

# Econ 702 - Week 2

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## 1 Solow growth Model

### 1.1 Review

- Firm

- Production function

$$Y_t = A_t F(K_t, N_t)$$

- Firms rent capital at a rate  $r_t$  and pay workers a wage of  $w_t$ . Those variables are exogenous to the firm. It chooses  $K_t$  and  $N_t$  to maximize

$$\Pi_t = A_t F(K_t, N_t) - r_t K_t - w_t N_t$$

- The FOCs are

$$w_t = A_t F_N(K_t, N_t), \quad r_t = A_t F_K(K_t, N_t)$$

- Household

- The household owns capital stock  $K_t$ , which it can rent to firms.
- Each household is also endowed with  $N_t$  unit of labor which it supplies to firm.
- It is assumed that a constant fraction of income is saved.

$$I_t = sY_t, \quad C_t = (1 - s)Y_t$$

- The equations of Solow model and their corresponding per worker terms are

- $Y_t = C_t + I_t$
- $Y_t = A_t F(K_t, N_t)$
- $K_{t+1} = I_t + (1 - \delta)K_t$
- $I_t = sY_t$
- $w_t = A_t F_N(K_t, N_t)$
- $r_t = A_t F_K(K_t, N_t)$

## 1.2 Exercise: Simple two country model - Allocation Puzzle

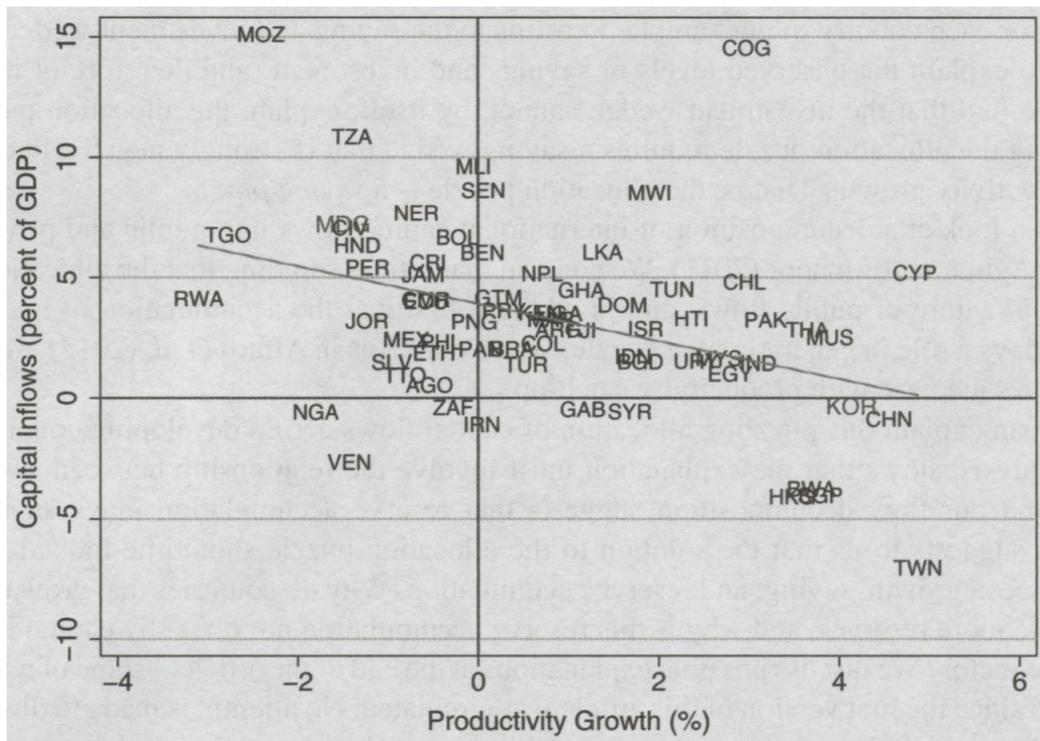
Suppose there is only one period and there are two countries A and B. In country A, there is one representative household who owns capital stock  $K_A = \bar{K} > 0$  and one unit of labor  $N_A = 1$ . There is one representative firm who produces by renting the capital with rental rate  $r_A$  and hiring labor with wage  $w_A$  in country A. The production function is

$$Y_A = A_A(\hat{K}_A)^\alpha(\hat{N}_A)^{1-\alpha}, \quad \alpha \in (0, 1)$$

Country B is symmetric except

$$A_A < A_B.$$

1. Write down the firm's profit in country A and country B. Derive the FOCs with respect to the capital choice  $\hat{K}_A$  and  $\hat{K}_B$ .
2. Suppose there is no international capital flow, i.e. firm in country A only rents the capital from country A household and firm in country B only rents the capital from country B household. Calculate the market the rental rate of capital  $r_A^*$  and  $r_B^*$  under no international capital flow.
3. Suppose there is a international capital renting market with rental rate  $r^*$  with  $r_A^* < r^* < r_B^*$ . Then which country rents from the rest of the world? Which country rents to the rest of the world?
4. Gourinchas and Jeanne (2013) show that cross country correlation between the capital inflow and productivity growth is negative among developing countries. That is, countries with higher productivity and investment opportunity experience capital outflow. Is this finding consistent with the model prediction?



**FIGURE 1**

**Average productivity growth and average capital inflows between 1980 and 2000. 68 non-OECD countries**

(Gourinchas and Jeanne (2013))