Goal To write code that can generate graphs to show how a country's relative autarky prices change with changes in its factor supplies, its technologies, and its preferences.

Country i's Data Country i's data consists of its factor supplies, its technologies and its preferences.

1) The factor supplies of Country i:

$$\bar{L}^i \text{ and } \bar{K}^i.$$

2) The (CRS) technologies of Country i:

$$\begin{aligned} q_x &= A_x^i (L_x)^{\alpha_x^i} (K_x)^{1-\alpha_x^i} \text{ for } A_x^i \geq 0 \text{ and } \alpha_x^i \in [0,1] \\ q_y &= A_y^i (L_y)^{\alpha_y^i} (K_y)^{1-\alpha_y^i} \text{ for } A_y^i \geq 0 \text{ and } \alpha_y^i \in [0,1]. \end{aligned}$$

3) The (homothetic) preferences of Country i:

$$U^i = (c_x)^{\beta^i} (c_y)^{1-\beta^i} \text{ for } \beta^i \in [0,1].$$

The Graphs Choose any allowable values for all of the parameters $(\bar{L}^i, \bar{K}^i, A_x^i, \alpha_x^i, A_y^i, \alpha_y^i, \beta^i)$, that is, Country i's factor supplies, its technology parameters, and its preference parameters (we won't calibrate these parameters to fit actual data, but in principle we could). Then, with x on the horizontal axis and y on the vertical axis, generate a graph of Country i's Production Possibilities Frontier (PPF). Recall that the PPF is defined as the solution to the problem, for each $\bar{q}_x \in [0, A_x^i (\bar{L}^i)^{\alpha_x^i} (\bar{K}^i)^{1-\alpha_x^i}]$,

$$\begin{aligned} & Max\ q_y \\ & s.t. \\ q_x &= A_x^i (L_x)^{\alpha_x^i} (K_x)^{1-\alpha_x^i} = \bar{q}_x \\ q_y &= A_y^i (L_y)^{\alpha_y^i} (K_y)^{1-\alpha_y^i} \\ L_x + L_y &\leq \bar{L}^i \\ K_x + K_y &\leq \bar{K}^i. \end{aligned}$$

Next, with x on the horizontal axis and y on the vertical axis, generate a graph of a few of Country i's indifference curves.

And finally, with x on the horizontal axis and y on the vertical axis, generate a graph of Country i's PPF and the indifference curve that is tangent to the PPF. Label the line that reflects the common slope of the PPF and the indifference curve, whose slope defines country i's relative autarky prices, with the label

$$-\left(\frac{p_x}{p_y}\right)_a^i.$$

Then change some of Country i's parameters and repeat the steps above, to see how changes in Country i's factor supplies, its technologies and its preferences would alter $-\left(\frac{p_x}{p_y}\right)_a^i$ and hence its comparative advantage.