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

In the Solow model, we write this in per-effective worker terms:

$$y_t = \frac{Y_t}{z_t L_t} \qquad \left(z_t \equiv A_t^{1/1-\alpha} \right)$$

We find a steady state

$$y_t = y_{t+1} = y_{t+2} = \ldots = y^{ss}$$

But if y_t is constant, and z_t is growing, Then Y_t / L_t is also growing at the steady-state

Growth rate of Y_t / L_t is $\hat{z}$ (the growth rate in productivity)

- $\hat{z}$ (and $\hat{A}$) are determined <u>exogenously</u>
- In other words, $\hat{z}$ is determined by the economist, not the model (it's an <u>input</u> to the model, not an output)

Endogenous Growth

- What causes A_t to grow, and what are the implications?
- Two types of jobs in the economy. Workers either:
  1. Producing output (Y)
  2. Producing "ideas" (R&D)

     ideas make the output workers more productive

$$L = L_Y + L_A$$

Total workers = output workers + ideas workers

- For simplicity, let's assume constant capital (imagine we're at the steady state level of capital)
- Production function:

$$Y_t = A_t L_Y$$

only output workers produce output

- Assume that a constant proportion of workers are L_A type

$$L_A = \gamma_A L$$

$$L = L_Y + L_A$$

$$L = L_Y + \gamma_A L$$

$$L - \gamma_A L = L_Y$$

$$L(1-\gamma_A) = L_Y$$

Plug this into the production Function:

$$Y = A\ L(1-\gamma_A)$$

Per-worker terms:

$$y = \frac{Y}{L}$$

$$y = A(1-\gamma_A)$$

Producing Ideas (A)

$\mu_A \equiv$ the price of coming up with new ideas

$$\hat{A} = \frac{L_A}{\mu_A}$$

$$L_A = \gamma_A L$$

$$\hat{A} = \frac{\gamma_A}{\mu_A} L$$

Production Function:

$$y = A(1-\gamma_A)$$

$$\hat{y} = \hat{A} \quad \text{(just like in Solow)}$$

$$\hat{y} = \frac{\gamma_A}{\mu_A} L$$

Result: If the ideas market is monopolistic, then higher growth can be achieved by increasing R&D

→ regulating (subsidize) the ideas market