

Chapter 5

The Standard (Augmented HOS) Trade Model

With revisions for ANU

Econ 3103/3013/8015

Paul R. Krugman Maurice Obstfeld

PEARSON Addison-Wesley

Copyright © 2008 Pearson Addison-Wesley. All rights reserved.

Slides prepared by Thomas Bishop

Preview

- Measuring the values of production and consumption
- Welfare and terms of trade
- Effects of economic growth
- Effects of international transfers of income
- Effects of import tariffs and export subsidies
- Income distribution

Copyright © 2008 Pearson Addison-Wesley. All rights reserved. 5-2

Introduction

- The standard trade model combines ideas from the Ricardian model and the Heckscher-Ohlin model.
 1. Differences in *labor, labor skills, physical capital, land and technology* between countries cause productive differences, leading to gains from trade.
 2. These productive differences are represented as differences in production possibility frontiers, which represent the productive capacities of nations.
 3. A country's PPF determines its relative supply curve.
 4. National relative supply curves determine world relative supply, which along with world relative demand determines an equilibrium under international trade.

Copyright © 2008 Pearson Addison-Wesley. All rights reserved. 5-3

The Supply Side, Again

- Imagine that technology is Cobb-Douglas. Then, for the home country, we know:

$$Q_C = A_C T_C^{0.2} L_C^{0.8}$$

$$Q_F = A_F T_F^{0.7} L_F^{0.3}$$

$$L = L_C + L_F$$

$$T = T_C + T_F$$

- And that firms choose T and L to maximise profits, constrained by perfect competition.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-4

Ricardian and HOS models

- In the HOS model, the production functions are the same in both regions.
- In Krugman's "standard model", the technologies differ, so that A_C and A_F differ between countries.
- When A_C and A_F are high, *total factor productivity* is high – both labour and land are more productive.
- As in the Ricardian model, though, comparative advantage depends on *relative values*.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-5

The Value of Production

- The result is the maximization of the value of national output, V (GDP), yielding, for any P_C/P_F , a point on the PPF.
- $V = P_C Q_C + P_F Q_F$ is the value of output, and when this value is constant the equation's line is called an *isovalue line*.
 - The slope equals the terms of trade: $-(P_C/P_F)$, and if relative prices change the slope changes.
 - This is the collective household's budget line for consumption decisions.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

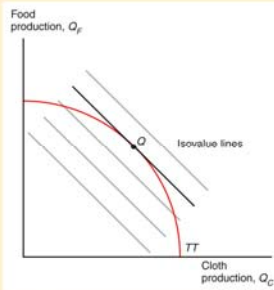
5-6

The Value of Production (cont.)

Figure 5-1

Relative Prices Determine the Economy's Output

An economy whose production possibility frontier is TT will produce at Q , which is on the highest possible iso-value line.



Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

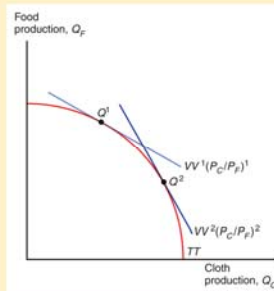
5-7

The Value of Production (cont.)

Figure 5-2

How an Increase in the Relative Price of Cloth Affects Relative Supply

The iso-value lines become steeper when the relative price of cloth rises from $(P_C/P_F)^1$ to $(P_C/P_F)^2$ (shown by the rotation from VV^1 to VV^2). As a result, the economy produces more cloth and less food and the equilibrium output shifts from Q^1 to Q^2 .



Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-8

The Value of Consumption

- The budget line: the value of the economy's consumption is constrained to equal the value of the economy's production (of GDP).
 - ♦ $P_C D_C + P_F D_F = P_C Q_C + P_F Q_F = V$
- Consumption choices depend on the solution to the standard consumer problem: maximise utility subject to this budget line.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

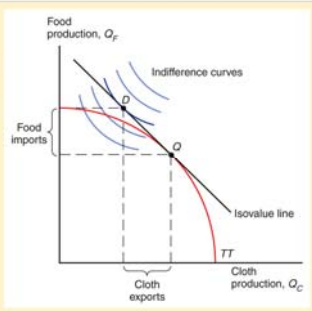
5-9

The Value of Consumption (cont.)

Figure 5-3

Production, Consumption, and Trade in the Standard Model

The economy produces at point Q , where the production possibility frontier is tangent to the highest possible iso-value line. It consumes at point D , where that iso-value line is tangent to the highest possible indifference curve. The economy produces more cloth than it consumes and therefore exports cloth; correspondingly, it consumes more food than it produces and therefore imports food.



Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

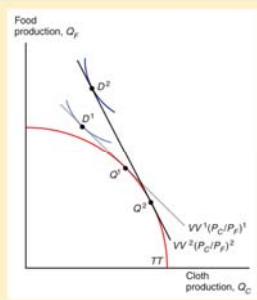
5-10

Prices and the Value of Consumption (cont.)

Figure 5-4

Effects of a Rise in the Relative Price of Cloth

The slope of the iso-value lines is equal to minus the relative price of cloth P_C/P_F , so when that relative price rises all iso-value lines become steeper. In particular, the maximum-value line rotates from VV^1 to VV^2 . Production shifts from Q^1 to Q^2 , consumption shifts from D^1 to D^2 .



Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-11

Welfare and the Terms of Trade

- The **terms of trade** refers to the price of exports relative to the price of imports.
 - ♦ When a country exports cloth and the relative price of cloth increases, the terms of trade increase or "improve".
- Because a higher price for exports means that the country can afford to buy more imports, an increase in the terms of trade increases a country's welfare.
- A decrease in the terms of trade decreases a country's welfare.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-12

Determining Relative Prices

- To determine the price of cloth relative to the price food in our model, we again use relative supply and relative demand.
 - ◆ relative supply considers *world* supply of cloth relative to that of food at each relative price
 - ◆ relative demand considers *world* demand of cloth relative to that of food at each relative price
 - ◆ In a two country model, world quantities are the sum of quantities from the domestic and foreign countries.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

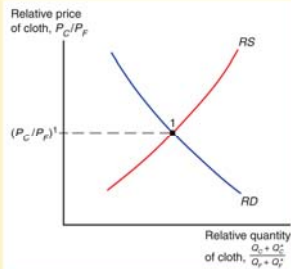
5-13

Determining Relative Prices (cont.)

Figure 5-5

World Relative Supply and Demand

The higher P_c/P_f is, the larger the world supply of cloth relative to food (RS) and the lower the world demand for cloth relative to food (RD). Equilibrium relative price (here, $(P_c/P_f)^*$) is determined by the intersection of the world relative supply and demand curves.



Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-14

The Effects of Economic Growth

- Is economic growth in China good for the standard of living in the US?
- Is growth in a country more or less valuable when it is integrated in the world economy?
- The standard trade model gives us precise answers to these questions.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-15

The Effects of Economic Growth (cont.)

- Growth is usually **biased**: it occurs in one sector more than others, causing relative supply to shift.
 - ♦ According to the Ricardian model, technological progress in one sector causes biased growth.
 - ♦ According to the Heckscher-Ohlin model, an increase in one factor of production (an increase in the labor force, arable land, or the capital stock) causes biased growth.
 - ♦ Key drivers of growth are therefore changes in *total factor productivity* (A_C and A_F) and changes in factor endowments, T or L .

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-16

The Effects of Economic Growth (cont.)

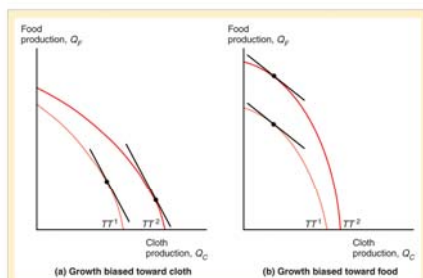


Figure 5-6
Biased Growth
 Growth is biased when it shifts production possibilities out more toward one good than toward another. In both cases shown the production possibility frontier shifts out from TT^1 to TT^2 . In case (a) this shift is biased toward cloth, in case (b) toward food.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-17

The Effects of Economic Growth (cont.)

- Biased growth and the resulting shift in relative supply causes a change in the terms of trade.
 - ♦ Biased growth in the cloth industry (in either the domestic or foreign country) will lower the relative price of cloth and lower the terms of trade for cloth exporters.
 - ♦ Biased growth in the food industry (in either the domestic or foreign country) will raise the relative price of cloth and raise the terms of trade for cloth exporters.
 - ♦ Suppose that the home country exports cloth and imports food.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-18

The Effects of Economic Growth (cont.)

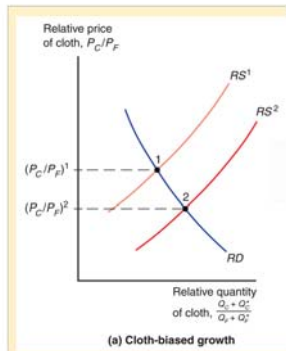


Figure 5-7
Growth and Relative Supply
 Growth biased toward cloth shifts the RS curve to the right (a), while growth biased toward food shifts it to the left (b).

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-19

The Effects of Economic Growth (cont.)

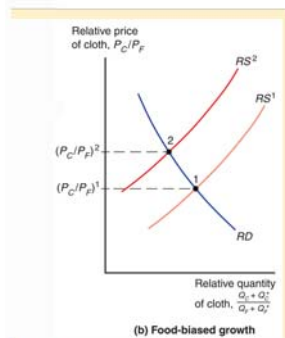


Figure 5-7
Growth and Relative Supply
 Growth biased toward cloth shifts the RS curve to the right (a), while growth biased toward food shifts it to the left (b).

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-20

The Effects of Economic Growth (cont.)

- **Export-biased growth** is growth that expands a country's PPF disproportionately in production of that country's exports.
 - ◆ Biased growth in the food industry in the foreign country is export-biased growth for the foreign country.
- **Import-biased growth** is growth that expands a country's PPF disproportionately in production of that country's imports.
 - ◆ Biased growth in cloth production in the foreign country is import-biased growth for the foreign country.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-21

The Effects of Economic Growth (cont.)

- **Export-biased growth** reduces a country's terms of trade, generally reducing its welfare and increasing the welfare of foreign countries.
- **Import-biased growth** increases a country's terms of trade, generally increasing its welfare and decreasing the welfare of foreign countries.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-22

Has Growth in Asia Reduced the Welfare of High Income Countries?

- The standard trade model predicts that *import* biased growth in China would reduce the US terms of trade and the standard of living in the US.
 - ◆ Import biased growth for China would occur in sectors that compete with US exports.
- But this prediction is not supported by data: there should be negative changes in the terms of trade for the US and other high income countries.
 - ◆ In fact, the terms of trade for high income countries have been positive and negative for developing Asian countries.
- In fact, China's growth has been export-biased.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-23

Has Growth in Asia Reduced the Welfare of High Income Countries? (cont.)

TABLE 5-1 Average Annual Percent Changes in Terms of Trade

| | 1986-1995 | 1996-2005 |
|--------------------|-----------|-----------|
| Advanced economies | 0.8 | -0.1 |
| Developing Asia | -0.4 | -1.1 |

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-24

Import Tariffs and Export Subsidies

- **Import tariffs** are taxes levied on imports
 - ◆ Ad valorem (% of trade value)
 - ◆ Specific (\$/unit addition to price)
- **Export subsidies** are payments given to domestic producers that export.
- Both policies influence the *terms of trade* and therefore national welfare.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-25

Import Tariffs and Export Subsidies (cont.)

- *Import tariffs* and *export subsidies* drive a wedge between prices in world markets (or external prices) and prices in domestic markets (or internal prices).
- If the home country imposes a tariff on food imports, the price of food relative to price cloth that domestic citizens face is higher.
- The *home terms of trade* $(P_C/P_F)_H$ is distorted (lower) than the international terms of trade.
- The relative supply of cloth at home falls as home suppliers respond to this distorted incentive.

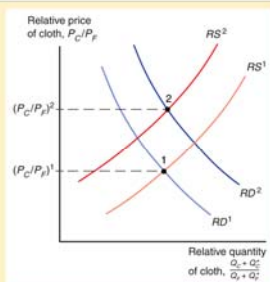
Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-26

Home import tariff on food and the international terms of trade, $(P_C/P_F)^*$

Figure 5-9
Effects of a Tariff on the Terms of Trade

An import tariff imposed by Home both reduces the relative supply of cloth (from RS^1 to RS^2) and increases the relative demand (from RD^1 to RD^2). As a result, the relative price of cloth must rise.



Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-27

Import Tariffs and Distribution of Income Across Countries

- When the home country imposes an import tariff on food, its terms of trade improves and home welfare may increase.
- The magnitude of this effect depends on the size of the home country relative to the world economy.
 - ◆ If the country is small part of the world economy, its tariff (or subsidy) policies will not have much effect on world relative supply and demand, and thus on the terms of trade.
 - ◆ But for large countries, a tariff rate that improves national welfare at the expense of foreign countries may exist.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-28

Export Subsidies and Distribution of Income Across Countries

- If the home country imposes a subsidy on cloth exports, the home terms of trade is higher.
 - ◆ Domestic producers receive a higher relative price of cloth, and therefore are more willing to switch to cloth production: the relative supply curve shifts.
 - ◆ Domestic consumers pay a higher relative price of cloth, and therefore are willing to switch to food consumption: the relative demand curve shifts too.

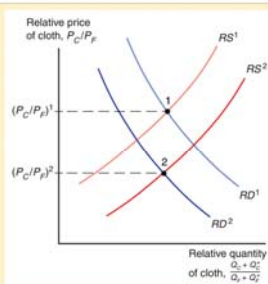
Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-29

Export Subsidies and the *international* terms of trade, $(P_C/P_F)^*$

Figure 5-10
Effects of a Subsidy on the Terms of Trade

An export subsidy's effects are the reverse of those of a tariff. Relative supply of cloth rises, while relative demand falls. Home's terms of trade decline as the relative price of cloth falls from $(P_C/P_F)^1$ to $(P_C/P_F)^2$.



Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-30

Export Subsidies and Distribution of Income Across Countries

- When the home country imposes an export subsidy, the terms of trade decreases and the welfare of the country decreases to the benefit of the foreign country.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-31

Import Tariffs, Export Subsidies and Distribution of Income Across Countries

- The standard model predicts that
 - ◆ an import tariff at home generally reduces home welfare because it hurts consumers more than it benefits producers, but it improves home's terms of trade
 - ◆ an import tariff at home can increase domestic welfare at the expense of the foreign country if the country is large enough and therefore the terms of trade gain is large.
 - ◆ an export subsidy by the home country reduces domestic welfare to the benefit of the foreign country.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-32

Import Tariffs and Export Subsidies in Other Countries

- But what about other countries?
 - ◆ A foreign country may subsidize the export of a good that Australia also exports, which will reduce its price in world markets and decrease Australia's terms of trade.
 - The EU subsidizes agricultural exports, which reduce the price that Australian farmers receive for their goods in world markets.
 - ◆ A foreign country may put a tariff on an imported good that the Australia also imports.
 - ◆ This reduces that country's relative demand for that good and hence its relative international price. It therefore improves Australia's terms of trade.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-33

Import Tariffs, Export Subsidies and Distribution of Income Within a Country

- Changes in the home terms of trade due to import tariffs and export subsidies affect home income distribution among consumers and producers *within a country*.
- A domestic import tariff raises income for home import-competing producers and it shifts resources away from the export sector.
- A domestic export subsidy raises income for domestic exporters, and it shifts resources away from the import-competing sector.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-34

Summary

1. A change in relative prices, say due to trade, causes an income effect and a substitution effect.
2. The terms of trade refers to the price of exports relative to the price of imports in world markets.
3. Export-biased growth reduces a country's terms of trade, generally reducing its welfare and increasing the welfare of foreign countries.
4. Import-biased growth increases a country's terms of trade, generally increasing its welfare and decreasing the welfare of foreign countries.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-35

Summary (cont.)

5. The effect of international transfers of income depend on the marginal propensity to spend on domestic goods, but generally the relative demand curve of donor will shift left leading to a decrease in the donor's terms of trade.
6. When the domestic country imposes an import tariff, the terms of trade increases and the welfare of the country may increase.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-36



Summary (cont.)

7. When the domestic country imposes an export subsidy, the terms of trade decreases and the welfare of the country decreases.
8. Generally, a domestic import tariff increases income for domestic import-competing producers and shifts resources away from the export sector.
9. Generally, a domestic export subsidy increases income for domestic exporters and shifts resources away from the import-competing sector.

Copyright © 2006 Pearson Addison-Wesley. All rights reserved.

5-37
