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

Marginal product of capital

$$\frac{\partial Y}{\partial K} = \alpha AK^{\alpha-1}L^{1-\alpha} = \frac{\alpha AK^{\alpha}L^{1-\alpha}}{K} = \alpha\frac{Y}{K} = r$$

Take the last equality, multiply through by K and divide by Y

$$\alpha = \frac{rK}{Y}$$

rK is capital income, hence α is capital's share of total output (i.e., capital's share of income). Similar story for labor's share.

$$A = \frac{A_1K_1^{\alpha}L_1^{1-\alpha} + A_2K_2^{\alpha}L_2^{1-\alpha}}{K^{\alpha}L^{1-\alpha}}$$
$$A = \frac{60^{0.34}60^{(1-0.34)} + 40^{0.34}40^{(1-0.34)}}{100^{0.34}100^{(1-0.34)}} = 1.0$$
$$A = \frac{70^{0.34}30^{(1-0.34)} + 30^{0.34}70^{(1-0.34)}}{100^{0.34}100^{(1-0.34)}} = 0.924\,95$$

Profit for a firm

$$\begin{aligned}\Pi &= (1-\tau_Y)\,PY - (1+\tau_k)\,rK - wL \\ &= (1-\tau_Y)\,PAK^{\alpha}L^{1-\alpha} - (1+\tau_k)\,rK - wL\end{aligned}$$

$\tau_Y > 0$, you are unfavored. If $\tau_y < 0$, you are favored

If $\tau_k > 0$, you are unfavored (raises cost of capital), and if $\tau_k < 0$, you are favored

Hiring decision. Hire labor until the marginal contribution to profits is 0. Differentiate profits with respect to labor to find its marginal contribution,

$$\frac{\partial \Pi}{\partial L} = (1-\tau_y)\underbrace{P(1-\alpha)\,AK^{\alpha}L^{-\alpha}}_{\text{True contribution}} - \omega = 0$$
$$P(1-\alpha)\,AK^{\alpha}L^{-\alpha} = \frac{w}{(1-\tau_Y)} > w$$