Inequality and Trade: The Specific Factors Model

Instructor: David Jinkins

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- Last week
  - Gravity model:
    1. Derivation
    2. Country-specific constant: remoteness
  - Ricardian model:
    1. Equilibrium wages different across countries
    2. Labor migration determined by absolute advantage
    3. Data: Countries export in relatively productive industries
    4. Institutions such as trust may cause differences in technology

- Today: Effect of trade on income distributions
  - Specific factors Model
    - Definition of specific factor
    - Simplest possible model
    - Production potential
    - Autarchy equilibrium and comparative statics
    - Trade equilibrium/Gains from Trade
  - Political economy: a preview
  - Labor migration
    - Theory
    - Evidence

Ricardo Redux

- Reason for trade: technological differences (comp. adv.)
- All countries *weakly* gain from trade
- All income goes to labor $\rightarrow$ all workers gain
- Since everyone the same, income distribution is degenerate

Sometimes trade hurts

- Why might trade liberalization hurt some?
  - Short run: adjustment costs like training or refitting machinery
  - Long run: some inputs no longer needed as much
  - Long run example from book: Japanese rice farming machinery

Specific factors

- Today: Focus on the short run
  - *Specific factors* can only be used to make one good
  - Ex: Try to open a restaurant using a car manufacturing plant
  - Given enough time...
- Evidence: American "displaced" workers suffer permanent 15% (avg.) drop in wages

Specific factors

- Why do countries trade?
  - Unlike Ricardo: same technology in all countries
  - Countries have different factor mix (more or less capital, say)
  - Different factor mix causes countries to specialize
  - Ex: More capital makes cars, more labor makes textiles

Simplest possible model for income distributions

- Two countries: Home (H) and Foreign (G)
- Two goods: Clothes (C) and Food (F)
- *Two* factors: Land (t) and Capital (k)
- Different from textbook (three factors)!
- Home endowment of land T less than foreign T^*
- Home endowment of capital K greater than foreign K^*

Two factor model

- Specific factors
  - Income dist.: different people own Land and Capital
  - Capital is used *only* to make clothes
  - Land is used *only* to make food
- Production technology
  - Clothes: $f_C(k) = \frac{k}{a_C}$
  - Food: $f_F(t) = \frac{t}{a_F}$
  - Same technology in both countries

Production Possibilities Sets

Payments to factor owners

- Like wages last time
- Capital gets $r_k = \frac{P_C}{a_C}$
- Land gets $r_t = \frac{P_F}{a_F}$

Equilibrium prices

- As last time, relative demand and supply

Equilibrium Gains from Trade

- autarchy home price ratio $< \frac{P_C^e}{P_F^e} <$ autarchy foreign price ratio

	Input	Clothes	Food
Home capital owner	One unit of capital	$\frac{1}{a_C}$	$\frac{P_C^e}{P_F^e}\frac{1}{a_C}$
Home land owner	One unit of land	$\frac{P_F^e}{P_C^e}\frac{1}{a_F}$	$\frac{1}{a_F}$

- Home capital owner gains from trade, but home land owner is hurt!

The textbook model

- The textbook model adds to capital and land a *mobile* factor called labor. Why?
- Historical reason – Paul Samuelson "Ohlin was Right", Swedish Journal of Economics 1971
- Ohlin: If technology is shared, factor prices (r_k, r_t, and w) equalize across countires if factors can move, but not if only goods are traded
- But factor prices do equalize if there are the same number of factors and goods
- Just now, for ex., equilibrium capital rent in both countries is $r_k = P_C^e / a_C$

The textbook model

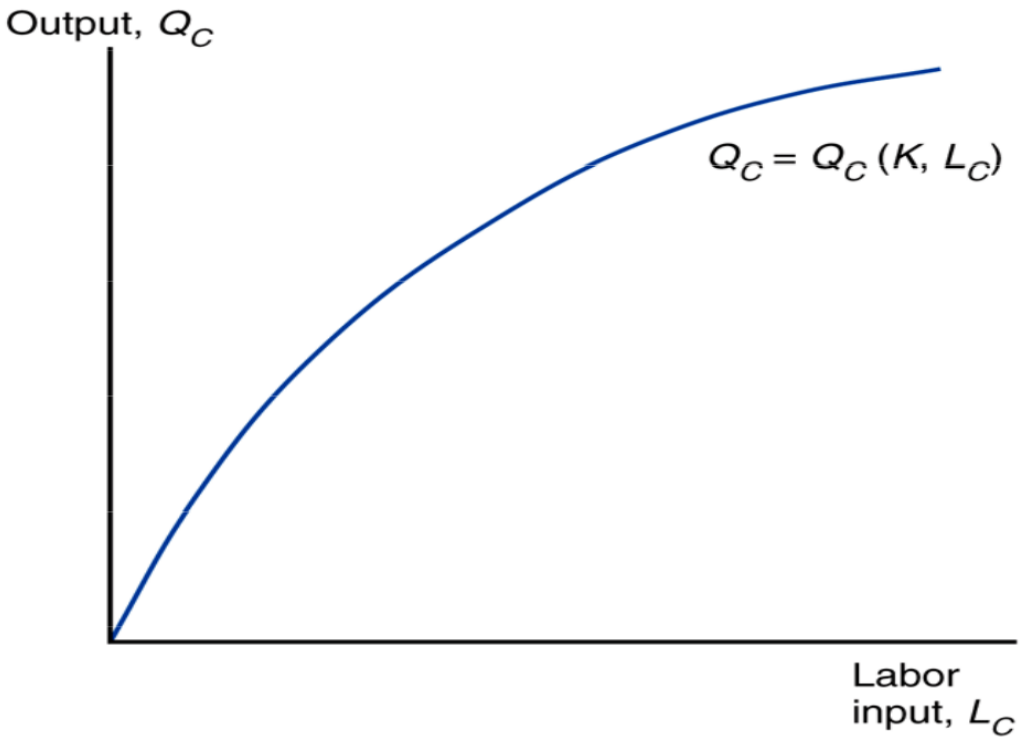
- Samuelson (and Ron Jones independently) developed the textbook version
- Countries with different endowments of land and capital can end up with different factor prices
- Point is to study *how* and *why* factor prices differ across countries
- Desirable, because in the real world wages and other factor prices widely differ
- Of course, analysis a bit more complicated

Production technology

- Clothing
  - In two factor example, production function $f(k) = \frac{k}{a_c}$
  - Now production function for clothing $f(k, l)$
  - Textbook notation $Q_C(K, L_C)$
- Food
  - In two factor example, production function $f(t) = \frac{t}{a_f}$
  - Now production function for clothing $f(t, l)$
  - Textbook notation $Q_F(T, L_F)$

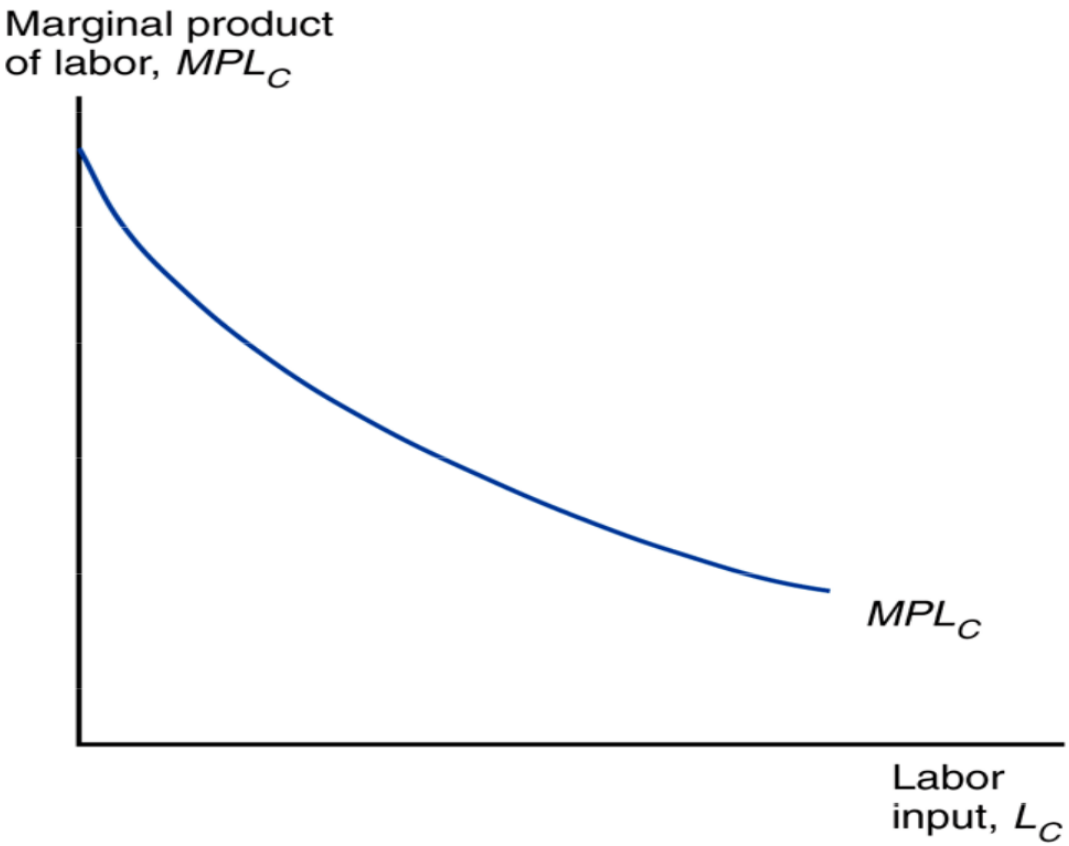
Production function

- Clothing, fix capital at K

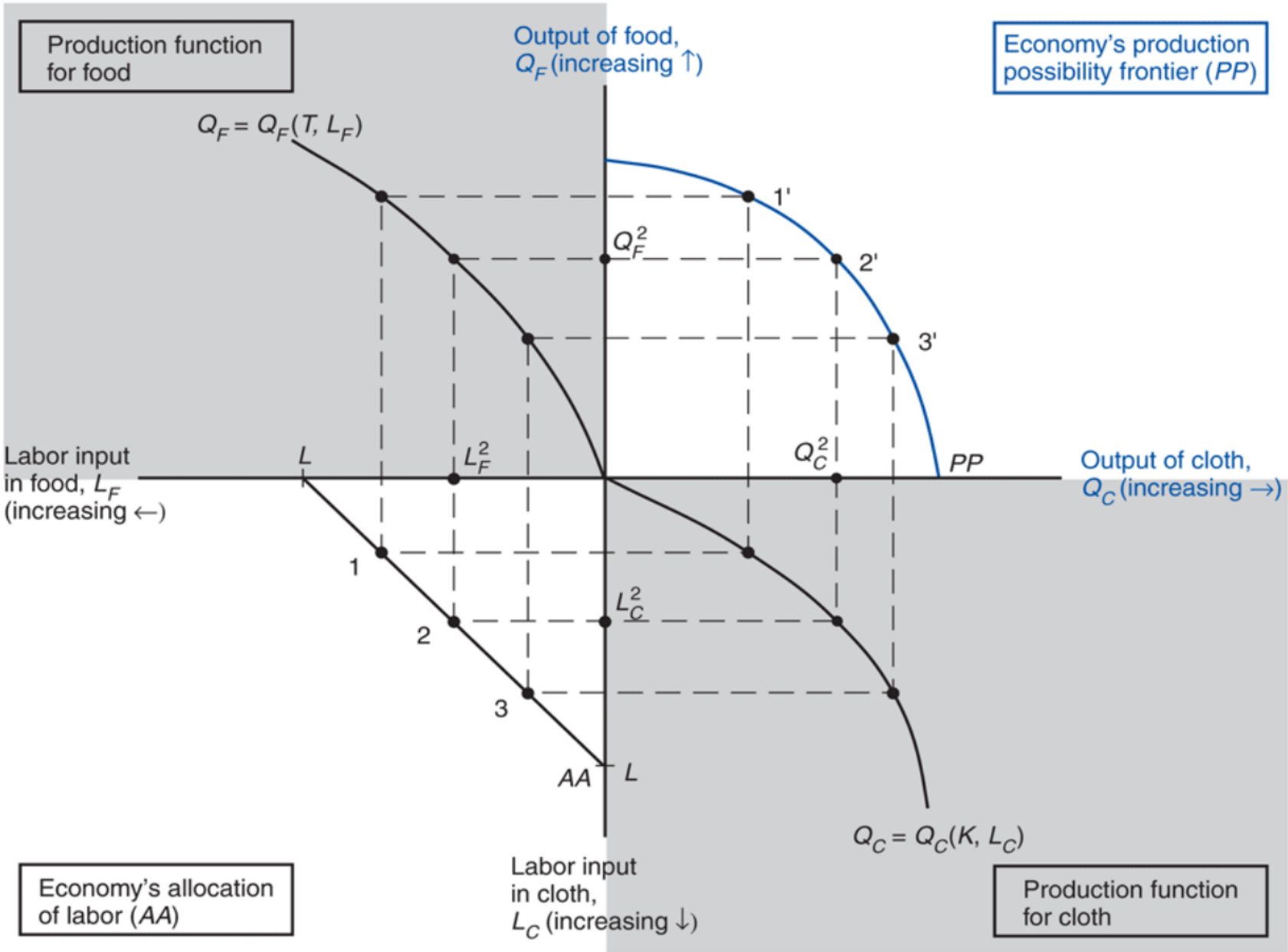


Decreasing MPL

- Clothing, fix capital at K



Graphically deriving the PPF



Important PPF observation

- The slope of the production possibilities frontier is $-\frac{Q_L^F(T,L_F)}{Q_L^C(K,L_C)}$
- Another way to write this: $-\frac{MPL_F}{MPL_C}$
- Heuristic argument – how much food do I have to give up to get a bit more clothing?

Taking a step back

- We have described what goods it is *possible* for a country to produce
- EG, if you were the dictator what mix of goods could you order produced
- But what goods *will* be produced by the economy in autarchy?
- What about with trade?

Autarchy wage

- Competitive firms, zero profit
- Wage:

$$w = Q_L^C(K, L_C)P_C = Q_L^F(T, L_F)P_F$$

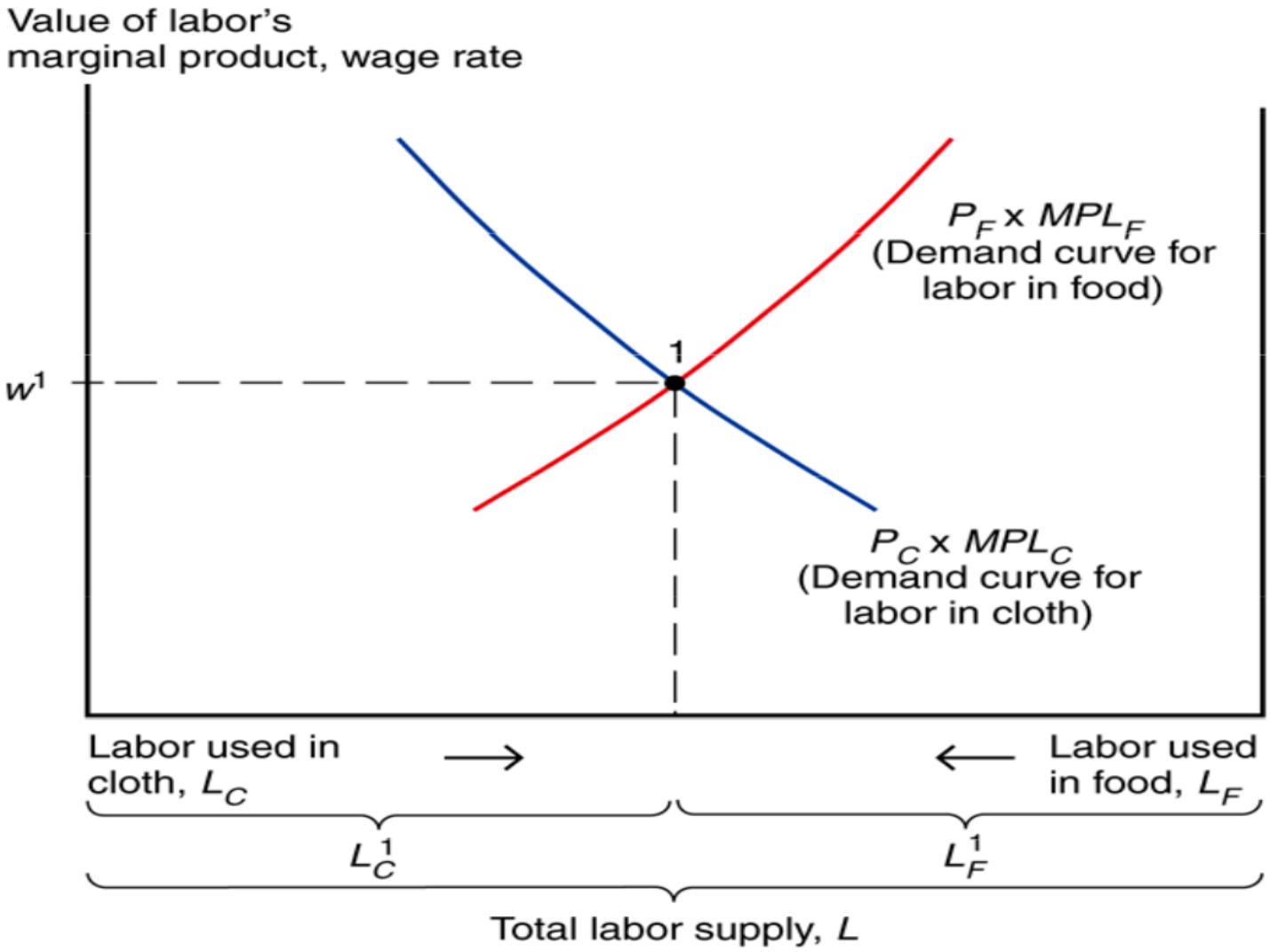
- Textbook equivalently writes:

$$w = MPL_C P_C = MPL_F P_F$$

- Why do these equations hold?
- Last week:

$$w = \frac{P_c}{a_c} = \frac{P_w}{a_w}$$

Graphical Autarchy wage



Autarchy Equilibrium and the PPF

- Wage given by:

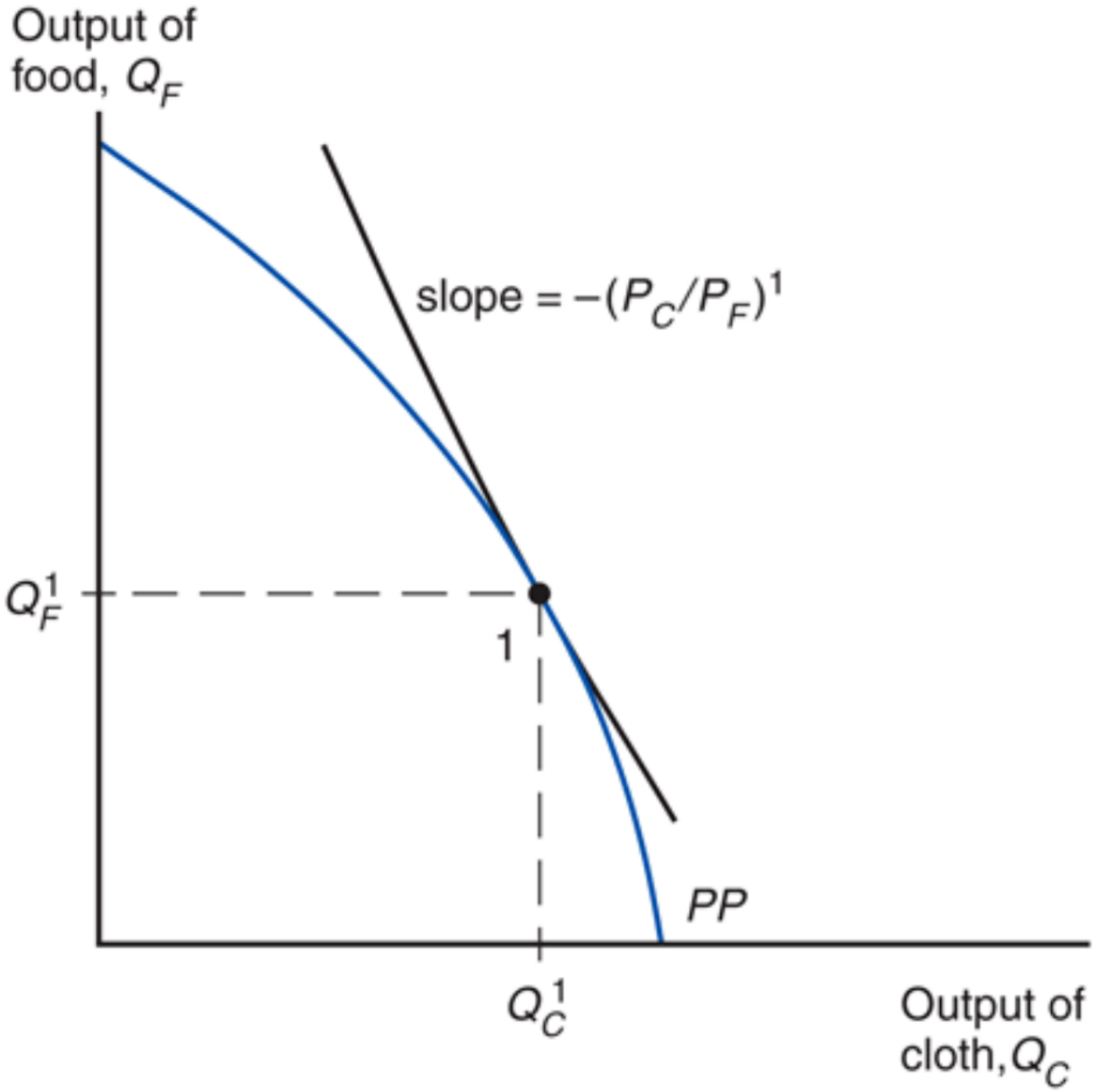
$$w = MPL_C P_C = MPL_F P_F$$

- We can write:

$$-\frac{P_C}{P_F} = -\frac{MPL_F}{MPL_C}$$

- Where have we seen the RHS?

Equilibrium and the PPF

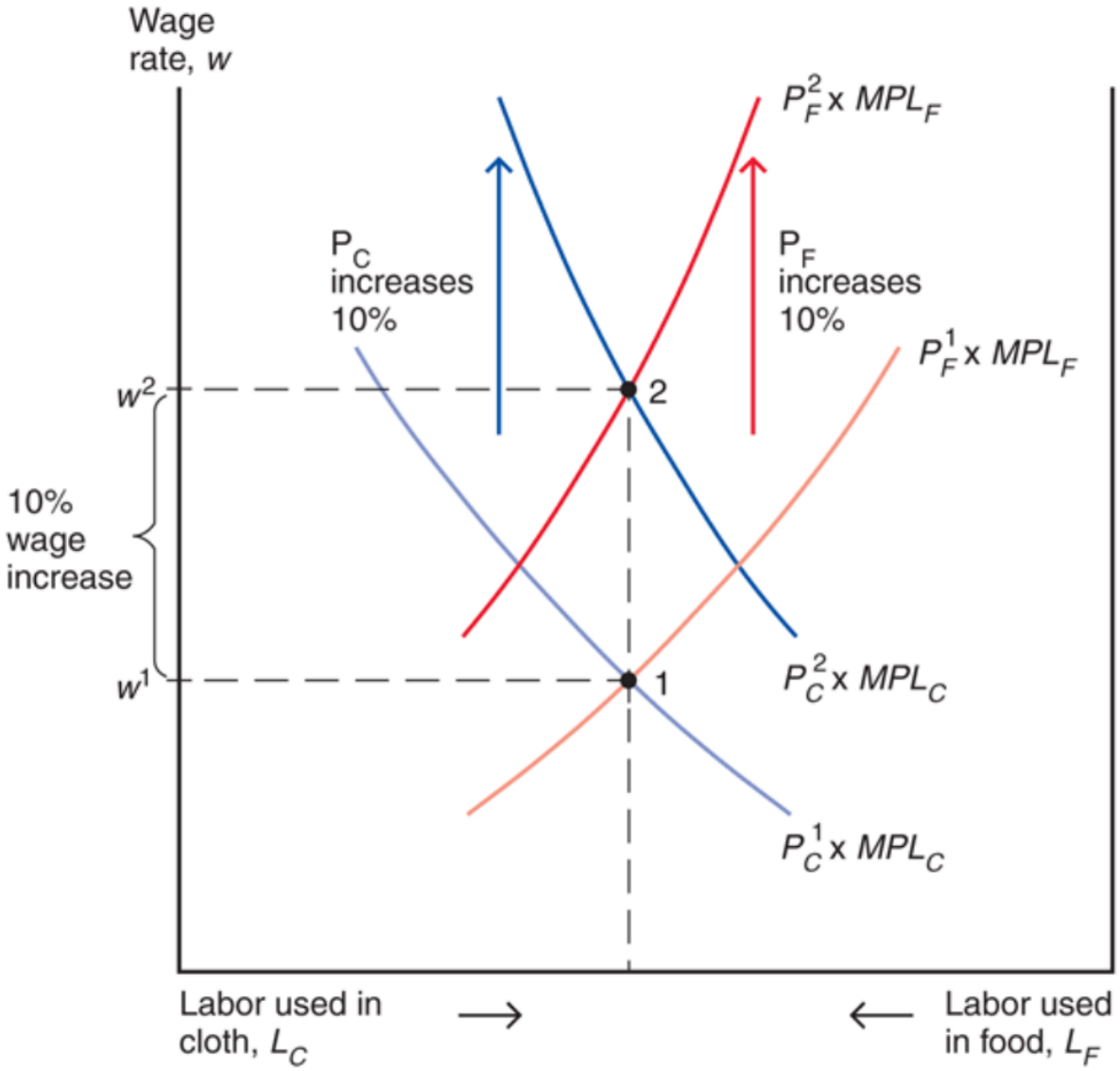


Price changes, labor allocation, and wages

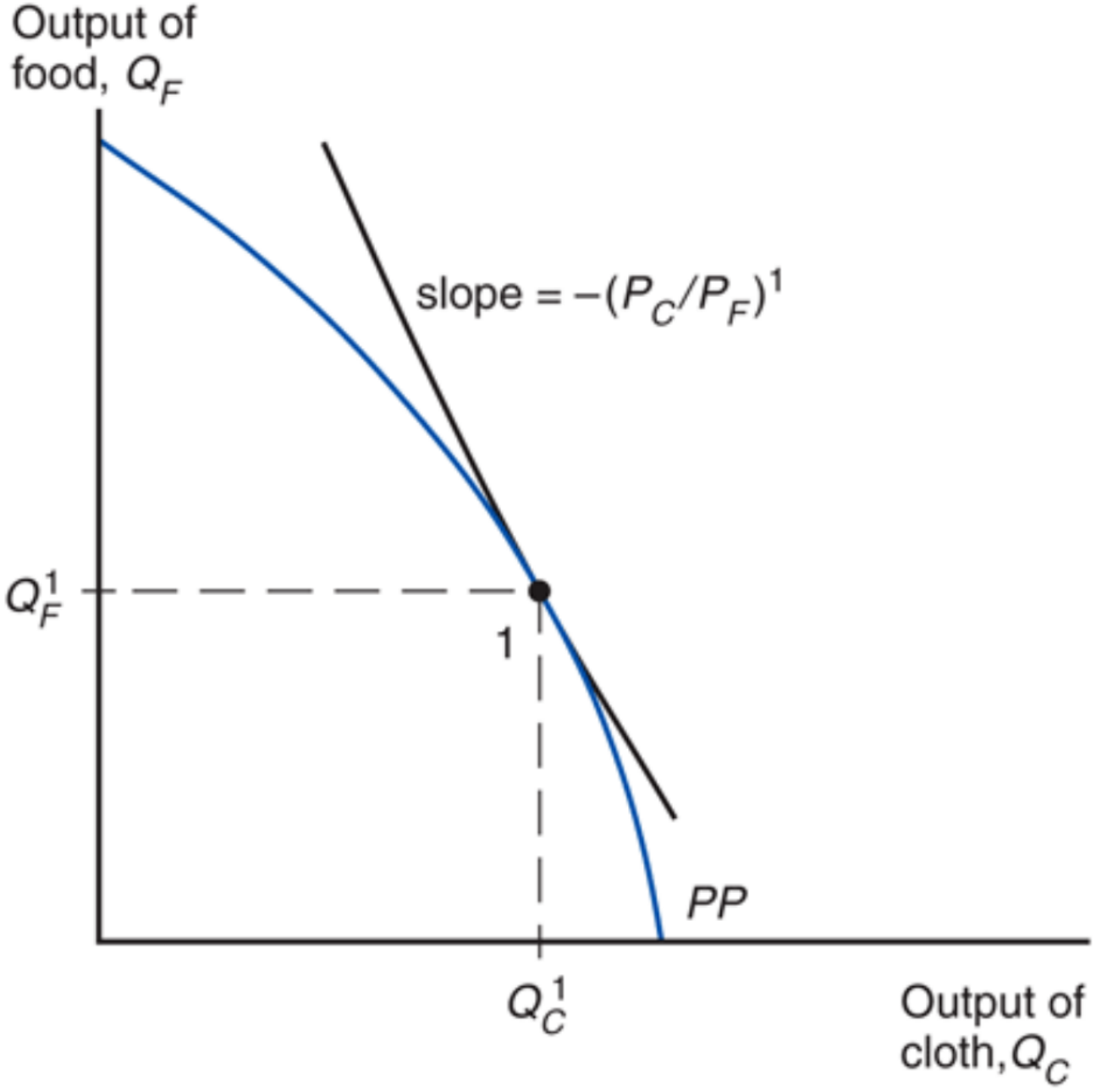
- Who is helped or hurt by:
  1. Proportional rise in prices
  2. Change in relative prices
- The book is hand-wavy here
- We need to know:
  - What is payment to capital?
  - What is payment to land?
  - What is payment to labor?

Price changes, labor allocation, and wages

- Proportional increase in wage, no labor allocation change



Price changes, labor allocation, and wages

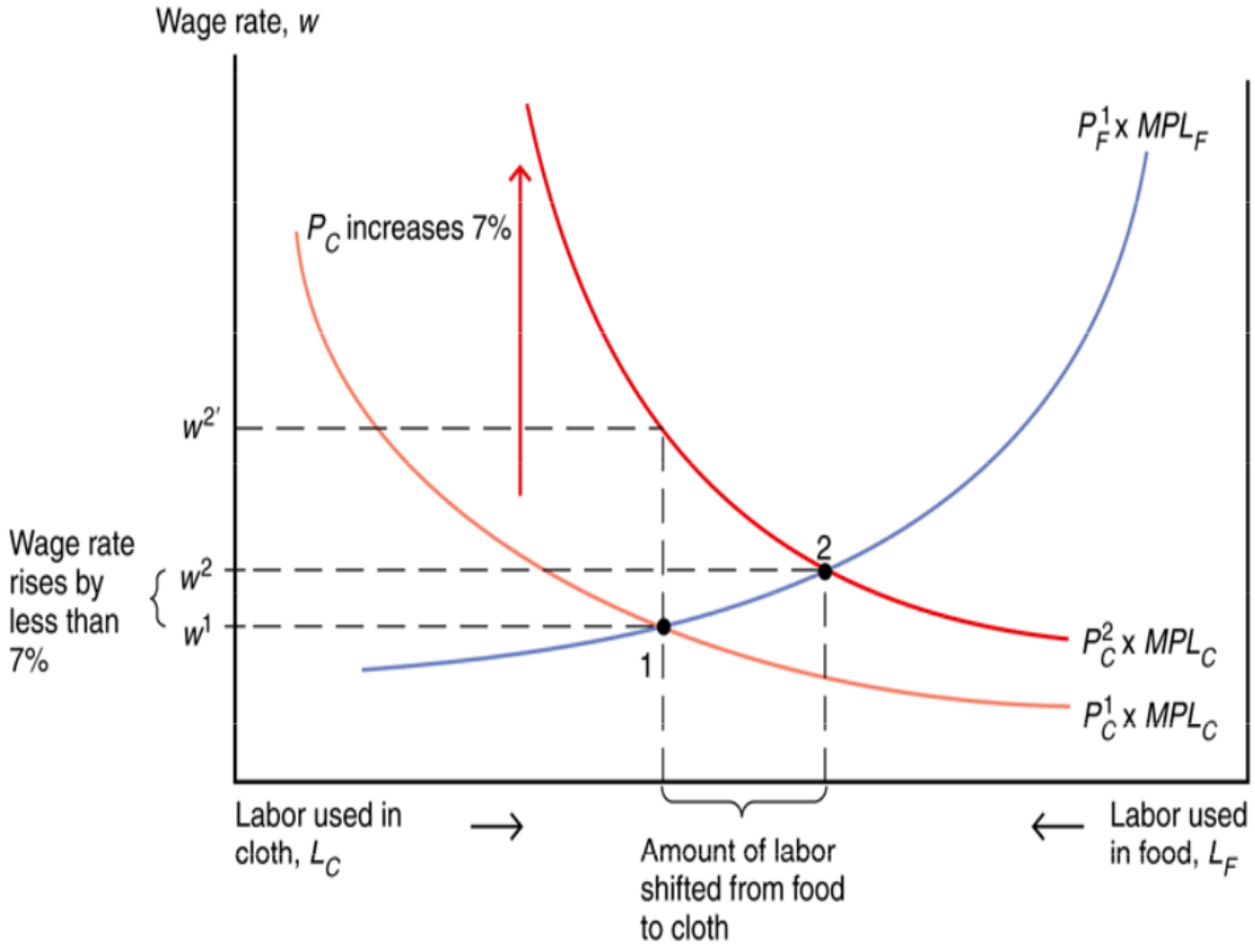


Price changes, labor allocation, and wages

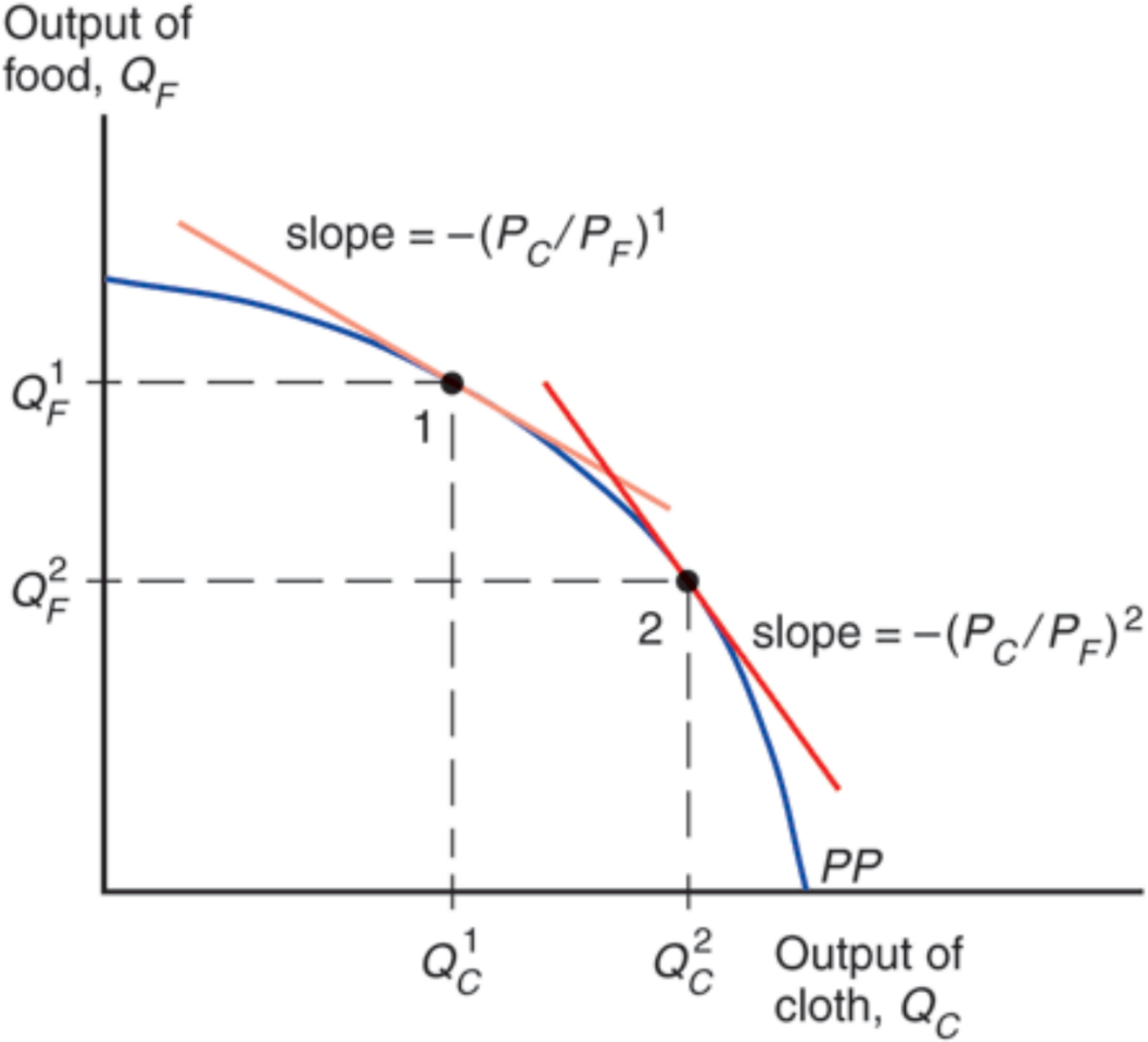
- Proportional price changes
  - No one hurt, as all returns rise proportionally to price

Price changes, labor allocation, and wages

- Less than proportional increase in wage due to falling MPL



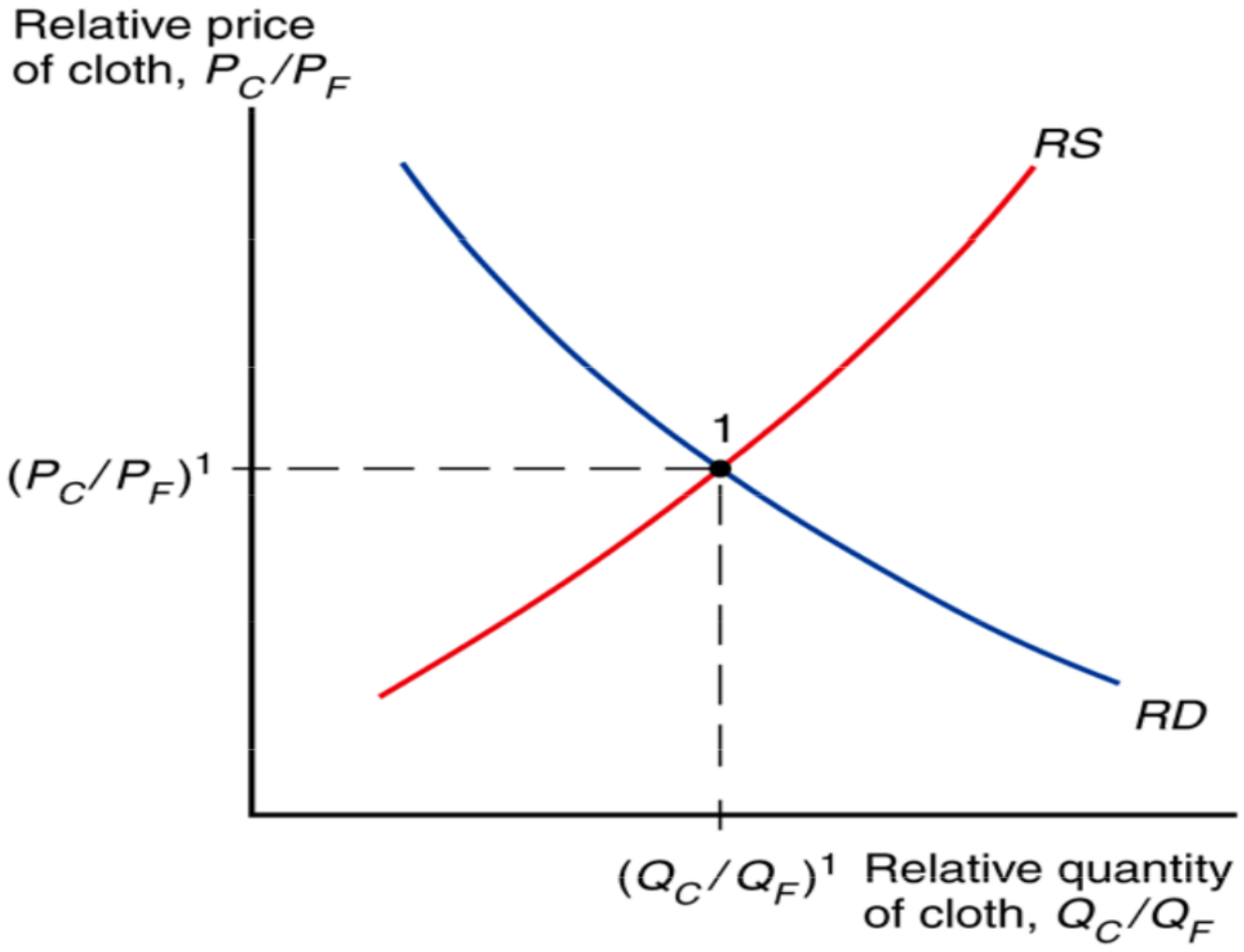
Price changes, labor allocation, and wages



Price changes, labor allocation, and wages

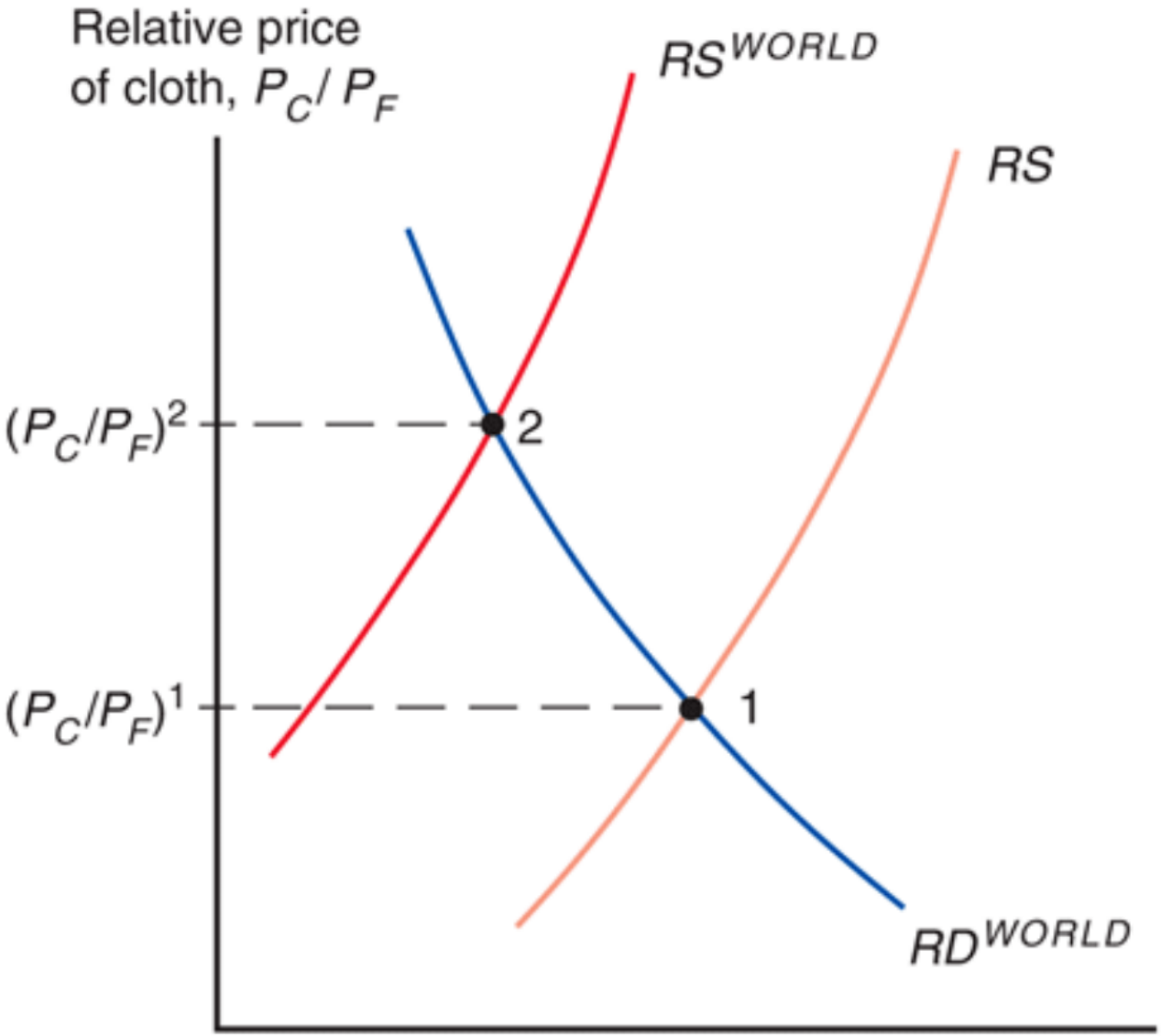
- Rise in price of clothes relative to food
- Begin waving of hands
  - Labor
    - Wage rises, but price of clothes rises more!
    - Workers can afford more food, but less clothes
    - Indeterminent effect on welfare
  - Capital
    - Price of clothes rises $\rightarrow$ pushes r_k up.
    - What happens to the marginal product of capital when L_c increases?
    - Good reason to think that marginal product of capital should increase
    - However what if $Q_C(K, L_C) = (K - L)^2$?
  - Land
    - Price of food stays constant, but clothes now more expensive!
    - Textbook assumes that marginal product of land goes down as L_F decreases
    - Thus r_t goes down, and price of clothes goes up, so land owners hurt.

Autarchy equilibrium rel quantities and prices



Trade equilibrium

- We can think of opening up to trade as a change in relative prices, in one direction or the other



Trade equilibrium

- Since trade is just a relative price change, our autarchy intuition holds
- If price of clothes goes up, capital gains, land loses, and labor is indeterminant

Trade equilibrium

- How can factor prices differ between countries?
- Final good prices (P_C and P_F) in trade equilibrium are the same everywhere
- Consider two countries, same about of labor and land, but home has more capital.
- Wages are higher at home, returns to land are lower at home, and return to capital indeterminate
- If we don't have time $\rightarrow$ homework

Gains from Trade

- Should countries restrict trade to prevent harm?
- Typically economists say no
- We will now show that with correct taxes and redistribution, trade can always make everyone better off
- Method: Show that trade expands the aggregate consumption possibilities set

Summing up

1. Simple model shows how trade can hurt some within a country
2. Textbook model shows how factor prices can differ in equilibrium, even if technology is the same
3. Everyone can still gain from trade, with the right redistribution

- Now:
  - Factor movement (international migration)
  - Some evidence

Note: Political economy

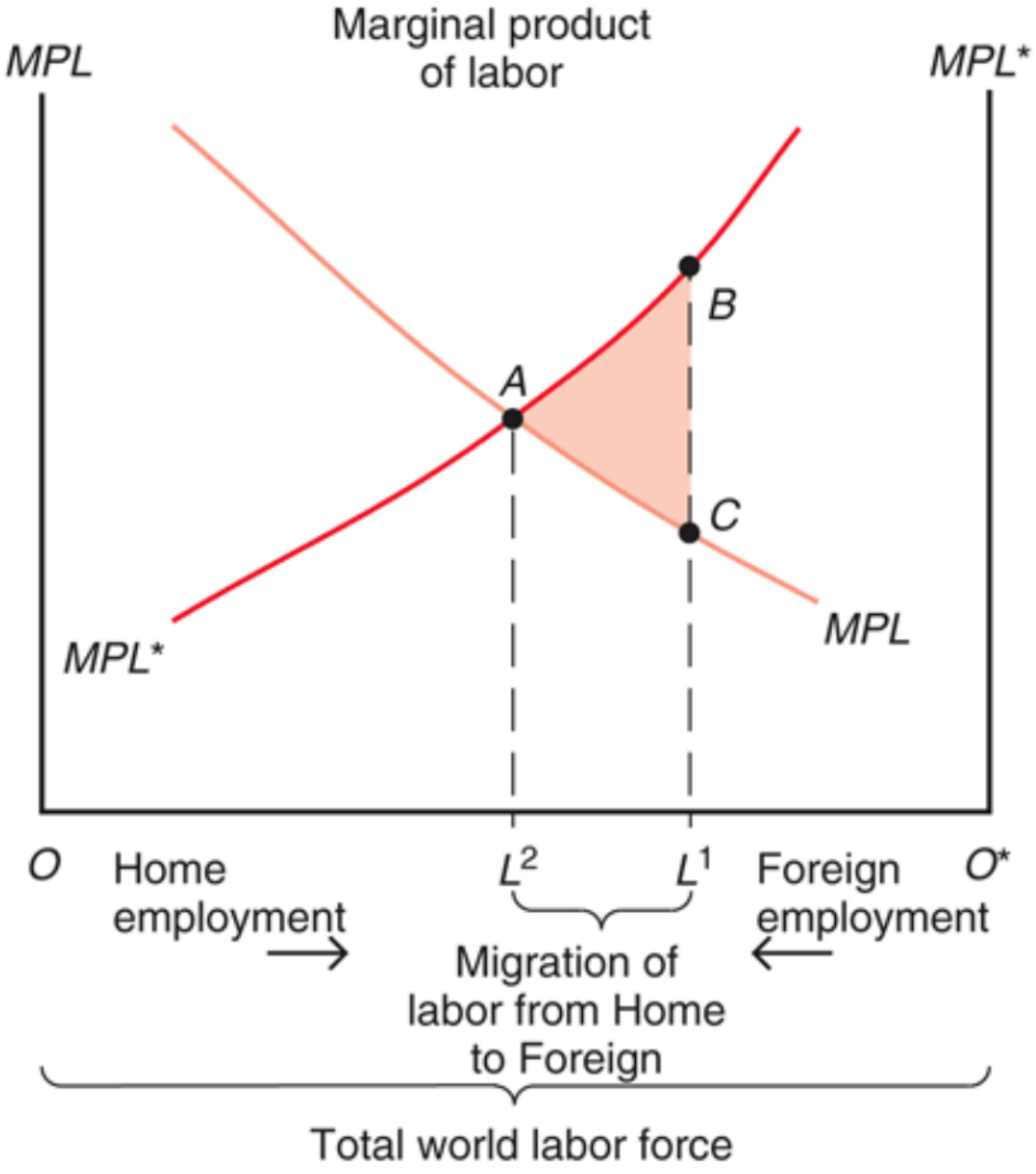
- Trade can hurt: American apparel workers get 35% lower wages than others
- We have shown, better to tax and distribute rather than stop trade
- Still politically much anti-trade rhetoric
  - Losses from trade are often concentrated in industries
  - Gains are often distributed over many people
- Ex: American sugar twice as expensive as world sugar
- Half of American sugar production in 17 factories
- Costs avg. American \$10 (55 dkk) a year

International Migration

- The single largest economic distortion in the world is barriers to migration
- The gains to opening borders are on the order of trillions of DKK a year

- Textbook: Who gains and who loses in a simple model of international migration?
- The simplest possible model:
  - Two countries
  - One good: Cheese
  - Two factors, labor and land
  - Why do we need two factors?

International Migration



International Migration

- No price, only cheese
- Foreign workers lose
- Home workers gain
- More cheese is produced, scope for welfare increasing taxes!

International Migration

	Real Wage, 1870 (U.S. = 100)	Percentage Increase in Real Wage, 1870–1913
Destination Countries		
Argentina	53	51
Australia	110	1
Canada	86	121
United States	100	47
Origin Countries		
Ireland	43	84
Italy	23	112
Norway	24	193
Sweden	24	250

Source: Jeffrey G. Williamson, "The Evolution of Global Labor Markets Since 1830: Background Evidence and Hypotheses," *Explorations in Economic History* 32 (1995), pp. 141–196.

- Summary: Effect of trade on income distributions
  - Specific factors Model
    - Definition of specific factor
    - Simplest possible model
    - Production potential
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    - Trade equilibrium/Gains from Trade
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Next time

- The Hecksher-Ohlin Model
  - Like model today, *but* two mobile factors
  - This was *the* workhorse trade model for 50 years
  - Enough realism to examine many trade issues
  - Why? My theory: can be almost totally analyzed graphically
- Significant decline in popularity over last 20 years
  - Great theory as it is testable!
  - Unfortunately has spectacularly failed nearly
  - Still alive (barely)

Fig. 4A-1: Showing that Output Is Equal to the Area under the Marginal Product Curve

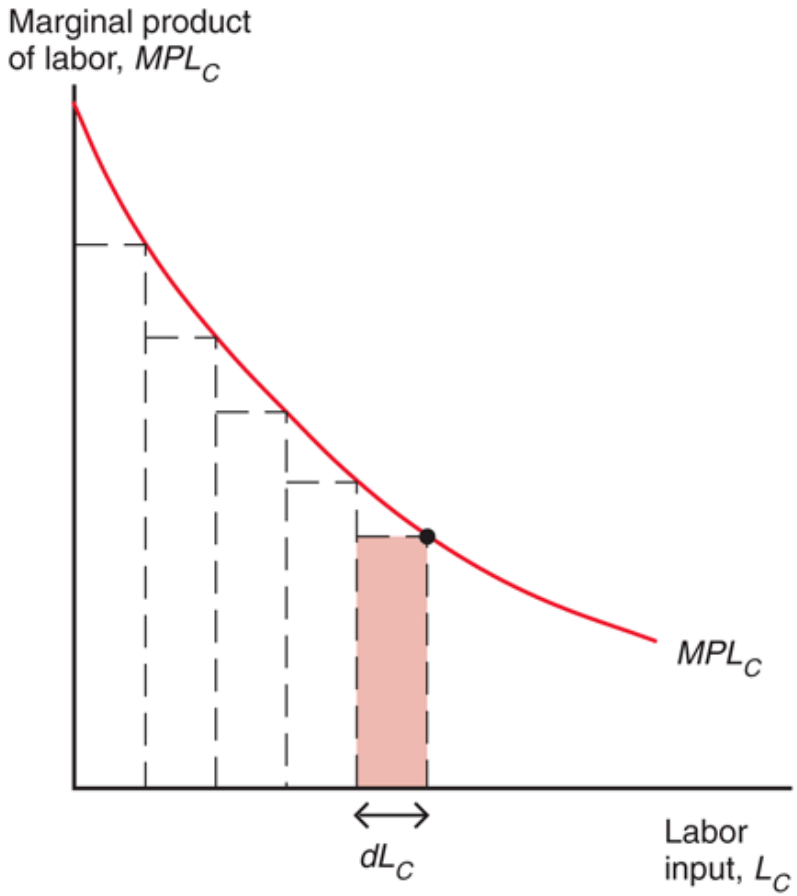

Fig. 4A-2: The Distribution of Income within the Cloth Sector

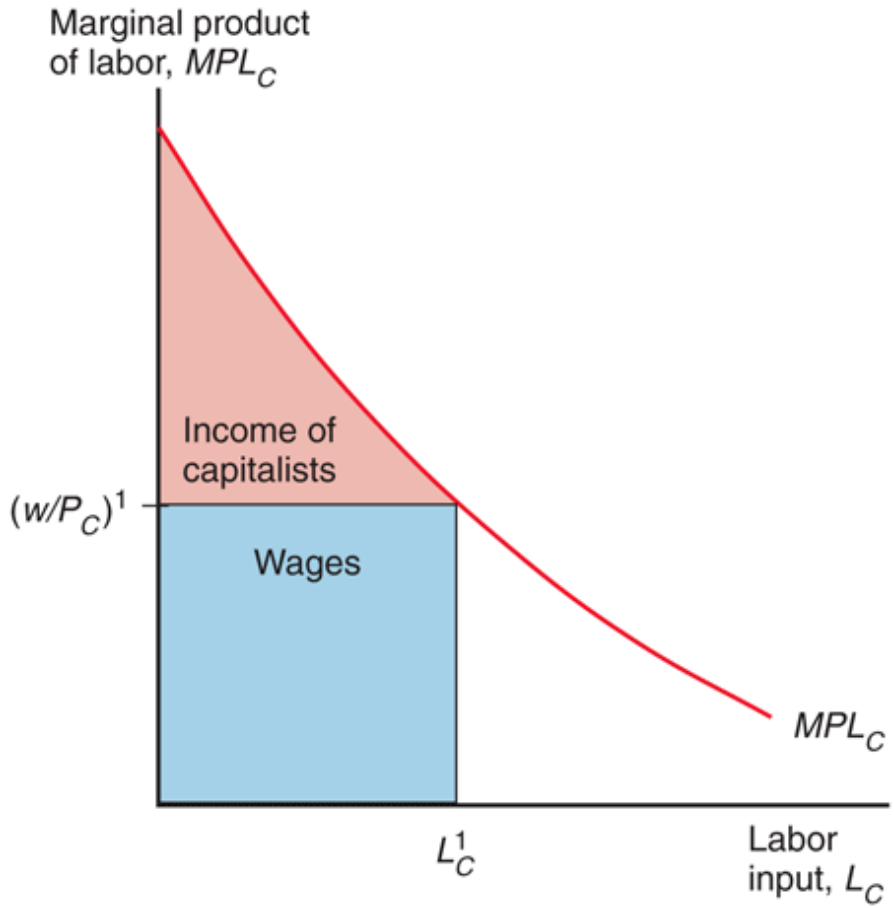

Fig. 4A-3: A Rise in P_C Benefits the Owners of Capital

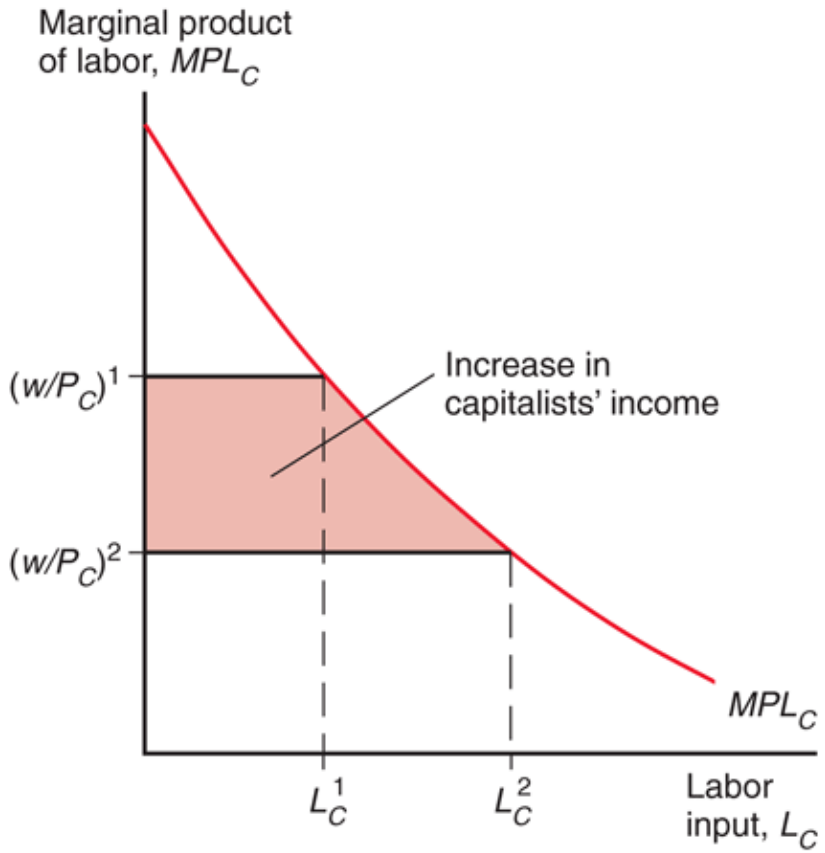

Fig. 4A-4: A Rise in P_C Hurts Landowners