Long Run Macroeconomics

Economic Growth
- The way to define wealth is to look at growth rates
- The rule of 70 states that if a variable grows at x% per year, then it will take 70/x years for that variable to double
- Real GDP per capita measures the ratio of a countries real GDP and its population

$$Real\ GDP\ per\ Capita = \frac{Y}{Pop} = \frac{Y}{Number\ Employed} \times \frac{Number\ Employed}{Pop}$$

- Real GDP per capita only grows if:
    - Average labour productivity grows (Y/N)
    - Share of working population grows (N/Pop)

Determinants of Labour Productivity
- Physical capital
- Land and other natural resources
- Technology
- Human capital
- Entrepreneurship and management
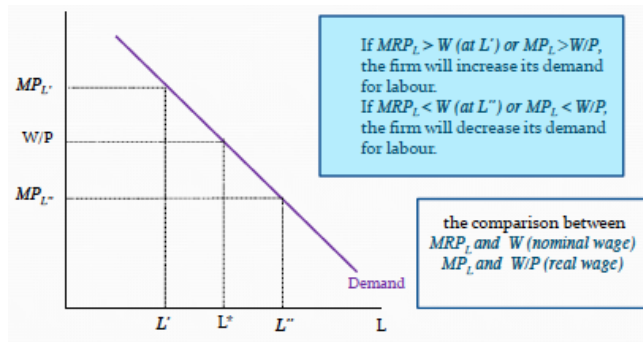- Political and legal environment

Labour and Capital
- Labour and capital are a firm's primary factors of production
- Secondary factors include:
    - Level of technological advancement
    - Skills possessed by the workforce
    - Managerial expertise
    - Access to infrastructure
    - Governments ability to provide political stability
- Decisions for capital and firms are based on the cost and benefit principle
    - Marginal cost is the real interest rate
    - Marginal benefit is the marginal product of capital
- When prices are constant, marginal revenue product of capital declines as the size of capital increases
    - As capital increases, marginal product of capital decreases

$$MRP_K = P \times MP_K$$

Demand for Labour
- The marginal benefit of hiring labour must exceed the marginal cost
- The marginal revenue product of labour (MRP_L) refers to the extra revenue received by a firm from selling the output obtained from an extra unit of labour

$$MRP_L = P \times MP_L$$

If $MRP_L > W$ (at L') or $MP_L > W/P$, the firm will increase its demand for labour.
If $MRP_L < W$ (at L'') or $MP_L < W/P$, the firm will decrease its demand for labour.

the comparison between
MRP_L and W (nominal wage)
MP_L and W/P (real wage)

Cobb-Douglas Production Function
- How much is produced at a given time, given a certain amount of primary factors of production (labour and capital)
- Secondary factors are assumed to be constant

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$$

- Labours total share in the economy is 1-α
    - If 1-α is 0.75, a 1% increase in the labour supply will lead to a 0.75% increase in growth
- Capitals total share in the economy is α
    - If α is 0.25, a 1% increase in capital stock will lead to a 0.25% increase in growth
- A 1% increase in total factor productivity (secondary factors) leads to a 1% increase in growth
    - Total factor productivity is referred to as the Solow Residual

Solow-Swan Model of Economic Growth
- Neo-classical growth model focussing on the role of capital accumulation to explain growth
- The level of GDP per worker depends on:
    - The level of total factor productivity
    - The amount of capital relative to the size of the labour force
- In the closed economy, S =I and thus s =θy (per capita savings)

Types of Investment

- Replacement investment (RI) is plant and equipment replacing worn out capital
    - Contributes to keep capital stock at initial level
    - New workers have to be equipped with enough capital so that the capital-worker ratio does not fall
    - A fraction of the capital stock which depreciates must be replaced
- Net investment (NI) is investment that exceeds the replacement of capital
    - Increases capital stock

$$ri = (n + d)k$$
$$i = ri + \Delta k$$

- The capital labour ratio will only grow if total savings exceeds replacement investment:

$$\Delta k = \Theta y - (n + d)k$$

Steady State

- Economy's steady state is the point at which neither per capita capital stock nor per capita income are changing
    - Savings will equal replacement investment

$$\Theta y = (d + n)k$$

- The convergence hypothesis states that countries with relatively low per capita capital stocks will grow faster than countries with higher per capita capital stocks
    - Given a similar steady state level, countries per capita incomes will eventually converge