The No-Trade Model

1. Identical production functions in all countries
2. Same relative factor endowments in all countries
3. Constant returns to scale
4. Identical, Homogeneous preferences in all countries
5. No Distortions (imperfect competition, externalities, taxes).

In this world, there would be no trade and no gains from trade.

Figure 6.1

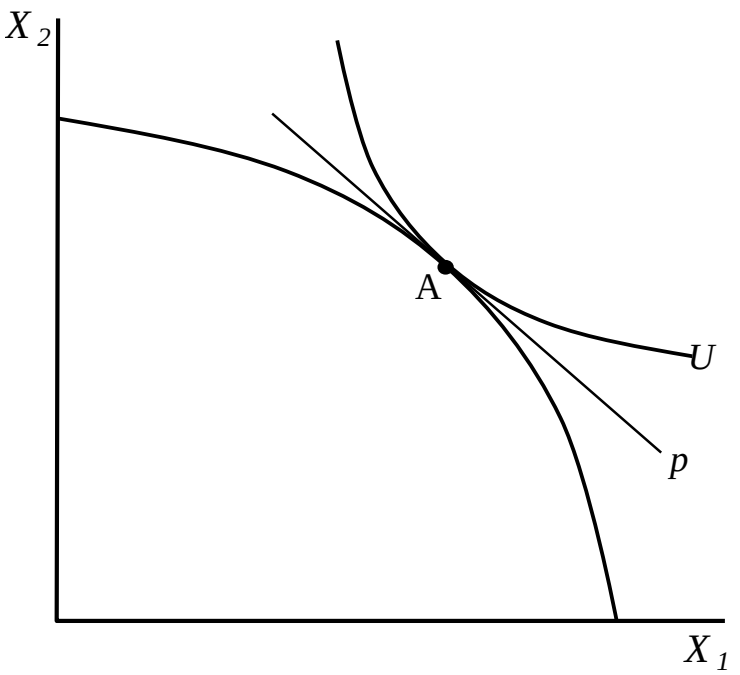
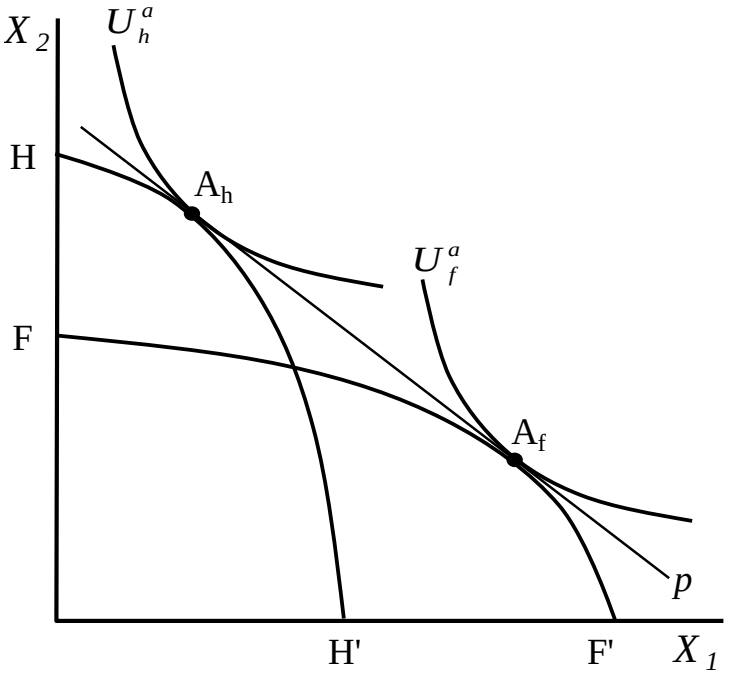


Figure 6.2



1. A one-factor model of technology differences

2. Comparative versus absolute advantage

   Existence of trading opportunities depends only on comparative Advantage.

3. Production frontier, closed-economy equilibrium

4. Comparative advantage and autarky price ratios

   Pattern of comparative advantage reflected in autarky prices

6. Excess demand and international equilibrium 3

   Constructing the excess demand curve
   Specialization

7. Real wage comparisons across countries

   The role of equilibrium prices
   The role of absolute advantage

8. The distribution of gains between countries

   Big versus small countries
   More productive versus less productive countries

The following is sometimes referred to as the "Ricardian model" of trade, where the basis for trade is differences in technology across countries. It is generally assumed that:

1. There is only one factor of production so as to separate technology from relative factor-endowment effects.

2. There are constant returns to scale and perfect competition in production so as to separate technology from industrial-organization effects.

$$X_1 = F_1(L_1) \qquad \text{specifically} \qquad X_1 = \alpha_1 L_1 \tag{7.1}$$

$$X_2 = F_2(L_2) \qquad \text{specifically} \qquad X_2 = \alpha_2 L_2 \tag{7.2}$$

$$\bar{L} = L_1 + L_2 \tag{7.3}$$

Absolute advantage refers to the comparison of the α's for a *given industry across countries*.

$$\alpha_{h2} > \alpha_{f2} \tag{7.4}$$

defines country *h* as having an *absolute advantage* in good X_2

The term comparative advantage refers to the relative productivity in the two industries across countries

$$\frac{\alpha_{h2}}{\alpha_{h1}} > \frac{\alpha_{f2}}{\alpha_{f1}} \tag{7.5}$$

defines country *h* as having a *comparative advantage* in good X_2

Proposition: a pattern of comparative advantage (inequality of the productivity ratios is a *necessary* and a *sufficient* condition for gains from specialization.

Marginal Products of Labor

	Home	Foreign
X_1	$\alpha_{h1} = 10$	$\alpha_{f1} = 20$
X_2	$\alpha_{h2} = 30$	$\alpha_{f2} = 20$

Country *H* has a *comparative advantage* in the production of X_2:

$\alpha_{h2}/\alpha_{h1} > \alpha_{f2}/\alpha_{f1}$.

Move 2 workers from X_1 to X_2 in Country h, 1 from X_2 to X_1 in Country f
Changes in Outputs due to Labor Reallocation

	Home	Foreign	Total
X_1	-10	+20	+10
X_2	+30	-20	+10

There exist gains from specialization

This will always be true if and only if the α_2/α_1 are different in the two countries.

But what if one country has an absolute advantage in all goods?

Marginal Products of Labor

	Home	Foreign
X_1	$\alpha_h = 5$	$\alpha_f = 20$
X_2	$\beta_h = 15$	$\beta_f = 20$

Move 2 workers from X_1 to X_2 in Country h, 1 from X_2 to X_1 in Country f

Changes in Outputs due to Labor Reallocation

	Home	Foreign	Total
X_1	-10	+20	+10
X_2	+30	-20	+10

Gains from specialization and trade are still possible even if one country has an absolute advantage in the production of all goods.

What is needed for the existence of gains from specialization is a pattern of *comparative advantage*.

More formal proof assuming $\alpha_{h2}/\alpha_{h1} > \alpha_{f2}/\alpha_{f1}$.

Reallocate labor in each country toward the comparative-advantage industry.

$$dL_{h2} = -dL_{h1} > 0 \qquad dL_{f1} = -dL_{f2} > 0 \tag{7.6}$$

Then the changes in the *total world output* of the two goods will be

$$dX_1 = -\alpha_{h1} dL_{h2} - \alpha_{f1} dL_{f2} \qquad dX_2 = \alpha_{h2} dL_{h2} + \alpha_{f2} dL_{f2} \tag{7.7}$$

Set the first equation to zero, reallocating labor within each country to hold world X_1 output constant, and solve for

$$dL_{f2} = -\frac{\alpha_{h1}}{\alpha_{f1}} dL_{h2} \quad \Leftrightarrow \quad dX_1 = dX_{h1} + dX_{f1} = 0 \tag{7.8}$$

Substitute (7.8) into the right-hand equation of (7.7), replacing dL_{f2} with (7.8).

$$dX_2 = \left[\alpha_{h2} - \frac{\alpha_{h1}}{\alpha_{f1}}\alpha_{f2}\right] dL_{h2} = \alpha_{h1}\left[\frac{\alpha_{h2}}{\alpha_{h1}} - \frac{\alpha_{f2}}{\alpha_{f1}}\right] dL_{h2} > 0 \tag{7.9}$$

The slopes of the production frontiers reflect comparative advantage

$$dX_1 = \alpha_1 dL_1 \qquad dX_2 = \alpha_2 dL_2 = -\alpha_2 dL_1 \qquad \frac{dX_2}{dX_1} = -\frac{\alpha_2}{\alpha_1}$$

The differences in slopes between two countries reflects comparative advantage.

The distance from the origin of the fontier reflects absolute advangtage.

Figures 7.1, 7.2

Figure 7.1

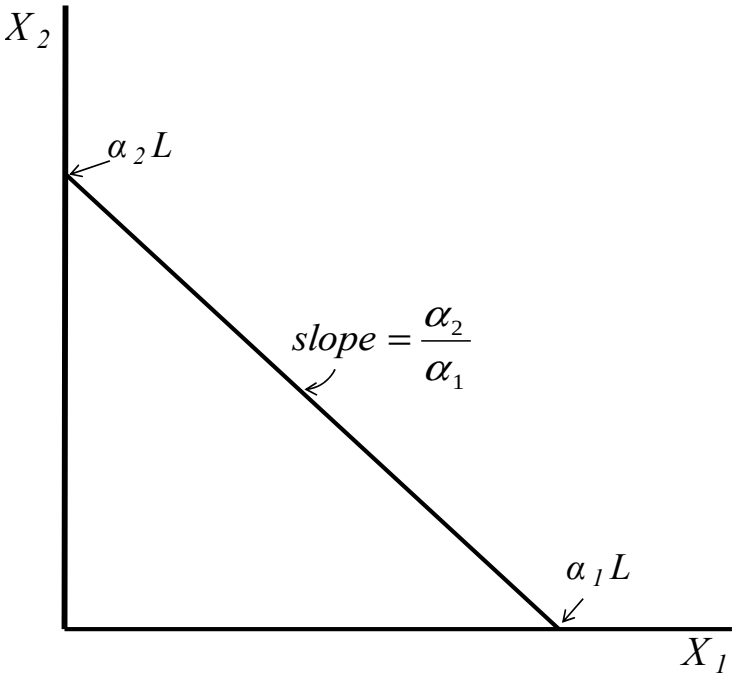
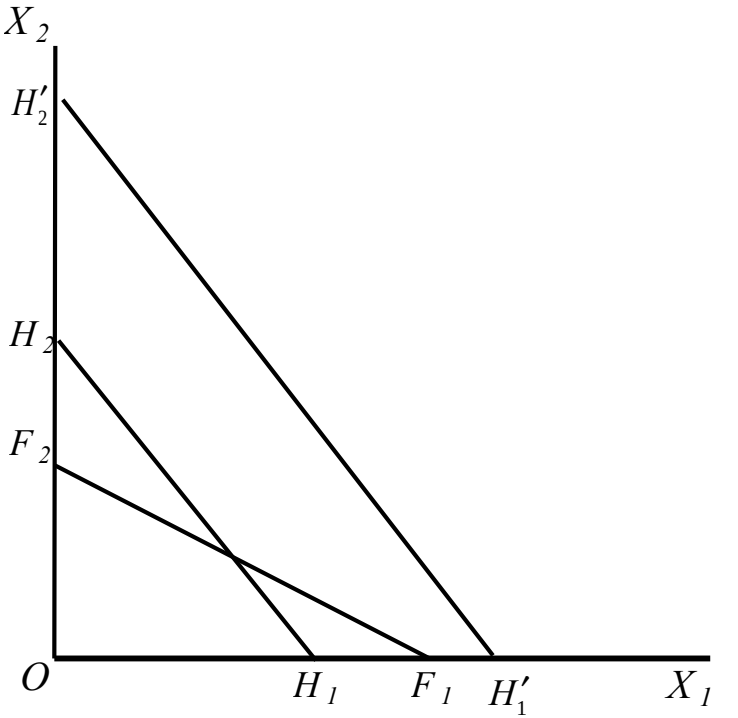


Figure 7.2



Comparative advantage predicts the *direction of trade and specialization.*

The equilibrium autarky price ratio will be the slope of the production frontier = the comparative advantage ratio

This follows from our earlier proof about the efficiency of the competitive economy (tangency of the production frontier with the price ratio).

Recall that the efficiency of the competitive economy also applies to "corner solutions" where it is optimal to specialize and produce only one good.

Figure 7.3 - examples of specialization and trade at different price ratios
Figure 7.4 - construction of the excess demand curve
Figure 7.5 - international equilibrium

Figure 7.3

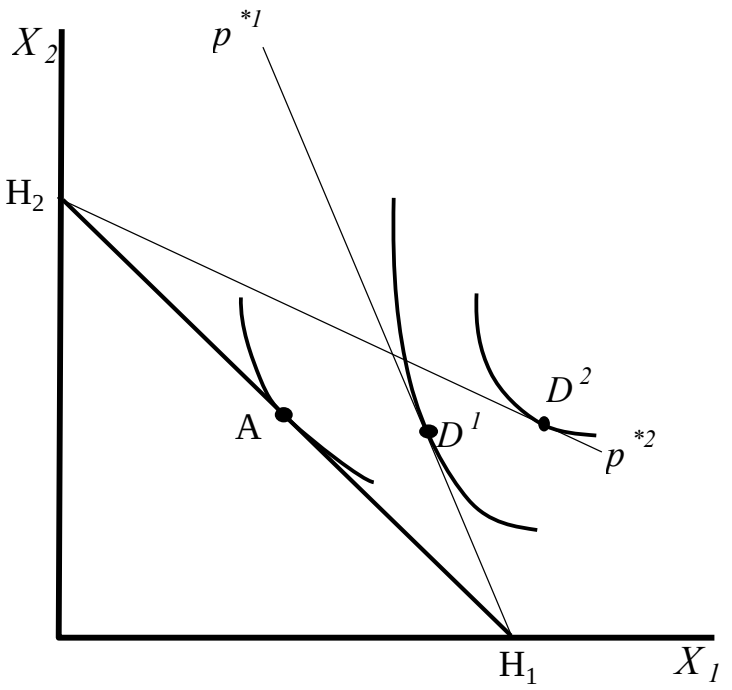


Figure 7.4

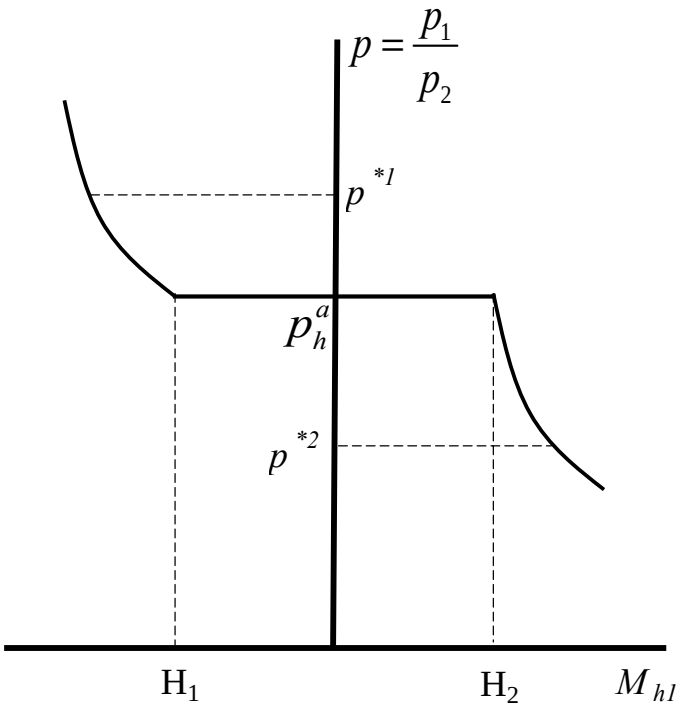


Figure 7.5

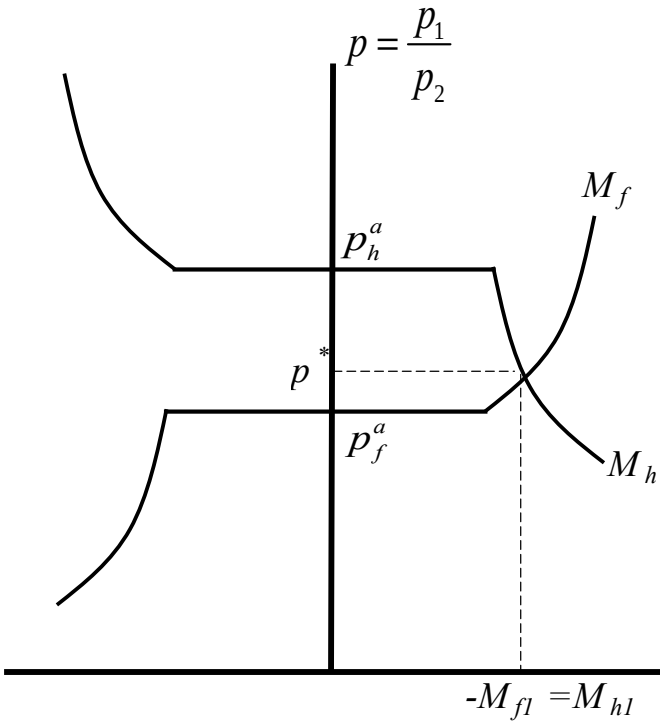
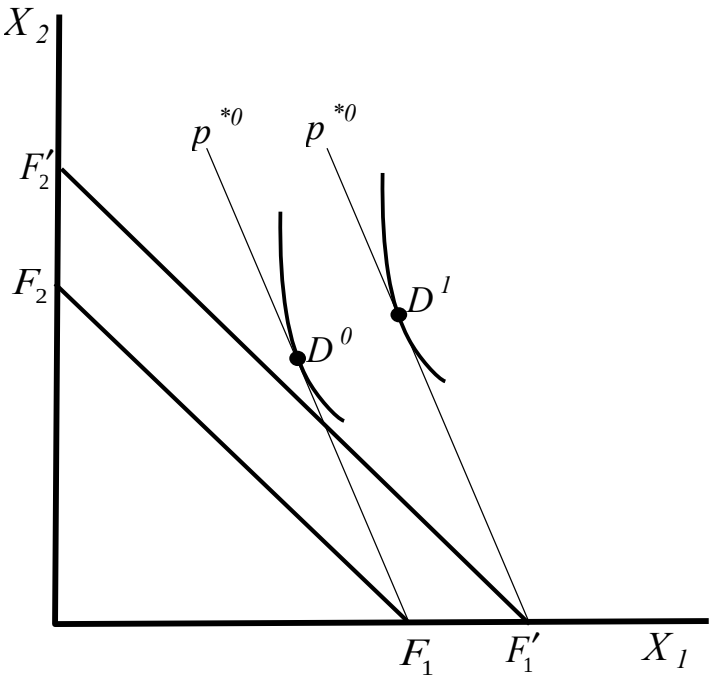


Figure 7.6



Absolute advantage does not determine the pattern of trade or the existence of gains from trade, but it does determine real income comparisons between countries.

We have established that the existence of mutual gains from trade depends only on comparative advantage, not absolute advantage.

One country may have an absolute advantage in everything, but it can still gain from specializing in what it does relatively well.

Suppose that both countries are specialized as in Figure 7.5, and so the wage rate in each country is determined by the competitive conditions that the value of the marginal product of labor equals the wage rate.

$$p_2^* \alpha_{h2} = w_h \qquad p_1^* \alpha_{f1} = w_f \qquad \text{thus} \qquad \frac{w_h}{w_f} = \frac{p_2^* \alpha_{h2}}{p_1^* \alpha_{f1}} \tag{7.10}$$

Second, the world price ratio lies (weakly) between the autarky price ratios of the two countries.

$$\frac{\alpha_{h2}}{\alpha_{h1}} \geq \frac{p_1^*}{p_2^*} \geq \frac{\alpha_{f2}}{\alpha_{f1}} \tag{7.11}$$

Third, assume that country h is has an absolute advantage in both goods in addition to having a comparative advantage in good 2, as in Figure 7.2.

$$\alpha_{h1} > \alpha_{f1} \qquad \text{and thus} \qquad \frac{\alpha_{h2}}{\alpha_{f1}} > \frac{\alpha_{h2}}{\alpha_{h1}} \tag{7.12}$$

We can then add an element to the left-hand side of the change of inequalities in (7.11) using (7.12)

$$\frac{\alpha_{h2}}{\alpha_{f1}} > \frac{\alpha_{h2}}{\alpha_{h1}} \geq \frac{p_1^*}{p_2^*} \geq \frac{\alpha_{f2}}{\alpha_{f1}} \quad \Rightarrow \quad \frac{p_2^*}{p_1^*}\frac{\alpha_{h2}}{\alpha_{f1}} > 1 \qquad (7.13)$$

where the right-hand inequality comes from multiplying the whole chain in (7.13) through by p_2^*/p_1^*.

But the right-hand expression is, from (7.10), the ratio of the wage rates in the two countries.

$$\frac{p_2^*}{p_1^*}\frac{\alpha_{h2}}{\alpha_{f1}} = \frac{w_h}{w_f} > 1 \qquad (7.14)$$

Absolute advantage in all goods => *higher real wage*.

Absolute advantage shows up in *real wage comparisons* between countries.

The more productive country will have the higher real wage.

Should having a higher real wage deter the country from trading?

No. We have argued that gains from trade depend only on comparative advantage.

If wages are market determined, a high wage is the result of high productivity, and is not a deterrent to gains from trade.

Discuss the term “competitiveness”.

Table 7.1 International Comparisons of Productivity and Wages in Manufacturing, 2004

	Market Exchange Rates			PPP Exchange Rates		
Country	VA per hour	Earnings per hour	Average Earnings	VA per hour	Earnings per hour	Average Earnings
US	$ 47.47	$ 16.15	$ 34,263.84	$ 47.47	$ 16.15	$ 34,263.84
Sweden	$ 46.10	$ 17.16	$ 33,459.65	$ 38.36	$ 14.28	$ 27,847.19
Netherlands	$ 42.85	$ 22.66	$ 41,238.26	$ 42.20	$ 22.32	$ 40,613.83
Japan	$ 38.94	$ 14.37	$ 32,506.47	$ 31.46	$ 11.61	$ 26,263.97
Australia	$ 36.94	$ 16.78	$ 33,247.49	$ 40.10	$ 18.22	$ 36,090.21
UK	$ 34.89	$ 19.22	$ 40,972.09	$ 32.34	$ 17.81	$ 37,978.26
France	$ 34.60	$ 20.37	$ 38,985.14	$ 33.62	$ 19.79	$ 37,870.91
Canada	$ 33.38	$ 15.37	$ 30,281.55	$ 36.05	$ 16.59	$ 32,702.79
Spain	$ 30.34	$ 14.91	$ 27,750.56	$ 35.86	$ 17.62	$ 32,800.87
Rep. of Korea	$ 16.40	$ 9.39	$ 23,145.03	$ 23.92	$ 13.70	$ 33,773.86
Mexico	$ 8.76	$ 1.77	$ 4,102.92	$ 12.40	$ 2.50	$ 5,811.97
Costa Rica	$ 8.57	$ 1.75	$ 4,325.54	$ 17.49	$ 3.58	$ 8,827.07
Philippines	$ 3.78	$ 0.48	$ 1,097.95	$ 15.81	$ 1.99	$ 4,588.86
Egypt	$ 3.39	$ 0.47	$ 1,374.00	$ 10.68	$ 1.48	$ 4,321.29
India	$ 0.64	$ 0.19	$ 458.55	$ 3.18	$ 0.95	$ 2,292.76

So

by the authors from International Labor Organization, *Laborsta Database*; World Bank, *World Development Indicat*
Monetary Fund, *International Financial Statistics*; and figures at www.NationMaster.com.

Table 7.2 Primary Results from Regressions of Bilateral Net Exports on Relative Labor Productivities

		Market Exchange Rates		PPP Exchange Rates	
Country Pair	Period	Slope (b)	R^2	Slope (b)	R^2
US-Japan	1984-91	**0.14**	0.09	**0.20**	0.10
US-Germany	1977-90	**0.46**	0.06	**0.83**	0.11
US-UK	1979-90	**-0.08**	0.03	-0.02	0.02
US-France	1978-90	**-0.21**	0.02	0.02	0.02
US-Italy	1979-89	**0.26**	0.11	**0.25**	0.01
US-Canada	1972-89	**0.41**	0.02	**0.73**	0.01
US-Australia	1981-91	**0.72**	0.05	**0.89**	0.10
US-Korea	1972-90	**-0.64**	0.02	**0.93**	0.18
US-Mexico	1980-90	**0.46**	0.14	**0.56**	0.18

Source: Golub and Hsieh (2000). Coefficients in bold are significantly different from zero at the one-percent level (99-percent confidence level), based on standard errors that are consistently estimated in the presence of heteroskedasticity.

Ricardian model provides an interesting an simple way analyzing the division of the gains from trade between countries.

Show that small countries are the bigger gainers.

(1) Begin with the equilibrium in Figure 7.5.

(2) Let country f grow: it's production frontier shifts out, Figure 7.6

(3) Country f desires to trade more at any given price ratio, Figure 7.7

(4) But this cannot be an equilibrium because there is no change in h.

(5) To re-establish equilibrium, the price of country f's export must fall, the price of its import must rise.

(6) Country h gains more, may get *all* gains, Figure 7.8

Figure 7.5

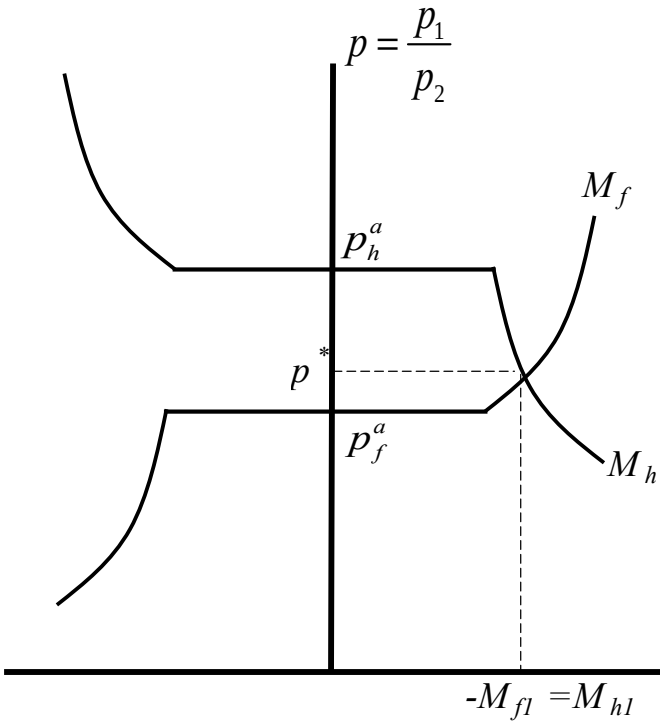


Figure 7.6

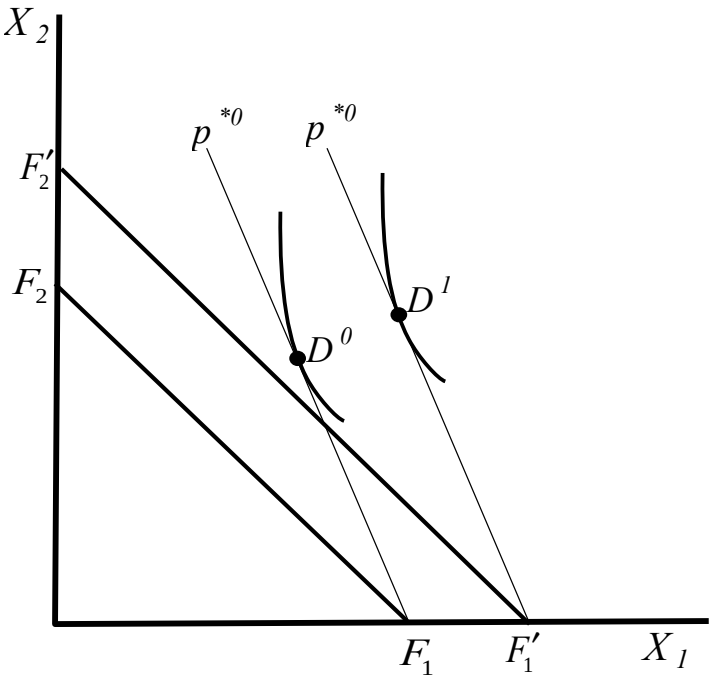


Figure 7.7

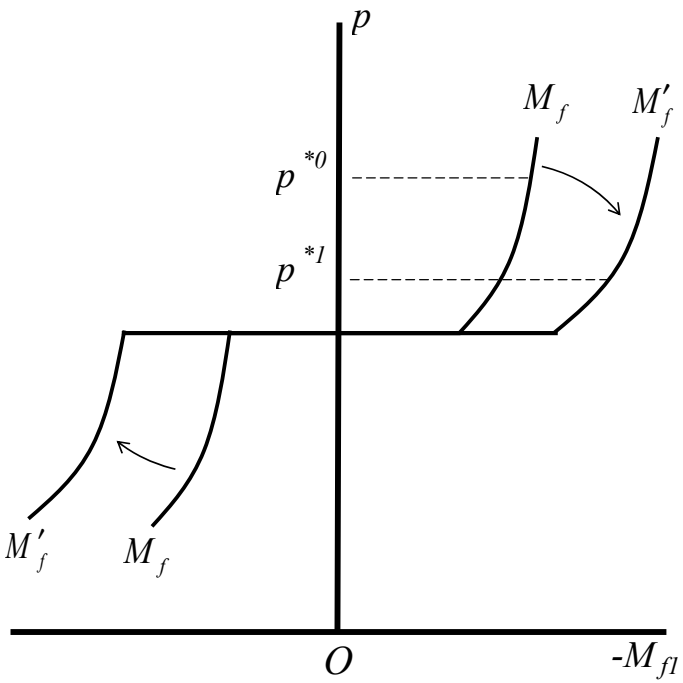
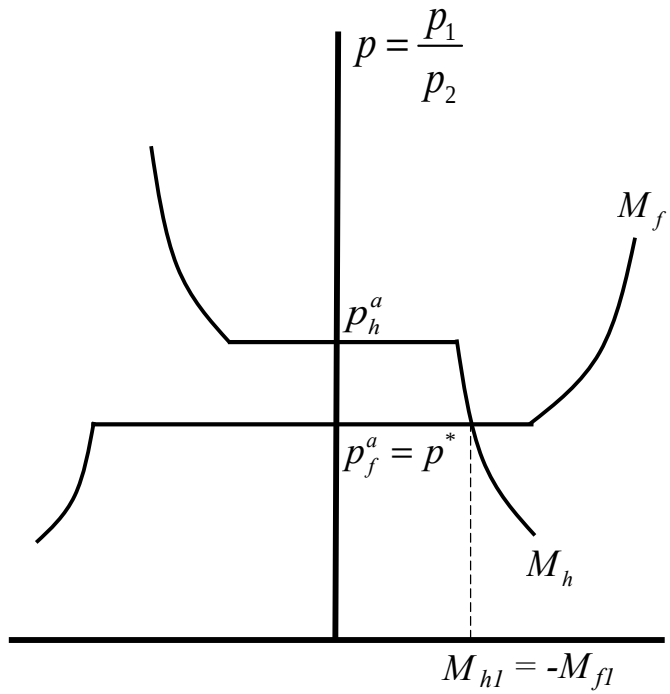


Figure 7.8



(a) With international differences in production technology, there will exist gains from trade.

(b) Countries should specialize according to comparative advantage, their relative ability to produce different goods.

(c) If prices are determined in a competitive market, then the market ensures the correct pattern of specialization. Government intervention is not needed or helpful.

(d) If a country is uniformly more productive (e.g., has an absolute advantage in everything), then it must have a higher real wage. Provided that wages are market determined, having a high wage should not be a deterrent to trade, is it just reflecting high productivity.

(e) It is important to note that in a competitive market economy, the real wage is *endogenous*. A high wage reflects high productivity. A high wage is not a reason not to trade.

The term "competitiveness" is frequently mis-used. The origin of gains from trade is to specialize in what you do relatively well.

Declining sectors are indeed relatively uncompetitive, but that should not be seen as a problem.

(f) Theory suggest that small countries are major gainers from trade: technically, they trade further away from their autarky prices than large countries.

Table 7.1

	Value Added	Wage
US	4747	1615
Sweden	3836	1428
Netherlands	4220	2232
Japan	3146	1161
Australia	4010	1822
UK	3234	1781
France	3362	1979
Canada	3605	1659
Spain	3586	1762
Rep. of Korea	2392	1370
Mexico	1240	250
Costa Rica	1749	358
Philippines	1581	199
Egypt	1068	148
India	318	95

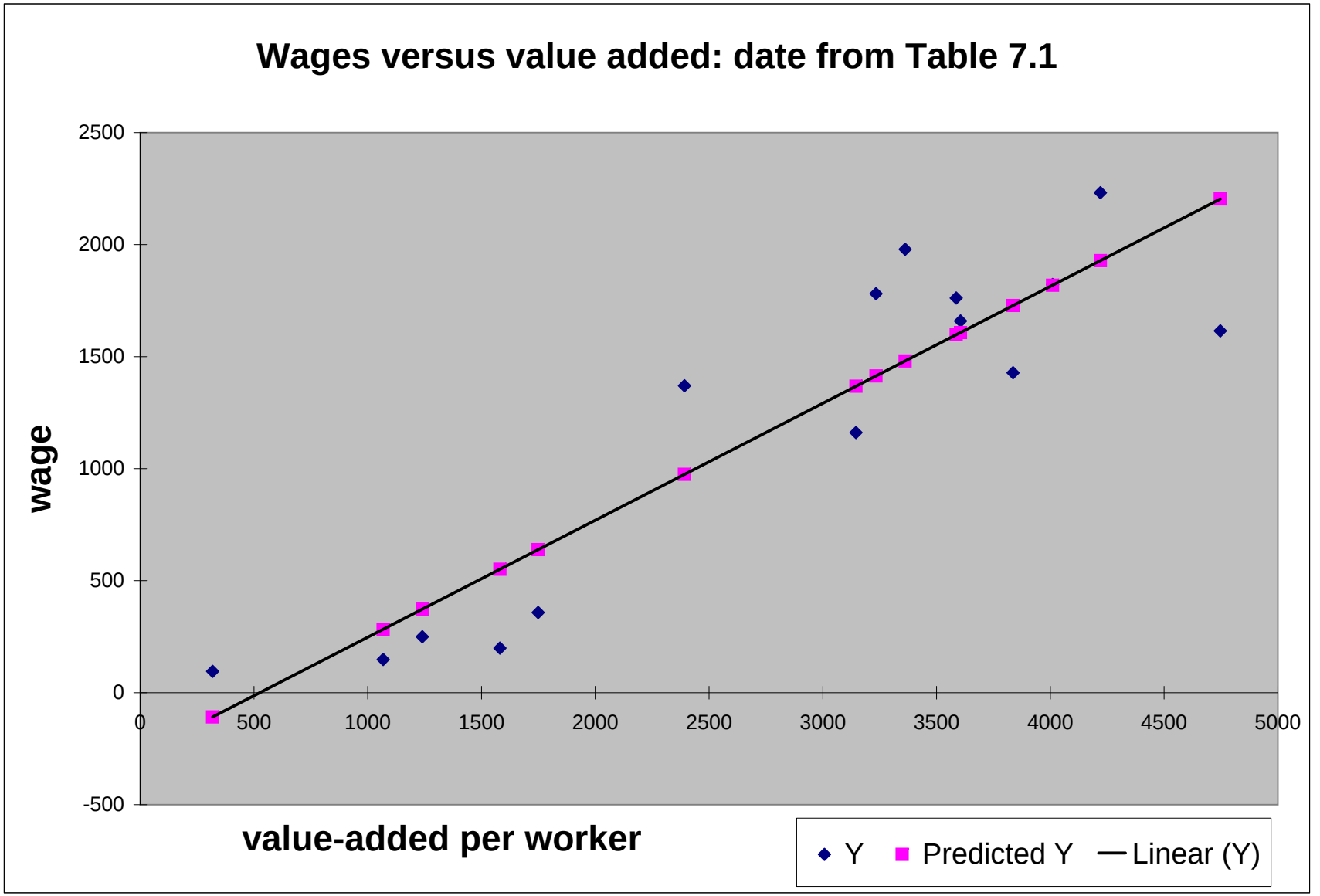
DEPENDENT VARIABLE: WAGE Date from Table 7.1

Regression Statistics	
Multiple R	0.908451
R Square	0.825282
Adjusted R	0.811843
Standard E	330.2961
Observatio	15

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Ipper 95.0%*
Intercept	-274.293	205.4737	-1.33493	0.204807	-718.192	169.6057	-718.192	169.6057
Value added perworker	0.522008	0.066615	7.836183	2.8E-06	0.378095	0.665921	0.378095	0.665921

RESIDUAL OUTPUT

Observatior	*Predicted Y*	*Residuals*
1	2203.678	-588.678
2	1728.129	-300.129
3	1928.58	303.4201
4	1367.943	-206.943
5	1818.958	3.041724
6	1413.88	367.1198
7	1480.697	498.3028
8	1607.545	51.45491
9	1597.627	164.3731
10	974.3495	395.6505
11	372.9965	-122.996
12	638.6985	-280.698
13	551.0012	-352.001
14	283.2111	-135.211
15	-108.295	203.2948


Wages versus value added: date from Table 7.1
wage
2500
2000
1500
1000
500
0
-500
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
value-added per worker
Y
Predicted Y
Linear (Y)