

# Globalization

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Econ 102

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# Introduction: The Specific factor model

- ▶ HOS model considers two factors that are perfectly mobile between the two industries
- ▶ However, the assumption of perfect mobility of factors can only arrive in the long run.
  - Takes time to get the information of a change in price from one industry to another.
  - Capital is often fixed in its sectoral usage.
- ▶ Economists make a logical distinction between time periods that is implicit in our discussion
  - Long run (HOS model): factors can move freely from one sector to the other
  - Short run (Specific factor model): at least one factor can be fixed in production functions.

## Overview (1/2)

- ▶ The model is similar to the Heckscher-Ohlin model, except that no substitution of capital between industries can take place, though labor is mobile
- ▶ Assumptions:
  - Only labor is homogeneous and common to the two production functions
  - Capital is fixed by industry in the short run
  - All other assumptions are the same as in the HOS model
- ▶ The model:
  - 2 goods: X and Y
  - 2 countries: Home and Foreign
  - 2 factors:
    - ▶ R: a type of capital specific to sector X
    - ▶ S: a type of capital specific to sector Y
    - ▶  $L_X$  and  $L_Y$  is the labor employed in sector X and Y respectively

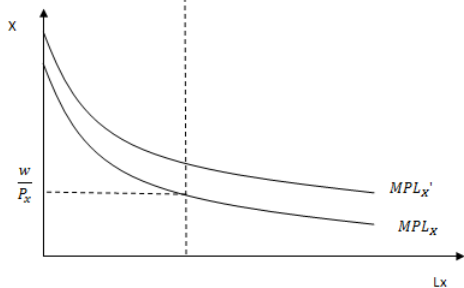
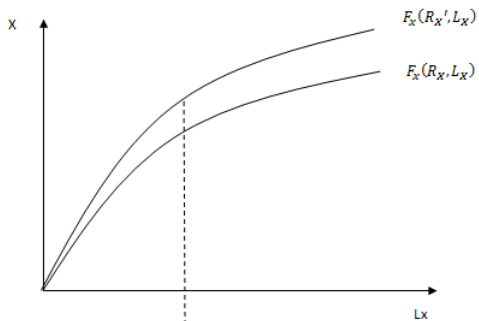
## Overview (2/2)

- ▶  $\bar{R} = R_X$ : the entire available stock of R is used to produce commodity X
- ▶  $\bar{S} = S_Y$ : the entire available stock of S is used to produce commodity Y.
- ▶  $\bar{L} = L_X + L_Y$ : the entire employment is divided into sector X and Y.
- ▶ Price of factors:
  - The return to R is defined by  $r$
  - The return to S is defined by  $s$
  - The return to L is defined by  $w$

## Properties of production functions (1/4)

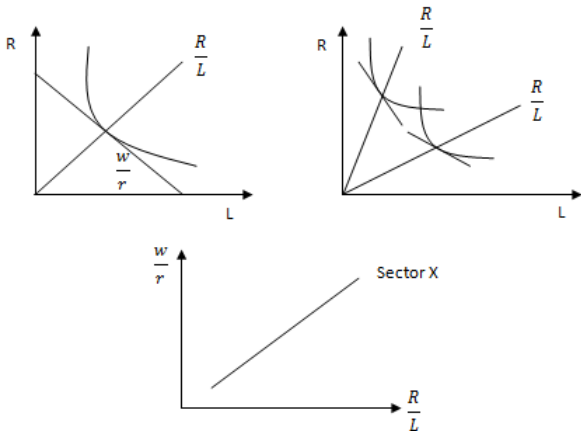
- ▶ The production functions have constant return to scale and decreasing marginal return.
- ▶ The total product of X increases as more labor is added to the fixed stock R, but it does so at a diminishing rate.
- ▶ The marginal productivity of labor is decreasing and we have:
  - $MPL = \frac{w}{P_x}$  in sector X
  - $MPK = \frac{r}{P_x}$  in sector X
  - $MPL = \frac{w}{P_y}$  in sector Y
  - $MPK = \frac{s}{P_y}$  in sector Y

## Properties of production functions (2/4)



## Properties of production functions (3/4)

- ▶ Link between relative prices of inputs and relative use of inputs
- ▶  $Cost_X = wL + rR \rightarrow R = \frac{Cost_X}{r} - \frac{w}{r}L$

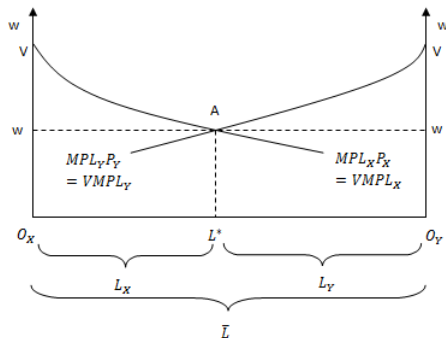


## Properties of production functions (4/4)

- ▶ Once you know the relative price of factors you have information on the relative use of inputs
- ▶ Because marginal products are function of capital-labor ratios, if one marginal product has changed, we immediately know that the other marginal product has changed in the opposite direction
- ▶ Completing the model requires linking sector X and Y together in a short-run general equilibrium framework
  - $MPL_X P_X = w$
  - $MPL_Y P_Y = w$
  - $L_Y + L_X = L$



# The Specific-Factor Model

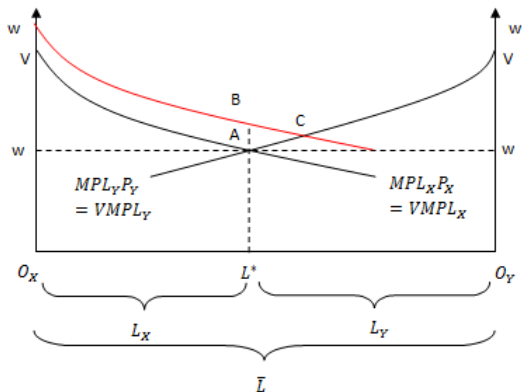


- ▶  $A$  represents the autarky equilibrium in the economy
- ▶ total returns of labor is defined by the area  $wO_XAL$
- ▶ total returns of capital is defined by the area  $VwA$

# The Specific-Factor Model

- ▶ How can we obtain a shift in  $MPL_X P_X$ ?
  - A change in  $R$  increases the function  $F_X$  which shifts up the  $MPL_X$  curve
  - An increase in  $L$  does not provoke a shift in  $MPL_X$  but a displacement along the  $MPL_X$
  - The last shift can be obtain if there is a change in  $P_X$
- ▶ What happens after free trade if the economy undergoes an increase in the relative price of good  $X$ 
  - This economy will export the good  $X$  on the workd market
  - It will shift up the  $VMPL_X$  curve

# The Specific-Factor Model



- ▶ Point B cannot be an equilibrium because  $w$  is higher in sector X than Y
- ▶ Labor moves from Y to X which provides the additional resources to expand output of X that can be exported

## The distribution of income (1/3)

- ▶ There is a higher allocation of labor to good  $X$  and a higher nominal wage rate in both industries
- ▶ The total income paid to  $R$ , the specific capital in  $X$  increases
- ▶ The total income paid to  $L$  in sector  $X$  increase
- ▶ The total income for  $S$ , the specific capital stock in sector  $Y$ , is smaller
- ▶  $r$  and  $w$  increases and  $s$  falls

## The distribution of income (2/3)

- ▶ To reach precise conclusions of the impact of free trade, we need to consider real wages and real return to capital
  - The labor influx in sector  $X$  lowers the capital-labor ratio  $\rightarrow$  reduces the real ratio  $\frac{w}{r}$  in sector  $X$ 
    - ▶ Owners of the specific capital stock in the expanding industry (sector  $X$ ) gain real income.
  - The labor exit in sector  $Y$  increases the capital-labor ratio  $\rightarrow$  increases the real ratio  $\frac{w}{s}$  in sector  $Y$ 
    - ▶ Owners of the specific capital stock in the declining industry (sector  $Y$ ) lose real income
  - $\frac{w}{p_x}$  is declining in sector  $X$  and  $\frac{w}{p_y}$  is increasing in sector  $Y$  because  $p_y$  does not change.
    - ▶ Each worker is better off in terms of ability to consume good  $Y$  but worse off in terms of ability to consume good  $X$

## The distribution of income (3/3)

- ▶ We have proven the following proposition

**Commodity prices and factor prices:** A relative price increase of a good benefits the specific factor used in that industry, reduces the real income of the other specific factor and has an ambiguous effect on the mobile factor.

- ▶ This proposition is in sharp contrast to the Stolper-Samuelson theorem

**Stolper-Samuelson theorem:** A rise in the price of the capital-intensive good raises the price of capital and results in both good being produced with lower capital-labor ratio.

- ▶ Here:  $\frac{R}{L}$  decreases in the expanding sector and  $\frac{S}{L}$  increases in the declining sector.

## Factor price equalization

- ▶ Home: The real income of R-capital rises and that of S-capital falls
- ▶ Foreign: The real income of S-capital rises and that of R-capital falls
- ▶ Labor will have a higher real wage with respect to good Y in Home but a lower real wage with respect to Y in foreign

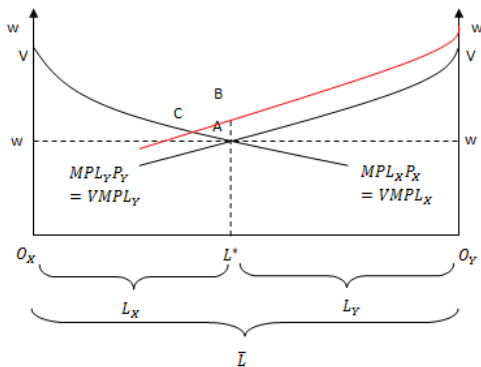
→ There cannot be any equality between real factor prices in the specific factor model

**Trade and Factor prices in the HOS model:** With free-trade, equalized commodity prices engenders identical real factor prices

**Trade and Factor prices in the Specific-Factor model:** With free-trade, the equalization of commodity prices does not equalize factor prices

## Rybczynski theorem (1/3)

- ▶ Let's now analyze the effect of a change in endowment on real factor income
- ▶ Let's consider first an increase in the endowment of S (specific-capital in sector Y)
  - All S must be employed in sector Y which increases the  $VMPL_Y$



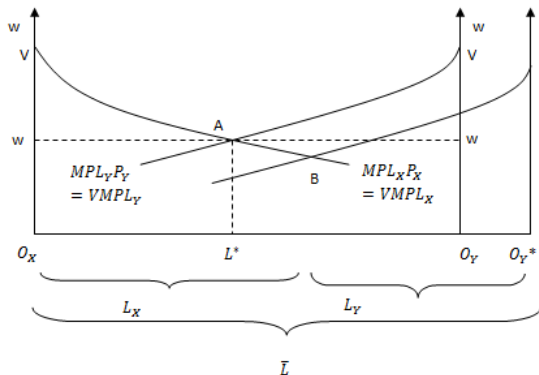


## Rybczynski theorem (2/3)

- ▶ In sector  $Y$ ,  $S$  and  $L$  increases and  $\frac{S}{L}$  increases  $\rightarrow s$  decreases. The output of  $Y$  increases.
- ▶ In sector  $X$ ,  $L$  decreases and  $\frac{R}{L}$  increases so  $\frac{w}{r}$  increases and  $r$  falls. The output of  $X$  falls.
- ▶ Implications for wages are clear because there is no change in price:  $\frac{w}{p_x}$  and  $\frac{w}{p_y}$  increases.
- ▶ We just proved that an increase in the endowment of a specific factor increases the output of the good that uses that factor and must lower the output of the other good by pulling labor from it.
  - This is similar to the Rybczynski theorem

## Rybczynski theorem (2/3)

- ▶ Let's now analyze the effect of an enlargement of the labor force in sector Y, shifting the origin for sector Y to  $O^* Y$



- ▶ The immediate implication is that the nominal wage is reduced.

## Rybcynski theorem (3/3)

- ▶  $L$  is increasing in sector X and sector Y because the increase in the labor endowment is divided between sectors. Output X increases.
- ▶ Implications for sector X:  $\frac{R}{L}$  is reduced,  $\frac{w}{r}$  is reduced and  $r$  increases. Output X increases.
- ▶ Implications for sector Y:  $\frac{S}{L}$  is reduced,  $\frac{s}{r}$  is reduced and  $s$  increases. Output Y increases.

A rise in the labor endowment expands both output as the new labor force is divided between the sectors

→ this is different from the Rybczynski theorem.

- ▶ We have proven the following proposition

**Factor endowments and output:** An increase in one specific factor increases the output of the commodity that uses that factor and reduces the output of the other industry. Increases in the supply of the mobile factor will expand both outputs.

## The patterns of trade

- ▶ Suppose that in the short run, the capital in the two countries is allocated differently between the two industries
  - In the Home country there is more capital in the Y sector
  - In the Foreign country there is more capital in the X sector
- ▶ This implies that  $\frac{S}{L}$  is higher in the Home country,  $s$  is lower in the home country
- ▶ Home country will export good Y and import good X

→ This outcome is like the HO theorem. The country will export the good that is intensive in the abundant factor.

→ However, this theorem relies on the existence of specific factor

**The patterns of trade:** In the specific factors model, each country will export the good with the absolutely abundant stock of specific capital assuming identical endowment of labor.

# Conclusion

- ▶ In the specific factors model the primary technological characteristic is:
  - factor mobility versus factor specificity
  - rather than factor intensities as in the HO model
- ▶ The Stolper-Samuelson theorem is verified in the expanding sector but is not in the declining sector
- ▶ Trade does not equalize factor prices across countries
- ▶ Differences in factor endowments have different effects in the specific-factor model
  - Increase in a specific factor will raise the output of the commodity using that factor
  - An increase in the mobile factor will raise the output of both commodities