

Inequality and Trade: The Specific Factors Model

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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 countries 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

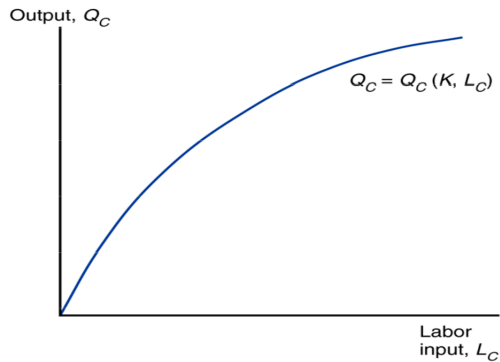
- ▶ In two factor example, production function $f(k) = \frac{k}{a_c}$
- ▶ Now production function for clothing $f(k, l)$
- ▶ Textbook notation $Q_C(K, L_C)$

- ▶ Food

- ▶ In two factor example, production function $f(t) = \frac{t}{a_f}$
- ▶ Now production function for clothing $f(t, l)$
- ▶ Textbook notation $Q_F(T, L_F)$

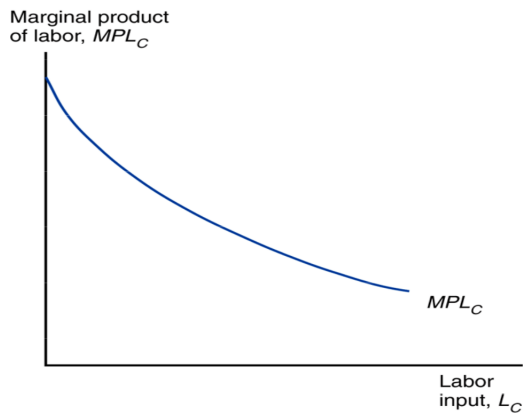
Production function

- Clothing, fix capital at K

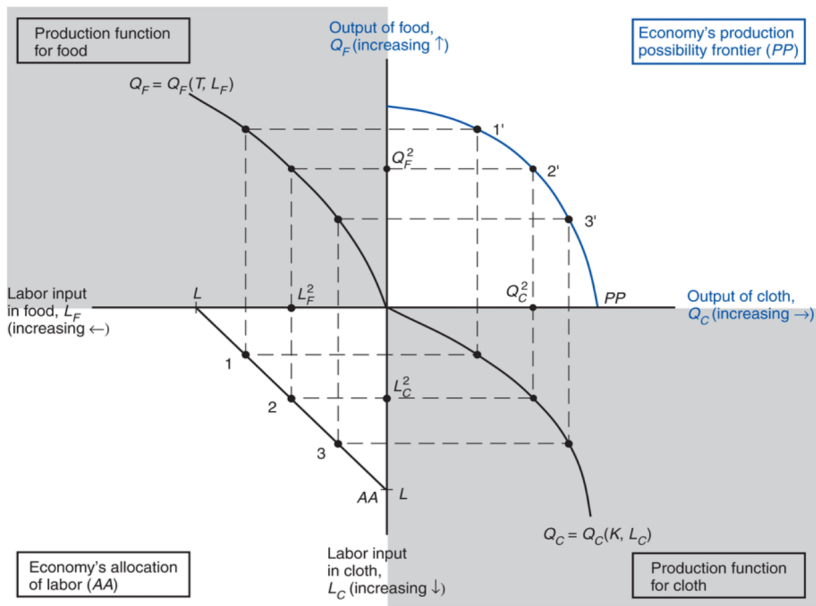


Decreasing MPL

- 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:

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

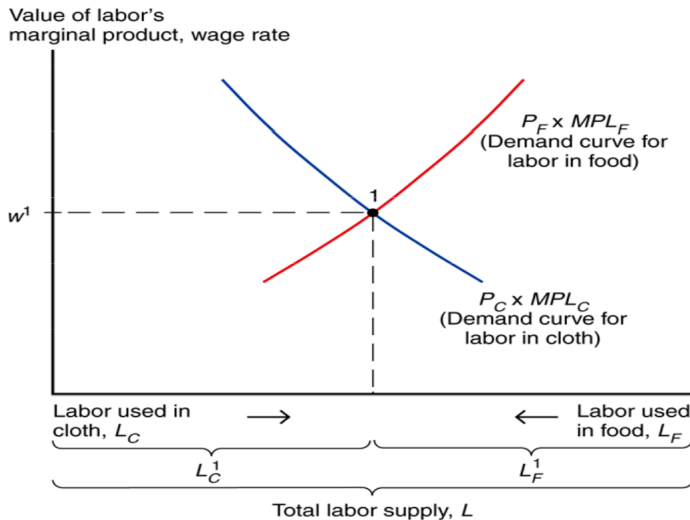
- ▶ Textbook equivalently writes:

$$w = MPL_C P_C = MPL_F P_F$$

- ▶ 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:

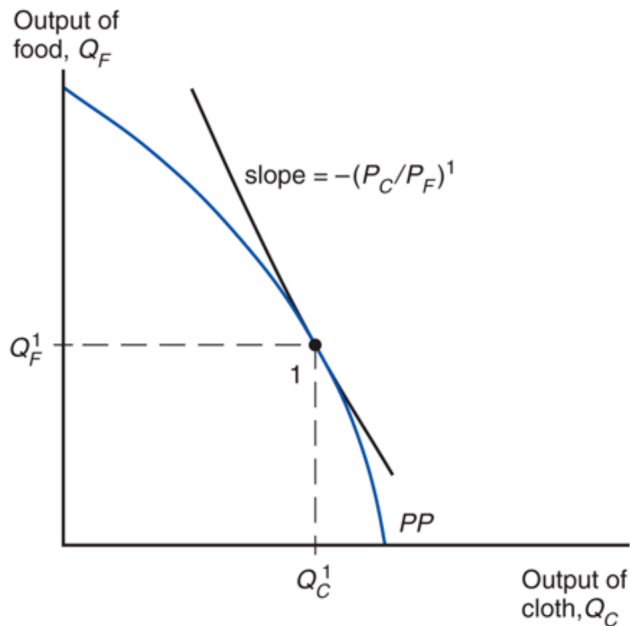
$$w = MPL_C P_C = MPL_F P_F$$

- ▶ We can write:

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

- ▶ Where have we seen the RHS?

Equilibrium and the PPF

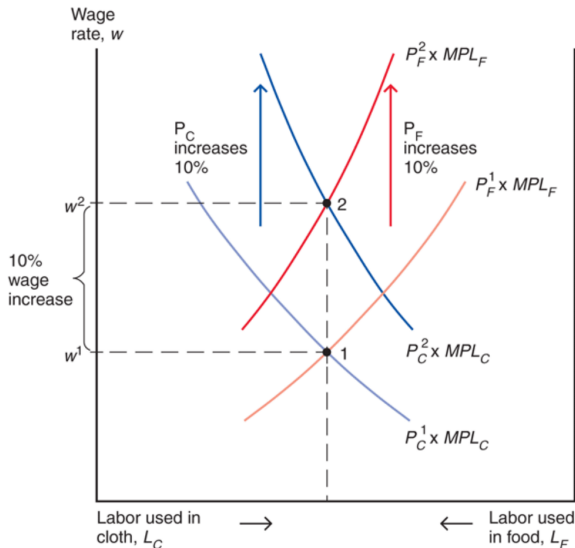


Price changes, labor allocation, and wages

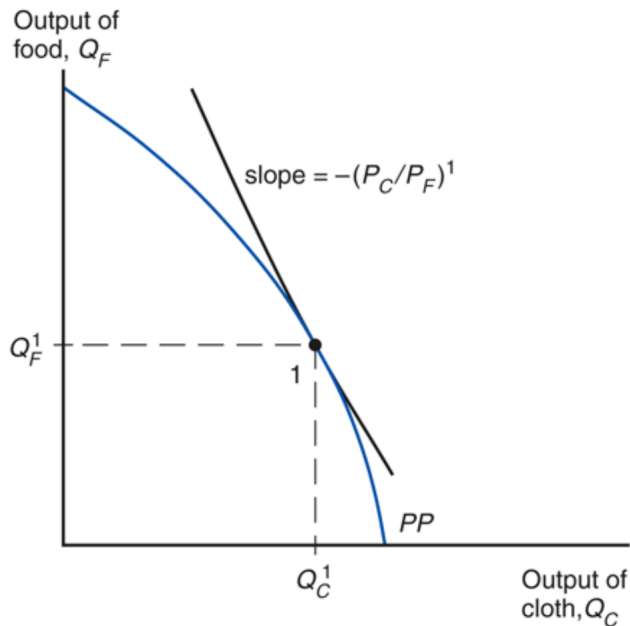
- ▶ Who is helped or hurt by:
 1. Proportional rise in prices
 2. Change in relative prices
- ▶ The book is hand-wavy here
- ▶ We need to know:
 - ▶ What is payment to capital?
 - ▶ What is payment to land?
 - ▶ What is payment to labor?

Price changes, labor allocation, and wages

- Proportional increase in wage, no labor allocation change



Price changes, labor allocation, and wages

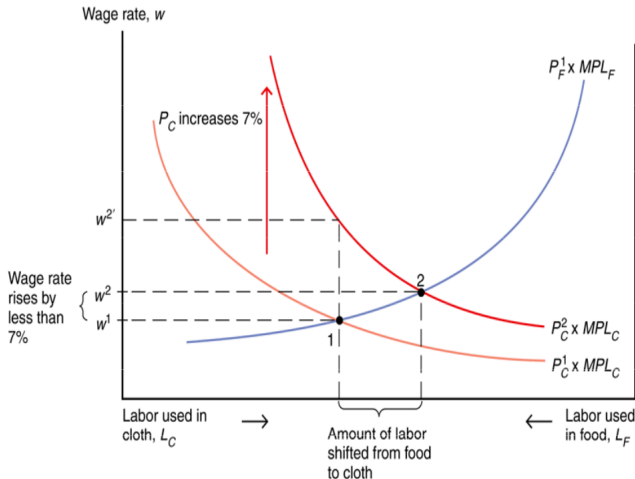


Price changes, labor allocation, and wages

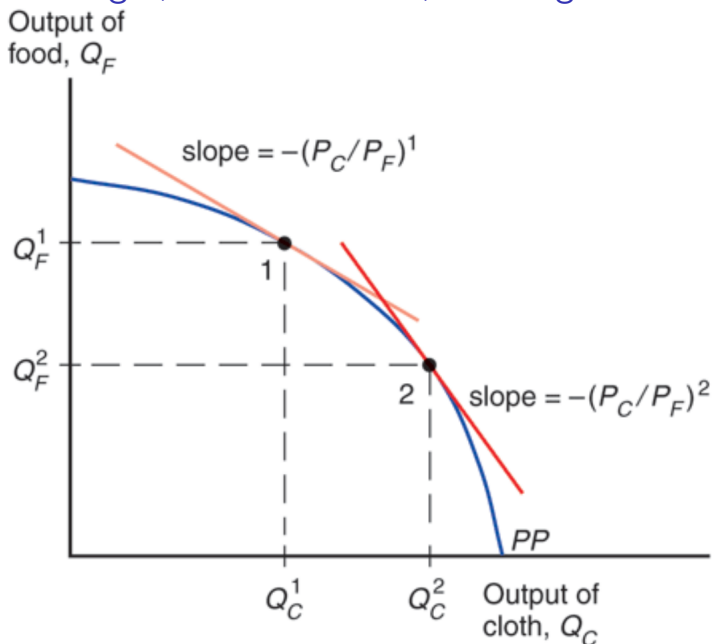
- ▶ Proportional price changes
 - ▶ No one hurt, as all returns rise proportionally to price

Price changes, labor allocation, and wages

- Less than proportional increase in wage due to falling MPL



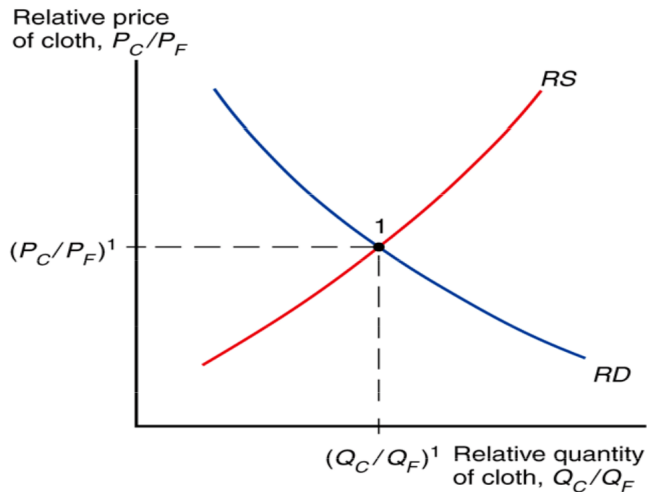
Price changes, labor allocation, and wages



Price changes, labor allocation, and wages

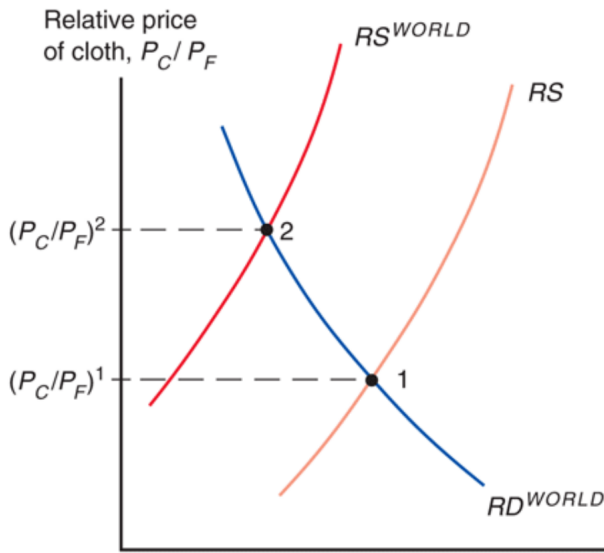
- ▶ Rise in price of clothes relative to food
- ▶ Begin waving of hands
 - ▶ Labor
 - ▶ Wage rises, but price of clothes rises more!
 - ▶ Workers can afford more food, but less clothes
 - ▶ Indeterminent effect on welfare
 - ▶ Capital
 - ▶ Price of clothes rises \rightarrow pushes r_k up.
 - ▶ What happens 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 indeterminate

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 amount 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 → 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

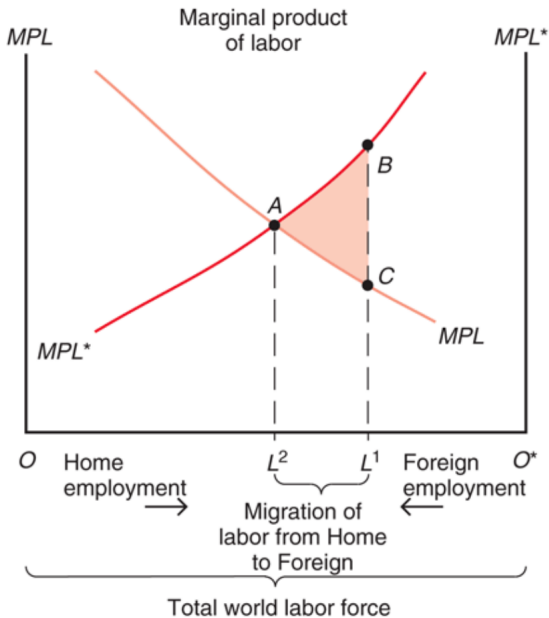
Note: Political economy

- ▶ 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.

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Next time

- ▶ The Heckscher-Ohlin Model
- ▶ This was *the* trade model for 50 years
- ▶ Reason for trade different factor endowments
- ▶ Guided policy thinking for 40 years.
- ▶ Trouble matching some trade facts
- ▶ Still alive (barely)



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

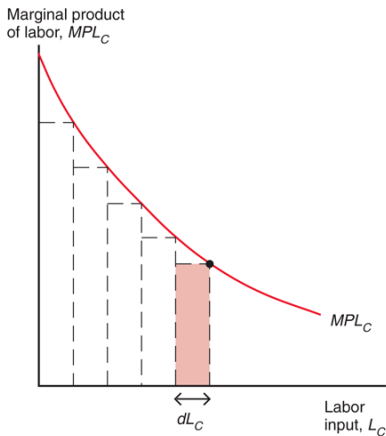




Fig. 4A-2: The Distribution of Income within the Cloth Sector

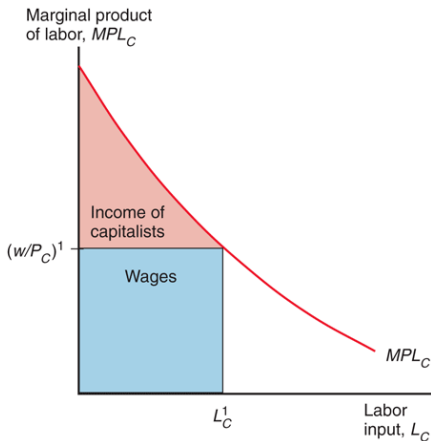




Fig. 4A-3: A Rise in P_C Benefits the Owners of Capital

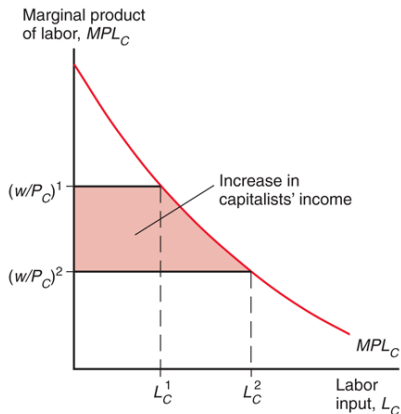




Fig. 4A-4: A Rise in P_C Hurts Landowners

