Exercices

The Standard Trade Model

1. Assume that two goods (X and Y) are produced in an economy using two production factors (capital K and labour L). Factors are perfectly mobile across sectors, and the production functions for each sector are: $X = F(K_x, L_x) = K_x^{\frac{1}{2}} L_x^{\frac{1}{2}}$ and $Y = G(K_x, L_Y) = AK_y^{\frac{1}{2}} L_y^{\frac{1}{2}}$, with $K = K_x + K_y$ and $L = L_x + L_y$. Determine the Production Possibilities Frontier for this economy, this is, obtain Y as a function of X.

   Solution:

$$A\sqrt{k - \frac{\sqrt{k}x}{\sqrt{l}}}\sqrt{l - \frac{\sqrt{l}x}{\sqrt{k}}}$$

2. Suppose that we can represent the Production Possibilities Frontier of a country using the following function:

$$Y = 10 - X^2,$$

   where X and Y represent the two goods produced in the country.

   1. Consider the following international prices for each good: $p_x = 1, p_y = 0.25$. Determine how much X and Y will the economy produce and draw a diagram illustrating the solution.

      Solution: $X_s = 2, Y_s = 6$.

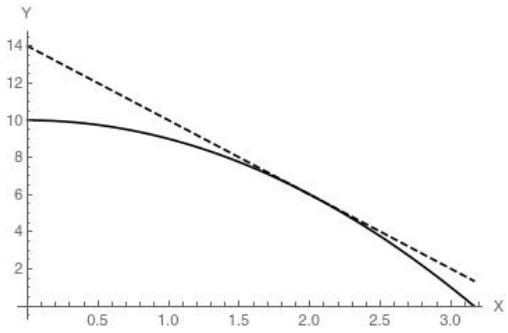

Figure 1: Exercise 2.1

   2. Furthermore, assume that consumers' utility is given by $U = \log(X) + \log(Y)$. At the relevant international prices $p_x = 1, p_y = 0.25$, determine the local demand for X and Y. Does the country import or export X and Y? Illustrate the solution.

      Solution: $X_d = 1.75, Y_d = 7$. At prices $p_x = 1, p_y = 0.25$, the country exports X and imports Y.

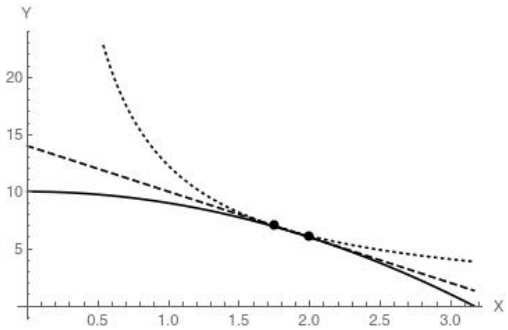

Figure 2: Exercise 2.2

3. Compute the relative supply and the relative demand curves for this economy.

   Solution: $\frac{X_s}{Y_s} = \frac{2p}{40-p^2}, \quad \frac{X_d}{Y_d} = \frac{1}{p}, \quad p \equiv \frac{p_x}{p_y}$.

   Note: the autarky equilibrium can be found either by:

   - Maximising utility subject to the PPF,
   - Finding the equilibrium relative price and computing the corresponding demand and supply.

4. Suppose that a second country (denoted by a \$) exists and that it exhibits the following supply and curves:

$$X_s^\star = 3 - \frac{(12 - 38p + p^3)}{4 + 4p}, \quad Y_s^\star = \frac{(12 - 38p + p^3)}{4 + 4p}.$$

   The demand curves coincide with across countries: $X_d^\star = X^d, \quad Y_d^\star = Y^d$. If the two countries can trade, determine the equilibrium price. At this price, does the first country import or export X and Y? **Note**: since demand curves are equal in both countries, the *world* relative demand coincides with the relative demand of either country. It is more or less simple to simplify the relative supply function, you should obtain $\frac{X_s^w}{Y_s^w} = \frac{X_s + X_x^\star}{Y_s + Y_s^\star} = p$.

   Solution: $p = 1$

3. Suppose that countries A and B have two factors of production, capital and labour and produce goods X and Y. Both countries have exactly the same technology, the production of X is capital-intensive, and country A is capital-abundant.

   1. Determine whether country A imports or exports good X.

      ** Solution**: Country A exports good X.

2. How do the following changes affect the terms of trade and what is the impact of welfare for both countries?

    1. Country A increases its capital stock.

       Solution: The relative price of X decreases, worsening A's terms of trade and improving B's. Welfare in A may increase (could decrease too, but is unlikely). Welfare in B increases.

    2. Labour supply increases in A.

       Solution: The relative price of Y decreases, improving A's terms of trade and worsening B's. Welfare increases in A and decreases in B.

    3. Country B increases its capital stock.

       Solution: the relative price of X falls, improving B's terms of trade and worsening A's. Welfare in B increases and decreases in A (A exports less and earns less for each exported good).

    4. Labour supply increases in B.

       Solution: the relative price of Y decreases, which improves A's terms of trade and worsens B's. Welfare increases in A, and it may incrase in B or decrease (less likely).

4. Korea and Singapore are similar economies in that they both have a comparative advantage with respect to the rest of the world in the production of eco-friendly products. Korea was the first to start producing such goods, and now Singapore is ramping up its production in this sector. How would you expect this to affect welfare in Korea? And in the European Union?

   Solution: The addition of Singaporean exports represents export-biased growth abroad for Korea. This reduces its terms of trade, and thus reduces welfare in Korea. For the European Union, instead, the additional exports from Singapore represent import-biased growth, which improves Europe's terms of trade and thus welfare.

5. Due to overfishing, Norway cannot catch the same quantity of fish as in other years. This reduces the potential quantity of fished that Norway can produce and also increase the world's relative price of fish (with respect to all other goods P_A). Draw two diagrams to explain how overfishing may increase or decrease welfare in Norway. Note: the relative production of fish with respect to *all*, is the slope of the line connecting the origin to the production point (when fish is in the vertical axis).

   Solution: If the production of fish relative to *all* decreases, then despite the increase in price Norway loses welfare. Instead, it is also possible for the relative production of fish relative to *all* to increase, which combined with the higher fish price improves welfare in Norway.