Specific factors and Income Distribution

Chapter 3

Intermediate International Trade

International Economics, 5th ed., by Krugman and Obstfeld
Specific factors model

- the effects of trade on income distribution are due to the facts that: (1) moving resources from one sector to another takes time and is costly, (2) industries differ in the factors of production they demand

- the specific factors model was developed by Ronald Jones and Paul Samuelson
• two goods: manufactures and food
• three factors: one mobile factor (labor \( L \)), and two specific factors (capital \( K \) and land \( T \))
• technology: manufactures use labor and capital, and food uses labor and land:

\[
\begin{align*}
Q_M &= Q_M (K, L_M) \\
Q_F &= Q_F (T, L_F) \\
L_M + L_F &= L
\end{align*}
\]
• $\text{MPL}_M$ is the marginal product of labor in manufactures, and $\text{MPL}_F$ is that in food; given K and T, there are diminishing returns in labor in each industry

• the *production possibility frontier* in the specific factor model shows how the economy mix of output changes as *labor is shifted from one sector to another*

• due to diminishing returns, the production possibility frontier is *bowed-out*, instead of the straight line it was on the Ricardian model
• the slope of the production possibility frontier measures the *opportunity cost* of manufactures in terms of food and is given by \(- \frac{\text{MPL}_F}{\text{MPL}_M}\):

manufactures output increases by \(\text{MPL}_M\) per extra unit of labor
shift \(\frac{1}{\text{MPL}_M}\) units of labor from food to manufactures to increase manufactures in one unit
each unit of labor shifted out of food lowers food output by \(\text{MPL}_F\)
then, to increase manufactures output in one unit, food output decreases by \(\frac{\text{MPL}_F}{\text{MPL}_M}\)
• how much labor will be employed in each sector? Since labor is freely mobile, the wage rate $w$ must be equal across sectors

• $P_M$ and $P_F$ are the prices for manufactures and food

• total labor supply is fixed at $L$

• demand for labor in each sector is determined by the distribution of labor $L_M$, $L_F$ that satisfies:

$$
\begin{align*}
P_M \cdot MPL_M &= w \\
P_F \cdot MPL_F &= w
\end{align*}
$$
• from the equations above, it follows that in equilibrium the *pretrade* relative price of manufactures is equal to the opportunity cost of manufactures in terms of food:

\[
\frac{MPL_F}{MPL_M} = \frac{P_M}{P_F}
\]

• *equal proportional change in prices*: if both \(P_M\) and \(P_F\) change in the same proportion, the only effect is that \(w\) changes in the exact proportion, while \((L_M, L_F)\) are the same
• **change in relative prices**: if only $P_M$ rises, so that $P_M / P_F$ increases, then $w$ increases but in less proportion, and $L_M$ increases, so that manufactures output rises and food output falls

• the **relative supply curve** shows that $Q_M / Q_F$ is a positive function of $P_M / P_F$

• the equilibrium *pretrade* relative price $P_M / P_F$ is determined at the intersection of the relative demand and supply functions
changes in income distribution due to an increase in the relative price of manufactures:

an increase in $P_M$ increases $w$ but in a smaller proportion, due to diminishing returns.
real wage in terms of manufactures $w / P_M$ decreases, but $w / P_F$ increases.

Workers are worse off or better off depending on the composition of their consumption.

Owners of capital $K$ are better off because profits increase more than the increase $P_M$, and so their income is higher in terms of $M$ and $F$.

Landowners are worse off because $w / P_F$ increased, and the rise in $P_M$ reduces purchasing power.
Trade in specific factors model

• two countries: Japan and U.S.
• to have trade between two countries, *the pretrade relative prices must differ*
• assume the relative demand is equal in both countries
• countries differ in their resources L, K and T, and so they have different relative supplies
• a country with a lot of $K$ and not much $T$ will tend to produce a high ratio of manufactures to food, at any given prices

• effects of an increase in $K$:

\[
\begin{align*}
\text{MPL}_M & \text{ increases} \\
P_M \text{ MPL}_M & \text{ increases, which means that demand curve for labor in manufactures shifts to the right} \\
w \text{ and } L_M & \text{ increase, and so } Q_M \text{ increases, while } Q_F \text{ decreases} \\
\text{for } P_M / P_F & \text{ given, since } Q_M \text{ increases, then } \\
\text{relative supply of } M & \text{ shifts to the right}
\end{align*}
\]
• effects of an increase in $T$: $Q_F$ increases and $Q_M$ decreases, so relative supply curve of $M$ in terms of $F$ shifts left

• effects of an increase in $L$: $w$ falls; both $L_M$ and $L_F$ rise, so $Q_M$ and $Q_F$ rise. The final effect on relative supply is ambiguous

• assume:
  Japan and U.S. have the same $L$
  Japan is relatively well-endowed with $K$
  U.S. is relatively well-endowed with $T$

• the relative supply curve of $M$ in Japan must lie to the right of that for the U.S.
• since relative demand is the same for both countries, the pretrade relative price of manufactures is lower in Japan than in U.S.
• with trade the world supply of manufactures and food equals the sum of the output in both countries
• trade equates the relative price of manufactures across countries; the world relative price is between the two pretrade relative prices
• let $D_M$ and $D_F$ be consumption of manufactures and food; some accounting:

\[
D_F - Q_F = \left(\frac{P_M}{P_F}\right) \times (Q_M - D_M)
\]

food imports = manufactures exports

• the equation above represents the **budget constraint** for each economy, and its slope equals $-\frac{P_M}{P_F}$: for each unit of manufactured not consumed, the country can get in the world market $\frac{P_M}{P_F}$ extra units of food.

• the budget constraint represents the **consumption possibilities** of the economy at different relative prices
• trade increases $P_M / P_F$ in Japan, and so increases the consumption of food. In equilibrium, Japan imports food and exports manufactures

• trade decreases $P_M / P_F$ in U.S., and so increases the consumption of manufactures. In equilibrium, U.S. imports manufactures and exports food

• in world equilibrium:

  Japan’s manufactures exports $= U.S.$ imports
  U.S. food exports $= Japan$’s imports
Income distribution and gains from trade

• who gains and who loses from trade? The key element is *the change in relative prices when the country opens to trade*

• since in Japan $P_M / P_F$ increases with trade, then owners of capital are better off, landowners worse off, and for workers is ambiguous:

  *Trade benefits the factor that is specific to the export sector of each country, and hurts the factor specific to the import-competing sectors, with ambiguous effects on mobile factors*
• could those who gain from trade compensate those who lose, and still be better off themselves? Yes, if the trading economy can consume more of both goods

• trade is potentially a source of gain to everyone because by expanding the economy’s choices, it is always possible to redistribute income so that everyone gains