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Title: THE STRUCTURE OF THE HARDWOOD PLYWOOD INDUSTRY IN THE FAR EAST EXPORTING COUNTRIES: JAPAN, REPUBLIC OF CHINA, REPUBLIC OF KOREA, AND THE PHILIPPINES

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The purpose of this study is to provide a systematic method to analyze relationships between inputs, technology, and market structure of an industry, and marketing activities among countries in general and to develop an economic analysis of trade flow of the hardwood plywood industry in the Far East exporting countries: Japan, Republic of China (Taiwan), Republic of Korea (South Korea), and the Philippines. It includes an analysis of the nature, determinants, potential and competition of the hardwood plywood industry in international trade as well as prospective changes in international relationships of these four countries resulting from increasing competition for foreign markets.

"Intra-industry" trade theory was used as a basis for analyzing nations' trade potential. This theory includes four secondary determining theories: product-cycle, factor endowments, quality differentiation and demand structure, and economic scale theories. In addition to the intra-industry theory, a nation's marketing activities were considered and elaborated for explaining that nation's actual trade performance.

A relative price index of the four exporting countries and each country's export growth were examined to show that a comparative cost advantage in producing hardwood plywood for international trade shifted from Japan, the innovating country, to South Korea, Taiwan, and the Philippines as the hardwood plywood industry proceeded from its introductory and growth stages to a mature stage during the last two decades; low-wage developing countries gained a competitive position in producing and exporting mature products of hardwood plywood.

The export composition of hardwood plywood products in Japan was analyzed to show that quality differentiation was the best strategy for an advanced country, such as Japan, endowed with ample scientific and engineering inputs, to increase or at least maintain its share in world markets. This analysis showed that a relative rise in the price of hardwood plywood in Japan did not bring about a decrease in exports.

Utilization of hardwood plywood production capacity in South Korea and the Philippines indicated that economic scale and low unit cost of product were related if the products were close export substitutes. It was revealed that low cost mature products from developing countries could gain a competitive position in world markets in spite of these countries' poorer foreign marketing networks.

An individual import function for the United States and export functions for Japan, South Korea, Taiwan, and the Philippines were estimated to explain trade behavior and predict trade patterns up to 1975.

Finally, an hypothesis explaining trade direction of higher-quality differentiated products was also tested. Quantity and price ratios of Japan's and Taiwan's exports to different areas were constructed for testing an hypothesis that higher-quality higher-priced products were likely to be exported to higher transport-cost areas.

The Structure of the Hardwood Plywood Industry in the Far East Exporting Countries: Japan, Republic of China, Republic of Korea, and the Philippines

by

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INTRODUCTION

A nation's standard of living and competitive position in world trade markets depend upon the level of its economic development. Without exception, an economic development program is the most important issue to every country, whether advanced or developing. This is particularly important to developing countries overall for their terms of trade and balance of trade have continued to deteriorate; hence their standard of living has slipped backward in relation to the advanced countries.

Over the last two decades, some developing countries have tried to become prosperous by some special economic development program, such as industrialization, and they have enjoyed high rates of growth in some industries as well as a high rate of economic growth. The United Nations also has made great effort to assist developing countries. Because endowments, levels of economic development and needs are different from country to country, the directions of economic development also vary from country to country.

Forests are considered as a most important asset of a nation's wealth for they provide a renewable source of raw material for a

range of industries--lumber industry, wood-based panel industry, and pulp and paper industry, which have acquired great importance in many advanced as well as developing countries. Among these industries, the one with the fastest and the most important growth in developing countries throughout the world has been plywood, nearly all of it produced from tropical hardwoods. Exports of plywood from developing countries grew by more than 150 percent between 1959-61 and 1963-65 and by $51 million, of which $46 million was due to increased exports to developed countries. By 1963-65, shipments originating in developing countries accounted for more than one-quarter of all plywood entering international trade, which compares with one-sixth in 1959-61 and one-tenth in 1953-55. The greater part of this increase was in Asia's exports to North America, and most of this came from in-transit industries in log importing countries of Japan, Republic of China (Taiwan), Republic of Korea (South Korea), and the Philippines. In 1969 the proportion of plywood production exported was about 99 percent for Taiwan, 86 percent for South Korea, 60 percent for the Philippines, and 7 percent for Japan.

The dollar value of plywood exports from the Asian primary producing countries in 1965, 1968, and 1970 were as follows:

	1965	1968	1970
	(million U.S. dollars)		
Japan	65.0	93.0	83.5
South Korea	18.0	65.6	102.4
Taiwan	28.5	58.2	83.8
Philippines	17.5	21.5	15.0

Value added plywood exports amounted to the following percentages of value added by all exports in each of the four countries:

	1962	1965	1969
		(percent)	
Japan	--	1.5	0.7
South Korea	<1.0	10.5	12.7
Taiwan	<1.0	5.9	6.5
Philippines	2.0	2.3	2.1

From 1965 to 1970 the growth in total value of hardwood plywood exports was:

Japan	1.3 times
South Korea	5.7 times
Taiwan	2.9 times
Philippines	0.8 times

From the mid-fifties until 1963, the U.S. market for hardwood plywood was dominated first by Japan, followed in 1964 by Taiwan,

and was finally overtaken by South Korea after 1967.

Because of the importance of forest industries to a nation's well-being and the growing competition of the plywood industry in world markets, FAO together with the local government has commissioned many UNDP projects concerned with the role of forestry and the forest industries in economic planning and development within Far East developing countries. Yet these projects were limited to basic investigations of natural resources and present status of markets for forest industries in each country. A good planning decision cannot be made without further, more complete information. For this end, the purpose of this study attempts to provide a systematic method to analyze the relationships between inputs, technology, and market structure of an industry and marketing activities among countries in general and to develop an economic analysis of the hardwood plywood industry in international trade in particular. It evaluates the competitive position of the hardwood plywood industry in international trade of Japan, South Korea, Taiwan and the Philippines and studies prospective changes in interregional relationships resulting from increasing competition for foreign markets.

Part I, dealing with trade patterns, consists of Chapters I through V. The comparative advantage theory is briefly reviewed in Chapter I. The Heckscher-Ohlin simple theory is relevant for analyzing and predicting trade patterns when the trade products

are homogeneous. Because of its unrealistic assumptions, the Heckscher-Ohlin model cannot satisfactorily explain the trade phenomena of the real world, so the "intra-industry" trade theory has emerged. The intra-industry trade theory includes four mutually exclusive secondary determining theories: comparative advantage theory (or simple Heckscher-Ohlin model), product-cycle theory (or technological gap trade theory), economic scale theory, and the quality differentiation and demand structure theory. These four are employed to explain potential trade direction, composition, and even potential trade magnitude.

In turn, the object of Chapter II is to restate at some length the most important points of the product-cycle theory which provides a clear theoretical rationale to make further theorectical exploration possible.

In Chapter III, attempt is made to combine these four forces (theories) together as a basic intra-industry trade theory to determine a nation's trade potential. Potential trade is not necessarily equal to actual trade. This is particularly true among developing countries. Many more factors have to be incorporated to explain actual trade in the real world.

In Chapter IV, the forces of the marketing functions, which are a major determinant of a nation's actual trade performance, are investigated.

The development of an industry and the competition among countries is treated in Chapter V. It is beyond the scope of this study to discuss this topic completely; a narrow range of topics that appeared relevant is discussed.

Part II dealing with economic aspects of international trade of the hardwood plywood industry of Japan, South Korea, Taiwan, and the Philippines consists of Chapters VI and VII. The empirical data were fitted in the theory to explain the trade patterns among these countries.

For the purpose of fitting the data in the theory, some preparatory work is first presented in Chapter VI. The structure and development of the hardwood plywood industry in Far East Asia, relevant aspects of timber resources, the nature of the industry's inputs and output, relative production costs, marketing activities, relative prices, and relative position of each country in world markets are treated in this chapter. Prospective changes in inter-regional relationships resulting from increasing competition for foreign markets are analyzed. Finally, policy implications for planning purposes of each country are also drawn in this chapter.

Chapter VII is devoted to providing a general practical importing function by which a country's importing behavior can be explained and measured quantitatively, based on the intra-industry trade assumption that consumers in any nation regard imports of

corresponding products as close substitutes instead of perfect substitutes. In this chapter, a special exporting function is also used for analyzing and predicting a country's export performance. Predictions of imports and exports are calculated. An hypothesis of direction of trade for high-quality, high-price differential products is also tested in this chapter.

PART I

DEVELOPMENT OF AN INDUSTRY AND ITS COMPETITIVENESS IN INTERNATIONAL TRADE

I POSITIVE ECONOMIC THEORY OF INTERNATIONAL TRADE: A BRIEF REVIEW

Nations trade with each other because they benefit from it. Other motives may be involved, of course, but the basic economic motivation for international trade is that of gain.

Ricardian Comparative Cost

The basic structure-of-trade theory was not developed until the ninteenth century, when Ricardo developed the theory of comparative cost (or comparative advantage), although Smith had contributed the thought of absolute cost-trade which was based on differences in absolute costs--the possibility of gain by importing a commodity which is supplied more cheaply from abroad. The essence of the principle of comparative cost can be briefly stated: That it will still be profitable for two countries to sell to each other goods in which they are relatively efficient in exchange for those in which they are relatively inefficient, even though all goods can be produced relatively efficiently (cheaply) in one country, so long as the more efficient country will export those goods whose comparative cost is lowest and will import those whose comparative cost is highest.

By using Ricardo's example, Portugal can produce a certain

amount of wine with 80 man-years of labor, and cloth with 90 man-years. England can produce wine with 120 man-years and cloth with 100. The domestic exchange ratio can be calculated as 1.125 units of wine which will exchange for 1 unit of cloth in long-run equilibrium of Portugal as indicated in Table 1.

Table 1. Ricardo's Comparative Cost.

	Man-years		Domestic exchange ratio
	Wine	Cloth	
Portugal	80	90	1 C = 1.125 W; or 1 W = 0.890C
England	120	100	1 C = .833 W; or 1 W = 1.200C

Ricardo further assumes that there was free international mobility of goods, but that capital and labor did not flow between countries. The terms of trade were also assumed to be 1 unit of wine in exchange for 1 unit of cloth. Portugal has an absolute cost advantage in producing both goods, but the relative efficiency is different. In this case, Portugal can produce wine with 80 man-years, which is one-third less than England requires to produce it, and Portugal can produce cloth with 90 man-years which is one-tenth less labor than England requires. Portugal has both an absolute and a relative cost advantage in producing wine. Therefore, if Portugal produces and exports wine and England produces and exports cloth,

both countries will benefit each other. Portugal will export wine and obtain cloth for only 80 man-years of labor instead of 90 man-years she would need to produce it. England will produce cloth and import wine in exchange for only 100 man-years of labor, which otherwise would cost 120 man-years if produced domestically. This basic theory has been fully developed by extending it to more than two countries and by including factor prices and changes in demand and supply, involving shifting of productive resources and altering the composition of trade. The basis for this comparative cost theory is the gain of trade. The theory is concerned only with the relationships of the pattern, terms, and welfare in trade under given circumstances. It deals only with the gains from trade at the given comparative (or absolute) cost situation and is not concerned with the determinants (factors) of that situation. For this reason, B. Ohlin (1933) elaborated his Hecksher-Ohlin trade theorem to explain trade relationships.

Heckscher-Ohlin Theorem

The Heckscher-Ohlin theorem (or factor endowment, or factor proportion theorem) in simplicity states that countries tend to export those commodities requiring more of their relatively plentiful factors; or, alternatively, countries will export goods which they can produce more cheaply than other countries. By assuming

different relative prices of the factors of production in the exchanging countries and different proportions between the factors of production in different commodities, each country tends to produce and to export those goods containing relatively large amounts of those production factors that are relatively cheap. A simple example gives a clearer explanation as shown in Table 2.

In the first case, the relative factor prices for Country I and Country II are 10/4 and 4/3, respectively, and the ratios of factor requirements in producing Commodity A and Commodity B are 5/10 and 9/6, respectively. For simplicity, assume that there are no other costs in producing and exchanging these commodities. Because both the relative factors and ratios of factor requirements for production of the two goods are different, the relative cost of production is 90/50 for Commodity A and 114/54 for Commodity B. If the exchange rate is assumed to be two dollars for one pound ($2 = £1), then Commodity A costs $90 (or £45) in Country I and $100 (or £50) in Country II, and Commodity B costs $114 (or £57) in Country I and $108 (or £54) in Country II. Each country has a comparative (or absolute) advantage in producing one commodity. In this case, Country I will produce and export good A while Country II has the comparative advantage in producing and exporting B. The limits of the rate of exchange between the dollar and the pound for the two-way trade is between $90/£50 and $114/£54, i.e.,

Table 2. Heckscher-Ohlin's Factor Proportion Theorem.

	Factor prices		Commodity A			Commodity B		
	Country I	Country II	Amount of factor in one unit	Unit cost Country I	Unit cost Country II	Amount of factor in one unit	Unit cost Country I	Unit cost Country II
	($)	(£)		($)	(£)		($)	(£)
First case (Differences in both relative factor prices and requirements)								
Labor	10	4	5	50	20	9	90	36
Capital	4	3	10	40	30	6	20	18
				90	50		114	54
Second case (Difference in only relative factor prices)								
Labor	10	4	5	50	20	3	30	12
Capital	4	3	10	40	30	6	20	18
				90	50		54	30
Third case (Difference in only relative factor requirements)								
Labor	10	4	5	50	20	9	90	36
Capital	4	1.6	10	40	16	6	24	9.6
				90	36		114	45.6

Source: Allen (1969, p. 29).

£1 = $1.80, and £1 = $2.11. Within these limits, the two countries will benefit if they trade with each other.

It is possible that the cost ratios are equal as shown in Table 2. In the second case, the relative factor prices for Country I and Country II are different, i.e., 10/4 (or 2.5) and 4/3 (or 1.33), respective, but the proportions between the factors of production in Commodity A and Commodity B are the same, 5/10 (or 0.50) and 3/6 (or 0.50), respectively. Finally, the cost ratios of production are 90/50 (or 1.80) for Commodity A and 54/30 (or 1.80) for Commodity B. If the exchange rate is assumed to be $1.80 = £1, then the costs of producing both commodities are the same in the two countries. In this case, it requires $90 (or £50) for producing Commodity A in Country I and also $90 (or £50) in Country II. Commodity B costs $54 (or £30) if produced in Country I and $54 (or £30) in Country II. There is no gain for either country to specialize in producing either commodity for export at this exchange rate. If the exchange rate is greater than $1.80 = £1, say $2 = £1, the costs of producing Commodity A are $90 (or £45) in Country I and $100 (or £50) in Country II, and production costs of Commodity B are $50 (or £25) in Country I and $60 (or £30) in Country II. Country I has an absolute advantage in producing Commodities A and B. Only Country I will benefit if trade occurs. On the other hand, if the exchange rate is smaller than $1.80 = £1, say $1 = £1, Country II

has an absolute advantage in producing and exporting both commodities.

In the third case, the relative factor prices of production are the same in Country I and Country II, but relative ratios of factor requirements are different. It is similar to the second case-- that if the exchange rate is greater than \$90/£36, then Country I has an absolute advantage of producing and exporting both commodities. On the other hand, if the exchange rate is smaller than \$90/£36, then Country II has an absolute advantage of exporting both commodities. If the exchange rate is \$90 =£36, there is no mutual gain when they trade with each other. In the second and third cases as shown in Table 2, there is no currency exchange rate permitting both countries to benefit from two-way trade.

W. Leontief tested this theorem in 1953 showing empirically that the U.S., presumably the most capital-intensive country in the world, should import labor-intensive products and export capital-intensive products; yet the U.S. exported labor-intensive products and imported capital-intensive products instead. This result, called the "Leontief Paradox," gave rise to a controversy that is still a subject of dispute, so the Heckscher-Ohlin theory remains.

II THE DEVELOPMENT OF AN INDUSTRY: PRODUCT-CYCLE APPROACH

International positive trade theory has been briefly discussed in the previous chapter. The Heckscher-Ohlin model, which in summary says that a country exports those commodities produced with relatively large quantities of the country's relatively abundant factors, was considered a "revolution" in international trade theory (Allen, 1969), even though this model has been subject to much criticism (Leontief, 1956; Minhas, 1962). Nevertheless, the Heckscher-Ohlin theory still occupies the very center of international trade theory and can be applied to all kinds of trade phenomena, if the trade product can be classified as a homogeneous product. Inter-industry or intra-industry trade patterns which can be explained by the simple Heckscher-Ohlin model generally can be found in the following cases.

1. Bulky raw or manufactured materials, such as logs (by species), sand, wheat, rice, and sugar are considered homogeneous products. Trade occurs because of the endowments or the availability of natural resources. For these products, transportation costs are a large portion of the total cost of products delivered to the consumer. Any country endowed with these kinds of resources tends to export to those countries that lack such resources or the capability of developing and using those resources. By including

transportation costs as a factor of production, countries tend to import those materials that are cheaply produced abroad. Take the southeastern Asian countries, for example: Japan, South Korea and Taiwan import Lauan logs (raw material) from the Philippines, Malaysia and Indonesia, while the Philippines imports rice from Taiwan. The U.S. exports softwood logs to Japan, but imports logs (of different species) from Latin America and Africa.

2. Commodities traded or imported and exported in completely unchanged form. This type of trade phenomena is very common in many countries, particularly Hong Kong. By including the factors of the value added processes which consist of providing the inputs of marketing administration, such as gathering marketing information concerned with demand, supply, price, the communications and services to the retailers, and the storage facilities, the H-O theorem can be applied to explain this trade pattern.

There are many other cases that may be considered as homogeneous products of trade, such as banking, shipping, mail services, insurance, and electricity.

In the practical world, goods and services are nearly infinite in characteristics and no two are exactly the same, especially in the case of manufactured products. For practical purposes, commodities

are classified into specific categories by industries.[1/] Trade commodities are also aggregated into categories by their corresponding industries for the usefulness and convenience of general economic analysis and statistical purposes. Because of this practical aggregation of commodities into categories, intra-industry trade, which means that a country simultaneously imports and exports some products classified in the same industrial category, is a very common trade pattern in the real world.

The comparative advantage theory, or more specifically, the Heckscher-Ohlin model, cannot explain those intra-industry or inter-industry trade patterns which in simplest form assumes a world consisting of a group of countries that use identical factors to produce identical goods by the use of identical and constant returns-to-scale production functions; such patterns are unrealistic to the real world. Even the developed form of the Heckscher-Ohlin model cannot be used to explain and predict this intra-industry trade pattern existing in the real world. Therefore, intra-industry trade theory is used in an effort to fill critical voids in the comparative trade model and to provide better criteria for the explanation and prediction of world trade patterns in manufactured goods.

1/ Such classifications can be found as SIC (Standard Industrial Classifications) and SITC (Standard International Trade Classifications).

In this chapter, discussion will focus on the stages of development of an industry--product-cycle theory. The relationships among inputs, technology, market structure and other factors connected with development of an industry will be examined in detail and will serve as the basis for further theoretical exploration.

Based on empirical observations, demand structure, production, and industry structure undergo many stages over time. Sales volume, production methods, factor inputs, prices and market structure which characterize a product of an industry vary in magnitude and relative importance as the product proceeds from its introductory to mature stages. The stages of development of most industries can be illustrated in Figure 1.

In Figure 1, sales volume of an industry is indicated on the vertical axis and time is shown on the horizontal axis. For the purpose of consistency in this study, the division of the product-cycle curve into three stages is considered to be more appropriate to the world-wide analysis of an industry or to the analysis of an industry within a country.

When a new product of an industry is first introduced to a market, demand for the product is low, the sales tend to be in small quantity; total volume remains relatively modest throughout the new (or first) stage. In the second (or growth) stage, sales volume accelerates rapidly, but slackens and may be overtaken

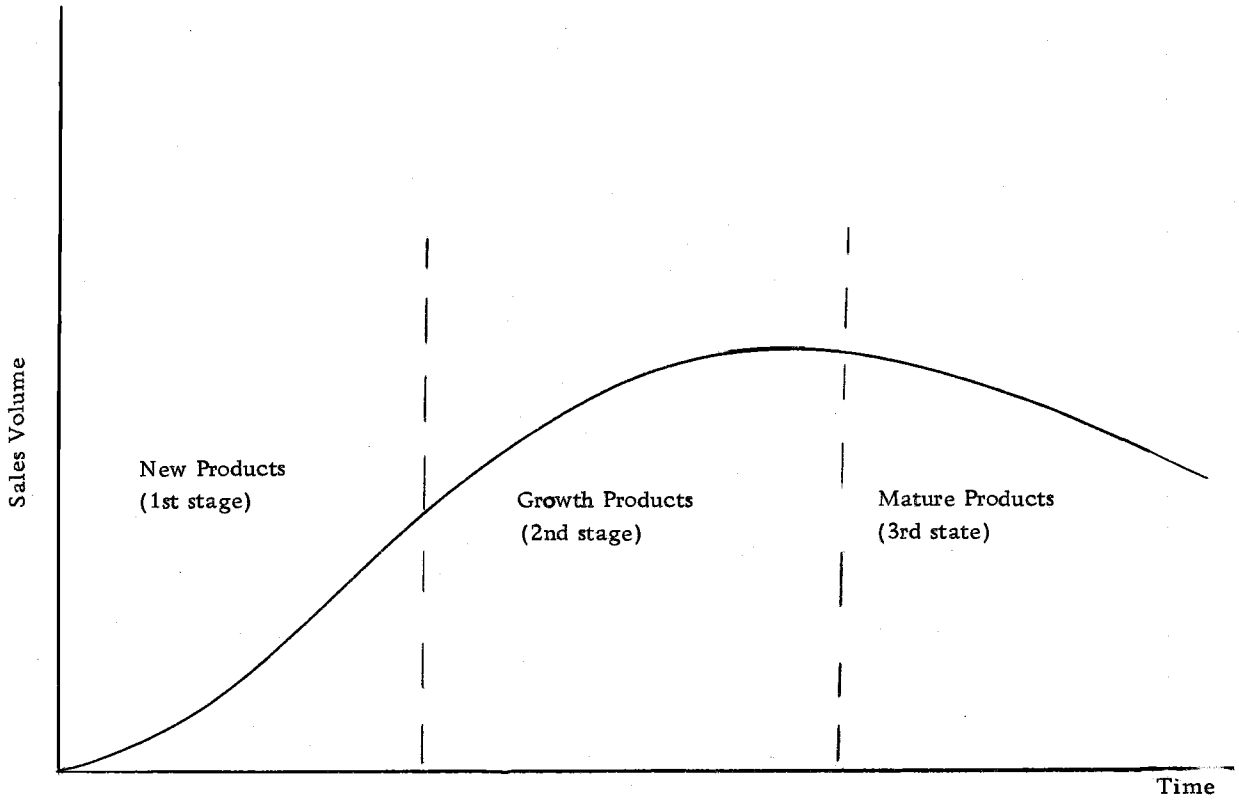


Figure 1. Product-Cycle curve.

by other industries that are in their early stages. The curve usually will flatten out in the third stage and may either continue to rise slightly or decline, depending on the demand for the product and the presence of substitutes, as well as changes in factor endowment.

First Stage (New Product)

A new product is defined as a product involving a revolutionary invention or discovery that is likely to change the industrial process fundamentally (Kuznets, 1953). The introductory stage of the product or industry is usually characterized by high costs and a labor-intensive production function. The production process is not fully known and runs are short, and the product is frequently manufactured in individual units or in relatively small amounts. Manufacture by mass production (or assembly-line methods) is relatively rare at this stage. Products are usually not standardized or are loosely standardized. Various changes are introduced into the manufacturing process, production sequence, product specification, and equipment during this stage of production.

The development of a product at this first stage is limited by the extent to which manufacturers try to keep their investments in fixed assets and fixed overhead as low as possible in order to minimize costs because of instability of the production process. Usually

they refrain from installing special-purpose machinery, which is more suitable for long runs of standardized products, because of uncertain market demand for the product.

New products contain a high proportion of scientific and engineering inputs. Professional knowledge and experience are the most critical for successful development and ability to survive the introductory stage. The employment costs of engineers and scientists are likely to account for a higher proportion of total outlays during the first stage than in any other stages. During the early stage, the ability of individuals and teams of scientists and/or engineers to solve the problems encountered is probably the only and more important determinant of success.

Entry into the market is limited by know-how rather than by financial considerations. Patent rights or copyrights are used for protecting the potential position of these pioneers. Capital requirements are comparatively modest. The market competition may be either monopolistic, duopolistic, or oligopolistic in structure, depending on the number of producers operating in the market.

Even though methods and techniques may be very crude, it is often economic to begin production almost immediately, because a high price may be charged for lack of competition, and the necessity to pay for development and experimentation with different production methods, designs, and materials from the seller's point of view.

Demand will depend on the availability, performance, and quality of substitutes. As long as a new product fulfills a given need better than existing substitutes, the public may be expected to pay at least as much for it as for the existing products and possibly even more. Advertising plays an important role in this stage. Consequently, when a new product can be manufactured more cheaply than the one it is intended to displace, manufacturers may make substantial profits during the first phase, until competition catches up with them and forces prices down closer to the level of production costs. The monopoly market is a good example of earning extra profit at this stage.

Second Stage (Growth Product)

Products that survive the introductory stage next enter the growth stage. During this stage of the product's development, market demand for the product grows rapidly. In order to meet a growing market demand, mass production and mass distribution techniques are introduced and production runs are lengthened; therefore, unit costs are reduced. When special-purpose machinery is utilized, the ratio of labor to capital is consequently reduced and the production process becomes more relatively capital-intensive.

The patents and copyrights usually expire and make entry technically possible. Therefore, a large number of firms are

attracted to the industry. As a result, casualties may increase for many of the entrants are not well equipped to serve the market competitively.

At this stage, product standardization and substitutes are developed, and price competition begins; hence, demand for the products becomes more elastic than in the first stage.

Price, in turn, is determined by the skill of management. Management becomes the most important input for the success of a firm. Mergers occur because of relative efficiency of manufacturers in producing and marketing products.

Third Stage (Mature or Standard Product)

When products enter the mature phase, industry sales volume may continue to rise, flatten out, or fall. It mainly depends on the availability of factor endowments, demand for the products and the level of substitution of new or existing substitutes. Product specifications are by now standardized. The sequence of operations and their scale are more or less fixed.

The manufacturing process becomes more capital-intensive than in the previous stages, and the optimal size of a manufacturing unit becomes larger. Consequently, economies of scale become an important factor in determining competitive strength of individual

manufacturers.

Labor skills become less important than in previous stages. The composition of the labor force changes; the proportion of unskilled and semi-skilled workers rises in comparison with previous phases.

The number of firms in the industry may not change much over time. Entry is commonly achieved through merger and acquisition, rather than by the establishment of new plants because of competition among firms. Exit, in turn, becomes very costly, since the specialized equipment and manufacturing processes can rarely be used to produce other products without substantial modifications.

Demand is becoming more and more price-sensitive. Prices have to be adjusted to the level of the least expensive sellers, i.e., the normal price. At this stage, quality becomes the most important factor in production. Customer expectations and buying habits stabilize in regard to the products, their specifications, prices, and useful duration. Customers are well informed about alternative sources of supply and sufficiently experienced to differentiate between diverging qualities.

Both in the growth phase and the mature stage, the market structure is considered to be monopolistic in nature by assuming that the industry includes the producers of the whole world and each country produces a product that is a fairly close substitute for that

of every other country. In addition, price is considered by entrepreneurs as a variable to achieve their goal of profit maximation.

The characteristics of the product cycle theory are summarized as follows (Wells, 1972, p. 10):

	New product	Growth product	Mature product
Demand structure	Low price elasticity for aggregate demand and for individual firm. Nature of demand not well understood by firm.	Growing price elasticity for firm and price competition begins.	Basis of competition in price or production differentiation through marketing techniques.
Production	Short runs, rapidly changing techniques dependent on skilled labor. Low capital intensity.	Mass production methods.	Long runs with stable techniques. Labor skills unimportant and capital intensive.
Industry structure	Small number of firms.	Large number of firms, but many casualties and mergers.	Number of firms declining.

III INTERNATIONAL TRADE STRUCTURE

In recent years, intra-industry international trade theory has been formulated[2/] with considerable success for the analysis of international trade in differentiated products and to explain the big expansion of international trade. The main objective of intra-industry trade is to analyze the nature, determinants and welfare effects causing a nation simultaneously to export and import products belonging to the same industry. Take plywood for example; Japan simultaneously imports plywood from South Korea, Taiwan, the Philippines and even the U.S., and exports plywood to the U.S. and other world markets. In a practical sense, these products produced in these countries are classified into the same category as plywood. According to the Heckscher-Ohlin model, Japan will only export plywood to the U.S. and not import from the U.S. if the plywood can be produced more cheaply in Japan than in the U.S. The traditional trade theory regards plywood as a homogeneous product in every country. Therefore, the Heckscher-Ohlin model cannot explain such intra-industry phenomena.

2/ Intra-industry trade theory has been formulated and used popularly by many authors. For the development of theory, see Grubel (1967); Linder (1963); Posner (1961); and Vernon (1966).

Intra-industry trade theory is based on the facts and assumptions that goods are close, but not perfect, substitutes in consumption from the consumers' point of view or in production from the producers' point of view. This theory is particularly effective in analyzing intra-industry trade patterns for the input requirements for those industries having nearly the same characteristics. Therefore, the purpose of this chapter is to formulate an analyzing system which will be able to explain the existing patterns of international specialization and to gain insights into the competition of an industry among regions and the prospective changes in international relationships--the composition and direction of trade, resulting from the expansion of trade.

In the previous chapter, the essence and main weakness of the Heckscher-Ohlin theorem was discussed. It does not imply that the theorem is not valid in the explanation of the pattern and location of trade. On the contrary, the Heckscher-Ohlin model as well as the basic intra-industry principles will be used as the most practical method to predict the pattern, composition, and direction of trade.

Quality Differentiation and Trade Pattern

Quality variations in manufactured goods arise from the differences of technology, facilities, skillfulness of labor, and the raw materials for the goods. It is evident that people with relatively

higher per capita income levels will select higher qualities of higher-priced consumer goods and people with relatively lower per capita income levels will select lower qualities of lower-priced consumer goods, based on the assumption that a consumer allocates his given budget among available goods in order to gain maximum satisfaction. The higher income people have more flexibility to allocate their incomes on the different kinds of products than those people with relatively low income levels in consumption.

The demand for a product is the aggregation of all individuals' demands for the product. If we separate an industry into many classes by quality variations, the demand for the industry will vary in the sense of absolute magnitude of income and income elasticity.

Assume that there are two countries, Country I and Country II, in the world as shown in Figure 2. The horizontal axis represents per capita income and the vertical axis represents differentiated products of an industry. The distances between any point a, b, c, d, e, f, and g and origin (o) indicates the degree of quality differentiation of the products demanded by Countries I and II.

The line oP indicates that higher income people have more flexibility to consume a larger range of quality variations in products. The limits of quality variations of the industry ranged from a low quality, low priced product, a, to the highest quality, highest priced product, g.

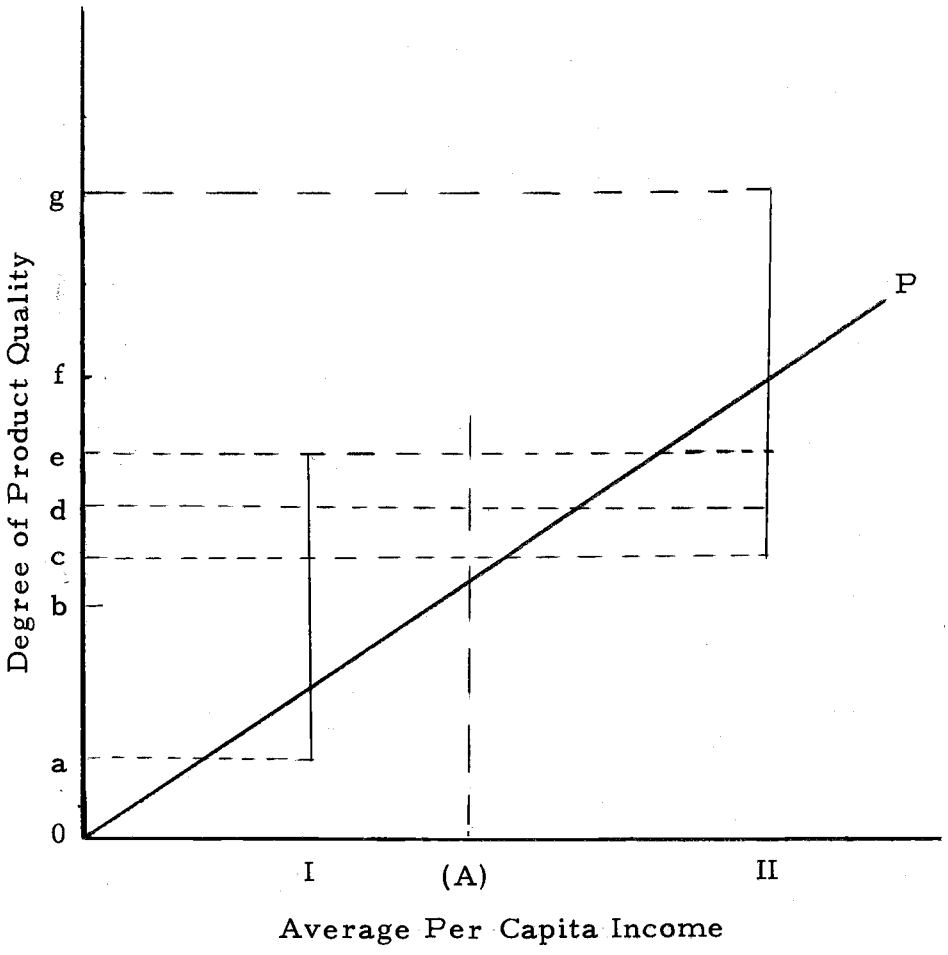


Figure 2. Linder's Trade Diagram (modified)

In Figure 2, the range of various quality demanded by low income level Country I is from a to e, with b the average. In Country II, the range is c to g, with f the average. The qualitative range c to e is common to both countries and is called an overlapping demand structure. Country I will consume products ranging from a to e and Country II will consume those products from c to g. Both countries will consume products qualitatively ranged from c to e and both countries will trade each other the products ranged from e to c if Country II is assumed to produce the higher quality products, c to g, and Country I the lower quality products, a to e. Trade occurs because of an overlapping demand structure between the two countries. On a world consisting of more than two countries, the overlapping demand structure will enable a country with a comparative cost advantage to exploit scale economies by exporting specialized products.

Outside some limited income interval, there is no demand for the products at some region, say, beyond e for Country I, and even outside some income interval, there is no demand at all for the product, say, beyond g or below a. This is the basic concept of the structure of demand for products, which causes big differences in consumption. These differences and similarities in consumption are the potential forces causing countries to trade with each other.

To start with, the assumption is made that production first

begins wherever demand arises. In other words, a product is first produced to meet domestic demand, then exported to other areas. The world consists of only two countries, Country I and Country II, with equal static endowments of capital, labor and raw materials, identical production functions, tastes, and per capita incomes, but income distributions are different. Country I has a larger proportion of people whose incomes are less than the average income of each country OA, and Country II consists of a large proportion of people with income levels around the average income of the two countries, which is assumed to be equal to OA as shown in Figure 2. The people in both countries with incomes greater than OA will purchase higher-quality, higher-priced products and the people with lower income levels than OA will purchase lower-quality, lower-priced products. Country I has a larger proportion of people with income levels less than OA; therefore, the demand for the low quality, low priced products is greater than that in Country II. As a result, it is most profitable for Country I to produce lower-quality, lower-priced products and export to Country II, and vice versa. Extensions of this model can be made in many cases by releasing some assumptions such as identical production functions, identical income, identical endowments, and identical inputs. By releasing the assumption of identical tastes in both countries, this model can be modified to include the situation in which two countries trade

with each other because of differentiation in style, packaging and branding of their products. Countries exchange products differing in style, packaging or branding because of overlapping demand for these products.

Start again with the assumption that two countries, I and II, have equal incomes, endowments, and production techniques, but differ in tastes or preferences, because each country has her own cultural background, educational system, appreciation of art, climate, and religion. Each country has her own taste with respect to style, packaging, or branding of goods assumed to be identical in price, properties and quality. They trade with each other because the consumers from these two countries have different overlapping combinations of tastes. The trade pattern in goods by differentiation of style, packaging and branding is evident in many situations. Advertising and reputation are considered as very important factors to increase a country's export shares. High income countries have much more flexibility in choosing to consume some special differentiated products than do relatively low income countries, because persons with high incomes have more to spend on goods other than necessities on which low income persons have to spend most of their income to sustain life. Usually, advanced industrial countries have the advantage to trade with developing countries, or compete with those developing countries in world markets because of marketing

power, and producers' reputations in advanced countries are much better than those in developing countries. This is particularly true in developing countries, such as South Korea, Taiwan and Hong Kong, where Japanese or American or any other advanced country branded products have an advantage (enjoy greater demand) over those products produced in developing countries. On the other hand, the more similar the average income levels of two countries, the more intensive, potentially, is the trade between them, for if two countries have similar demand structures, the exportables and importables of one country may also be the exportables and importables of the other country.

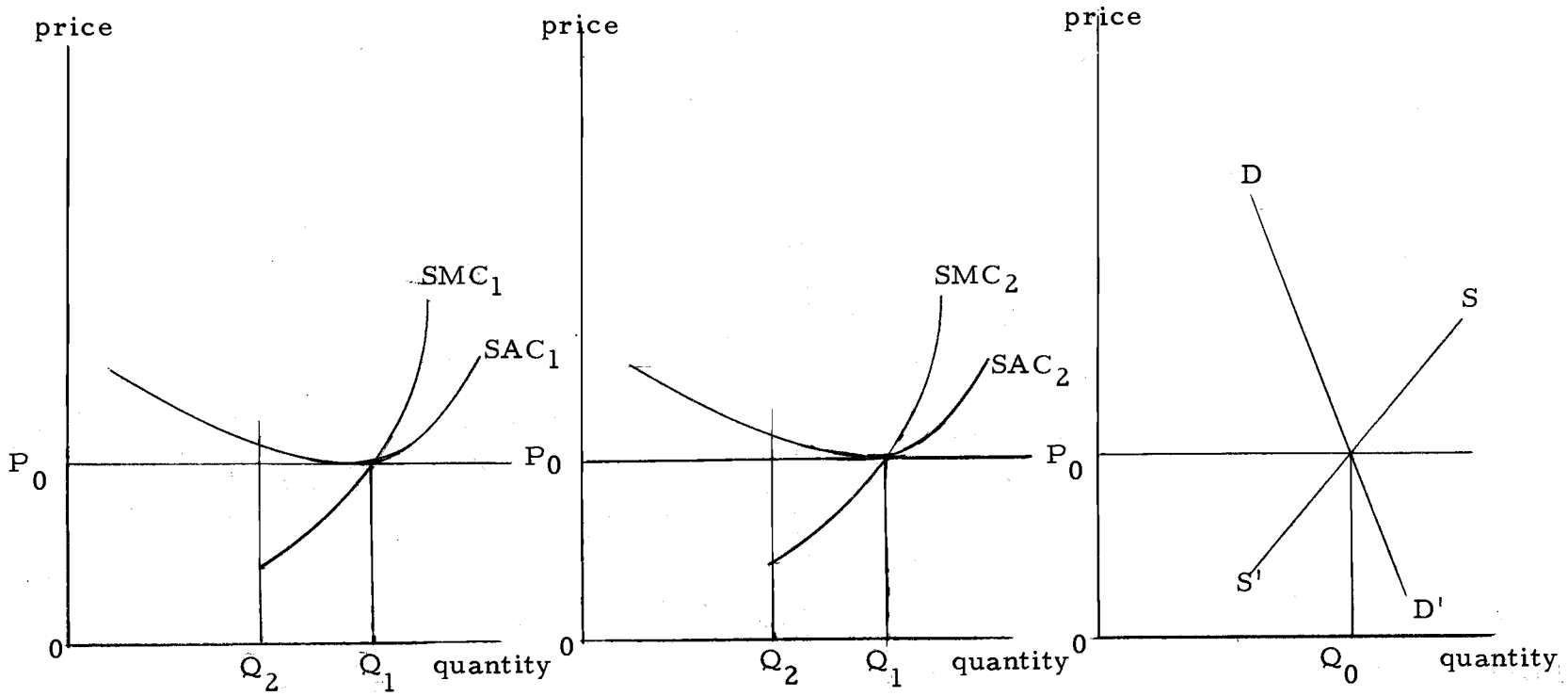
Economic Scale and Trade Flow

As discussed in Chapter II, the economies of scale of an industry is related to its stage of development. The economies of scale of an industry varies among different countries, and the optimum plant size varies in each country at any given time, for every country has a different ability to sell her products (this is a marketing factor discussed in Chapter IV), and to use equipment efficiently. A plant will have a cost advantage if it can use its equipment more efficiently. This implies that the plant can reduce the idle time of machines, which will reduce inventories of raw materials and of finished products, and reduce the unit cost of production. Economic scale is

referred to as relative efficiency of using facilities, which changes over time in a country, and it also is different from country to country because the economic development level is different from one country to another. Some countries with their economic environments will be able to build plants up to optimum sizes and have the comparative advantage to compete in world markets by reducing unit costs. In this case, relative efficiency of using equipment or economic scale is the factor that determines that country's trade patterns. The relationship between trade and efficiency is made clearer by the following graphic exposition.

Again, assume that Country I and Country II are producing some products which are assumed to be homogeneous for the purpose of explanation. Both countries are identical with respect to production function, capital inputs, natural resources, and labor. Therefore, the optimum size of plants can be realized by considering the total supply of and total demand for the products in the countries if there are no other costs that will arise when trade occurs, such as transportation costs, taxes, and tariffs. In other words we consider the countries as a whole.

On Figure 3, SMC_1 and SMC_2 are short-run marginal cost curves for average firms in Country I and Country II, respectively, at optimum size of operation. SAC_1 and SAC_2 are short-run total average cost curves for Country I and Country II, respectively.



a. Average firm in country I b. Average firm in country II c. Industry

Figure 3. Short-run Equilibrium of the Typical Firms with Identical Optimum Plant Size.

By assumption, cost curves are identical in both countries if the plants are built at optimum size, $0Q_1$.

The marginal cost curve is the firm's supply schedule. Market price (P_0) is determined by the industry demand for and supply of the products, and market supply of the industry is $0Q_0$ at equilibrium. Both countries are at normal profit.

If the average firm in Country I cannot use its equipment efficiently, say rate of production is smaller than average because of inexperience in operating the machines efficiently and of marketing factors causing Country I to be unable to sell products at the rate of production at minimum cost ($0Q_1$), then the production of products will be less than that of optimum firms during a given period of time, say $0Q_2$. If the typical firm in Country II is able to sell what it produces, then the production of the firm in Country II will be greater than $0Q_1$. Extra profit will be made by the typical firm in Country II. Additional firms will enter the industry in Country II. Finally, equilibrium is reached at $0Q_0$ for the industry and $0Q_1$ for the firm in Country II. Meantime, if the typical firm in Country I is still operating at the rate of $0Q_2$ per period of time, then the firm will lose money and cannot compete with the firms in Country II. In the long run, the same result may be obtained by similar considerations. Leibenstein (1966) has also shown that more efficient firms hava a low cost advantage in production.

Development of an Industry and International Trade

The development of an industry is discussed in the previous chapter. When a product is introduced, by assumption the first stage new product can be considered as an innovative new product of superior quality, for which a cheaper revolutionary production technique has been developed. The average cost of production is relatively high in the first stage of the industry as illustrated in Figure 4. P_0 in Figure 4(a) may be considered as the production cost after the product has survived its infancy. The costs at first decrease as the industry progresses to the mature stage from the new product stage. P_1 may be considered as the minmum cost at optimum size of the industry. Time T_2 at the point around cost P_1 may be considered as the time when patents or copyrights or government franchises expire sometime around minimum cost,[3/] P_1. Trade patterns will be found to vary corresponding to the development of the industry. Two cases are explained below.

3/ Actually, cost data are difficult to obtain with accuracy. In general cases, price will serve as a good indicator for production cost for this purpose.

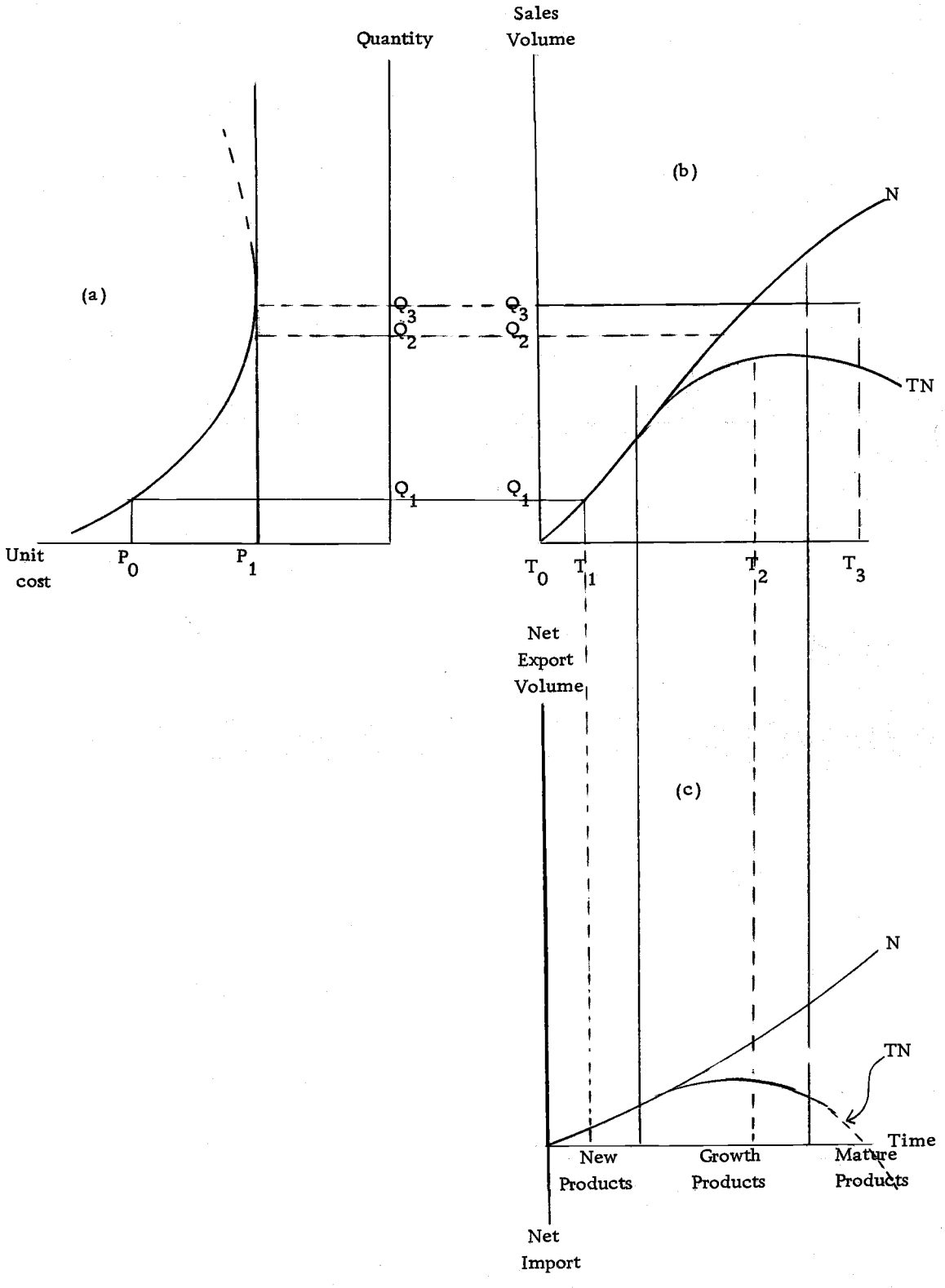


Figure 4. Development of an Industry.

Normal Trade Product

When a product has survived its infancy by competing successfully with other substitutes, demand increases, and the technology of production and distribution also changes. Consequently, the sales volume increases and the cost of production decreases. If the innovating country has a comparative cost advantage, she will continue to produce and export products as demand increases. Any product can be classified as a normal trade product for the innovating country if the export curve follows the production curve N in Figure 4(b) and exporting curve N in Figure 4(c), even after the product reaches its mature stage where competition usually becomes very intense. Alternatively, the innovating country always has a comparative advantage to produce and export the product over time.

Technological Gap Product

A product is classified as a technological gap product if the comparative advantage of an innovating country depends on a technology gap, protected by patent or copyrights. If this protection expires, say at time T_2 when the product enters its mature stage, the cost advantage shifts to other countries and exports start to fall. The production of the product follows the curve of TN in Figure 4(b) and the exporting performance follows the curve TN in

Figure 4(c). The trade between the time T_0 and T_2 is called technological gap trade because the innovating country has a technological advantage. The trade after time T_2 is called low-wage trade because at this stage, the product is standardized and specified, the production method is also standardized, and therefore the optimum plant size with minimum cost can be set up in any country. The most important cost factor causing the cost differences is labor. By its trade nature, a normal trade product is classified as low-wage trade.

If a country wants to maintain its share of exports but is facing the technological product situation, this country will produce higher quality or better design by differentiation in style and packaging. The cost (or price) will slightly increase for additional inputs acquired to produce these higher quality products as indicated in 4(a) (dotted line).

This model can be extended to explain trade patterns by dividing some countries into two groups, say, for example, advanced countries and developing countries. It also can be modified to group all other countries as a group of innovating countries to compare with some specific country.

When the product reaches the mature stage, factor endowments, economies of scale, and product differentiation play an important role in determining the comparative advantage for a

country's exporting potential.

Institutional Factors

Transportation costs and man-made trade barriers are considered to have a negative effect in the potential of trade. The effects of these factors on trade potential are complicated and no generalization can be made; hence some special points important to trade relationships among countries are discussed in the following section.

Effect of Transportation Costs on Trade Potential

Assume that the difference between the f. o. b. and the c. i. f. [4/] prices is the transport costs if these prices include all the costs involved in transporting the goods from sellers in one place to buyers in another place. The purpose of discussing effects of transportation costs on trade potential is to study the level costs ruling at any time and the impact on the relationships among the f. o. b. and c. i. f. costs and quantity.

An intra-industry trade is still assumed. The domestic products and imports from any country are close substitutes but not homogeneous, perfect substitutes. The relationship is

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[4/] f. o. b. = free on board; c. i. f. = cost, insurance, and freight.

represented by a simple demand and supply model as shown in Figures 5-7. The most important point is to discuss the incidence of the cost of transport. The person who makes the freight payment to the shipping line from the exporting area to the consuming place is not necessarily the person who bears the freight rate. This is very important for a country competing in the world market, because transport costs account for a large proportion of total cost of a product on a c. i. f. basis.

In the following discussion[5/], S represents short-run supply of Country I's export products to Country II and D is short-run demand for exports from Country I in Country II. T represents transportation costs per unit of product, including insurance. No other costs, such as tax and tariff, arise during transport.

Case 1 - Completely Inelastic Supply. In Figure 5, the market is in equilibrium at market price $0P_0$ and quantity $0Q_0$ which is assumed to be fixed when there is no transport cost levied. The f. o. b. price $0P_0$ is equal to the c. i. f. price. When transport costs T per unit are introduced, the relationship between the f. o. b. and the c. i. f. prices is in the following form:

$$T = \text{cif} - \text{fob}$$

5/ No intention is made to discuss the shape of short-run and long-run demand and supply curves. The purpose here is to use demand and supply technique for analytical purposes in this section.

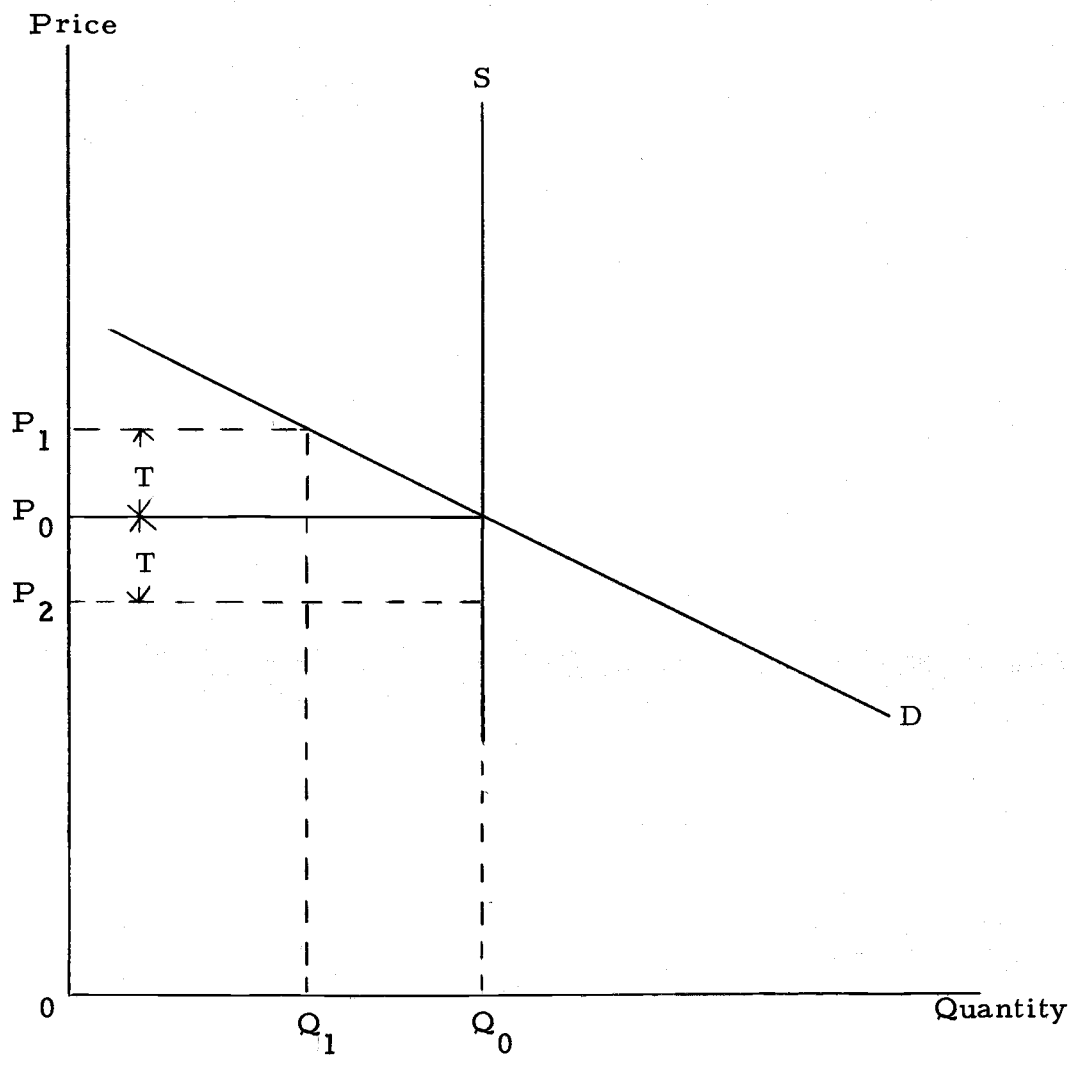

Figure 5. Industry's Short-run Trade Equilibrium and Incidence of Transport Cost in case of Perfect Inelastic Supply.

Either the exporter or importer may pay the freight, but eventually the exporter will bear the freight cost. First, suppose transport costs are borne by the exporter by raising the c. i. f. price from $0P_0$ to $0P_1$ ($0P_1 = 0P_0 + T$); demand will fall from $0Q_0$ to $0Q_1$. There is an excess supply (Q_1Q_0) and the price will fall again. Finally, price will reach its original market price, $0P_0$. $0P_0$ is the c. i. f. price which is equal to the new f. o. b. price, $0P_2 + T$. The exporter bears the whole freight cost. Second, if T is added to the supplier, there is no influence on the market demand. The new market price is equal to the original market price which is the c. i. f. price. The new f. o. b. price will be $0P_2$, where $0P_2 = 0P_0 - T$. The supplier also has to bear the whole freight cost. In this case, if the demand is not completely inelastic, the supplier has to bear the whole freight costs no matter who actually pays the freight bill.

Case 2. Completely Inelastic Demand. If the demand is assumed to be completely inelastic with respect to price, then the importer bears the freight charges. In Figure 6, there is no effect of price on demand in the importing place. The market equilibrium is determined by supply conditions, if demand is given as shown in Figure 6. Therefore, considerations will be focused on the supply side. The market price is at $0P_0$ and quantity $0Q_0$ is supplied in equilibrium before the transport cost is introduced. If the f. o. b. price of the supplier is decreased by T when the transport cost is

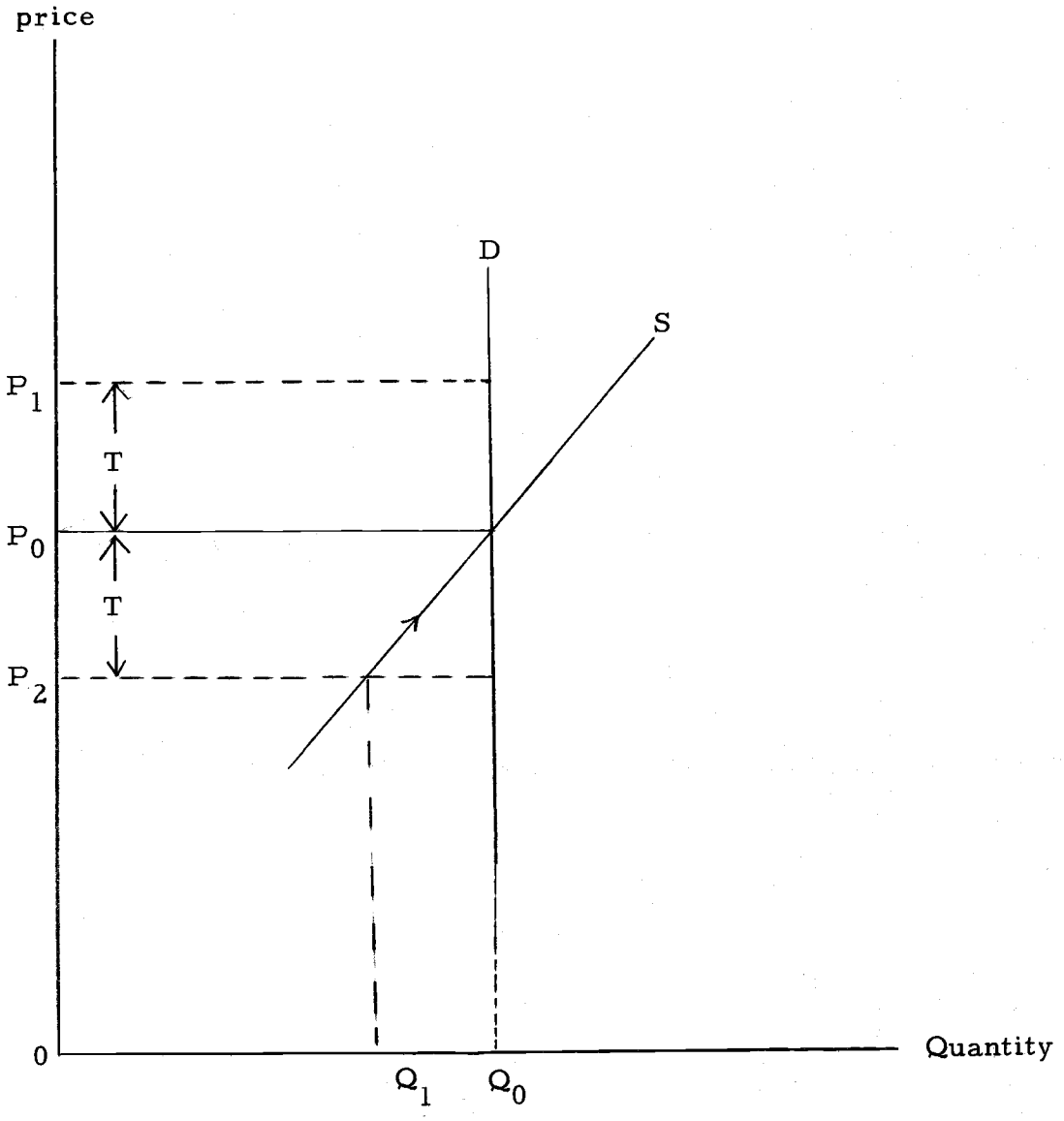

Figure 6. Industry's Short Run Trade Equilibrium and Incidence of Transport Costs in the Case of Perfect Inelastic Demand.

introduced, demand exceeds supply, Q_1Q_0, and price will go up again. The equilibrium price of f. o. b. will be $0P_0$ and quantity is $0Q_0$. The new c. i. f. price is equal to $0P_0 + T$, indicating the purchaser bears the whole freight charge regardless of who actually pays the freight cost.

Case 3. Negatively Sloped Demand and Positively Sloped Supply. In Figure 7, neither the demand nor supply curves are completely inelastic. Assume that the supplier bears the whole transport cost of T. We may transform the supply S to S' which is the new supply curve when transport cost is assumed to be levied on the supplier. The f. o. b. price is $0P_1 = 0P_0 - T$, where an excess demand, Q_2Q_0, exists. The purchaser is willing to consume more and pay a higher price. Finally, the equilibrium is reached at P_3. The c. i. f. price is $0P_3$, which is equal to $0P_0 + P_0P_3$ and the f. o. b. price is $0P_2$, which is equal to $0P_0 - P_2P_0$. Transportation cost is equal to $P_2P_0 + P_0P_3$. It is apparent that both parties are willing to pay the freight charge. The magnitude of the transport cost paid by each party depends on the elasticities of the demand and supply curves. 6/

6/ Elasticity of demand or supply with respect to price is defined as

$$= \frac{dQ}{dP} \cdot \frac{P}{Q},$$

where Q and P are at some specific point. Even if the supply or demand curve is a straight line, the elasticities will vary according to the magnitude of Q's and P's.

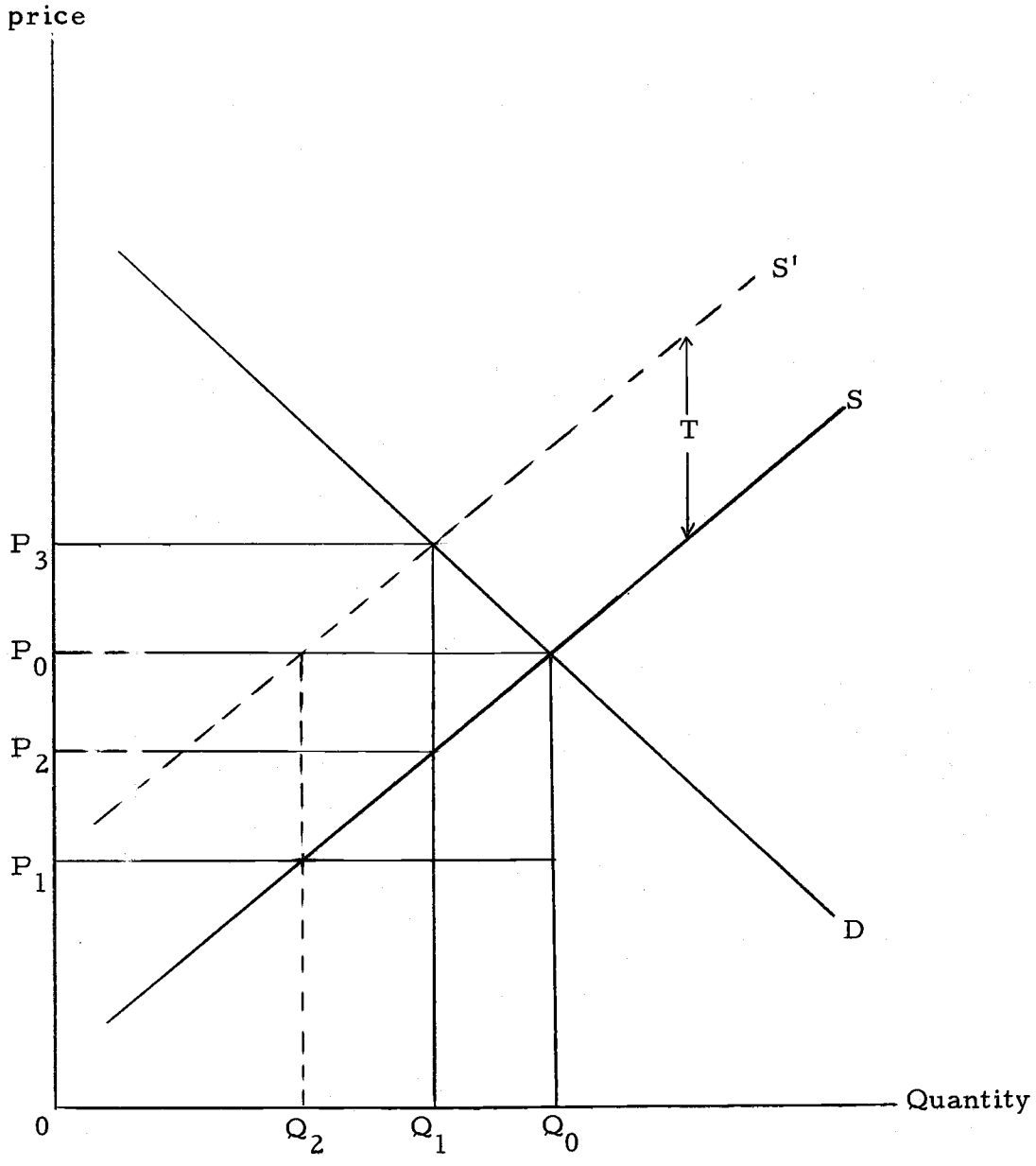

Figure 7. Effect of Transport Cost on Trade.

Generally speaking, if the supply is relatively inelastic in relation to demand, the supplier will always be likely to pay the larger fraction of the freight charge. Where a relatively inelastic supply is associated with a highly elastic demand, the exporter will bear most of the freight cost. If demand and supply have equal elasticity, the freight cost will likely be shared equally, and vice versa.

The effect of transport cost on the quantity traded also depends on the elasticity of demand. The more elastic the demand, the change in quantity traded will be larger if the transport cost is introduced.

This analysis can be applied to the changes in demand and supply curves, the change in tariff rate, the change in existing transport cost, and changes in subsidies. Similar conclusions will be achieved without much exposition.

Next, consideration is given to the question of who has the advantage in world markets, developing or advanced countries? For plywood products, the supply elasticities are low in many developing countries for domestic consumption is small and, in some countries, raw materials have to be imported from other foreign markets. The demand elasticity for an individual country's plywood is relatively high in world markets because there are many close substitutes for them. For the reasons discussed previously,

the supplier is likely to bear the major part of transportation costs in developing countries. Changes in institutional factors will have more effect on f. o. b. prices in developing countries than c. i. f. prices in world markets, located mainly in advanced countries. However, the supply of plywood is more elastic in advanced countries, such as Japan and the U. S., for they have large domestic markets for the products. Therefore, the freight cost is more likely to be shared by sellers and buyers.

It has been implicitly assumed that markets are operating without government control or interference in the foregoing discussion. Actually, there are many other factors, such as price-fixing, cartels, quotas, restrictions and economic aid, which may change the elasticity of supply to the export market and the elasticity of demand for export from foreign suppliers. It is difficult to conclude who bears the transport cost in actual practice if the market is under control or governments interfere.

Some conclusions are drawn by ending the discussion of this chapter as follows:

1. The product-cycle approach is the conjuncture of the comparative advantage (Heckscher-Ohlin model), economic scale, and quality differentiation and demand structure models. It provides a complete systematic method to explain and further to predict trade patterns statically and dynamically.

2. When factors of production change over time, a country may be in a competitive position in exporting in the early stage of an industry and becomes an importing country at the mature stage of the industry, because the factors of production change and shifts the relative comparative advantage to other countries.

3. When production enters the mature stage, it becomes low-wage trade. One way for disadvantage countries to maintain their exporting potential is by differentiating products and increasing the economic scale of an industry to decrease unit production costs.

4. Based on the quality-income distribution principle, the more similar two countries are in income levels, the more intensive, potentially, is the trade between these two countries.

5. Transportation costs and man-made barriers are also a major factor in determining a country's exporting potential.

IV. MARKETING FACTORS AND A COUNTRY'S COMPETITIVENESS

The purpose of this chapter is to analyze marketing factors which will determine a country's competitiveness in world markets. It explains why actual trade is much smaller than potential trade and the difficulties of setting up import-replacing infant industries in developing countries. Further the marketing costs and problems which an exporting country must face and solve are examined and implications for policies are drawn for enforcing a country's penetrating performance in foreign markets.

Changes in a country's share of export trade are not entirely determined by changes in price factors; changes in market functions and in demand conditions in world markets also influence trade shares. The changes in competitiveness may be attributed to a combination of factors such as (1) differential rates of productivity growth in different countries, (2) changes in export taxes or subsidies, (3) differential rates of improvement in quality of exports, (4) differential rates of development of new products for export, and (5) differential rates of improvement in delivery products to foreign markets in time and in supplying enough quantity required by foreign markets. A better understanding of market functions provides a full picture of trade patterns from which the improved trade policies can be deduced.

Before going further, a definition of competitiveness will make the statements clearer and give insight into problems encountered in the development and international trade of any industry. "Competitiveness" or "competitive strength" is defined as follows: A country's competitiveness in a given market may be said to have increased when the volume of its exports to that market relative to the volume of other exporting countries tends to rise as a result of changes in export supply conditions in exporting countries as well as changes in import demand conditions in importing countries (Fleming and Tsiang, 1956).

This definition can be extended to explain the phenomena of different situations, such as industrialization in developing countries, by building import-replacing infant industries or by exporting domestic consumption oriented products to foreign markets.

Stages of Marketing Development

A nation's marketing system is determined by that country's stage of economic development which is the sum total of mutual interaction among geographic, economic, and human factors. Different stages of economic development reflect different marketing structures which represent different levels of marketing performance domestically and internationally (Carson, 1967).

There are five stages of marketing development for a

systematic description of a country's marketing structure and marketing activities in domestic as well as in international trade.

The first stage--the traditional society--characterized by a non-monetary subsistence economy. Market structure is limited within tribes. Distribution is usually within the family. Sometimes it may be extended to include families within the village and tribe or to exchange between villages or tribes. A barter system is usually used instead of monetary exchange. Such a market system is not common in the world today except for a few desert tribes in Africa or a few inhabitants of South Asian islands.

The second stage--development of preconditions for take-off--is an economy of scarcity. It is a stage of a society in transition. Business enterprises start to exploit by using modern scientific methods in agriculture and industry. They are mainly devoted to production and usually sell their products directly to consumers. Distribution specialization starts at this stage to meet the rapid expansion of new industry and rapid growth of demand for goods. At this stage, production is mainly for domestic consumption. Foreign companies or individuals may enter the market. Therefore, it can be distinguished as an "import" stage. Wholesalers and retailers appear in the society.

The third stage--the take-off--is a stage of rapid growth in production. It is an import-replacing stage. New industries are

introduced to meet the growing domestic demand. The expansion of new industry stimulates specialization of marketing structures. Wholesalers and retailers are more specialized to perform the distributive tasks. In order to replace imports, modern marketing techniques of advertising, sales promotion, and customer services become important to entrepreneurs.

The fourth stage--the drive to maturity--is an early exporting stage. When a country enters into this stage, it can produce capital goods, such as automobiles, refrigerators, and some machinery. Integration starts to occur in order to be able to distribute the increasing output of a highly automated production system. Trading firms or government agencies emerge to handle the over-production; to distribute more efficiently and to increase export potential.

The fifth stage--the age of high mass consumption--is a large scale integration stage. This is a stage of the application of industrial facilities, scientific know-how, and new marketing methods for increasing overall market efficiency. Multinational firms are a typical example of large-scale integration, which is considered as the most successful business institution of advanced countries (Ryans and Baker, 1967).

Import Replacing

Advantages

Generally speaking, local manufacturers who produce for export markets must overcome more obstacles than the local manufacturer who produces for domestic markets and tries to replace foreign suppliers. Without government interference, the real problems involved in exporting may be (1) the communication network from a supplying country to the consuming country, (2) the ability to penetrate a foreign market and maintain a market share, and (3) establishment of a foreign sales organization to promote sales performance. Local manufacturers do not have such problems when they begin producing for local markets.

In the long run, local manufacturers in developing countries have cost advantages which are the most important factor in replacing imports from foreign sources for the levels of standard of living in developing countries are relatively low compared with developed countries. Consumers in developing countries will consume domestic products instead of imports; because their disposable income is low they would rather buy low quality, cheaper products than expensive, high quality ones. This is particularly important for the trade pattern between two countries with a relatively large

gap in living standards.

Disadvantages of Setting Up an Import Replacing Industry

In the short run in most developing countries, foreign suppliers in advanced countries may have special advantages over domestic suppliers to start producing products to replace imports from advanced countries, under the assumption that there is no government interference. The consumers in developing countries prefer products from developed industrialized countries rather than new, domestic, low quality, infant products manufactured domestically for the following reasons.

Based on the product-cycle theory discussed in Chapter II, consumers in developing countries initially consume an introductory product innovated and supplied by an advanced country. When demand for this product increases as it enters its growth stage, production and technology undergo changes and production starts in other advanced countries that have a comparative advantage, because patents or copyrights have expired by this time. As the product enters its mature stage, some developing countries then also have an advantage which in summary is that products can be produced more economically in these developing countries than in advanced countries. Consumers in a developing country may

consume a product which is produced in advanced countries from its new stage through the growth stage to the mature stage; they know the quality and other characteristics of the product. It will take a certain period of time for these customers in developing countries to adjust their habits and tastes to a product produced domestically in the third stage of industry growth. Besides, the quality of a product produced in advanced countries at the mature stage of production is much better than that of a mature product produced in developing countries in an early phase of their production. For an infant industry in a developing country, even though producing a mature product, may have much higher average production costs than for a product produced in advanced countries due to the additional expenses of training skilled laborers and the inexperience of operating equipment efficiently in these developing countries. With this disadvantage, local manufacturers are sometimes hardly able to compete with foreign suppliers. For these reasons, foreign suppliers are able to maintain their market share and compete with those local new suppliers in developing countries in the short term. In this case, the issue of protection policy will be an important factor to build domestic infant industry to replace imports.

Marketing Costs and Exporting

According to the Heckscher-Ohlin theorem, developing countries presumably ought to export manufactured products which are relatively labor-intensive. By now, in addition to Leontief's paradox, a considerable amount of empirical work (Vernon, 1966; Torre, 1970) has shown that some developing countries also export relatively capital-intensive manufactured products to advanced industrialized countries, particularly the United States. The linkage between this theorem and the trade phenomena of the real world lies in the omission of marketing considerations in the theorem. It is evident that marketing information or communication or both is not a free good and instantaneously available. Market knowledge and marketing skills are considered to be major determinants for exploiting exporting markets.

The quality of a product produced in a developing country is usually relatively lower than that of a product produced in an advanced country as discussed in the previous section. Due to lack of capital and of marketing skills, as well as the product quality disadvantage in developing countries, domestic entrepreneurs in developing countries are rarely able to market their products in other countries in competition with advanced countries. Although theory discussed in Chapter III says that two developing countries with

similar demand structures presumably have a potential basis for trading with each other, in actual practice they may rarely do so because the factors cited above prevent them from expanding their markets except within their own territories. Therefore, probable expansion of labor-intensive exports of new and growth products from developing countries will be quite limited, whereas advanced countries are able to export any product, either capital-intensive or labor-intensive, wherever profitable.

Some capital-intensive and labor-intensive mature products can be produced in developing countries and exported to other advanced or developing areas because demand for these products is relatively large, especially in advanced countries; textiles are an example. Such products are either imported (mainly) by advanced countries or exported by developing countries because demand is large and the comparative advantage of producing these products lies with developing countries. The U.S. exports some new and growth products to developing countries in the earlier stages of an industry's production and imports products classified within the same industry at later stages of production because of technological advantage and labor cost disadvantage. In the U.S., relatively the the exports are labor-intensive and the imports are capital-intensive, according to the product-cycle theory discussed in Chapters II and III, for products produced and exported in an industry's early stages are

considered relatively labor-intensive compared to those produced at the mature stage, of which some are imported for domestic consumption in the U.S.

In general, an advanced country in contrast to underdeveloped countries, has well-organized marketing networks which provide better and quicker information on price changes and on demand and supply conditions for a product, and also better forecasts of conditions. Those countries with better organized market networks, therefore, have an advantage in international trade; and actual trade is much less than the export potential in developing countries.

The Role of Government in Actual Trade

Marketing information is not a free good and marketing costs are much higher in foreign than in domestic markets. Market networks are relatively poorer in developing countries. In addition to firms' competition, governments play an important role in helping entrepreneurs to increase their ability to export. The purpose of this section is to describe schemes applied in developed and developing countries for the purpose of increasing exports. Discussions in this section are based on U.N., Incentives for Export in Developed and Developing Countries, August, 1968.

Fiscal Incentives

The essence of fiscal incentives for export is indirectly or directly to decrease production cost and to establish a price-competitive position in world markets. Six types of fiscal schemes have been used in developed and developing countries.

Income Tax Concessions. In some countries, exports are exempted from taxes, either wholly or partially. The income tax concession is granted in anticipation of increases in earnings from exports and/or in respect of expenditures incurred in connection with export promotion, such as export market development and establishment of manufacturing branches abroad.

Accelerated Depreciation Allowances. This is mainly designed to encourage manufacturer-exporters to undertake export expansion.

Drawback Systems. Under a drawback system, duties levied on raw materials or other input factors imported in production of a good for foreign markets are refunded after exportation.

Exemption from and Refund of Internal Taxes. Usually, exports are exempt from turnover taxes at the last stage of production.

Manufacture-in-bond of Internal Taxes. These facilities provide for free entry of imports and their re-export in processed or finished form. These arrangements are equivalent to the drawback

system.

Adjustments in Export Tariff. These adjustments are usually used for a reduction or elimination of export duties.

Financial Incentives

Actually, financial and fiscal policies are considered as either direct or indirect subsidies, which in turn, either reduce costs or increase profits.

Direct and Indirect Subsidies. Subsidy schemes have been used to promote exports of certain products of a country indirectly by reducing production cost or price.

Financial Assistance for Export Promotion Activities. Financial assistance is usually given to exporters by governments or government-supported organizations for promotion of exporting activities, such as export publicity and dissemination of market information, participation in foreign trade fairs and exhibitions, sending abroad trade delegations and study teams, establishment of offices and branches abroad, quality control and pre-shipment inspection, and transport freight concessions.

Financing of Exports. Many countries have provided special facilities for exporters. The interest rates charged in the case of exports are lower than those charged on domestic credit for similar sales.

Assistance in Marketing Operations

In order to increase a country's export performance, governments in advanced and developing countries have made great efforts to provide entrepreneurs with information about foreign markets and marketing techniques, which are key factors of success in exporting. In practice, governments of advanced and developing countries assist their exports in the following aspects: sale management in merchandise assortments, branding, packaging, selling methods, marketing research and advertising; paying practices; pricing; customer service; and channels of distribution. These activities can be classified as follows:

1. Collection and dissemination of foreign market information: The nature of the demand for specific products; consumer preferences, the nature and extent of the competition; substitute products, including supply quality and price; pattern of local production and the distribution and consumption of the product; marketing techniques and advertising media; distribution channels; commercial agents; price conditions abroad; import requirements and regulations; custom laws and procedure; documentation; arrangements regarding credit, transport, and shipping.

2. Foreign market surveys, done only in advanced countries.

3. Export publicity and exhibitions abroad.

4. Training of export management personnel.

In conclusion of this chapter, a country's exporting performance is entirely determined by its market structure (or institution), which in turn is limited by the stage of economic development in that country. With the support of government, marketing enterprises in advanced countries are endowed with industrial facilities, equipment, and methods to dominate world markets. They have advantages over developing countries from using their endowed potential of advertising, distribution channels, and cooperative buying-selling arrangements. Governments in developing countries, therefore, play a very important role in increasing the export penetration ability of domestic entrepreneurs in world markets.

V INTERNATIONAL INVESTMENT AND TRADE COMPETITION

The underlying forces of potential versus actual trade of a country have been discussed in detail in previous chapters. Yet, questions about shifts in patterns of trade have not been adequately analyzed. For this purpose, this chapter is designed to provide a better, if not complete, understanding of locational shifts of an industry from an innovating country to other countries over time. A further step is the integration of these relationships into a comprehensive model for analyzing and, ultimately, controlling the economic environment. Much emphasis is placed on the cross-section view of industrial revolution which may be considered as a phenomenon of expanding markets from an innovating country to other countries. Locational changes through time under the impact of trade are discussed.

New Products

Assume that every country has equally likely opportunities to create or generate new products. Actually, the ability to create new products varies from country to country because of know-how, stage of development, resources, and need for new products in each country are different. In general, those highly industrialized

advanced countries with abundant intellectual and scientific inputs have greater ability and opportunity to assess scientific principles that enable advanced countries to create new products than do underdeveloped countries with relatively poor intellectual and scientific inputs. Even among the advanced countries, application of scientific know-how to the generation of new products differs from country to country. Among countries there is a gap in generating new products. This gap, described in Chapter III as a technological gap, is the main force allowing a country to dominate entire markets during the first stage of production in product-cycle theory. From this simple discussion we may say that producers are not equally able to generate the same products at a given point in time. Producers, wherever located, are not all equally conscious of and equally responsive to all opportunities wherever and whenever they might arise. This uncertainty in producing new products implies that knowledge is not a free good as noted in Chapter IV. Therefore, it is reasonable to believe that local producers are more likely to be aware of the need in that market and produce new products to supply that market than producers located elsewhere would be, according to the ease of access to knowledge, including scientific and marketing problems. However, factors affecting the location of industry are complicated. It is believed that a producer's decision on location of production not only depends upon comparative cost analyses,

but also on other factors, such as communication and external economies (Meyer, 1963). Vernon (1966) summarized the factors affecting the location of industry as follows:

> In the early stage of introduction of a new product, producers were usually confronted with a number of critical, albeit transitory conditions. For one thing, the product itself may be quite unstandardized for a time, its inputs, its processing, and its final specifications may cover a wide range . . . . The unstandardized nature of the design at this early stage carries with it a number of locational implications. First, producers at this stage are particularly concerned with the degree of freedom they have in changing their products. Of course, the cost of the inputs is also relevant. But as long as the nature of these inputs cannot be fixed in advance with assurance, the calculation of cost must take into account the general need for flexibility in any locational choice.
>
> Second, the price elasticity of demand for the output of individual firms is comparatively low. This follows from the high degree of production differentiation, or the existence of monopoly in the early stages. One result is, of course, that small cost differences count less in the calculation of the entrepreneurs than they are likely to count later on.
>
> Third, the need for swift and effective communication on the part of the producer with customers, suppliers, and even competitors is especially high at this stage. This is a corollary of the fact that a considerable amount of uncertainty remains regarding the ultimate dimension of the market, the efforts of rivals to preempt that market, the specification of the inputs needed for production, and the specification of the products likely to be most successful in the effort (Vernon, 1966, p. 195).

The considerations tend to argue that a decision on location of a new industry should be based on the potential type of inputs, market potential, marketing factors, and external economies, which is

far beyond a simple factor-cost-plus-transportation analysis. All these considerations have the following implications for location of an industry.

1. The U. S. has the competitive position to be the location of certain kinds of products, such as those associated with high income and those that substitute capital for labor. U. S. markets consist of consumers with an average income that is higher than any other national market. The U. S. has, in general, a large potential home market. For the supply of production factors concerned, the U. S. manufacturer has access to the greatest concentration of scientific and engineering talents. The U. S. is also better able than foreign competitors to benefit from transport and marketing costs, and government protection. Labor costs are higher in the U. S. than most other countries. In general, high labor costs will affect relatively the competitive position of the U. S. for making certain new products, say, for example, those products in which labor substitutes for capital.

   An innovating country has a comparative advantage in exporting new products under the protection of patents or copyrights. This trade phenomenon is called technological trade because of the technological gaps among producers. The potential of trade is greater among those countries with

greater similarity in levels of income, as discussed in Chapter III. Take computers for example, the U.S. is the innovating country; therefore, the U.S. has the technology gap of know-how advantage to export computers to world markets. The biggest demand for the machines will be those countries with high incomes and high levels of industrialization, such as Japan, France, and Germany, but not those countries with low incomes, such as the Asian and African developing countries. Of course, the first production location of this new product is the U.S. The trade is purely a technological gap phenomenon, at the first stage of production as shown in Figures 8 and 9.

2. The scheme can be extended to analyze other advanced countries endowed with ample scientific inputs. They are able to generate new products for domestic consumption and export. At the first stage of an industry's production, trade is determined by technological gaps.

Growth Products

In this stage of product development, demand for a product expands and a certain degree of standardization usually takes place. The growth of demand and product standardization make it possible to use mass production and distribution techniques and encourage

long-term planning with some degree of certainty. Meantime, efforts at product differentiation may intensify and variety may appear as a result of specialization. This implies that the need for flexibility declines and concern about production cost begins to take the place of concern about product characteristics. Leading industrial countries have a competitive advantage at this stage. They are well endowed with production factors for development of a product.

Some demand for a product may appear elsewhere if producers are able to use their marketing techniques to promote sales elsewhere. Once the market expands to some extent in any advanced or developing country, producers located in the new production location will consider setting up new production facilities in the importing countries. The basic criteria for setting up a production facility can be the marginal production cost plus the transportation cost after producers have weighed factor costs and technology different from those at home. This is especially critical to producers in the location where employment or labor cost is high. This phenomenon is taken for granted (Pogner, 1961) without further verification of the complexity of foreign investment.

When producers decide to set up facilities elsewhere than the home place of a new product, nationwide competition will arise. Vernon (1966) argued that

> . . . the production-cost differences between rival producing areas are usually differences due to scale and difference due to labor costs. If the producer is an international firm with producing locations in several countries, its costs of financing capital at the different locations may not be sufficiently different to matter very much. If economies of scale are being fully exploited, the principal differences between any two locations are likely to be labor costs (p. 98).

Foreign firms will compete with home firms in the third market. In turn, if labor cost differences are large enough to offset the transport costs, the foreign producers are likely to export products back to the home land. The competitive position of the innovating country in world markets changes because of the shift of industry from its home land to foreign areas. If the innovating country still has its competitive position in the world market, the trade of the products is regarded as normal. The competitive position of an innovating country depends on its comparative advantage of factor endowments and its marketing ability at the second stage of production (growth product). If the innovating country has better organized marketing networks than other countries, then the demand for the innovating country's products will be greater than for other countries' corresponding products, for the country with a better marketing network has a greater potential to export its products to world markets as discussed in Chapter IV. At this stage of production, a country's competitive position in world markets mainly depends on comparative factor endowments and marketing ability. The greater

the marketing ability, the greater the demand for the products. Consequently, if the demand is big enough, then production rate is rationalized to achieve economic scale advantage.

If the innovating country has a comparative disadvantage in factor endowments and is relatively less efficient in marketing activity, then the innovating country's exports will decrease, and it will import some of the products from a foreign country if demand exceeds the domestic supply. These imports can be considered as close substitutes of the corresponding products produced domestically. Therefore, intra-industry trade occurs and the competition becomes more vigorous as shown in Figure 9.

The potential market at the growth stage of production may expand greatly even in developing countries. As discussed previously, the actual trade probably will occur largely among advanced countries, and partially among advanced and developing countries, because of differences in demand structures and efficiency of marketing activities, as discussed in Chapters III and IV.

Advanced countries have advantages in producing growth products, for they have the necessary inputs and factor endowments to produce these products by mass production and mass distribution processes which enables them to minimize unit product cost.

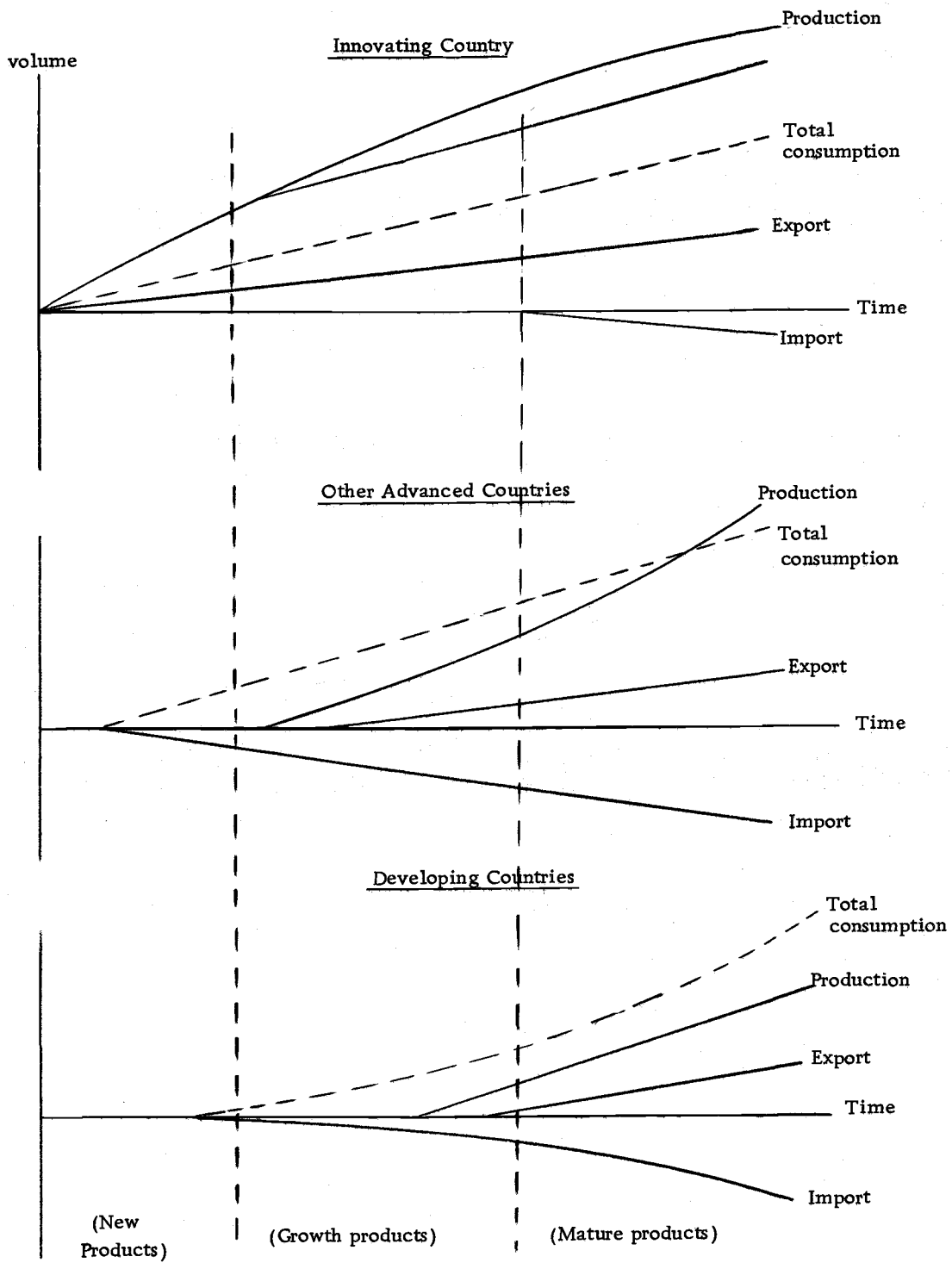

Figure 8. Stages of Industry Development (normal trade).

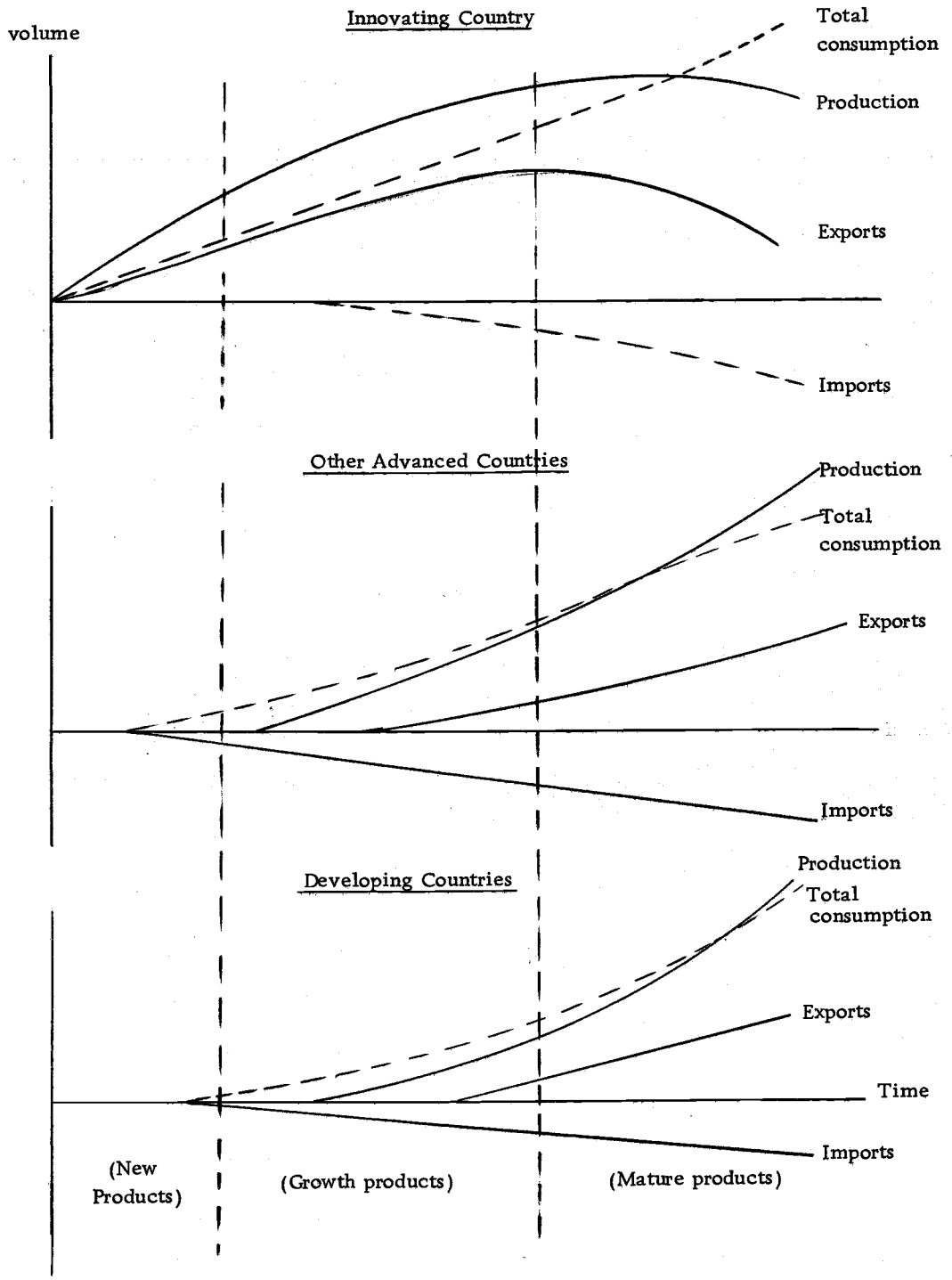

Figure 9. Stages of Industry Development (technological gap trade)

Mature (Standardized) Products

When an industry enters its mature stage, it has undergone changes from its introductory and growth stages in order to compete with substitute products and achieve mass production conditions. Further, mature products possess special characteristics, such as a low requirement for technological inputs, a higher degree of technological stability, and an increase in the lower skilled labor content; consumers are well aware of product quality and supply, as discussed in Chapter II, which make these products suitable for production by and export from developing countries. (Vernon (1966) pointed out that the

> . . . manufacturing processes which receive significant inputs from the local economy, such as skilled labor, repairmen, reliable power, spare parts, industrial materials processed according to exacting specifications, and so on, are less appropriate to the less-developed areas than those that do not have such requirements. Unhappily, most industrial processes require one or another ingredient of this difficult sort (p. 203).

He explained that industries that produced a standardized product would be in the best position to avoid the problem.

This is not to say all kinds of standardized products can be produced economically in less developed countries; therefore, it is appropriate further to examine what characteristics of mature products render them suitable for production in developing countries.

First, the production function must be such as to require significant inputs of labor, for developing areas have an abundant low-wage labor force. Second, there must be a high price elasticity of demand for the output of individual firms. In developing countries, the overall market is relatively small, and it is uneconomic for a large number of manufacturers to invest or to establish distribution channels in each developing country. Generally speaking, the demand for the product of any individual manufacturer is very close to the entire demand for that product. If a market is large enough for setting up a new plant, it will be profitable for a manufacturer to invest in that market. Third, products whose production process does not rely heavily upon the external economic environment would be more appropriate than those that require an elaborate industrial environment. And lastly, those products that require a short period of time for training skilled labor are more appropriate than those requiring a long period of time.

At the mature stage of production, factor endowments and marketing factors are considered to be the most important for determining a country's exporting potential. According to the businessmen's profit maximization assumption, an entrepreneur will produce the product having the lowest cost and export it to wherever the highest profit can be obtained, either to the home land or to third markets. Importers in advanced countries with efficient marketing

systems will import these products from developing low cost areas and even export those products from those developing areas to third markets. Although actual trade is likely to be very small among developing countries because of their poor marketing organization, the demand for standard products in advanced countries is large enough for developing countries to produce these products.

Intra-industry trade will occur; some countries will trade with each other, and the products will be considered as in the same industry because of quality, demand structure and preference differences among the trading countries. The competition is very intense in these markets. If it is a normal trade product, then the innovating country still is in a competitive position. If it is a technological good, the competitive advantage shifts from an innovating country to other countries. In order to increase or at least maintain a country's market share, including the home land, the innovating advanced country might use product differentiation strategy to produce higher-quality, higher-priced products (Figures 8 and 9). Because of this additional effort, the production costs and the prices of the product might be higher than before.

The above discussion implies that these developing countries do not necessarily have to concentrate on exporting agricultural products, raw materials, or labor-intensive products. They may be in a very strong competitive position to produce certain kinds of

capital-intensive mature products for export to world markets. The normal intra-industry and technological gap intra-industry trade patterns are depicted by Figures 8 and 9, respectively. This implies that an increase in the price of a competitive product in a country will not necessarily cause a decrease in the producing country's market share.

At the mature stage, for raw products, developing countries have a competitive position in international trade. This in turn asserts that those export-oriented developing countries have to improve their product quality in order to compete with other developing countries. Otherwise they cannot maintain their international market share.

Overall in actual trade, in spite of this phenomenon and the high rate of growth of some products from certain developing countries, many developing countries (or developing countries overall) continued to experience an adverse balance of trade and a continued deterioration in their terms of trade. As a result, living standards in developing countries steadily slipped backward in relation to developed countries (Linder, 1961).

This explains why some developing countries that are aware of their export potential translate it into actual exports, while other developing countries do not make an effort to use their export potential or do not make full use of their potential. Appropriate

government policies can bring about the successful manufacture of certain kinds of export products.

PART II

ECONOMIC ANALYSIS OF THE HARDWOOD PLYWOOD INDUSTRY IN FAR EAST ASIA

VI COMPARATIVE ECONOMIC ANALYSIS OF THE HARDWOOD PLYWOOD INDUSTRY IN INTERNATIONAL TRADE OF JAPAN, SOUTH KOREA, TAIWAN AND THE PHILIPPINES

The purpose of this chapter is to explain comparative relationships of trade in the Far East Asian exporting countries. Empirical evidence is investigated to evaluate relatively the competitive position of Japan, Republic of China (Taiwan), Republic of Korea (South Korea), and the Philippines. Also analyzed are prospective changes in interregional relationships resulting from increasing competition for raw materials and in the export of hardwood plywood to foreign markets.

The Characteristics of the Hardwood Plywood Industry in the Far East Exporting Countries

Plywood is a labor-intensive product relatively to the other products of the forest industry as a whole, such as pulp and paper, lumber, or other board products, and this makes the plywood industry a particularly appropriate one for establishing in the relatively underdeveloped countries which have a large potential labor force, and where wages are relatively low. There also exists a local market for hardwood plywood in each country. In addition, the production process of hardwood plywood is well established. Machinery is standardized and is easily obtainable from foreign advanced

countries. These situations not only make it possible for developing countries to establish a domestic hardwood plywood industry very easily but also enable them to export the products very easily and give the producers in developing countries a strong competitive position in foreign markets to compete with advanced countries.

Japan is the most important producing and exporting hardwood plywood country in Far East Asia. Early in 1849, plywood was first introduced to Japan but the plywood industry was not established until 1907; up to about 1937 the machinery required by plywood mills either was imported or manufactured by the Japanese themselves. Modernization of the plywood industry started in the 1950's and is now entering the automation stage. Japanese plywood development started from 1949 when Lauan logs were imported from the Philippines and Japan centered on the exporting of Lauan plywood to North America. This period consisted of the development period of Lauan plywood from 1950-1955 and of the Lauan plywood export peak from 1956 to 1959. In the first half of this period, excess supply occurred as a result of rapid expansion of this industry. Quantities were finally controlled in order to obtain steady markets (both foreign and domestic) so Japanese exports to the U.S. market (about 80% of total hardwood plywood exported) was restricted in 1960, and American buyers promoted imports from the Philippines, Taiwan, and South Korea. As a result, Japan's share of North

American markets in relation to South Korea, Taiwan, and the Philippines decreased from 100 percent before 1956 to 51 percent in 1962, and dropped to 27 percent in 1964, 15 percent in 1967, 9 percent in 1969, and 6 percent in 1970.

During this period, the Philippines was the first to use her own raw material extensively for plywood production and export, mainly financed by American and Japanese capital. Taiwan began plywood production and exports around 1950, followed by South Korea in 1959. Taiwan occupied the first position in hardwood plywood imports into the North American market in 1964. South Korea took over first position in 1967. These four major hardwood plywood exporting countries ranked as follows in the U.S. market in 1970: South Korea, 51 percent; Taiwan, 27 percent; the Philippines, 16 percent; and Japan, 6 percent.

With the exception of the Philippines, the most important problem for the industry in Japan, Taiwan, and South Korea has been the difficulty of obtaining sufficient raw material to process into plywood for export to other regions, mainly North America, in competition with each other. The log supply for these three countries has come from Southeast Asia during the last two decades.

Demand for and Supplies of Hardwood Logs

Historical Development of the Hardwood Plywood Industry in Far East Asia

The hardwood plywood industry was established to meet the vast increase in demand which arose from North America after 1950.

The total hardwood plywood production has been increasing tremendously since 1950. From 1950 to 1970, the increase was about 45 times for Japan, 68 times for Taiwan, 26 times for the Philippines, and more than 800 times for South Korea. The total hardwood plywood production of these four countries in 1969 was as follows: Japan, 5.780 million cubic meters; South Korea, 0.821 million cubic meters; Taiwan, 0.599 million cubic meters; and the Philippines, 0.309 million cubic meters (Table 3). The average annual rate of growth in hardwood plywood production for the four countries from 1950 to 1960, and 1960 to 1969, is as follows:

Country	Average annual rate of growth	
	1950-1960	1960-1969
	Percent	
Japan	76	31
South Korea	280	303
Taiwan	87	65
Philippines	56	1

Table 3. Hardwood Plywood Production and Trade in Far East Exporting Countries: Japan, South Korea, Taiwan, and the Philippines, 1946-1969. (In 1,000 M^3)

Year	Japan			South Korea			Philippines			Taiwan		
	Production	Export	Import	Production	Export	Import	Production	Export	Import	Production	Export	Import
1946	67	---	---	1	---	---	---	---	3	2	---	3
1947	100	---	---	2	---	---	---	---	6	2	---	6
1948	111	1	---	2	---	---	---	---	1	2	---	1
1949	147	8	---	3	---	---	---	---	---	6	---	1
1950	149	16	---	1	---	---	4	---	2	10	---	---
1951	233	39	---	1	---	1	13	---	---	15	---	1
1952	298	21	---	2	---	1	28	---	---	18	---	1
1953	408	58	---	2	---	1	34	---	---	19	---	---
1954	537	164	---	5	---	1	40	1	---	28	1	---
1955	683	234	---	11	---	1	56	71	---	21	---	---
1956	852	260	---	14	---	---	93	21	---	23	2	---
1957	979	328	---	21	---	---	119	30	---	43	2	---
1958	1,067	344	---	23	---	---	167	100	---	88	14	---
1959	1,293	425	---	27	1	---	264	190	---	80	16	---
1960	1,286	353	---	29	2	---	286	104	---	97	19	---
1961	1,499	344	---	24	14	---	230	149	---	110	51	---
1962	1,033	358	---	45	15	---	280	173	---	120	72	---
1963	2,073	341	---	53	46	---	235	244	---	160	133	---
1964	2,453	360	---	215	152	---	208	135	---	240	208	---
1965	2,627	382	1	314	256	---	264	143	---	260	223	---
1966	3,101	377	2	353	277	---	319	234	---	312	261	---
1967	3,778	337	21	440	311	---	285	235	---	334	248	---
1968	4,744	425	7	703	600	---	410	254	---	421	397	---
1969	5,780	393	26	821	709	---	309	195	---	599	596	---

Source:

FAO, Year Book of Forest Products, 1946-1970.

--- = Not available.

South Korea had the greatest expansion from 1950 to 1969; Taiwan was in second position; Japan had a very stable increase; the Philippines had jumped to its peak in 1960 and maintained a moderate growth rate since.

With respect to export development in hardwood plywood, Japan reached her peak in 1959 and enjoyed a stable market share thereafter. The total exports of Japan are 16, 425, and 393 thousand cubic meters, respectively, for the years of 1950, 1959, and 1969 (Table 3). South Korea started exporting late in 1959 and had the greatest growth in exporting thereafter. From 1960 to 1969, the quantity of hardwood plywood exported from South Korea increased from 2 to 709 thousand cubic meters. The Philippines with her own raw material had reached her peak of exporting at 245 thousand cubic meters in 1963 and had a slow fluctuation in exports after 1963 because of competition from Taiwan and South Korea. Taiwan is similar to South Korea; from 1960 to 1969 the exports of hardwood plywood increased from 19 to 596 thousand cubic meters (Table 3).

Japan's ratio of export to total production of hardwood plywood has decreased since 1959 because of increased demand for hardwood plywood domestically and increased competition from Taiwan, South Korea and the Philippines. It decreased from 33 percent to less than 7 percent between 1958 and 1969. The production in Japan was

mainly for domestic consumption after 1960. On the other hand, the production of hardwood plywood in South Korea, Taiwan, and the Philippines was mainly for export. The ratio of export to total production in 1969 is as follows: Taiwan, 99 percent; South Korea, 86 percent; and the Philippines, 60 percent.

Supplies of Logs (Tropical Hardwoods)

There are three regions which produce and export hardwoods. Because of institutional structures and freight distances, each region has customers in certain regions, as illustrated in Figure 10.

The Philippines, Sabah, Sarawak, Indonesia and W. Malaysia. More than 70 percent of the world's supply of total tropical hardwoods originates in this region. It supplies practically all the requirements of the East Asian and Japanese markets and part of Western Europe as well.

Africa. The second in importance as a source of supply for tropical timber is Africa, specifically six countries in western Africa: Cameroon, Congo, Congo Gaben, Ghana, Ivory Coast and Nigeria. These countries accounted in 1965 for 97.5 percent of all African log exports. Over 90 percent of the log exports went to the European Economic Community and the United Kingdom.

Latin America. This is the largest area of all these regions, but does not export volumes of tropical hardwoods, comparable to those of the other two. In addition, a comparatively smaller part of its production goes to overseas markets.

As discussed above, logs are the main item in the interregional trade of tropical forest and wood products from developing producer countries to the developed importer countries at the present time. Transport costs accounted for a large proportion of total cost from producing areas to the users. The f. o. b. price of logs in the Philippines was U. S. $8. 5 per thousand board feet and the freight rate was U. S. $21. 23 per thousand board feet from the Philippines to Japan. The freight rate amounted to more than 70 percent in this case. The yield ratio from log to veneer (or plywood) is about 50 percent. If products of veneer (or plywood) can be manufactured in these raw material developing countries and exported directly to consuming areas, instead of exporting logs to in-transit (manufacturing) countries, a large proportion of the transport cost can be saved. Because of the ease of setting up processing facilities for hardwood plywood manufacture in developing countries, it is more economical to export processed products than raw material from these developing areas to hardwood plywood consuming areas, either from the consumers' or producers' points of view. In the long run, therefore, processed products are considered more

important in the interregional trade of developing countries and in the developed importer countries; hence, in the future, new developing countries will compete with older developed and advanced countries.

The main trade flows of hardwood logs from the three main supplying areas--Southeast Asia, Africa, and Latin America--to the primary importing areas, such as Far East Asia, Europe, and North America, are represented in Figure 10. Southeast Asia originated more than 70 percent of international trade in hardwood logs. About 99 percent of logs imported into Far East Asia in 1969 came from Southeast Asia. Almost all the hardwood logs exported from Africa went to the European market. Only a relatively small fraction of total exported logs from Africa went to North America and Far East Asia. This explains why the trade markets are divided mainly into two regions: Southeast--Far East Asia; and Africa--Europe.

Import and Export of Hardwood Logs in Far East Asia

As discussed previously, raw materials for hardwood plywood in Japan, South Korea and Taiwan come from Southeast Asia, Japan's imports of Southeast Asian hardwood logs increased from 0.549 million cubic meters to 17.639 million cubic meters between

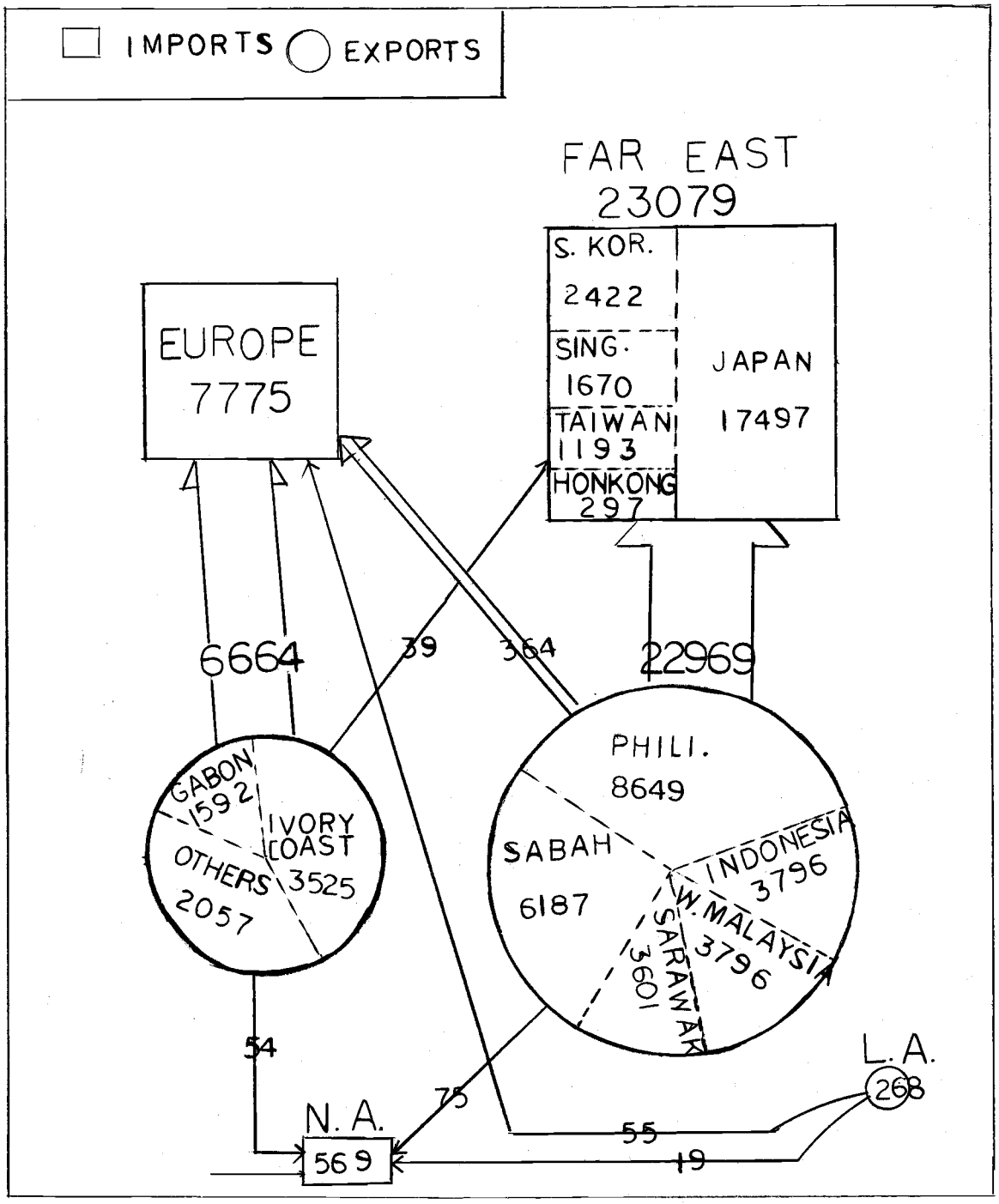

Figure 10. Main Trade Flow of Tropical Hardwood Logs, 1969 (1000 cubic meters). Figures may not add to total because only main trade countries are included.

Source: FAO Year Book of Forest Products, 1969-70.

1952 and 1970 (Table 4) nearly a 30-fold increase. South Korea had the biggest expansion of log imports in the shortest period--from 0.123 million cubic meters in 1960 to 2.422 million cubic meters in 1969, or a 20-fold increase in a 9-year period (Table 4). Taiwan also had a substantial increase in hardwood imports which grew from 0.102 million cubic meters in 1960 to 1.193 million cubic meters in 1969. The quantity of logs imported by South Korea and Taiwan was relatively smaller in comparison with that of Japan. More than 80 percent of logs from Southeast Asia was imported by Japan and about 20 percent was shared by South Korea and Taiwan.

Exports of Logs from Southeast Asia

The exploitation of raw material in Southeast Asia has undergone substantial changes recently. The Philippines has been the most important supply country in this area. More than 60 percent of hardwood logs (mainly Lauan logs) was supplied by the Philippines to the rest of the world (mainly Japan) before 1960. The volume of logs exported by the Philippines grew from 3.512 million cubic meters in 1960 to 8.649 million cubic meters in 1969. Sabah was in second place during the last decade with an increase in log exports from 1.771 million cubic meters in 1960 to 6.187 million cubic meters in 1969. Indonesia, Sarawak and West Malaysia increased their log exports rapidly after 1964, particularly Indonesia and

Table 4. Import of Southeast Asian Lauan Logs by Japan, South Korea, and Taiwan, 1952-1970 (in 1,000 M^3). a/

Year	Japan	South Korea	Taiwan
1952	549	b/	---
1953	1,284	---	---
1954	1,460	---	9
1955	1,850	---	24
1956	2,315	---	38
1957	2,459	---	35
1958	3,303	---	67
1959	4,230	---	171
1960	4,568	123	102
1961	5,549	100	224
1962	6,373	231	276
1963	7,798	218	534
1964	7,871	308	482
1965	8,848	509	619
1966	11,101	815	708
1967	12,469	915	899
1968	13,151	2,435	1,090
1969	15,685	2,422	1,193
1970 c/	17,639	3,000	1,500

Source:

a/ FAO Year Book of Forest Products, series.

b/ --- = not available.

c/ Estimates.

West Malaysia, because they have a large raw material resource for exploitation (Table 5). The market shares of log exports in this area are shown below for 1960 and 1969:

Country	Market Share	
	1960	1969
	Percent	
Indonesia	2	16
Philippines	61	38
Sabah	31	26
Sarawak	6	13
West Malaysia	0	7
Total	100	100

The market share of the Philippines decreased substantially because of rapid growth in Indonesia and West Malaysia. Indonesia and West Malaysia will enjoy their big market shares in the near future because they are endowed with abundant exploitable resources which will be discussed in later sections.

Resources

The proportion of logs consumed in plywood production in the southeastern Asia region was relatively small compared to other forest industries (lumber, pulp and paper), accounting for less than 4 percent of total industrial wood consumption during 1953-1955;

Table 5. Exports of Hardwood Logs from Indonesia, the Philippines, Sabah, Sarawak, and West Malaysia, 1960-1969 (in 1,000 M^3). a/

Year	Indonesia	Philippines	Sabah	Sawawak	West Malaysia
1960	115	3,512	1,771	349	b/
1961	105	3,776	2,254	493	---
1962	78	3,952	2,473	688	---
1963	78	6,521	3,000	875	---
1964	78	6,140	3,384	866	889
1965	140	6,698	3,818	1,206	1,036
1966	203	5,882	4,855	1,933	---
1967	421	7,090	5,321	2,243	---
1968	1,927	7,511	5,796	2,987	1,730
1969	3,796	8,649	6,187	3,061	1,862

Source:

a/ FAO Year Book of Forest Products, 1961-1970.

b/ --- = not available.

about 3.3 percent has been predicted for 1975 (FAO 1961). Moreover, there is no special classification of forest type or logs for use in plywood production. Therefore, a general discussion of the raw material supply situation for all forest industries is presented. The area to be analyzed has been limited to those countries relevant to the subject matter of this study.

Forest Types

The forests of the Southeast Asia region [7/] are generally classified as broadleaved and coniferous, situated in both tropical and temperate zones. The broadleaved forest can be further sub-classified into (i) wet evergreen, (ii) moist deciduous, (iii) dry deciduous, (iv) special gregarious types, and (v) temperate deciduous forest (FAO, 1961 and 1963).

The stands of wet evergreen forests are dense and composed of numerous species. The dominant story is represented by large-dimensioned, tall trees, most of which are dipterocarps. The understory contains a great variety of small, sub-dominant trees which are usually of lesser commercial importance. The whole forest is tangled with lianas and climbers which make extracting operations difficult, and expensive. This type of forest covers over half the forest land in the southeastern Asian region.

Moist deciduous forests are also dense but they include relatively fewer species than the wet evergreen forests. Teak (Teckma grandis) and Sal (Shorea robusta) are the most important commercial species, which occupy most parts of the central dry zone, such as in

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[7/] Classification of region and subregions are specified in Table 6.

Laos, Cambodia, Burma, Thailand, and India.

The dry deciduous and mangrove forests are mainly in South Asia, which is beyond the scope of this study.

The temperate deciduous forest comprises about 10 percent of the total forest area in East Asia (Japan, Korea, and Taiwan). The main species are beech, oak, maple, chestnut, walnut, alder, elm, and birch.

Only a few conifers occur in tropical forest lands, mainly in East Asia.

Forest Area

In the southeastern Asia subregion, forests occupied about two thirds of the total land area and more than two-thirds of the eastern Asia subregion (Table 6). About 40 percent of forest land in the southeastern Asia sub-region in classified as unexploited productive forests, a considerable proportion of which are classified as accessible. The potential for future development is relatively promising in this area. On the other hand, a large proportion of forest land has been exploited in the eastern Asia sub-region, limiting the future development of forest industries unless raw materials are imported from Southeast Asia.

The broadleaved forest occupies over 90 percent of the forest area of the southeastern Asia sub-region. Most of the forests in

Table 6. Land Use Statistics of Far East Asia. (In 1,000 hectares)

Region and country	Total land area	Forest area					Non-forested land		
		Accessible			Inaccessible				
		Productive in use	Productive Not in use	Unproductive	Productive	Unproductive	Agricultural land	Brush land	Other land
Southeast Asia									
Malaysia (excluding Singapore)	13,145	3,290	4,348	832	257	791	2,240	606	781
Brunei	577	181	194	---	49	---	17	123	7
Indonesia	148,329	57,886	605	2,117	26,187	3,382	14,282	---	43,870
East New Guinea	46,540	250	5,010	---	---	31,160	5,000	---	5,120
Netherlands New Guinea	41,278	90	910	3,000	27,000	---	10,278	---	---
North Borneo	7,611	355	224	---	4,665	1,062	1,191	91	23
Philippines	29,741	4,132	2,307	2,886	2,020	1,830	13,011	1,367	2,190
Sarawak	12,242	1,302	8,042	---	---	---	2,495	---	403
Sub-total	299,463	66,492	21,640	8,832	60,178	38,270	48,514	2,187	52,394
East Asia									
Taiwan (China)	3,529	1,152	160	16	621	---	1,043	---	517
Hong Kong	97	5	---	---	---	---	16	16	60
Japan	36,769	11,438	6,624	2,615	1,390	---	5,401	1,395	7,906
South Korea	9,022	3,384	665	625	577	---	2,505	17	1,749
North Korea (estimates)	11,406	8,000	---	---	970	---	2,385	---	51
Sub-total	60,823	23,979	7,449	3,558	3,558	---	10,850	1,428	10,283
TOTAL	360,286	90,471	29,089	12,390	63,736	38,270	109,364	3,615	62,676

Source:

FAO, Timber Trends and Prospects in the Asia-Pacific Region, Geneva. 1961.

--- = Not available.

this sub-region belong to the wet evergreen, moist deciduous, and dry deciduous tropical types. The forest types of the eastern Asia sub-region are dry deciduous species mixed with conifers.

Average Standing Volume

According to FAO's investigation, the estimates of stocking per hectare were about 90 cubic meters for the broadleaved species and 70 cubic meters for the conifers in Far East Asia. Based on FAO's data the growing stock of this area was estimated in each sub-region as follows: (FAO, 1961)

Sub-region	Productive forests in use 1,000 ha	Growing stock Million M^3	M^3/ha
Southeast Asia			
Conifer	3,594	180	50
Broadleaved	60,608	9,008	149
Total	64,202	9,188	143
East Asia			
Conifer	12,000	749	62
Broadleaved	11,979	576	68
Total	23,979	1,275	67

The southeastern sub-region is favorably endowed both in stocking and density. The total stocking in the southeastern sub-region is about three times larger than in the eastern Asian sub-

region. The average stand is about 55 cubic meters per hectare in Japan, Korea, and Taiwan and about 143 cubic meters per hectare in Southeast Asia.

The exploitation in the Southeast area was about 12 million cubic meters of industrial wood from the forests in use during 1953-1955 and was estimated to reach about 20 million cubic meters in 1975 (FAO, 1963). These fellings are very small in comparison to the forest area of 66 million hectares and to its growing stock of more than 10, 000 million cubic meters. In East Asia, the total felling in the forest in use was 68. 9 million cubic meters which was about three cubic meters per hectare in 1953-1955. As investigated by FAO, fellings cannot be increased in the eastern Asia area in the future. The main resource of raw material depends on the Southeast area.

Table 7 indicates that Indonesia owned the biggest natural resource not yet fully exploited, and the growing stock was also highest, about 8, 700 million cubic meters in total or 150 cubic meters per hectare. Countries having the next largest growing stock are the Philippines and Malaysia, with about 350 million cubic meters or 100 cubic meters per hectare. The growing stock is relatively high in Japan, but Japan's forests are "overexploited". The stock in Japan is about 750 million cubic meters or 63 cubic meters per hectare. The stock in Taiwan is about 200 million

Table 7. Area, Growing Stock, and Increment of Forests in Far East Asia, 1958-1962. a/

Country	Forest area (1,000 ha)	Growing stock		Annual increment	
		Million M^3	M^3/ha	Gross Million M^3	Net Million M^3
Malaysia b/					
Coniferous					
Broadleaved	3,290	340	103	4.4	2.9
Total	3,290	340	103	4.4	2.9
Indonesia					
Coniferous	2,718	116	43	--- e/	---
Broadleaved	55,168	8,590	156	---	---
Total	57,886	8,706	150	310.4	---
North Borneo					
Coniferous					
Broadleaved	355	37	104	2.0	0.3
Total	355	37	104	2.0	0.3
Philippines c/					
Coniferous	850	61	72	0.1	0.1
Broadleaved	3,282	317	97	14.5	8.7
Total	4,132	378	91	14.6	8.8
Sarwak					
Broadleaved	1,302	50	38	---	1.0
Taiwan d/					
Coniferous	240	96	400	---	---
Broadleaved	912	101	111	---	---
Total	1,152	197	171	---	---
Japan					
Coniferous	6,531	419	64	13.6	13.6
Broadleaved	4,907	306	62	15.3	15.3
Total	11,438	725	63	28.9	28.9
South Korea					
Coniferous	2,237	34	15	1.6	---
Broadleaved	1,147	19	17	1.1	---
Total	3,386	53	16	2.7	2.7

Source:

a/ FAO, Timber Trends and Prospects in the Asia-Pacific Region, Geneva. 1961.

b/ FAO, Forest Industries Development - Malaysia, Rome. 1970.

c/ FAO, Demonstration and Training in Forest, Forest Range, and Watershed Mgt. - Philippines, Rome. 1970.

d/ FAO, Forest and Forestry Industry Development - Taiwan, Rome. 1969.

e/ --- = Not available.

cubic meters with an average of 171 cubic meters per hectare. Total growing stock in South Korea is about 53 million cubic meters or 16 cubic meters per hectare, the lowest average in this region (Table 7).

Indonesia, Malaysia and the Philippines are abundantly endowed with forests which could not only meet any increases in local demand but also provide large potential exports. Japan, although endowed with ample forest resources, consumes much more industrial wood than domestic forests can supply. Taiwan and South Korea are endowed with relatively small forest resources; therefore, future development of their forest products industries will depend on imports, mainly from Indonesia, Malaysia and the Philippines.

In the long run, a permanent forest estate of adequate size is desired by each country. Further elaboration of questions concerning short-run felling and long-run supply are beyond the scope of this study.

Main Species Used for Plywood in Southeast Asia

According to an FAO investigation (FAO, 1963), there were only a few species of wood extensively used for plywood throughout the world in 1960-1962; Douglas-fir, 47 percent; birch (including alder in U. S. S. R.), 13 percent; Lauan species, 9 percent; beech,

3 percent; Okoume, 3 percent; other, 25 percent.

The main species of wood used for making plywood in Far East Asia are listed in Table 8. The most important species are dipterocarpaceae species. The species other than Lauan are mainly used in Japan for making high-quality expensive veneers. Lauan plywood accounts for more than 90 percent of hardwood plywood production in Japan, South Korea, Taiwan, Malaysia, and the Philippines (Japan Plywood Assn., 1968).

Trade Flows of Hardwood Plywood in Far East Asia

Hardwood plywood is a newly developed industry in this region. Because of its special characteristics making it suitable for manufacture in developing countries, trade competition increased and trade patterns shifted during the last two decades. For the world as a whole, imports and exports of plywood overall are illustrated by Figure 11, from which some implications can be drawn for this regional study.

The world trade pattern of plywood (Figure 11) has the same characteristic as the hardwood log trade pattern discussed previously (Figure 10). It mainly can be divided into two regions: America and Far East Asia; Europe and Canada. Nearly 90 percent of hardwood plywood exported from Far East Asia was imported

Table 8. Main Species of Wood for Plywood Manufacturing in Far East Asia.

Scientific name (species)	Common name	Origin
Araliaceae		
Kolopanax ricinifolium	sen	Japan
Betulaceae		
Betula	birch	Japan
Burseraceae		
Auccoumea	okoume	Africa
Dipterocarpaceae		
Dipterocarpus	apitong, gurijum, keruing, yang	Southeast Asia
Hopea	selangan, giam, takien	"
Parashorea malaanon		"
Parashorea plicata	bagtican, Philippine mahogany	Philippines
Pentacme contorta	white lauan	Southeast Asia
Shorea negrossensis	red lauan	"
S. polysperma	tangile	"
Fagaceae		
Fagus crenata	Japanese beech	Japan
Quercus crispula	Japanese oak	Japan
Verbenaceae		
Tectona grandii	teak	Southeast Asia

Source: FAO, Plywood and Other Wood-based Panels, Rome, 1963.

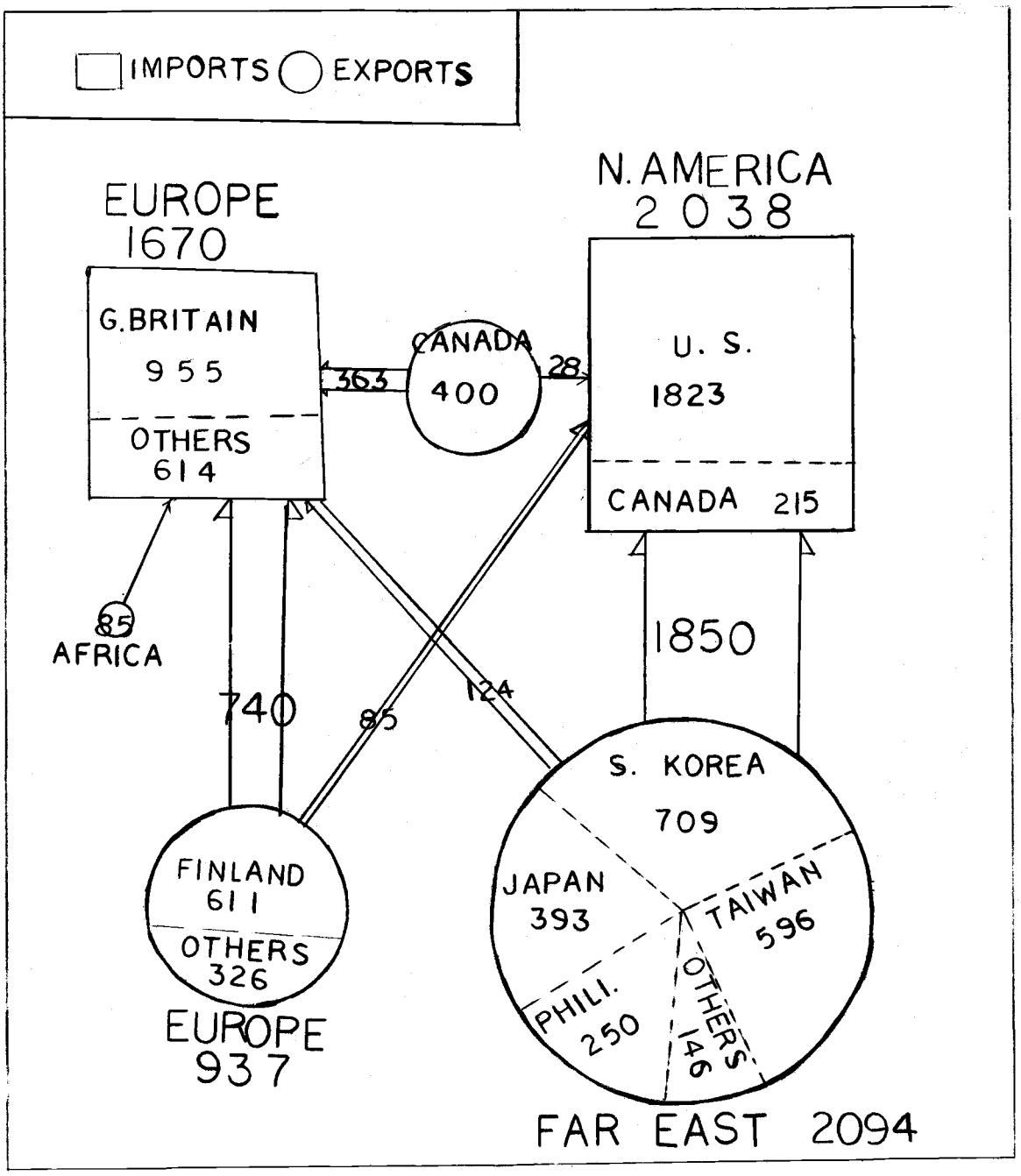

Figure 11. Main Trade Flows of Plywood, 1969 (1000 cubic meters). Figures may not add to total because only main trade countries are included.

Source: FAR, Year Book of Forest Products, 1969-70.

by the U.S. in 1969 (Table 9).

The most important Far East Asia countries exporting hardwood plywood at the present time are South Korea, Taiwan, Japan, and the Philippines. The most important importing country is the U.S. Japan recently also imported small amounts of hardwood plywood from South Korea, Taiwan, the Philippines, and the newly developing countries, such as Malaysia.

U.S. plywood production, imports, exports and consumption, shown in Table 10 have undergone major changes since the early 1950's. At that time, U.S. imports accounted for less than five percent of U.S. consumption; by 1971 about three-fifths of hardwood plywood consumption was imported from Far East Asian countries. This change is well explained by the intra-industry theory discussed in Part I. Before 1950, the plywood industry was considered to be in the stage between new products and growth products. The industry reached its mature stage around 1955. Before 1960, the U.S. had either a technological or economies-of-scale advantage; the U.S. was able to compete with other countries in world markets (including the U.S. market). After 1955, the comparative advantage lay with the developing countries in terms of low-wage trade. After 1955, the U.S. exported some plywood to other countries, which undoubtedly was comprised of high-priced, high-quality products.

Imports of hardwood plywood increased rapidly after 1954;

Table 9. Direction of Trade for Plywood Produced in Southeast Aisan Regions, 1969. (In 1,000 M^3)

To: / From	Japan	South Korea	Taiwan	Philippines	Canada	United States	Rest of world	Total export
Japan	0	0	0	0	34.4	316.9	41.9	393.2
South Korea	36.9	0	0	0	4.3	683.6	2.8	727.6
Taiwan	22.2	0	0	0	93.7	402.6	77.3	595.8
Philippines	0	0	0	0	0.1	246.0	3.1	249.2
Canada	2.9	0	0	0	0	22.1	375.4	400.4
United States	0.6	0	0	0	35.1	94.9	94.9	130.6
Rest of world	0	0	0	0	81.7	151.8	0	233.6
Total import	62.6	0	0	0	248.3	1,823.0	595.4	2,729.3

Source:

FAO, Year Book of Forest Products. 1969-70.

Table 10. U. S. Plywood Production, Imports, Exports, and Consumption, by Softwood and Hardwood, 1951-1971. a/
(In million sq. ft., 3/8-inch basis)

Year	Domestic production			Imports			Exports			Apparent consumption		
	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods	Total	Soft-woods	Hard-woods
1951	4,192	2,995	1,197	53	4	49	4	4	1	4,241	2,995	1,246
1952	4,403	3,178	1,224	61	1	60	13	13	---b/	4,450	3,166	1,284
1953	5,076	3,848	1,228	156	---	155	10	10	1	5,222	3,839	1,383
1954	5,106	3,989	1,116	306	---	306	7	7	1	5,405	3,983	1,422
1955	6,639	5,284	1,355	443	---	442	10	8	2	7,071	5,276	1,795
1956	6,780	5,432	1,347	498	---	498	16	15	1	7,262	5,418	1,844
1957	6,830	5,653	1,177	597	---	597	15	15	1	7,412	5,639	1,773
1958	7,838	6,487	1,151	643	---	643	14	12	2	8,267	6,475	1,792
1959	9,082	7,736	1,346	938	---	938	75	72	3	9,945	7,664	2,281
1960	8,861	7,759	1,102	725	---	715	15	13	2	9,571	7,757	1,814
1961	9,801	8,496	1,305	739	13	727	17	14	3	10,523	8,495	2,028
1962	10,831	9,315	1,516	903	13	891	19	17	2	11,716	9,311	2,404
1963	12,058	10,375	1,683	945	10	935	19	18	1	12,984	10,367	2,617
1964	13,366	11,455	1,912	1,045	5	1,040	31	28	2	14,380	11,431	2,949
1965	14,477	12,428	2,049	1,052	5	1,047	37	30	6	15,492	12,402	3,090
1966	14,925	12,849	2,076	1,257	3	1,254	56	48	8	16,126	12,804	3,321
1967	14,756	12,840	1,916	1,247	3	1,244	93	85	8	15,909	12,758	3,152
1968	16,395	14,385	2,009	1,896	10	1,886	78	64	14	18,213	14,332	3,882
1969	15,407	13,538	1,869	2,121	13	2,107	215	199	16	17,314	13,354	3,960
1970c/	15,907	14,149	1,758	2,049	2	2,047	172	114	58	17,785	14,038	3,747
1971c/	18,288	16,358	1,930	2,548	3	2,545	114	99	15	20,721	16,262	4,459

a/ Data may not add to totals because of rounding.

b/ --- = less than 500,000 square feet.

c/ Preliminaty estimates

Source: U. S. D. A. The Demand and Price Situation for Forest Products, Misc. Pub. No. 1231, 1972. p. 79.

627.6 million square feet in 1955; 1,014.0 million square feet in 1960; 2,132.9 million square feet in 1965; and 4,168.2 million square feet in 1970 (Table 11). Because of a large increase in demand for hardwood plywood in the U.S. market and the tremendous changes in product or structure, U.S. imports of plywood (of which over 99 percent is hardwood) have increased about 50 times between the fifties and early seventies. The main exporting countries, as indicated in Table 11, are Japan, South Korea, Taiwan, and the Philippines. These four major exporting countries accounted for more than 95 percent of total imports to the U.S. market in 1970-1971. The growth rate of U.S. imports was about 7.5 percent annually over the past decade. A scarcity of high-quality hardwood timber and increased demand for hardwood plywood in the U.S., due to high growth in furniture manufacture and a big jump in housing construction, when combined with a relatively low price for imported plywood, will undoubtedly lead to continued rapid growth of imports in the future. The U.S. also steadily imports a small amount of high-quality, high-priced plywood from Canada and Europe. The price of plywoods imported from Canada and Europe is about twice that of hardwood plywood imported from the major exporting countries of Far East Asia. Because of special preferences of U.S. customers, the imports from advanced areas (Europe and Canada) are expected to be very stable in future

Table 11. U. S. Imports of Hardwood Plywood [a/] by Country of Origin, 1950-1971 [b/]. (In million square feet, surface measurement)

Year	Total	Canada	Latin America	Asia						Africa	Europe	China
				Total	Japan	Philippines	Taiwan	South Korea	Other Asia			
1950	63.3	50.0	6.3	5.4	5.1	.3	--- [d/]	---	---	---	1.5	---
1951	70.2	47.2	5.6	13.1	12.9	.1	---	---	0.1	0.4	3.8	---
1952	85.0	57.1	3.7	17.6	17.3	.1	0.1	---	---	0.6	6.0	---
1953	220.4	50.8	8.6	106.3	105.0	.5	0.4	---	0.4	3.6	51.0	---
1954	434.0	71.1	8.0	291.8	289.0	1.5	0.1	---	1.1	5.3	51.7	6.2
1955	627.6	99.3	8.9	439.1	428.6	9.8	0.1	---	0.7	10.9	62.5	6.9
1956	706.5	81.2	5.3	543.5	529.2	14.9	0.4	---	1.0	13.8	53.4	9.3
1957	846.4	64.4	9.2	717.6	679.8	33.2	3.4	---	1.2	11.0	40.4	3.9
1958	911.4	42.4	11.9	794.3	669.6	97.4	23.4	---	3.9	15.6	46.3	0.9
1959	1,330.2	60.2	32.1	1,083.0	810.9	213.6	37.3	0.4	20.8	25.8	125.1	4.0
1960	1,014.0	43.0	13.8	857.1	688.3	118.8	45.4	0.2	4.4	16.7	83.2	0.2
1961	1,097.4	42.1	17.7	962.0	660.5	153.4	108.6	15.9	23.7	14.6	58.6	2.4
1962	1,438.9	56.6	15.6	1,269.2	740.1	214.4	212.5	51.4	50.8	13.8	83.7	---
1963	1,620.7	71.9	18.8	1,428.4	739.8	246.7	273.0	120.3	48.6	9.1	92.5	---
1964	1,947.2	68.1	13.7	1,747.2	680.5	355.7	461.3	205.4	44.4	9.3	108.8	---
1965	2,132.9	64.5	10.9	1,932.3	768.0	307.8	468.2	336.7	51.7	6.8	118.3	---
1966	2,553.8	64.1	8.7	2,329.0	783.4	397.9	528.8	573.6	45.2	6.6	145.1	.2
1967	2,532.7	48.0	8.1	2,355.9	632.3	471.5	485.4	702.0	64.8	2.4	118.2	---
1968	3,841.2	53.0	12.1	3,619.1	921.3	602.2	829.6	1,167.2	98.8	1.0	156.0	---
1969	4,290.3	40.6	11.7	4,043.9	802.3	572.1	936.0	1,589.8	143.6	1.8	192.3	---
1970	4,168.2	24.9	10.3	3,996.3	623.6	570.9	939.6	1,787.3	75.0	0.5	136.1	0.1
1971 [c/]	5,182.3	45.9	13.8	4,995.1	599.8	593.3	1,397.4	2,252.4	152.3	---	127.4	---

a/ Includes mixed species

b/ Data may not add to totals because of rounding.

c/ Preliminary

d/ --- = Less than half of unit.

Source: U. S. Department of Commerce, Bureau of the Census, FT135.

consumption. The price of plywood imported from different countries is as follows: (U. S. D. A. Demand and Price Situation for Forest Products)

Year	Country				
	Japan	Philippines	Taiwan	South Korea	Canada and Europe
	(Dollars per thousand square feet (surface measurement))				
1950	59.50	124.00	--	--	109.20
1955	64.30	104.80	95.90	--	115.30
1960	72.90	66.80	35.30	52.30	94.70
1965	65.60	58.70	40.50	43.50	88.10
1970	80.50	42.10	39.10	41.60	92.50
1971	89.40	42.80	40.30	43.20	92.70

The price of hardwood plywood is highest for Europe in relation to the exporting countries. The price of hardwood plywood in South Korea, Taiwan, and the Philippines converged to about $40 per thousand square feet in surface measure and was fairly stable between 1960 and 1971. The price in Japan increased substantially from $59.50 per thousand square feet in 1950 to $89.40 per thousand square feet in 1971, an increase of 1.5 times. If the products of hardwood plywood produced in different countries are considered close substitutes, the country with the lowest price has a price

advantage in competing with other countries; hence, Taiwan, South Korea, and the Philippines have a competitive position in the U.S. market.

Comparative Economic Analysis

Log Price and Log Freight Rate

The cost of raw material accounted for more than 50 percent of the total cost of plywood production. Because of a rapid increase in demand for logs (Lauan logs), the price of logs has also increased substantially in Southeast Asia. The f.o.b. price of logs in the Philippines grew from 114.75 pesos [8/] per thousand board feet in 1950 to 329.61 pesos per thousand board feet in 1967, a 3-fold increase (Table 12). The average export price for logs in West Malaysia increased from 64M$ [9/] per ton of cubic feet in 1957 to 81M$ per ton of 50 cubic feet in 1968, a 1.3-fold increase (Table 13). The average f.o.b. log price in Sabah also increased substantially: 1.71M$ per cubic feet in 1954; 2.24M$ per cubic feet in 1968 (Table 14). The price of logs will tend to rise continuously in the future due to continued demand for logs in Japan, South Korea, and Taiwan.

8/ 3.90 pesos = 1 U.S. dollar.

9/ 3.03M$ = 1 U.S. dollar.

Table 12. Average f. o. b. Price of Philippine Lumber and Log Exports, 1950-1967. a/

Year	Lumber		Logs	
	Price (pesos b/ 1, 000 bd. ft.)	Index (1957=100)	Price (pesos/1, 000 bd. ft.)	Index (1957-100)
1950	221.60	90.66	114.75	65.45
1951	229.56	93.90	147.14	84.56
1952	212.76	87.05	139.54	80.20
1953	240.01	99.20	152.27	87.51
1954	223.13	91.29	142.04	81.63
1955	233.67	95.60	151.47	87.05
1956	251.54	102.91	183.07	105.21
1957	244.42	100.00	174.00	100.00
1958	220.04	90.03	167.13	96.05
1959	228.89	93.65	177.46	101.99
1960	272.73	111.58	198.06	113.83
1961	277.01	113.33	203.04	116.69
1962	272.59	111.53	232.10	133.39
1963	299.11	122.38	259.93	149.38
1964	328.01	134.20	280.10	160.98
1965	333.42	136.41	281.58	161.82
1966	346.36	141.71	282.29	162.24
1967	385.95	157.90	329.61	189.43

Source:

a/ Central Bank of the Philippines.

b/ 3.90 pesos = 1 U.S. dollar.

Table 13. Average Export Price of Logs and Sawn Timber in West Malaysia, 1957-1968. a/

Year	Logs		Sawn timber	
	Price (M$ b/ per ton of 50 cu. ft.)	Index 1957=100	Price (M$ per ton of 50 cu. ft.)	Index (1957=100)
1957	64	100	162	100
1958	60	94	157	97
1959	53	83	147	91
1960	56	88	183	112
1961	55	86	146	90
1962	56	88	156	96
1963	58	91	164	101
1964	54	84	184	114
1965	54	84	183	113
1966	56	88	162	100
1967	73	114	172	106
1968	81	127	182	115

Source:

a/ Office of the Commerce of Forests, State of Sabah

b/ M$ 3.03 = 1 U.S. dollar.

Transportation costs between Southeast Asia and East Asia decreased because of using cargo transport techniques (Table 15).

Transportation costs play an important role in trade. Take 1967 for example: Although the log price was only $8.2 per thousand board feet, the transport cost was $21.23 per thousand board feet shipped from the Philippines to Japan. Raw material countries, such as the Philippines, Malaysia and Indonesia, have a transport cost advantage for manufacturing hardwood plywood over Japan, South Korea, and Taiwan, which have to import logs to process into plywood.

Comparative Costs

It is difficult to compare the relative costs of production among countries. However, some examples of production costs will serve to indicate the relative competitive advantage of each country in world markets.

The composition of plywood production costs varies among different countries because of different endowments in each country. Mill capacity is relatively large in North America, 75, 000 cubic meters per year. Japan, Scandinavia, and continental Europe (B) have moderate capacities: 22, 500, 30, 000, and 22, 500 cubic meters per year, respectively. Mill capacities are relatively low in Southern Europe and Continental Europe (A): 6, 000 and 7, 500 cubic

Table 14. Average Log Price f.o.b., Sabah, 1954-1968. a/

Year	White Seragas		Red Seragas	
	Price M$ b/ per cu. ft.	Index (1957=100)	Price (M$ per cu. ft.	Index (1957=100)
1954	1.71	122	1.77	133
1955	1.90	136	1.63	122
1956	2.04	146	1.82	137
1957	1.40	100	1.33	100
1958	1.99	142	1.76	132
1959	1.52	109	1.54	116
1960	1.82	130	1.85	139
1961	1.62	116	1.71	129
1962	1.82	130	1.82	137
1963	1.92	137	1.92	144
1964	1.78	127	1.77	133
1965	1.88	134	1.89	142
1966	2.08	149	2.07	156
1967	2.29	164	2.29	172
1968	2.25	161	2.22	167

Source:

a/ Office of the Commerce of Forests, State of Sahah.

b/ M$ 3.03 = 1 U.S. dollar.

Table 15. Estimated Average Log Charter Rate from the Philippines to Japan, 1950-1968. a/

Year	Rate (U.S. $/1,000 bd. ft.)	Index (1957=100)
1950	15.25	61
1951	28.75	113
1952	19.80	78
1953	20.00	78
1954	17.80	70
1955	28.25	111
1956	32.04	126
1957	25.50	100
1958	13.58	53
1959	17.80	70
1960	17.25	70
1961	18.98	74
1962	19.38	76
1963	18.26	72
1964	18.92	74
1965	19.75	77
1966	20.87	82
1967	21.23	83
1968	21.23	83

Source:

a/ UNCTD, Level and Structure of Freight Rates, 1970.

meters per year, respectively (Table 16).

Wood and other raw materials comprised more than 60 percent of total production costs: continental Europe, 73.8 percent; southern Europe, 76 percent; Scandinavia, 64 percent; Japan, 81 percent; and North America, 59 percent (Table 16).

Labor cost varies among countries. Therefore, the proportion of labor cost to total production cost is also different: continental Europe, 18 percent; southern Europe, 16 percent; Japan, 13 percent; and North America, 38 percent (Table 16).

According to FAO's investigation, the absolute plywood production cost of typical firms in Japan and northwest U.S. is as follows:

Input	Country	
	Japan (1962)	Northwest U.S. (1960)
	(Cost: U.S. $ per cubic meter)	
Wood	48.50	24.50
Electric power and steam	4.90	1.60
Labor	11.60	20.30
Supplies and materials	16.50	6.70
Total	81.50	53.10

The firms in northwest America have a cost advantage in producing plywood. This is mainly due to the cost of raw material. Japan has

Table 16. Manufacturing Data and Costs of Plywood Production in Selected Areas.

Manufacturing data	Unit	Continental Europe (A)	Continental Europe (B)	Southern Europe	Scandinavia	Japan	Northwest America
Mill capacity	M^3/yr.	7,500	22,500	6,000	30,000	22,500	75,000
Plywood thickness	mm	5	5	7	5.5	4	11
Degree of mechanization		Low	High	Low	High	Average	High
Raw material		Okoume	Okoume	Beech	Birch	Lauan	Douglas-fir
Log diameter	cm	70	70	45	20	70	110
Log price at mill	US$/$M^3$	35	35		15	28	23
Yield	%	45	50	40	33	52	40
Labor	h/M^3	50	30		30	35	10
Wood and other raw materials	%	70	77.5	76	64	81	59
Power and steam	%	8	8.5	8	11	6	3
Labor	%	22	14	16	25	13	38
Total percentage		100	100	100	100	100	100

Source: FAO Plywood and Other Wood-Based Panels, 1963.
Estimate by FAO, no date specified.

to import Lauan logs from Southeast Asia with high costs of logs and transportation, whereas the U.S. uses relatively inexpensive, high-quality softwood, such as Douglas-fir, as raw material.

Relative production costs among the Far East exporting countries of Japan, South Korea, Taiwan and the Philippines indicated comparative positions from the highest to the lowest cost as follows: Japan, 100 percent; Taiwan, 83.4 percent; South Korea, 81 percent; and the Philippines, 66.2 percent (Table 17). This implies that the Philippines has the best cost advantage in producing and exporting hardwood plywood. Yet, production costs alone do not necessarily guarantee a country's actual exporting ability. Incidence of transportation cost, product differentiation and quality, and marketing activities are also major factors in determining a country's actual trade, which will be discussed in the following sections.

The relative cost of glue and other materials ranged from 14 percent in Japan to 16.5 percent in South Korea with small differences among these four countries. Labor cost in South Korea and Taiwan are about half that of Japan; the Philippines is about 1.5 times South Korea's. Cost of logs is much higher in Japan, South Korea, and Taiwan than in the Philippines because of transport costs and the relative efficiency of operation which results in different yield ratios. Other indirect costs are estimated as follows: Taiwan, 9.1 percent,

Table 17. Relative Costs of Exporting Plywood from Japan, South Korea, the Philippines, and Taiwan, 1968. (Index: Japan = 100)

Manufacturer's costs	Japan	South Korea	Philippines	Taiwan
Cost of log	66.0	52.3	34.1	53.1
Glue and other materials	14.0	16.5	16.3	15.9
Labor	11.0	5.0	7.0	5.3
Indirect costs, depreciation and overhead	9.0	7.4	8.8	9.1
Total direct cost	91.0	73.8	57.4	74.3
Total (Index)	100	91.2	66.2	83.4

Source: Japanese Plywood Association, World Plywood, 1968.

Japan, 9 percent, the Philippines, 8.8 percent; and South Korea, 7.4 percent.

Transportation Costs of Hardwood Plywood

Transportation costs play a very important role in determining trade patterns. Transportation costs for hardwood plywood accounted for more than one-third of total costs delivered to consuming areas. Take South Korea for example (Lin, 1971), the total production cost of hardwood plywood in South Korea was $39.70 per thousand square feet and the transportation cost from South Korea to the U.S. Atlantic Coast in 1968 was $30.00 per thousand square feet and to U.S.

Pacific Coast $22.00 per thousand square feet.

Based on discussion in Chapter III, the country with inelastic supply is more likely to bear the incidence of freight costs; South Korea, Taiwan, and the Philippines are subject to transportation costs because they have relatively small domestic markets as well as serious competition in foreign markets.

The freight rates from the Far East to North America did not change much over the last two decades. The average freight rate in 1960 for these four countries to the U.S. Pacific Coast was: Japan and South Korea, $24.00 per thousand square feet; Taiwan, $26.58 per thousand square feet; and the Philippines, $27.00 per thousand square feet. In 1968 the rate was: Japan and South Korea, $22.00 per thousand square feet; Taiwan, $21.75 per thousand square feet; and the Philippines, $26.50 per thousand square feet (Table 18). The rate for Far East Asia to the U.S. Atlantic Coast in 1968 was: Japan and South Korea, $31.00 per thousand square feet; Taiwan, $30.00 per thousand square feet; and the Philippines, $36.50 per thousand square feet (Table 19). Relatively, Taiwan has a favorable position, compared to the Philippines and South Korea. The Philippines is in the least favorable position with respect to transportation cost.

The supply of hardwood plywood for export in Japan is relatively elastic in comparison to South Korea, Taiwan and the Philippines,

Table 18. Evaluation of Plywood Freight Rates from Japan, South Korea, Taiwan, and the Philippines to U.S. Pacific Coast, 1957-1968. a/

Year	Japan and South Korea	Taiwan	Philippines
	(U.S. $/40 cu. ft. or 1,000 sq. ft.) b/		
1957	21.00	29.23	26.00
1958	21.00	29.23	26.00
1959	24.75	26.58	27.00
1960	24.75	26.58	27.00
1961	26.00	26.58	27.00
1962	20.00	28.23	23.00
1963	17.50	19.31	23.00
1964	18.25	19.31	23.00
1965	18.25	20.30	23.00
1966	19.50	20.30	24.00
1967	22.00	21.75	26.50
1968	22.00	21.75	26.50

Source:

a/ Washington, D.C., Federal Maritime.

b/ Or ton equivalent.

Table 19. Plywood Freight Rates from Japan, South Korea, Taiwan, and the Philippines to U.S. Atlantic and Gulf Coast, 1957-1958. a/

Year	Japan and South Korea	Taiwan	Philippines b/
	(U.S. $/40 cu. ft. or 1,000 sq. ft.)		
1957	31.00	42.19	34.00
1958	27.00	37.38	36.50
1959	31.00	37.38	36.50
1960	31.00	37.38	36.50
1961	27.00	37.38	36.50
1962	25.00	36.00	31.00
1963	25.00	27.90	31.00
1964	26.00	27.90	31.00
1965	28.00	27.33	31.00
1966	31.00	29.93	34.00
1967	29.50	28.75	34.00
1968	31.00	30.00	36.50

Source:

a/ Washington, D.C., Federal Maritime.

b/ Or ton equivalent.

for Japan has a large domestic market and a big potential for penetrating foreign markets. The freight rate is likely to be shared by Japan and foreign buyers; hence Japan bears relatively less transport cost in comparison to South Korea, Taiwan and the Philippines. This implies that Japan has a price advantage of exporting hardwood plywood relatively to South Korea, Taiwan, and the Philippines in world markets.

The freight rate did not change very much over the last 20 years from the Far East to Europe approximating $35 per thousand square feet (or ton).

Trend of Plywood Prices

Economic theory says that variations in the price of a good produced under competitive conditions are caused by factors that differ in intensity over time. In the short term, price variations are mainly caused by demand for and supply of a product. Excess supply will result in a falling price and increased demand in a rising price if the product is a normal one; the supply curve is positively sloped, and the demand curve is negatively sloped. In a short period of time, the main cause of price variations are demand factors such as changes in the number of houses under construction. In the long run, much emphasis is placed on the supply factors or the costs of production and availability of substitutes. In the long run, the price

of a good under a competitive market structure will converge to its average cost of production. Overall, plywood prices may vary because of changes in demand for the product, resource availability, productivity, and availability of substitutes over time.

Average f. o. b. prices of hardwood plywood in Japan, South Korea, Taiwan and the Philippines show some special characteristics. The f. o. b. price in Japan increased from $51.88 per thousand square feet in 1952 to $65.76 per thousand square feet in 1960, and $88.00 per thousand square feet in 1970. It ranged from $50.63 per thousand square feet to $41.55 per thousand square feet between 1960 and 1970 in Korea. A similar situation applies in Taiwan. The price of hardwood plywood decreased slowly from $52.63 per thousand square feet in 1952 to $40.53 per thousand square feet in 1965 and to $39.02 per thousand square feet in 1970. The price of hardwood plywood in the Philippines decreased substantially from $126.76 per thousand square feet in 1952 to $66.78 in 1960, to $58.70 in 1965, and $42.12 in 1970 (Table 20).

The f. o. b. prices of hardwood plywood of these three developing countries converged toward the same value because of strong competition in world markets. Ignoring transport costs, these three developing countries had a price advantage over Japan in exporting hardwood plywood to world markets after 1960.

It is more appropriate to use an index of hardwood plywood

Table 20. Average f. o. b. Price of Hardwood Plywood in Japan, South Korea, Taiwan, and the Philippines, 1952-1970.

Year	Japan[a, b]	South Korea[c]	Philippines[d]	Taiwan[e]
	(U.S. $/1,000 sq. ft. surface measure)			
1952	51.88		126.76	52.63
1953	60.65		235.09	61.22
1954	57.59		78.50	28.57
1955	59.71		104.76	98.76
1956	60.99		81.98	63.30
1957	62.34		68.83	38.10
1958	59.88		60.12	40.37
1959	66.76	54.30	68.94	48.33
1960	65.76	50.63	66.78	35.43
1961	63.20	43.39	55.78	43.34
1962	70.12	50.32	67.79	47.61
1963	72.30	46.40	62.49	39.95
1964	70.57	45.87	60.63	41.73
1965	62.64	43.61	58.70	40.53
1966	72.77	43.92	56.19	41.22
1967	75.83	42.93	50.08	40.11
1968	71.99	45.84	49.81	41.45
1969	70.00	45.81	53.12	39.09
1970	79.70	41.55	42.12	39.02
1971	88.00			

Source: Compiled from:

a/ Japanese Plywood Association, World Plywood, Japan, 1968.

b/ Japan, Lumber Journal, series.

c/ Statistic Division, Economic Planning Board, Republic of Korea.

d/ Philippine Lumber Producers' Association, Inc., Manila, Philippines.

e/ Economic Administration, Year Book of Export and Import Statistics, Republic of China.

prices relative to all commodity prices as an indicator for price trend analysis. In general, if an industry is very competitive in a market and many substitues are available, the relative price index of the industry tends toward unity over time. However, the objective of this discussion is placed on the relative price indexes between exporting countries in world markets. Input conditions change in every country over time. Given existing conditions, a nation can increase its market share in world markets either by lowering the selling price index of a product and keeping quality constant, or by raising the quality of the product.

Relative plywood price indexes for Japan, South Korea, Taiwan, and the Philippines in world markets are given in Table 21. Japan's relative price index increased from about 0.5 to 1.97 during the period 1952-1970. The Philippines' relative price first decreased from 1952 to 1959, increased to some extent up to 1962, and remained fairly constant from 1962 to 1970. The relative price in Taiwan fluctuated before 1957 and remained fairly constant after 1961. South Korea's price index was very stable throughout the period 1959 to 1970, as shown in Table 21 and Figure 12.

As discussed in the beginning of this chapter, hardwood plywood reached its mature stage around 1950. According to the product-cycle theory discussed in Chapter II, production cost tends toward a constant when a product reaches its mature standard stage.

Table 21. Relative Prices (c. i. f.) of Plywood in the Far East Exporting Countries, 1952-1970.

Year	Japan	South Korea	Philippines	Taiwan
1952	0.67		2.09	0.86
1953	0.41		2.59	0.93
1954	0.76		1.35	0.50
1955	0.59		1.61	1.56
1956	0.79		1.23	1.03
1957	0.99		1.00	0.58
1958	1.17		0.83	0.61
1959	1.11	0.76	0.78	0.66
1960	1.25	0.72	0.86	0.49
1961	1.32	0.70	0.82	0.67
1962	1.27	0.75	0.96	0.67
1963	1.50	0.71	0.92	0.58
1964	1.52	0.74	0.99	0.63
1965	1.40	0.77	1.11	0.69
1966	1.54	0.75	1.02	0.70
1967	1.71	0.75	0.89	0.71
1968	1.56	0.83	0.97	0.75
1969	1.91	0.77	1.02	0.67
1970	1.97	0.80	0.95	0.78

This implies that the relative price index is also constant. At this stage of production, in order to increase, or at least to maintain, its share in world markets, an innovating country tends to improve product quality, and therefore to get a higher price. This is apparently shown in Figure 12. The comparative advantage shifted to the developing countries in the 1960's; they started exporting standard products to world markets in competition with Japan.

Japan exported higher-quality, higher-priced plywood and simultaneously began importing lower-quality, lower-priced

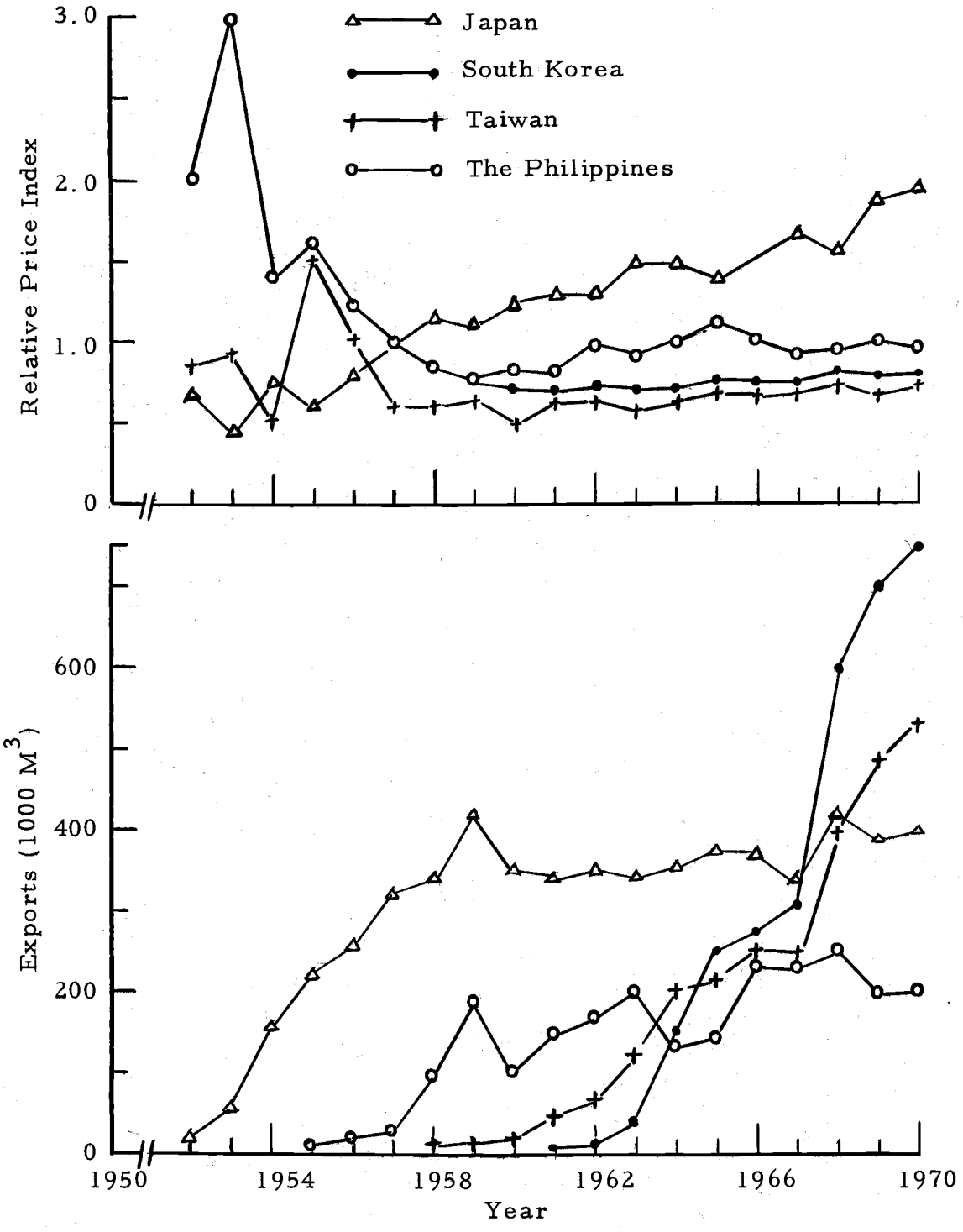

Figure 12. Relationships Between Relative Price Index and Export of Hardwood Plywood for the Four Exporting Countries, 1952-1970.

plywood in order to meet her increased domestic demand. From Figure 12, a conclusion can be drawn that the levels of economic development in South Korea, Taiwan and the Philippines are almost the same; therefore the products produced by these countries are very close substitutes. If those products are good substitutes, the country exporting the lower-priced products will have a competitive advantage. South Korea and Taiwan have relatively lower price indexes, therefore, their export volumes increased relative to Japan and the Philippines. On the other hand, Japan, with its potential in product differentiation, was able to retain its trade share in world markets even though her relative price nearly doubled from 1956 to 1970.

From these trade phenomena, one important conclusion is that an increase in relative price in world markets will not necessarily result in a decreasing export potential. As a result, the international price mechanism cannot be heavily relied on for trade flow adjustment purposes.

Product Differentiation

The trade pattern of hardwood plywood for Japan in relation to other Asian developing countries is one of technological trade, reached sometime before 1960 when hardwood plywood entered its mature stage. Consequently, the comparative advantage shifted

from Japan to the developing countries. In order to meet increased demand of her domestic market and to increase, or at least maintain, her foreign market share, Japan has had to make a big effort toward product differentiation as discussed previously. Her producers have developed highly processed products of hardwood plywood, such as so-called "fancy and semi-fancy" plywood, made of a 0.3-0.8mm sliced face veneer laminated to a base panel. The face veneer is specially selected to display the beautiful natural figure of wood grain and tone. Additional types of product differentiation include printed and plastic overlays laminated to plywood. In order to meet the increased demand for these highly differentiated secondary products, Japan with her well organized marketing network has been able to purchase the most desirable species from foreign sources. Besides, Japan has also improved the quality of plywood products by developing better glues and manufacturing processes for producing fire-retardant and water-resistant products as well as those that resist checking. Japan possesses ample scientific inputs which enable her to develop these high quality products and maintain her market share in the world. In addition to these facts, Japan during the past decade has improved her production facilities to achieve a 30 percent increase in efficiency in using raw materials, because of the rising prices of overseas logs and a shortage of raw materials at hom, as discussed in previous sections.

Because of product differentiation and competition in the world market, the composition of Japanese hardwood plywood exports has also changed: Lauan plywood decreased substantially from 933 million square meters in 1959 to 152 million square meters in 1971; secondary processed plywood increased rapidly from 164 million square meters in 1964 to 398 million square meters in 1971, a 2.5-fold growth within seven years; and Japanese hardwood plywood grew from 212 million square meters in 1959, the peak year of export, to 330 million square meters in 1971. In spite of a substantial rise in the f.o.b. price of Japanese hardwood plywood, the total export value increased from 27.515 million yen in 1959, the peak year of export to 38,074 million yen in 1971, a 1.3-fold growth (Figures 13 and 14 and Table 22).

According to the quality differentiation and demand structure theory, demand potential for mature products in world markets is likely to be large. The big increase in demand for hardwood plywood in Japan is mainly the increase in consumption of standard Lauan plywood; hence Japan has increased imports of mature products from overseas. Alternatively, Japan has increased her imports of standard hardwood plywood, because the Lauan plywood imported from developing countries and the hardwood plywood produced in Japan are considered to be close substitutes; therefore, Japan can import the standard product more cheaply than that produced

Table 22. Quantity and Value of Plywood Exports from Japan by Type, 1956-1971.

Year	Quantity (million M^2)				Value (million yen)			
	Lauan	Hard-wood	Secondary	Total	Lauan	Hard-wood	Secondary	Total
1956	569	142		701	10,315	5,075		15,390
1957	701	174		883	13,258	6,558		19,816
1958	750	177		927	13,615	6,372		19,988
1959	933	212		1,145	19,181	8,335		27,515
1960	739	213		952	18,606	8,925		22,530
1961	729	199		928	18,971	7,146		21,118
1962	729	235		964	15,232	9,095		24,327
1963	626	293		920	12,031	11,796		23,934
1964	538	271	161	969	8,742	10,796	5,103	24,631
1965	567	270	201	1,089	8,240	9,032	6,150	23,422
1966	480	273	262	1,015	7,310	10,120	9,172	26,602
1967	368	291	248	907	5,892	10,365	8,504	24,761
1968	482	365	296	1,143	7,946	14,485	11,057	33,489
1969	333	366	359	1,058	5,392	14,463	13,535	33,389
1970	325	328	315	867	4,067	11,197	11,582	25,946
1971	152	330	398	881	2,743	12,903	14,428	30,074

Source: Japan Lumber Journal, December 15, 1972, p. 15.

domestically (Table 3). Simultaneously, Japan exports high quality, high priced products to other countries. Intra-industry trade explains this phenomena.

Marketing Factors

Empirical studies (Bain, 1956) have shown the effects of differences in marketing factors, such as product differentiation,

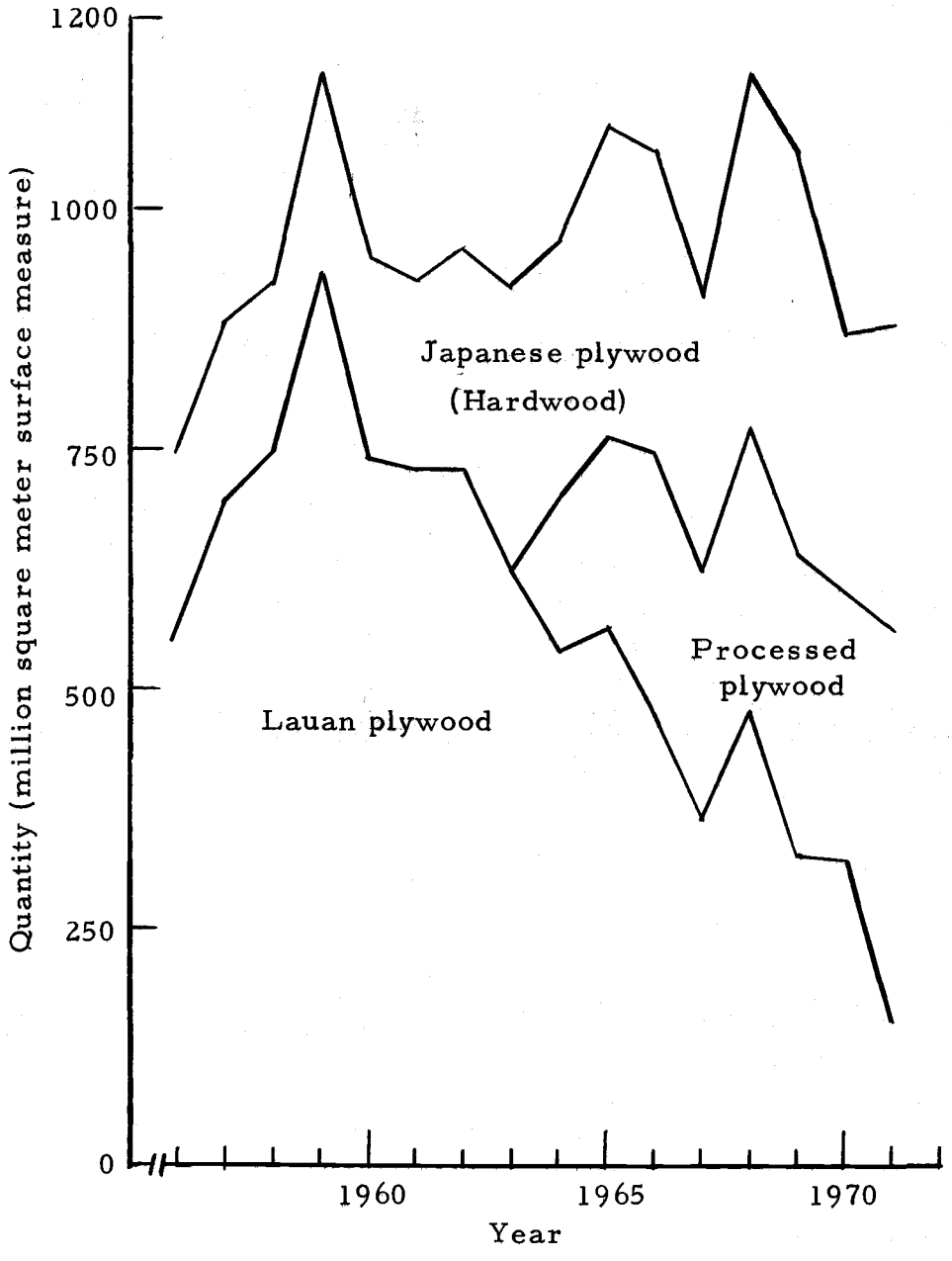

Figure 13. Composition Changes in Hardwood Plywood Exports from Japan by Type.

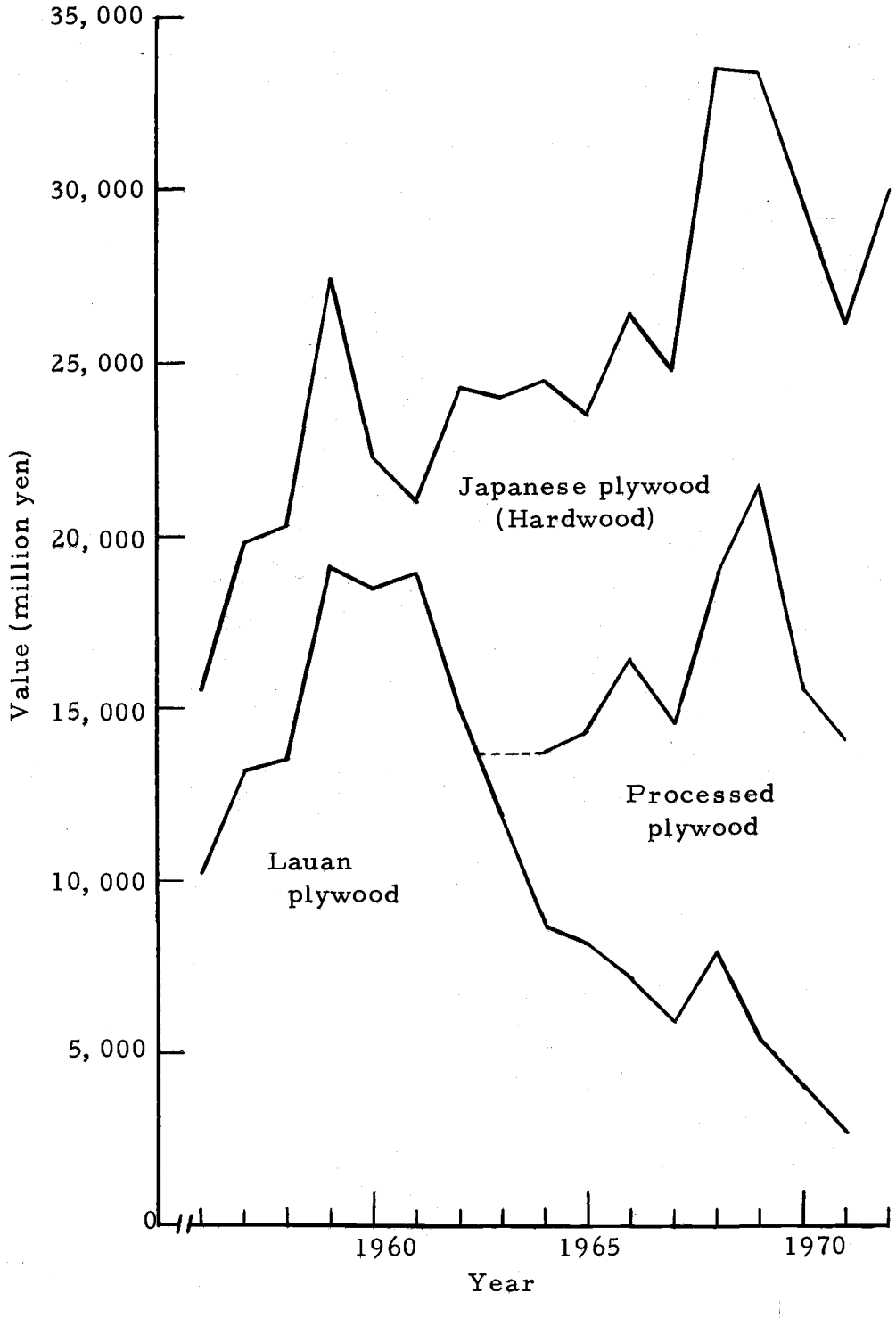

Figure 14. Composition Changes in Hardwood Plywood Export Value in Japan by Type.

promotional levels, service requirements, and captive distribution channels, on export performance and potential from developing countries. J. Torre pointed out:

> . . . Market knowledge and marketing skills are necessary conditions for exploiting exports to a degree that varies with the marketing characteristics of the products. The lower performance of domestic firms in exporting highly differentiated products, as opposed to exporting products with negligible marketing entry barriers, has been attributed to the fact that the requisite marketing skills and knowledge seem to be relatively scarce resources in developing countries. (Torre, 1970).

However, in this study, some trade evidence on hardwood plywood exports from Japan, South Korea, Taiwan and the Philippines shows the importance of marketing factors on exporting performance.

It is clear that foreign markets are very important to these developing export-oriented countries in the Far East, as discussed earlier, for the proportion of plywood production exported is above 99 percent for Taiwan, 86 percent for South Korea, and 60 percent for the Philippines, as of 1969. The development of the plywood industry in these countries depends on the demand for the products in world markets.

Substantial increases in both capacity and production have occurred in the hardwood plywood industry in South Korea and the Philippines to meet the demand in foreign markets. South Korea started exporting plywood about 1959, when the world market was

dominated by Japan, the Philippines and Taiwan, but production was mainly for domestic consumption. After 1963, the expansion of production in South Korea was for export. In the mature stage of production, there exists a well-established market throughout the whole world, which enables a country to penetrate foreign markets more readily and compete with other producing countries, as discussed in Part I. South Korea, a developing country with a relatively poor marketing network throughout the world, could easily export her products to compete with other existing countries. As shown in Table 23, South Korea was able to use her production potential up to 99 percent, for there was a big demand for her products even though production capacity increased almost 100 times from 1960 to 1969.

The Philippines is also considered to be a country with relatively poor foreign marketing activities. Theoretically, the optimal-size plant could be built in the Philippines, according to the product-cycle theory. She has to compete with Japan, which has a well-organized competitive position, as well as to compete with Taiwan and South Korea. They, in turn, were in price-advantageous positions. Therefore, the demand for the Philippines' product is limited. As a result, the Philippines has never fully utilized her production potential in manufacturing plywood. Capacity utilization percentages ranged from 87.5 to 50.0 from 1960 to 1967 (Table 23).

Table 23. Capacity and Production of Plywood in South Korea and the Philippines, 1960-1969. (In million square feet)

Year	Philippines [a] (surface measure)					South Korea [b] (1/8" basis)				
	Capacity (A)	Output (B)	Export	No. of plants	Utilization ratio (B/A)	Capacity (C)	Output (D)	Export	No. of plants	Utilization ratio (D/C)
1960	480.0	324.0	178.3	14	67.5	300.0	186.9	19.0	5	62.3
1961	474.8	260.3	111.6	10	54.8	300.0	166.3	50.0	5	55.4
1962	575.6	316.7	144.7	18	55.0	210.0	283.8	73.0	5	77.0
1963	740.0	400.3	194.5	22	54.1	420.0	335.2	186.3	6	79.8
1964	854.7	470.2	301.7	21	55.0	600.0	501.5	352.6	6	83.6
1965	971.7	597.4	323.4	21	61.5	850.0	729.2	574.9	6	85.8
1966	1,094.8	733.3	353.9	22	50.0	1,200.0	1,198.2	931.5	6	99.8
1967	1,059.5	661.2	362.5	24	58.2	1,500.0	1,490.4	1,131.9	7	99.4
1968	--- [c]	695.0	429.9	---	---	2,520.0	2,383.9	1,762.5	7	94.6
1969	---	523.9	330.5	---	---	2,673.0	2,209.4	1,937.3	10	60.2

Source:

[a] Bureau of Forestry and Board of Industry, Manila, Phillipines.

[b] Plywood Association, Republic of Korea.

[c] --- = Not available.

Discussion in this section leads to the following conclusions:

i) At the mature stage of production, a country with price (or cost) advantages can attain its optimum economic scale of production.

ii) With economic scale and price advantages (which are mutually beneficial) a country even without a well-organized marketing network can maintain a competitive position in the world market. This implies that South Korea and Taiwan have price competitive positions in producing and exporting mature products of hardwood plywood, both presently and in the near future.

Prospective Changes in Interregional Relationships Resulting from Increasing Competition for Foreign Markets

Because of its disadvantaged position for hardwood plywood in world markets, as discussed previously, the Philippine Government introduced restrictions on log exports as shown below, mainly to Japan, South Korea, and Taiwan, beginning in 1967, in order to protext its own industry and enable it to compete with other exporting countries, mainly South Korea and Taiwan:

	Home consumption	Export
	Percent	
First year, 1967	10	90
Second year, 1968	20	80
Third year, 1969	30	70
Fourth year, 1970	40	60
Fifth year, 1971, and thereafter	60	40

As a main importing country, Japan's reaction to the Philippine Government's restriction was aggressive, for more than half of Japan's imports of hardwood logs were supplied by the Philippines. In order to seek a long-run sustained supply of logs, Japan in 1967 began shifting her raw material source from the Philippines to West Malaysia and Indonesia, which are endowed with an abundant timber resource, as discussed previously (Table 5). In addition to this, Japan also made an effort to import logs from Latin America and Australia, where the supply potential is relatively low compared with South Asia. South Korea and Taiwan followed Japan's path to exploit raw material from Malaysia and Indonesia. Consequently, the log market share of the Philippines in relation to the total log exports of Southeast Asia decreased from 61 percent in 1960 to 38 percent in 1969.

Malaysia has also developed her hardwood plywood industry rapidly since 1966. The development of production and export of

hardwood plywood in West Malaysia was as follows: (UN, FAO, 1970)

Year	Production (1,000 sq. ft.; 5 mm basis)	Export
1960	4,586	300
1961	6,379	898
1962	11,437	2,424
1963	15,938	4,871
1964	26,912	13,749
1965	59,917	8,378
1966	116,662	29,010
1967	123,076	66,617
1968	218,220	130,096
1969	323,700	240,000 10/

From 1960 to 1969, production of hardwood plywood in West Malaysia increased 70-fold and exports about 80-fold. This implies that world markets for hardwood plywood will become more and more competitive as those raw-material-endowed countries, such as Indonesia and West Malaysia, develop their own industries (Indonesia has installed production facilities recently, also).

In the short run, South Korea, Taiwan, and even Japan, have solved their log supply problems and dominated world markets. In the long run, these developing countries--the Philippines, West

---

10/ Estimated.

Malaysia, and Indonesia--have a comparative advantage in producing and exporting hardwood plywood. According to FAO's investigation, the log supply will be enough to meet the rapid increase in demand in the near future; hence, South Korea and Taiwan with their cheap skilled labor will still have a comparative position in exporting plywood and dominating the world market. South Korea, Taiwan, the Philippines, Malaysia and Indonesia will benefit from producing standardized products in the near future, instead of producing high-quality, high-priced differentiated products, due to the lack of scientific and engineering inputs in these countries.

Finally, conclusions of this chapter are drawn as follows:

i) Plywood manufacture requires relatively large amounts of labor inputs and raw materials, therefore, the Philippines, Malaysia and Indonesia should be able to achieve a competitive position in manufacturing and exporting mature hardwood plywood in the near future for they have ample resources.

ii) South Korea and Taiwan, with the advantage of abundant cheap labor, will still dominate world markets for producing and exporting standard mature products of hardwood plywood before the plywood industry is fully developed in the Southeast Asia raw-material-endowed countries. In spite of Philippines restrictions on log supply, in the short run, South Korea and Taiwan will be able to obtain their supply from Malaysia and Indonesia and still be in a

competitive position for producing standard products of hardwood plywood for export.

iii) Although Japan has differentiated her hardwood plywood production, her relative share of world markets either in value or in volume will decrease in the near future because the comparative cost advantage shifted to the developing countries when plywood entered its mature stage, and Japan has experienced a substantial increase in demand for plywood domestically.

iv) Prices of mature products of hardwood plywood will tend to rise in the future because of quality differentiation. In spite of a rise in the price of hardwood plywood, the producing countries will still enjoy their large share in world markets, for their supply capacity is relatively smaller than the demand potential in advanced countries, particularly in the U.S., and the price of hardwood plywood in Far East Asia is relatively low in comparison to that in the U.S.

v) In order to meet the big increase in domestic demand, Japan will import substantial amounts of standard products of hardwood plywood from these low-cost developing countries--as a result of intra-industry trade.

vi) In the long run, processed products are considered more important in raw-material-endowed developing countries;

therefore, a permanent forest estate of adequate size to sustain a long-run supply for its industry is desired by each country.

VII ECONOMETRIC ANALYSIS OF HARDWOOD PLYWOOD IN THE INTERNATIONAL TRADE OF THE FAR EAST EXPORTING COUNTRIES

Broadly speaking, plywood (hardwood and softwood) has great potential in usage. It can be used for construction of walls, ceilings and floors. It also can be used for furniture manufacturing, such as household, hi-fi, TV and stereo, and many other items such as shoe heels, guitar backs, bowling alley gutters, water skis, toys, gun stocks, and luggage stock. The major usage is in construction. Plywood satisfies consumers' wants indirectly; therefore, plywood is usually referred to as a producer or unfinished good. The demand for plywood is considered as a derived demand for it is related to the demand for another commodity, such as a house, to satisfy a consumer's want.

The demand for plywood, like demand for a consumer good, is a schedule showing the quantities that buyers are willing to purchase at any of a series of prices under the assumption that other factors which influence a consumer's behavior are held constant. In a static sense, these factors include substitutes for plywood, the demand for the final product, the supply of other productive services, and the fraction represented by plywood in the total cost of the final product. In a dynamic sense, demand for plywood may increase or decrease depending upon the growth of the economy, the growth of

population, and the levels of substitution of new or existing substitutes.

The purpose of this chapter is to discuss import-export demand relationships; more specifically, the specifications of import-export functions, including selection of appropriate dependent and independent variables and the functional form for statistical fitting. An hypothesis regarding the direction of trade of differentiated products within or among countries is tested. It states that a relatively larger proportion of high-quality, high-priced product tends to be exported to that market where transport cost is highest. The final objective is the application of the import-export functions and the hypothesis for analyzing and predicting trade relationships quantitatively.

Specification of Import and Export Functions

Determinants of Imports and Specification of Import Functions

There are numerous factors, such as economic activity related to a commodity, domestic prices and capacity, foreign prices and product availabilities acting separately or jointly interacting, that determine an import function of a commodity. This study tries to use the most important factors to explain imports and yield good predictions. This statistical study is based on the assumption that market relationships between the level of imports and some explanatory variables on the demand side will hold consistently throughout

the data period. The central issue here is the specification of the import demand relationship in a form most suitable for statistical fitting.

The Dependent Variable. From a previous discussion of market structure of the hardwood plywood industry in the Far East, it is apparent that a country's import demand for a product is determined by that country's economic development level and the prices of imported products and of domestic products and other related substitutes. The theory of demand suggests that quantity is the appropriate dependent variable.

Independent or Explanatory Variables. Based on demand theory, a consumer allocates his income among consumable commodities in order to get maximum satisfaction. The quantity of imports of raw materials and unfinished goods purchased by one country will depend upon its level of production, the price of imports, and the price of alternative domestic substitutes. Imports of hardwood plywood are considered close substitutes for domestic plywood. Therefore, the average prices of imported hardwood plywood and domestic plywood are relevant to the import function. Further, assume that the substitution of plywood for other materials remains constant in the short term. The final functional form is simplified as

$$X = f(M, PI, PD)$$

where X is total quantity of hardwood plywood imported,

M is national income (or level of production),

PI is the price of imports, and

PD is the price of domestic plywood.

If import quantity and industrial production are expressed an an index and a relative plywood price is obtained by dividing the import price by the domestic price, the above equation becomes:

$$X = g(IP, RP)$$

where IP is the index of industrial production, and

RP is the relative plywood price index.

A fuller elaboration of this function is made in the following section.

Import Demand Factors--The Normal Trade Case. Industrial production (or GNP in real terms) is related to any kind of economic activity in a country as a whole and is considered as an aggregate indicator (or independent variable) to reflect levels of consumption. A higher gross national product indicates a higher national total income. Different levels of economic activities, which include different levels of investment and consumption, will bring about different levels of gross national product (or of income and industrial production). Alternatively, changes in IP are attributed to changes in investment.

Based on the discussion in Part I, demand for products changes over time. Many factors cause changes in consumption of products during the stages of development of an industry. These changes in

demand for hardwood plywood include changes in technology, changes in consumers' tastes and preferences, and changes in economic activities, such as changes in construction and furniture manufacture.

Even with a comparative advantage in producing and exporting products of an industry, a country tends to import some products of the same industry from other countries, for reasons discussed in Part I. In this case, changes in demand for plywood (the normal trade case) may be safely hypothesized as changes in economic activities and changes in tastes and preferences of the importing country, which is in a competitive position in world markets (including the domestic market). In this case usually, the import quantity is relatively small in comparison with consumption of domestic products. Imported products usually are high priced and of special quality. Price, therefore, might not be relevant to the consumer. IP will reflect the total result of changes in economic activities and tastes.

Other Import-Determing Factors--Technological Gap Trade Case. In addition to factors influencing changes in demand for imports, discussed in the previous section, other factors such as changes in technology, changes in factor endowments, and changes in quality are also important in determining a country's level of imports. These factors can be classified as domestic supply factors,

foreign supply factors, and trade barriers.

In the case of technological gap trade, production cost changes over time in response to different situations. A country may increase its imports because it lost its competitive position in producing and exporting; or a country may decrease its imports because of changes in its competitive position in world markets. These changes in domestic and foreign supply are classified as the technological gap trade factors discussed in Part I.

Other changes in duties, transportation costs, and other applicable price-barriers are usually related to the movement of imports. However, some nonprice factors may also be important to imports, such as export incentives in exporting countries, market organization for sales promotion and port facilities for loading and unloading in exporting and importing countries.

Usually these factors influencing a country's imports are difficult to measure individually. In addition to this, imported products include all the products of different quality made in different countries. For practical reasons, such as to predict import potential and balance of payments and trade relationships among many countries, the total effects of these factors are hypothesized to be summed up and expressed as relative price and economic growth effects. Relative price is the ratio of total weighted import prices to domestic prices (or price indexes) and serves as an indicator to

the importing country for evaluating its chance of consuming imports relative to domestic products. More specifically, relative price will reflect the substitution effect as well as the income effect. Economic growth is represented by the levels of industrial production or by changes in levels of industrial production. If an index is used, the industrial production index and its changes will reflect dynamic forces that affect a nation's import potential.

Basic Import Function and Definition of Variables

Based on the previous discussion, a country's total import function can be constructed as below:

$$\bar{X}._{jt} = A_0 + A_1(IP)_{jt} + A_2(RP)_{jt} + A_3(RP)_{jt}^2 + \mu$$

where

$\bar{X}._{jt} = \frac{X._{jt}}{X._{jk}} \times 100$ is total import volume index of plywood in country j, based on the year k, i.e., $\bar{X}._{jk} = 100$;

$X._{jt}$ is total imported plywood volume of country j at time t;

$(IP)_{jt}$ is the industrial production index in country j at time t;

$(RP)_{jt}$ is a relative price index ratio of weighted import prices (or price indexes) of hardwood plywood and prices (or price indexes) of domestic plywood, and is equal to

$$\frac{\sum_{i \neq j} \frac{X_{ij} P_j^i}{X_{ij}}}{P_j^d}$$

where

X_{ij} is volume of plywood of country i exported to countryj;

P_j^d is price index of domestic plywood produced in country j;

P_j^i is price index (c. i. f.) of plywood of country i imported by country j;

A's are coefficients; and

μ is the error term.

Basic Export Function and Definition of Variables

The basic form of exporting function is hypothesized as

$$S \equiv \frac{q}{Q} = f(\frac{p}{P})$$

where

S is export share of the focus country;

q and Q are total exports of the focus country and the world, respectively;

p and P are the prices of the good of the focus country and of the world, respectively.

Further, the function can be written as

$$q = Q \cdot f(\frac{p}{P}) = g(Q, RP)$$

This implies that a nation's total export is a function of world total export and of that nation's price relative to that of the world. If indexes are used, the function can be written:

$$\bar{q} = g(\bar{Q}, \overline{RP}).$$

where $\bar{q}$ is a nation's export index;

$\bar{Q}$ is an index of total world exports;

$\overline{RP}$ is a relative price index of the focus nation to that of the world.

The growth of total exports reflects an overall dynamic effect of world demand for exports from the importers' point of view. Supply factors, such as level of development of an industry, factor endowment, and marketing activities, are appropriate for including in the exporting function. Actually these are nonprice factors which are difficult to measure quantitatively. Therefore a time trend is used to indicate a nation's stages of industry development and changes in marketing activities.

Marketing and production skills are a function of time, and production costs will decrease gradually. Usually a decrease in relative or absolute price will cause an increase in exporting performance.

Overall, the exporting function is specified as follows:

$$Y_i = b_o + b_1 S_t + b_2(CP)_{it} + b_3(TR)_t + b_4 T + b_5 T^2 + \mu$$

where

Y_i is nation i's estimated export index;

S_t is world total export index in year t, base year k; $S_t = \frac{\bar{S}_t}{\bar{S}_k}$;

$$S_{it} = \frac{\sum_{j}^{m} X_{ijt}}{\sum_{i}^{n} \sum_{j}^{m} X_{ijt}} ;$$

X_{ijt} represents quantity exported by nation i to nation j in year t;

$(CP)_{it}$ is relative price index of country i in year t, base and equals $\frac{\overline{CP}_{it}}{\overline{CP}_{ik}}$ 100;

$$\overline{CP}_{it} = \sum_{j \neq i} \frac{X_{ij}}{X_{i.}} \left[\frac{P_{ij}}{\sum_{A \neq i, j} \frac{X_{Aj}}{\sum_{A \neq i, j} X_{Aj}} P_{Aj}} \right]$$

P_{ij} is export price (c. i. f.) of country i in market j;

$(TR)_{it}$ is weighted average transport cost index of country i, in year t, base year k;

b's are coefficients;

μ is error term.

Clarification of the Importing and Exporting Equations

Theoretically a sophisticated model can be built to measure those factors affecting a nation's importing and exporting behavior in intra-industry trade as discussed in Part I and in the previous sections. Because of lack of data and the statistical difficulty in estimating unbiased equations (Leamer and Stern, 1970), a simple model including major factors (independent variables) was constructed to estimate each country's exporting and importing performance.

Absolute values of variables instead of quantity indexes are more appropriate for trade flow analyses. However, indexes were used due to limitations of data and difficulties in obtaining consistent quantity values among countries in this study.

With respect to the choice of functional form, simple additive and log additive linear forms were tested. A simple additive form was considered to be more suitable for fitting the available data.

The exporting and the importing equations estimated might be considerably biased for the reasons discussed above; therefore, the structural estimated functions were regarded as simulated functions. The application of these functions for forecasting is limited to short-run purposes only.

Confidence limits for the fitted equations were calculated based on the standard error of estimate which is smaller than the root mean

squared error of forecast values (Dhrymes, et al., 1972). This implies that the confidence limits are smaller than expected values based on the estimate standard error of the forecast.

Empirical Importing and Exporting Functions

Having chosen function forms for analyzing and predicting the trade flow pattern, the ordinary least squares regression analysis is well suited for use with the time series data which were available.

The objective of this study is to analyze the trade patterns of the plywood industry in the Far East exporting countries of Japan, South Korea, Taiwan, and the Philippines. The main importing country is the U.S. as discussed in the previous chapter. Based on the intra-industry trade phenomena, each country has an export function and an import function. Due to lack of data only one import function for the U.S. and four exporting functions for Japan, South Korea, Taiwan, and the Philippines were obtained.

Importing Function

U.S.

$$Y = \underset{(3.06)}{418.93} + \underset{(6.19)^{**}}{1.7029\,(IP)} - \underset{(-3.80)^{**}}{7.5632\,(RP)} + \underset{(3.38)^{**}}{0.027737\,(RP)^2}$$

$R^2 = 0.9700$

Durbin-Watson statistic = 1.90
Values in parentheses are calculated "t" values.
** indicates significant at the 99% level.

Three variables are significant at the 99% probability level. The computed D-W statistic is 1.90 which is greater than the upper limit of the table value. Therefore, the hypothesis of serial correlation is rejected. From 1951 to 1970, the relative price index decreased from 129.54 to 87.94 percent and the IP increased from 56.45 to 116.80 and total imports increased from 3.09 percent (actual) in 1951 to 183.94 percent in 1970 (1964-66=100). This can be interpreted by the intra-industry theory. A comparative advantage has shifted from the U.S. to the Far East exporting countries since 1950 because of lack of good quality hardwood resources in the U.S. Around 1950, the production technology for producing plywood had been fully established. Countries such as Japan, South Korea, Taiwan and the Philippines have an advantage in producing and exporting hardwood plywood because labor costs are relatively cheap in these countries compared to the U.S. Actual and estimated imports of hardwood plywood into the U.S. were illustrated in Figure 15.

Further, if it is assumed that the U.S. annual rate of growth in industrial production will continue to be four percent and the relative price index will decrease at a constant annual rate of two percent, then predicted index levels of hardwood plywood imports into the U.S. up to 1975 were calculated as follows:

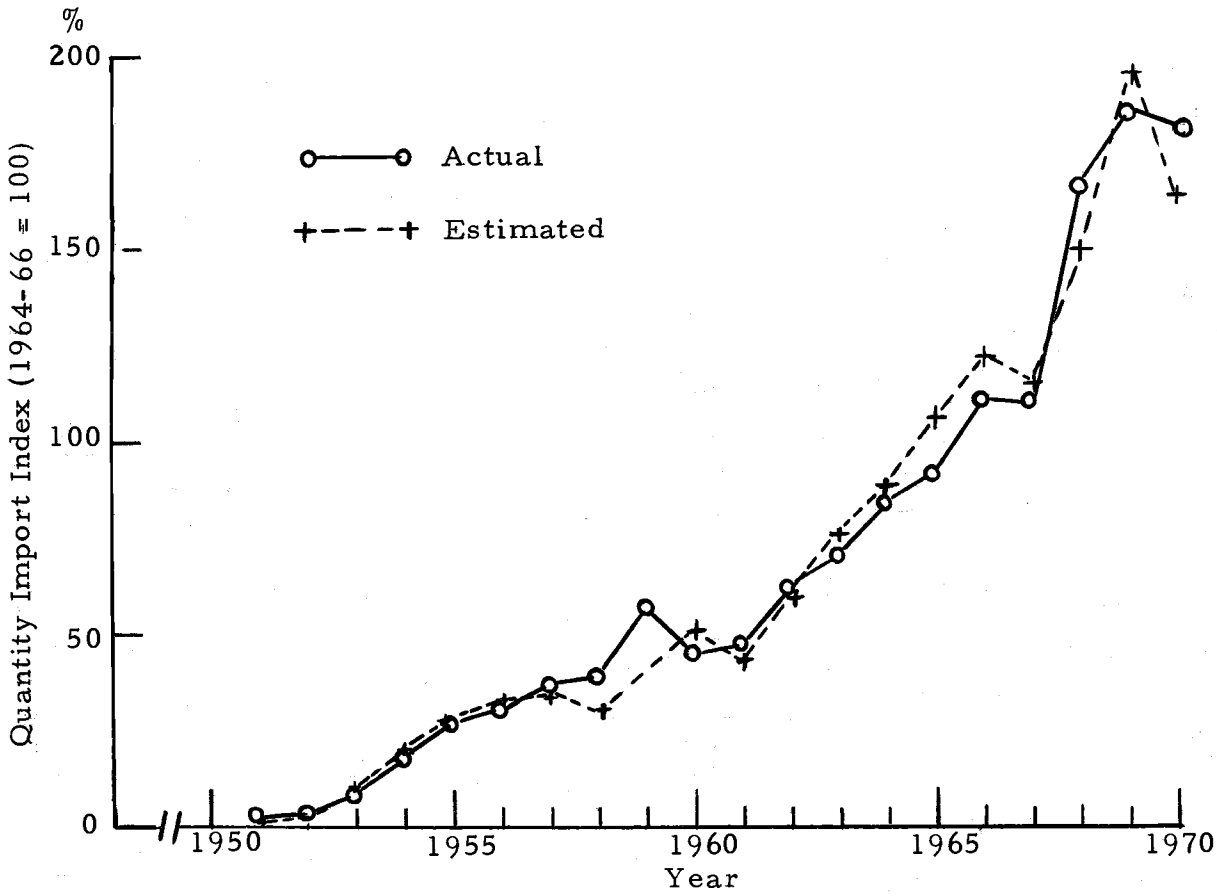

Figure 15. Actual vs. Estimated Imports of Hardwood Plywood in the USA.

Year	Predicted index volume of U.S. imports (1964-66=100)	Confidence limits 95%
1971	202.55	173.94 - 231.16
1972	215.72	186.06 - 245.39
1973	229.12	198.23 - 260.01
1974	242.74	210.45 - 275.02
1975	256.58	222.72 - 290.43

Exporting Functions

Because of the characteristics of trade patterns in Far East Asia, the calculation of relative price and total exports are based on the quantity exported by Japan, South Korea, Taiwan and the Philippines only. Export functions for these countries are shown in Table 24.

The high overall multiple correlation coefficient (R^2) implies that proportion of total variation of the mean is well explained by the regression. A low relationship between exports and price implies that other nonprice factors play an important role in exporting performance. Actually the variations in price index for each country are relatively small, except for Japan. The relatively high calculated Durbin-Watson values imply that the hypothesis of positive autocorrelation in time series is rejected.

Table 24. Structural Plywood Exporting Functions for the Far East Asia Exporting Countries.

$$Y = aK + bX = c\ TR + d\ RP + e\ T + f\ T^2$$

Estimated		Constant	Total Regional Growth of Export	Transport Cost Index	Relative Price Index	Time Trend	T^2	Durbin-Watson	R^2
Y		K	X	TR	RP	T	T^2	D-W	
				1964-1966=100					
Japan	a	-19.27 (-3.14)	+0.9416 (5.64)**			+17.843 (13.73)**	-1.0665 (-10.62)**	2.17	0.95
	b	154.11 (7.19)	+0.24947 (2.05)**		-0.79274 (-2.73)**			2.08	0.46
South Korea		-139.68 (-8.69)	+2.525 (18.83)**					1.53	0.98
Taiwan		94.52 (2.96)	+0.3324 (+2.56)*	-0.64184 (-3.20)**		-8.7289 (04.55)**	+0.8812 (6.41)**	2.11	0.99
Philippines		293.89 (2.82)	+0.26067 (1.88)*	-2.2674 (02.62)*	-0.10439 (-1.40)			1.01	0.84

Values in parentheses are calculated "t" values.
* indicates significance at the 95% level of probability.
** indicates significance at the 99% level of probability.

a. Based on data from 1951 to 1969.
b. Based on data from 1960 to 1971 for forecasting purposes.

Export behavior in innovating and developing countries, according to intra-industry trade theory, was shown to be a time-dependent phenomena (Fig. 8 and 9); a time-trend variable, therefore, was included for Japan and Taiwan to account for trade development and also to include the effect of the other nonquantitative time-related variables, mentioned above, that cannot be measured effectively.

Japan. Japan was the pioneer in making and exporting hardwood plywood. Japan was first well-equipped with machines either imported from the U.S. or made domestically around 1950 when the production cost was lowest, which implied that the price of plywood was also at a minimum. The f. o. b. price of Japanese plywood fluctuated around $60 per thousand square feet (surface measure) during 1951-1960. Japan exported plywood to the world market, mainly the U.S. Because of a big increase in demand, Japan's exports increased substantially in the sixties and Japan dominated the world markets in hardwood plywood. During this period of time, there was no other big competitor to compete with Japan in world markets; therefore, the price of plywood in Japan was fairly stable. The increase in exporting is mainly due to the effort of marketing penetration and a big increase in world demand, not because of decreasing prices of Japan's plywood. After 1960, the Philippines, Taiwan, and South Korea became exporting countries. In order to

its share in the world market and to supply increasing domestic demand, production was greatly increased in Japan. Better quality differentiated products with higher production costs appeared in world markets. The prices rose from about $60 per thousand square feet in the late fifties to more than $80 in the late sixties. Prices increased about 30 percent in Japan. The relative price ratio of Japan to the rest of the world increased substantially, about 200 percent between 1951 and 1969 and about 100 percent from 1957 to 1969. The total export volume did not decrease during this period of time, even though the relative price ratio increased twice between 1960 and 1970. Even with an increased demand for plywood, Japan was not able to supply exports at the lower prices which the developing countries could offer. Changes in exports were actually caused by changes in production methods, production costs, demand, and preferences for better quality differentiated products. These changes were well explained by market share, relative price ratio, and a time trend (discussed in Part I) reflecting changes in comparative advantages among countries and the domestic demand for and supply of the products (Figure 16).

South Korea. The plywood industry developed in South Korea in the early sixties. With its low production cost South Korea had a comparative advantage in producing and exporting mature

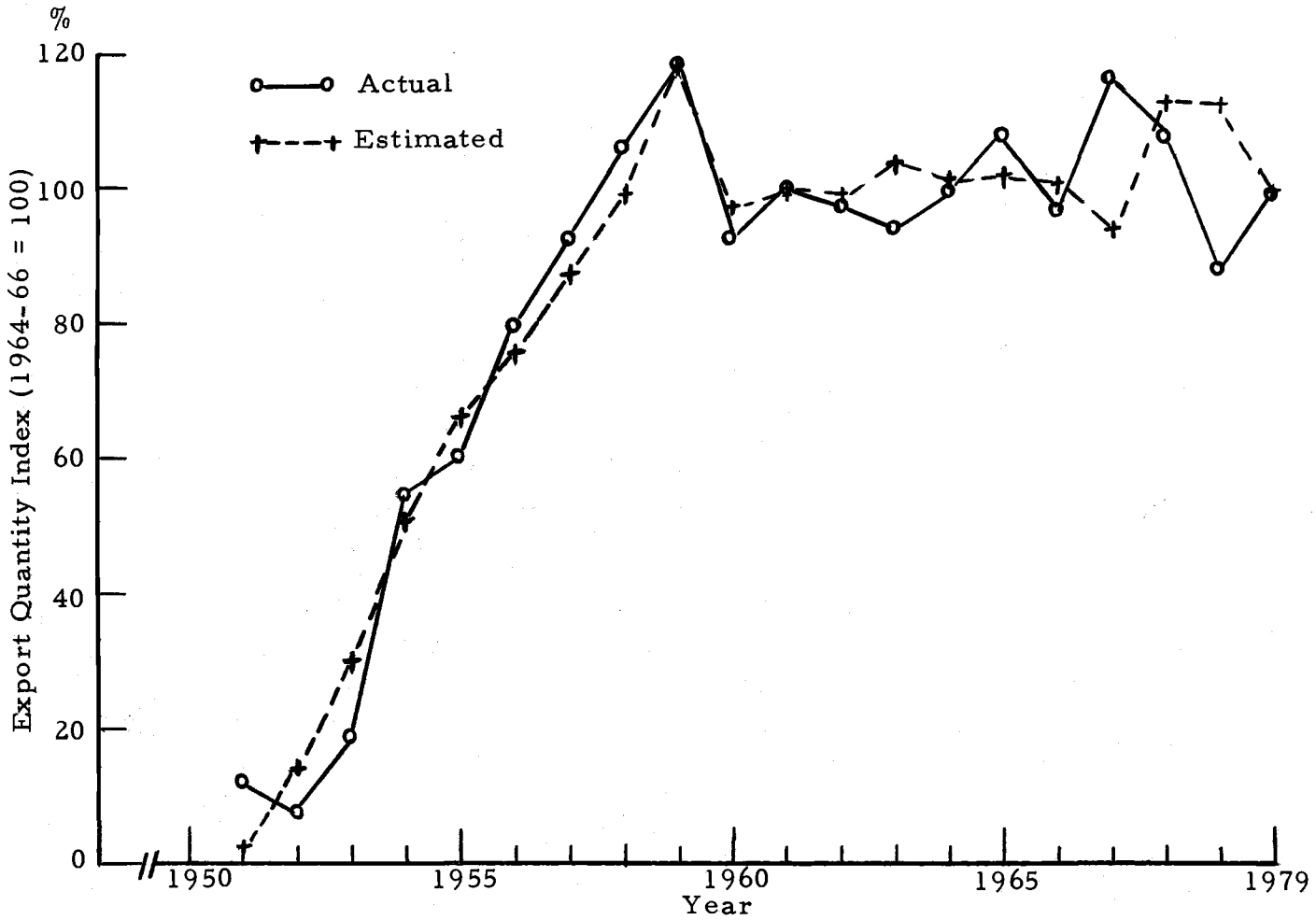

Figure 16. Actual vs. Estimated Exports of Hardwood Plywood in Japan.

products of plywood. Since production cost was relatively low, the price remained low and stable (about $40 per thousand square feet).

For the same reasons discussed previously, learning by doing, South Korea had increased its exports more than 100 times. Within ten years, mainly because of big increases in demand for plywood in world markets, South Korea was able to supply this quantity at a low price. The exporting performance is well explained by growth of world demand for hardwood plywood (Figure 17).

Taiwan. The same conditions as in South Korea were characteristic of Taiwan's hardwood plywood exports. Taiwan with its low labor cost advantage was able to expand its exports by producing a standard mature plywood product, which did not require a highly organized marketing network to penetrate world markets. Exports of hardwood plywood from Taiwan increased more than 200 times from 1960 to 1970. The average annual growth rate is about 20 percent within the ten years. Because of its cost advantage and a relative price ratio of about 0.70 over the last decade, Taiwan should still be able to expand its exports in the future (Figure 18).

The Philippines. Price of plywood in the Philippines was much higher than in the other exporting countries, for the relative price was about 1.0 in comparison to about 0.70 to 0.80 in Taiwan and South Korea. Since Philippine plywood is a very close substitute for Taiwan's and South Korea's product, the lower-priced product

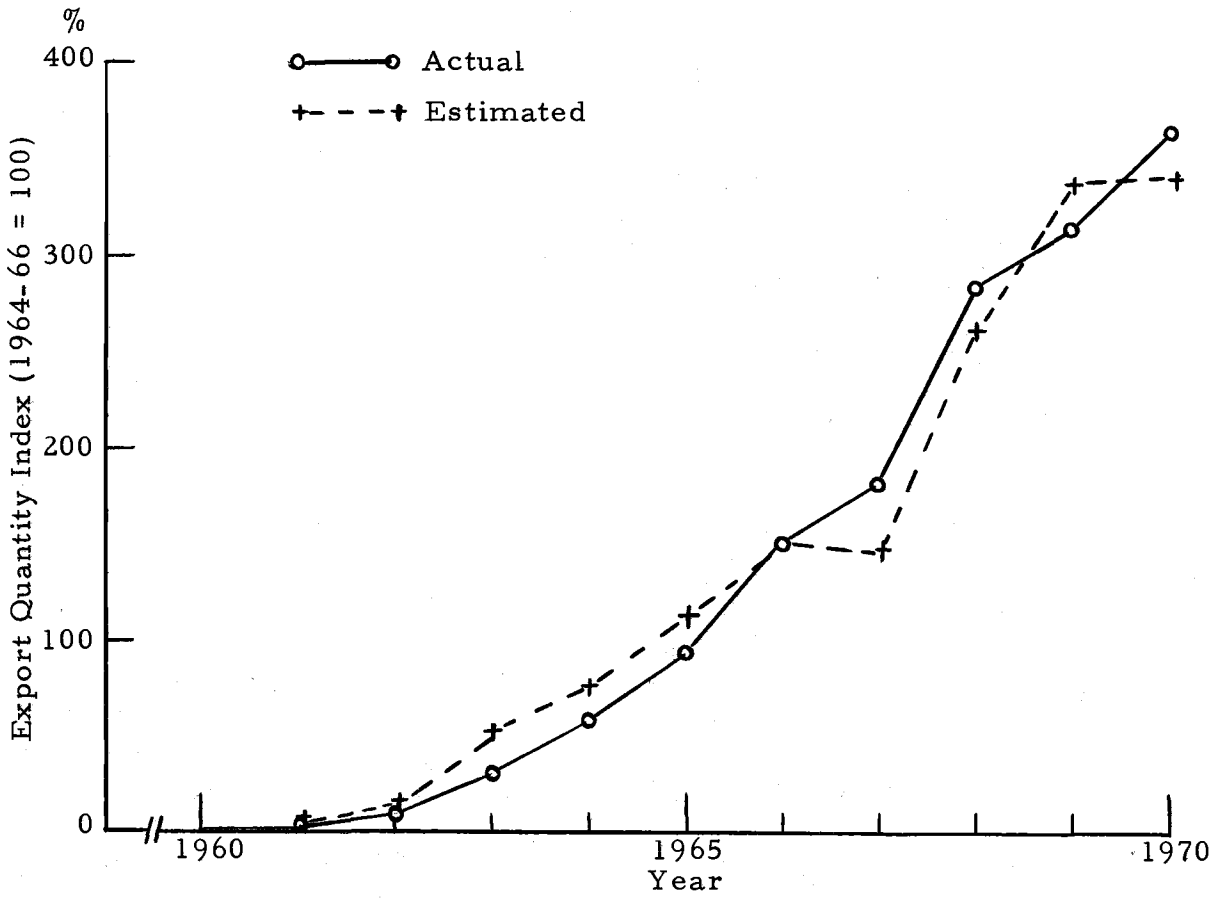

Figure 17. Actual vs. Extimated Exports of Hardwood Plywood in South Korea.

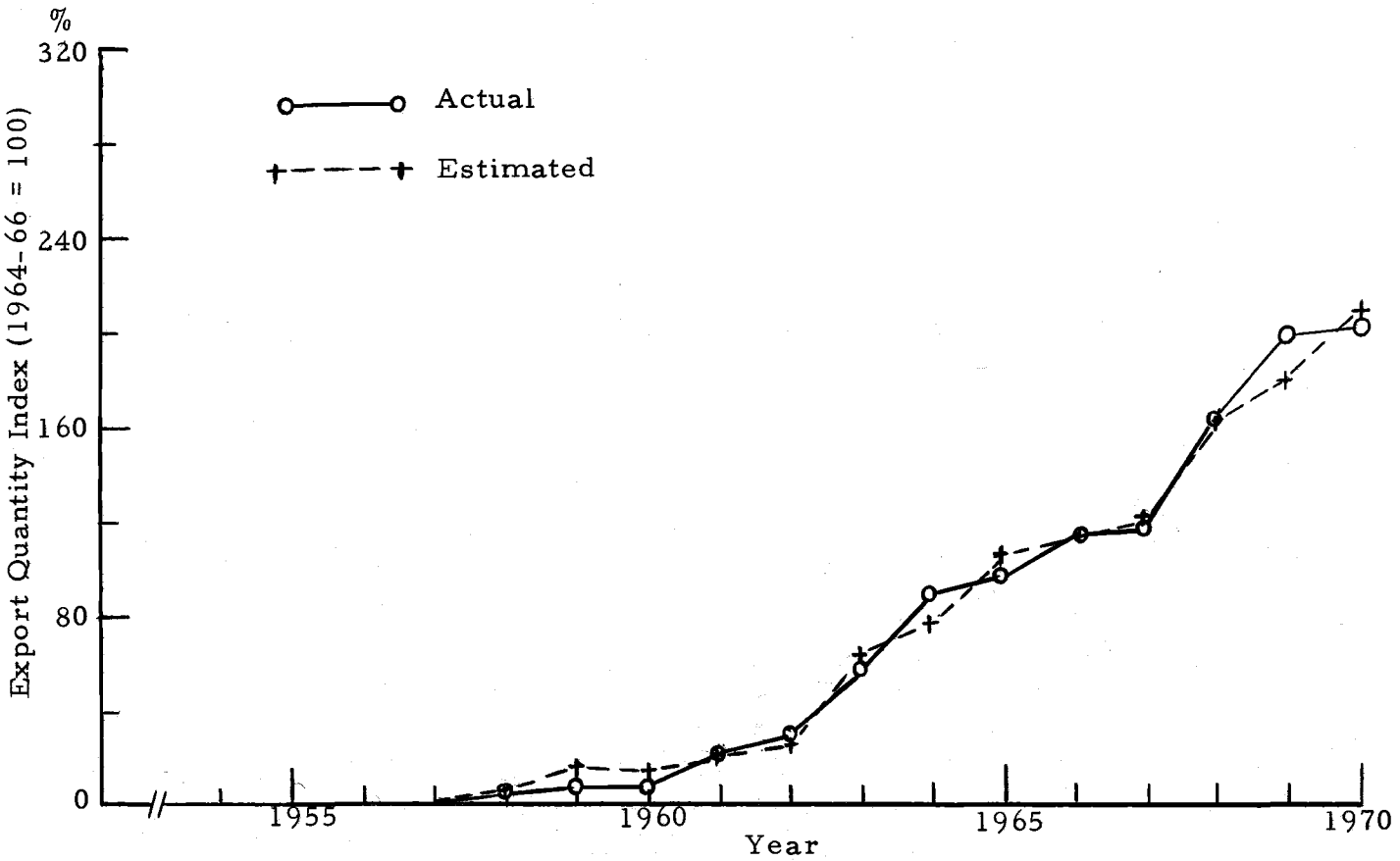

Figure 18. Actual vs. Estimated Exports of Hardwood Plywood in Taiwan.

will be substituted for the higher-priced product. Because the Philippines has this high price disadvantage, its plywood production did not expand as fast as in South Korea and Taiwan. The actual and estimated export performance of the Philippines is shown in Figure 19.

Another factor influencing the Philippine's hardwood plywood export performance has been her exports of veneer and logs, which have been more profitable than plywood.

Prediction

Prediction (or projection) is one of the most important objectives of estimating individual economic relationships. Predictive accuracy is considered the most important criterion in evaluating a method for projecting, but this can only be judged against actual values with the passage of time. A second criterion is the level of explanation of a methodology. The better the analytical power, the better the method. However, analytical power is in itself no guarantee of predictive performance.

The choice of appropriate explanatory variables plays an important role in prediction. Theoretical criteria for choosing dependent and explanatory independent variables are considered the appropriate procedure for estimating structural equations as discussed in the beginning of this chapter. Further considerations are placed on those slowly changing variables, such as population

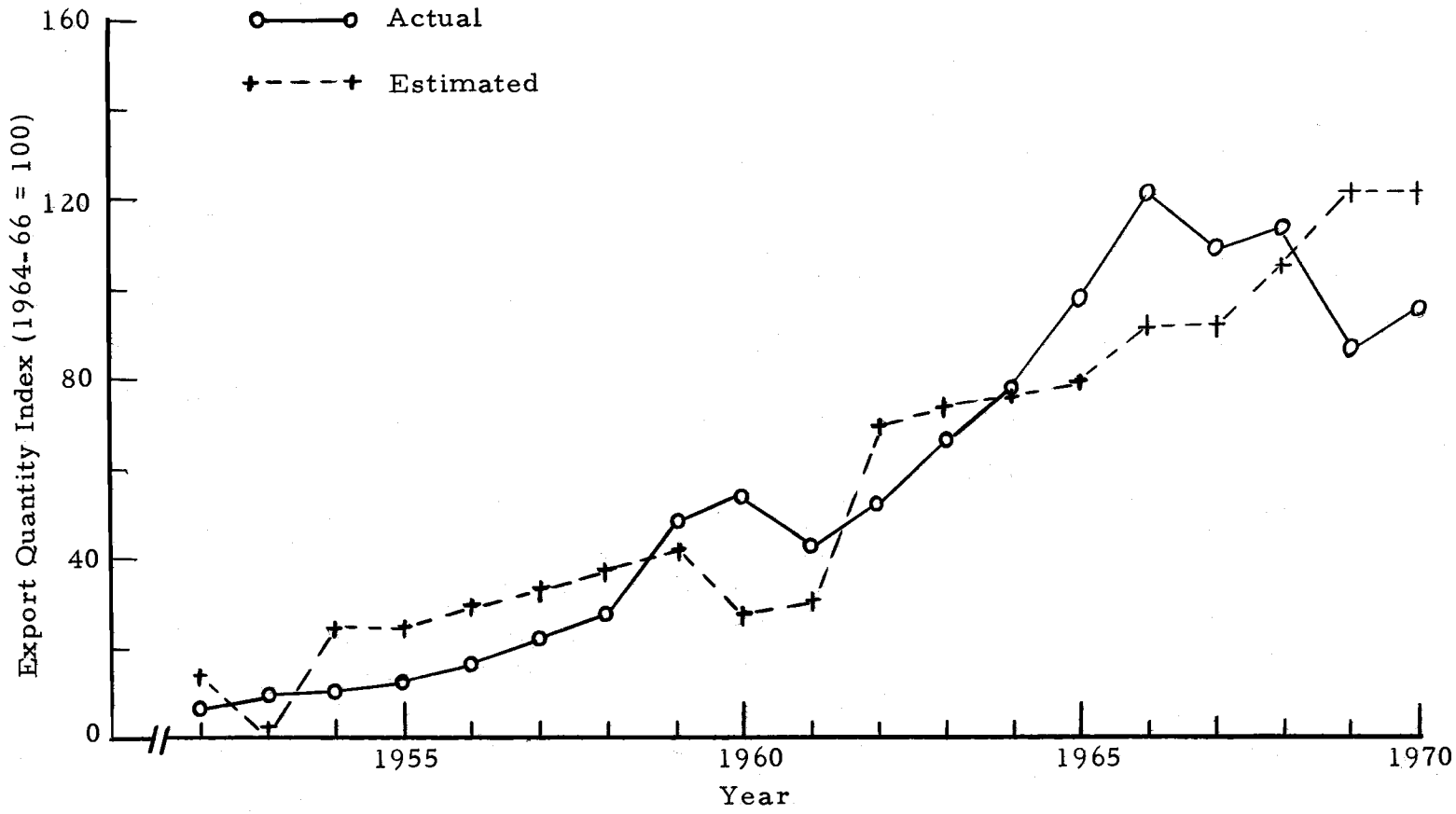

Figure 19. Actual vs. Estimated Exports of Hardwood Plywood in the Philippines.

and the labor force, GNP or industrial production index. These explanatory variables can presumably be easily calculated by projecting historical trends without risk of too great discrepancy between estimated and actual values over time. Another class of variation is the set of government instruments, such as tariff levels and taxes. These variables can be obtained or forecasted with considerable accuracy by government policy makers. Actually, the choice of variables will depend significantly on the situation concerning the questions a researcher is attempting to explain or predict. Good prediction heavily depends on the evaluation of data adjustments, for changes in society are probablistic and not deterministic. This phenomenon of trade was explored in detail in Part I. However, there is no available source for comparison of this study. To this end, the basic purpose of the projections in this study is to obtain conditional trends based on predetermined and explanatory variables.

Assume that the growth rate of world import (export) will continue up to 1975 with a 12 percent annual average increase and that relative prices will continue to be very stable in the near future, because levels of economic development are also the same and the stage of development of the hardwood plywood industry is a critical competitive condition. Also, raw material is being supplied by new developing countries; hence, the price of hardwood logs will tend to be very stable in the near future. Final projections of exports for

the four exporting countries are given in Table 25: South Korea exhibits the greatest growth--a 466 percent increase over the decade 1965 to 1975 (1964-66=100); Taiwan has the second largest increase of 363 percent during the decade; the Philippines will have a moderate increase of 138 percent by 1975; and Japan's exports will decrease slightly during the period.

Hypothesis Test of Trade Direction of Differentiated Products

In this section an important aspect of direction of trade in differentiated products is examined. The hypothesis to be tested is that if a nation does export, it is likely to export a relatively larger proportion of higher-quality, higher-priced products to higher-transport-cost markets than to a local market.

Corollary hypotheses are that: (1) A nation is likely to export a relatively larger proportion of lower-quality, lower-priced products to low transport-cost markets; (2) a country producing lower-quality, lower-priced products is likely to increase its market share locally than in places where transport costs are relatively high; (3) a country will tend relatively to increase exports of higher-quality products to foreign markets and consume a relatively larger proportion of lower-quality products domestically. The main issue is relative changes in exporting to different market areas and not

Table 25. Predicted Exports of Hardwood Plywood from Japan, South Korea, Taiwan, and the Philippines, 1971-1975. a/
(1964-66=100)

Year	Japan	South Korea	Taiwan	Philippines
1971	95.71 b/	370.41 (311.34-429.41)	237.89 (217.51-258.27)	126.77 (82.32-171.22)
1972	95.10 (76.67-113.54)	400.71 (339.81-461.59)	266.97 (243.39-290.55)	129.90 (84.20-175.60)
1973	94.13 (75.03-113.23)	431.01 (368.15-493.87)	296.94 (268.74-325.14)	132.51 (85.59-179.42)
1974	93.16 (73.31-113.01)	461.31 (396.33-526.29)	329.54 (296.08-363.01)	135.64 (87.06-184.21)
1975	92.19 (71.53-112.85)	501.62 (425.53-564.33)	363.91 (324.33-403.49)	138.50 (88.24-188.77)

a/ Values in parentheses are confidence limits at the 95% probability level.

b/ Actual value.

the absolute levels of exports.

A numerical example will make this hypothesis clearer. Assume that Japan's total exports of hardwood plywood comprise two differentiated products--fancy plywood (an expensive product) and Lauan plywood (an inexpensive product). In 1965, 20 percent of fancy plywood was exported to Far East Asia (which had relatively low transport costs) and 80 percent to North America (with a relatively high transport cost). In 1970 Japan exported 15 percent of fancy plywood to Far East Asia and 85 percent to North America, even though the relative price of fancy plywood to Lauan plywood was higher in 1970 than in 1965 and there had been a five percent increase in North America and five percent decrease in Far East Asia.

Assume that the f. o. b. prices of the two kinds of plywood in Japan are $80 per thousand square feet for fany plywood and $40 per thousand square feet for Lauan plywood. Transport costs from Japan to Asia and to the U. S. are assumed to be $5 per thousand square feet and $20 per thousand square feet, respectively. The relative (c. i. f.) price in the U. S. of fancy plywood vs. Lauan plywood is $(80+20)/(40+20) = \frac{100}{60}$, whereas the relative price in Asia is $\frac{85}{45}$. If the price of fancy plywood increases to $100 per thousand square feet, the relative price of fancy vs. Lauan plywood changes much more in Asia than in the U. S., if other prices remain unchanged

from $\frac{100}{60} = 1.67$ to $\frac{120}{60} = 2.00$ in the U.S., an increase of 0.33;

and from $\frac{85}{45} = 1.89$ to $\frac{105}{45} = 2.33$ in Asia, an increase of 0.44,

which is 34 percent greater than the increase in the U.S. With a relatively higher increase in price, consumers will consume relatively less; therefore, relatively less fancy plywood would be consumed in Asia and a relatively larger amount would be purchased in the U.S.

Japan produces a high-priced differentiated plywood; Taiwan a standard low-priced plywood. Both countries export their products to Far East Asia and to North America. The transport costs from these two countries to North America are relatively higher than to Far East Asia. Therefore, the relationship between quantity exported and prices of products in the two countries can be expressed as follows:

$$\frac{\left[\left(\frac{Q_{JU}}{Q_{TU}}\right) \Big/ \left(\frac{Q_{JA}}{Q_{TA}}\right)\right]_{t_o}}{\left[\left(\frac{Q_{JU}}{Q_{TU}}\right) \Big/ \left(\frac{Q_{JA}}{Q_{TA}}\right)\right]_{t}} = \frac{\left[\left(\frac{P_J + T_{JU}}{P_T + T_{TU}}\right) \Big/ \left(\frac{P_J + T_{JA}}{P_T + T_{TA}}\right)\right]_{t_o}}{\left[\left(\frac{P_J + T_{JU}}{P_T + T_{TU}}\right) \Big/ \left(\frac{P_J + T_{JA}}{P_T + T_{TA}}\right)\right]_{t}} \quad \text{(A)}$$

where

Q_{JU} is quantity of hardwood plywood exported from Japan to the U.S.;

Q_{TU} is quantity of hardwood plywood exported from Taiwan to the U.S.;

Q_{JA} is export of the product from Japan to Asia;

Q_{TA} is export of the product from Taiwan to Asia;

P_J, P_T represents f.o.b. prices for Japan and Taiwan, respectively;

T_{JU}, T_{JA} is transport cost from Japan to the U.S. and Asia, respectively;

$t_o = 1961$

$t = 1962\text{-}1970.$

This equation implies that a relative increase in the price of Japan's products would cause a relative increase in the denominator on the right-hand side of the equation and a relative decrease in the denominator on the left-hand side of the equation. Thus, an increase in Japan's product price would relatively decrease her exports to Asia and increase them to the U.S., and relatively increase Taiwan's exports to Asia and decrease those to the U.S. Therefore $\frac{Q_{JU}}{Q_{TU}}$ would increase and $\frac{Q_{JA}}{Q_{TA}}$ would decrease; hence, the ratio of the left-hand side of the equation would increase.

An empirical test for exports from Taiwan and Japan was obtained as follows:

$$\hat{Y} = 554.60 - 541.28X$$
$$(2.19)^*$$

where, $\hat{Y}$ is the variable on the left-hand side of equation (A) and X represents the independent variables on the right-hand side of equation (A). The calculated "t" value is significant at the 95 percent probability level, using a one-tailed test (tabular t value = 1.833, d.f. = 9, α=0.05); therefore, the coefficient of X is significantly different from zero and the hypothesis was not rejected.

Relatively, Japan increased her export proportion to North America from about 76 percent of total exports in 1961, to 84 percent in 1970 and decreased exports to Asia from six percent in 1961 to about one percent in 1970. On the other hand, Taiwan increased relatively her exports to Asia from 2 to 11 percent between 1961 and 1970 and decreased exports to North America from 96 percent to 82 percent between 1960 and 1970 (Table 26).

In conclusion, theoretical considerations are appropriate for choosing dependent and independent variables. From a theoretical point of view, import (or export) demand can be divided into consumer goods and producer goods. The consumer good is a direct demand and the producer good is a derived demand. Each represent different economic phenomena in an economy and require different explanatory variables.

The final goal of estimating import-export functions is prediction. Historical, slowly changing, deterministic variables are best for forecasting purposes. Unfortunately, there is no guarantee of

Table 26. Composition of Hardwood Plywood Trade from Japan and Taiwan to Asia and North America, 1961-1970 (in percent).

FROM / TO	Japan					Taiwan				
	Total	Asia	Europe	North America	Other	Total	Asia	Europe	North America	Other
1961	100	7	15	76	2	100	2	1	97	0
1962	100	6	11	81	2	100	2	1	97	0
1963	100	6	10	83	1	100	9	2	88	1
1964	100	4	15	79	2	100	11	3	82	4
1965	100	4	11	81	4	100	10	3	86	1
1966	100	4	9	84	3	100	13	3	82	2
1967	100	4	11	82	3	100	7	6	74	13
1968	100	3	10	84	6	100	7	6	86	1
1969	100	9	11	81	9	100	10	3	78	9
1970	100	1	12	84	3	100	11	5	82	1

of successful performance of a model. Leamer and Stern (1970) have pointed out that construction of an econometric model is much more an art than a science, and the exceedingly difficult choice of variables and model structure is based more on chance than on design. Hopefully, the variables chosen and data collected in this study are relevant to the forecast and the particular time period.

The hypothesis suggested that higher-priced products tend to be exported greater distances. This implies that new producing countries producing low-priced products will eventually dominate nearby markets. This is very important to developing countries, for most do not have well established marketing networks to promote product sales in distant markets. On the other hand, advanced countries with well organized marketing networks are able to produce and sell high-quality, high-priced products in more distant places.

VIII SUMMARY AND CONCLUSIONS

The plywood industry is relatively labor intensive in relation to other industries, such as lumber, pulp and paper, steel, automobiles, and petroleum. The production process for hardwood plywood is well established; machinery is standardized and is obtained from foreign advanced countries; capital required for investment is relatively small; and products are well known to consumers in world markets. These conditions have made the hardwood plywood industry the most rapidly growing and the most important growth industry in the developing countries of Far East Asia--South Korea, Taiwan, the Philippines and Malaysia--which have a large potential labor force and relatively low wages.

The dollar value of hardwood plywood exports from the Far East exporting countries in 1970 was as follows: Japan, $83.5 million; South Korea, 102.4 million; Taiwan, $83.8 million; and the Philippines, $15.0 million. The plywood industry contributed the following percentages of value added in total exports for the four countries in 1969: Japan, 0.7%; South Korea, 12.7%; Taiwan, 6.5%; and the Philippines, 2.1%. From 1960 to 1969 the growth in total value of hardwood plywood export was: Japan, 1.3 fold; South Korea, 5.7 fold; Taiwan, 2.9 fold; and the Philippines, 0.8 fold.

Japan, South Korea and Taiwan import logs from Southeast

Asia, mainly from the Philippines, Malaysia, and Indonesia, and process them into plywood for domestic consumption and export. They compete with each other in the third (export) market, mainly the United States. Competition among these countries in foreign markets has become very intense since 1960.

Because of the importance of the hardwood plywood industry to these nations' well-being and the growing competition in world markets, this study attempted to provide a systematic method to analyze relationships between inputs, technology, market structure of the industry, and marketing activities among countries in general and to develop an economic trade flow analysis of the hardwood plywood industry of Japan, South Korea, Taiwan and the Philippines. This study includes an analysis of the nature, determinants, potential, and competition of the hardwood plywood industry in the international trade of these countries as well as prospective changes in international relationships resulting from increasing competition for foreign markets.

Trade Potential

A country's trade potential is explained by an intra-industry trade theory that includes four subsidiary theories: product-cycle, factor endowment, quality differentiation and demand structure, and economic scale.

Based on product-cycle theory, products of an industry undergo three stages of development: new product, growth product, and mature product. In the first stage of production, new products of an industry require a large proportion of scientific and engineering inputs. Those highly advanced countries with abundant intellectual and scientific resources have greater ability and opportunity to assess scientific principles that enable a country to create new products of superior quality by improved production techniques than do underdeveloped countries with relatively poorer intellectual and scientific inputs. When a product has survived its infancy by competing successfully with other substitutes, it enters into a growth stage; demand increases and mass production and mass distribution are introduced; hence, unit cost of production tends to decrease. During the first stage and early phases of the second stage of production, entry into markets is limited by know-how which is protected by patent and copyrights. An innovating country has a technological advantage in producing new and improved products to export, which is a phenomenon of technological gap trade.

When a product enters its mature stage, the manufacturing process becomes uniform and product specifications standardized. Quality differences between countries are more likely to become smaller; the products become close substitutes. At this stage of production, the country with relatively abundant factor endowments

can produce standard products at low unit costs, resulting in a comparative advantage in exporting. The Heckscher-Ohlin model explains this trade potential: a country tends to export those commodities requiring more of its relatively plentiful factors; or, a country will export goods which it can produce more cheaply than other countries. This implies that a competitive position in exporting may shift from innovating countries to other new producing countries, including both advanced and developing countries.

According to demand structure and quality differentiation theory, the more similar the demand structures of two countries, the more intensive, potentially, is the trade between them; alternatively, the more similar the average income levels of two countries, the more intensive, potentially, is the trade between these two countries. At the first and second stages of production advanced countries have an intensive potential to trade with each other because of their overlapping demand structure for products. At the third, or mature product, stage of production, there exists a big potential for all countries to trade with each other, for products are standardized; hence, demand structures for products are more likely to be similar among countries. Any country with a comparative cost advantage in producing mature products will have a competitive position in world markets. At this stage of production, product differentiation and the ability to produce superior quality,

high-priced products will still provide even an advanced country with a competitive position in world markets, in spite of its price disadvantage for producing standardized mature products. Because trade potential at the third stage of production is large, developing countries have a comparative advantage to produce some mature products for export, as follows: those products requiring significant inputs of labor, in developing areas having an abundant low-wage labor force.

In a statis sense, a plant will have a cost advantage if it can use its equipment more efficiently by increasing the length of production runs. This implies that the plant can reduce machine idle time, which will reduce inventories of raw materials and of finished products, and reduce the unit cost of production; hence, the plant will have a relative comparative cost advantage in world markets.

Potential vs. Actual Trade

A country's potential for trade is not usually equal to its actual trade. This is particularly true in developing countries. The major determinant of a country's actual trade is that country's marketing activities, which in turn are limited by its stage of economic development.

A country's marketing structure, in general, can be fitted into

five stages, as below.

The first stage--the traditional society--is a non-monetary subsistence economy. Distribution is based on a barter system, and its market horizon is limited to within the village or tribe.

The second stage--development of precondition for take-off--is an import stage. It is characterized by an economy of scarcity. Foreign suppliers stimulate the development of business enterprise. Production is mainly for domestic consumption and specialization in marketing distribution is just beginning.

The third stage--take-off--is an import-replacing stage. During this period, new industries are introduced to meet the growing domestic demand. Marketing techniques of distribution, advertising, sales promotion, and customer services are more specialized.

The fourth stage--the drive to maturity-- is an initial phase of exporting. Capital goods are produced and the marketing structure becomes more sophisticated. Marketing activities expand beyond domestic territories; yet the marketing network to world-wide consuming areas is still relatively poor.

The fifth stage--the age of high mass-consumption-- is the large-scale integration stage. Marketing networks are well organized domestically and internationally; mass production, mass distribution techniques, marketing research, and new forms of

customer services are introduced for overall efficiency.

In general, advanced countries are well endowed with sophisticated world-wide marketing networks while developing countries lack such networks; hence actual trade is relatively smaller than its potential level in developing countries.

To overcome disadvantages in production and marketing, governments in developing countries play an important role in assisting local businessmen to increase their export potential by using various fiscal, financial and foreign marketing schemes.

Empirical data, investigated in this study, show that Japan, as an innovating country in Far East Asia, had a comparative advantage for producing and exporting hardwood plywood at the early stages of production, i.e., as new and growth products, and dominated world markets from 1940-1965. When hardwood plywood entered its mature stage in the mid-sixties the comparative advantage shifted from Japan to certain developing countries--South Korea, Taiwan, the Philippines, and Malaysia; world markets have been dominated in turn by these countries. In order to maintain her exporting market share, Japan has turned to product differentiation for making better-quality, higher-priced hardwood plywood. Even though the relative price index of hardwood plywood (in relation to South Korea, Taiwan and the Philippines) has grown about two-fold from 1960 to 1970, the dollar value of plywood exports from Japan has increased

1.3 fold during this time period.

Although endowed with raw material, the Philippines was unable to compete with Japan, South Korea and Taiwan, because her marketing network to world markets was relatively poorer than that of Japan and the price of hardwood plywood was relatively higher than that of South Korea and Taiwan; therefore, the Philippines has never fully utilized her production capacity. The utilization ratio has ranged from 50 to 70 percent of total capacity. South Korea was able to utilize her facilities up to 99 percent during the past decade because of making a mature hardwood plywood product and having a relative price advantage in international markets.

In order to protect her own hardwood industry, the Philippines has put restrictions on log exporting to competing plywood producing countries--Japan, South Korea and Taiwan; hence these log exporting countries have shifted to importing logs from Indonesia and Malaysia, where there are ample hardwood forest resources. Meanwhile, countries in Southeast Asia such as West Malaysia have developed their own plywood industry rapidly. Competition in exporting hardwood plywood to world markets therefore, has become more intensive. South Korea and Taiwan, with their skillful low-wage labor, are still able to dominate world hardwood plywood markets, even though they have to import logs from Southeast Asia. Japan, the major log importing country, tended to decrease her export potential because of a strong increase in domestic demand for hardwood

plywood, and she has also a price disadvantage in export markets in comparison with South Korea, Taiwan and the Philippines.

Based on intra-industry trade theory, individual multiple regressions were chosen for trade analysis and for prediction of hardwood plywood exports from Japan, South Korea, Taiwan, and the Philippines, and hardwood plywood imports into the U.S.

In a multiple regression model of imports, indexes of industrial production and of import price in relation to domestic price of hardwood plywood were selected for explaining import behavior theoretically and practically. The industrial production index reflects a country's level of economic growth and the relative price index represents the total effect of prices of imports and domestic products on that nation's import behavior. One import function was obtained for the U.S. Percentage increase in 1975 was predicted to be 256.58 percent (1964-66=100), with about 70 percent increase in 1975 over 1970.

In a multiple regression model of exports, a demand function for a nation's export was first derived and tested, based on an assumption that each country's products in the same industry category, such as hardwood plywood, were considered close but not perfect substitutes. World total import (or export) was found to be an important factor for explaining export behavior of individual countries, yet export was not sensitive to the relative price factor.

This demand for export was explored to explain a nation's export behavior based only on the demand side. This functional form was modified to include supply factors, such as the development of an industry, marketing factors, changes in factor endowment, and changes in transportation cost. These factors are mainly non-price factors; therefore, a time trend variable was used to reflect the total effects of these supply factors. By including both factors of demand for and supply of exporting products, the R^2 and Durbin-Watson statistics were considerably improved, which implied that exporting behavior was well explained by the variables in the exporting function. Predictions of hardwood plywood were made from 1971 to 1975. Percentage increases in 1975 over 1965 were predicted as follows (based on 1960-66=100): Japan, 92.19%; South Korea, 466.36%; Taiwan, 363.91%; and the Philippines, 138.50%. South Korea, thus, will have the greatest increase and Japan a slight decrease; Taiwan will be second with a substantial increase; the Philippines will be third with a moderate increase.

Finally, conclusions and implications of this study follow:

1. The overall impact of the growth of the hardwood plywood industry in the four developing countries (South Korea, Taiwan, Malaysia and the Philippines) and of the great increase in Japan's domestic demand is likely to cause a decrease in Japan's export potential in the near future. In order to

maintain her share in world markets, Japan and her abundant scientific, intellectual, and marketing inputs, will tend to devote her efforts to produce higher-quality, higher-priced products of hardwood plywood and to exploit new markets in the world for these products. On the other hand, Japan will be importing substantial amounts of lower-quality, lower-priced hardwood plywood products from the four developing countries in order to meet her increased domestic demand.

2. South Korea and Taiwan, with their comparative advantage of significantly lower wages and abundant skilled labor, are expected to continue to produce mature standarized products of hardwood plywood and to dominate world markets among the producing countries in Far East Asia. They will enjoy a great expansion of production and exports in the near future before the hardwood industry has been fully developed in the Philippines and Malaysia, both of which are much more heavily endowed with raw materials than Taiwan and South Korea.

3. The Philippines will have a moderate rate of growth in production and exports because of competition from the other three countries and because of her flexibility in being able to export forest products in the form of logs, lumber, veneer, and plywood.

4. Those countries in Southeast Asia with abundant raw materials, Malaysia and Indonesia, will benefit from setting up their own hardwood plywood industry instead of exporting logs to foreign markets. They will be able to experience a high rate of growth in the development of their hardwood plywood industry in the near future because of high log transport costs and low veneer and plywood yields from logs.

5. Advanced countries endowed with abundant scientific, intellectual, and marketing inputs can still produce mature products by using product differentiation strategy to maintain a competitive position in world markets, even though having a price disadvantage. It was found that a rise in the price of a product does not necessarily bring about a decrease in exports.

6. For those developing countries with relatively poorer scientific and marketing abilities, producing mature products is the best strategy in economic planning and development.

7. Because producers in developing countries generally lack marketing abilities, government in these countries play an important role in stimulating a country's export potential by setting up import-replacing infant industries which eventually begin exporting.

8. Import behavior was well explained by using indexes of industrial production and price of imports relative to domestic products.

9. A nation's exporting performance was well interpreted by three types of variables: demand, supply, and marketing factors. Under the assumption of intra-industry trade and constant elasticity of substitution, total growth of demand for a good and relative price variables were considered theoretically and practically as demand factors. Supply and marketing factors are difficult to measure; hence a time-trend and institutional transport cost variables were chosen to represent supply and marketing factors. The plywood exporting behavior of nations in Far East Asia was stimulated quite well using as independent variables a relative price index, a transport cost index, and a time-trend.

10. New producing countries manufacturing low-priced standardized products will eventually dominate nearby markets; advanced countries with well organized marketing networks are able to produce and sell high-quality, higher-priced products in more distant places.

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APPENDIX

Table 27. Data for Estimating Import Functions of Hardwood Plywood for the U.S. 1951-1969 (1964-66=100).

Year	United States		
	Volume index [a]	IP [b]	RP [b, c]
1951	3.09	56.45	129.54
1952	3.59	58.54	144.49
1953	9.72	63.40	118.38
1954	19.15	59.58	111.63
1955	27.69	67.08	115.32
1956	31.18	69.38	114.72
1957	37.35	69.93	115.10
1958	40.84	65.06	111.69
1959	58.70	73.33	112.87
1960	44.75	75.48	108.25
1961	48.42	76.18	117.00
1962	63.49	82.15	109.39
1963	71.52	86.32	103.81
1964	85.93	91.88	102.05
1965	94.12	99.58	99.08
1966	112.70	108.54	98.88
1967	111.77	109.79	103.21
1968	169.51	114.93	91.06
1969	189.32	120.00	77.11
1970 [d]	183.94	116.81	87.94

Source: Compiled from:

[a] U.S.D.A., The Demand and Price Situation for Forest Products, 1971-1972.

[b] U.N. Monthly Statistics, IP = Industrial production index.

[c] U.S.D.A., Department of Commerce, Bureau of Census, U.S. Imports, Commodity by Country, FT135.

[d] Preliminary.

Table 28. Production and Export of Hardwood Plywood and Related Data for Export Function Estimation in Japan, 1951-1970.

	Total Production[b/] ($1,000 M^2$, surface measure)	Total Export[b/] ($1,000 M^2$, surface measure)	Export Percentage	Export Index	Total Regional Growth of Export[c/] (1964-66=100)	Transport Index
1951	42,426	11,545	38.1	12.64	5.08	108.60
1952	47,576	6,492	20.6	7.11	2.39	108.60
1953	91,470	16,962	23.7	18.57	6.08	108.60
1954	132,746	50,464	40.8	55.24	16.65	108.60
1955	165,268	55,043	34.9	60.26	24.23	108.60
1956	207,906	72,640	35.7	79.52	28.22	108.60
1957	244.294	84,604	35.5	92.61	35.90	108.60
1958	266,702	97,163	37.3	106.36	46.67	124.12
1959	323,301	108,554	32.0	118.83	63.03	128.00
1960	356,921	85,315	24.5	93.39	47.87	128.00
1961	399,540	91,790	23.6	100.48	55.85	134.47
1962	511,356	88,834	17.9	97.25	61.73	107.74
1963	576,232	85,586	17.3	93.69	76.39	90.38
1964[a/]	664,777	91,726	14.0	100.41	85.27	94.38
1965[a/]	716,865	98,688	13.9	108.03	100.13	100.85
1966[a/]	830,585	83,633	10.1	91.55	114.59	103.43
1967	976,086	89,158	9.2	97.60	112.79	113.78
1968	1,121,474	106,731	9.5	116.84	167.15	113.78
1969	1,260,680	98,300	7.8	107.61	188.79	113.78
1970	1,426,769	80,587	5.5	88.27	190.10[d/]	113.78
1971		81,807		89.55		

[a/] Data may not add to total because of rounding.

Source: Compiled from:

[b/] Japan Lumber Journal, Vol. 12, No. 19, 1971.

[c/] FAO, Year Book of Forest Products.

[d/] Estimated.

Table 29. Shipment and Export of Hardwood Plywood and Related Data for Export Function Estimation in the Republic of China, 1954-1970.

Year	Total Shipment [a]	Total Export [a]	Export Percentage	Export Index	Total Regional Growth of Export [b]	Transport Cost Index
	(1,000 sq. ft. surface meas.)			(1964-66=100)		
1954	34,802	1,801	5.2	0.22	16.65	143.11
1955	34,665	1,665	4.8	.21	24.23	143.11
1956	37,710	2,710	7.2	.34	28.22	143.11
1957	47,221	7,221	15.3	.92	35.90	130.15
1958	75,464	32,464	43.0	4.14	46.67	130.15
1959	100,712	55,715	55.3	7.10	63.03	130.15
1960	116,625	66,625	57.1	8.50	47.87	130.15
1961	229,485	175,483	76.5	22.39	55.85	134.18
1962	305,632	245,652	80.4	31.34	61.73	99.74
1963	517,285	452,285	87.4	57.70	76.39	99.74
1964	776,656	706,563	91.0	90.15	85.27	99.35
1965	829,205	754,205	91.0	96.23	100.13	100.85
1966	970,378	890,379	91.8	113.60	114.59	111.93
1967	995,000	912,000	91.8	116.36	112.79	111.93
1968	1,325,350	1,278,920	96.4	163.18	167.15	111.93
1969	1,660,000	1,560,000	98.3	199.04	188,79	111.93
1970	1,704,362	1,585,000	93.0	202.23	190.10 [c]	111.93

Source: Compiled from:

[a] Economic Administration, Republic of China.

[b] FAO, Year Book of Forest Products.

[c] Estimated.

Table 30. Production and Export of Hardwood Plywood and Related Data for Export Function Estimation in the Republic of Korea, 1960-1970.

Year	Total Production [a/]	Total Export [a/]	Export Percentage	Export index [b/]	Total Regional Growth of Export
	(1,000 sq. ft., surface meas.)			(1964-66=100)	
1960	186,960	19,027	10.2	3.07	47.87
1961	166,318	50,520	30.4	2.15	55.85
1962	283,775	73,712	26.0	11.89	61.73
1963	335,187	186,288	55.6	30.06	76.39
1964	501,473	352,571	70.3	56.90	85.27
1965	729,208	574,868	78.8	92.77	100.13
1966	1,198,158	931,479	77.7	150.32	114.59
1967	1,490,367	1,131,932	76.0	182.67	112.79
1968	2,383,944	1,762,449	73.9	284.43	167.15
1969	2,783,781	1,937,324	69.5	312.65	188.79
1970	2,840,197	2,246,299	79.1	362.52	190.10 [c/]

Source: Compiled from:

[a/] Bureau of Statistics, Economic Planning Board, Republic of Korea.

[b/] FAO, Year Book of Forest Products.

[c/] Estimated.

Table 31. Production and Export of Hardwood Plywood and Related Data for Export Function Estimation of the Philippines, 1951-1970.

Year	Total Production [a]	Total Export [a]	Export Percentage	Export Volume Index	Total Regional Growth of Export [b]	Transport Cost Index	Relative Price Index
	(1,000 sq. ft., surface measurement)			(1964-66 = 100)			
1952	38,223	242	0.6	6.36	2,39	114.54	200,96
1953	58, 832	182	0.3	9.80	6.08	114.54	345.19
1954	65,770	1,649	2.5	10.95	16.65	114.54	129.80
1955	81,369	4,033	4.9	13.55	24.23	114.54	154.80
1956	105,301	9,278	8.8	17.54	28.22	114.54	118.26
1957	135,204	24,853	16.2	22.52	35.90	114.54	96.15
1958	168,901	52,681	31.2	28.13	46.67	114.54	79.80
1959	298,289	182,421	61.1	49.69	63.03	114.54	75.00
1960	324,026	179,281	55.3	53.97	47.87	118.96	80.77
1961	260,308	111,640	42.8	43.36	55.85	118.96	88.85
1962	316,734	144,714	45.7	52.76	61.73	101.33	92.31
1963	400,342	194,462	48.6	66.69	76.39	101.33	88.46
1964	470,205	301,702	64.2	78.32	85.27	101.33	95.19
1965	597,426	323,375	54.1	98.52	100.13	101.33	106.73
1966	733,254	353,984	48.3	122.14	114.59	97.34	98.07
1967	661,160	362,515	54.8	110.14	112.79	97.34	85.58
1968	695,034	429,498	61.8	115.78	107.15	97.34	93.27
1969	523,866	330,498	63.1	87.26	188.79	97.34	98.08
1970	578,048	241,696	41.8	96.29	190.10	97.34	91.35

Note: Calendar year, July 1 to June 30.

Source: Compiled from:

[a] Philippine Lumber Producers' Association, Inc., Manila, Philippines.

[b] FAO, Year Book of Forest Products.

Table 32. Data for Hypothesis Testing

Year	Quantity Ratio [a, b/]	Price Ratio [c, d/]
1961	1.0000	1.0000
1962	1.2434	1.0238
1963	6.3199	1.0000
1964	11.8551	1.0112
1965	10.5185	1.0117
1966	14.8722	.9991
1967	8.6625	.9758
1968	11.8383	.9717
1969	46.3892	.9709
1970	50.3367	.9754

Source: Compiled from:

a/ FAO, Year Book of Forest Products.

b/ Economic Administration, Republic of China.

c/ From Tables 18, 28 and 29.

d/ Transport cost in Far East is estimated at $5 per thousand square feet.