Effective Protection

A nation's **tariff structure** measures how it taxes various imports. Typically, industrial countries place higher tariffs on finished products than on raw materials.

The **effective rate of protection** is the amount of protection the domestic industry actually gets. It is computed by dividing the nominal rate of protection on a particular product by the domestic content or value added of the product.

Value added. If you purchase some materials for $10, work on them, and sell them for $40, you have added $30 to the value of the ultimate product.

Tariffs and quotas are not uniformly applied across all product categories. Some imports face a stiff tariff, while others are waived into the country with a customs agent giving them only a perfunctory nod.

Thus, an average tariff rate of 5 percent on all imports may include tariff rates of zero on some imports and 50 percent on others. The LDCs have long felt that the **tariff structure** of developed countries discriminated against their *potential* manufactured exports to the industrialized world. This is because although nominal tariff rates have always been low in the developed world, their **effective rates of protection** have been much higher.

Effective rates of protection measure the *actual rate of protection* granted a domestic industry, such as the shoe industry. Suppose a nation places a 50 percent tariff on all imported shoes, but at the same time allows the raw materials (leather) needed to make them to enter the nation duty-free. Suppose, further, that the cost of leather equals 50 percent of the total cost of producing a pair of shoes, so that if a pair of shoes sells for $60 in the domestic market, the cost of the leather required to produce them is $30. Assuming the shoe industry imports leather, the domestic **value added** to a pair of shoes is $30. (Value added can be computed quite directly. If a lumberjack sells a cabinetmaker some lumber for $100, and the cabinetmaker then constructs a cabinet out of the wood and sells it for $300, the value added by the cabinetmaker equals $200.) And it is the value added, the jobs of domestic workers, that the country wants to protect.

The effective rate of protection, the one that counts from the point of view of the domestic industry, can be calculated from the following formula.

$$T_{eff} = \frac{T_j - T_i I_{ij}}{1 - I_{ij}}$$

T_{eff}, the rate of effective protection, equals the tariff rate on the final product, T_j, minus the tariff rate on the inputs used to produce it, T_i, multiplied by the proportion of the input relative to the total product, I_{ij}, all divided by the proportion of the value added domestically. Assume T_j, the tariff on finished shoes, equals .5; T_i, the tariff on leather, equals zero; and I_{ij}, the proportionate value of leather in producing a pair of shoes, equals .5. Although the nominal tariff rate is 50 percent, the effective rate of protection, what the shoe industry actually obtains, is 100 percent, which means that the actual tariff barrier on shoes is *twice as high* as listed.

$$T_{eff} = \frac{.5 - (0)(.5)}{1 - .5} = \frac{.5}{.5} = 1 = 100\%$$

If both shoes and leather faced a 50 percent tariff, the effective rate of protection would be 50 percent or (.5−.25)/.5 equals .5. If shoes faced a 50 percent tariff while leather imports were taxed at 100 percent, the effective rate of protection would equal zero. In such a case, the nominal tariff rate would be higher than the effective rate.

Most countries impose higher tariffs on *final products* than on inputs so that effective rates are normally higher than nominal rates of protection. Such tariff structures make it more difficult for outsiders, including LDCs, to penetrate markets within the industrialized world. However, quotas, not effective rates of protection, are probably the biggest commercial stumbling block hindering LDC exports to the developed world. Furthermore, it is worth noting that LDCs, not DCs, have the highest rates of effective protection.

BOX 7.5 Effective Rates of Protection

Alan Deardorff and Robert Stern computed nominal and effective rates of protection in the European Union, Japan, and the United States in the 1980s (see Table 7.6). Even though only the *top five* effective rates of protection are presented in the present table, we can see that nominal and effective rates of protection have been highly correlated. Industries that received a high nominal rate of protection also received a high effective rate of protection.

On average, effective rates of protection were higher in Japan than in the United States, which, in turn, were higher than in the European Union. Note that certain industries, wearing apparel and footwear, for example, had high effective rates of protection in all three regions.

TABLE 7.6 Nominal and Effective Rates of Protection

	Nominal Rate	*Effective Rate*
European Union		
Footwear	11.1%	20.1%
Wearing apparel	13.4%	19.3%
Food, beverages & tobacco	10.1%	17.8%
Transportation equipment	8.0%	12.3%
Glass and glass products	7.7%	12.2%
average for 22 industries	6.1%	8.8%
Japan		
Food, beverages & tobacco	25.4%	50.3%
Footwear	15.7%	50.2%
Wearing apparel	13.8%	42.2%
Agr., forestry & fisheries*	18.4%	21.4%
Furniture and fixtures	5.1%	10.3%
average for 22 industries	8.3%	10.9%
United States		
Wearing apparel	22.7%	43.3%
Textiles	9.2%	18.0%
Footwear	8.8%	15.4%
Food, beverages, & tobacco	4.7%	10.2%
Glass and glass products	6.2%	9.8%
average for 22 industries	3.6%	5.8%

*Agriculture, forestry, and fisheries.

Source: Alan V. Deardorff and Robert M. Stern, *The Michigan Model of World Production and Trade: Theory and Applications* (Cambridge, MA: MIT Press 1985); pp. 103–108.

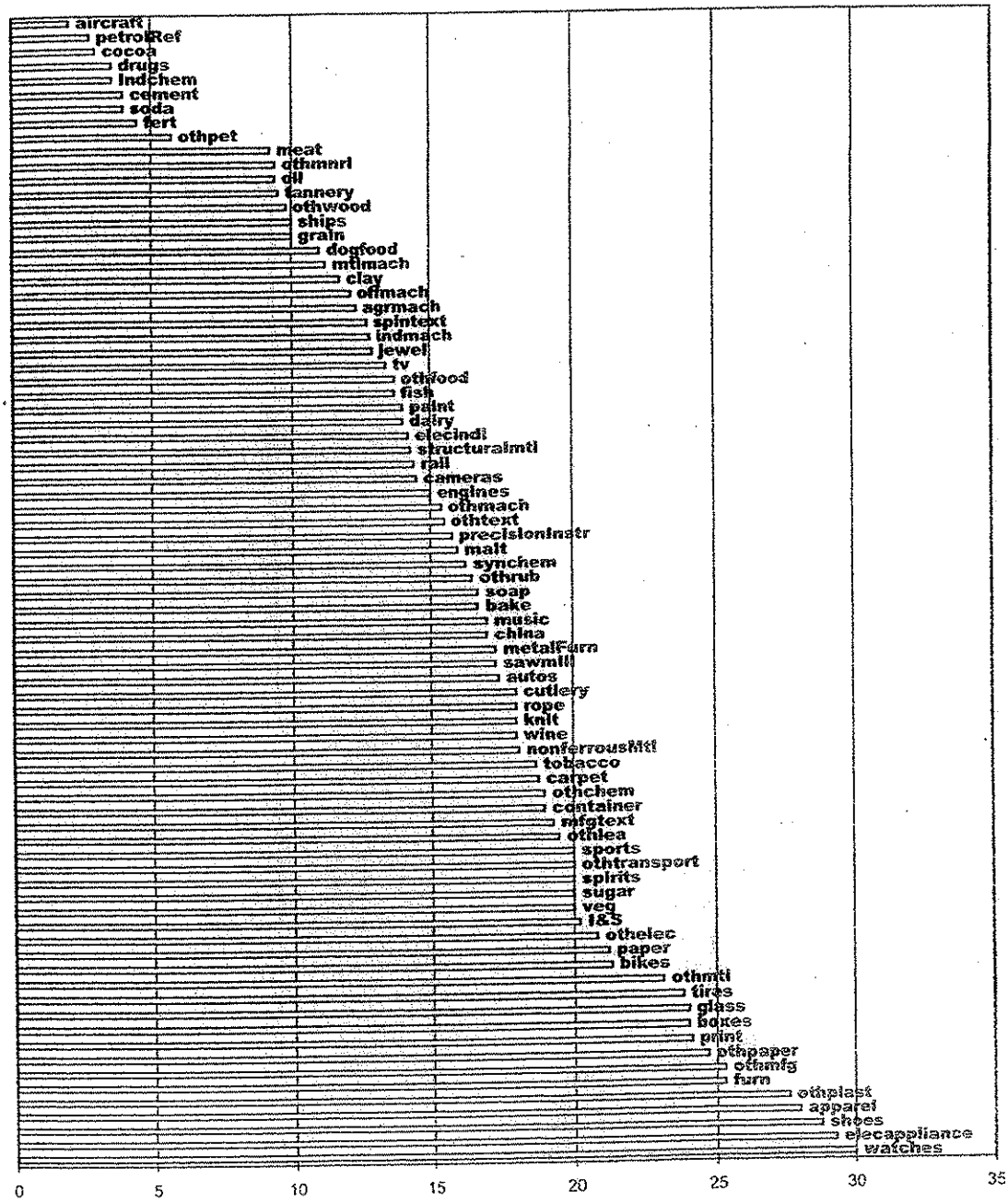


Fig. 2. Argentina's External Tariffs (%) in 1996. ISIC (rev. 2) four-digit industries.

Model A1 is the base model just as it appears in Eq. (1). It is estimated with data pooled across 1992, 1993, and 1996 using approximately 2830 observations per cross-section. If external tariffs are sticky then it is appropriate to include initial tariffs as a control variable. Model A2 thus includes tariffs in 1992 as a regressor.[10] It is estimated with the 1993 and 1996 cross-sections. Model A3, the final base model explored, contains full two-way

[10] Tariff data from an even earlier period were not available to us.

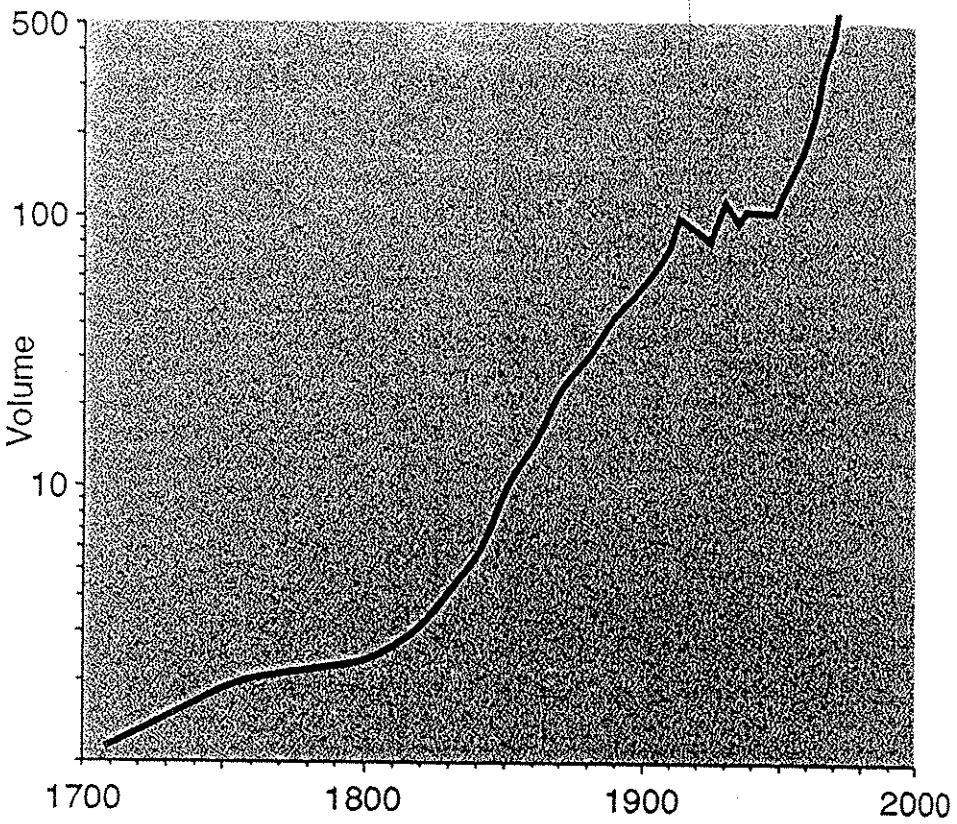


CHART II-3. *Volume of World Trade, 1720–1971*

Sources: See Appendix B.

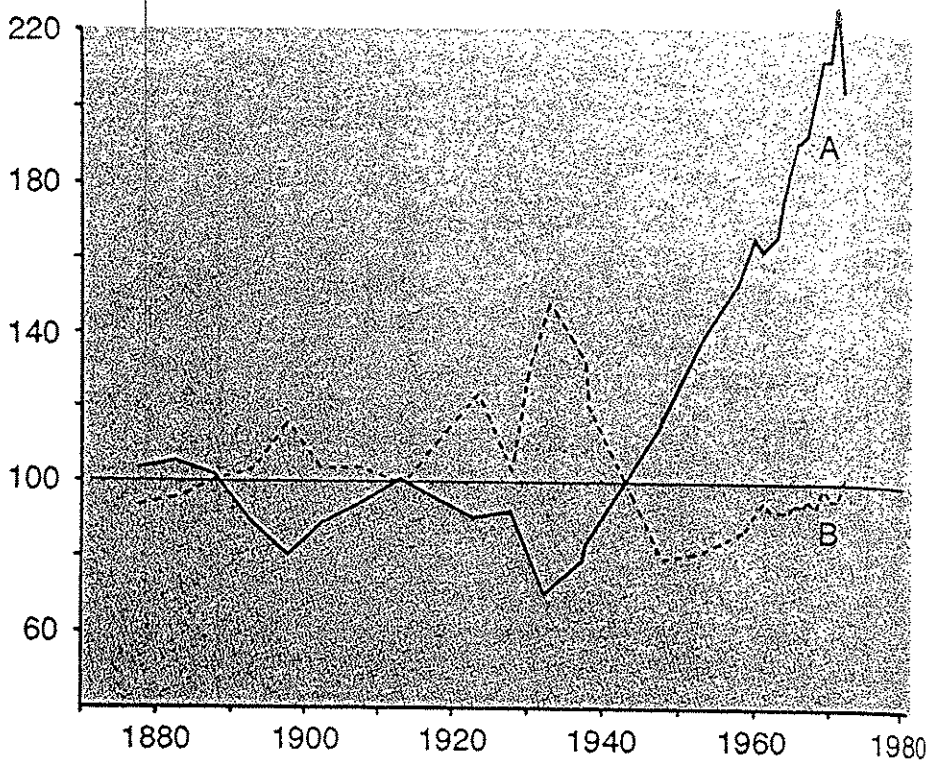


CHART II-13. *Relative Price Movements and World Trade, 1876–1880 to 1972*

A. Quantum index of world trade in manufactured goods as percentage of that in primary goods.

B. Price index of manufactured goods as percentage of that for primary goods.

Source: Folke Hilgerdt, *Industrialization and Foreign Trade*, p. 18, updated from *United Nations Statistical Yearbooks*, various years.

Table 5-3. *Japan's Trade with the United States, 1973–86*

Year	Exports to United States (f.o.b.)		Imports from United States (c.i.f.)	
	Billions of dollars	Percent of total	Billions of dollars	Percent of total
1973	9.4	25.6	9.3	24.2
1974	12.8	23.0	12.7	20.4
1975	11.1	20.0	11.6	20.1
1976	15.7	23.3	11.8	18.2
1977	19.7	24.5	12.4	17.5
1978	24.9	25.5	14.8	18.6
1979	26.4	25.6	20.4	18.5
1980	31.4	24.2	24.4	17.4
1981	38.6	25.4	25.3	17.7
1982	36.3	26.2	24.2	18.3
1983	42.8	29.1	24.6	19.5
1984	59.9	35.2	26.9	19.7
1985	65.3	37.2	25.8	19.9
1986	80.5	38.5	29.1	23.0

Sources: Bank of Japan, *Balance of Payments Monthly* (January 1987), pp. 15, 19; (July 1984), pp. 15, 19.

TABLE 8

MAJOR EXPORTS AND IMPORTS OF JAPAN, 1972

(a) Items	*(b) Quantity (1000 metric tons unless otherwise stated)*	*(c) Value (million yen)*
EXPORTS:		
1. Iron and steel	21,374	1,111,976
2. Automobiles	2,029[a]	913,069
3. Ships	9,887[b]	739,938
4. Radios	37,790[a]	318,195
5. Metal products	—	307,325
6. Motor cycles	2,207[a]	255,558
7. Synthetic fabrics	—	250,857
8. Scientific and optical instruments	—	237,673
9. Tape recorders	26,715[a]	202,942
10. Television sets	5,836	174,028
Total exports		8,806,072
IMPORTS:		
1. Crude oil	249,193[c]	1,209,669
2. Lumber	44,836[d]	531,916
3. Iron ore	111,520	392,685
4. Coal	49,278	332,043
5. Ores of non-ferrous metals	16,048	313,023
6. Non-ferrous metals	—	283,983
7. Cotton	867	190,846
8. Petroleum products	—	165,984
9. Soybeans	3,396	146,046
10. Wool	363	143,225
Total imports		7,228,979

Source:

Nihon Tokei Nenkan, 1973/74 (1974), pp. 292–95.

Notes:

[a] In thousand units; [b] In thousand gross tons; [c] In thousand kl; [d] In thousand cubic meters.

Table 6.1. Variations in export performance 1900-86

Annual average compound growth rate in export volume

	1900-13	1913-50	1950-73	1973-86
Australia	4.3	1.3	5.8	4.2
Austria	2.5	−3.0	10.8	6.1
Canada	5.8	3.1	7.0	4.2
Belgium	4.9	0.3	9.4	3.4
Denmark	4.5	2.4	6.9	4.4
Finland	5.2	1.9	7.2	3.6
France	3.8	1.1	8.2	3.3
Germany	6.4	−2.8	12.4	4.4
Italy	3.4	0.6	11.7	4.9
Japan	9.9	2.0	15.4	7.6
Netherlands	4.6	1.5	10.3	3.1
Norway	5.6	2.7	7.3	5.5
Sweden	4.9	2.8	7.0	3.2
Switzerland	3.6	0.3	8.1	3.5
United Kingdom	4.2	0.0	3.9	3.7
United States	2.5	2.2	6.3	1.7
OECD average	4.8	1.0	8.6	4.2
Bangladesh	(4.2)	−1.5	2.0	4.2
China	4.7	1.1	2.7	10.4
India	4.2	−1.5	2.5	2.5
Indonesia	4.0	2.3	6.5	3.3
Pakistan	(4.2)	−1.5	3.6	6.7
Philippines	2.8	3.7	5.9	5.9
South Korea	8.0	−1.3	20.3	14.0
Taiwan	7.4	2.6	16.3	11.6
Thailand	5.0	2.3	4.4	9.4
Asian average	4.9	0.7	7.1	7.6
Argentina	4.2	1.6	3.1	4.4
Brazil	0.4[a]	1.7	4.7	6.8
Chile	3.8	1.4	2.4	9.1
Colombia	7.8	3.9	3.8	6.0
Mexico	4.6	−0.5	4.3	11.1
Peru	6.7	2.7	5.8	−2.2
Latin American average	4.6	1.8	4.0	5.9
Developing country arithmetic average	4.8	1.1	5.9	6.9
USSR	4.7	−0.1	10.0	4.7
32 country total	4.3	0.6	7.7	4.5

[a] 1901-13.

Source: Derived from Tables D-2 and D-3.

Table 3.2. Per capita real GDP growth: 1900-87

Annual average compound growth rates

	1900-13	1913-50	1950-73	1973-87
Australia	1.1	0.7	2.5	1.5
Austria	1.4	0.2	4.9	2.3
Belgium	1.0	0.7	3.5	1.7
Canada	3.3	1.5	2.9	2.2
Denmark	2.0	1.5	3.1	1.7
Finland	1.8	1.9	4.3	2.4
France	1.5	1.1	3.8	1.7
Germany	1.6	0.7	4.9	2.0
Italy	2.0	0.7	4.8	2.0
Japan	1.2	0.9	8.0	2.8
Netherlands	0.9	1.1	3.5	1.2
Norway	2.0	2.1	3.2	3.6
Sweden	1.5	2.1	3.3	1.6
Switzerland	1.4	2.1	3.1	0.9
United Kindom	0.7	0.8	2.5	1.5
United States	2.0	1.6	2.2	1.5
OECD average	1.6	1.2	3.8	1.9
Bangladesh	0.5	−0.3	−0.7	2.1
China	0.3	−0.5	3.7	6.0
India	0.5	−0.3	1.6	1.8
Indonesia	0.5	−0.2	2.1	3.1
Pakistan	0.5	−0.3	1.7	3.1
Philippines	2.5	−0.2	1.9	0.6
South Korea	(0.8)	−0.2	5.2	6.2
Taiwan	0.3	0.4	6.2	6.0
Thailand	0.3	0.0	3.2	3.9
Asian average	0.7	−0.2	2.8	3.6
Argentina	2.5	0.7	2.1	−0.8
Brazil	1.4	2.0	3.8	2.2
Chile	(2.1)	1.7	1.5	0.2
Colombia	(2.1)	1.5	2.2	1.9
Mexico	1.8	1.0	3.1	0.9
Peru	(2.1)	1.4	2.5	0.1
Latin American average	2.1	1.4	2.5	0.8
Developing country average	1.2	0.7	2.7	2.5
USSR	1.6	2.3	3.6	1.2
32 country average	1.4	1.0	3.3	2.2

Source: Derived from Table 1.3. The regional averages are arithmetic.

Figure 1: World Average Export-to-GDP, 1960-2001

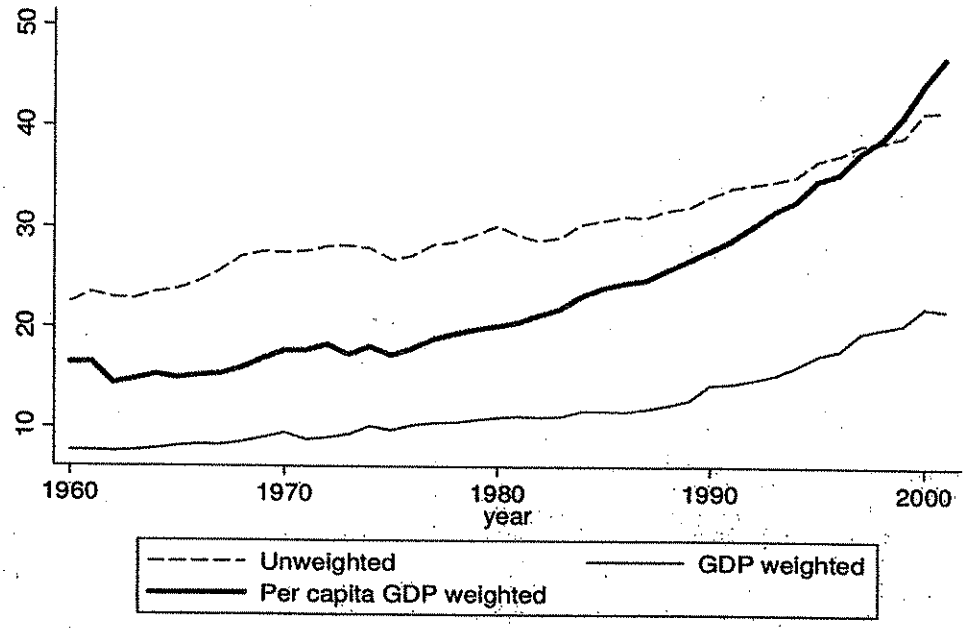


Figure 2: Export-to-GDP by Regions, 1960-2001

(Simple Average)

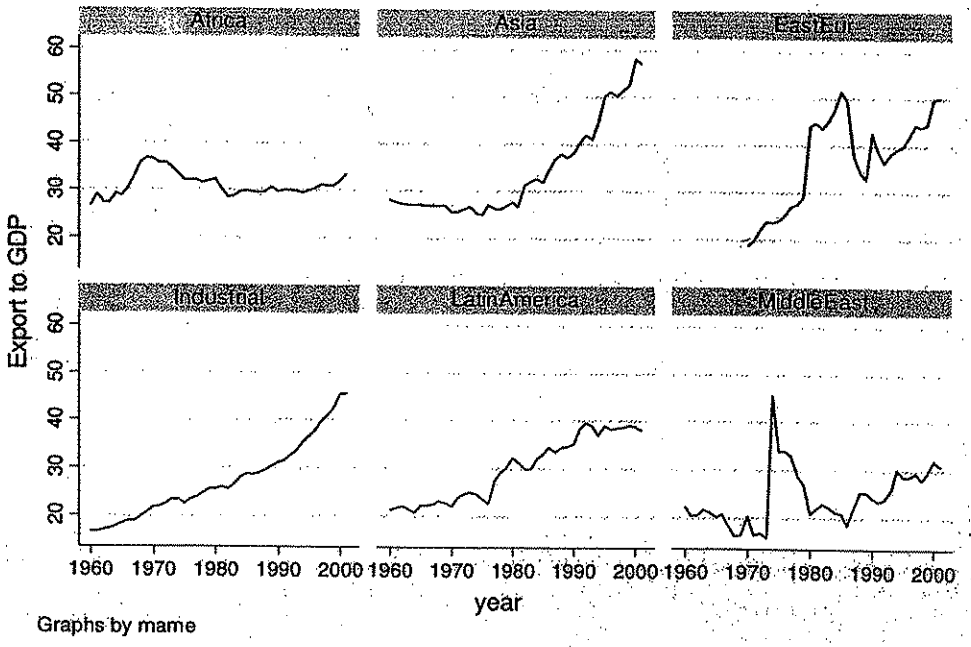
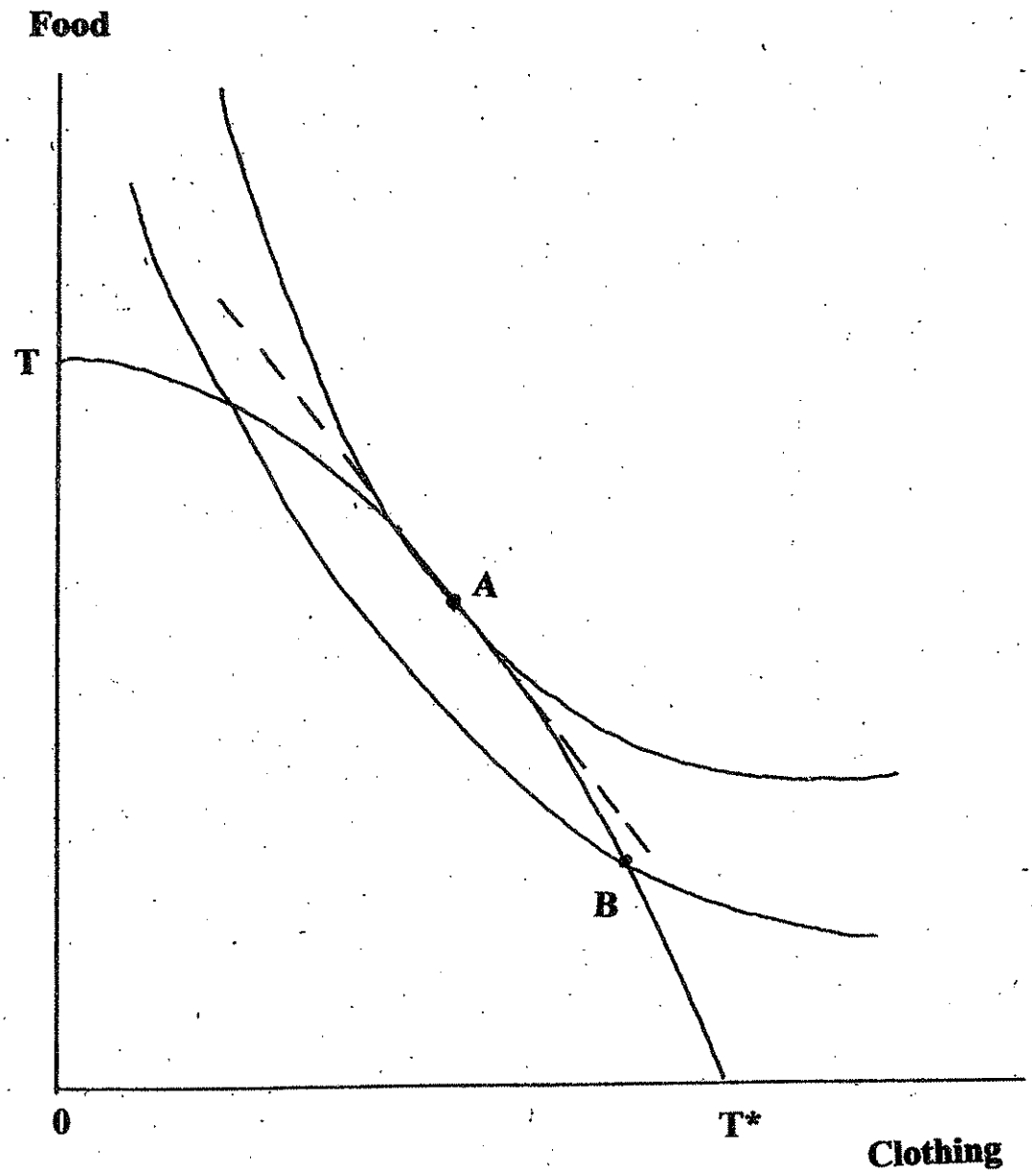
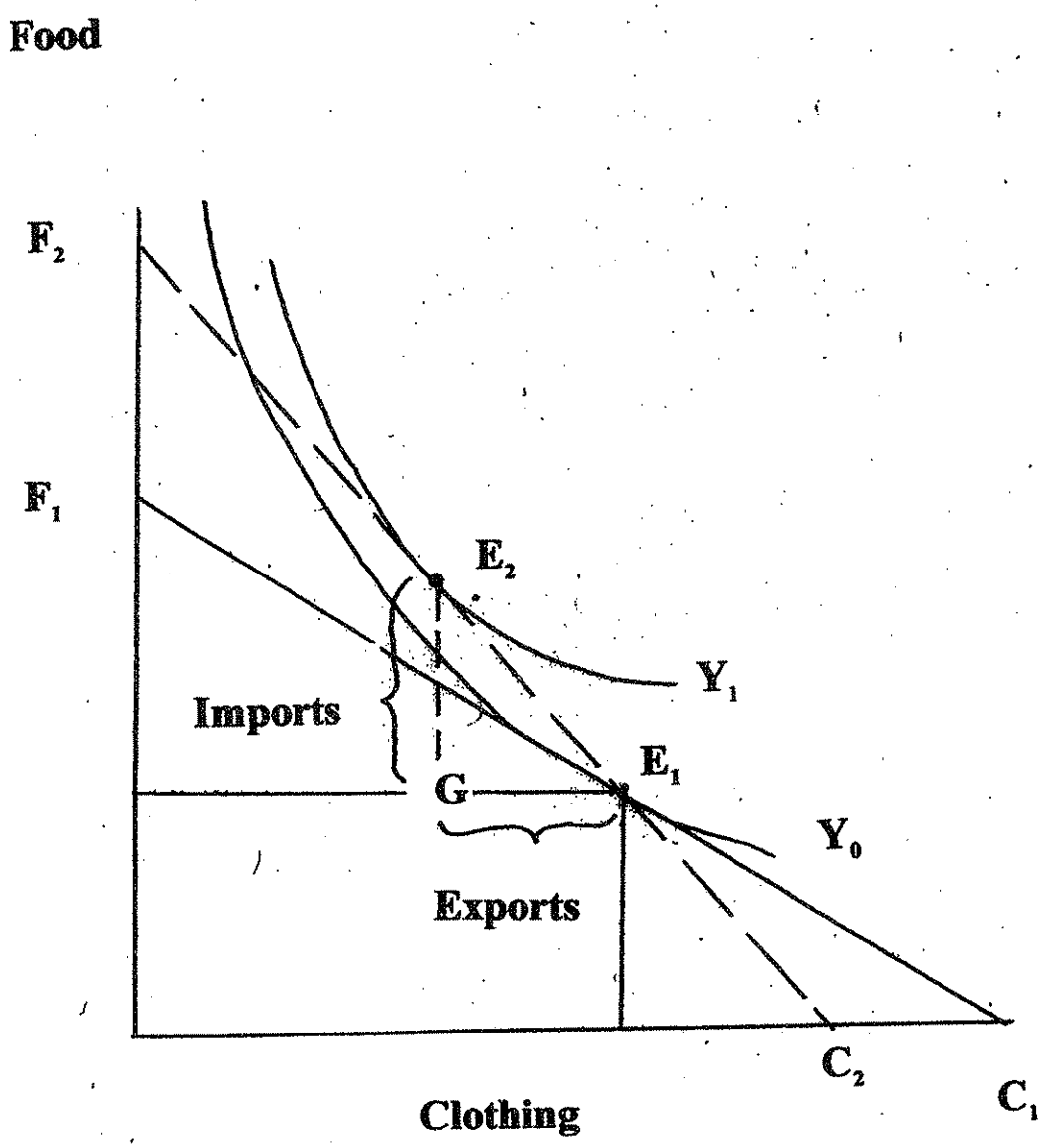


Figure 1.F: The Optimal and Sub-Optimal Production Points for an Autarky Economy



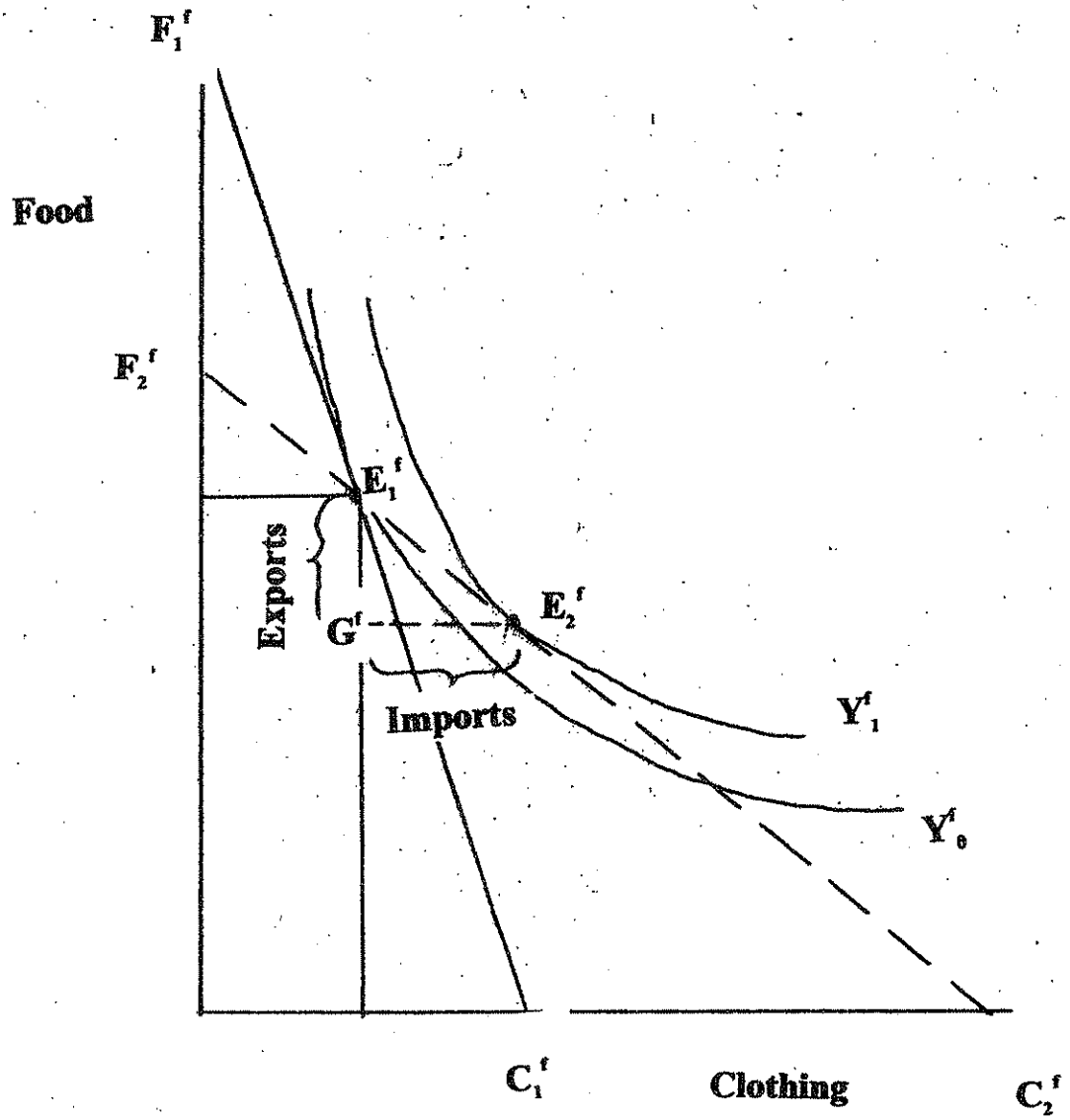
An autarky economy can produce and consume anywhere along the transformation curve TT*. At point A, where the indifference curve is tangent to the transformation curve, consumer welfare is maximized (ie.: welfare levels are higher at A than at any other point, say at B.

Figure 1.B: The Trade Triangle for the Home Country



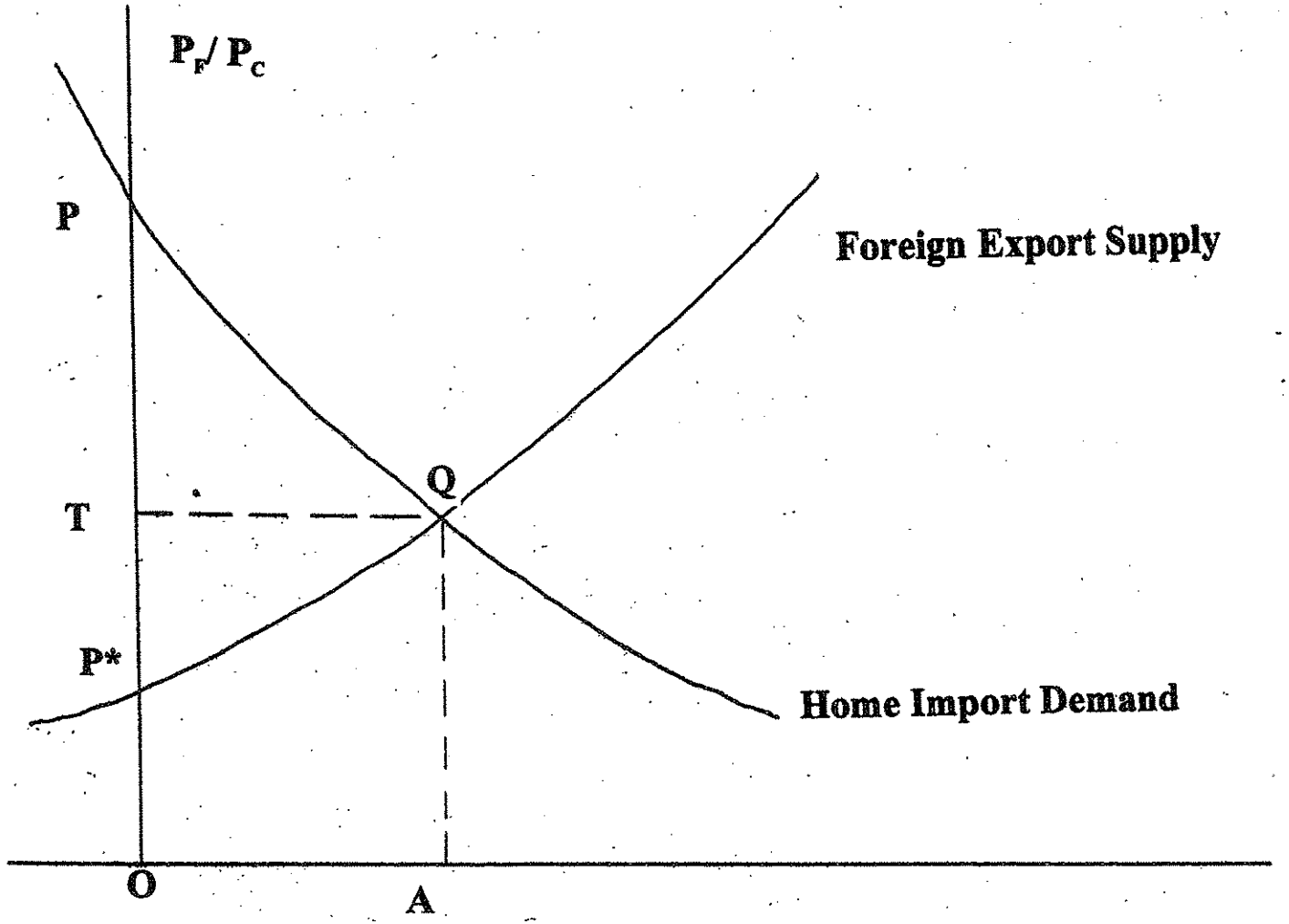
In autarky the home country consumes its endowment bundle E_1 at relative prices show by line F_1C_1. If it opens up to trade at prices shown it by line F_2C_2 it could export GE_1 units of clothing to obtain E_2G units of food, improving its real income from Y_0 to Y_1

Figure 1.C: The Foreign Country Also Benefits from Trade (The Trade Triangle for the Foreign Country)



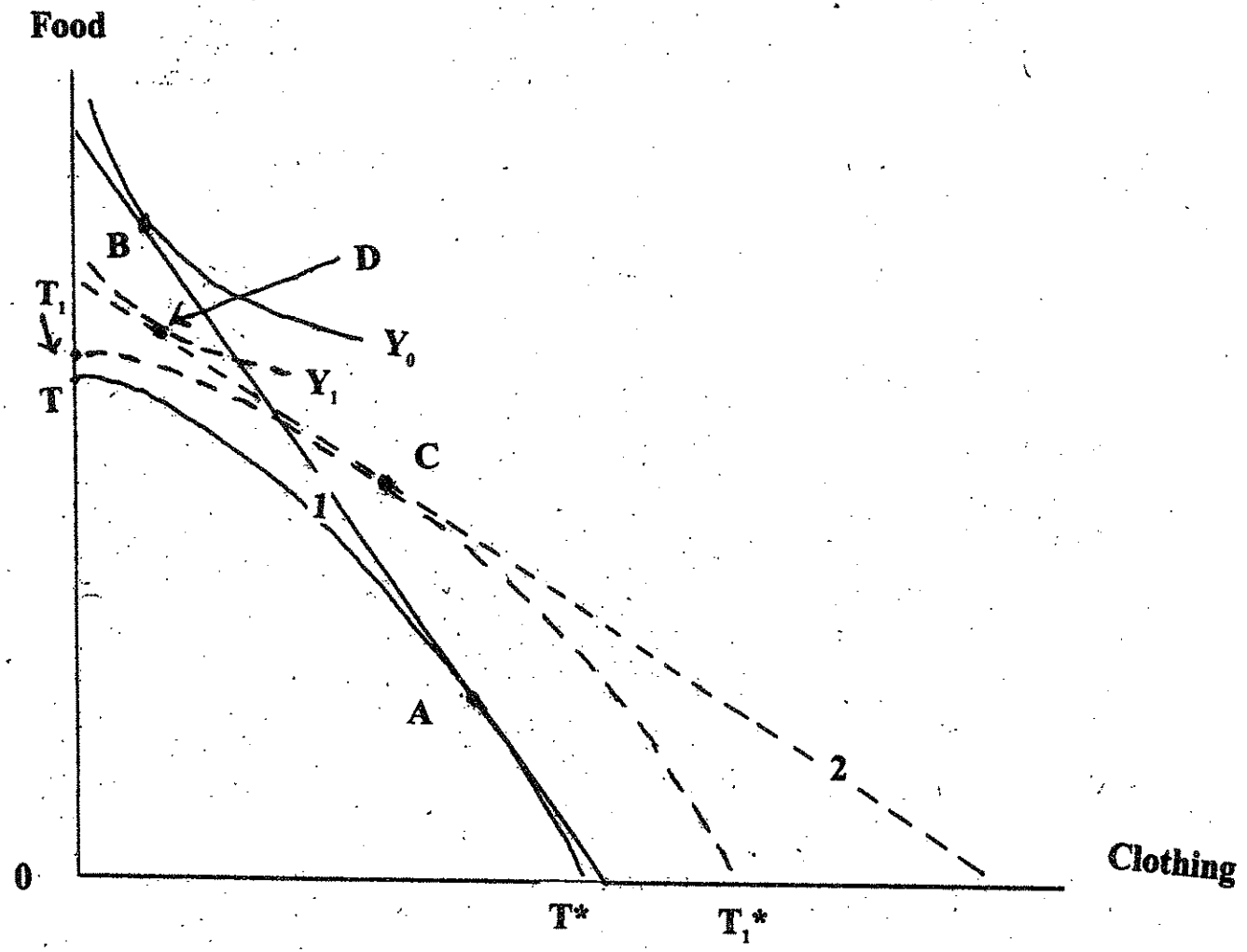
The foreign country consumes its endowment bundle, E_1^f, at relative prices shown by line $F_1^f C_1^f$ in a state of autarky. If it opens up to trade it can export $E_1^f G^f$ units of food to obtain $G^f E_2^f$ units of clothing, thus consuming the bundle shown by E_2^f. In doing so it improves its real income, moving from level Y^f_0 to Y^f_1

Figure 1.D: Excess Demand for Food in the Home Market and The Relative Price of Food Given Free-Trade Imports of Food



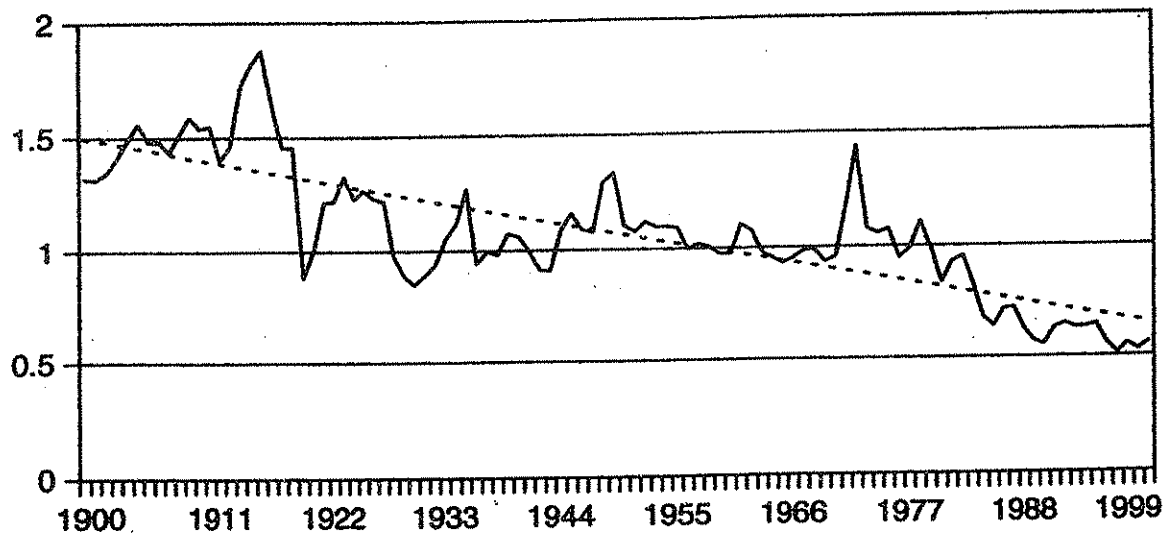
Equilibrium quantity* OA *represents free-trade imports of food by the home country; the equilibrium price ratio for price of food relative to price of clothing is* OT, *below the level P that would prevail without food imports

Figure 1.G: Concentrating on Cheap Manufactures or Primary Products May be a Bad Thing in the Long Run



Growth biased toward the nation's export industry (clothing in this example) can reduce real income by so worsening the terms of trade (from line 1 to line 2) that consumption (at D) ends up on a lower indifference curve than at its initial point (at B)

Figure 1.H: The Terms of Trade Have Not Been Favorable to Primary Products Over the Course of the Twentieth Century



Source: Updated version of the Grilli-Yang index, based on data compiled and kindly made available by Dr Stephan Pfaffenzeller, University of Liverpool.

Figure 37.1 Terms-of-trade index

Source: **Page 19 in David Sapsford, *"Terms of trade and economic development,"* in Amitava Krisha Dutt and Jaime Ros (ed), *International Handbook of Development Economics*, Volume 2 (Northampton, MA: Edward Elgar, 2008).**

Labor Productivity, the Terms of Trade and Relative Wages In a Ricardian Labor Theory of Value Model

Country A		Country B	
Labor Productivity (Labor input per unit of output):			
Food (a_{LF})	2	Food (a_{LF})	4
Clothing (a_{LC})	4	Clothing (a_{LC})	6
If Both Countries Produce Only Food at a Common World Price then the Relative Wage of B Compared to A (Set at One) Is [(a)]:			
1 (w)		½ (w*)	
If Both Countries Produce Only Clothing at a Common World Price then the Relative Wage of B Compared to A (Set at One) Is [(b)]:			
1 (w)		2/3 (w*)	
If Country A Produces Only Food and Country B Produces Only Clothing and the Global Terms of Trade Between Food and Clothing Lie Between the Terms of Trade for Country A and Country B Then [(c)]:			
1 (w)		Between ½ and 2/3 (w*)	

(a) $w/w^* = (1/a_{LF})/(1/a^*_{LF}) = (1/2)/(1/4) = 2$

(b) $w/w^* = (1/a_{LC})/(1/a^*_{LC}) = (1/4)/(1/6) = 3/2$

(c) $w/w^* = [(1/a_{LF})/(1/a^*_{LC})]*[(p_F/p_C]$

because $w = p_F a_{LF}$ and $w^* = p_C a^*_{LC}$

Thus $w/w^* = [(1/2)/(1/6)]\ \lambda = 3\ \lambda$ where $½ < \lambda < 2/3$

Implications of the Heckscher-Ohlin Theory of Trade

I The Factor Equalization Theorem

Free trade equalizing commodity prices between countries that share the same technology and produce the same commodities equates wages and rents between the home and foreign country

II Specialization when Factor Proportions Differ

When factor proportions differ in a major way between the home and foreign country factor prices are not equalized between the two countries. In this case under free trade the capital-abundant country exports capital-intensive goods and the labor-abundant country labor-intensive goods.

III The Stolper-Samuelson Theorem

A barrier to trade (e.g.: tariff, quota, transport costs) that drives up the import price in the home country benefits the factor of production that is intensively used in producing the import-competing good.

Note: This is a modified version of text appearing in pages 138-139 in Richard Caves, Jeffrey Frankel and Ronald Jones, World Trade and Payments: An Introduction, Seventh Edition (New York: HarperCollins College Publishers, 1996).