CHAPTER 3

- Setting up the specific factor model

- Change in production

- Aggregate gains from trade

- Effect on labor wages

- Effect on returns to K and Land

CHAPTER 3

- Setting up the specific factor model

- Change in production

- Aggregate gains from trade

→ Effect on labor wages?

→ Effect on returns to Capital and Land?

3 Gains from Trade

Gains for everyone?

- When there are gains from trade *on average*, it does not imply that everyone gains from trade

- The interesting part of the model is to examine what happens to the return to each factor:
  1) Labor wage
  2) Rental rate of Capital and Land

  Do workers gain? Do land and capital owner gain?

3 Gains from Trade

Gains for everyone?

1) What about laborers?

Does income from labor increase?

3 Gains from Trade

Gains for everyone?

1) What about laborers?

   Does income from labor increase?

   Ambiguous! Workers do not necessarily gain

3 Gains from Trade
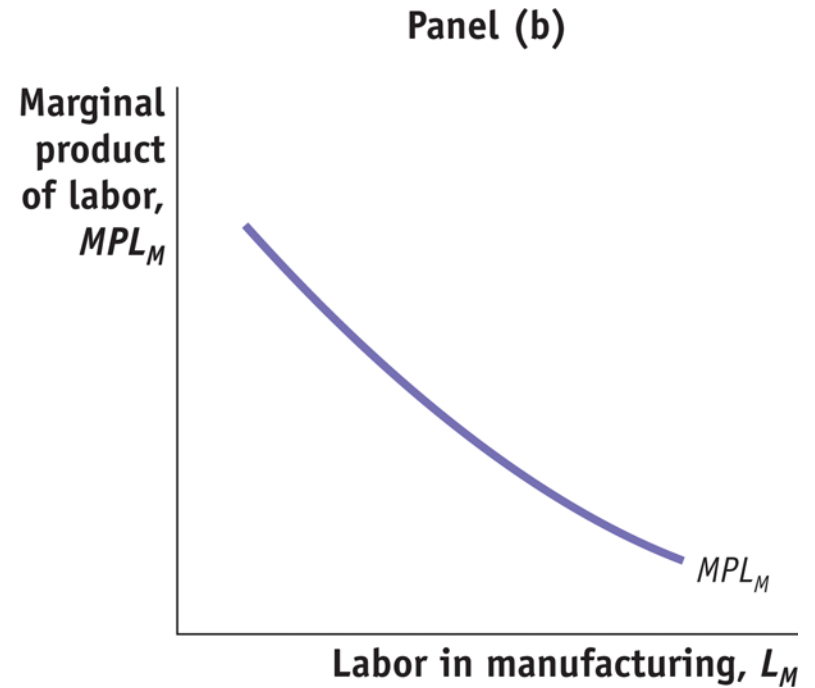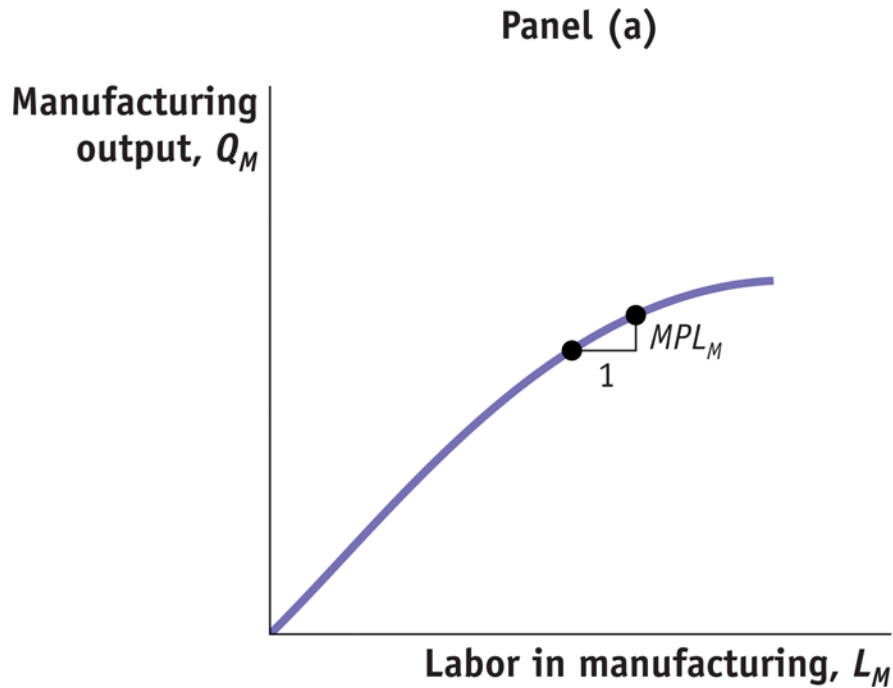
Gains for everyone?

1) What about laborers?

Equilibrium wages:

- In equilibrium, wages are equalized across industries.
- This implies:

$$w = P_M \cdot MPL_M = P_A \cdot MPL_A$$

3 Gains from Trade
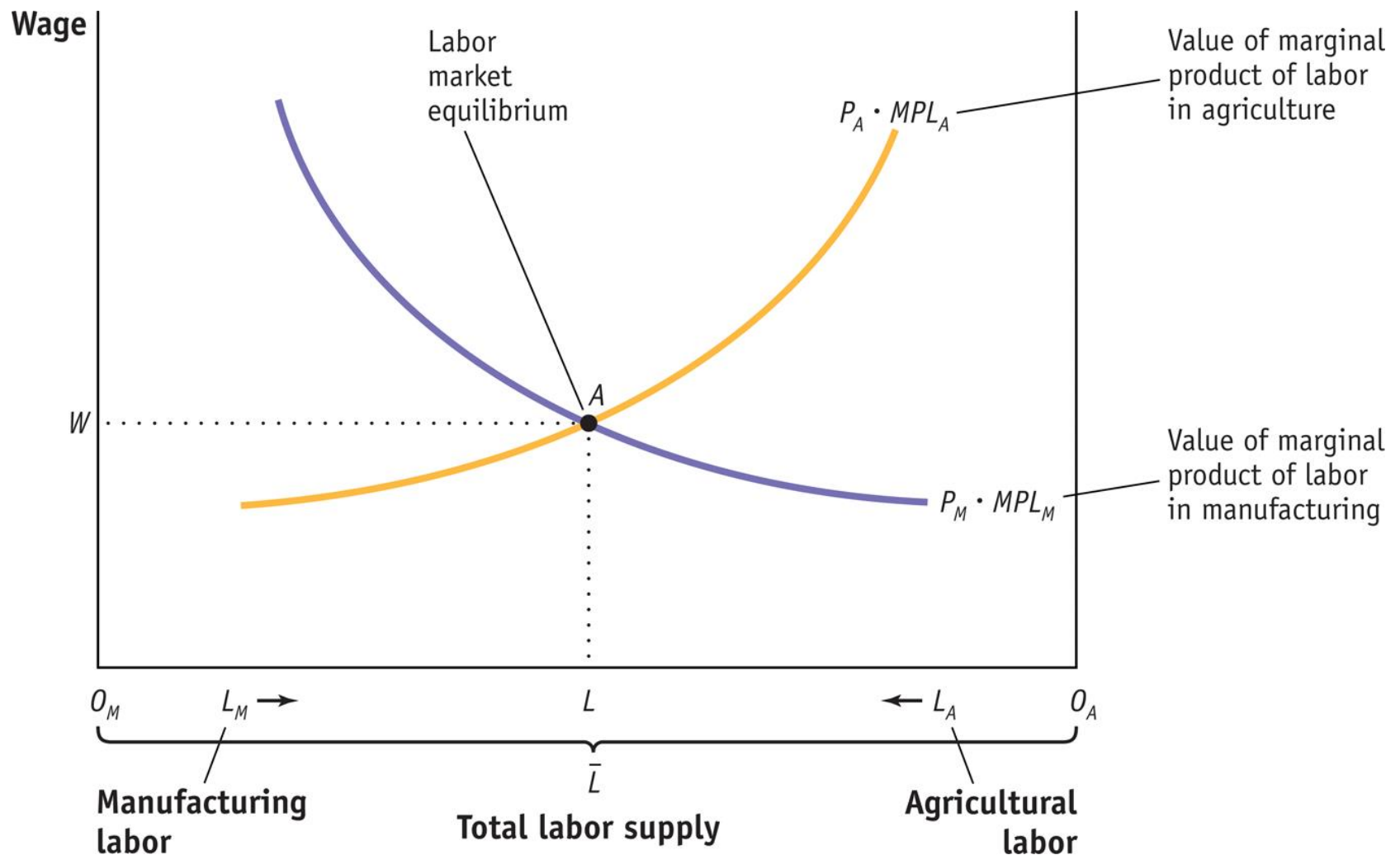
Diminishing returns for labor in each industry:

Panel (a)

Manufacturing output, Q_M

MPL_M

1

Labor in manufacturing, L_M

Panel (b)

Marginal product of labor, MPL_M

MPL_M

Labor in manufacturing, L_M

(same for Agriculture)

3 Gains from Trade

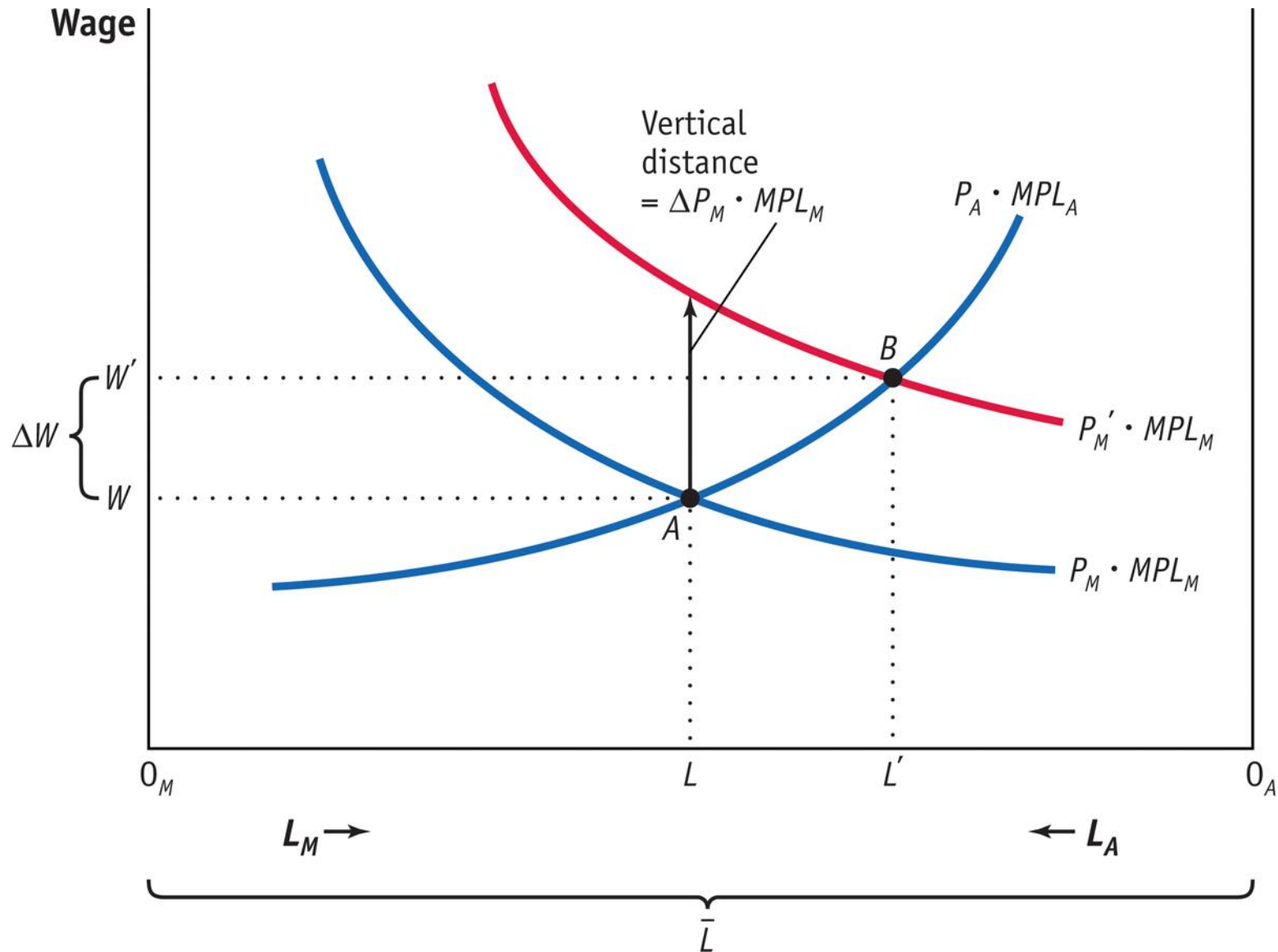Combining the two industries on the same graph:

3 Gains from Trade

Gains for everyone?

Assume for now that P_A doesn't change and P_M increases

(Note: we would obtain similar results if P_A decreases and P_M doesn't change; it's all about relative prices)

Effect of an increase in the price P_M

Wage (vertical axis)

Vertical distance $= \Delta P_M \cdot MPL_M$

$P_A \cdot MPL_A$

$P_M' \cdot MPL_M$

$P_M \cdot MPL_M$

W'

ΔW

W

B

A

0_M L L' 0_A

$L_M \rightarrow$ $\leftarrow L_A$

$\bar{L}$

3 Gains from Trade

Do workers gain?

Can they buy more Agric. goods? More Manuf. Goods?

- Wage increases → workers can buy more Agri goods

- But do wages increase more than P_M?

Effect of an increase in the price P_M

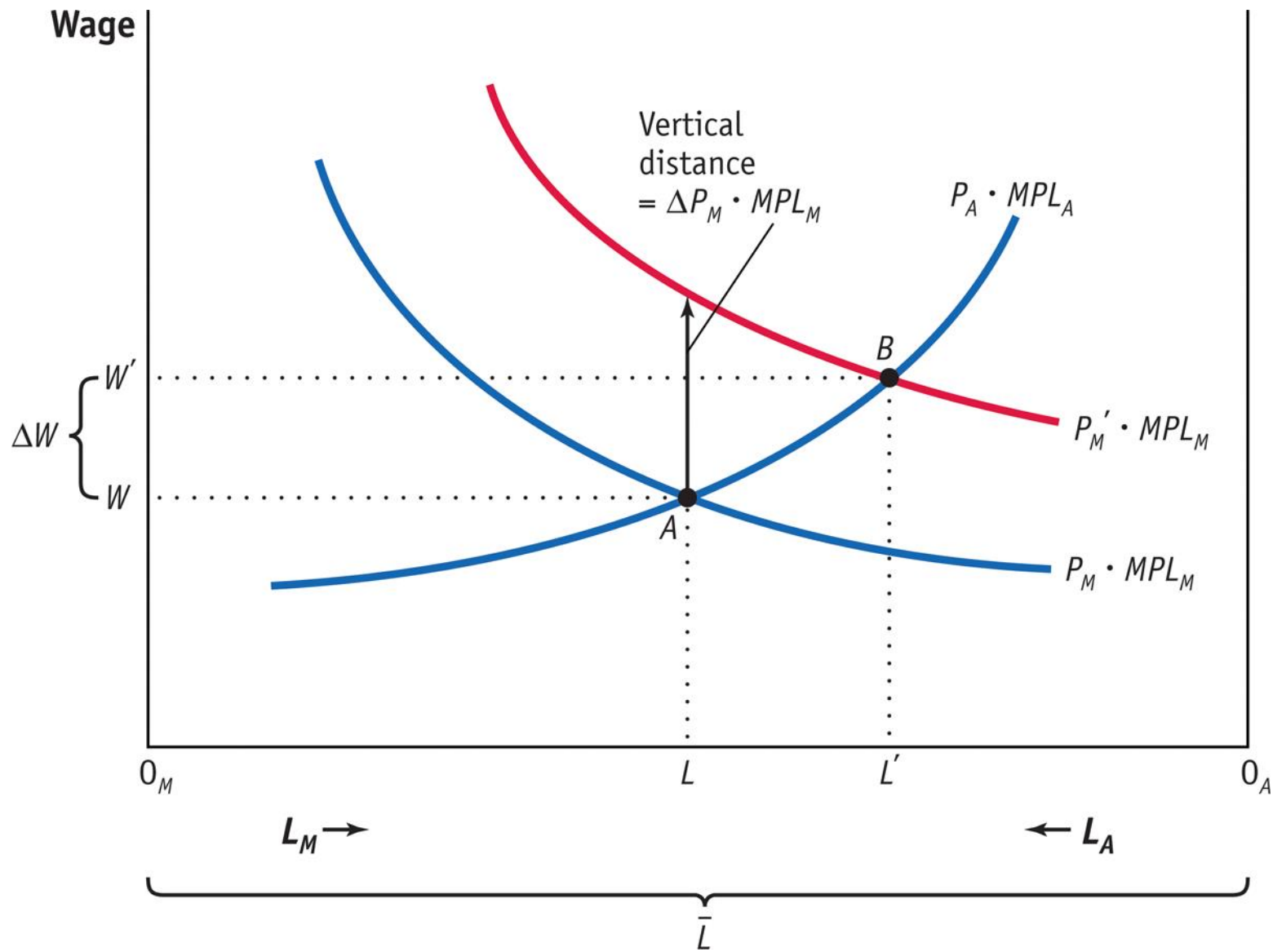# 3 Gains from Trade

Do workers gain?

Can they buy more Agric. goods? More Manuf. Goods?

- Wage increases → workers can buy more A' goods

- But workers can't buy as much Manuf goods as before:

$$\Delta W < \Delta P_M \cdot MPL_M$$

(see graph) which implies:

$$\frac{\Delta W}{W} < \frac{\Delta P_M \cdot MPL_M}{W} = \frac{\Delta P_M}{P_M}$$

3 Gains from Trade

More details:

- Change in wages:

$$\Delta W = \Delta(P_M \cdot MPL_M)$$

$$= \Delta P_M \cdot MPL_M + P_M \cdot \Delta MPL_M$$

- Since workers are moving from Ag to Manuf, MPL_M decreases and thus:

$$\Delta W < \Delta P_M \cdot MPL_M$$

- For relative wages:

$$\frac{\Delta W}{W} < \frac{\Delta P_M \cdot MPL_M}{W} = \frac{\Delta P_M \cdot MPL_M}{P_M \cdot MPL_M} = \frac{\Delta P_M}{P_M}$$

3 Gains from Trade

Suppose that the price of manufacturing does not change but that the price of agricultural goods decreases by 1%.

We get:

a) Wages decrease but not as fast as the price of Agricultural goods, i.e. decline by less than 1%

b) Wages decrease faster than the price of Agricultural goods, i.e. decline by more than 1%

c) Wages increase by more than 1%

d) Wages increase but increase by less than 1%

3 Gains from Trade

Suppose that the price of manufacturing does not change but that the price of agricultural goods decreases by 1%.

We get:

a) Wages decrease but not as fast as the price of Agricultural goods, i.e. decline by less than 1%

➔ In general, the relative change in wages will be in between the two price changes.

3 Gains from Trade

Gains for everyone?

1) What about laborers?

- Their income grow faster than the price of Agricultural products, but slower than the price of manuf. goods

- Overall effect is ambiguous and depends on preferences:
  - Workers may loose if they care a lot about manufacturing goods

3 Gains from Trade

Gains for Land and Capital owners?

2) What about income from Capital and Land?

(Capital is used in Manuf, Land in Agriculture)

- Rental rate of capital (machines)?

- Rental rate of land?

3 Gains from Trade

Gains for Land and Capital owners?

2) What about income from Capital and Land?

(Capital is used in Manuf, Land in Agriculture)

- Rental rate of capital (machines):

$$R_K = P_M \cdot MPK_M$$

- Rental rate of land:

$$R_T = P_A \cdot MPT_A$$

3 Gains from Trade

Gains for Land and Capital owners?

Checking whether their budget line shifts:

- Can K owners buy more agricultural goods?
  Does R_K / P_A increase?

- Can K owners buy more manufacturing goods?
  Does R_K / P_M increase?

- Can Land owners buy more agricultural goods?
  Does R_T / P_A increase?

- Can Land owners buy more manufacturing goods?
  Does R_T / P_M increase?

3 Gains from Trade

If the price of <u>manufacturing</u> goods increases, whose wage increases faster than the price of <u>manufacturing</u> goods?

a) Both Land owners and K owners' income increases faster than the price of manufacturing goods

b) Only Land owners' income increases faster than the price of manufacturing goods

c) Only K owners' income increases faster than the price of manufacturing goods

d) Neither Land or K owners' income increases faster than the price of manufacturing goods

3 Gains from Trade

If the price of <u>manufacturing</u> goods increases, whose wage increases faster than the price of <u>manufacturing</u> goods?

c)   Only K owners' income increases faster than the price of manufacturing goods

3 Gains from Trade

If the price of <u>manufacturing</u> goods increases, who can buy more <u>agricultural</u> goods?

a) It depends on preferences

b) K owners but not Land owners

c) Land owners but not K owners

d) Both

e) Neither

3 Gains from Trade

If the price of <u>manufacturing</u> goods increases, who can buy more <u>agricultural</u> goods?

b) K owners for sure

    Not Land owners for sure

K owners are the big winners

Land owners are the big losers

3 Gains from Trade

Gains for Land and Capital owners?

Recall that: $R_K = P_M . MPK_M$

If workers move towards the manufacturing sector, the marginal product of capital increases

(because there are more workers to operate each machine)

- Since MPK_M increases, $R_K / P_M = MPK_M$ also increases: Capital owners can *buy more manuf. goods*

- Since P_M / P_A increases, we can also conclude that: $R_K / P_A = MPK_M . P_M / P_A$ increases and that Capital owners can also *buy more agricultural goods*

3 Gains from Trade

Gains for Land and Capital owners?

Recall that: $R_T = P_A . MPT_A$

If workers move away from the agricultural sector, the marginal product of land decreases

(because there are <u>fewer</u> workers to operate each machine)

- Since MPT_A decreases, $R_T / P_A = MPT_A$ also decreases: Land owners can *buy <u>less</u> agricul. goods*

- Since P_A / P_M decreases, we can also conclude that: $R_T / P_M = MPT_A . P_A / P_M$ decreases and that Land owners can also *buy <u>less</u> manufacturing goods*

3 Gains from Trade

Adjustments: Summary (1/2)

- There are **two main adjustments** to opening to trade

When the price of manufacturing goods goes up:

1) Direct effect on real income:
   - Positively affects income in Manufacturing
   - Negatively affects the cost of living in Agriculture

2) Effect on productivity:
   Leads workers to move from Agriculture to Manufacturing:
   → **Affects MPL_A, MPL_M, MPK and MPT**

3 Gains from Trade

Adjustments: Summary (2/2)

When workers move from Agriculture to Manufacturing, this leads to a…

- Decrease in MPL in Manufacturing
    - →Mitigates the income increase for manuf workers

- Increase in MPL in Agriculture:
    - →Mitigates the cost-of-living increase for Ag workers

- Increases in MPK
    - →Magnifies the gains for K owners

- Decreases in MPT
    - →Magnifies the loss for Land owners

3 Gains from Trade

Gains from trade?

- Gains on average for the economy

- Ambiguous for workers that are mobile between sectors

- Gains for factors trapped in the sector with a comparative advantage

- Loss for factors trapped in the sector with a comparative disadvantage

3 Gains from Trade

Quantitative implications:

Can we compare the gains/loss to the change in prices?

3 Gains from Trade

In the specific-factor model, an increase in the price of manufacture $\Delta P_M > 0$ (keeping P_A constant) yields:

$$a) \quad \frac{\Delta R_T}{R_T} < 0 < \frac{\Delta W}{W} < \frac{\Delta P_M}{P_M} < \frac{\Delta R_K}{R_K}$$

$$b) \quad \frac{\Delta R_T}{R_T} = 0 < \frac{\Delta P_M}{P_M} < \frac{\Delta W}{W} < \frac{\Delta R_K}{R_K}$$

$$c) \quad \frac{\Delta R_T}{R_T} < 0 < \frac{\Delta P_M}{P_M} < \frac{\Delta R_K}{R_K} < \frac{\Delta W}{W}$$

3 Gains from Trade

If the price of manufacturing goods increases by 10%:

- Wages <u>increase by less</u> than 10%

- The rental rate of Land <u>decreases</u>

- The rental rate of Capital <u>increases by more</u> than 10%

Hence:

$$a) \quad \frac{\Delta R_T}{R_T} < 0 < \frac{\Delta W}{W} < \frac{\Delta P_M}{P_M} = 10\% < \frac{\Delta R_K}{R_K}$$

3 Gains from Trade

In the specific-factor model, suppose that P_M increases by 15% while P_A increases by 10%, we get:

$a)$ $\quad \dfrac{\Delta R_K}{R_K} < 10\% < \dfrac{\Delta W}{W} < 15\% < \dfrac{\Delta R_T}{R_T}$

$b)$ $\quad \dfrac{\Delta R_T}{R_T} < 10\% < \dfrac{\Delta W}{W} < 15\% < \dfrac{\Delta R_K}{R_K}$

$c)$ $\quad \dfrac{\Delta R_K}{R_K} < 10\% < 15\% < \dfrac{\Delta W}{W} < \dfrac{\Delta R_T}{R_T}$

3 Gains from Trade

In the specific-factor model, suppose that P_M increases by 15% while P_A increases by 10%, we get:

$$b) \quad \frac{\Delta R_T}{R_T} < 10\% < \frac{\Delta W}{W} < 15\% < \frac{\Delta R_K}{R_K}$$

3 Gains from Trade

In the specific-factor model, suppose that P_M decreases by 10% while P_A increases by 5%, we get:

$$a) \quad \frac{\Delta R_T}{R_T} < -10\% < \frac{\Delta W}{W} < 5\% < \frac{\Delta R_K}{R_K}$$

$$b) \quad \frac{\Delta R_K}{R_K} < -10\% < \frac{\Delta W}{W} < 5\% < \frac{\Delta R_T}{R_T}$$

$$c) \quad \frac{\Delta R_T}{R_T} < \frac{\Delta W}{W} < -10\% < 5\% < \frac{\Delta R_K}{R_K}$$

$$d) \quad \frac{\Delta R_K}{R_K} < \frac{\Delta W}{W} < -10\% < 5\% < \frac{\Delta R_T}{R_T}$$

3 Gains from Trade

In the specific-factor model, suppose that P_M decreases by 10% while P_A increases by 5%, we get:

$$b) \quad \frac{\Delta R_K}{R_K} < -10\% < \frac{\Delta W}{W} < 5\% < \frac{\Delta R_T}{R_T}$$

3 Gains from Trade

Flipping price changes

If the price of Agriculture increases more than the price of Manufacturing goods:

- It implies that Home has a comparative advantage in Agriculture

- Gains for Land owners

- Loss for Capital owners

- Ambiguous effects for (mobile) workers

4 Applications

Further comments and illustrations:

- Examples of employment and factor price changes

- Effect of trade on labor when workers are not mobile

- How to compensate losers?

4 Applications

Further comments and illustrations:

→ Examples of employment and factor price changes

- Effect of trade on labor when workers are not mobile

- How to compensate losers?

4 Applications

Illustrations:

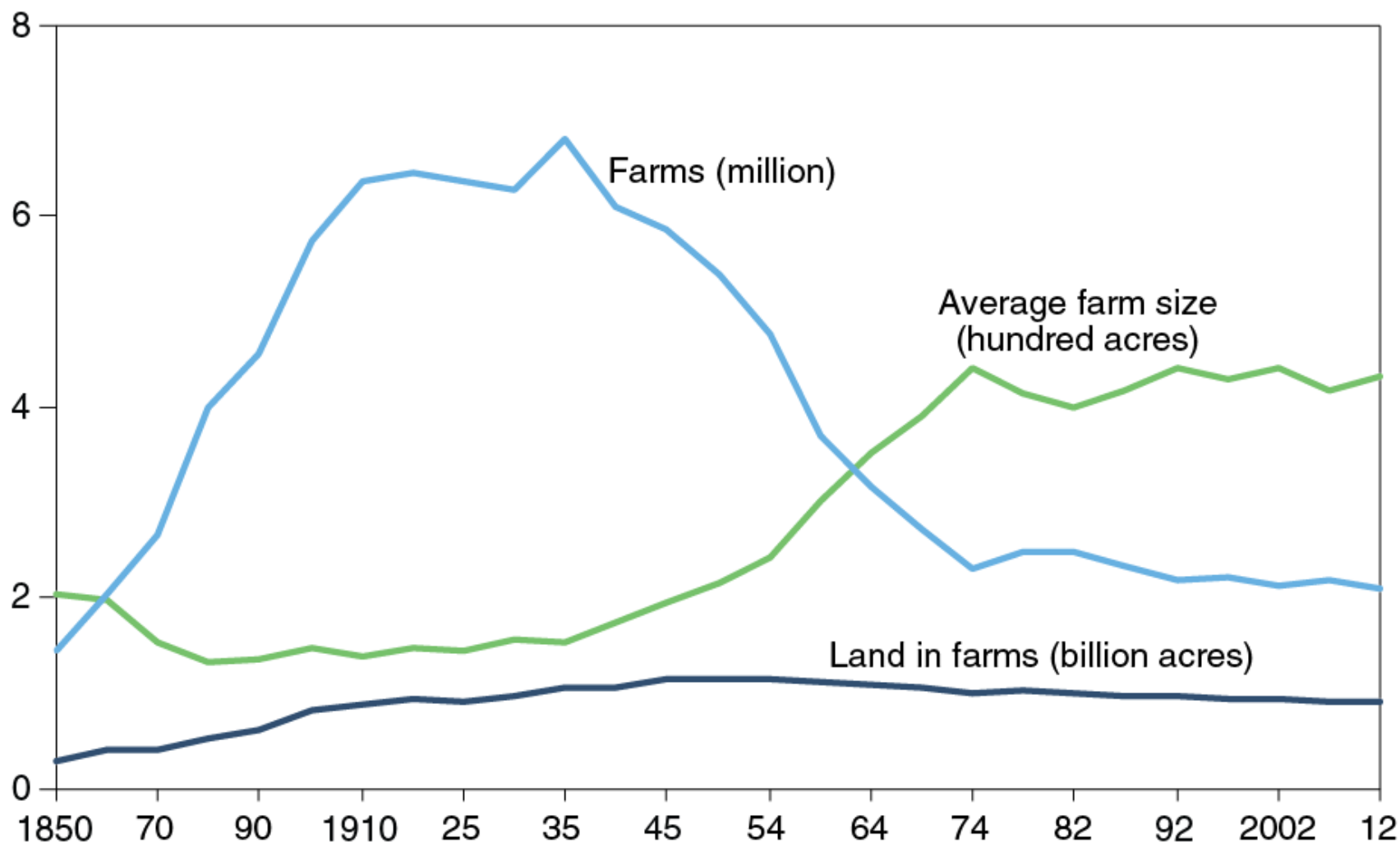- Sector in the US with decreasing employment and lower earnings?

4 Applications

- Agriculture:
  - Decreasing employment
  - Increasing size of farms
  - Lower returns to land?

    Land prices increase for other reasons…

Farms, land in farms, and average acres per farm, 1850–2012

Million farms/billion acres/hundred acres

Farms (million)

Average farm size (hundred acres)

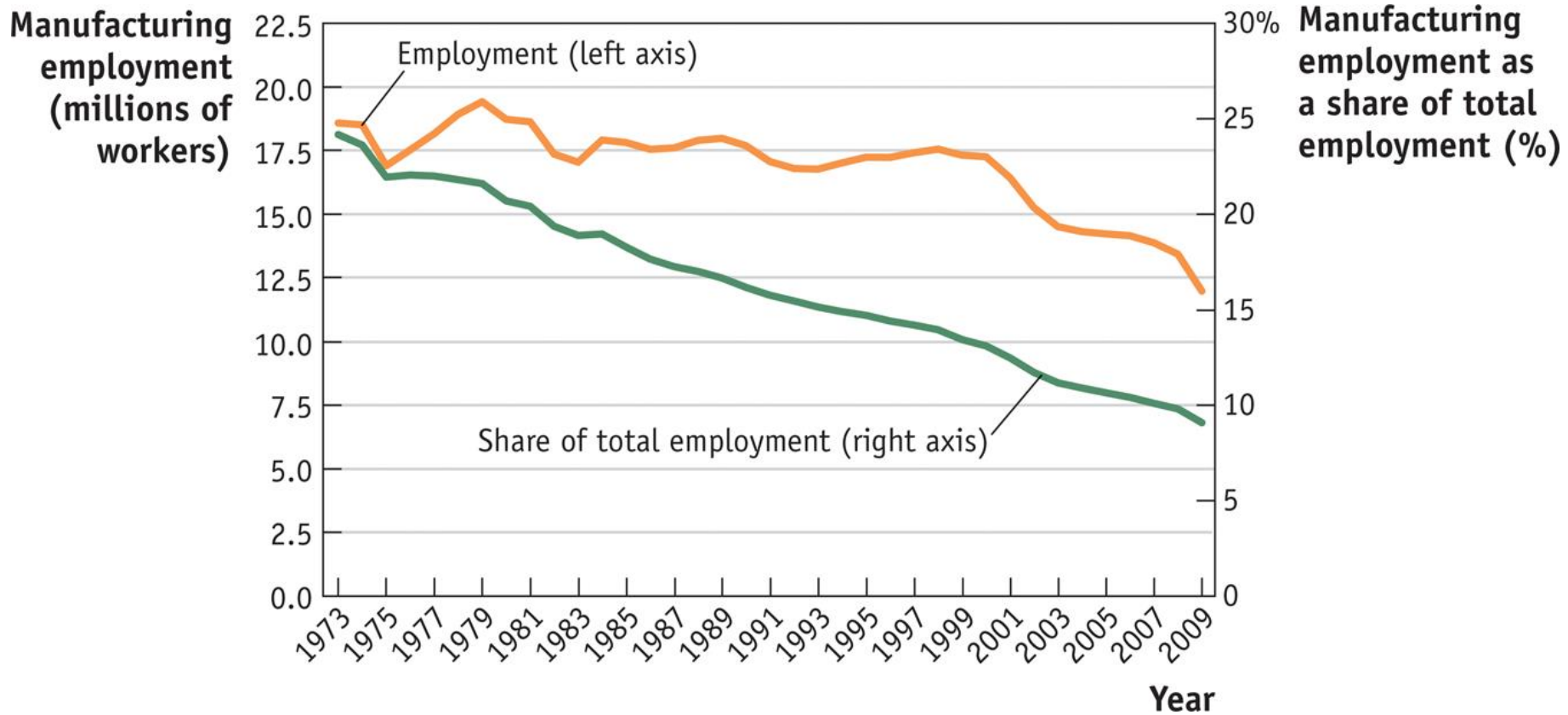Land in farms (billion acres)
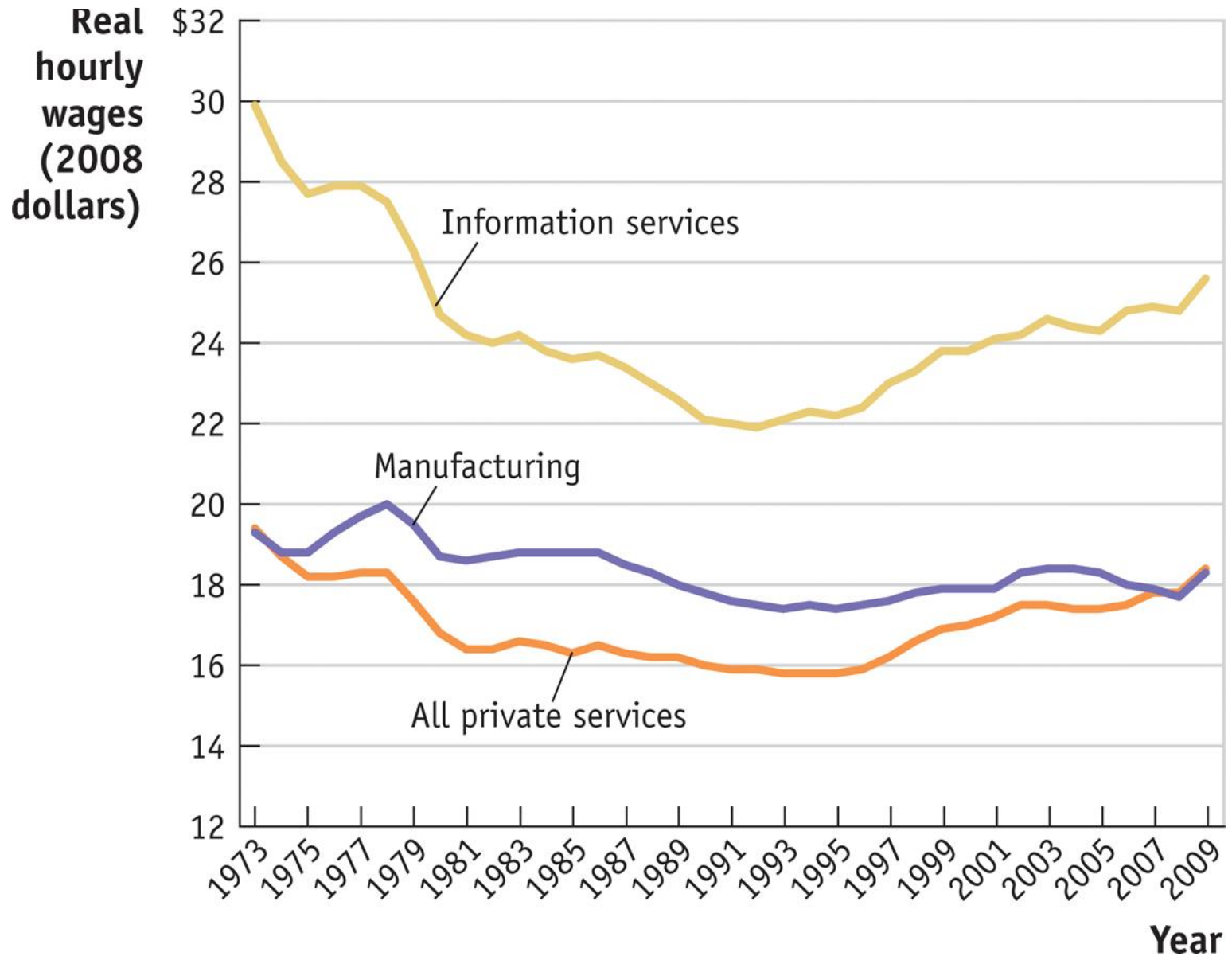
4 Applications

Illustrations:

Better examples:

- Manufacturing as a whole:
  - Decreasing employment!
  - Lower wages

- Services:
  - Increasing employment
  - Increasing wages, especially since the early 90's

4 Applications

4 Applications

4 Applications

Another illustrations: "China Syndrome"

Workers and politics often specifically worried about competition with Chinese imports. Is the fear justified?

- See Autor et al (2013 article on "China Syndrome")

- Examine the effect of regional trade exposure to Chinese imports on employment across commuting zones (CZ's):

- *Results partially consistent with specific-factor model*

4 Applications

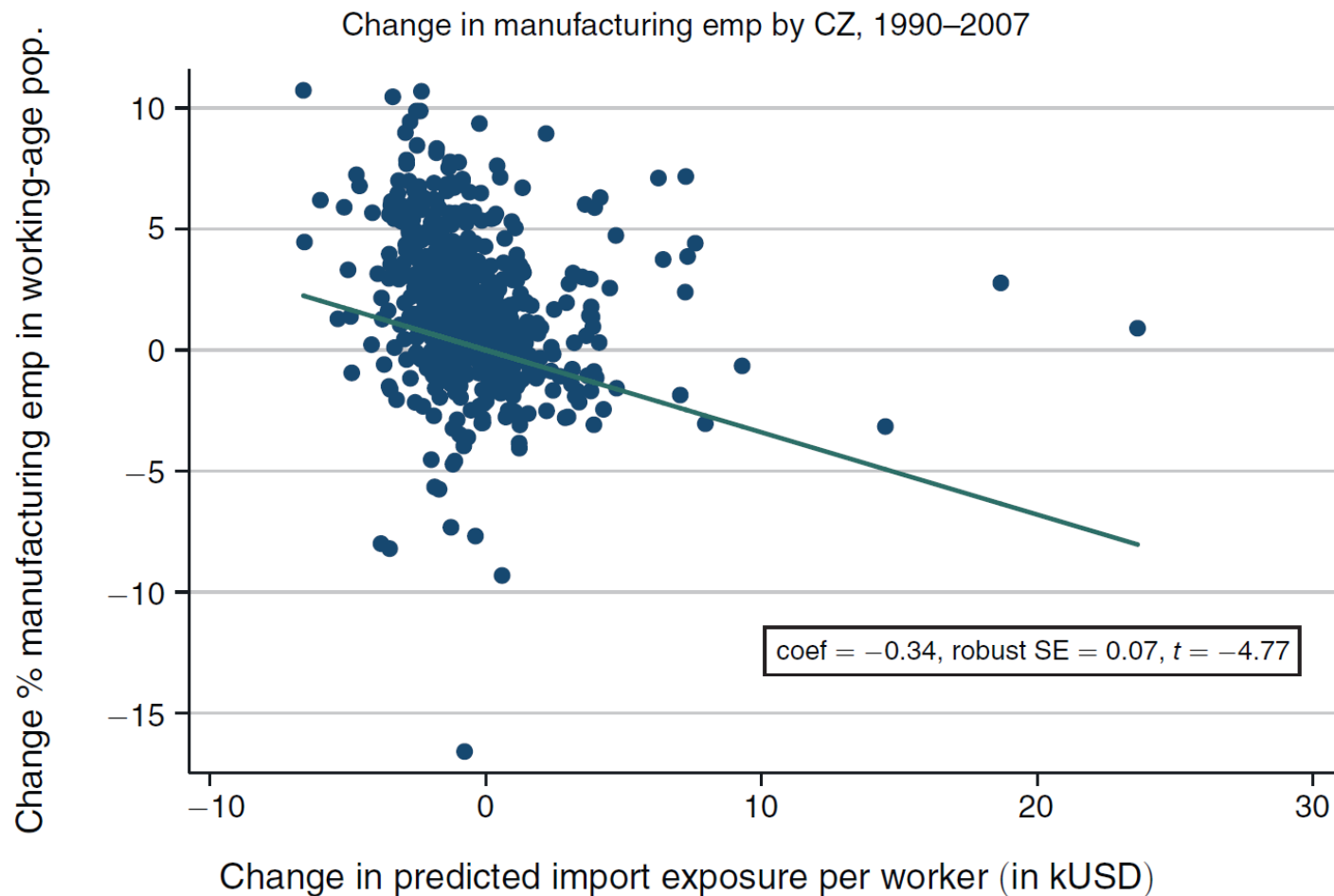## Employment effect of exposure to Chinese imports:

FIGURE 2. CHANGE IN IMPORT EXPOSURE PER WORKER AND DECLINE OF MANUFACTURING EMPLOYMENT

4 Applications

Employment and wage effects of exposure to Chinese imports:

TABLE 7—COMPARING EMPLOYMENT AND WAGE CHANGES IN MANUFACTURING
AND OUTSIDE MANUFACTURING, 1990–2007: 2SLS ESTIMATES

Dependent variables: Ten-year equivalent changes in log workers and average log weekly wages

	I. Manufacturing sector			II. Nonmanufacturing		
	All workers (1)	College (2)	Noncollege (3)	All workers (4)	College (5)	Noncollege (6)
Panel A. Log change in number of workers						
(Δ imports from China to US)/worker	−4.231*** (1.047)	−3.992*** (1.181)	−4.493*** (1.243)	−0.274 (0.651)	0.291 (0.590)	−1.037 (0.764)
R^2	0.31	0.30	0.34	0.35	0.29	0.53
Panel B. Change in average log wage						
(Δ imports from China to US)/worker	0.150 (0.482)	0.458 (0.340)	−0.101 (0.369)	−0.761*** (0.260)	−0.743** (0.297)	−0.822*** (0.246)
R^2	0.22	0.21	0.33	0.60	0.54	0.51

Notes: $N = 1{,}444$ (722 CZs × two time periods). All regressions include the full vector of control variables from column 6 of Table 3. Robust standard errors in parentheses are clustered on state. Models are weighted by start of period CZ share of national population.

*** Significant at the 1 percent level.

4 Applications

Employment and wage effects of exposure to Chinese imports:

"Exposure": Looking at industries depending on their exposure to Chinese import competition, i.e. share of workers working in industries with larger imports from China.

Higher "exposure" to Chinese imports lead to:

- Lower employment in manufacturing
- No change in services employment
- No changes in manufacturing wages
- Lower wages in wages in services sectors

Interpretation: many workers lose their job. Those who find a job in services have lower wages as a result.

4 Applications

Further comments and illustrations:

- Examples of employment and factor price changes

- Effect of trade on labor when workers are not mobile

→ **How to compensate losers?**

4 Applications

Getting back to the model, with industries A and M, with workers, land and capital.

- Workers sometimes loose
- Land owners always loose
- Capital owners gain

How to shield land owners and maybe workers from negative effects of trade?

4 Applications

How to shield land owners (and maybe workers) from negative effects of trade? Redistributing to Land owners after raising a tax on…

a) Tax on Manufacturing production so that we decrease domestic Manufacturing production

b) Tax on imports of Agricultural goods so that we increase domestic Agricultural production

c) Subsidies for Agricultural production so that we increase domestic Agricultural production

d) Tax on revenues from capital

4 Applications

How to shield land owners (and maybe workers) from negative effects of trade?

→ The best is to redistribute wealth without affecting overall gains from trade, i.e. without affecting production in manufacturing vs. agricultural sector.

4 Applications

How to shield land owners (and maybe workers) from negative effects of trade?

→ The best is to redistribute wealth without affecting overall gains from trade, i.e. without affecting production in manufacturing vs. agricultural sector.

→ In this case, answer is **d): tax revenues from capital**
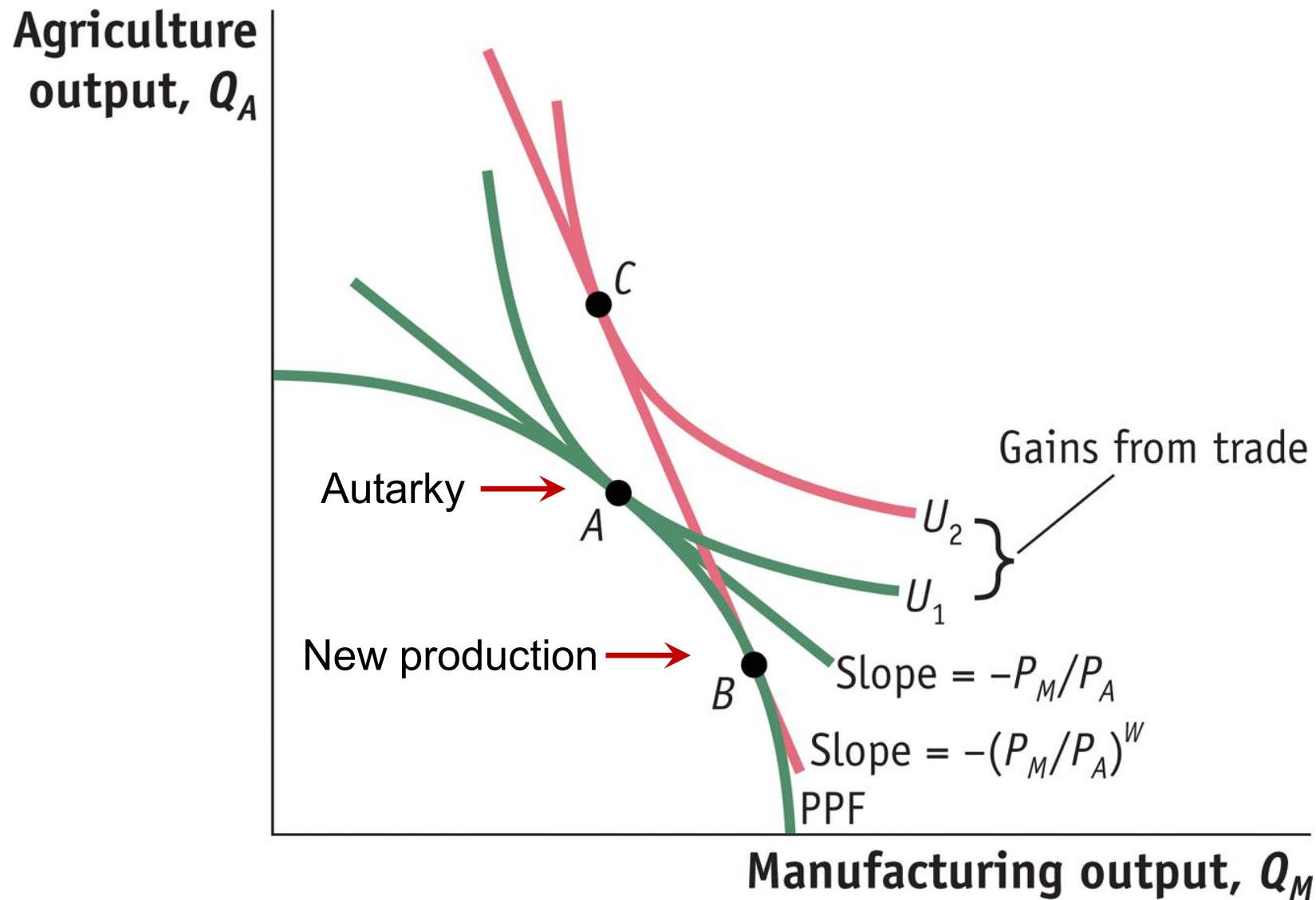
4 Applications

Why not a), b) or c)?

a) Tax on Manufacturing production

b) Tax on imports of Agricultural goods

c) Subsidies (negative tax) for Agricultural production

Either approach will shift production B back towards Autarky equilibrium and would erode the gains from trade...

Moving production back to A would erode gains from trade

Agriculture output, Q_A

Autarky → A

Gains from trade

U_2 }
U_1 }

New production → B

Slope = $-P_M/P_A$

Slope = $-(P_M/P_A)^W$

PPF

Manufacturing output, Q_M

4 Applications

So why d)?

d) Tax on revenues from capital

Here, taxing capital would not affect production (fixed K):
→ Hence would not affect the aggregate gains from trade.

Caveats:

- Taxing capital would affect capital accumulation and decrease manufacturing production
- In the US, manufacturing relatively more affected than Agriculture and services

4 Applications

In doubt? Policy recommendations:

- Foster <u>mobility</u> away from shrinking sectors

- <u>Redistribute</u> to those who are "trapped" in comparative disadvantage sectors

4 Applications

Example of redistribution program

Trade Adjustment Assistance (TAA) Program:

- Any case: unemployment insurance

- TAA program in manufacturing (since 1962):

  Additional unemployment/health insurance to workers who are laid off because of import competition.

- Jobs stimulus bill: signed on February 17, 2009:

  workers in the service sector (as well as farmers) who lose their jobs due to trade can now also apply for TAA.

4 Applications

Workers displaced by competition from Chinese imports:

Have they been (partially compensated)?

Yes (but not large enough to fully compensate their loss)

TABLE 8—IMPORTS FROM CHINA AND CHANGE OF GOVERNMENT TRANSFER RECEIPTS
IN CZs, 1990–2007: 2SLS ESTIMATES

Dep vars: Ten-year equivalent log and dollar change of annual transfer receipts per capita (in log pts and US$)

	Total individual transfers (1)	TAA benefits (2)	Unem-ployment benefits (3)	SSA retirement benefits (4)	SSA disability benefits (5)	Medical benefits (6)	Federal income assist (7)	Educ/ training assist (8)
Panel A. Log change of transfer receipts per capita								
(Δ imports from China to US)/worker	1.01***	14.41*	3.46*	0.72*	1.96***	0.54	3.04***	2.78**
	(0.33)	(7.59)	(1.87)	(0.38)	(0.69)	(0.49)	(0.96)	(1.32)
R^2	0.57	0.28	0.48	0.36	0.32	0.27	0.54	0.33

Conclusion

Trade in specific-factor model:

Can be driven by either:

- Differences in technology
- Or differences in endowments (land or capital)

→ See chapter 4 on how differences in endowments generate trade

Conclusion

- Gains on average for the economy
  - **But:** winners and losers
  - Factors trapped in comparative-disadvantage industries tend to loose
  - Possible to redistribute so that everyone gains

- Illustrations:
  - Manufacturing vs. Agriculture vs. Services
  - "China syndrome" (Autor Dorn and Hanson 2013)
  - Displaced workers: NAFTA compensation program