

## SPECIFIC FACTORS MODEL

- Assume 2 goods, X and Y, are produced under constant returns, each requiring two factors, labor and capital
- Tastes are homogeneous and identical for consumers
- Labor is homogeneous and common to both production functions, but capital is specific to each industry in short-run
- Production functions are:

$$X = F_X(R_X, L_X) \quad (1)$$

$$Y = F_Y(S_Y, L_Y) \quad (2)$$

where  $R_X$  and  $S_Y$  are types of capital specific to each sector

- Factor supply constraints are:

$$\bar{R} = R_X, \bar{S} = S_Y, \text{ and } \bar{L} = L_X + L_Y \quad (3)$$

i.e., there is full employment of factors

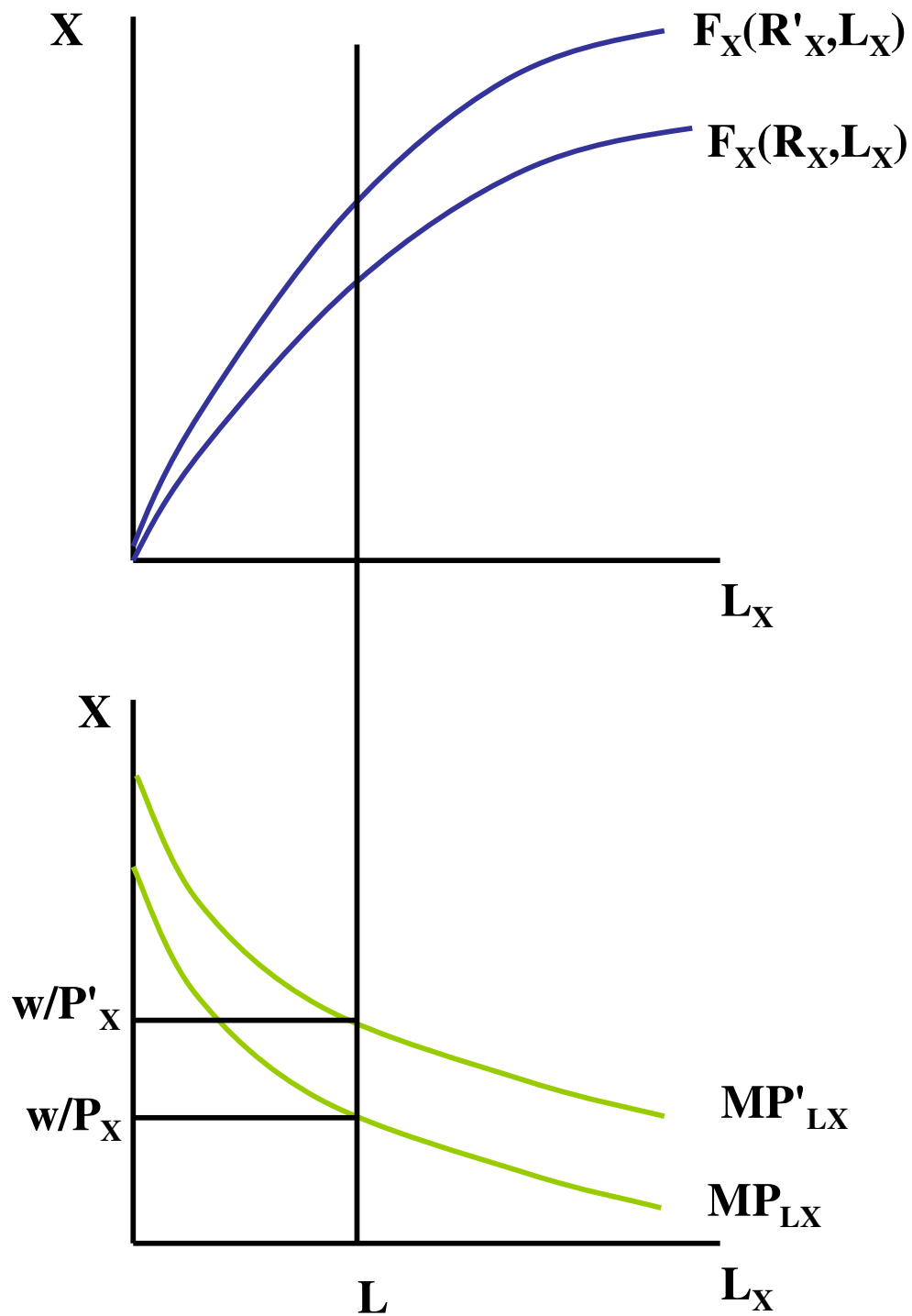
- **Return to labor,  $w$ , is the same across both industries as it is mobile, return to capital in industry X is  $r$ , and  $s$  in industry Y**
- **For industry X, with fixed amount of capital  $R_X$  in short run, increases in labor employed exhibit diminishing returns – see Figure 1**
- **If endowment of capital  $R$  is increased, for any amount of labor employed, total output of X, and marginal product of labor,  $MP_{LX}$ , increase, while marginal product of capital,  $MP_{RX}$ , falls, i.e.,  $MP_{LX}$  and  $MP_{RX}$  are functions of capital/labor ratio,  $R_X/L_X$**
- **With competitive factor markets, each factor is paid value of its marginal product:**

$$VMP_{LX} = MP_{LX} P_X = w \quad (4)$$

$$VMP_{RX} = MP_{RX} P_X = r \quad (5)$$

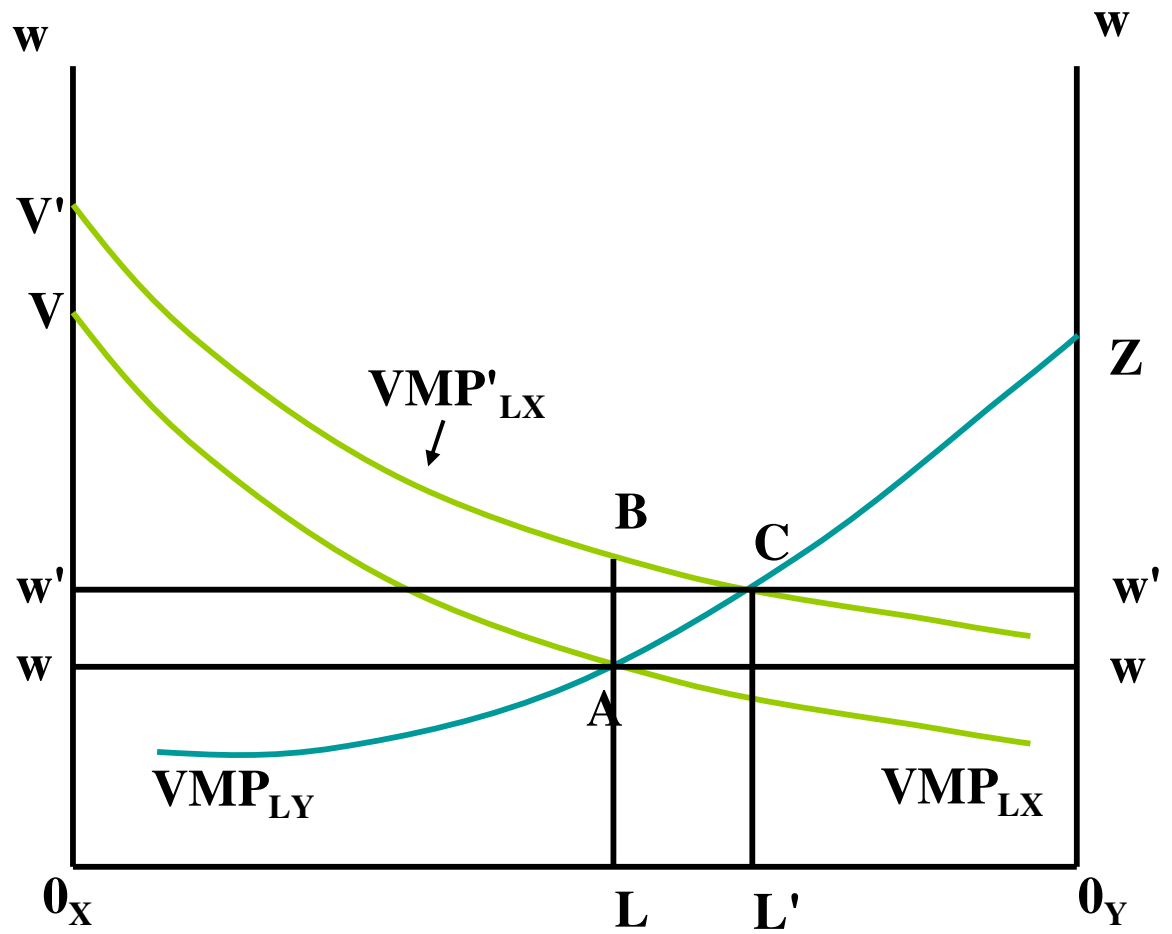
**i.e., real return to each factor, its marginal product, will be a function of capital to labor ratio**

**Figure 1**



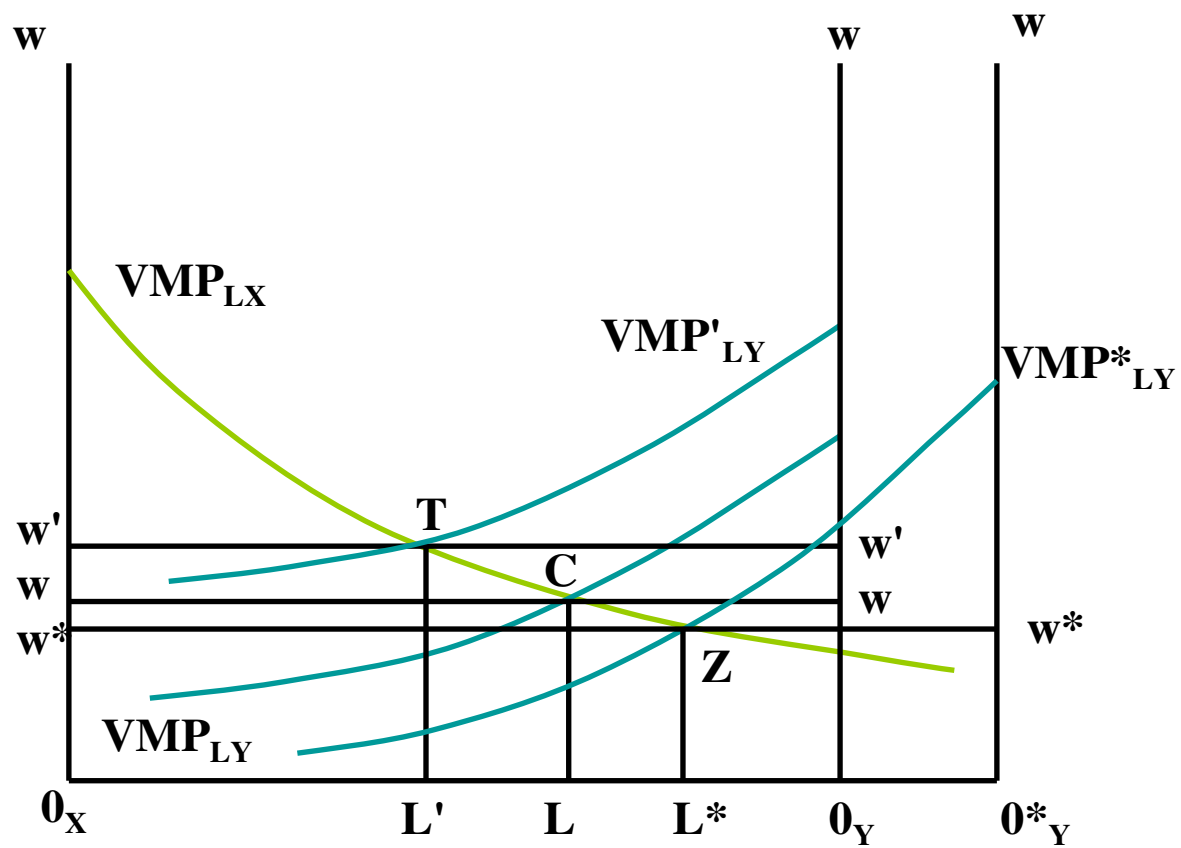
- Due to labor mobility, value of marginal product of labor in X and Y will be the same, and equal to common wage  $w$
- For given prices,  $P_X$  and  $P_Y$ , equilibrium is described in Figure 2
- If A is autarky equilibrium,  $0_X L$  is employment in industry X, and  $0_Y L$  is employment in industry Y
- Labor income in X is  $w 0_X L_A$ , and  $w 0_Y L_A$  in Y, while R earns  $V w A$  in X and S earns  $Z w A$  in Y
- Suppose country opens up to trade, and faces an increase in  $P_X$ , shifting up  $VMP_{LX}$ 
  - B is not an equilibrium, as  $w$  in X  $>$   $w$  in Y
  - Labor moves from Y to X, moving economy along relevant  $VMP_L$  curves to free trade equilibrium at C, with new wage of  $w'$  in both industries
  - Total labor income increases, nominal ( $r$ ) and real return ( $r/P_X$ ) to R increases, and nominal ( $s$ ) and real return ( $s/P_Y$ ) to S decreases

Figure 2



- As  $R_X/L_X$  falls, and  $S_Y/L_Y$  rises, real wage falls in X, and rises in Y – whether workers gain or lose welfare depends on preferences – the *neoclassical ambiguity*
- Provides a basis for understanding why there may be *coalitions* between factors in lobbying for and against trade policies – as opposed to *conflict* between abundant and scarce factors implied by Stolper-Samuelson theorem
- In Figure 3, suppose S increases, equilibrium moves from C to T, which raises real return to labor in both sectors, and lowers real return to capital in both sectors as capital/labor ratio in both sectors rises
- Suppose labor endowment L increases, resulting in a new equilibrium at Z – this lowers nominal and real return to labor, total returns to R are higher, and nominal and real returns increase for both R and S as both  $R_X/L_X$  and  $S_Y/L_Y$  fall
- Result shows there is no presumption towards factor price equalization in short run – i.e., free trade in goods will not necessarily exhaust gains from trade

Figure 3



- Suppose each country has same amount of labor, but home country has a larger stock of specific capital  $S$  in industry  $Y$ , and foreign country has a larger stock of specific capital  $R$  in industry  $X$ 
  - Home country exports  $Y$ , and foreign country exports  $X$
  - Result depends on stocks of specific factors *not* relative factor intensities
  
- Suppose each country has identical stocks of specific factors, but supply of labor is larger in foreign country
  - Output of  $X$  and  $Y$  increases in foreign country
  - Impossible to predict which good it exports without more knowledge of production technologies, i.e., slopes of  $VMP_{LX}$  and  $VMP_{LY}$  curves in Figure 3
  
- Broader interpretation where specific factors are capital and land, industry  $Y$  (agriculture) requires land and labor, while  $X$  (manufacturing) requires capital and labor