International Trade I: Theory

The Specific Factors Model[1]

Monika Mrázová

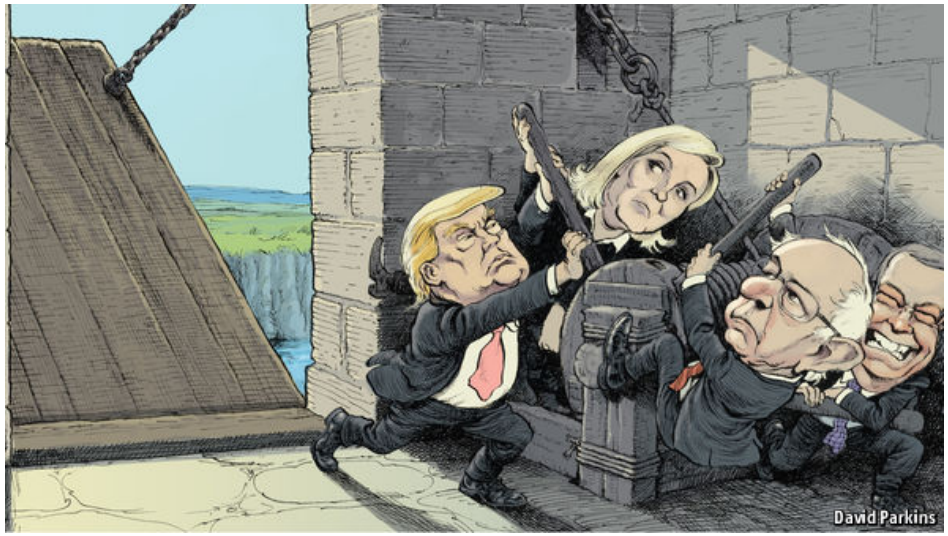
Spring 2024

[1] These lecture notes are based on materials from A. Costinot, A. Dixit, R. Feenstra, Feenstra&Taylor, and J. P. Neary.

Outline of the Lecture

Outline of the Lecture

Motivation



Source: The Economist, Jul 30th 2016

- Distributional conflict of trade has occupied a big part of recent political debate across the world
- Ricardian model: only one factor of production $\rightarrow$ no distributional conflict $\rightarrow$ need a new model!

Reading

- *F pp. 71-75
- Jones, R., and P. Neary. “The Positive Theory of International Trade.” pp. 21-27, in Jones, Ron, and Peter Kenen. Handbook of International Economics. Vol. 1. North Holland, 1998
- Neary, J.P., “Short-Run Capital Specificity and the Pure Theory of International Trade,” Economic Journal (1978).
- *Introductory level:* FT Chs. 3 and 5 or KOM Ch. 4

Factor Proportion Theory

- The law of comparative advantage establishes the relationship between relative autarky prices and trade flows
  - But where do relative autarky prices come from?

- Factor proportion theory emphasizes *factor endowment differences*

- **Key elements:**
  1. Countries differ in terms of factor abundance [i.e *relative* factor supply]
  2. Goods differ in terms of factor intensity [i.e *relative* factor demand]

- Interaction between (1) and (2) will determine differences in relative autarky prices, and in turn, the pattern of trade

Plan for this lecture

- In order to shed light on factor endowments as a source of CA, we will assume that:
  - Production functions are identical around the world
  - Households have identical homothetic preferences around the world

- We will focus on two special models:
  - **Ricardo-Viner** with 2 goods, 1 "mobile" factor (labor) and 2 "immobile" factors (sector-specific capital) $\rightarrow$ **today**
  - **Heckscher-Ohlin** with 2 goods and 2 "mobile" factors (labor and capital)

- The second model is often thought of as a long-run version of the first (Neary 1978)
  - In the case of Heckscher-Ohlin, what is the time horizon such that one can think of total capital as fixed in each country, though freely mobile across sectors?

Outline of the Lecture

Basic environment

- Consider an economy with:
  - Two goods, $g = 1, 2$
  - Three factors with endowments L, K_1 and K_2
    - ★ L is a "mobile" factor, can be employed in all sectors
    - ★ K_1 and K_2 are "immobile" factors, can only be employed in one
- We denote by:
  - p_1 and p_2 the prices of goods 1 and 2
  - w, r_1 and r_2 the prices of L, K_1 and K_2
- Output of good g is given by

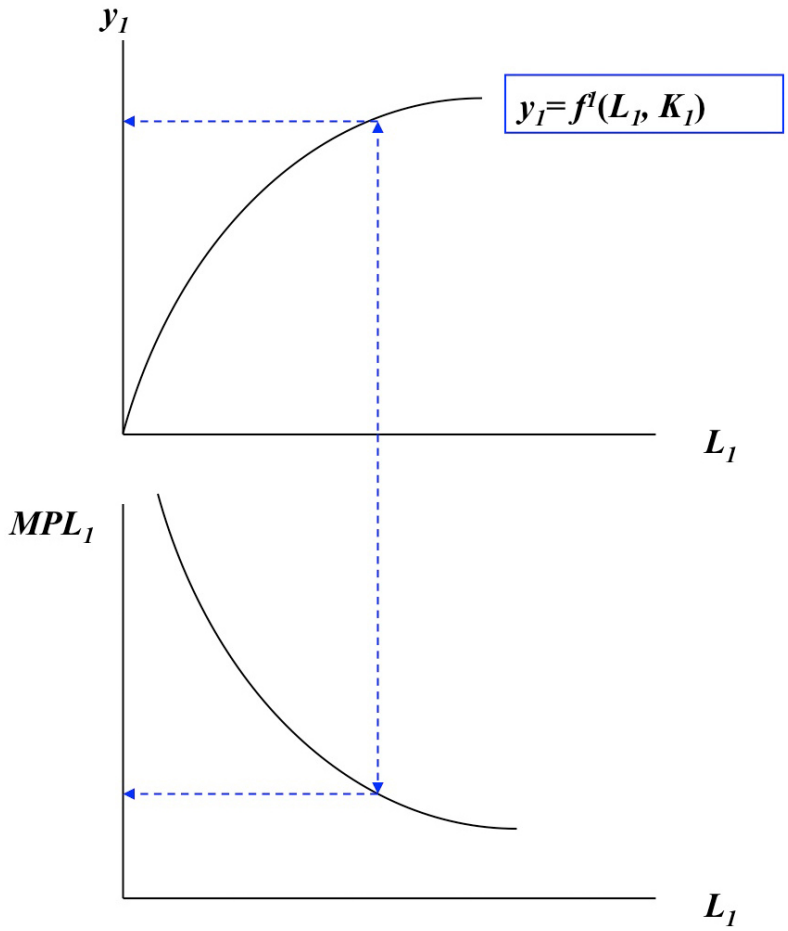
$$y_g = f^g(L_g, K_g)$$

where:

- L_g is the (endogenous) amount of labor in sector g
- f^g is the production function in sector g:
  - ★ positive, increasing, concave
  - ★ homogenous of degree 1 in (L_g, K_g), i.e. CRS

Some immediate implications

- Concave production function $\Rightarrow$ decreasing marginal product: $f^g_{LL} < 0$ and $f^g_{KK} < 0$



- Model is isomorphic to DRS model: $y_g = f^g(L_g)$ with $f^g_{LL} < 0$
- Payments to specific factors under CRS $\equiv$ profits under DRS

What's new?

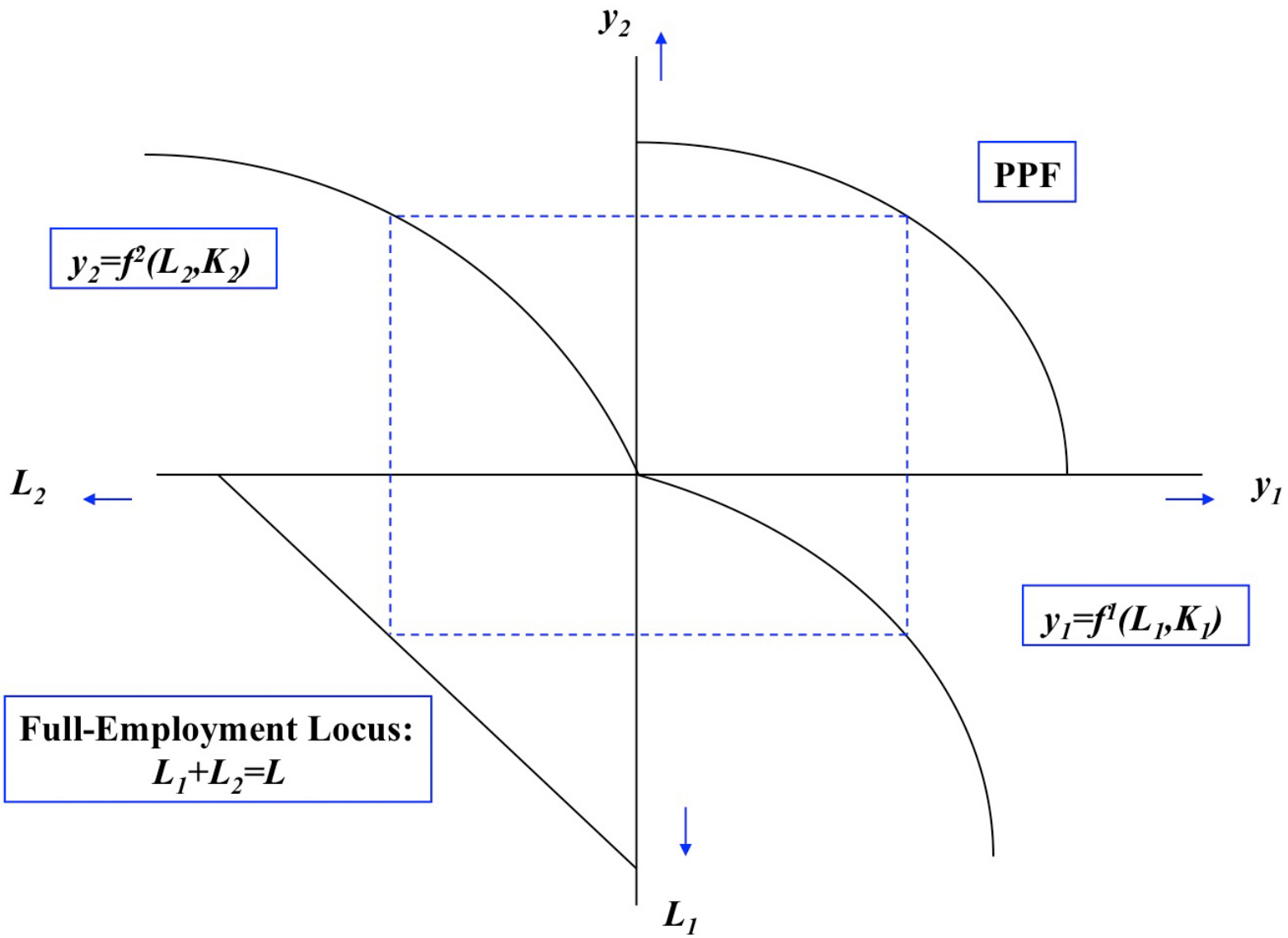
- Two countries, two goods
- Perfect competition
- Full employment
- Endowments given, immobile across countries
- Constant returns to scale in each sector

Same as in 2-sector Ricardian model

- 3 factors of production
  - Labour L is mobile between sectors
  - Capitals K_g are immobile or *sector-specific*

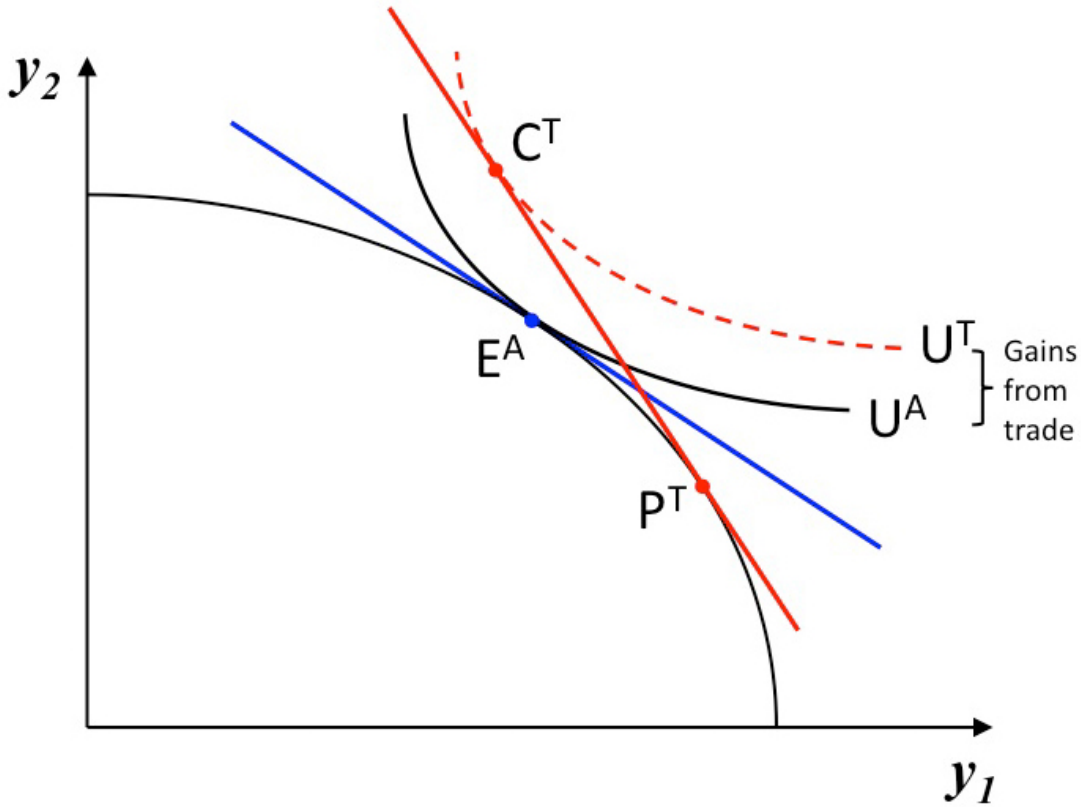
Difference in assumptions

Deriving the PPF



Gains from trade

- Assume that the Home country has a comparative advantage in good 1: $p_1/p_2 < (p_1/p_2)^{ROW}$



Outline of the Lecture

Equilibrium: Small open economy (SOE)

- **"Small open economy":** (p_1, p_2) exogenously given
  - So no need to look at good market clearing

- **Profit maximization:**

$$p_g f_L^g(L_g, K_g) = w \tag{1}$$
$$p_g f_K^g(L_g, K_g) = r_g \tag{2}$$

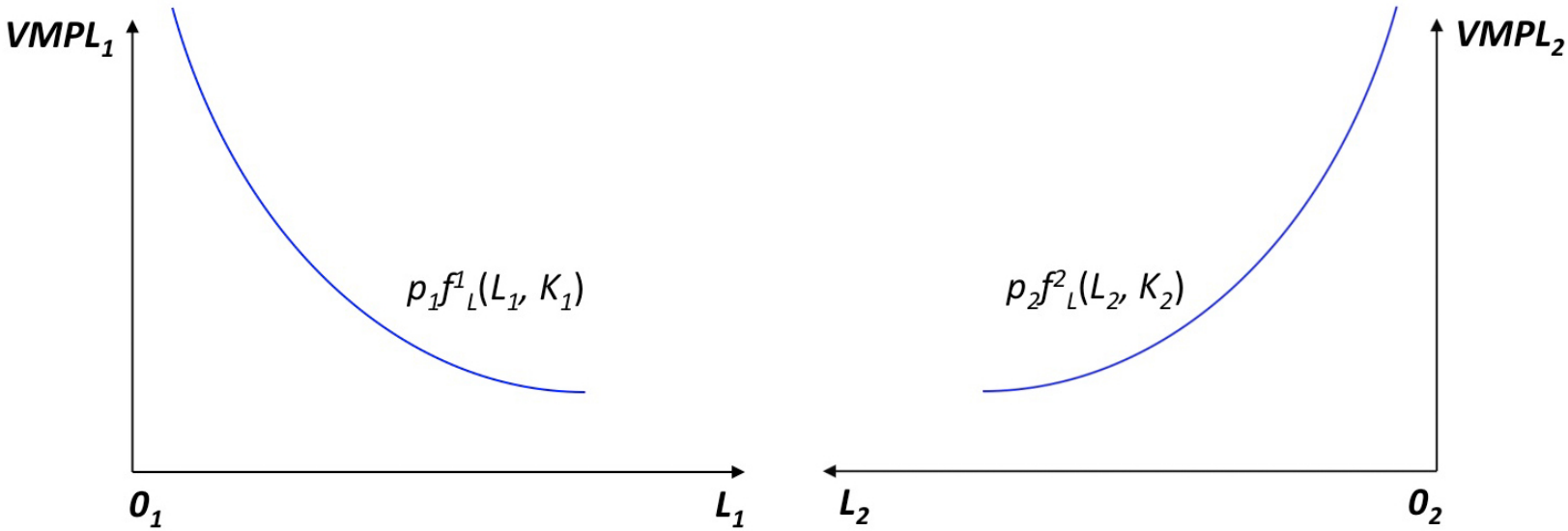
- **Labor-market clearing:**

$$L = L_1 + L_2 \tag{3}$$

- Equations (1) and (3) jointly determine labor allocation and wage

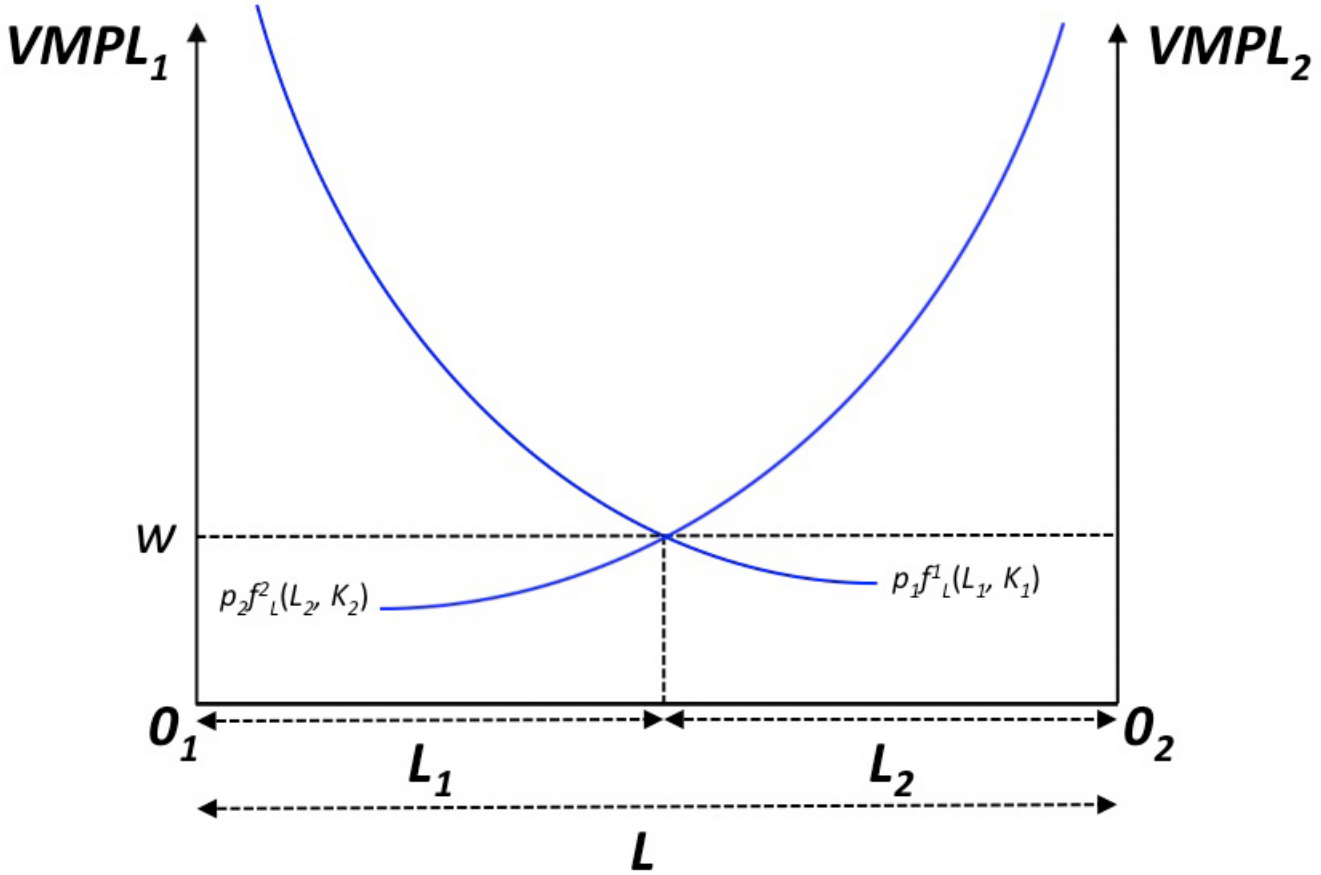
Graphical analysis: VMPL curve

- At given prices, and for a given endowment K_g, the VMPL curve $p_g f_L^g(L_g, K_g)$ is the MPL curve $\rightarrow$ it is the demand curve for labor



Equilibrium allocation of labor

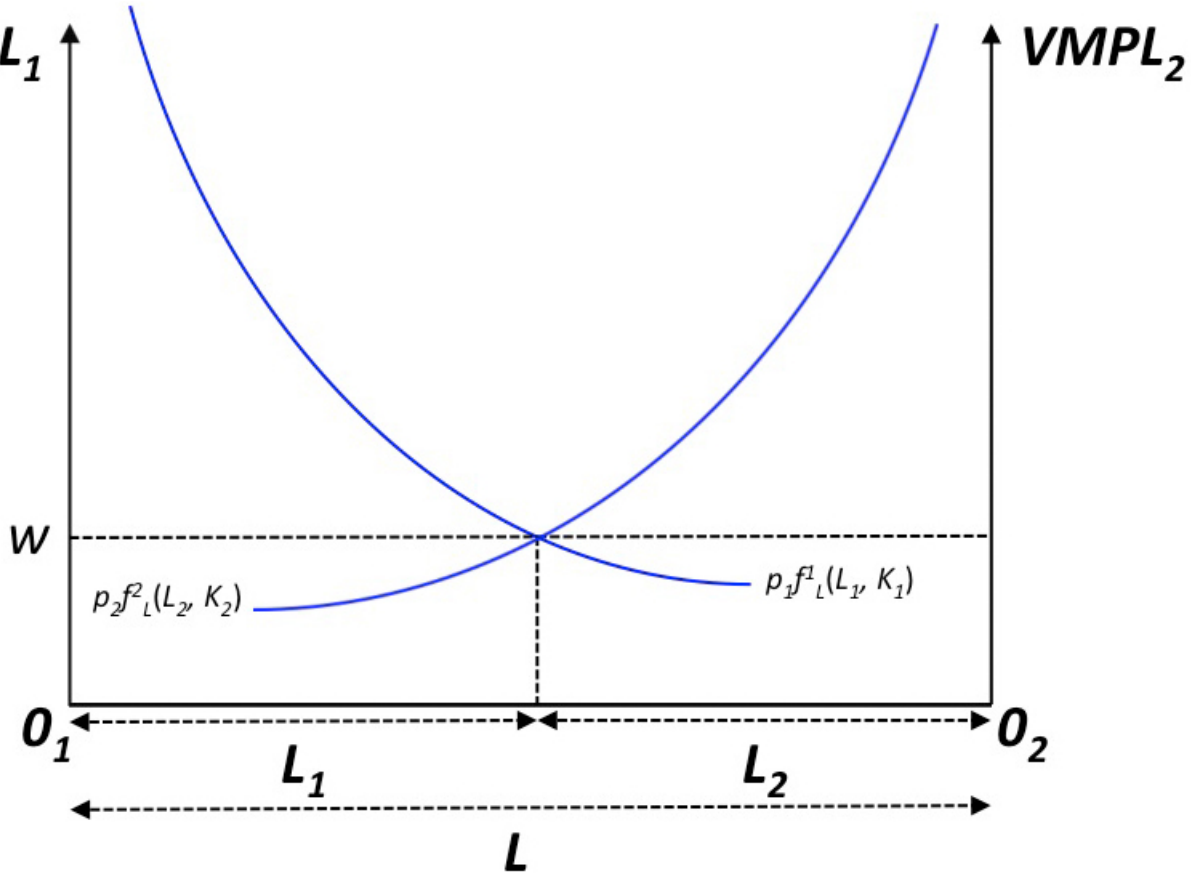
- Combine the two VMPL curves for the two sectors



- Horizontal axis measures L: i.e., full employment
- Intersection of two demand curves determines equilibrium wage and allocation of labor between sectors

Equilibrium payments to the specific factors

- $K_g r_g = \int_0^{L_g} (p_g f_L^g(L, K_g) - w) dL$



Outline of the Lecture

"Hat" algebra

- Jones' (1965) algebra

$$\hat{x} = \frac{dx}{x} = d \ln x$$

- Basic rules:
  - $z = xy \Rightarrow \hat{z} = \hat{x} + \hat{y}$
  - $z = x + y \Rightarrow \hat{z} = \omega \hat{x} + (1 - \omega)\hat{y}$ with $\omega = \frac{x}{z}$

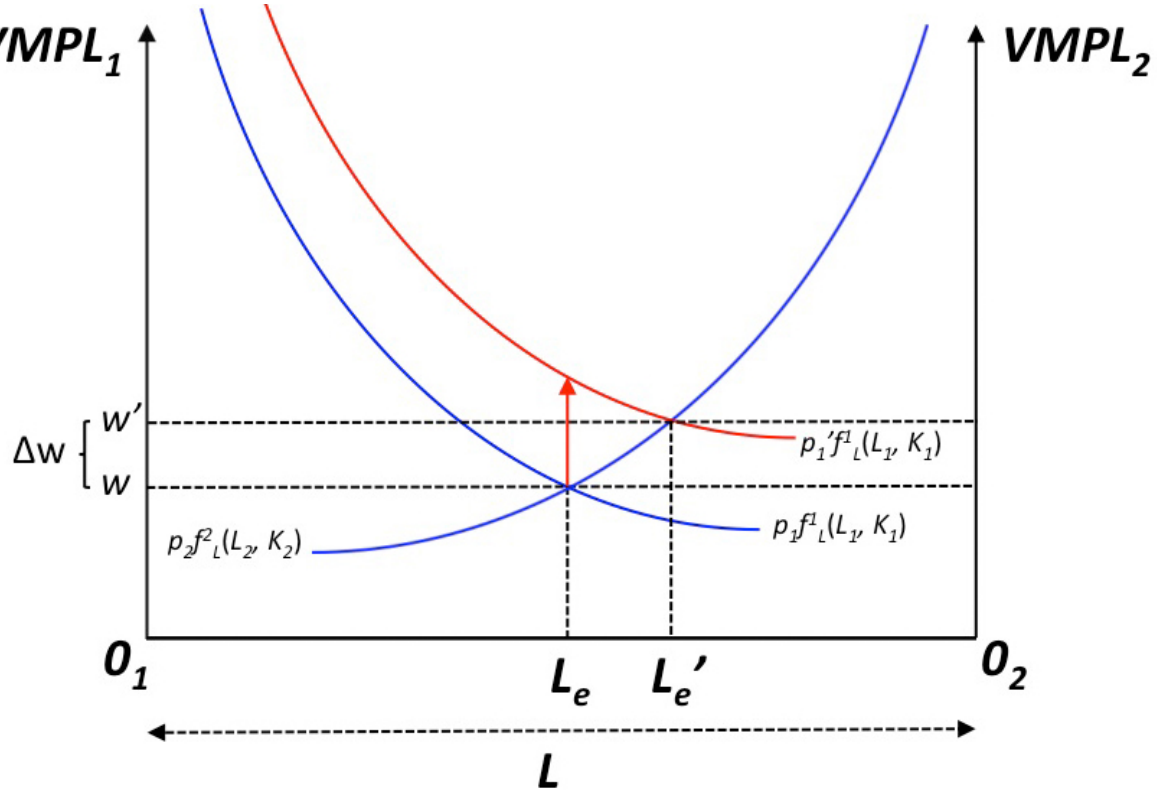
- Corollaries:
  - $z = \frac{1}{x} \Rightarrow \hat{z} = -\hat{x}$
  - $z = x^a \Rightarrow \hat{z} = a\hat{x}$

Effect of an increase in p_1

- $L_1 \uparrow$ and $L_2 \downarrow$
- $y_1 \uparrow$ and $y_2 \downarrow$
- $w \uparrow$, but $w/p_1 \downarrow$:

$$\frac{dw}{dp_1} = f_L^1 + p_1 f_{LL}^1 \frac{dL_1}{dp_1} < f_L^1 = \frac{w}{p_1}$$

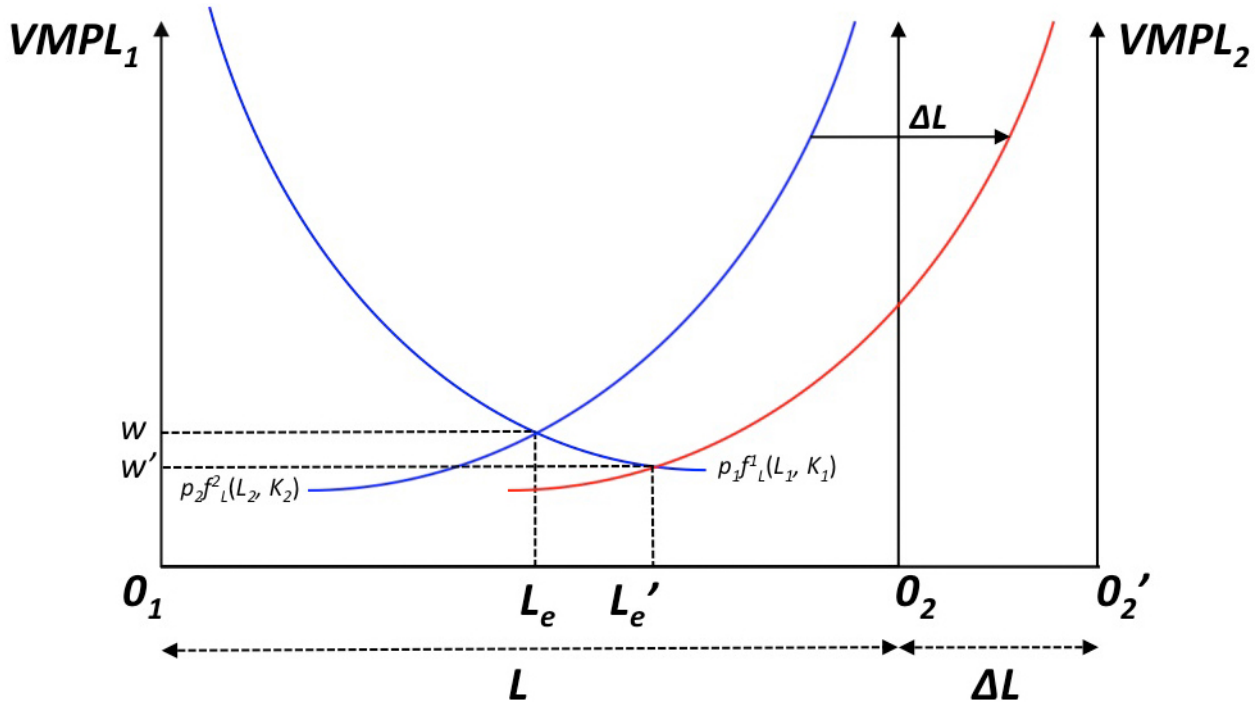
so $\frac{dw}{w} = \hat{w} < \hat{p}_1 = \frac{dp_1}{p_1}$



- Condition (2) $\Rightarrow r_1/p_1 \uparrow$: $\frac{dr_1}{dp_1} = f_K^1 + p_1 f_{KL}^1 \frac{dL_1}{dp_1} > f_K^1 = \frac{r_1}{p_1}$ whereas r_2 (and a fortiori r_2/p_1) $\downarrow$
- "Magnification effect": $\hat{r}_2 < \hat{p}_2 < \hat{w} < \hat{p}_1 < \hat{r}_1$ (assuming $\hat{p}_2 < \hat{p}_1$)

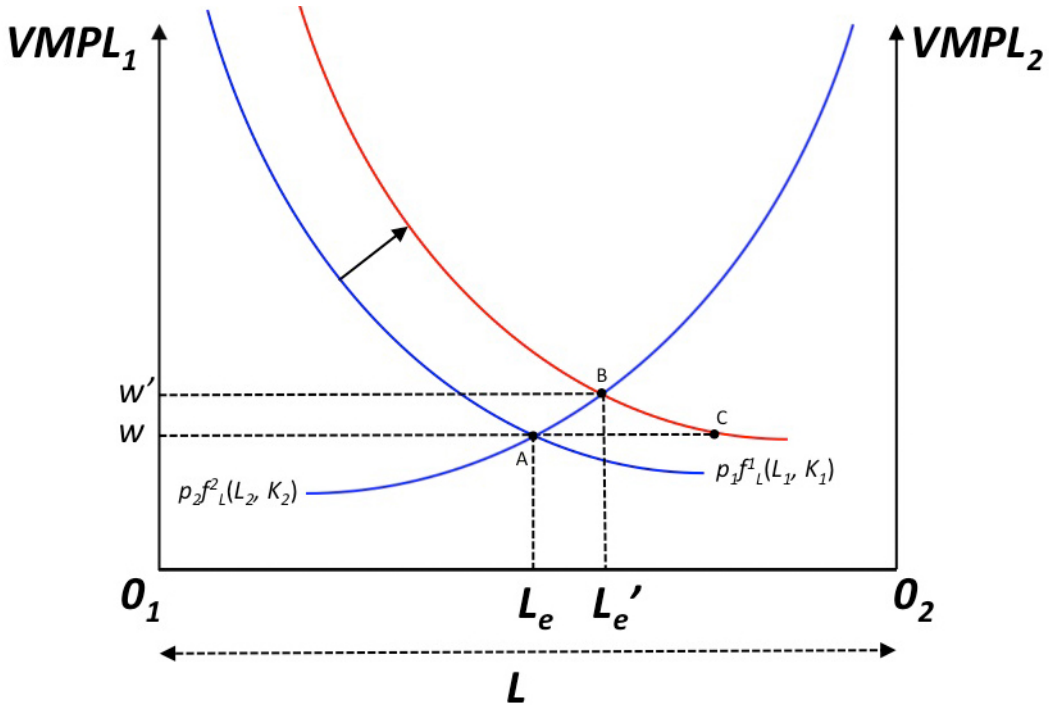
Effect of an increase in L

- $L_1 \uparrow$ and $L_2 \uparrow$
- $y_1 \uparrow$ and $y_2 \uparrow$
- $w \downarrow$
- $r_1 \uparrow$ and $r_2 \uparrow$



Effect of an increase in K_1

- $L_1 \uparrow$ and $L_2 \downarrow$
- $y_1 \uparrow$ and $y_2 \downarrow$
- $w \uparrow$
- $r_1 \downarrow$ and $r_2 \downarrow$



Other comparative statics

- One can use the same type of arguments to analyze consequences of productivity shocks etc.
- In all cases, results are intuitive:
  - "Dutch disease" (Boom in export sectors, Bids up wages, which leads to a contraction in the other sectors)
  - Useful political-economy applications (Grossman and Helpman 1994)
- Easy to extend the analysis to more than 2 sectors:
  - Plot labor demand in one sector vs. rest of the economy

Equilibrium: two-country world

- Predictions on the pattern of trade in a two-country world depend on whether differences in factor endowments come from:
  - Differences in the relative supply of specific factors
  - Differences in the relative supply of mobile factors
- Accordingly, any change in factor prices is possible as we move from autarky to free trade (see Feenstra Problem 3.1 p. 98)

Outline of the Lecture

Differences between Ricardo and RV

- In Ricardo's model, if the two countries had identical technologies, there would be no difference in autarkic relative prices, so no comparative advantage and no reason to trade. In the specific factors model, even if the two countries have identical technologies (same production functions $f^1(.,.)$, $f^2(.,.)$), their factor endowment differences can create comparative advantage

- In Ricardo, trade can lead to complete specialization: import-competing sector disappears completely. That cannot happen in Specific Factors. If all labor were to leave the sector 1, the marginal product of labor there, working with the given fixed K_1, would be very high. So it would be profitable / efficient to bring back some labor into 1. Efficiency / equilibrium condition is equality of values of marginal products.

Differences between Ricardo and RV (2)

- In Ricardo there was no distributional conflict. In Specific Factors there is very sharp distributional conflict between owners of the specific capital in the two sectors. Workers may side with either; depends on their consumption pattern.

Ricardo-Viner: General Conclusions

- Differences in resources: a source of comparative advantage
- Trade (and any other change) has both winners and losers
- Winners are factors specific to export sectors; losers are factors specific to import-competing sectors
- Winners *could* compensate losers . . .
- BUT: In practice, such compensation is rarely carried out fully. Though there are examples of partial compensation (e.g., adjustment assistance, retraining subsidies, temporary subsidies. . .)

Political economy of trade

Countries gain overall from trade, but distributional conflict $\rightarrow$ should trade be restricted? $\rightarrow$ few economists would agree

- Income distribution effects not specific to international trade (technological progress . . . affect income distribution too)
  - Why treat effects of trade differently?
- Overall gains so possible compensation
- The losing side is usually better organised (lobbies. . .) $\rightarrow$ political bias