Economics notes

Microeconomics

Free market: Market without government intervene
Any operation from government results in a loss in market total revenue

Competitive market: Nobody can influence the market price
Competitive market: Nobody can influence the market price

1. Enough buyers
2. Enough homogeneous or identical products (narrow market)
3. Both sellers and buyers can enter and exit freely

The law of demand

Whenever the price if a commodity rises, its quantity demanded will drop

Market equilibrium

In competitive market, the market will enter the efficient status when the total surplus is maximized. Then both sellers and buyers have no incentives to change the quantity of commodity, so the price is fixed. But in uncompetitive market, equilibrium is not consistent with efficiency.

Market failure

Market fails to achieve the status of efficiency when it tends to equilibrium.

Causes:
Externalities, public goods, monopolies, or information asymmetries can cause markets to reach an equilibrium that is not efficient.

Externalities:
if not all the behaviour made by participants are independent, the market equilibrium may not be the efficient system.flowchart LRflowchart LR

Elastic:
Price elasticity of demand = ***Percentage*** change in quantity demanded

Percentage change in price:

Pindyck,Microeconomics, p.55

> ite the price elasticity of demand as follows:7
> Ep = ΔQ/Q ΔP/P = PΔQ QΔP

The percentage change in quantity will always have the opposite sign as the percentage change in price, but we commonly omit the negative sign.

1. Sufficient close substitute or not
2. Necessary or luxury commodity
3. Broad or narrow market
4. Long or short term

Income Elasticity

> Pindyck,Microeconomics, p.57
>
> I:
>
> $$E_I = \frac{\Delta Q/Q}{\Delta I/I} = \frac{I}{Q}\frac{\Delta Q}{\Delta I}$$

normal good : Income Elasticity > 0
inferior good Ei < 0
Deadweight Loss(DWL)

Global loss without any parts of the systems benefits.(Systemic loss)

Factors: Tax and Subsidies, Price ceiling and floor

Batman loss: loss because of resulting price barrier by government

> Pindyck,Microeconomics, p.334
>
> Welfare loss When Price modification/tax is held

Mask loss: loss because of government setting tariff when domestic market connecting to global market

> Pindyck,Microeconomics, p.352
>
> import tariff or Quota (general Case)

Polity bind {

If a policy(e.g. tax) can influence or break the recent conditions of market(equilibrium), it is binding, or it is not binding.

}

Good {

Excludability: accessibility in consumption, It defines a good is private or public;

Rivalry: influenceability to other consumers. It defines a good is private or public;

}

Mankiw, Gregory N., Principles of Economics, 9th , p.248

> Figure 1 Four Types of Goods

Normal behaviour {

Maximize: Producers maximize their profits, Consumers maximize their utilities.

}

Preference (What a Consumer Wants){

Completeness: all accessible;

Transitivity: comparable;

Non-saturate: more is better;

Rationality: always maximize revenue;

}

Budget constraint(the bundles a consumer can afford){

x**Px** + y*Py* = Income

}

Indifferent curves(bundles with equivalent utility){

MRS(Marginal Rate of Substitution){

Can be represented by the slope of the indifferent curve.

}

Utility(an abstract measure of the satisfaction or happiness that a consumer receives from a bundle of goods){

}

}

Optimization(consumers actually do){

Use simultaneous equation of indifferent curve and budget constraint.

If(we find a indifferent curve to be the tangent line of budget constraint)
{
The point = internal solution of optimization

}else{

The point will be the intersect point between the indifferent curve and budge constraint where the point is on the X or Y axis, no matter the curve is tangential or not.)

}

}

The demand and supply relationship with cost{

The law of cost{

At first, the marginal cost(MC) tends to fall as the production scale up; After a critical point, MC tends to rise due to the cost of management.

}

Pindyck,Microeconomics, p.383

> Lerner Index of Monopoly Power

Pindyck,Microeconomics, p.383

> index of monopoly power can also be expressed in terms of the elasticity of demand

Pindyck,Microeconomics, p.118

> MUF/PF = MUC/Pc
> [!PDF|red] Pindyck,Microeconomics, p.118
> equal marginal principle—i.e., has equalized the marginal utility per dollar of expenditure across all goods—will she have maximized utility.

}

Macroeconomics

1. Principles

1. GDP

GDP: Production and Income

The measure of aggregate output in the national income accounts is called the gross domestic product, or GDP

production side

1. GDP Is the Value of the **Final** Goods and Services Produced in the Economy during a Given Period
   [final]Not contingent upon the process(**consumption**)

2. GDP Is the Sum of **Value** Added in the Economy during a Given Period.
   [value]The value added by a firm is defined as the value of its production minus the value of the intermediate goods used in production.(**Social utility**)

income side

3. GDP Is the Sum of Incomes in the Economy during a Given Period.(Measured before applying taxes)
   [incomes]
   1.labor income: revenues goto pay workers
   2.capital income(profit income): revenues goto firm, as remuneration for the owners of the capital used in production.

> [!] Aggregate production and aggregate income are always equal

Households-Firms circular flow

- [Factors of production] include *labor*, *physical capital*, *land*, *natural resources*, etc.
- [Factor payments] are what firms pay for the factors of production, which generally include wages and rents
- Households supply [factors of production], receive [factor payments], and pay for **goods and services**
- Firms hire [factors of production] and produce **goods and services**

Diagram

$$Households \underset{\text{deliver food \& services}}{\overset{\text{pay for food \& services}}{\rightleftharpoons}} Firms$$

$$Households \underset{\text{pay for factors of production}}{\overset{\text{supply laber \& other factors of production}}{\rightleftharpoons}} Firms$$

Omitted in the Diagram

- Government

    - Collects taxes and Redistributes
    - Purchases goods and services
    - Hires government workers and provides government service
- Financial sector
    - Savers supply funds and borrowers demand loans
- Foreign sector
    - Trades goods and services and financial assets

Components of GDP

- Final goods and services go to four sectors
    - households
    - firms
    - government
    - the foreign sector
- These roughly correspond to four components of GDP
    - Consumption: Spending by households for goods and services
    - Investment: Spending on **capital** formation(expansion)
      [capital]Capital is used to produce more goods and services, but does not become part of them
        - [!]**financial instruments** \DONOT count as investment or towards GDP
            - Trading of financial assets is like trading used goods -no value is created through the change of ownership
- Government purchase: Government's purchase of goods and services
  [!]**transfer payments** not included
  [transfer payments]Transfer payments refer to the redistribution of income and wealth through the economic system by the government or other entities without receiving any corresponding goods or services in return
    - Net eXport
      Exports (X) count towards GDP, no matter if final or not
      Imports (IM) are deducted since they are not produced within the border but recorded as consumption/investment/ government purchase
      Net Export: $NX = X - IM$
      that,

$$GDP = C + I + G + NX$$

Nominal and real GDP

Nominal GDP((current)dollar GDP)

Nominal GDP is the sum of the quantities of final goods produced times their **current** price.
[current]This definition makes clear that nominal GDP increases over time for two reasons:

1. the **current** production of most goods increases over time.
2. the **current** price of most goods also increases over time.

Real GDP(GDP in terms of goods, base year dollar GDP, GDP adjusted for inflation)

Real GDP is the sum of the quantities of final goods produced times their **constant** price.
[constant] a weighed coefficient for all final goods

- base year method
  GDP calculated with prices from the same year (the base year)
  [base year] real GDP is equal to nominal GDP
  real GDP in chained [base year] dollars
- Chain method: takes both years 'GDP as factors
  $\frac{\text{Real GDP 2008}}{\text{Real GDP 2007}} = \sqrt{\frac{\text{2008 GDP using 2007 Prices}}{\text{2007 GDP using 2007 Prices}}} \sqrt{\frac{\text{2008 GDP using 2008 Prices}}{\text{2007 GDP using 2008 Prices}}}$

Denotations

1. GDP will refer to real GDP and Y_t will denote real GDP in year t.
2. Nominal GDP, and variables measured in current dollars, will be denoted by a dollar sign in front of them—for example, $ Y_t for nominal GDP in year t.

GDP: Level versus Growth Rate

growth in real GDP
$Growth\ \ Rate = \frac{Y_t \ - \ Y_{t-1}}{Y_{t-1}}$

- real GDP per person(GDP per capita)
  the average standard of living
- expansion and recession
  positive growth and negative growth of GDP

What GDP omitted

1. Non-markets activities
   - household production
   - volunteer services
   - barter(service for service)
2. Leisure
3. Underground
4. Environment Quality
5. Ignore Inequality

2. Inflation

inflation - the rate of growth in prices

Price indices

price index measures the average price of a given class of good or services relative to the price of the same goods and services in a base year

GDP deflater

GDP deflator - prices of all final goods in GDP

$$P = GDP\ deflator = \frac{Nominal\ GDP}{Real\ GDP} * 100$$

[!]GDP deflator of the base year is 100
[Pt]P_t is GDP deflator at year t

$$\pi_t = Inflation = \frac{P_t\ -\ P_{t-1}}{P_{t-1}}$$

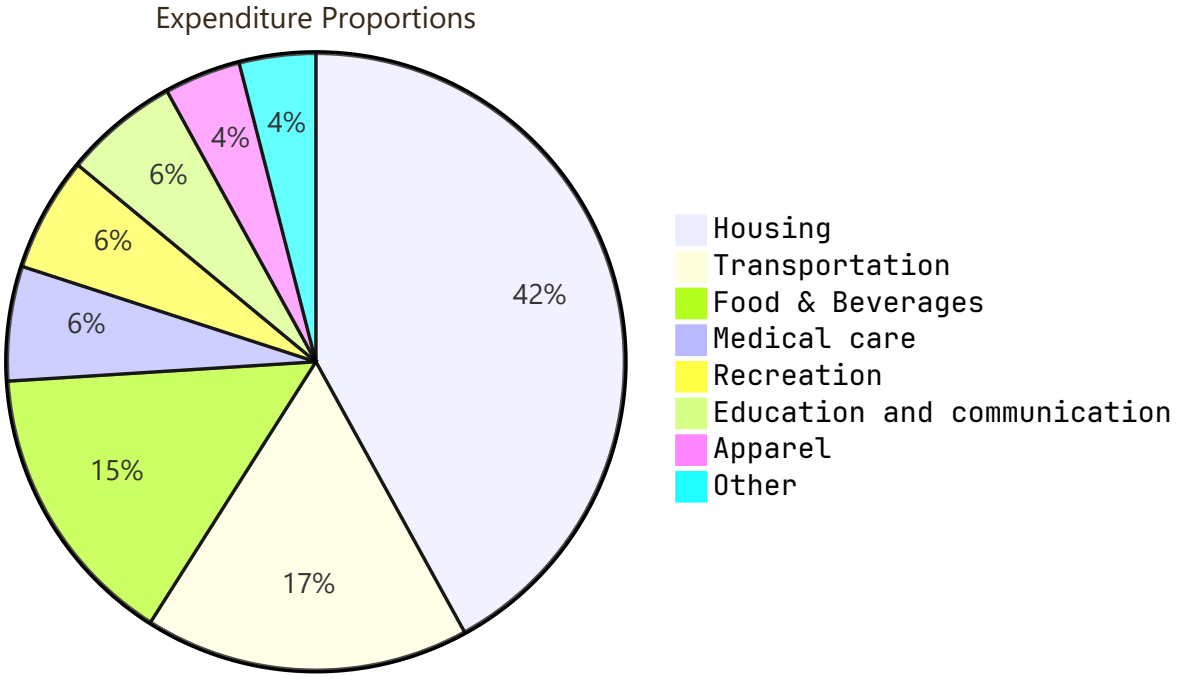
Consumer Price Index (CPI)

CPI is the ratio of the cost of the **basket of goods** in **current year** to the cost in the **base year**

$$CPI_t = \frac{Price\ Of\ Basket_t}{Price\ Of\ Basket_{base}} * 100 = deflator$$

[!]CPI for the base year is always 100

- cost-of-living adjustments (COLAs)
  - reflect changes in cost of living
  - measure inflation
- Divide a nominal quantity by its price index to express the quantity in real terms
  [CPI's baskets]



Indexing

Indexing increases a nominal quantity each period by the percentage increase in a specified price index
Real(constructed quantity) * CPI = Nominal(actual quantity)

Bias

1. Substitution Bias
   - The weighed price omit the cheaper goods consumers would choose because of different growth speed of each price

2. Consumers prefer to choose cheaper alternatives, but CPI still calculate the dearer
3. Unmeasured Quality Change
   > ==CPI **overstate** the increase of living cost

Inflation and Interest Rates

Nominal interest rates

Nominal interest rate is the annual percentage increase in the current **value** of a financial asset or debt
[!]Not adjusted for inflation
[value]price reference

Real interest rate

Real interest rate is the annual percentage increase in the **real purchasing power** of a financial asset or a debt
[purchasing power]Real cost of borrowing
Fisher equation:
real interest rate = nominal interest rate - inflation

$$r = i - \pi$$

or

$$r = i - \pi^e$$

Costs of Inflation

1. Noisy prices
- Real prices measures
  1. cost of production
  2. the value consumer places
- Nominal prices also measures
- inflation
  So, consumer can't distinguish production information from the price clearly
2. Menu cost
- Chancing current determined price is costly
- Lack of incentive to change price contributes to **nominal rigidity**
  [nominal rigidity]nominal variables can't response to the market immediately
3. Costs of Holding Cash
- Nominal money tends to depreciate
  People manage cash balances to limit losses
4. Distortions in Tax
- Tax laws usually assume zero inflation
- Capital depreciation allowance

5. Redistribution of Wealth
   Unfairly distribute the capital between borrowers and lenders

6. Difficulty in Long-Run Planning
   Erratic inflation makes planning risky

3. Labour Market and Unemployment

Labour market

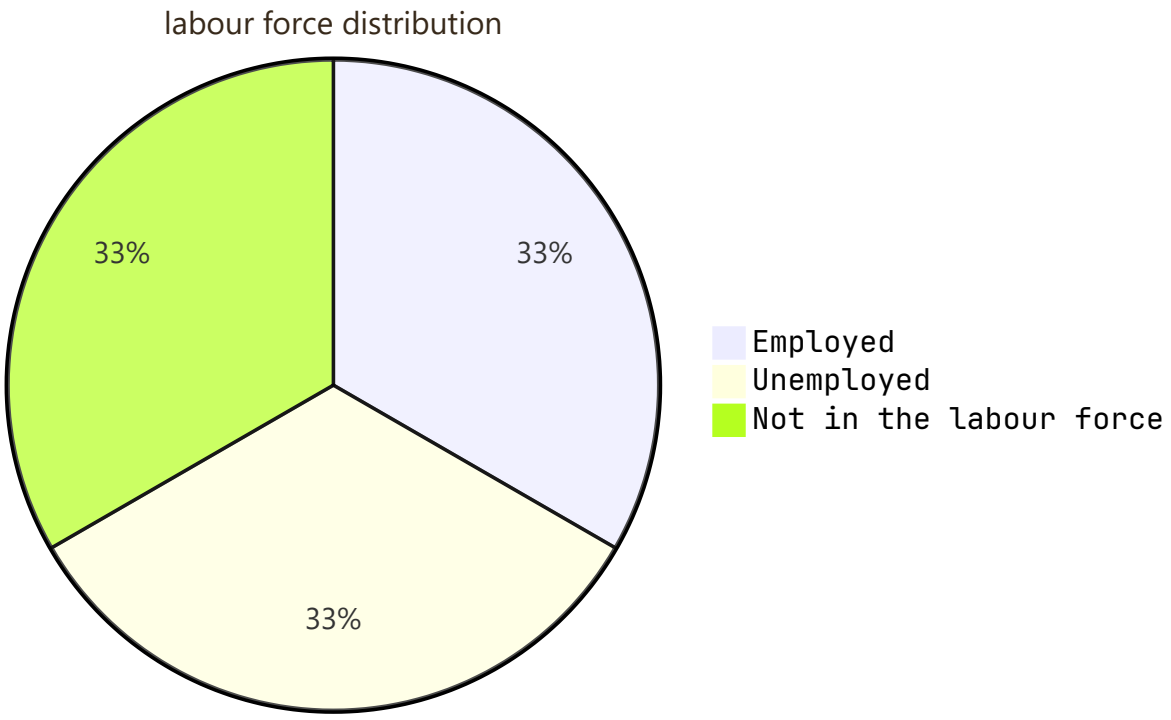
- labour market is an input market
  - wage ⟺ price
  - employment(employer, employee) ⟺ quantity(demanded, supplied)
- Supply and demand principle works to explain the wages of worker and quantity of labour (employment conditions)
  S&D curves shifts

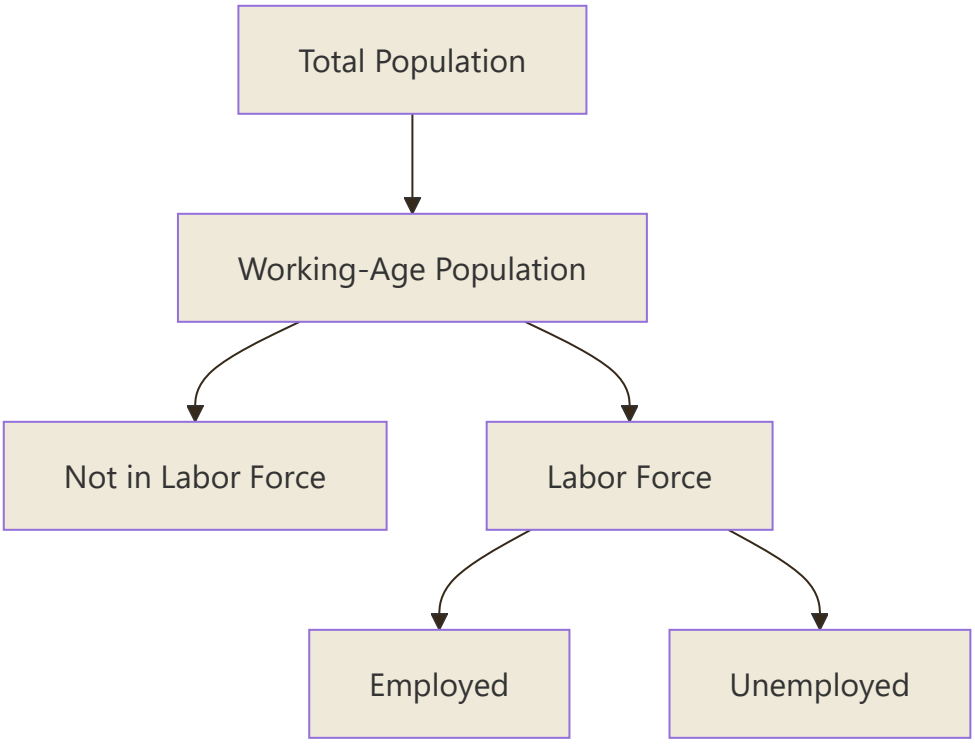
demand of labour

7. the productivity of workers
8. returns of marginal worker(marginal utility)
- negative return
- constant return
- positive return
9. wage rate
   marginal revenue product of labour(MRPL) > wage rate
   [wage rate]wages for worker per period

supply of labour

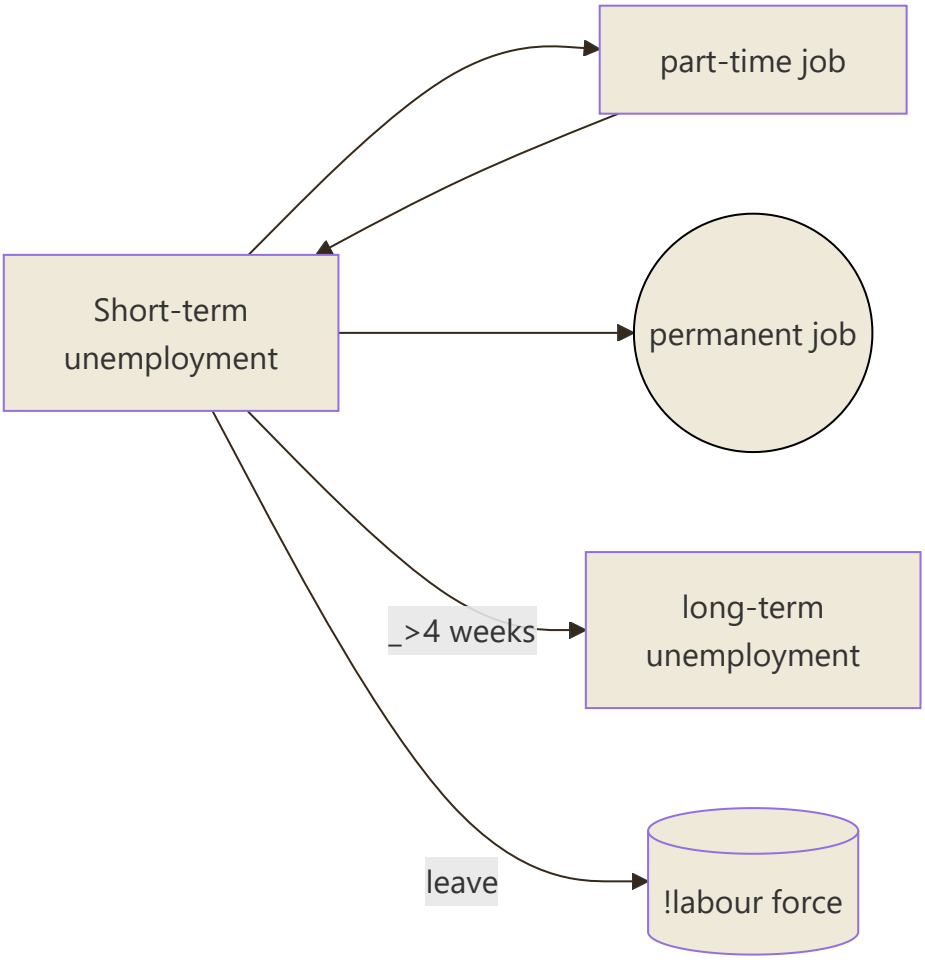
- Aggregate labour supply
  - size of working labour population
  - elasticity of employment
    as share of willing working-age population
  - immigration and emigration;
- Real wages
  - nominal wage / deflater



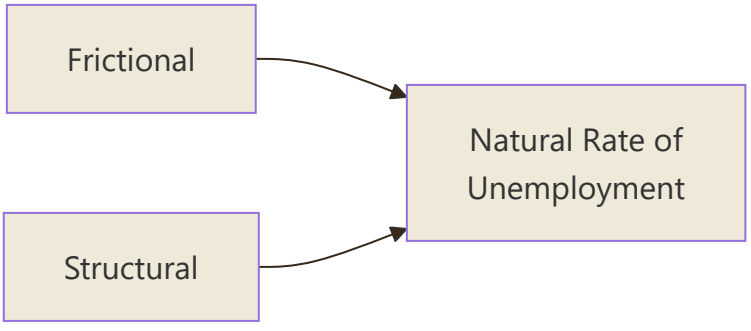


Unemployment

- Duration
  [Unemployment spell] is the period during which an individual is continuously unemployed
  [Duration of Unemployment]length of **unemployment spell**



- Type of Unemployment
  - [frictional]
    occurs when workers are between jobs
  - [structural]
    long-term, chronic unemployment
    for that:
    mismatch between workers and market needs
  - [cyclical]
    is the increase in unemployment during economic slow-downs



- [nature rate of unemployment] The nature rate of unemployment around which the actual **unemployment** rate **fluctuates**

Natural Rate(of unemployment)

- Factors
  - UI(Unemployment insurance)
  - Training programs
  - Labour laws
  - Minimum wages
  - Efficiency wages
  - Unions
    +Empowers workers' life
    -cartels leading employment
    [cartels] a kind of Monopoly Institutions

4.Growth

production function

$Y = AF(K, L, H, M)$
[Y] real GDP
[A] level of technology & other factors
[K] capital
[L] labour
[H] human resources
[M] others

$$\begin{aligned} & \lambda Y = AF(\lambda K, \lambda L, \lambda H, \lambda M) \\ let: \ & \lambda = 1/L \\ & Y/L = AF(K/L, 1, H/L, M/L) \\ let: \ & y = Y/L, \ \ k = K/L, \ \ h = H/L, \ \ m = M/L \ \ \&\& \\ suppose: \ & f(k, h, m) = F(k, 1, h, m) \\ then: \ & Y/L = AF(k, 1, h, m) = f(k, h, m) \end{aligned}$$

Cobb-Douglas production function

$$Y = AK^{\alpha}L^{1-\alpha}$$

- Diminishing return to K || L
- Constant return to scale

5. Financial Products

Financial Institutions

- Financial system
  The group of institutions that **funnel** saving of one person to fund the investment of another
  - Financial markets
    Institutions where savers can **directly** provide funds to borrowers
    - Bond market: Companies borrow from investors
    - Stock market Company sells partial ownership
  - Financial intermediaries
    Institutions through which savers **indirectly** provide funds to borrowers
    - Banks

        - Mutual funds, insurance companies

Savings

- Flow & Stock
  1. Flow: **var** per unit of time
  2. Stock: **var** at point in time
     - *Flow* causes the change of *Stock*
- National Saving: total saving in the economy
  National saving = Private Saving + Public Saving
  Given that Y=C+I+G+NX

$$S_{National} = S_{private} + S_{public} = (Y - T - C) + (T - G) = Y - C - G$$
$$= I + NX$$

  when NX=0, S=I i.e. In a **closed** economy, Saving = Investment
  1. Private saving
  - households saving

$$S_{\text{private}} = Y - T - C$$

  - Y: i.e. GDP = total income of households
  - T: real Tax = nominal Taxes - transfers ? - Government interest payments
  [GIP] :Interest is paid to holders of government bond
  - C: consumption
  - Reasons for household saving
  1. Life-cycle saving
  - Education
  - Retirement
  2. precautionary saving
  - Unemployment
  - Medical emergency
  3. Bequest saving
  - Inheritance
  - firm saving
  - retained earnings
  - depreciation assets
  [retained earnings] respect to the mermaid below
  2. Public saving

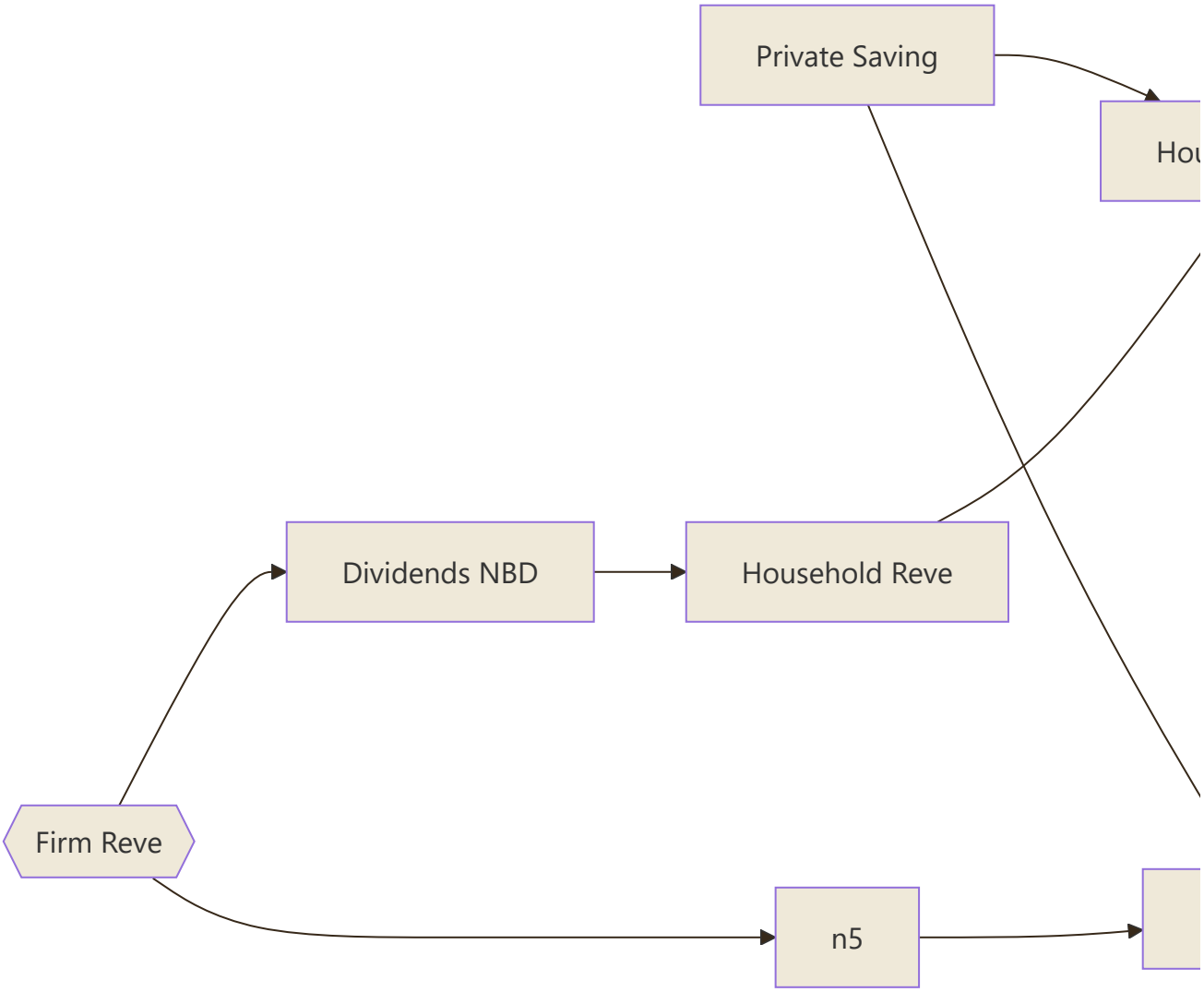
$$S_{public} = T - G$$

  - Budget statues
  1. Budget surplus: T[Tax] > G[Government Spending]
  2. Budget deficit T < G
  3. Budget balanced T = G
  - government spending increases beyond tax revenue
  - Government has to borrow to finance its deficit
  - Less funds available for private investment

  3. Device to support saving
  1. Favorable demographic structure
  - Mainly working age POP (*Life-cycle saving*)

- Longer life expectation
2. Lower the cost of saving ⇒stock || Raise the cost of withdrawal ⇒flow
3. Reduce government budget deficit || increase government budget surplus
- pension

Financial Market Graph



Financial markets

- Interest rate
  - Real interest rate: $r = i - \pi$
  - Increase in the interest rate
    ⇒ saving more attractive
    ⇒ raises the quantity of loanable funds supplied
- Funds: households loan their saving out to Financial intermediaries

    - Benefits
        1. Households earn interest
            - Ac. r
        2. Profits retained by firms to fund investments
        3. Increase supply of loanable funds
- Crowding out

Demand Curves in Financial market

```
Saving(Funds) Supplied <=> Quantity Supplied

Investment(Capital) Demanded <=> Quantity Demanded

Interest Rate <=> Price(Cost)

Market Equilibrium <=> Saving supplied = Investment demanded
```

`r is the Return to` **`Saving*`**
`r is the Cost of` **`Investment`** `&&` **`Borrowing`**

- Saving Demand Curve
  Supply of *Saving* ⟹ Financial Market(Borrowing supplied)
- Loanable funds Demand Curve
  Demand of *Borrowing* ⟹ Financial Market(Investment supplied)
- Investment Demand Curve
  Demand of *Investment* ⟹ New Capital formation
  [!] \NOT financial assets
- Market Equilibrium
  $\text{Saving Supplied} = \text{Investment Demanded}$, at some point *r*
  ⟹ $S = Y - C - G = I$, in a closed Financial system
  that implies, `Y = C + I + G`

Investment

`investment is the purchase of new capital`
:: funded by *Market* in *Financial System*(set up loans)

- Capital Formation
  Cost-Benefit Principle: Pursue investment if **cost** is less than **benefit**
  ⟹ create `Investment Demands`:
  - Firms borrow for equipment
  - Households borrow for financial assets
  ! the purchase of **stocks** or **bonds** is \NOT investment!
- Investment Decisions
    - *Cost* of capital

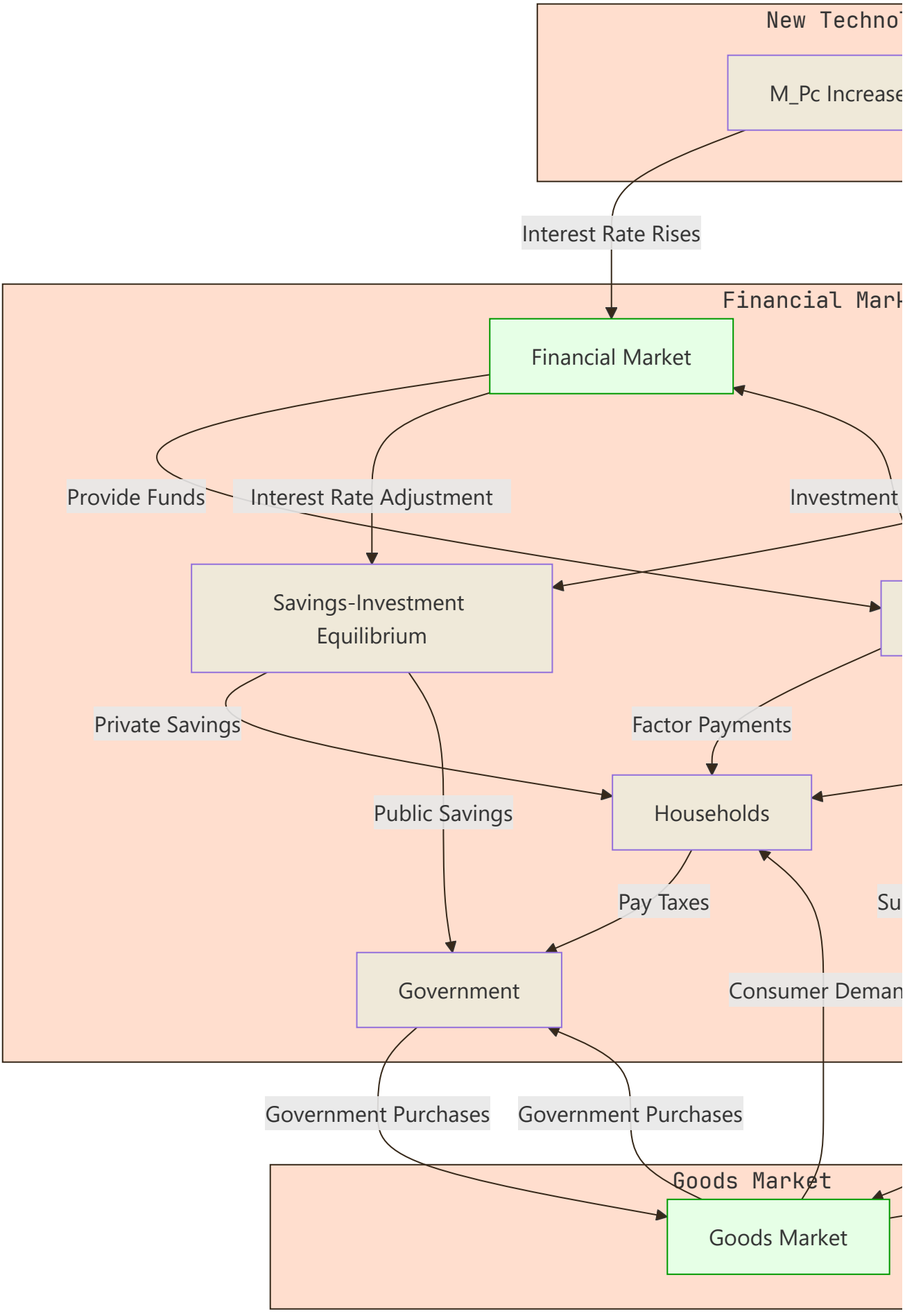
$$\text{Annual cost} = \text{real interest rate} * \text{price of real capital}$$

- *Benefit* of capital

$$\text{Benefit} = M_{Pc}(\text{marginal product of capital})$$

```java
class Hello{
    public static void main{
        System.out.println("Hello, world!")
    }
}
```

All-in-one System Market Graph


New Techno
M_Pc Increase
Interest Rate Rises
Financial Mark
Financial Market
Provide Funds
Interest Rate Adjustment
Investment
Savings-Investment Equilibrium
Private Savings
Factor Payments
Public Savings
Households
Pay Taxes
Government
Consumer Deman
Government Purchases
Government Purchases
Goods Market
Goods Market

6.Monetary Economy

Money

- Barter: trade with good or service
- Functions of money
  1. Medium of exchange
  2. Unit of account`
  3. Store of value
- Kind of money
  1. Commodity money: real things with value
  2. Fiat money: Legal Tender(money to pay a debt in legal)

Money supply

- Measures of Money
  1. M0
     1. Only currency
  2. M1
     2. Currency
     3. Demand deposits
     4. other liquid deposits
  3. M2
     1. M1
     2. **small denominations** time deposits
     3. **retail money market** funds
  4. M3
     4. M2
     5. other types of assets(~~depreciated~~)
- Fractional(partial) Reserve Banking
  - reserve ratio *R*
  - Reserve ratio = Total reserves as a percentage of total deposits

$$\mathrm{R}_{bank} = \frac{\mathrm{M}_{\text{res by bank}}}{\mathrm{M}_{\text{deposit in bank}}}$$

  - reserve requirements (*rr*)
  - established by centre bank, to guarantee (**R>rr**)

  - Money multiplier: the amount of broad money generated with the money supplied by the central bank
  - At maximum, the money multiplier is *1/R*(minimum is *0*)

Monetary Theorem

- a *Run* on a bank
  - When people suspect that a bank is in trouble, they may "**run**" to the bank to withdraw their funds
- Monetary Policy: Central banks administrations
  1. Open-Market Operations (OMOs): the **purchase and sale** of **securities**, mostly government bonds, by the central bank

2. Reserve requirement (*rr*)
   affect how much **loanable fund** commercial bank can **supply**
   - the **reserve rate** of commercial bank cannot below *rr*
3. Discount rate
   the **interest rate** for commercial bank borrowing from central bank
   - guarantee that Reserve requirement cannot be avoid by short term borrowing

- Other policies
1. **Repos**(repurchase agreement) and **Reverse repos**
   1. *Repo*: short-term borrowing with government securities
      - A dealer sells government securities and **buys it back** after a short period at slightly **higher prices**
        [=]**Reverse** Short selling 反向做空
   2. *Reverse Repo*: short-term lending
      - A buyer buys government securities and **sells it back** after a short periods at slightly **higher prices**
        [=]Long Position 做多
2. Quantitative Easing (QE)
   - Central bank **directly** purchasing **riskier & longer-term** assets in *open financial markets*

Monetary flow func

$$MV = YP$$

or, $M^d = kYP$ (money demand func)

- M: **aggregate** money supply
- V: **average** velocity of monetary flow (k=1/V)
- Y: **aggregate** output
- P: price level(**average** nominal price)

$$\Delta M\% + \Delta V\% = \Delta Y\% + \Delta P\%$$

when V is a constant,

$$\Delta M\% = \Delta Y\% + \Delta P\%$$

Monetary neutrality

Monetary neutrality is a proposition stating that changes in the `money supply` `do not affect real variables`

7. Fluctuations

Business Cycles

- Recession: real growth rate < 0
  - a *significant decline* in economy that is *spread across the economy* and that *lasts more than few months*
  - `depth, diffusion, duration`
- Peak: High point(beginning) of the business cycles

- Trough: Low point(end) of a recession
- Characteristics
  1. Economic fluctuations are *irregular and unpredictable*
  2. Most macroeconomic variables fluctuate together; there is *one* business cycle for the whole economy
  3. As output falls, unemployment rises(*counter-cyclical*) and capacity utilization falls(*pro-cyclical*)
  4. Inflation slows down during recessions
  5. Business cycles are coordinated among *trading nations*
  6. Business cycles reflect [short-term fluctuations] of the economy

Short-term fluctuations

- Properties
  1. Recessions and expansions are irregular in their length and severity
  2. Recessions and expansions affect the entire economy
  3. Recessions may have global impact
- Potential output, Y^*, is the maximum sustainable amount of real GDP that an economy can produce(full-employed GDP)
  - Y^* can be exceeded with greater capital and labour for a short time
  - Y^* grows over time
  - Y(Actual output) grows at a variable rate, generally follows Y^*
- Output gap: the difference between potential output and actual output at a point of time
  - $$\text{Output gap} = \frac{Y - Y^*}{Y^*} \times 100\%$$
  - gap negative $\Rightarrow$ $Y < Y^*$ $\Rightarrow$ *Recession*
  - gap positive $\Rightarrow$ $Y > Y^*$ $\Rightarrow$ *Expansion*
  - ☑ *Stabilization policies* considered when there are output gap
-
- Cyclical unemployment
  - natural rate of unemployment, $u*$, is the sum of frictional and structural unemployment
  - Cyclical unemployment, u_c = u - $u*$
    - Recessionary $\Rightarrow$ $u > u^*$ $\Rightarrow$ $u_c > 0$
    - Expansionary $\Rightarrow$ $u < u^*$ $\Rightarrow$ $u_c < 0$
    - ☑ Okun's law: describe how the u_c changes with output gap
      - $\Delta(Y - Y^*)=2\Delta u_c$,or $\Delta u_c=1/2\Delta(Y - Y^*)$
- Inflation and Deflation
  - Inflation: refer to whatever the *Price Level increase*
  - Deflation: refer to whatever the *Price Level decrease*

Consumption func

- Current disposable Income, Y^D
  - Y^D = $Y - T$, where T = Taxes - Transfers - Government interest payments
  - Marginal propensity to consume (MPC)

        - $$MPC = \frac{\text{Change in consumption}}{\text{Change in } Y^D} = \frac{\Delta C}{\Delta Y^D}$$
    - Marginal propensity to save (MPS)
        - MPS = 1 - MPC
- Consumption func
  -
$$C = a + b \times Y^D, b = MPC$$
  - a: autonomous consumption
  - a = $f(Y^{De}$, r, $Wealth$, P)
  - Y^{De}: Expected deposable output +⟹ a⬆️
  - r: Real interest rate +⟹ a⬇️
  - Wealth: Household Assets - Households Liabilities +⟹ a⬆️
  - P: Price level +⟹ Wealth -⟹ a⬇️
  - b * Y^D: income-side consumption
  - b=MPC

Investment func

- Interest Rate Sensitivity Ratio (RSR)
    - RSA: Rate sensitive assets
    - RSL: Rate sensitive liabilities
    - $$RSR = \frac{RSA}{RSL}$$
- Investment func
  -
$$I = a - b \times r$$
  - a: autonomous investment
  - a = $f(Y^D$, Y^{De}, Tax)
  - Y^D: Cash Flow +⟹ a⬆️
  - Y^{De}: Expected profitability +⟹ a⬆️
  - Tax: Tax Policies
  - b * r: interest-prone Investment
  - b=RSR

8. Net Export

- Definition:
$$NX = X - IM$$
    - *X*: Export
    - *IM*: Import
    - **NX** measures a country's balance of trade in goods and services
        - NX > 0 ⟹ Trade deficit
        - NX < 0 ⟹ Trade surplus
        - NX = 0 ⟹ Trade balanced

Exchange rate

nominal exchange rate E:
E = Value of domestic currency / Value of foreign currency

real exchange rate e:
e = Purchasing power of dom / Purchasing power of fore = $E * \frac{P_{dom}}{P_{fore}} \Rightarrow$

$\Delta E\% = \Delta P_{fore}\% - \Delta P_{dom}\% = \pi_{fore} - \pi_{dom}$

- Interest Parity (IP)
  - the return value of asset everywhere should be equivalent, due to exploiting of arbitrage
  - formula:
  - $$1 + i_t = (1 + i_t^*)\frac{Et}{E_{t+1}^e}$$
  - Taking log for approximation:
  - $$i_t = i_t^* - \Delta E^e\%$$
  - $\Delta E^e\%$ is the percent change of E within expectation
- Purchasing Power Parity(PPP)
  - PPP is a theorem insists that E should be *s.t.* ***e=1***
    - e=1 $\Rightarrow$ $E * \frac{P_{dom}}{P_{fore}} = 1$
    - *i.e.* $E = \frac{P_{fore}}{P_{dom}}$

Export Func

$$X = f(e, Y^*, Preference, Policies)$$

- Determinant of Exports
  - Real exchange rate (e)
    - w.r.t nominal exchange rate E && inflation rate π + $\Rightarrow$ ⬇️
  - Income of trading partners Y^* + $\Rightarrow$ ⬆️
  - Preference of foreign customers
  - Trade policies

Import Func

$$I = f(e, Y, Preference, Policies)$$

- Imports
  - Real exchange rate (e)
    - w.r.t nominal exchange rate E && inflation rate π + $\Rightarrow$ ⬆️
  - Income of domestic buyer Y ⬆️

Sum Up: P_{dom}+ $\Rightarrow$ e+ $\Rightarrow$ NE ⬇️ ^exchange-rate

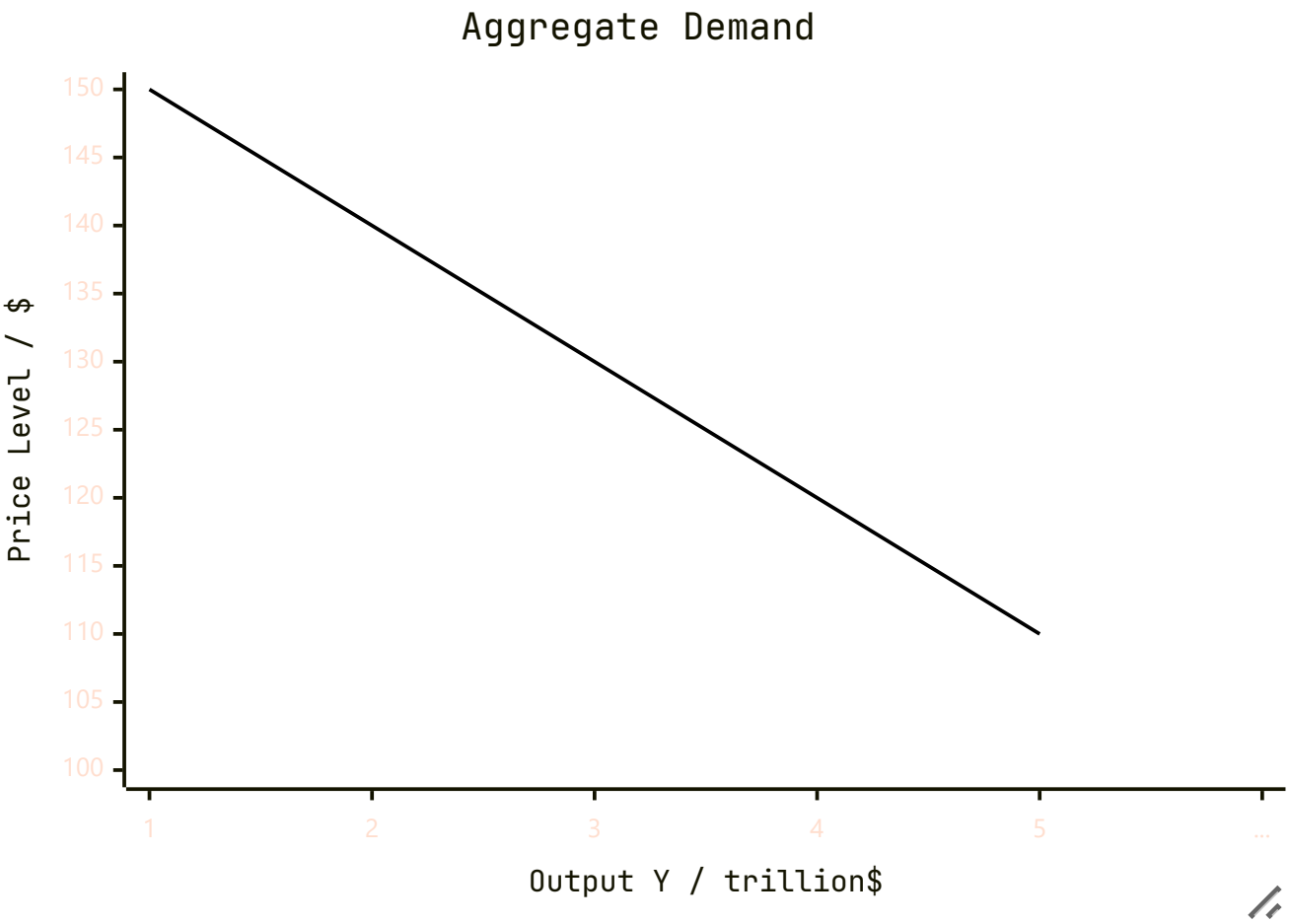
Limitations of global parity theorems

- Hold only for no-arbitrage(or full-arbitrage) circumstances and may fail for:
  1. Many good cannot easily be traded
     - Price difference cannot be arbitraged away
     - Cost of storage and transportation
  2. Tariffs creates gaps in prices
  3. Foreign and domestic goods may not be perfect substitutes
     - Preference

Aggregate Demand

> measured by Aggregate Expenditure, i.e. GDP

AD curve



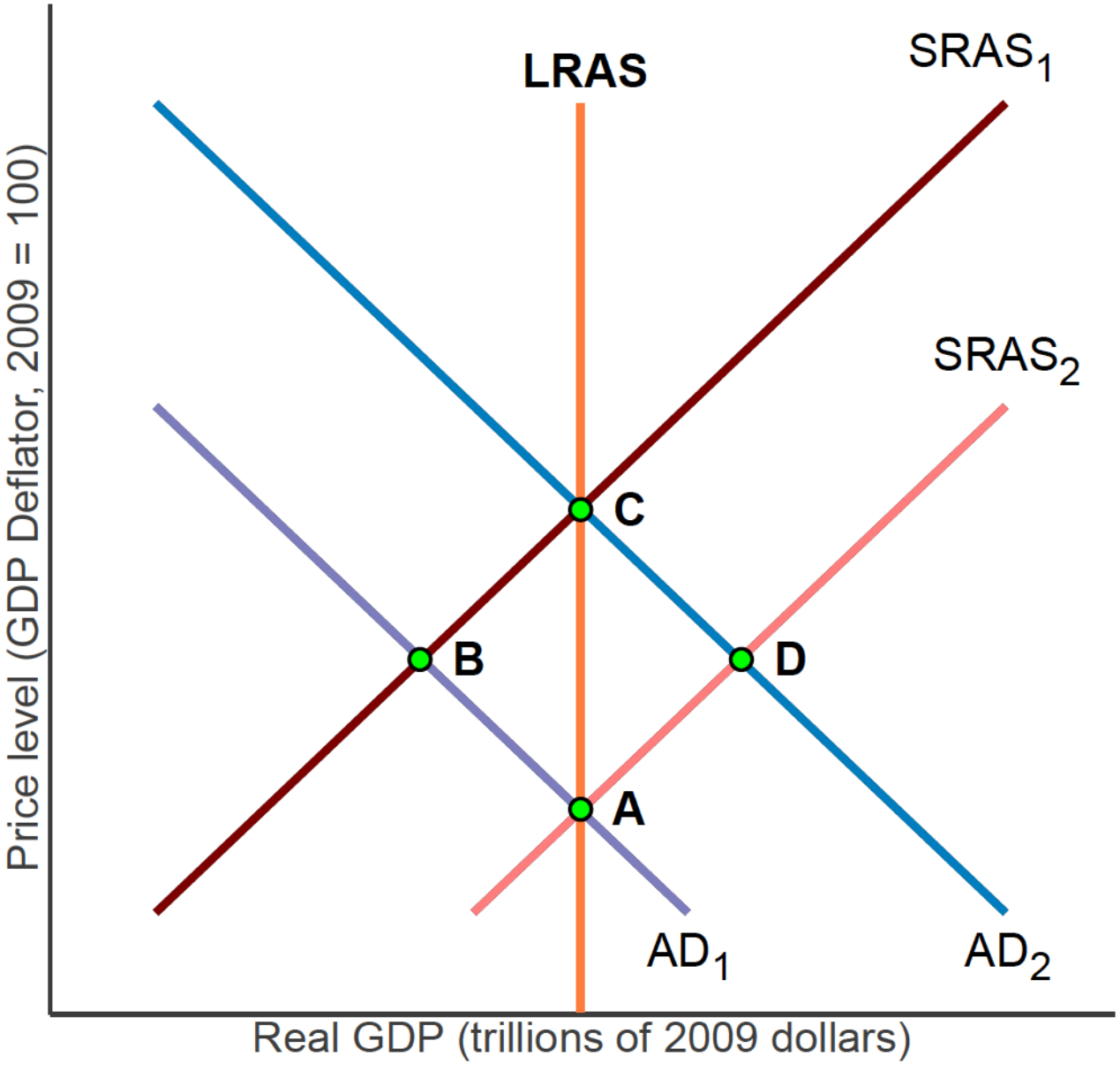
AD func

- Y = C + I + G + NX
  - C: P+ ⇒ Wealth -⇒ a⬇ ⇒ C⬇ ^consumption-func
  - I: P+ ⇒ Md+ ⇒ r+ ⇒ I⬇ ^monetary-func^investment-func
  - NX: P+ ⇒ NX⬇ ^NX-func
- ⇒ P+ ⇒ Y⬇

10. Aggregate Supply and Aggregate Equilibrium

- SRAS:
  - slope up
    - menu cost
    - cost delay ⇒ sales bonus due to price level rises
- LRAS
  - vertical
    - Output(real GDP) not depends on price level

AS curve



Equilibrium occurs at the intersections of ADs and ASs

Phillips Curve

Phillips curve evaluate the