Economic Model Explanation

Economic Model

Multinational's Profit

This equation calculates the total profit of a multinational corporation. The total profit Ω_t is the sum of the profits from each country i after accounting for a tax rate τ_i^π.

$$\Omega_t = \sum_i (1 - \tau_i^\pi)\Omega_{i,t} \quad ; \quad i = \{H, F\} \tag{1}$$

Country Level Profit

This equation calculates the profit of the multinational in each country. The profit $\Omega_{i,t}$ in country i at time t depends on the productivity $A_{i,t}$, the capital $K_{i,t}$, the labor $L_{i,t}$ and population $N_{i,t}$, and the government capital $K_{G,i,t}$. The profit is reduced by the wage bill $W_{i,t}L_{i,t}N_{i,t}$.

$$\Omega_{i,t} = A_{i,t}K_{i,t}^{\alpha}(L_{i,t}N_i)^{1-\alpha}K_{Gi,t}^{\beta_i} - W_{i,t}L_{i,t}N_{i,t} \tag{2}$$

Constraint

This equation ensures that the sum of capital across all countries is equal to the sum of the specific capital in each country multiplied by the population of each country.

$$\sum_i K_{i,t} = \sum_i K_{si,t}N_i \tag{3}$$

Equations

These equations describe the dynamics of capital and savings in the economy.

$$K_{si,t} = S_{i,t-1} + (1 - \delta)K_{si,t-1} \tag{4}$$
$$\tag{5}$$

- $K_{si,t}$ represents the capital stock in country i at time t. - $S_{i,t}$ is the savings in country i at time t. - δ is the depreciation rate of capital.

$$S_{i,t} = (1 - c)Y_{i,t} \tag{6}$$
$$\tag{7}$$

- $S_{i,t}$ is calculated as a fraction $(1 - c)$ of the output $Y_{i,t}$.

$$Y_{i,t} = \frac{1}{N_i} \frac{K_{si,t}}{\sum_i K_{si,t}} \Omega_t + W_{i,t} L_{i,t} \tag{8}$$

$$\tag{9}$$

- $Y_{i,t}$ is the output in country i at time t, calculated based on the capital share and total profit Ω_t plus the wage bill.

$$K_{Gi,t} = I_{Gi,t} + (1 - \delta) K_{Gi,t-1} \tag{10}$$

$$\tag{11}$$

- $K_{G,i,t}$ is the government capital in country i at time t, updated by investment $I_{G,i,t}$ and depreciated by δ.

$$I_{Gi,t} = g_i \tau_i^{\pi} \Omega_{i,t} \tag{12}$$

$$\tag{13}$$

- $I_{G,i,t}$ is the government investment, calculated as a function of the tax rate τ_i^G and profit $\Omega_{i,t}$.

$$L_{i,t} = W_{i,t}^{1/\phi_i} \tag{14}$$

- $L_{i,t}$ is the labor in country i at time t, determined by the wage $W_{i,t}$ and a parameter ν_i.

First Order Conditions (F.O.Cs)

These equations derive the optimal conditions for profit maximization.

$$\alpha(1-\tau_i^\pi)A_{i,t}K_{i,t}^{\alpha-1}(L_{i,t}N_i)^{1-\alpha}K_{Gi,t}^{\beta_i} = \lambda_{i,t} \tag{15}$$

$$(1-\alpha)A_{i,t}K_{i,t}^{\alpha}L_{i,t}^{-\alpha}N_i^{1-\alpha}K_{Gi,t}^{\beta_i} = W_{i,t} \tag{16}$$

We get

$$\frac{1-\tau_H^\pi}{1-\tau_F^\pi} = \frac{A_{F,t}(L_{F,t}N_F)^{1-\alpha}}{A_{H,t}(L_{H,t}N_H)^{1-\alpha}} \left(\frac{K_{GF,t}^{\beta_F}}{K_{GH,t}^{\beta_H}}\right) \left(\frac{K_{F,t}}{K_{H,t}}\right)^{\alpha-1} \tag{17}$$

$$\frac{1-\tau_H^\pi}{1-\tau_F^\pi} = \frac{A_F(L_F N_F)^{1-\alpha}}{A_H(L_H N_H)^{1-\alpha}} \left(\frac{K_{GF}^{\beta_F}}{K_{GH}^{\beta_H}}\right) \tag{18}$$

Steady State and Equal Capital Stocks ($K_H = K_F$)

This equation shows the relationship between different variables when the capital stocks in both countries H and F are equal in the steady state.

$$\frac{(1-\tau_H^\pi)(\tau_H^\pi)^{\beta_H}}{(1-\tau_F^\pi)(\tau_F^\pi)^{\beta_F}} = \frac{A_F g_F^{\beta_F} N_F^{1-\alpha+\beta_F}}{A_H g_H^{\beta_H} N_H^{1-\alpha+\beta_H}} \frac{L_F^{1-\alpha+(1+\phi_F)\beta_F}}{L_H^{1-\alpha+(1+\phi_H)\beta_H}} \tag{19}$$