these agents are not acting independently; they are deeply interconnected.

The principle of economic interdependence suggests that we need to understand these connections and feedback effects to fully understand how the macroeconomy works. A macroeconomic perspective is necessary to study these interdependencies and their impacts on aggregate economic outcomes like total output, employment, inflation, and economic growth.

Macro Economics can be divided into two parts :

- observations between countries: poor countries vs. rich countries

Macro studies the reasons behind these observations (differences).

- observations within countries: sizable fluctuations and consequences.

Macro studies these observations as well.

## Basic Concepts of GDP

In order to measure total income, total output, total spending within a country, we can use GDP.

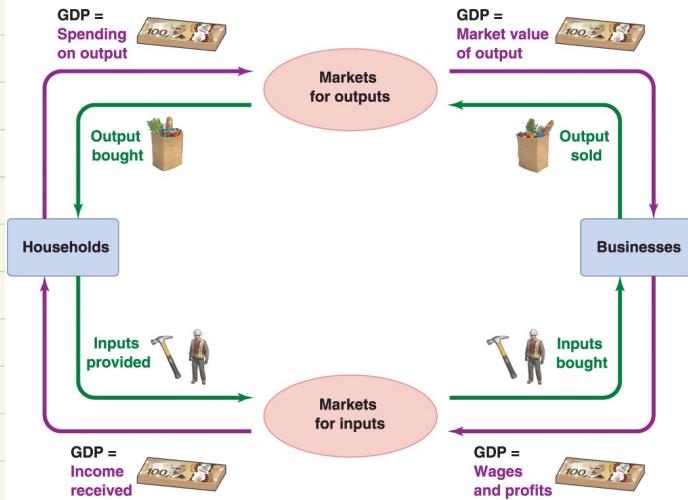
To illustrate the value of total income, total output and total spending, we have **circular flow diagram**:

The circular flow shows that the market value of output = spending on output = income received = wages + profits. GDP is defined as the value of these flows.

The green arrows show that each **flow of goods or services in one direction** is matched by a **flow of money in the other direction**, shown by the purple arrows.

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This diagram omits government, financial sector, and the rest of the world.



The green arrow is the flow of real resources.

The purple arrow is the flow of money exchanges for resources.

This diagram also shows a framework of interdependence principle in an economy:

- household income depends on the business : how many people business want to hire.
- business depends on how many things they want produce.
- The amount of production depends on spendings and needs of each household.
- The spendings of each household depends on the household income.
- Each components in the cycle is actually inputs.

The flow of money is the measure of the market value of the real resources that are bought, sold, produced, and earned. This means:

- All output that is produced get sold at the same market price, and so the market value of the total output = total spending
- Total spending = total income because someone's spend = someone's income.

The values of total output, total spending, and total income are the same, and equal to this economy's GDP. This means we could have three approaches to calculating GDP.

**Definition (Gross domestic product):** It is the market value of all final goods and services produced within a country in a year.

**Definition (GDP per person):** Sometimes it is called GDP per capita, it is total GDP divided by total population in a country.

Here is a break down of the definition of GDP:

- Market value: Market price times quantity
- Goods and Services: Tangible items and intangible items.
- Produced: Anything that is created or substantially changed. A change of ownership (resale) does not include in GDP. However, a service that facilitates this change is included.
- Final: things that are brought to their final users and will not be used to produce other things and services. So no intermediate goods. For example, the steel used to make a car would not be directly included in the GDP because its value is ultimately embedded in the final product. otherwise we would overestimate the GDP.
- Within a Country: All things in the geographical borders of a country.
- in a year: A specific time frame. GDP can be measured in different time frames.

## Three ways to measure GDP

There are three ways to measure GDP:

- By adding up every dollar of spending (Expenditure approach)
- By adding up every dollar's worth of output produced (Production (value-added) approach).
- By adding up every dollar of income earned (Income approach)

### Expenditure approach:

- only spending on final goods and services are produced
- GDP included inventories: it counts goods that are made, instead of when they are sold.
- $GDP = C + I + G + NX$ , this equation is always true because it defines all goods and services in an economy.

**Consumption (C):** Household spending on final goods and services such as food, doctor visit, cloths, or gas. There are durable goods (cars, washing machine) and nondurable consumption (food, gas).

Remark: rent on houses are special. If you pay rent to live in a house, the rent is counted as consumption. If own a house, and live inside this house, imputed rent is counted in GDP, which is an estimated rent value of your house, so you pay this imputed rent to yourself.

**Investment (I):** They are spending on new capital assets that increase the economy's productive capacity. They are usually business purchases such as building factories and airplanes and computers. They also include spending on research and development. Inventories are also counted as inventories investment. Residential purchase by a household is also included as residential investment.

Conventional investments such as buying stocks, buying lands and money depositing is not included since they are only "storage" or "change of ownership".

Depreciation (capital consumption allowance) is added positively to the investment. Because a portion of investment is used to replace worn-out equipments (depreciation) to maintain current level of production.

**Government purchase (G):** Spending on consumption and investment by the government. These includes highway expenditures, military budget, and police salary.

Transfer payments (redistribution of income to the less well-off people) and interest payment (cost of borrowing money by the government) are not included.

**Net exports (NX):** Exports - imports . Spending on exports is included in the GDP. And imports are excluded in the GDP because they are not produced domestically. However, imports can be included in C, I, and G, and have been counted. So we need to subtract imports in NX to avoid double counting.

## Production (value-added) approach

**Value-add:** The amount by which the value of an item is increased at each stage of production, which = Total sales - cost of intermediate inputs.

GDP equals total output

which is measured as the sum of value added at each stage



$$\text{Total GDP} = \sum \text{value-added}$$

For example:

#2 In 2021, Timberworks Inc. pays its workers \$5,000 to cut down trees and saw them into wood. On December 31, 2021, Table Inc. purchases the wood for \$8,000. In 2022, Table Inc. pays its workers \$6,000 to make tables from the wood boards. On December 31, 2022, Table Inc. sells the tables to IKEA for \$24,000. In 2023, IKEA sells the tables for \$34,000 to its customers.

- 2.1 Assuming all of this happened in Canada, how much GDP was generated throughout this process?
- \$10,000
  - \$16,000
  - \$26,000
  - \$29,000
  - \$34,000

By value-added approach:

	Timber work	Table	IKEA
Value of Sales	8000	24000	34000
intermediate costs	0	8000	24000
value-added	8000	16000	10000
GDP contribution	$8000 + 16000 + 10000 = 34000$		

## Income approach

$$GDP = \text{Factor payment} + \text{Non-factor payment}$$

**Factor payment**: it equals to wages and salaries + business profit + interest payments.

**Non-factor payment**: it equals to non-direct taxes + depreciations (positively add) - subsidies.

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2.3 Assume now that consumers have to pay 13% Ontario sales tax (HST) over the furniture they buy from IKEA. How much GDP is now generated?

- a) \$11,300
- b) \$18,080
- c) \$29,380
- d) \$32,770
- ✓\$38,420**

	Timber works	Tables	IKEA
value of sales	8000	24000	34000
Intermediate goods	0	8000	24000
wages	5000	6000	0
Profits.	3000	10000	10000
Taxes			4420
value-added	8000	16000	14420

$$\text{Income approach } GDP = 34000 + 4420 = 38420$$

## limitation of GDP

- Price are not values : what we values are not necessarily the price. Sometimes, the benefits are bigger than the spending.
- non market activities are not included : This can miss a lot of productive activities.
- The shadow economy is missing
- Environmental degradation is not counted
- Leisure is not counted : GDP counts the benefits of work, but ignore the costs.
- GDP ignores income distribution

## Real and Nominal GDP

Nominal GDP: it is GDP measured with current price. The equation is :

$$\text{Nominal GDP}_{2023} = \text{price}_{2023} \times \text{quantity}_{2023}$$

Real GDP: it is GDP measured with a constant year price. The equation is :

$$\text{Real GDP}_{2023} = \text{price}_{\text{base year}} \times \text{quantity}_{2023}$$

Base year : arbitrary year chosen to be fixed

The main difference between real GDP and nominal GDP is real GDP remove the effect of money (inflation), so, we can have a more accurate image of economic growth.

# Inflation

## Two ways of measuring inflation

**Inflation:** It is a generalized rise in the overall levels of prices.

**Deflation:** It is a generalized decrease in the overall levels of prices.

**Inflation rate:** It is the annual percentage increase in the average price level.

There are two ways of measuring inflations: **GDP deflator** and **consumer price index (CPI)**.

**GDP deflator:** This measures the price changes relative to a base year. It is calculated as :

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

Remark: GDP deflator for base year = 100

To calculate inflation rate, we use :

$$\text{Inflation rate} = \frac{\text{GDP deflator}_t - \text{GDP deflator}_0}{\text{GDP deflator}_0} \times 100\%$$

For example :

Base year		Current year		
P	Q	P	Q	
				Nominal GDP in current year = $5 \times 100 + 20 \times 20 = 900$
Good A	4	5	100	Real GDP in current year = $4 \times 100 + 10 \times 20 = 600$
Good B	10	20	20	GDP deflator in base year = 100, GDP deflator in current year = $\frac{900}{600} = 150$
Inflation rate = $\frac{150 - 100}{100}$		$\times 100\% = 50\%$		

**Consumer price index (CPI):** It is an index that tracks the average price consumers pay over time for a representative "basket" of goods and services. It is calculated as :

$$\text{CPI} = \frac{\text{Value of basket in current prices}}{\text{Value of basket in base year}} \times 100$$

And inflation is calculated as :

$$\text{Inflation} = \frac{\text{CPI}_{\text{current}} - \text{CPI}_{\text{last}}}{\text{CPI}_{\text{last}}} \times 100\% = \frac{\text{Price level this year} - \text{Price level last year}}{\text{Price level last year}} \times 100\%.$$

CPI can be used to deflate and inflate (to have the same purchasing power) nominal values :

$$\text{- Deflated current value} = \text{past value} \times \frac{\text{CPI}_{\text{past}}}{\text{CPI}_{\text{current}}}$$

$$\text{- Inflated current value} = \text{past value} \times \frac{\text{CPI}_{\text{current}}}{\text{CPI}_{\text{past}}} = \text{past value} \times \left( \frac{\text{CPI}_{\text{current}} - \text{CPI}_{\text{past}}}{\text{CPI}_{\text{past}}} + 1 \right) = \text{past value} \times (1 + \text{inflation})$$

Remark: Inflating and adjust to have the same purchasing power is called indexation.

For example:

	2020		2021		2022		2020 Basket		
Good	P (\$)	Q	P (\$)	Q	P (\$)	Q	in 2020	in 2021	in 2022
A	10	10	15	8	20	5	100	150	200
B	5	18	3	30	4	25	90	54	72
C	1	10	2	5	5	10	10	20	50
Total							200	224	322

- $CPI_{2020} = 200 / 200 = 100$

- $CPI_{2021} = 224 / 200 = 112$

- $CPI_{2022} = 322 / 200 = 161$

$$\text{Inflation in 2021} = \frac{112 - 100}{100} \times 100\% = 12\%$$

$$\text{Inflation in 2022} = \frac{161 - 112}{112} \times 100\% = 43.8\%.$$

CPI	Inflation	Suppose we have 10000 in 2008, in 2018, it has the current value of $10000 \times \frac{114.1}{133.4} \approx 8553$ (Deflated nominal value)
2008	114.1	Suppose we have 10000 in 2008, to have the same purchasing power of 10000 in 2008 as in 2018, we need $10000 \times \frac{133.4}{114.1} \approx 11691$
2009	114.4	0.3%
2010	116.5	1.8%
2011	119.9	2.9%
2012	121.7	1.5%
2013	122.8	0.9%
2014	125.2	2.0%
2015	126.6	1.1%
2016	128.4	1.4%
2017	130.4	1.6%
2018	133.4	2.3%

**Price index:** A price index is a measure that examines the weighted average of prices of a basket of consumer goods and services. CPI and GDP deflator are two price indices.

- GDP deflator is a broad measure of inflation in the economy as it includes all the goods and services produced domestically, so consumption goods and investment goods. It excludes the imported goods, and it changes over time to reflect changing composition of GDP.

- CPI is narrow and based on a specific basket of goods and services that are purchased by a typical household. And it includes imported goods that are consumed by household.

It does exclude investment goods and government services.

There are several issues with price indices (CPI and GDP deflator):

- Substitution bias: CPI calculation assume a fixed basket of goods. But consumers can change their consumption habits when prices change. This bias can overstate inflation.
- Quality adjustment bias: over time, quality of goods and services can change significantly. They can cost the same or even less. Making CPI estimation inaccurate.
- New goods and services: Price indices may not include entire new goods and services. They enter markets with high price and decline over time. This effect may count towards inflation.
- Personal income difference: Due to income differences, basket can vary, but price index is only an average measure of the entire population.

### The function of money

Function 1: Money is the medium of exchange.

Function 2: Money is the unit of account, which means it is a common unit that people use to measure economic value. However, the value of the money needs to be relatively stable for it to be a reliable unit of account. In context, people experience money illusion, which is the tendency of people to think of currency in nominal values, instead of its real purchasing power. Economist often assumes rational behavior (people not suffer from money illusion).

Function 3: Money is used to store values, which means you store this purchasing power for another day.

### Real costs of inflation

Type 1: Costs associated with high level of inflation (above 10%)

- Distortions in the tax and benefits systems when not indexed:

- Increases in nominal incomes push individuals into higher tax brackets.
- Nominal benefits do not keep up with inflation.

- Shoe-leather costs: Increased costs of transactions caused by inflations. It represents the resources that are wasted when people change their behavior to avoid costs of inflation.

- **menu costs**: costs to firms resulting from changing its prices. For example: administrative costs of recalculating prices and margins. Making the market less efficient, as they prevent firms from changing their prices as frequently as they might want to in response to changes in supply and demand.

**Remark**: shoe-leather costs and menu costs are also costs for expected inflation.

Type 2 : Costs of unexpected inflation (higher than expected)

- loss real wages when indexed with expected inflation.

- shoe-leather costs

- menu costs

- Redistribution between borrowers and lenders. Specifically :

**Nominal interest rate**: For each dollar borrowed, number of dollars that are repaid, expressed as percentage per year.

**Real interest rate**: For each dollar borrowed. inflation-adjusted value of each dollar repaid. expressed as percentage per year.

The relation between nominal interest and real interest is:

**Approximation** : Real interest = nominal interest - inflation (usually used when inflation < 10%)

**Exact**:  $1 + \text{real interest rate} = \frac{1 + \text{nominal interest rate}}{1 + \text{inflation rate}}$  (when inflation > 10% or depends on the question).

We have the following example to illustrate redistribution between borrowers and lenders :

- **when there is no inflation**: Robart borrows 1000 from Kate, and agrees to repay 1040 one year later.

$$\text{Nominal interest rate} = \frac{1040}{1000} \times 100\% = 4\%$$

$$\text{Approximate real interest rate} = 4\% - 0\% = 4\%$$

- **when expected inflation = actual inflation = 2%** : Robart borrows 1000 from Kate. and agrees to repay 1060 one year later.

$$\text{Nominal interest rate} = \frac{1060}{1000} \times 100\% = 6\%$$

$$\text{Approximate real interest rate} = 6\% - 2\% = 4\%$$

No one is better off or worse off compare with the previous case.

- When expected inflation = 2% and actual inflation = 4% : Robert borrows 1000 from Kate, and agrees to repay 1060 a year later.

Nominal interest rate = 6%

Approximate real interest rate =  $6\% - 4\% = 2\%$

Robert is better off because he repays less.

Kate is worse off because she receives less.

In general :

Higher than expected inflation is good for borrower, bad for the lender (and vice versa).

Fisher effect: Real interest rate is independent of monetary measures, and nominal interest rate will adjust to accommodate changes in expected inflation.

### Unemployment

**Unemployed person:** it is a person who

- Part of the working age population
- Does not currently have a job
- Is available for work
- Has been actively looking for a job

**Working age population:** population over age 15.

**Labor force:** number of employed + number of unemployed

**Unemployment rate:**  $\frac{\text{number of unemployed}}{\text{labor force}}$

**Labour force participation rate:**  $\frac{\text{labor force}}{\text{working age population}}$

We have different types of unemployment:

**Frictional unemployment:** takes time to find a job

**Structural unemployment:** more people seeking a job in a particular labor market than there are jobs at the going wage rate.

**Cyclical unemployment:** occurs during economic growth and contraction (recession and boom).

**Natural rate of unemployment** = frictional + structural.

**Equilibrium unemployment rate (natural rate of unemployment):** The long-run unemployment rate to which the economy tends to return, which equals to frictional + structural.

The unemployment rate fluctuates over time, but it's never 0.

**Cyclical unemployment rate** = Actual unemployment rate - Natural rate of unemployment.

There are some problems with unemployment rate:

- Unemployment rate doesn't distinguish between short and long term unemployment.
- There are some people not in the statistics:
  - Marginally attached : people who want to find a job, and have been looking for the past few years, but are not actively looking for work.
  - Underemployment : Someone who is working but wants more hours or whose job is not adequately using their skills.
  - Involuntarily part time : Someone who is working part-time but wants full-time work.

There are costs of unemployment:

**Economic costs:**

- The unemployed often end up with lower wages and worse career opportunities.
- Permanent unemployment can arise from periods of high unemployment.
- High unemployment means that the government receives lower tax revenue but spends more.

**Social costs:**

- Unemployment is isolating and painful.
- Long-term unemployment is associated with worse outcomes (lose skills, discriminations, permanent earning losses, health problems)
- Children may suffer

# Economic growth

## Sources of economic growth

The production function: The methods by which inputs are transformed into output which determines the total production that is possible with given set of ingredients. The general form is:

$$Q = f(L, K, M), \text{ where}$$

- Q is the quantity of output.

- K, L, M are amount of physical capital, amount of labour, and quality of human capital.

The aggregate production function: It is the production function but for a whole economy. It relates L, K, M to the total output of the economy.

In general, a country's real GDP  $Y = A \times f(K, L, H)$ , and GDP per capital  $\frac{Y}{L} = A \times f\left(\frac{K}{L}, \frac{H}{L}\right)$

where:

- Y = aggregate real output (Real GDP)

- A = total output productivity (Technology), which is intensive margin (changes in quantity of outputs holding the units of variable input constant).

- K = The amount of physical capital

- L = amount of labor

- H = quality of human capital.

-  $f(\cdot)$  = aggregate production function

Extensive margin (changes in the number of units of output due to changes in units of inputs).

For L:

- Population boosts total GDP, but not GDP per capita.

- Unfavourable demographics are likely to slow economic growth.

- Shorter workweek will reduce GDP.

For H:

- Secondary education and postsecondary education promotes greater productivity in jobs

- Primary education promotes future learning.

For K:

- physical capital is a complement to labour

- Investment depends on saving rates.

- Foreign investment builds capital stock.

For A:

- New recipes help to produce more given physical inputs, like computers and AI.

we have the following insights in boosting  $Y$ :

- Encourage savings and investments will boost  $K$ . Because:

$\text{Capital}_2 = \text{Capital}_1 + \text{investment} - \text{depreciation}, \Rightarrow \text{investment}, \uparrow \Rightarrow \text{capital}, \uparrow \Rightarrow Y \uparrow$

- Increase education will boost  $H$ .

- Promote research and development will boost  $A$ .

- Better public goods and infrastructure will boost  $A$ .

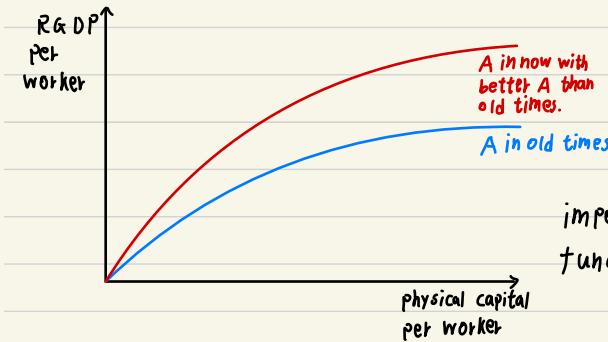
- Increase  $L$  boost  $Y$ , but not  $\frac{Y}{L}$ . For  $\frac{Y}{L} = A \times f\left(\frac{K}{L}, \frac{H}{L}\right)$ ,  $\frac{Y}{L}$  will boost iff  $\Delta K > \Delta L, \Delta H > \Delta L$ .

If a production function has constant returns to scale (proportional increase in all inputs leads to the same proportion increase in output), we can increase all inputs and  $A$  used in production to boost  $Y$ .

If a production function has increasing returns to scale (proportional increase in all inputs leads to a more than proportional increase in output), we can increase all inputs and  $A$  used in production to boost  $Y$ .

If a production function has diminishing returns to scale (proportional increase in all inputs leads to less than proportional increase in output), we can focus to improve  $A$  to boost  $Y$  as intensive margin.

All production function experience diminishing marginal productivity. As  $\frac{K}{L}$  increases,  $\frac{Y}{L}$  increases at slowing rate.



important insights:  $A$  shifts production function.

## Accounting for growth

**Growth Accounting:** It is the estimation of the contribution of each major factor in the aggregate production function to economic growth.

Given  $GDP = A \times f(L, K, H)$ :

$$\% \Delta Y = \% \Delta A + \alpha_K \% \Delta K + \alpha_L \% \Delta L + \alpha_H \% \Delta H, \% \Delta A = \% \Delta Y - \alpha_K \% \Delta K - \alpha_L \% \Delta L - \alpha_H \% \Delta H$$

where  $\% \Delta Y = \frac{Y_2 - Y_1}{Y_1} \times 100\%, \% \Delta A = \frac{A_2 - A_1}{A_1} \times 100\%$ .

$\alpha_K, \alpha_L, \alpha_H$  are elasticities of output with respect to capital, labor and human capital.

- If  $\alpha_K$  is 0.3, when there is 1% increase in K and anything else is constant, Y is increased by 0.3%

- If  $\alpha_L$  is 0.3, when there is 1% increase in L and anything else is constant, Y is increased by 0.3%

- If  $\alpha_H$  is 0.3, when there is 1% increase in H and anything else is constant, Y is increased by 0.3%

**Income share of each factor of production:** proportion of total output in the economy that is paid to each factor of production. For example, income share of L is the proportion of the total output that is paid to labor (wages, dividends, ...)

when there is no externalities in perfectly competitive factor market, and the production is constant returns to scale, elasticities of each factor = income share of each factor.

## Institutions to promote economic growth

1: Property rights

2: Government stability

3: Efficient regulations

4: Intellectual property law

5: Research and development subsidies

# Investment

## Investment in Macroeconomics

**Investment:** Spending on new capital assets that increases the economy's productive capacity. Capitals can be machinery and factories, inventories, residential construction, and research/development.

**Saving ≠ Investment:** bank deposits, bonds, stocks, ... They are not creating new productive capacity.

**Capital stock:** Total quantity of capital at a point in time.

Investment is the flow of new purchases of capital that add to this stock.

**Depreciation:** The decline in capital due to wear and tear, obsolescence, accidental damage, and aging. Depreciation subtracts from stock.

There are different types of investment:

- **Business investment:** spending by businesses on new capital assets.

- **Inventories:** Businesses also invest by maintaining inventories of raw materials, work in-progress, and finished goods. Increase in inventories is also investment.

- **Housing investment:** spending on building or improving houses or apartments.

Investment is an important economic variable:

- Investment fluctuates dramatically as business conditions change.

- Investment changes quickly, and Capital stock changes slowly.

- Investments in capital area are an important source of differences across countries in productivity and prosperity.

## Tools to analyze investments

**Present value (PV):** The present value is the current worth of a future sum of money given a specific rate of return.

**Future value (FV):** The future value is the value of a current asset at a future date based on an assumed rate of growth.

$$PV = \frac{FV}{(1+r)^n} . FV = PV \times (1+r)^n$$

where : r is the interest rate per period , n is the number of periods.

### Case 1: one year, no depreciation

$PV = \frac{FV}{1+r} \Rightarrow$  invest when  $PV >$  investment cost.

### Case 2: Multiple years, no depreciation, multiple cash flows $R$ :

$$PV = \frac{R_1}{1+r} + \frac{R_2}{(1+r)^2} + \dots$$

Invest when  $PV >$  investment cost.

### Case 3: many years (forever), no depreciation, steady cash flow every period.

$$PV = \frac{R}{r}, \text{ where } R \text{ is the same and goes on forever.}$$

Invest when  $PV >$  investment cost.

### Case 4: Multiple years with depreciation every year and same cash flow

$$PV = \frac{R}{r+d}, \text{ where } R \text{ is the cash flow every year, and it goes forever.}$$

Invest when  $\frac{R}{r+d} >$  investment cost.  $C \Rightarrow$  user cost of capital  $= (r+d) \times C$

Invest when  $R > (r+d) \times C$ .

### Savings and investments

When we have a closed economy with no trade.

Government makes Transfer ( $T_f$ ) to household.

Households pay Taxes ( $T$ ) to government.

National Savings ( $S$ ) = private savings + public savings.

$$\text{Private savings } (S_{\text{pri}}) = Y + T_f - C - T$$

$$\text{Public savings } (S_{\text{pub}}) = T - T_f - G$$

$$I = S = Y + T_f - C - T + \underbrace{T - T_f - G}_{S_{\text{pub}}} = S_{\text{pri}}$$

### When we have open economy with trade

**Net foreign investment (NFI):** Difference between capital outflows from a country and the capital inflows into a country over a period. It measures how much of a country's savings is being invested abroad versus how much foreign savings is being invested in home country.

$NFI = \text{Domestic investment abroad.} - \text{Foreign investment in the country}$

If  $NFI > 0$ , it means country's domestic savings are being used to acquire foreign assets (capital outflow)

If  $NFI < 0$ , it means country is attracting foreign capital to finance its domestic investments (capital inflow)

$$\text{In open economy, } NFI = NX = X - IM \Rightarrow I + NFI = S = \underbrace{Y + T_f - C - T}_{S_{pri}} + \underbrace{T_f - G}_{S_{pub.}}$$

### Market for loanable funds

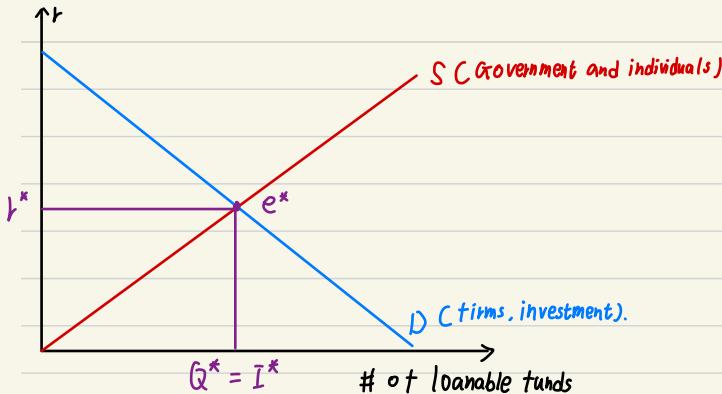
Savers and investors meet in market for loanable funds.

**Demand:** Relationship between quantity of funds demanded (borrowers) and the price

**Supply:** Relationship between quantity of funds supplied (lenders) and the price

**Price:** The real interest rate ( $r$ ).

### Domestic market of loanable funds.



Shift domestic demand for loanable funds:

- Technological advances: This makes capital more productive, which will increase revenue, thus providing incentive to invest more. shift demand curve to the right.
- Expectations: If they are optimistic about future, lead them to invest more. Thus, shifting the demand to the right
- Corporate taxes: The higher the corporate tax rate, the smaller the share of future profits that your company gets to keep. This leads to less investment given interest rate, shifting the demand line to the left.
- Lending standards and cash reserves: less restrictive lending standards or more abundant cash reserves lead to more investment at any given interest rate, shifting the investment line to the right.

## Shift domestic supply for loanable funds

- changing in personal saving rates: Any factor that shifts people's willingness to save will shift the supply of loanable funds. For example: big tax breaks that encourages saving is going to shift to the right.
- Changes in government budget balance: when there is surplus in government budget, it will shift to the right. When there is deficit, it is going to shift to the left.
- Global shocks: when there are favorable saving conditions for domestic and foreign funds. or positive global economic shock, it is going to shift to the right. otherwise, it will shift to the left.

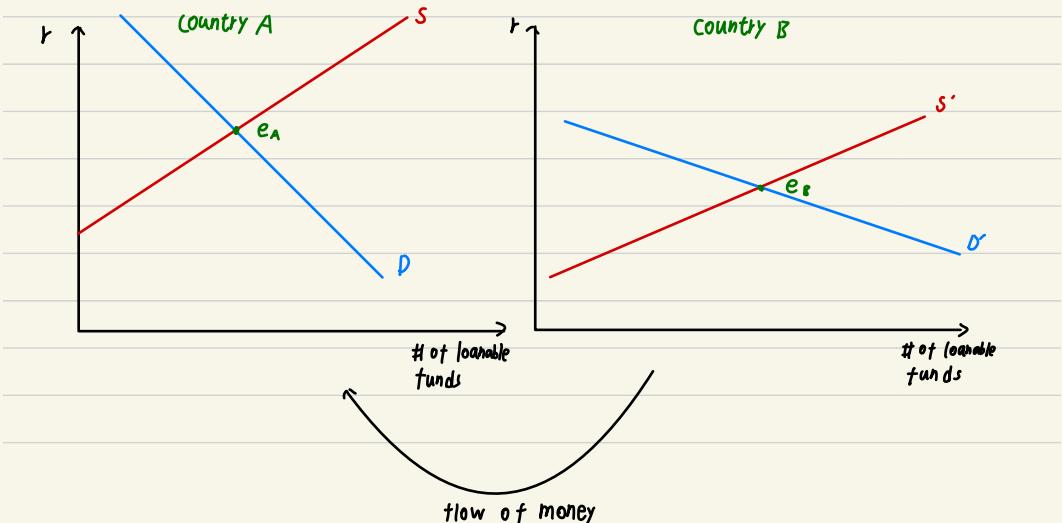
## Open economy with world interest rate.

In open economy with no regulations on cash flow and trade, two countries will achieve the same interest in both countries, and this interest rate is called world interest rate.

- If a country's domestic interest rate is higher than world interest rate, it will attract foreign capital.

- If a country's domestic interest rate is lower than world interest rate, it will export capital.

Suppose two countries A and B, where Country A has higher interest rate than Country B. Because the higher interest rate, investors in B will invest in country A for higher returns.

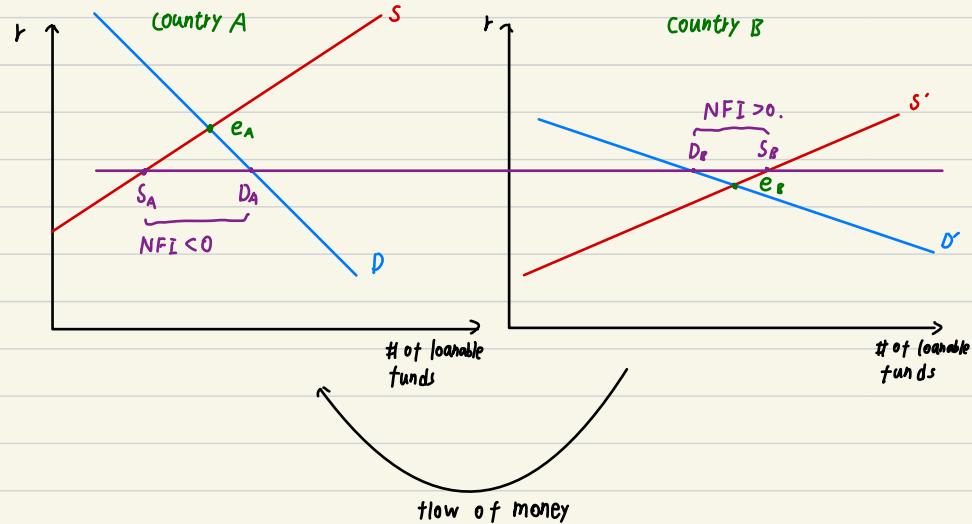


As more and more investors in country B start to invest in country A, they are transferring savings in B to A. Thus, shifting the supply curve to the left.

As country A receives many foreign investment, the supply of funds increases. shifting the supply curve to the right.

So, Country B's domestic interest rate increases, and Country A's interest rate decreases. This shift will continue until they have the same interest rate, which is the world interest rate.

So, World interest rate is always between A's rate and B's rate.



# The financial market: banks, bonds and stocks

## Banks

Banks make money by charging higher interest rate than they pay: when you deposit money to banks, you are lender, and bank is the borrower. The price your bank pays to borrow is the interest rate you receive. The bank then lend your money to someone with a higher interest rate.

There are five important bank functions:

- Banks pool savings from many savers and lend to specific borrowers.
- Banks spread the risk of lending money across many borrowers.
- Banks check the financial and credit information of borrowers.
- Banks provide payment services such as atm or direct bank transfer.
- Banks create long-term loans from short-term deposits.

**Bank run**: when many bank customers try to withdraw their savings at the same time.

- Bank run can cause a bank to collapse.
- A bank run is likely whenever people believe that a bank run is likely.
- Bank runs can be contagious.
- Deposit insurance (a guarantee that you won't lose the money you deposit in the bank) makes bank runs much less likely.

**shadow banking**: sector of finance industry that conducts similar activities to traditional banks, but operates outside of the usual banking regulations and oversight. They do not have access to central bank funds and safety nets such as deposit insurance.

**Fire sales**: rapid selling of assets, often at prices significantly below their intrinsic value, typically in response to a need for immediate liquidity.

Fire sales can cause shadow bank runs to spread.

Shadow banks are also opaque.

## Bond market

**Bond**: An IOU. Specifically, a promise to pay back a loan with interest.

**The bond market**: A bond market is a financial market place where participants can issue new bonds or buy and sell bonds.

The bond market has 4 functions:

- It is an alternative market where companies can borrow the large sums of money they need to fund their investments, and savers can lend the funds they aren't using.
- It funds government debt.
- It spreads the risk by spreading the borrowing across many lenders.
- It creates liquidity, which means if a bond holder needs to access their money before bond's maturity date, they can sell the bond to other investor to liquid.

Bond market has some risks:

- Simply not getting paid.
- The longer the term bond, the greater the uncertainty about future interest rates and thus greater the term risk, which is the risk that arises from uncertainty about future interest rate.

Usually long-term bond requires high interest rate.

- Bond might be hard to sell, or able to sell it quickly and not getting a good price for it.

Usually, government bonds are the safest investment.

## Stock market

**Stock share:** A stock share, or share represents ownership in a corporation and constitutes a claim on part of the corporation's assets and earnings.

**Stock market:** It is a public market place for buying, selling, and trading of company stock shares. The stock are second hand.

**Dividend:** it is a payment made by a corporation to its shareholders, usually in the form of cash or additional shares.

Stock market has the following functions:

- Stock channel funds from savers to investors, such as initial public offering (IPO).
- Stock spreads the risk of business performance across many shareholders, reducing the risk that any one person faces.
- Stock reallocate control over business decisions.

Stock market creates liquidity, and easy to own stocks.

There are some differences between stocks and bonds:

- Bonds pay certain annual interest payments, while stocks pay uncertain dividends.
- Bond holders get paid before stockholders if a company declares bankruptcy.
- Stockholders help control how a company is run

## International finance and exchange rate

### Balance of Payment

**The balance of payment:** It is a financial statement that summarizes a country's total economic transactions with the rest of the world over a specific time period.

BOP is divided into two main accounts:

**Current account (CA):** This records the country's trade in goods and services, along with earnings on overseas investments and transfer payments such as foreign aid. It is comprised of the following sub-accounts:

**Trade balance:** Ex - IM

**Net income from abroad (NFI):** This includes earnings on foreign investments minus payments made to foreign investors.

**Net current transfer:** foreign aids, grants, remittances.

**Capital account (KA):** This tracks the flow of capital in and out of the country. It has the following sub-accounts:

**Capital:** transfer of capital assets, natural assets, and intangible assets.

**Foreign currency reserves:** changes in these reserves.

**Financial:** transfer of financial assets.

The BOP must always balance  $\Rightarrow CA + KA = 0$ .

Any surplus in CA is matched with a deficit in KA

Here are changes that affect CA and KA:

**Trade account:** If a country exports goods, it will increase, and vice versa.

**NFI:** If a country's residents earn income from investment overseas, it will increase, and vice versa.

**Net current transfer:** If a country receives transfer, it will increase.

**capital:** If foreign entities buy capitals in a country, it will increase. If a domestic entity buy capitals in other countries, it will decrease.

**Financial:** If foreign buy domestic assets (stocks, bonds, ...), or if domestic investor withdraw overseas investment, it will increase, and vice versa.

**foreign currency reserve:** If a country has an increase in foreign reserve, it will increase.

## Exchange rates

To purchase goods from another country, need to exchange domestic currency for foreign currency. For foreign countries to purchase a country's domestic goods, need to exchange foreign currency for that country's currency.

**The nominal exchange rate:** The rate at which a person can trade the currency of one country for the currency of another. Nominal is often dropped.

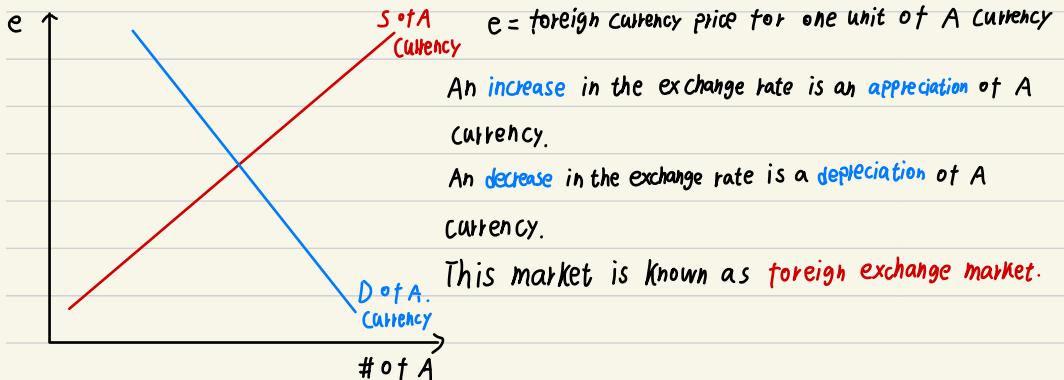
Nominal exchange rates can be quoted in two ways:

- Direct method: 1 unit of domestic currency to X units of foreign currency.  $\Rightarrow e = \frac{\# \text{ of foreign currency}}{\# \text{ of Canadian currency}}$

- Indirect method: 1 unit of foreign currency to X units of domestic currency.  $\Rightarrow \frac{1}{e}$

Consider the nominal exchange rate  $e$  between country A and B, where 1 unit of currency in A to X units of currency in country B.

The  $e$  is the price of foreign currency. And price is determined where supply of foreign currency equals the demand for foreign currency.



The demand for domestic currency  $\Rightarrow$  foreign countries

The supply of foreign currency comes from a demand for A currency.

Those who supply (sell) foreign currency are demanding (buying) A currency.

Supply of foreign currency (demand of domestic currency) originates from:

- A exports goods and services to B, foreign buy from A.
- Capital inflow (e.g. foreign investment)
- Foreign visitors to A.

The supply for domestic currency  $\Rightarrow$  country A

A demand for foreign currency comes with a supply of A currency.

Those who demand (buy) foreign currency are supplying A currency.

Demand of foreign currency (supply of domestic currency) originates from:

- A imports goods and services from B. A buys foreign goods.
- Capital outflows (A invest abroad)
- People from A to visit other countries.

In general, who supplies A currency demands B currency; who supplies B currency demands A currency.

When exchange rate increases, the quantity supplied of domestic currency increases (demand for foreign currency by country A increases).  $\Rightarrow$  why supply is up-sloping.

When exchange rate increases, the quantity demanded of domestic currency decreases (the quantity supplied of foreign currency decreases).  $\Rightarrow$  why demand is down-sloping.

Shifts on demand and supply of foreign currency

- Imports and exports:

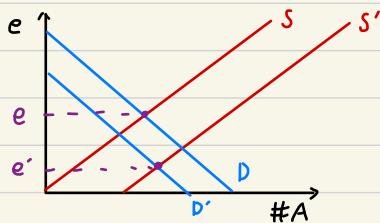
foreigners want more products in A  $\Rightarrow$  exports increase  $\Rightarrow$  foreigners need more A currency  
 $\Rightarrow$  demand of A shifts to the right  $\Rightarrow$  A currency appreciates.

Country A imports more  $\Rightarrow$  demand for foreign currency increases  $\Rightarrow$  the supply of domestic currency increases  $\Rightarrow$  supply curve move to the right  $\Rightarrow$  A currency depreciates.

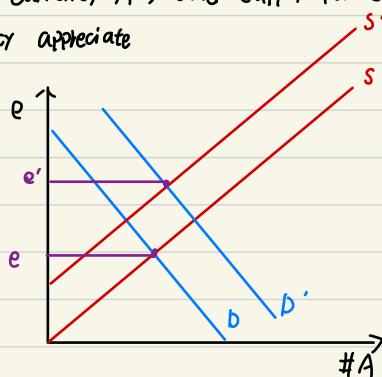
- interest rate:

Domestic interest rate is higher than foreign interest rate  $\Rightarrow$  foreign investors have incentive to invest in country A  $\Rightarrow$  increase in supply of foreign currency and increase in demand of domestic currency  $\Rightarrow$  A currency appreciate.

- Inflation: higher inflation relative to other country  $\Rightarrow$  goods and services become more expensive  $\Rightarrow$  less foreigner will demand domestic goods, and country will import more goods and exports less goods  $\Rightarrow$  when exports decrease, the supply of foreign currency decreases, so the demand of domestic currency decreases  $\Rightarrow$  when imports increase, the demand of foreign currency increases, so the supply of domestic currency increases.  $\Rightarrow$  demand curve will move to the left, and supply curve will move to the right  $\Rightarrow$  exchange rate will decrease.  
 $\Rightarrow$  A will depreciate.



When inflation is lower than other countries  $\Rightarrow$  exports increase and imports decrease  
 $\Rightarrow$  Increase demand for currency A. And supply for currency A decreases.  $\Rightarrow$  So exchange rate increases  $\Rightarrow$  A currency appreciate



when we have equal inflation, the e does not change.

### Real exchange rates

**Real exchange rate:** It is a measure of the value of one country's currency in terms of another country's currency, but adjusted for price level differences between the two countries. In other word, it is the rate at which the goods and services of one country can be traded for the goods and services of another country.

$$RER = ex \frac{P_{\text{domestic}}}{P_{\text{Foreign}}}$$

changes in the real exchange rate can significantly affect a country's balance of trade, which is a major component of the current account. The real exchange rate reflects the rate at which goods and services in one country can be exchanged for goods and services in another country.

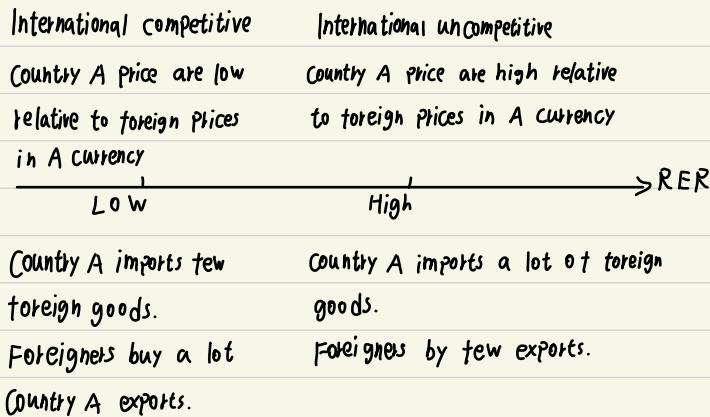
If a country's real exchange rate appreciates (its currency becomes more valuable in terms of purchasing power), its goods become relatively more expensive on the global market. This tends to reduce exports and increase imports, leading to a decrease in the current account balance, all else being equal. Conversely, if a country's real exchange rate depreciates (its currency loses value in terms of purchasing power), its goods become cheaper on the global market, which tends to increase exports and decrease imports, leading to an increase in the current account balance, all else being equal.

Suppose item A cost 1500 in country A, and 12000 in Country B

If  $1A = 5.45B$ .  $1500 \times 5.45 = 8175$  in B currency

$\Rightarrow \frac{8175}{12000} = 0.68 \therefore RER = 5.45 \times \frac{1500}{12000} = 0.68 \Rightarrow$  Buy 1 item A in Country A, which can buy 0.68 item in Country B

Suppose we have the same set up:



In general, a real exchange rate depreciation leads Country A to import less and export more. And the real exchange rate is the exchange rate for output.

On economic scale, the economy wide version of  $RER = e \times \frac{\text{Price index}_{\text{domestic}}}{\text{Price index}_{\text{foreign}}}$ . Price index can be CPI when RER falls, NX increases.

## Purchasing Power Parity and $E_{PPP}$ .

**Purchasing Power Parity:** It is an economic theory that compares different countries' currencies through a "basket of goods" approach. According to this concept, any unit of currency should buy the same amount of goods and services in all countries.

The underlying principle of PPP is the law of one price. The law states that identical goods should sell for the same price in different countries in the long run.

PPP suggests that the nominal exchange rate reflects the price level of two countries.

For example: Country A and Country B started with different price levels, that means 1 unit of A currency cannot buy the same amount of the same item in Country B, and vice versa.

By law of one price, eventually, with 1 unit of A currency will buy the same amount of the same item in A and B. Because 1 unit of A currency has the same purchasing power in Country A and B, they must have a nominal exchange rate  $E_{PPP}$  that reflect this price level and purchasing power.

So, current nominal exchange rate will move to  $E_{PPP}$  with PPP is respected (we have PPP's assumption)

$$We\ have\ E_{PPP} = \frac{P_{\text{foreign}}}{P_{\text{domestic}}}$$

- if  $e < E_{PPP}$ , domestic currency is undervalued
- if  $e > E_{PPP}$ , domestic currency is overvalued.

## Types of exchange rate

**The flexible exchange rate:** A floating exchange rate is determined by supply and demand of foreign exchange market. The central bank typically does not intervene.

**The fixed exchange rate:** Under a fixed exchange rate, the value of a country's currency is fixed to a certain value. The central bank maintains this rate by intervening in the foreign exchange market, buying or selling its own currency as needed.

The central bank uses official financing transaction in the capital account to meet the excess demands or supplies that arise at the fixed value.

- Devaluation: let  $e$  decrease
- Revaluation: let  $e$  rise

For example:

- If the central bank sets the exchange rate below market equilibrium, there is an excess demand for domestic currency. The central bank would have to sell domestic currency to increase the supply and keep the exchange rate below equilibrium. This also increases the foreign currency reserve.
- If the central bank sets the exchange rate above equilibrium, the central bank has to buy the excess supply of domestic currency with foreign currency to increase the demand. Thus, it makes the exchange rate above equilibrium. This decreases the foreign currency reserve.

**Managed float (Dirty float) exchange rate:** A currency's value is primarily free to fluctuate, but the central bank may intervene. For example:

- When foreigners want a currency, demand for a currency increases. A currency appreciates. Central bank of A may print more money to increase supply of A currency to counteract this appreciation.
- When country A has capital outflow, the supply of A currency will increase. A currency will depreciate. Central bank can use foreign reserve to buy A currency to increase the demand of A, and this will counteract this depreciation.

### Some advantages of fixed exchange rate

- Stability and predictability: Since the exchange rate is fixed, the predictability and stability in trade is enhanced since business and investors can predict the costs.
- Control inflation: If a country with high inflation pegs to one with low inflation, the low inflation environment can potentially be imported.

### Some advantages of flexible exchange rate

- Monetary policy independence: Monetary policy is not dedicated to maintaining a fixed exchange rate.
- Shocks absorber: The rate will naturally depreciate or appreciate to changes in economy.

Imagine a scenario where a country's major export suddenly decreases in demand on the global market. In a floating exchange rate system, the decrease in demand for the country's exports would likely lead to a decrease in demand for its currency (since less of its currency is needed to buy its exports). This would cause the currency to depreciate. As the currency depreciates, the country's exports become cheaper to foreign buyers, which can stimulate demand and potentially offset the initial decrease in demand for the country's exports.

Conversely, imagine a scenario where a country experiences a surge in inflation. In a floating exchange rate system, the inflation could lead to a depreciation of the country's currency, since each unit of currency is now worth less in terms of what it can buy. This depreciation can make the country's exports cheaper and more attractive to foreign buyers, which can increase export demand and potentially help stabilize the economy.