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# Mechanical Processing of Tropical Hardwood in Developing Countries: Issues and Prospects of Plywood Industry Development in the Asia-Pacific Region

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ABBREVIATIONS

ACP	African, Caribbean and Pacific
ADO	Export Tax on Timber in Indonesia
CIF	Cost, Insurance, Freight
DBH	Diameter at Breast Height
FAO	Food and Agriculture Organization of the United Nations
FOB	Free on Board
GOI	Government of Indonesia
GSP	Generalized System of Preferences
HPH	Concession of Holder
MFN	Most Favored Nations
OPEC	Organization of Petroleum Exporting Countries
PNG	Papua New Guinea
RKT	Allowable Quotas for Annual Cuttings
SEALPA	Southeast Asian Lumber Producer Association
SEHH	Exportable Log Quotas

## SUMMARY AND CONCLUSIONS

Recent developments in the tropical hardwood sector in the Asia-Pacific region suggest that the structure of tropical hardwood trade in this region is changing dramatically with global implications. In the last few years, three major traditional suppliers, i.e., Indonesia, Malaysia and the Philippines, which together account for over 80% of world exports of tropical hardwood logs, have taken decisive steps to reduce log exports. The measures involve export quotas (or outright bans) and/or increased government charges ("royalties," "export taxes," etc.) on log exports. Their objectives are (a) to conserve the semi-nonrenewable resources, (b) to collect maximum resource rent from the rich forest resources which are owned by governments, and, most importantly, (c) to secure benefits from increased local processing of logs.

This report examines the issues related to, and the prospects for, the growth of local processing of tropical hardwood in log-producing areas. While the report covers the broad issues of mechanical processing of tropical hardwood, the analysis is narrowly focussed on the plywood industry in the Asia-Pacific region. The plywood industry is considered the most important part of mechanical wood processing activities in terms of developmental strategy.

Two-thirds of tropical hardwood logs are produced in the tropical Asia-Pacific region, which exports two-thirds of its production--80% as logs and only 20% in processed forms (sawnwood, plywood and veneers). The log-producing Asia-Pacific countries account for over 85% of world exports of tropical hardwood logs. Major log exporters in the region are Malaysia, Indonesia, the Philippines and Papua New Guinea. Sixty percent of their log exports goes to Japan and 38% goes to the newly industrialized developing economies in Asia. While Japan consumes most of the imported logs at home, the Republic of Korea, the Province of Taiwan and Singapore "re-export" a substantial part of their imported logs in the form of processed products (plywood and sawnwood).

The countries that produce tropical hardwood consume 55% of world production themselves, while Japan consumes 18-20%, Western Europe 12%, the United States 5% and the log-importing developing economies (Republic of Korea, Province of Taiwan, Singapore and Hong Kong) consume 8-9%. Almost 95% of Japan's imports are in log form, while virtually all of the US imports are in plywood form. In Western Europe, about 40% of tropical hardwood sawnwood consumed there is produced there from imported tropical logs and 60% is imported as sawnwood, while 60% of tropical hardwood plywood consumed in Western Europe is produced in Europe from imported logs and 40% is imported as plywood.

The evolution of the plywood and other mechanical processing industry in the Asia-Pacific region has been reviewed, and the following conclusions have emerged:

- (a) Throughout the post-World War II period, the sustained growth of US imports of tropical hardwood plywood has been the most important single factor responsible for the expansion of the plywood industry in the region.
- (b) From the end of World War II to the mid-1960s, Japan was the leading exporter of plywood which it produced from tropical logs imported from Southeast Asian suppliers.
- (c) Since the mid-1960s, the Province of Taiwan and the Republic of Korea have replaced Japan as the major exporters of plain plywood.
- (d) The main reasons for the change in the shares of these exporters were (i) the heavy subsidization of plywood exports as a part of the outward-oriented industrial development strategy in the Province of Taiwan and the Republic of Korea from the early 1960s to the mid-1970s, and (ii) the sharp increases in costs in Japan partly due to the appreciation of the Japanese currency.
- (e) Plywood exports from the Philippines increased in the second half of the 1950s as the Philippines enjoyed preferential access to the US market under the Laurel-Langley agreement. However, because of the continued inward-oriented economic policy the growth of Philippine plywood exports ran out of steam in the mid-1960s.
- (f) Exports of sawnwood and plywood to the UK market (and later the EC market as a whole) expanded steadily. The factors responsible for this success are the historical ties with the UK, the Commonwealth preference access and successful marketing supported by the work of Timber Industry Boards in Peninsular Malaysia and Singapore.

Two important features of mechanical wood processing tend to favor the location of such activities in the log-producing areas. These are (a) that it is a relatively unskilled-labor-intensive activity; and (b) that it is a typically weight-reducing activity, and, in the long run, a transport-cost-saving activity.

In terms of current government policy, the major tropical hardwood-producing areas in the Asia-Pacific region are broadly divided into two groups: (a) states attempting to reduce log exports (the Philippines, Peninsular Malaysia, Sabah and Indonesia) and (b) states with liberal log export policies (Sarawak, Papua New Guinea, other Pacific islands). Recently, the policies of the first group have been to apply quantitative

restrictions on log exports, to increase government charges per unit of logs exported, and to promote local processing of logs. Increased exports of processed products would result in higher export earnings, higher value added, higher employment and regional development of remote least-developed areas. In contrast, the policies of the second group have been to encourage log exports. As a result, these areas have been experiencing rising trends in log export quantities and increasing foreign exchange earnings, but only a slow growth in processing and low government revenues from forest utilization.

In this context, a distinction must be made between two objectives: (a) the objective of obtaining the various benefits of local processing and (b) the objective of obtaining maximum resource rent from the semi-nonrenewable resources. The latter objective requires careful consideration of the projected long-term price increases in tropical hardwood logs in real terms and the fact that standing trees grow over time.

For Peninsular Malaysia and the Philippines, the appropriate policy is to phase out log exports completely and to take steps to improve the cost competitiveness of the processing industries. This is being implemented already. The wood-processing industries in Peninsular Malaysia and the Philippines could be strengthened if the governments adopted more aggressive, outward-oriented industrial policies.

In the case of Papua New Guinea (PNG), the liberal log export policy seems to be clearly the superior policy at this time. The timber resources of PNG are not so attractive commercially as those of the Philippines, Malaysia or Indonesia (excluding West Irian). Therefore, it is more urgent for PNG to develop a market for its species.

In Sabah and Indonesia, policy options are more open than in Peninsular Malaysia, the Philippines or PNG. Sabah and Indonesia (excluding West Irian) happen to have the richest forest resources in terms of incidence of commercially attractive species per unit area. But there are a number of short-run problems in increasing local processing. Attracting the necessary labor force to Sabah or the Indonesian outer islands is a problem. The infrastructure required for the large-scale growth of processing industries in these areas would be a heavy financial burden. Until sufficiently large flows of processed-product exports are built up, transport cost economics works against such processing. Furthermore, substantial resource rent that could be collected from log exports will have to be forgone until export-oriented processing industries are well established. This could take several years, or possibly a decade. Nevertheless, Sabah and Indonesia may consider it politically desirable to develop some kind of industries in the remote regions. If so, timber processing seems to provide the best chance of ultimate success. Indeed, timber processing, along with agriculture, could be used as the core of a regional development strategy.

Since the basic economics is in favor of local processing in Sabah and Indonesia in the long run, strong protection measures for the infant export industry may be justified in the light of the Korean and Taiwanese experiences. Adoption of an overall export promotion strategy such as Korea's could be quite effective. Specific steps needed include the following measures: (a) to minimize the use of price ceilings and other interventions in domestic markets; (b) to improve the efficiency of domestic transport (especially shipping) and port facilities; and (c) to develop a few wood product terminals at strategic locations. To ensure an internationally acceptable quality of products and to secure market access, joint ventures with experienced foreign companies could be effective at this stage of development.

As for the state of Sarawak, it seems that it could collect higher resource rent on its log exports than it does now. Sarawak may be forgoing both the resource rent on logs and the benefits of local processing. It may very well be a case of favoring a group of private businesses at the expense of the public interest.

One of the issues in the plywood trade has been the import duties in industrialized countries, especially the escalated nature of these duties, which result in very high effective rates of protection on tropical hardwood plywood. This has distorted the pattern of trade in tropical hardwood products. One reaction of industrialized countries to the recent changes in the log-export policies of major log-producing countries has been to reduce import barriers on veneers and sawnwood, which, of course, is a welcome trend. However, industrialized countries should, ideally speaking, reduce/eliminate import barriers on tropical hardwood plywood. Until this happens, the second-best solution in terms of maximizing world economic efficiency is for log-exporting countries to offset the distortion by subsidizing the plywood industry through a two-tiered system of pricing logs based on higher government charges on export logs than on logs processed locally.

Plywood manufacturing should be the core of the development strategy for mechanical wood-processing industries. If development of the plywood industry is promoted, saw-milling and production of other wood-based panels (particleboard, etc.) would automatically be promoted because they would be complimentary to plywood manufacturing by improving efficiency in raw material usage.

## I. INTRODUCTION

1.01 Tropical hardwood-producing countries have long aspired to increase their exports of processed timber products and reduce their log exports. In fact, a number of Latin American countries have either banned or severely restricted their exports of logs for more than two decades. Some African and Asian producers of tropical hardwood also have taken measures to restrict their log exports in the hope that these would help accelerate expansion of their exports of processed timber products. While Latin American producers now process virtually 100% of their tropical hardwood, the majority of African and Asian producers are still exporting the bulk of their hardwood in log form.

1.02 Recent developments in the tropical hardwood sector in the Asia-Pacific region, however, suggest that a wholesale restructuring of the tropical hardwood trade is under way with global implications. In the last few years, three major traditional suppliers, i.e., Indonesia, Malaysia and the Philippines, which together accounted for well over 80% of world exports of tropical hardwood logs in 1978, have taken decisive steps to reduce log exports. There seem to be three main reasons for this trend. First of all, the governments of these countries have become increasingly aware of the possible exhaustion of their prime tropical hardwood resources in the near future. Second, the success of OPEC in petroleum exports made the major traditional log-exporting countries appreciate greater economic rent possible from their rich forest resources owned by the governments. Finally, but perhaps most importantly, the determination of these countries to accelerate the growth of local timber processing and to substitute mechanically processed wood products (such as sawnwood, veneer sheets, plywood and further processed products) for round-log exports has become firmer.

1.03 The purpose of this report is to review the issues related to, and the prospects for, the growth of local processing of tropical hardwood in log-producing countries. More specifically, the report tries (a) to identify the factors affecting the location of mechanical processing of tropical hardwood, especially the plywood industry in the Asia-Pacific region; (b) to assess gains and losses from promotion of tropical hardwood processing from the viewpoint of log-producing countries; and (c) to examine the policy options for log-producing developing countries.

1.04 While the report is concerned with the broad issues of tropical hardwood processing, the analysis is rather narrowly focussed in terms of both the processing chains and the countries involved. As regards processing chains, the study deals with mechanical processing of logs but not pulp and paper manufacturing. The products covered are tropical hardwood logs (i.e., sawlogs, veneer logs, logs for sleepers) and the products derived from them through the first-stage mechanical processing--i.e., sawnwood

(including sleepers 1/), veneer sheets, plywood (including blockboard) and particleboard. Wood products made from these "intermediate" products are generally excluded. 2/ Furthermore, the analysis concentrates on the plywood sector because (a) a majority (65-70%) of the logs exported from the producing countries are veneerlogs which are used mainly for plywood making in the importing countries; and (b) the gross value added to the log material is generally higher in plywood than in sawnwood, and, therefore, there is a greater interest in plywood manufacturing than in sawmilling on the part of log exporting countries.

1.05 In terms of country coverage, the study focuses on the tropical Asia-Pacific region because it is by far the most important, accounting for two-thirds of world tropical hardwood log production. The study pays special attention to the three most important tropical-hardwood-exporting countries in the region, i.e., the Philippines, Malaysia and Indonesia. In addition to these three countries, it was possible for the field work to cover two major log-importing countries, i.e., Japan and Singapore, but the field work did not cover two other major log-importing processing areas, i.e., the Republic of Korea and the Province of Taiwan. Because of the importance of the latter two areas in the processing of tropical hardwood logs produced in the Asia-Pacific region, special efforts have been made to collect available information on the Republic of Korea and the Province of Taiwan from secondary sources.

1.06 Chapter II provides background information on the tropical hardwood sector. It includes broad historical trends in and present patterns of production and trade of both tropical hardwood logs and their processed products. In addition, it covers trends in consumption, the market structure, trade barriers, prices, export unit values and the long-term market outlook. Background information on technical characteristics of tropical hardwood resources, identification of processing chains and uses of tropical hardwood is provided in Annexes A, B and C.

1.07 Chapter III discusses the postwar evolution of the plywood trade in the Asia-Pacific region and identifies major factors that have affected the location of the export-oriented plywood production in the region. The period is divided into four sub-periods: (a) 1946-1960; (b) 1960-1973; (c) 1974-1977; and (d) 1978-1980.

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1/ "Sleepers" and "railroad ties" are used interchangeably.

2/ At least for some developing countries, the export potential in a group of secondary processed products, such as window frames, doors, parquet floorings, furniture components and other wood moldings including various joinery parts, is considered "promising", and deserves careful evaluation, but these are outside the scope of this study.

1.08 Chapter IV analyses available cost of production data on plywood and attempts to identify the key determinants of location of processing. The analysis focuses on plywood because it is the most important product from the viewpoint of development strategy. The analysis presumes that the hypothetical end market is Japan. The costs of production are divided between "ex-factory" and "post-factory" costs (the latter including the cost of transportation to Japan and import duties in Japan).

1.09 Chapter V discusses the possible benefits of increased local processing from the viewpoint of the log-producing countries. The possible benefits are a creation of value added, backward linkage effects, additional foreign exchange earnings, employment, and regional development.

1.10. Chapter VI presents the conclusions.

## II. THE TROPICAL HARDWOOD SECTOR

### A. Tropical Hardwood in World Wood Economy

2.01 Tropical hardwood is one of the most important primary commodities for developing countries in terms of export earnings. In 1979, exports of broadleaved (hardwood) industrial roundwood 1/ from developing countries amounted to \$3.1 billion, while exports of coniferous (softwood) roundwood earned these countries a meager \$75 million. Virtually all of the broadleaved roundwood exports from developing countries are in the form of sawlogs, veneerlogs and logs for sleepers (logs, hereafter) 2/. Only a small fraction of these exports are pulpwood and other industrial roundwood 3/, and fuelwood exports are practically negligible.

2.02 In volume, tropical hardwood logs are a rather modest component of total world wood production (Statistical Appendix Table SA1). In 1979, world wood production amounted to 3.0 billion m<sup>3</sup>, of which 47% was industrial wood with the remaining 53% being fuelwood. Within industrial wood, logs are the most important sub-category. In 1979 logs accounted for 61% of world production with pulpwood and other industrial wood accounted for 24% and 15% respectively. Only 28% of logs are broadleaved, or hardwood, and about one-half of hardwood logs are tropical hardwood. Thus, tropical hardwood logs account for only 4% of total volume of trees harvested.

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1/ In this respect, the terms "hardwood," "broadleaved wood" and "non-coniferous wood" are used interchangeably. Similarly, "softwood" and "coniferous wood" are used interchangeably. "Industrial roundwood" includes all forms of roundwood except fuelwood.

2/ "Sleepers" and "railroad ties" are used interchangeably.

3/ "Other roundwood" includes pitprops, poles, piling, scaffolding and formwork roundwood, etc.

2.03 Within the "logs" category, however, the relative importance of tropical hardwood has been increasing. During 1961-1979, the period for which consistent data are available, production of tropical hardwood logs increased at 5.1% per annum, while production of softwood and temperate hardwood logs increased only at 1.4% and 0.5% per annum respectively (Statistical Appendix Table SA1).

2.04 Furthermore, from the viewpoint of developing countries, tropical hardwood logs are of particular importance. Unlike softwood, production of which is dominated by industrialized countries and centrally planned economies, tropical hardwood, which accounts for almost one-half of world production of hardwood logs, is available only from developing countries. Exports of tropical hardwood logs and their derived products 1/ from developing countries have risen rapidly over the last three decades, amounting to some \$5.8 billion in 1979 (Statistical Appendix Table SA2). These have risen sharply primarily because of the shortages of temperate hardwood supply in the industrialized countries (Statistical Appendix Table SA3).

2.05 Tropical hardwood exports are especially important for a number of individual developing countries. For example, in 1976-1978, the share of tropical hardwood logs and sawnwood in non-oil exports was over 23% for Congo, Gabon, Burma, Indonesia and Solomon Islands; 11-17% for Cameroon, Central African Republic, Ivory Coast and Malaysia. 2/ Also, tropical hardwood exports have critical importance to regions (often rather remote regions) of some countries--e.g., the states of Sabah and Sarawak in Malaysia, Mindanao in the Philippines, Kalimantan, Sumatra and other outer islands in Indonesia, and the Amazonia in Brazil.

2.06 There is every reason to believe that demand for tropical hardwood logs will continue to grow more rapidly than demand for softwood logs or for temperate hardwood logs. Provided that supplies of tropical hardwood logs are available, therefore, the relative importance of tropical hardwood logs within the logs category is expected to continue to increase, at least, over the next two decades and perhaps beyond. As tropical hardwood supplies from traditional sources dry up, supplies are expected to come increasingly from the hitherto little exploited tropical forest areas such as West Irian of Indonesia and the inner areas of Papua New Guinea, the Amazonia and Zaire.

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1/ The products of first-stage mechanical processing, namely, sawnwood, sleepers, veneers, plywood, and other wood-based panel products.

2/ World Bank, Commodity Trade and Price Trends, August 1980, Table 9 and Table 11.

B. Production

1. Tropical Hardwood Logs

2.07 Production of tropical hardwood logs in the three tropical regions has expanded rather rapidly in the last three decades. It increased at some 5% per annum in 1961-1979 (Table 2.1). Among the three producing regions, the tropical Asia-Pacific is the most important accounting for two-thirds of world tropical hardwood production today. It has also been the fastest growing supplier, with production having grown at 6.1% per annum in 1961-1979. Indonesia, Malaysia and the Philippines are the main producers in the region. While India also has been a major producer, its production is primarily consumed at home. Production in Papua New Guinea has picked up rapidly since the early 1970s.

2.08 Tropical Africa accounts for 13-14% of world production. Major producers have been concentrated in West and Central Africa. The most important producers are Ghana, Gabon, Ivory Coast and Nigeria (Table 2.1). These are followed by Cameroon, Liberia, Zaire, Congo and Central African Republic. <sup>1/</sup>

2.09 Tropical Latin America, which includes the Caribbean countries but excludes three temperate countries (Argentina, Chile and Uruguay), accounts for 19-20% of world production. Major producers in this region are Brazil, Costa Rica, Colombia, Ecuador, Peru and Paraguay. As will be discussed below, much of the production in these countries is consumed locally.

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<sup>1/</sup> Countries that might become significant producers by 1990 include Angola and Mozambique.

Table 2.1: PRODUCTION OF TROPICAL HARDWOOD LOGS BY REGIONS AND MAJOR COUNTRIES, 1961, 1970, 1978 AND 1979

	1961	1970	1978	1979	Growth Rate 1961-79 /a
	-----million m <sup>3</sup> (r) /b-----				% per annum
<u>Tropical Asia &amp; Pacific /c</u>	<u>26.8</u>	<u>53.3</u>	<u>81.5</u>	<u>82.0</u>	<u>6.1</u>
of which, Burma	1.6	1.7	1.2	1.2	-1.5
India	3.3	5.0	7.4	7.4	4.3
Indonesia	3.9	10.7	25.0	26.9	10.7
Malaysia	6.3	18.7	31.5	31.5	8.8
Philippines	6.9	10.7	7.2	6.6	-0.2
Papua New Guinea	0.1	0.4	1.1	1.1	13.5
<u>Tropical Africa</u>	<u>9.1</u>	<u>14.9</u>	<u>15.8</u>	<u>16.2</u>	<u>3.1</u>
of which, Cameroon	0.4	0.8	1.6	1.6	7.6
Congo	0.4	0.8	0.4	0.4	0.0
Gabon	1.6	1.9	1.1	1.1	-2.0
Ghana	1.7	1.6	2.1	2.1	1.1
Ivory Coast	1.3	3.5	4.6	5.0	7.4
Liberia	0.1	0.2	0.6	0.8	11.6
Nigeria	1.2	1.4	2.2	2.2	3.2
Zaire	0.6	0.5	0.3	0.3	-3.6
<u>Tropical Latin America /d</u>	<u>12.5</u>	<u>15.3</u>	<u>22.2</u>	<u>23.3</u>	<u>3.3</u>
of which, Costa Rica	0.4	0.7	1.3	1.3	6.4
Brazil	6.8	7.5	12.6	13.3	3.6
Colombia	2.2	2.0	2.0	2.2	0.0
Ecuador	0.7	1.5	1.7	1.7	4.8
<u>TOTAL</u>	<u>48.4</u>	<u>83.5</u>	<u>119.5</u>	<u>121.5</u>	<u>5.0</u>

/a All growth rates are based on end-points.

/b Cubic meters roundwood.

/c Includes Kampuchea and Vietnam.

/d Includes Caribbean countries.

Source: FAO, Yearbook of Forest Products; and FAO yearbook of Forest products Standard Tapes.

## 2. Processed Tropical Hardwood Products

2.10 Tropical hardwood logs harvested from the forests are processed into sleepers, sawnwood and veneer sheets. Sleepers are used as railroad ties without further processing. Sawnwood comes in a variety of shapes and is usually kiln dried. Logs suitable for peeling or slicing are made into veneer sheets, a predominant portion of which is used for making plywood. Logging, sawing and veneer-making activities produce wastes and residues and a good part of these are used in making particleboard and, to a much lesser extent, fiberboard. <sup>1/</sup>

### (a) Sawnwood

2.11 Production of tropical hardwood sawnwood takes place both in the log-producing countries and in countries that import the logs. Unfortunately, global statistics on production of hardwood sawnwood do not distinguish tropical hardwood from temperate hardwood. However, some rough estimates can be made for production of tropical hardwood sawnwood.

2.12 Production of hardwood sawnwood in selected years is shown in Table 2.2. All production of hardwood sawnwood in the tropical countries and most production in such log-importing developing economies as the Republic of Korea, Hong Kong, the Province of Taiwan and Singapore are of tropical hardwood species. While 5-10% of Western Europe's production of hardwood sawnwood and 70-75% of Japan's production are made from imported tropical hardwood logs. Practically all hardwood sawnwood produced in other countries such as the United States, Canada, Australia, South Africa, New Zealand, Argentina, Chile, Uruguay and the temperate centrally planned economies is of temperate species. Thus, in 1979, about 62% of the hardwood sawnwood produced in the market economies was of tropical species. Of these, about two-thirds was produced in the tropical log-producing countries themselves with the rest sawn in the four Asian log-importing developing economies, Western Europe and Japan.

2.13 Over the last two decades, the shares of tropical-hardwood-producing countries and tropical-log-importing developing economies in world production of hardwood sawnwood have increased significantly, while the shares of industrialized countries and centrally planned economies have decreased (Table 2.2). It is especially notable that production in tropical-hardwood-producing countries has increased rapidly (at 4.3% per annum in 1961-1979). Production in the tropical log importing developing economies also grew rapidly (at 6% per annum). In contrast, production of hardwood sawnwood in the industrialized regions, which rose significantly in the 1960s, has stagnated since the beginning of the 1970s.

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<sup>1/</sup> For a more detailed description of processing chains for tropical hardwood, see Annex B.

**Table 2.2: PRODUCTION OF HARDWOOD SAWWOOD<sup>/a</sup> BY MAJOR REGIONS AND MAJOR COUNTRY ECONOMIES, 1961, 1970, 1977, 1978 AND 1979**

	1961	1970	1977	1978	1979	Growth Rate 1961-79
	-----million m <sup>3</sup> (sawnwood)-----					% per annum
<u>Tropical Hardwood-Producing Areas</u>	14.97	20.92	31.14	31.20	32.07	4.3
<u>Tropical Asia-Pacific</u>	7.95	11.31	16.93	17.00	17.90	4.7
of which, Burma	0.45	0.62	0.40	0.40	0.40	-0.7
India	1.20	1.95	2.60	3.00	3.50	6.1
Indonesia	1.71	1.66	3.50	3.50	3.97	4.8
Malaysia	1.63	3.10	5.59	5.59	5.15	6.6
Philippines	1.04	1.34	1.57	1.78	1.45	1.9
Thailand	0.88	1.16	1.74	1.57	1.82	4.1
Papua New Guinea	0.03	0.09	0.11	0.11	0.11	7.5
<u>Tropical Africa</u>	1.83	2.50	3.62	3.51	3.57	3.9
of which, Ghana	0.42	0.36	0.32	0.32	0.32	-1.5
Ivory Coast	0.11	0.31	0.88	0.66	0.67	10.6
Liberia	0.04	0.04	0.14	0.04	0.05	1.2
Mozambique	0.07	0.13	0.11	0.11	0.11	2.5
Nigeria	0.37	0.57	0.94	0.94	1.00	5.7
Zaire	0.22	0.16	0.09	0.09	0.09	4.8
<u>Tropical Latin America &amp; Carib.</u>	5.29	7.11	10.59	10.69	10.50	3.9
of which, Brazil	3.00	3.50	6.05	5.59	6.74	4.6
Colombia	0.98	1.09	0.90	0.90	0.95	-0.2
Costa Rica	0.26	0.36	0.68	0.68	0.05	-9.3
Ecuador	0.31	0.70	0.85	0.76	0.76	5.1
Nicaragua	0.05	0.10	0.23	0.23	0.23	8.8
Paraguay	0.04	0.21	0.38	0.38	0.38	13.3
Peru	0.10	0.31	0.47	0.42	0.42	8.3
Venezuela	0.15	0.33	0.35	0.35	0.35	4.8
<u>Temperate Regions</u>	33.40	45.83	42.50	44.54	44.90	1.7
<u>Industrialized Countries</u>	32.03	42.65	38.04	40.08	41.01	1.4
of which, United States	14.08	16.35	15.57	15.95	17.21	1.1
EC-9	6.93	8.88	9.09	8.63	8.31	1.0
Other Europe	0.60	0.83	0.96	0.98	0.90	2.3
Japan	5.02	9.83	6.24	8.16	8.16	2.7
Canada	1.01	1.33	1.05	1.33	1.16	0.8
<u>Developing Economies</u>	1.37	3.18	4.46	4.46	3.89	6.0
of which, Rep. of Korea	0.26	0.51	1.28	1.56	1.03	7.9
Hong Kong	0.13	0.17	0.23	0.26	0.26	3.9
Prov. of Taiwan	0.06	0.82	1.50	1.57	1.32	18.5
Singapore	0.00	0.77	0.30	0.36	0.36	-8.1 /b
Argentina	0.57	0.59	0.75	0.59	0.59	0.2
Chile	0.35	0.32	0.40	0.12	0.33	-0.3
<u>Market Economies Total</u>	48.37	66.75	73.64	75.74	76.97	2.6
<u>Centrally Planned Economies</u>	24.83	25.85	25.66	24.70	25.83	0.2
<u>World Total</u>	73.20	92.60	99.30	101.30	102.80	1.9

/a Includes both temperate and tropical hardwood species.

/b 1970-1979.

Source: FAO, Yearbook of Forest Products Standard Tapes; for the Province of Taiwan, estimates were based on local sources.

(b) Tropical Hardwood Plywood

2.14 There are no official statistics on world production of tropical hardwood plywood as such, because FAO data on plywood do not distinguish even between hardwood and softwood. However, it can be assumed that all plywood production in the tropical countries and the tropical-hardwood-log-importing developing economies in Asia is of tropical hardwood species. In addition, 97-98% of production in Japan and 37-40% of production in Western Europe consist of tropical hardwood plywood. Tropical hardwood plywood production in other countries (i.e., the United States, Canada, Australia, temperate developing countries in Latin America, etc.) is very small, perhaps less than 5% of their plywood production. The next two paragraphs concern plywood production of all species. An analysis of tropical hardwood plywood production trends is provided in a later chapter.<sup>1/</sup>

2.15 World production of plywood increased very rapidly in the 1950s and 1960s, but more slowly since the early 1970s (Table 2.3), mainly due to the stagnant world economic growth. Over the last two decades, there has been a significant change in the relative shares of major producing regions. Excluding the centrally planned economies (which account for about 7% of world production), within the market economies, the share of the industrialized countries decreased from 93% to 80% in 1961-1979. While the share of Japan increased from 10% to 21% over the same period, the share of the United States, still the single largest producer (mainly softwood plywood), declined from 52% to 44%. Western Europe's share also declined, from 15% to 7%.

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<sup>1/</sup> Statistical difficulties are compounded because of production of plywood from mixed species, softwood as well as temperate hardwood.

Table 2.3: PRODUCTION OF PLYWOOD BY MAJOR REGIONS AND AREAS,  
SELECTED YEARS IN 1955-1979

	1955	1961	1965	1970	1978	1979
	-----1,000 m <sup>3</sup> (plywood)-----					
<u>Developing Economies</u>	<u>699</u>	<u>1,015</u>	<u>1,857</u>	<u>3,983</u>	<u>8,140</u>	<u>8,041</u>
<u>Tropical Africa</u>	<u>66</u>	<u>124</u>	<u>254</u>	<u>248</u>	<u>349</u>	<u>373</u>
<u>Tropical Latin Amer. &amp; Carib.</u>	<u>164</u>	<u>315</u>	<u>409</u>	<u>652</u>	<u>1,222</u>	<u>1,261</u>
of which, Brazil	97	190	220	342	722	762
Mexico	21	47	64	96	188	206
<u>Tropical Asia-Pacific</u>	<u>137</u>	<u>272</u>	<u>495</u>	<u>1,144</u>	<u>1,923</u>	<u>1,978</u>
of which, India	49	73	101	128	176	180
Indonesia	0	3	3	7	472	525
Malaysia	0	7	28	197	465	490
Philippines	56	112	257	653	490	503
<u>Log Importing Producers</u>	<u>53</u>	<u>256</u>	<u>687</u>	<u>1,866</u>	<u>4,581</u>	<u>4,359</u>
Rep. of Korea	11	45	215	847	2,560	2,338
Prov. of Taiwan	21	165	351	794	1,527	1,527
Singapore	0	0	32	215	482	482
Hong Kong	0	0	0	10	12	12
<u>Temperate Latin America</u>	<u>39</u>	<u>1</u>	<u>66</u>	<u>73</u>	<u>65</u>	<u>70</u>
<u>Industrialized Countries</u>	<u>8,715</u>	<u>13,472</u>	<u>19,985</u>	<u>26,199</u>	<u>30,631</u>	<u>32,012</u>
United States	5,840	8,580	12,811	14,078	17,056	18,200
Canada	684	1,104	1,702	1,851	2,807	2,511
EC-9	929	1,355	1,640	1,832	1,448	1,562
Other W. Europe	457	791	1,044	1,308	1,135	1,197
Japan	683	1,499	2,627	6,922	8,041	8,400
Other /a	122	143	161	208	144	142
<u>Market Economies Total</u>	<u>9,414</u>	<u>14,486</u>	<u>21,842</u>	<u>30,182</u>	<u>38,771</u>	<u>40,053</u>
<u>Centrally Planned Economies</u>	<u>1,422</u>	<u>2,034</u>	<u>2,478</u>	<u>2,992</u>	<u>3,172</u>	<u>3,161</u>
<u>World Total</u>	<u>10,836</u>	<u>16,520</u>	<u>24,323</u>	<u>33,174</u>	<u>41,943</u>	<u>43,214</u>

/a Australia, New Zealand and South Africa.

Source: FAO, Yearbook of Forest Products Standard Tapes, and FAO, World Forest Product Statistics 1954-1963.

2.16 In contrast to the experience of industrialized countries, developing economies' plywood production, which had grown rapidly in the 1960s, continued to grow at a respectably high rate, 8% per annum in the 1970-1979 period. As a result, the developing economies' share increased from 7% to 20%. Among the developing economies, plywood production has been rising rapidly in both the tropical hardwood-producing countries and the log-importing "processor" economies. And yet, the share of the tropical hardwood-producing countries as of 1979 was still only 9% while the share of the log-importing developing market economies was close to 11% in that year.

(c) Veneer Sheets

2.17 The bulk of veneer sheet production consists of veneers produced by plywood companies and used for plywood making within their own plywood factories. These veneers are not included in global statistics of veneer production. In 1979, world production of "reported," or "market," veneer sheets amounted to 4.6 million m<sup>3</sup>, of which 1.6 million m<sup>3</sup> were produced in developing market economies. As available statistics do not distinguish tropical hardwood veneers from veneers made from temperate hardwood or softwood, it is difficult to know precisely the volume of "market" veneers produced from tropical hardwood. However, most of veneers produced in developing market economies can probably be presumed to be of tropical hardwood species. The Philippines alone accounts for 40% of "market" veneers produced in developing economies.

2.18 Another problem with statistics on veneer production is that they do not distinguish sliced veneers from peeled veneers. Decorative veneers are made by slicing high grade logs of decorative species and are used as face veneers for plywood, blockboard, particleboard or sawnwood. In terms of volume, sliced veneers of decorative quality are only a small fraction of market veneers, but they are much more valuable than peeled veneers on a per-unit volume basis. It should be pointed out, however, that sliced veneers are also made from low-grade logs for use in packaging and other utility purposes. The bulk of veneer sheets is peeled veneers which are used for plywood making.

(d) Particleboard

2.19 So far, discussions have focused on tropical hardwood logs, sawnwood, plywood and veneers. The wastes and residues derived from processing tropical hardwood into sawnwood, veneers and plywood are used, among other things, for making particleboard, although it is impossible to trace how much particleboard is made from the wastes and residues of tropical hardwood. A short review of trends in the particleboard industry is provided below.

2.20 The growth of world particleboard production has been phenomenal in the last 20 years. World production grew at 13% per annum in 1961-1979 (Table 2.4). It is a relatively new industry which has grown rapidly as particleboard has substituted for sawnwood and plywood in many uses mainly because particleboard prices have been relatively low.

Table 2.4: PARTICLEBOARD PRODUCTION IN 1961 AND 1979

	Volume of Production		Growth Rate 1961-1979 % per annum
	1961	1979	
	-----thousand m <sup>3</sup> -----		
<u>Developing Countries</u>	<u>81</u>	<u>1,849</u>	<u>17.9</u>
Asia	19	626	20.2
Africa	7	118	16.0
Latin America	55	1,105	17.1
<u>Industrialized Countries</u>	<u>3,129</u>	<u>30,405</u>	<u>12.7</u>
Western Europe	2,362	20,044	11.9
United States	578	7,200	14.2
Japan	105	950	12.3
Other	84	2,211	18.8
<u>Market Economies Total</u>	<u>3,210</u>	<u>32,254</u>	<u>12.9</u>
<u>Centrally Planned Economies</u>	<u>739</u>	<u>8,785</u>	<u>13.9</u>
World Total	<u>3,949</u>	<u>41,039</u>	<u>13.1</u>

Source: FAO, Yearbook of Forest Products, various issues.

2.21 The development of the industry so far has been concentrated in industrialized countries, especially in Western Europe. As of 1979, industrialized countries accounted for 74% of world production, while developing countries contributed only 4.5%. Western Europe alone accounted for almost 50% of world production. Particleboard is produced largely for local consumption and rarely for export. In 1979, world exports accounted for 14% of world production, but over 80% of these exports consisted of intra-West European trade.

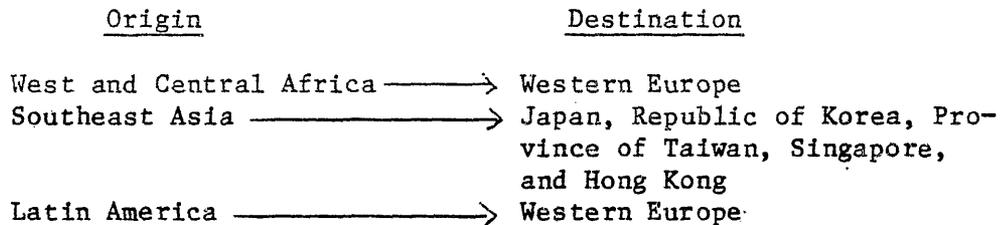
### C. Trade and Consumption

2.22 Because of the relative scarcity of temperate hardwood logs, the market for tropical hardwood in industrialized countries (all of which

are located in the temperate zones) has been expanding rapidly. From 1961 to 1978, consumption of tropical hardwood in industrialized countries increased at 6.8% per annum. Consumption of tropical hardwood in some fast-growing developing economies whose domestic hardwood availability is limited has also been rising rapidly. Consumption in the log-producing countries increased at 4.2% per annum.

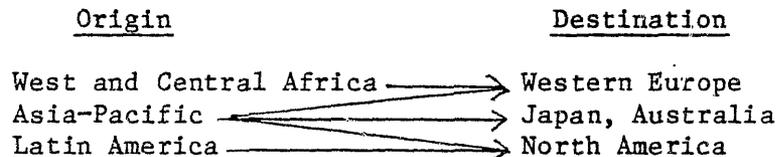
1. Pattern of Trade Flows in Tropical Hardwood

2.23 Broadly speaking, most of the world trade in tropical timber flows from three major producing areas -- Southeast Asia, West and Central Africa and Latin America -- to three main market areas -- North America, Western Europe and Japan. For logs, the rather close traditional relationship between origin and destination and the transport cost factor have strongly influenced trade developments and the trade pattern. Schematically, the major trade flows have been as follows:



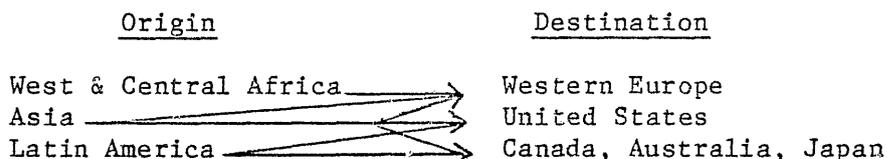
The United States, Canada, Australia and New Zealand import only small quantities of tropical logs. One recent change in the above pattern of trade is that log exports from Latin America have been reduced to negligible quantities as a result of the policies of the exporting countries in that region. Statistical Appendix Table SA4 illustrates the log trade-flow matrix for 1977.

2.24 For tropical sawn hardwood, the pattern of trade flows is more diversified than for logs. Schematically, major sawnwood trade flows can be illustrated as follow:

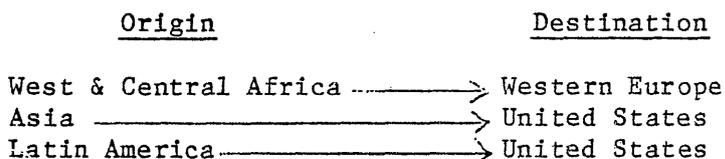


Statistical Appendix Table SA5 shows the major trade flows in tropical sawn hardwood in 1977. Exports of sawnwood from Southeast Asia to Western Europe have been increasing rapidly. In contrast, Japan's imports of tropical sawnwood from Asia have been rising only sluggishly, as consumption of hardwood sawnwood there tended to decrease during the 1970s.

2.25 World exports of tropical hardwood plywood originate mainly in Asia, which includes two types of exporters -- log-producing (Malaysia, the Philippines, etc.) and log-importing (the Republic of Korea, the Province of Taiwan, Singapore, Japan, etc.). In the 1950s through the mid-1960s, Japan was the largest exporter of tropical hardwood plywood and the United States was the main market. As other in-transit processor exporters such as the Republic of Korea, the Province of Taiwan and Singapore expanded their exports and Japanese domestic consumption increased, Japan's exports of tropical hardwood plywood declined. Main importers have been the United States, Canada and Western Europe. The existing trade pattern in tropical hardwood plywood can be schematized as follows (Statistical Appendix Table SA6):



2.26 World trade in tropical hardwood veneers is relatively small compared with trade in logs, sawnwood or plywood. Unlike plywood, exports of tropical hardwood veneers mainly come from the log-producing countries, with the minor exception of Singapore. The basic pattern of trade is as follows (Statistical Appendix Table SA7):



One notable feature of tropical hardwood veneer exports is that they have been rather stagnant since the mid-1960s except for the surge in 1971-1974.

## 2. Exports of Logs and Processed Products

### a. Export Dependence

2.27 A high proportion of tropical hardwood log production is exported in various forms. The "export dependence" of log production as measured by the ratio of combined exports of logs, sawnwood, plywood and veneers (in roundwood equivalent volume) to log production in the log-producing countries as a whole has been steadily increasing over the last two decades; it increased from 35% in 1961 to 53% in 1977 (Table 2.5). The ratio varies significantly from one country to another, but generally speaking, the export-dependence ratio has increased significantly for most countries (with some notable exceptions such as the Philippines and Ghana). In the tropical Asia-Pacific region between 1961 and 1977, the export dependence of tropical

hardwood rose from 37% to 67%. A decline in the ratio for the Philippines was more than offset by the increase for Malaysia and Indonesia. For Africa, overall export dependence decreased as increases for Gabon, Cameroon and Liberia were overwhelmed by declines for such traditional exporters as Nigeria, Ghana and Ivory Coast. In Latin America, only 7% of tropical hardwood produced there is exported.

Table 2.5: THE RATIO OF EXPORTS (LOGS AND PROCESSED PRODUCTS)/a TO LOG PRODUCTION IN SELECTED TROPICAL HARDWOOD-PRODUCING COUNTRIES, 1961 AND 1977

	1961	1977
	----- (Percent) -----	
<u>Tropical Asia-Pacific</u>	<u>37.4</u>	<u>66.7</u>
Indonesia	3.2	81.8
Malaysia	59.4	72.7
Philippines	74.4	45.2
<u>Tropical Africa</u>	<u>67.7</u>	<u>51.4</u>
Ivory Coast	83.5	78.8
Ghana	73.9	36.4
Gabon	86.5	93.7
Cameroon	45.9	80.3/ <u>b</u>
Liberia	17.1	66.6
Nigeria	72.1	5.3
<u>Tropical Latin America</u>	<u>6.8</u>	<u>7.2</u>
Brazil	1.6	6.0
Colombia	5.6	2.5
Ecuador	7.7	7.3
<u>All Tropical Regions</u>	<u>35.0</u>	<u>53.2</u>

/a Roundwood equivalent.

/b 1975.

Source: FAO, Yearbook of Forest Products, 1977.

2.28 Exports of tropical hardwood generally flow from log-producing countries to industrialized countries, predominantly in log form. However, substantial quantities of tropical hardwood logs are also exported from the log-producing countries to a few rapidly industrializing developing areas such as the Republic of Korea, the Province of Taiwan, Singapore and Hong Kong; the latter areas in turn export processed wood products to industrialized countries. Developing economies' exports of tropical hardwood (logs and processed products combined) are dominated by log-producing Asia-Pacific countries and log-importing in-transit processing areas which are located in East and Southeast Asia ("other developing" in Statistical Appendix Table SA8); these two groups accounted for 71% and 15% respectively of developing economies' exports in 1978 and are responsible for the rapid increase (about 9% a year in 1961-1978) in developing countries' (gross<sup>1/</sup>) exports of tropical hardwood (logs and processed products combined).

(b) Share of Processed Products in Exports

2.29 The share of processed products (sawnwood, plywood and veneers) in the total tropical hardwood exports (roundwood equivalent volume) of log-producing countries has been relatively low (Table 2.6). Having declined in the 1960s, it increased in the 1970s, recovering to the 1961 level of 23.4% by 1978. Thus, although the processed-product share is estimated to have increased even further in the last two years, log exports are still the dominant form of tropical hardwood exports of log-producing developing countries.

Table 2.6: PERCENTAGE SHARE OF PROCESSED PRODUCTS/<sup>a</sup> IN TOTAL TROPICAL TIMBER EXPORTS OF DEVELOPING REGIONS, 1961, 1970, 1977 and 1978

	1961	1970	1977	1978
	-----Percent-----			
<u>All Exporting Regions</u>	<u>24.7</u>	<u>25.5</u>	<u>33.7</u>	<u>34.2</u>
Tropical Asia-Pacific	20.6	12.8	20.0	20.9
Tropical Africa	24.2	22.7	21.4	22.4
Tropical Latin America	50.0	73.3	100.0	100.0
<u>Total Log-Producing Regions</u>	<u>23.4</u>	<u>16.8</u>	<u>22.6</u>	<u>23.4</u>
<u>Log-Importing Developing<sup>/b</sup></u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

<sup>/a</sup> Processed products include sawnwood, veneers and plywood only. The share is based on the roundwood equivalent volume.

<sup>/b</sup> Includes Hong Kong, Singapore, Republic of Korea and Province of Taiwan.

Source: FAO, Yearbook of Forest Products Standard Tapes.

<sup>1/</sup> Without deducting the logs imported by the in-transit processors.

(c) Log Exports

2.30 The log-producing Asia-Pacific countries account for over 85% of tropical hardwood log exports (Statistical Appendix Table SA8). Major exporters of logs are Malaysia, Indonesia, the Philippines, Papua New Guinea and Burma in the Asia-Pacific region; and Cameroon, Congo, Gabon, Ghana, Ivory Coast and Liberia in Africa (Statistical Appendix Table SA9). There are no significant log exporters in Latin America because of strict government policies to discourage or prohibit log exports and encourage local processing.

(d) Processed Product Exports

2.31 In the last two decades, the processed-product exports of log-importing developing economies have experienced a dramatic expansion. As a result, the share of processed products in total tropical hardwood exports of all developing economies (the log-importing and the log-producing combined) has increased sharply--i.e., from 25% to 34% in 1961-1978 (Table 2.6). Plywood exports from log-importing processing areas have increased the most, followed by sawnwood exports (Statistical Appendix Table SA8). In veneers, exports by the log-importing developing areas have been relatively insignificant.

2.32 Exports of tropical hardwood sawnwood from developing economies increased at 9% per annum from 1.8 million m<sup>3</sup> to 7.0 million m<sup>3</sup> in 1961-1978. Major exporters of tropical hardwood sawnwood are: among the log-producing Asia-Pacific countries, Malaysia, the Philippines, Indonesia, Burma and Thailand; in Africa, Ivory Coast; in Latin America, Brazil and Paraguay; and among the log-importing processors, Singapore (Statistical Appendix Table SA10).

2.33 Exports of tropical hardwood plywood by developing economies increased at 12.6% per annum in 1961-78, reaching 4.5 million m<sup>3</sup> in 1978. Major exporters of tropical hardwood plywood are: among the log-producing Asia-Pacific countries, the Philippines and Malaysia; and among the log-importing Asian economies, the Republic of Korea, the Province of Taiwan and Singapore (Statistical Appendix Table SA11). It is noteworthy that, as of 1978, the latter group accounted for 76% of developing economies' exports while the former group accounted for 19%. There are no "major" exporters of plywood in Africa or Latin America.

2.34 As will be discussed in Chapter III, the last three decades have seen dramatic changes in the cast of main actors in the tropical hardwood plywood export scene. In the 1950s, Japan was the principal exporter of plywood made from imported tropical hardwood. The main destination was the United States. In the 1960s, Japan's exports ceased to grow although they remained at high levels. In the meantime, the Philippines, Gabon and the Province of Taiwan emerged as significant exporters in the early 1960s, and exports by the Philippines and the Province of Taiwan expanded rapidly.

Furthermore, the Republic of Korea emerged as a major exporter in the mid-1960s; Singapore and Malaysia in the late 1960s. In the 1970s, largely as a result of the sharp appreciation of the yen against the US dollar and the concomitant rise in Japanese wage levels in US dollar terms, Japan's exports declined dramatically while exports by the Republic of Korea, the Province of Taiwan, Malaysia and the Philippines held up relatively well.

2.35 As for veneers, there are no major exporters among the developing economies, although Congo, Ivory Coast, Brazil, Malaysia, the Philippines and Singapore do export some. The largest exporters of tropical hardwood veneers is currently Malaysia with 185,000 m<sup>3</sup> exported in 1978 (Statistical Appendix Tables A12). In terms of roundwood equivalent volume, veneers accounted for less than 4% of total processed exports of developing economies in 1978 (Statistical Appendix Table SA8).

2.36 Among the log-producing developing countries, there is quite a variation in the percentage share of processed products in timber exports; the percentage ranges from less than 10% for Indonesia and Gabon to practically 100% for Brazil and some other Latin American countries (Statistical Appendix Table SA13). The very high percentages for Latin American countries reflect the fact that all Latin American countries have maintained policies of either totally prohibiting or severely restricting log exports.

2.37 The above discussions of processed tropical hardwood products exclude particleboard. Particleboard production in developing economies is still minimal and that is domestically consumed. Indeed, particleboard exports are limited. Over 80% of what little world trade takes place consists of intra-West European trade (Statistical Appendix Table SA14). Particleboard is heavy and of relatively low value per unit weight (and volume), making it unattractive for shipping over long distances.<sup>1/</sup> The principal advantage of particleboard over sawnwood and plywood is its low cost. A high transport cost would wipe out this advantage in competing with sawnwood and plywood.

### 3. Consumption

2.38 Currently, a little over 50% of tropical hardwood (logs and processed products) is consumed in the log-producing regions while industrialized countries consume almost 40% (Statistical Appendix Table SA15). The market for tropical hardwood has been growing more rapidly in industrialized countries than in log-producing countries mainly because of the relative scarcity of temperate hardwood logs. Statistical Appendix Table SA16 shows total hardwood (temperate as well as tropical) consumption.

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<sup>1/</sup> The FOB export unit value (\$/m<sup>3</sup>) of particleboard is about one-third of that of plywood for EEC-9 as well as for industrialized countries as a whole. On a value per unit weight basis, the relative "price" of particleboard vis-a-vis plywood is even lower.

(a) Sawnwood

2.39 Apart from the log-producing countries themselves, major consumers of tropical hardwood sawnwood are Western Europe, Japan, and a group of importing developing economies such as Singapore, the Republic of Korea, Hong Kong and the Province of Taiwan. The United States, Canada, Australia and South Africa import tropical hardwood sawnwood in modest quantities but they produce very little of it themselves. Therefore, their consumption of tropical hardwood sawnwood is relatively small.

2.40 In Western Europe, consumption of hardwood sawnwood in 1977 reached 16.2 million m<sup>3</sup>(s), of which about 27%, 4.3 million m<sup>3</sup>(s), is estimated to have been of tropical species.<sup>1/</sup> About 40% of tropical hardwood sawnwood consumption in turn is estimated to have been sawnwood produced in Western Europe from imported tropical logs (Statistical Appendix Table SA17).

2.41 In Japan, consumption of hardwood sawnwood in 1977 is estimated to have been 9.7 million m<sup>3</sup>(s), of which 4.6 million m<sup>3</sup>(s), or 48%, were of tropical species. Almost 95% of the latter was sawnwood made in local sawmills from imported tropical logs. Back in 1961, consumption of tropical hardwood sawnwood was only about 2 million m<sup>3</sup>(s), or 41%, of total hardwood sawnwood consumption in Japan (Statistical Appendix Table SA17).

2.42 Western Europe and Japan together consumed some 8.9 million m<sup>3</sup>(s) of tropical hardwood sawnwood in 1977. Of this, 6.1 million m<sup>3</sup>(s), or almost 70%, were sawnwood made in these consuming countries from imported logs.

(b) Plywood

2.43 Major consuming regions of tropical hardwood plywood are Western Europe, Japan and the United States, as well as the developing economies that produce tropical hardwood plywood. Other industrialized countries (Canada, South Africa and Australia) also consume modest but significant quantities, importing most of these in plywood form.

2.44 Despite inadequate statistical data, some rough estimates have been made for production, consumption and trade of tropical hardwood plywood in Western Europe, the United States and Japan in 1976 as shown in Statistical Appendix Table SA18.

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<sup>1/</sup> Cubic meter units in this and the following two paragraphs refer to actual sawnwood volume.

2.45 Virtually all tropical hardwood plywood and veneers consumed in the United States are imported as processed products rather than as logs. In contrast, the bulk of tropical hardwood products consumed in Japan is processed there from imported logs. In Western Europe, about 48% of hardwood plywood production is of tropical species. About 40% of consumption is imported in the form of plywood (including veneers) while the remaining 60% is imported in logs and processed in the region.

#### D. Markets and Prices

##### 1. Market Structure

2.46 There is no comprehensive literature on the global market structure of the tropical hardwood sector. Therefore, what can be said on this subject is limited to some generalizations based on the partial bits of information that are available.

2.47 Generally speaking, the world market for tropical hardwood logs is fairly competitive. It is certainly not a typical oligopolistic or oligopsonistic market in terms of the numbers of buyers and sellers involved at the world level. There are countless producers, sellers, buyers and consumers of tropical hardwood logs. However, it is also true that competition in the tropical hardwood log trade has been less than perfect in some respects as explained below.

2.48 First of all, because of the heterogeneity of tropical hardwood species and the vast variety of products (different sizes of sawnwood, plywood, etc.), there is no organized market that deals with tropical hardwood logs or tropical timber products. Information regarding "world market prices" for tropical hardwood logs, sawnwood and plywood is not readily available; only some indicative price quotations for some products in some national markets and CIF and FOB prices for some countries are regularly published.<sup>1/</sup>

2.49 In the case of logs, transportation costs have limited expansion of the market. At least partly because of the high transportation costs (relative to the value of the commodity), there has been a tendency for trade flows in logs to be geographically concentrated.<sup>2/</sup>

2.50 There is a fairly visible concentration of importers of South Sea logs in Japan,<sup>3/</sup> which is the world's largest importer of tropical

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<sup>1/</sup> Prices are discussed below in Subsection 3.

<sup>2/</sup> See Section C, Subsection 1, above.

<sup>3/</sup> Tropical hardwood species (excluding teak) produced in Southeast Asia and South Pacific islands are referred to as South Sea timber in Japan.

hardwood logs. In 1977, when a total of 158 companies imported 21 million m<sup>3</sup> of South Sea logs into Japan, the "top ten" firms accounted for 52% of the total imports and another ten firms for a further 24%.<sup>1/</sup> Considering that many of the other importing firms are affiliated with the largest twenty, the degree of concentration of market power in South Sea log importing in Japan is rather high, although there is no evidence of collusive market distortions by importers.

2.51 On the supply side, a large number of producers are engaged in tropical hardwood log production. For example, in Indonesia, there were some 296 logging concessions in 1976.<sup>2/</sup> In the Philippines, there were 315 timber licenses in operation as of the end of 1978.<sup>3/</sup> In Papua New Guinea, there were about 55 logging licenses in operation in 1978 (excluding the ones smaller than 1,000 hectares).<sup>4/</sup> How many logging operations exist in Malaysia today is not known.

2.52 The effective number of independent companies engaged in log production in these countries, however, must be substantially less than the above numbers of logging licenses and operations indicate. A number of companies are engaged in logging operations at more than one place (sometimes in different countries). Also, interlocking ownership relationships tend to reduce the effective number of independent companies involved. Furthermore, recently Indonesia has been encouraging consolidation of smaller concessions into larger units.

2.53 The involvement of foreign companies in logging operations is substantial. In addition to outright equity ownership relationships, dependence of local logging firms on foreign firms through suppliers' credits for initial purchase of equipment and associated marketing arrangements for log output is quite pervasive. Comprehensive data showing such relationships, however, are not available.

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<sup>1/</sup> Based on information provided by the Japan Lumber Importers' Association.

<sup>2/</sup> C.E.M. Keil, Logging and Log Processing in Indonesia, Annex Table A-4.

<sup>3/</sup> Based on: Philippines, Ministry of Natural Resources, Bureau of Forest Development, Philippine Forestry Statistics 1978.

<sup>4/</sup> Papua New Guinea, Office of Forests, Compendium of Statistics 1978.

2.54 Prompted by the collapse of the log export markets in 1974, the national timber trade associations of Indonesia, the Philippines and Malaysia (Sabah) established the Southeast Asian Lumber Producer Association (SEALPA) in 1975. The association was later joined by Papua New Guinea. The main objectives of SEALPA are to stabilize the tropical hardwood log export market, to promote the growth of timber processing in these countries, to standardize grading rules and to promote reforestation. Although SEALPA's nickname, the "green cartel," overstates the organization's current capabilities, its efforts toward supply management at a time of depressed market conditions apparently have had some impact on the market. On the whole, SEALPA's influence on the market seems to be effected mainly through regular consultations and exchanges of information. The effectiveness of SEALPA has been enhanced materially by the participation of the Japan Lumber Importers' Association, the Korean Plywood Industries Association, the Taiwan Plywood Manufacturers and Exporters Association and the American Imported Hardwood Plywood Association.<sup>1/</sup>

2.55 One important feature of the tropical hardwood market is that the semi-nonrenewable resources are in the state-owned forests. For the purpose of collecting resource rent, the governments have set rates of royalties, taxes, and other charges on the production and/or exports of logs. These government charges could be, and have in fact been, changed radically and these changes have affected the prices of logs. Furthermore, on the grounds of environmental and other concerns, these governments could take measures affecting markets, e.g., to restrict the volume of production and/or exports. While the details of recent developments in this area will be discussed in Chapter III, it suffices here to emphasize the influence of government policies on the market.

2.56 For sawnwood and plywood, the markets are very competitive for the following reasons. First, these industries consist of numerous small and medium-size firms. Second, consumers are scattered in a variety of different industries. Third, compared with trade in logs, transport costs for processed products are less important, so that the potential market for processed products is more diversified geographically.

## 2. Trade Barriers

2.57 Import barriers in industrialized countries are mainly tariff barriers. Although there are no tariff barriers on tropical hardwood logs,

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<sup>1/</sup> Elizabeth B. Bollmann, The Timbering and Wood-Processing Industries of Indonesia, p. 40.

significant tariffs are imposed on more processed products. Table 2.7 summarizes the existing tariff structure on the relevant wood and wood products in the major consuming countries, the EEC, Japan, the United States and Canada. Generally speaking, in terms of Most Favored Nation (MFN) tariff schedules, log imports are free of duty everywhere. Simple sawnwood imports are also generally free of duty except in Japan where imports of sawnwood made of Southeast Asian species are dutiable. Better grades of sawnwood are dutiable in the majority of industrial countries at about 5-10%, except in the United States where they are duty free. Veneer sheets, plywood and particleboard are subject to MFN duties ranging from 7-20% in the major consuming countries.<sup>1/</sup>

2.58 For tropical hardwood plywood, Japan has an MFN duty rate of 20% and no Generalized System of Preferences (GSP) relief has been offered so far. In the United States, MFN duties range from 3-17% on hardwood plywood and veneer panels. While a relief rate of 8% is available for the hardwood plywood imports coming from the least developed countries, there is no relief for tropical hardwood plywood under the GSP of the United States. In this context, it is noteworthy that the list of the least developed countries does not include Malaysia, the Philippines, Indonesia or Papua New Guinea and that, therefore, the MFN 14% rate applies to the imports from these countries. The EC's MFN rate on tropical hardwood plywood is 12.6%. While the EC offers duty-free access to developing countries under the GSP, duty-free imports are subject to quote ceilings. Under the Lomé Convention, unlimited duty-free access is assured to all ACP countries,<sup>2/</sup> but Malaysia, Indonesia and the Philippines are not among the ACP countries. Thus, tariff barriers in the major industrial countries are a significant factor affecting the export potential of the Southeast Asian plywood exporters.

2.59 In the context of the Asia-Pacific tropical hardwood trade, tariff escalation seems to have played an important role in the historical determination of the location of processing activities. The main importers of tropical hardwood have been Japan and the United States. Both countries--and, to a lesser extent, Canada--have maintained substantial import duties on processed products while having no duties on logs. The situation has entailed rather significant effective rates of protection for their industries competing with imports.

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<sup>1/</sup> The US eliminated import duties on veneers as of January 1981.

<sup>2/</sup> A total of 57 African, Caribbean and Pacific developing countries.

**Table 2.7: EXISTING TARIFFS ON SELECTED WOOD PRODUCTS IN EEC, JAPAN, UNITED STATES AND CANADA**

BTR/ <u>a</u>	Commodity	EEC		Japan		United States			Canada		
		MFN/ <u>b</u>	GSP/ <u>c</u>	MFN/ <u>b</u>	GSP/ <u>c</u>	MFN/ <u>b</u>	LDDC/ <u>d</u>	GSP/ <u>c</u>	MFN/ <u>b</u>	British Preference	GSP/ <u>c</u>
------(Percent)-----											
44.03	Wood in the rough.	Free		Free		Free	Free		Free	Free	
44.04	Wood, roughly squared	Free		Free		Free	Free		Free	Free	
44.05	Wood, simply sawn thicker than 5mm	Free		Free		Free	Free		Free	Free	
	- Dipterocarp species	Free		10.0	5.0	Free	Free		Free	Free	
44.07	Railway sleepers	4.9		Free		Free	Free		Free	Free	
44.11	Fiber building board	10.9		12.0	Free	0.15	Free	Free	<u>/e</u>	<u>/e</u>	<u>/e</u>
44.13	Wood, planed, tongued, etc.	4.9		Free		Free	Free		5.0	5.0	3.0
	- Dipterocarp species			10.0	Free	Free	Free				
44.14	Veneer sheets, thickness less than 5mm	6.9	Free <u>/e</u>	15.0	Free	Free	Free	Free	10.0	10.0	6.5
	- Sheets for plywood			15.0	7.5	Free	Free	Free	10.0	10.0	6.5
44.15	Plywood - Dipterocarp species	12.6	Free <u>/e</u>	20.0	N.A.	14.0	8.0	N.A.	10.0	10.0	N.A.
	- Other hardwood	12.6		20.0	N.A.	6.4-17.0	8.0		15.0	15.0	10.0
44.18	Reconstituted wood (particleboard)	11.8		15.0	Free	5.5-8.5	4.0		<u>/e</u>	<u>/e</u>	<u>/e</u>
44.19-4.28	Wooden mouldings, packing cases, buckets, joinery, household utensils, tools, other articles of wood	6.1-13.2		0-15	Free	0-17	0-8		0-20	0-17.5	0-13

- /a Brussels Nomenclature.
- /b Most-Favored-Nation duties.
- /c Generalized Scheme of Preferences.
- /d Preferences for the least developed developing countries.
- /e Not known.
- /f Subject to ceiling quotas.

Source: EC, Official Journal of the European Communities; Japan Tariff Association, Customs Tariff Schedules of Japan; US International Trade Commission.

2.60 Japan's imports of processed wood products have been restricted by the high tariffs. Plywood imports especially have been restricted by the 20% duty. Japan's GSP has excluded tropical hardwood plywood. Since the cost of logs accounts for a rather high percentage of the price of plywood (60-70%) and since all other inputs are produced in Japan, the effective rate of protection on plywood is high, indeed. More specifically, the cost of logs accounts for some 71% of the cost of plywood in Japan.<sup>1/</sup> Therefore, the import duty rate of 20% on plywood and the zero duty on logs imply an effective rate of protection of well over 60%(!) for the Japanese plywood industry.

2.61 On the exporting countries' side, trade barriers exist in the form of export quotas and export taxes. In the Asia-Pacific region, the Philippines, Malaysia and Indonesia have imposed, or attempted to impose, export quotas and/or export taxes on logs, with either the short-term objective of reducing oversupply in the face of depressed market conditions or the long-term objectives of resource conservation and/or promotion of local processing.<sup>2/</sup> It should perhaps be emphasized here that export taxes in this context are not just "export barriers." Although these government charges are called export taxes, they are economically similar to stumpage fees or royalties. However, since these charges have often been higher than those imposed on locally sold logs, the export taxes have indeed had the effect of discriminating against overseas sales of logs.

### 3. Prices

2.62 Because of inherent differences in the quality of the wood and because of sizable margins of error in reporting, great caution should be exercised in comparing tropical hardwood prices. Nevertheless, a few observations may be justified. First, FOB log prices in the Philippines and Sabah seem to be consistently higher than FOB prices in Kalimantan (Samarinda). This seems to reflect, at least partly, the quality preference of the consumer for logs from the former area, and also partly, the lower freight rates from the area to Japan and other log-importing regions. Second, within Japan, lauan logs suitable for sawing are consistently more expensive than lauan logs suitable for plywood making. Third, as illustrated in the two sawnwood price series shown in Table 2.8, sawnwood price levels can be very different when the species, qualities, sizes and locations involved are different. Fourth, the thinner the plywood, the more expensive it is in terms of the price per unit volume. Among the three representative series of plain (unfinished) plywood prices in Japan shown in

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<sup>1/</sup> See the analysis of the cost-of-production structure of the plywood industry in the next chapter.

<sup>2/</sup> For details, see Section E below.

Table 2.9, the cheapest is the 12mm (thickness) plywood; the 4mm plywood costs about 22-30% more. The most expensive is the thinnest type (2.5-2.7mm thick) whose price is about 30-48% higher than the 4mm type. The prices do not necessarily move exactly in parallel.

2.63 The unit values of exports of logs, sawnwood, veneer sheets and plywood from selected countries in the Asia-Pacific region are presented for 1970-1978 in Table 2.10. Since species composition of exports (and quality, etc.) can and do change over time, unit value changes do not necessarily reflect proportionate changes in prices which normally refer to specific products, markets and qualities.

2.64 Finally, long-term price trends for tropical hardwood logs, sawnwood and plywood can be observed from Figures 2.1, 2.2 and 2.3 respectively. Trends in "real" prices could look quite different depending on the deflators used.

#### 4. Market Outlook

2.65 World consumption of tropical hardwood in the pre-oil-crisis period increased rather rapidly, e.g., at 7.3% per annum in 1961-1973. It then declined sharply in 1974 and 1975--by 19% over the two years. It recovered strongly in 1976, increasing by some 20%. From 1976 to 1979, it increased at 3.3% per annum. Thus, it is clear that since the violent boom-bust-recovery cycle of 1973-1976 the growth of tropical hardwood consumption has been much slower than before that period.

Table 2.8: PRICES OF SELECTED "SOUTH SEA" SPECIES,  
LOGS AND SAWWOOD 1970-1980

Year	Logs						Sawwood	
	Indonesia Export, average FOB price to Japan from Samarinda, meranti logs	Malaysia Export, average FOB price to Japan from Sabah, selaya logs	Philippines Export, average FOB price to Japan lauan logs	Japan Average wholesale price, lauan logs Plywood      Sap logs quality		Malaysia Export, average FOB price for dark red meranti <sup>/a</sup>	Japan Wholesale price, lauan planks 3.0-3.4cm x 30cm x 4.0m	
-----US dollars per cubic meter (actual volume)-----								
1970	NA	NA	NA	37.2	NA	51.2	NA	
1971	NA	NA	NA	38.0	NA	51.9	NA	
1972	NA	NA	NA	37.6	NA	79.6	NA	
1973	51.3	66.8	55.3	65.6	NA	116.2	NA	
1974	47.7	64.7	54.2	78.6	NA	88.5	NA	
1975	40.0	54.0	47.5	59.3	80.5	103.8	225.1	
1976	56.8	77.5	68.2	79.6	98.1	132.0	256.3	
1977	56.1	80.3	81.2	89.8	116.9	130.8	306.1	
1978	59.5	90.0	87.3	91.8	137.8	176.9	377.7	
1979	137.1	174.2	154.5	159.1	192.6	262.0	537.0	
1980	130.0	176.5	168.3	187.9	243.9	NA	622.3	

<sup>/a</sup> GMS strips and scantlings, standard and better. Dark red meranti is one of the many "lauans", and it is treated somewhat distinctly in the marketplace.

Sources: For Malaysian sawwood - FAO, Forest Products Prices 1961-1980.  
All others - Forestry Agency of Japan, Mokuzai Shikyo Gappo (Monthly Wood and Wood Products Report), various issues.

Table 2.9: WHOLESALE PRICES FOR PLAIN PLYWOOD OF LAUAN SPECIES IN JAPAN AND PHILIPPINES

Year	Thickness	Japan /a			Philippines
		12.0mm	2.5-2.7mm	4.0mm	6.35mm
	Width	0.90m	0.91m	0.91m	1.22m
	Length	1.80m	1.82m	1.82m	2.44m
1973	NA	NA	NA	NA	109.1
1974	NA	NA	NA	NA	124.7
1975	152.6	226.9	198.4	136.4	136.4
1976	196.8	242.8	234.1	164.4	164.4
1977	206.1	285.4	269.8	205.4	205.4
1978	224.7	331.0	301.2	191.2	191.2
1979	344.4	455.6	420.1	NA	NA
1980	377.2	481.3	445.9	NA	NA

/a The typical size in Japan is 0.91m (width) by 1.82m (length) with the thickness from 2.5mm to 12.0mm or more.

Source: Forestry Agency of Japan, Mokuzai Shikyo Geppo (Monthly Wood and Wood Products Report), various issues; FAO Forest Products Prices 1961-1980.

2.66 Up until 1973, tropical hardwood consumption grew at a fast pace because industrialized countries increasingly substituted tropical hardwood for temperate hardwood, supply of which was constrained. In recent years consumption growth of tropical hardwood has been distinctly slower, not only because of the slowdown in world economic growth but also because of emerging supply constraints and the resultant rising trends in tropical hardwood log prices.

**Table 2.10: EXPORT UNIT VALUES OF TROPICAL HARDWOOD LOGS, SAWWOOD, PLYWOOD AND VENEERS IN SELECTED COUNTRIES AND ASIA-PACIFIC REGION, 1970-1979**

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
<b>Indonesia</b>										
Logs	11.0	15.1	17.1	30.3	41.7	31.5	44.5	47.0	46.4	76.1
Sawwood	34.0	33.9	20.6	49.0	79.1	79.6	75.1	84.5	113.3	181.9
log equivalent (at 55.0%)	18.7	18.6	11.3	27.0	43.4	43.7	41.2	46.5	62.2	100.0
Plywood	-	-	-	-	-	106.7	66.7/a	171.6	231.1	246.2
log equivalent (at 50.0%)	-	-	-	-	-	53.4	33.4/a	85.8	115.6	123.1
Veneer sheets	-	-	-	-	-	-	-	-	-	-
log equivalent (at 52.6%)	-	-	-	-	-	-	-	-	-	-
<b>Malaysia</b>										
Logs	18.5	18.8	20.1	30.8	35.6	26.0	37.0	38.6	43.0	43.0
Sawwood	48.3	48.0	55.5	106.3	103.4	94.5	114.3	126.1	124.6	126.5
log equivalent at (55.0%)	26.6	26.4	30.5	58.5	56.9	52.0	62.9	63.9	68.5	69.6
Plywood	125.3	104.6	113.2	185.8	206.9	192.6	183.9	194.3	206.3	206.0
log equivalent (at 50.0%)	57.7	52.3	56.6	92.9	103.5	96.3	92.0	97.0	103.2	103.0
Veneer sheets	34.2	34.0	29.8	44.3	51.8	41.9	52.8	57.1	48.7	49.4
log equivalent (at 52.6%)	18.0	17.9	15.7	23.3	27.1	22.0	27.8	30.0	25.6	26.0
<b>Philippines</b>										
Logs	25.5	26.5	25.3	39.1	46.0	36.3	58.0	65.4	65.8	115.7
Sawwood	60.1	51.9	64.0	82.2	105.9	107.2	138.3	146.6	148.1	216.8
log equivalent at (55.0%)	33.1	28.0	35.2	45.2	58.2	59.0	76.1	80.6	81.5	119.2
Plywood	97.5	98.2	107.6	152.1	161.0	131.2	166.0	154.7	195.0	271.1
log equivalent (at 50.0%)	48.8	49.1	53.8	76.1	80.5	65.6	83.0	82.4	97.5	135.6
Veneer sheets	66.4	52.4	81.5	109.1	98.6	82.0	103.0	120.6	146.2	191.8
log equivalent (at 52.6%)	34.9	27.6	42.9	57.4	51.9	43.1	54.2	68.7	76.9	100.9
<b>Papua New Guinea</b>										
Logs	14.3	13.7	12.8	18.9	27.2	25.4	25.3	33.2	35.6	35.6
Sawwood	68.8	74.2	103.2	134.6	138.7	129.6	134.3	149.4	137.5	137.5
log equivalent at (55.0%)	37.8	40.8	56.8	74.0	76.3	71.3	73.9	82.2	75.6	75.6
Plywood	238.2	229.0	252.3	263.8	311.1	279.5	400.9	465.5	525.3	525.3
log equivalent (at 50.0%)	119.1	114.5	126.2	131.9	155.6	139.8	200.5	232.8	262.7	262.7
Veneer sheets	96.0	90.6	83.4	126.7	139.4	112.5	122.2	131.0	117.0	117.0
log equivalent (at 52.6%)	50.5	47.7	43.9	66.6	73.3	59.2	64.3	68.9	61.5	61.5
<b>Asia Total<sup>/b</sup></b>										
Logs	19.5	20.6	20.9	33.6	41.2	31.3	43.3	45.5	47.2	64.5
Sawwood	54.5	52.0	58.7	102.6	110.8	101.8	117.5	123.3	133.0	172.6
log equivalent at (55.0%)	29.4	28.4	32.1	56.0	66.5	55.6	64.2	67.3	73.2	94.9
Plywood	117.9	122.4	131.3	188.7	192.4	180.1	203.7	222.3	238.7	304.8
log equivalent (at 50.0%)	62.0	64.4	69.1	99.3	101.2	94.7	107.1	116.9	119.4	152.4
Veneer sheets	63.0	51.9	66.4	98.9	82.5	91.8	138.4	143.4	138.8	229.7
log equivalent (at 52.6%)	33.1	27.3	34.9	52.0	43.4	48.3	72.8	75.4	73.0	120.8

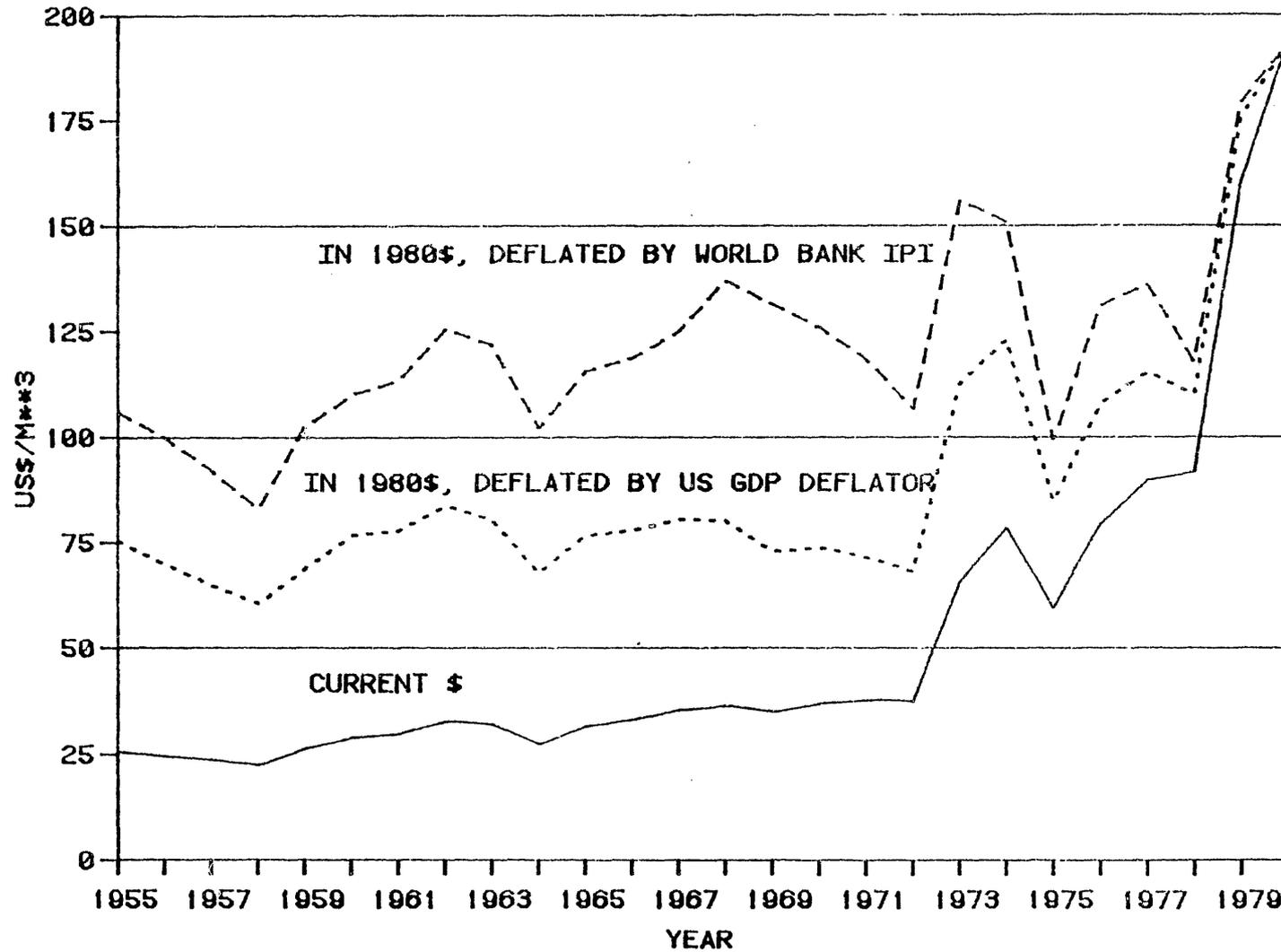
<sup>/a</sup> The data are suspected of serious biases.

<sup>/b</sup> Includes, inter alia, exports from the log-importing processors such as Singapore, the Republic of Korea and the Province of Taiwan.

A dash (-) means no exports.

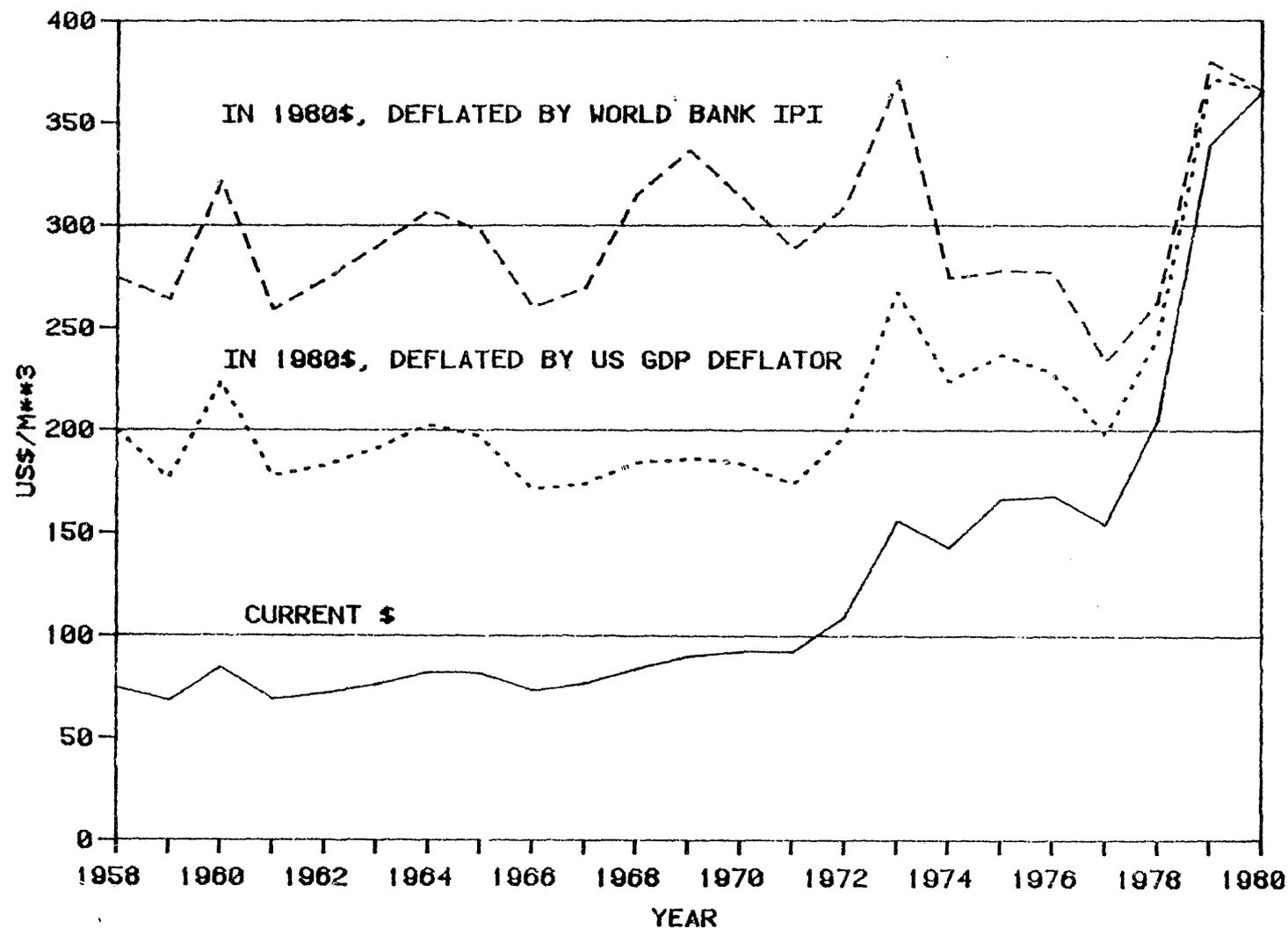
Source: FAO, Yearbook of Forest Products Standard Tables.

FIGURE 2.1: PRICE OF LAUAN VENEERLOGS IN JAPAN, 1955-1980  
(US\$/CM)



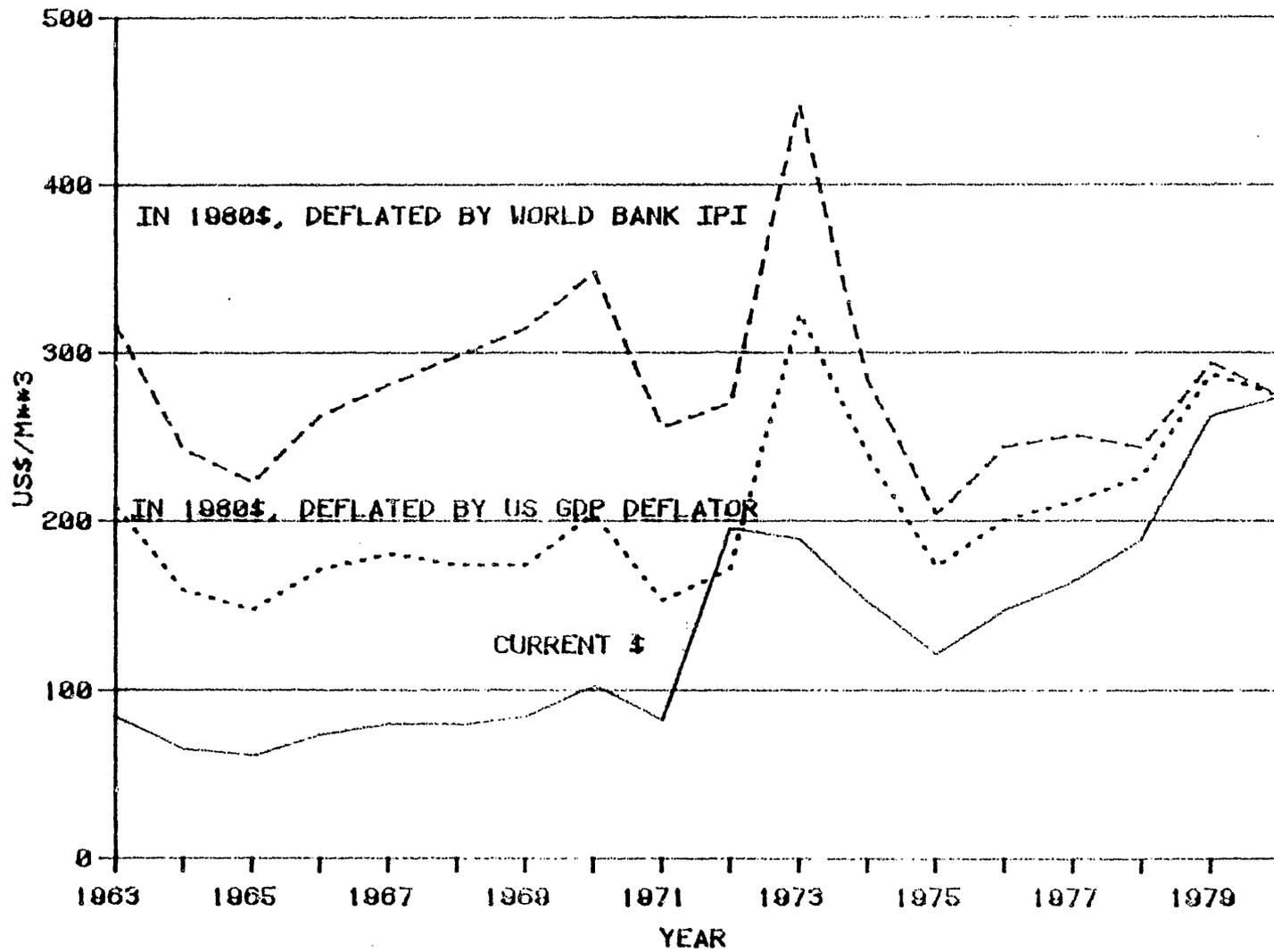
SOURCE: BASED ON STATISTICAL APPENDIX TABLE SA19

FIGURE 2.2: PRICE OF MERANTI SAWWOOD, 1958-1980  
(US\$/CM)



SOURCE: BASED ON STATISTICAL APPENDIX TABLE SA20

FIGURE 2.3: PRICE OF PLAIN LAUAN PLYWOOD IN JAPAN, 1963-1980  
(US\$/CM)



SOURCE: BASED ON STATISTICAL APPENDIX TABLE SA21

2.67 In the long term (1980-2000), consumption of tropical hardwood logs is expected to grow at 2-3% per annum, depending on the world economic growth rate and supply availability. Since the potential of the traditional supplying regions is limited, additional supply has to come from the hitherto relatively unexploited tropical forests in West Irian, Papua New Guinea, the Amazonia and Zaire. Under the currently known technological conditions, the cost of bringing out commercially marketable logs from these forests in significant quantities is likely to be substantially higher than the cost of production in the currently exploited forest areas in the Philippines, Malaysia, Indonesia, etc. Thus, prices of tropical hardwood logs are expected to edge up in real terms in the long run.

### III. THE EVOLUTION OF THE LOCATIONAL PATTERN OF MECHANICAL PROCESSING OF TROPICAL HARDWOOD IN THE ASIA-PACIFIC REGION

#### A. Introduction

3.01 There are two apparent factors that should tend to favor mechanical processing of wood in the log-producing developing countries. First, mechanical wood processing is considered to be relatively labor-intensive and, therefore, comparatively advantageous industrial activity for developing countries where the opportunity cost of labor is generally low. Second, the first stage of mechanical wood processing -- i.e., production of sawnwood, veneers and plywood -- is a highly weight- and volume-reducing activity and therefore, since the cost of moving logs from producing to importing countries accounts for a substantial portion of the CIF price, location of processing in the log-producing countries should be favored. Despite these two factors, however, major log-producing countries in the Asia-Pacific region continue to export an enormous volume of logs (about 80% as of 1978), with only 20%<sup>1/</sup> of their tropical hardwood exports being exported in the form of sawnwood, veneers and plywood.

3.02 The purpose of this chapter is to review how the locational pattern of mechanical processing of tropical hardwood evolved in the Asia-Pacific region in the last 30 years or so and to understand why it evolved the way it did. Our attention is focused on the plywood sector because a majority (65-70%) of the logs exported from the producing countries are veneerlogs which are used mainly for making plywood in the importing countries. Furthermore, the value added to the log material is generally higher in plywood production than in sawnwood production, and, therefore, there is a greater interest in plywood manufacturing than in sawmilling in the major log exporting countries.

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<sup>1/</sup> In roundwood equivalent volume.

3.03. That production of mechanically processed wood products is a relatively labor-intensive activity is supported by a study by Hal B. Lary.<sup>1/</sup> Using the value added per employee as a guide to factor intensity in manufacturing in the US in 1965, he concluded that, among the 19 major industry groups, six industry groups are "intensive in the use of relatively unskilled labor since they are below the United States average in both wage and nonwage value added per employee". (The six groups were the sectors producing (1) textiles, (2) clothing, (3) "lumber and wood products", (4) furniture, (5) leather and leather goods and (6) a "miscellaneous group comprising a variety of items".<sup>2/</sup>

3.04 In a more recent study, Bela Balassa estimated physical and human capital intensities for 184 product categories in the manufacturing sector in the US in 1972.<sup>3/</sup> The results of his estimates for "veneers and plywood" and "sawmill products" are shown in Table 3.1. The results indicate (a) that, at least, in terms of the "flow" measure of physical capital intensity, both veneer/plywood and sawmill products rank very low among the 184 product categories; and (b) that, in terms of human capital intensity, both "industries" rank well below the averages of the 184 "industries" examined. Put another way, Balassa's results indicate that both veneer/plywood and sawmill products can be labelled as relatively unskilled-labor-intensive products.<sup>4/</sup>

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1/ Hal B. Lary, Imports of Manufactures from Less Developed Countries.

2/ Hal B. Lary, p. 23. Concerning the limitations of the methods used by Hal B. Lary, see A.S. Bhalla, "The Concept and Measurement of Labour Intensity" in A.S. Bhalla (ed.), Technology and Employment in Industry, pp. 20-23.

3/ Bela Balassa, "A 'Stages' Approach to Comparative Advantage.

4/ This, of course, does not mean that plywood making does not require any skilled labor. It means that, among the whole range of industries existing in an industrialized, diversified economy like the US economy, plywood making is relatively unskilled-labor-intensive.

Table 3.1: PHYSICAL, HUMAN AND COMBINED CAPITAL INTENSITIES OF VENEER/ PLYWOOD AND SAWMILL PRODUCTS IN THE US, 1970, AND THEIR RELATIVE RANKING IN THE SELECTED 184 "INDUSTRIES"

Nature of Capital	Concept of Capital per Worker	Veneers and Plywood		Sawmill Products		
		USS per Worker	Ranking Among All Industries/a	USS per Worker	Ranking Among All Industries/a	
<sup>s</sup> P i	Physical	stock	11,850	54	10,940	69
<sup>s</sup> H i	Human	stock	21,362	112	10,586	155
<sup>s</sup> K i	Combined/b	stock	33,212	103	21,526	146
<sup>f</sup> P i	Physical	flow	4,370	145	4,058	153
<sup>f</sup> H i	Human	flow	7,350	125	6,272	152
<sup>f</sup> K i	Combined/b	flow	11,720	134	10,330	155

/a Giving Rank 1 to the largest magnitude of each capital intensity measure listed, among the 184 "industries" covered in the study, these two groups of products are ranked as indicated.

/b Physical plus human capital.

Source: Bela Balassa, A 'Stages' Approach to Comparative Advantage, Appendix Table 1.

3.05 That the cost of ocean transportation of logs is relatively high is illustrated by the fact that freight cost accounted for roughly 25% of the CIF unit value of Japan's imports of lauan logs from the Philippines in 1958-1967 (Table 3.2). The logs are transported from the log-producing regions in Southeast Asia to Japan and other wood processing regions by special log carriers on a charter basis. Since only about half of the log volume is actually recovered in sawwood and plywood, there is a presumption that, if processing is done in the log-producing regions, there might be a

substantial saving in transport cost. However, so long as shipping of processed products is done on a liner basis, savings in transport costs would not automatically result from locating processing plants in log-producing areas. Only when the flow of processed products from a producing region to a consuming region is large enough to justify shipping on a charter basis, could there be savings in transport costs from transferring processing facilities from Japan, the Republic of Korea, the Province of Taiwan, etc. to the log-producing areas.

Table 3.2: TOKYO WHOLESALE PRICE AND CIF IMPORT UNIT VALUE  
FOR PHILIPPINE LOGS AND OCEAN FREIGHT RATES FOR  
JAPAN'S LOG IMPORTS FROM THE PHILIPPINES, 1957-1967

Year	Wholesale Price of Philippines Lauan Logs in Tokyo	CIF Unit Value of Lauan Log Imports From Philippines	Ocean Freight For Logs From Philippines to Japan	Ratio of Freight Cost to Import Unit Value
	US\$/m <sup>3</sup> (r)	US\$/m <sup>3</sup> (r)	US\$/m <sup>3</sup> (r)/ <u>a</u>	(%)
1957	29.88	24.30	8.32	34.2
1958	26.50	19.80	5.17	26.1
1959	29.96	22.40	6.00	26.8
1960	33.67	26.30	6.21	23.6
1961	29.73	24.50	6.65	27.1
1962	34.76	27.10	6.69	24.7
1963	35.83	27.90	6.40	22.9
1964	33.88	26.00	6.59	25.3
1965	35.54	27.40	6.75	24.6
1966	37.54	29.90	7.12	23.8
1967	39.83	32.00	7.20	22.5
1958-67 (average)				24.74

/a Converted at 360 Yen = \$1.

Source: Wholesale price of logs and ocean freight - Japan, Bureau of Forestry, Timber Market Monthly Report; UNCTAD, The Maritime Transportation of Tropical Timber, TD/B/c.4/59, 5 January, 1970, p. 114. CIF unit value of logs - Japan, Ministry of Finance, Japan Exports and Imports, Commodity by Country, various issues.

B. Plywood Trade in the Pacific Basin up to 1960

3.06 In Asia, plywood was produced in Japan, India, the Republic of Korea and the Province of Taiwan before 1945. The details of early plywood operations in these regions are not known, but, at least, in Japan and the Republic of Korea, the history of plywood production goes back to before World War I.<sup>1/</sup> It can be safely assumed that plywood was also produced in India well before 1940 and in the Province of Taiwan, during World War II at the latest (although under Japanese management).

3.07 In the years right after World War II, plywood production expanded very rapidly in Japan, rose at modest pace in India, and was re-established in the Republic of Korea and the Province of Taiwan (Table 3.3). At that time, plywood production in these areas was primarily for domestic consumption and exports were only incidental.

3.08 Beginning in 1948, Japan started to import Lauan logs from Southeast Asia (mainly the Philippines). The importation of logs was urged by the US military occupation forces to meet the hardwood plywood needs at their facilities in Japan. Log imports from Southeast Asia expanded very rapidly as plywood producers received priority allocations of foreign exchange for log imports. In the late 1940s, Japan also started to export plywood, mainly to the US (Table 3.4).<sup>2/</sup> Small quantities of plywood produced in Malaysia began to be shipped to the UK.

3.09 Throughout the 1950s, Japanese exports of plywood expanded at a phenomenal rate, reaching 375,000 m<sup>3</sup> per annum in 1959-61, or 7.6 times the level in 1950. About 70% of these exports were sent to the US. Thus, along with the export incentives based on priority allocations of foreign exchanges for raw material imports, the rapid expansion of US imports of hardwood plywood played a critical role in the growth of Japanese plywood exports.

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1/ See Kazuo Kitamura, Mokuzai-Gyokai (The Wood Industry), p. 99; and US Agency for International Development, Survey of the Korean Hardwood Plywood Industry and International Plywood Markets, p. 19.

2/ A brief account of the development of "South Sea" log imports and plywood industry expansion in Japan in the period up to the mid-1950s is provided in Japan Lumber Importers' Association (Nihon Mokuzai Kyokai), Progress of Twenty Years (Niju-nen no Ayumi), pp. 132-136.

Table 3.3: PLYWOOD PRODUCTION IN SELECTED COUNTRIES/ECONOMIES, 1946-1979

Year	Prov. of Taiwan	Rep. of Korea	Hong Kong	Singapore	Malaysia	Philippines	India	Indonesia	Israel	Thailand	Papua N. Guinea	Japan
------(1,000 m <sup>3</sup> )-----												
1946	-	1	-	-	-	-	15	-	-	-	-	67
1947	(1)	2	-	-	-	-	24	-	-	-	-	100
1948	(1)	2	-	-	-	-	21	-	-	-	-	111
1949	(3)	3	-	-	1	-	22	-	-	-	-	147
1950	(5)	1	-	-	1	(2)	31	6	-	-	-	149
1951	(7)	1	-	-	1	(6)	40	7	-	-	-	233
1952	8	2	-	-	5	(11)	27	7	8	-	-	298
1953	8	2	-	-	5	(17)	34	8	11	-	-	408
1954	12	5	-	-	6	(19)	34	8	16	-	1	537
1955	13	11	-	-	6	(27)	49	8	21	-	14	553
1956	12	14	-	-	5	(45)	55	2	21	-	12	552
1957	14	21	-	-	7	(58)	56	3	28	3	13	979
1958	22	23	-	-	6	(81)	55	3	28	6	12	1,067
1959	33	27	-	-	2	(128)	58	3	35	11	11	1,293
1960	36	29	-	-	2	(139)	72	3	40	19	14	1,286
1961	65	45	-	-	7	112	73	3	47	15	10	1,499
1962	88	84	-	-	10	136	79	3	54	16	14	1,833
1963	152	99	-	-	12	172	93	3	60	18	11	2,073
1964	227	148	-	14	12	202	97	3	70	24	10	2,453
1965	250	215	-	32	28	257	101	3	88	26	20	2,627
1966	296	353	1	45	59	308	99	3	72	38	12	3,101
1967	300	440	1	76	73	410	101	3	76	40	12	3,778
1968	436	703	7	110	120	309	114	4	81	43	17	4,743
1969	609	821	10	193	172	338	112	7	94	46	16	5,893
1970	760	847	10	215	197	653	128	7	96	47	16	6,922
1971	879	1,024	12	250	231	642	144	7	97	49	18	7,197
1972	1,324	1,093	12	327	330	732	130	4	108	56	16	7,748
1973	1,342	1,481	12	350	375	705	126	9	113	55	18	8,596
1974	1,101	1,217	12	350	311	274	143	24	102	60	22	7,443
1975	1,043	1,436	12	334	404	423	127	104	64	51	19	6,168
1976	1,227	1,671	12	380	525	416	141	214	71	63	15	7,136
1977	1,272	2,289	12	348	565	489	149	279	71	68	15	7,476
1978	1,607	2,560	12	482	465	490	176	472	71	75	15	8,041
1979	1,451	2,338	12	482	490	503	180	525	71	80	15	8,400

Source: Except for Taiwan and Philippines, FAO data have been used as follows:  
 1946-1953.....FAO, World Forest Products Statistics 1946-1955 (Rome, 1957);  
 1954-1960.....FAO, World Forest Products Statistics 1954-1965 (Rome, 1965);  
 1961-1979.....FAO, Yearbook of Forest Products Standard Tapes.

Taiwan 1947-1952.....The author's estimates based on FAO, World Forest Products Statistics 1946-1955 (Rome, 1957);  
 and the report mentioned below.

1953-1979.....Taiwan Plywood Manufacturers and Exporters Association, "Plywood Industry in Taiwan",  
 January 1980, p. 7 Table 2.

Philippines: Because of the obvious discrepancy between the figures reported in the FAO Forestry Tape and those in the  
 earlier FAO publications mentioned above, the figures reported in the latter for 1946-1960 have been  
 "adjusted" by the author by dividing the reported figures by 2.065 (i.e., the average ratio for the over-  
 lapping years 1961-1963). Data for 1961-1979 have been taken from the FAO Forestry Tape.

Table 3.4: PLYWOOD EXPORTS OF SELECTED COUNTRIES/ECONOMIES, 1948-1979

Year	Prov. of Rep. of		Hong Kong	Singapore	Malaysia	Philippines	India	Indonesia	Thailand	Papua		Israel	Japan
	Taiwan	Korea								N. Guinea	Israel		
(1,000 m <sup>3</sup> )													
1948	-	-	-	-	-	-	-	-	-	-	-	-	2
1949	-	-	-	-	-	-	-	-	-	-	-	-	9
1950	-	-	-	-	1	-	-	-	-	-	-	-	16
1951	-	-	-	-	1	-	-	-	-	-	-	1	49
1952	-	-	-	-	1	-	-	-	-	-	-	1	22
1953	-	-	-	-	2	-	-	-	-	-	-	2	58
1954	-	-	-	-	1	(1)	-	-	-	-	-	6	165
1955	-	-	1	-	2	(3)	-	-	-	-	-	3	234
1956	1	-	.1	-	2	(10)	-	-	-	-	-	8	260
1957	2	-	1	-	2	(15)	-	-	-	-	-	11	328
1958	10	-	5	-	1	(49)	-	-	-	-	-	12	345
1959	16	1	19	-	18	(93)	-	-	-	-	-	23	425
1960	20	2	-	-	5	(51)	-	-	-	-	-	23	354
1961	52	12	1	-	2	73	-	-	-	10	-	21	345
1962	72	18	2	-	3	84	-	-	-	12	-	26	358
1963	133	54	7	-	2	119	-	-	-	8	-	38	342
1964	208	104	8	7	6	148	-	-	-	9	-	44	360
1965	222	170	3	10	10	145	-	-	-	10	-	48	382
1966	263	277	1	28	18	171	1	-	-	8	-	44	377
1967	269	311	2	40	40	171	1	-	-	10	-	53	337
1968	377	600	5	69	71	261	2	-	-	11	-	43	425
1969	576	709	5	110	107	204	5	-	-	11	-	40	393
1970	682	822	1	132	144	261	10	-	3	12	-	44	222
1971	781	1,028	1	178	191	278	6	-	12	12	-	51	327
1972	1,116	1,195	1	278	271	317	6	-	19	9	-	54	270
1973	1,116	1,322	2	436	355	388	23	-	28	13	-	53	150
1974	804	1,030	1	289	215	171	29	-	28	16	-	33	123
1975	761	1,258	1	380	233	157	15	1	9	12	-	33	116
1976	862	1,623	2	459	407	260	33	13	11	11	-	33	133
1977	946	1,703	-	441	344	340	15	14	5	6	-	33	140
1978	1,240	1,605	-	553	410	383	15	85	1	6	-	33	105
1979	1,078	1,297	1	568	432	406	7	116	-	6	-	33	105
1980	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: The data sources are the same as those for the plywood production data in Table 3.3. The figures in parenthesis for the Philippines are the author's estimates based on (a) the average ratio for 1961-1963 between the figures in FAO Standard Forestry Tables and those in FAO, World Forest Products Statistics 1954-1963, and (b) the figures given in the latter for 1954-1960.

3.10 In 1946, the UK was the single most important importer of plywood, accounting for 60% of world imports, while the US accounted for only 4% (Table 3.5). In the first postwar decade, imports by both the UK and the US increased very rapidly. However, US imports increased far more rapidly than UK imports, and by the late 1950s, the US share in world imports had reached some 30%, while the UK share had declined to below 40%.<sup>1/</sup> (Indeed, while the US share has almost always remained above 30% since the early 1960s, the UK share declined until the early 1970s and has since remained well below 20%).

3.11 The rapid increase in plywood imports by the US played a vital role in the development of the tropical hardwood plywood trade in the Asia-Pacific region. While domestically produced softwood plywood has always accounted for more than 70% of US plywood consumption, the share of imports in hardwood plywood consumption has steadily increased throughout the postwar period, rising from 10% in 1951-54 to 67% in 1975-79 (Table 3.6). Furthermore, within the expanding US imports of hardwood plywood, the share of imports from Asia rose rapidly, reaching over 80% by 1957 and over 90% by 1965; in contrast, the share of imports from Canada declined from about 80% in 1950 to below 10% by 1957. Statistical Appendix Table SA22 shows US imports of hardwood plywood by major suppliers in 1950-1978, while Figure 3.1 shows the changing shares of major suppliers in the US imports of hardwood plywood in the same period. It is evident that Japan's share rose sharply in the 1950s and that in 1954-1960 Japan became the dominant supplier, accounting for over two-thirds of US hardwood plywood imports.

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<sup>1/</sup> Two distinct characteristics should be noted regarding UK imports of plywood. First, the UK has never had a large plywood industry at home, with production never exceeding 60,000 m<sup>3</sup>. Therefore, most UK plywood consumption requirements have been met by imports. Second, except for imports from Canada (which have accounted for 15-25% of total UK imports), UK plywood imports have consisted of hardwood variety (including moderately significant volumes of birch plywood from Finland).

Table 3.5: PLYWOOD IMPORTS BY THE US AND THE UK, 1946-1979

	World Total	US	UK		Share in World Total		
			Total	Hardwood Only	US	UK Total	US & UK
	-----1,000 m <sup>3</sup> -----				-----percent-----		
1946	365	14	217	n.a.	3.8	59.5	63.3
1950	405	37	183	n.a.	9.1	45.2	54.3
1955	996	247	429	n.a.	24.8	43.1	67.9
1959	1,526	539	491	423	35.3	32.2	67.5
1960	1,517	411	640	n.a.	27.1	42.2	69.3
1961	1,556	451	576	n.a.	29.0	37.0	66.0
1963	1,960	675	701	551	34.4	35.8	70.2
1965	2,577	892	859	665	34.6	33.3	67.9
1968	3,873	1,624	1,075	784	41.9	27.8	69.7
1970	4,701	1,771	1,101	820	37.7	23.4	61.1
1973	6,946	2,200	1,480	1,190	31.7	21.3	53.0
1974	5,349	1,337	921	704	25.0	17.2	42.2
1975	5,287	1,674	830	641	31.1	15.4	46.5
1976	6,312	2,058	1,058	886	32.6	16.8	49.4
1977	6,055	1,963	874	681	32.4	14.4	46.9
1978	6,846	2,209	1,063	836	32.4	15.5	47.9
1979	6,957	1,836	1,213	n.a.	26.3	17.4	43.8

Source: 1946 and 1950 - FAO, World Forest Products Statistics 1946-1955, Rome, 1957.  
 1955 and 1960 - FAO, World Forest Products Statistics 1954-1963, Rome, 1965.  
 1961 to Present - FAO, Yearbook of Forest Products Standard Tapes

UK imports of hardwood plywood have been derived by subtracting imports from Canada from total imports of plywood.

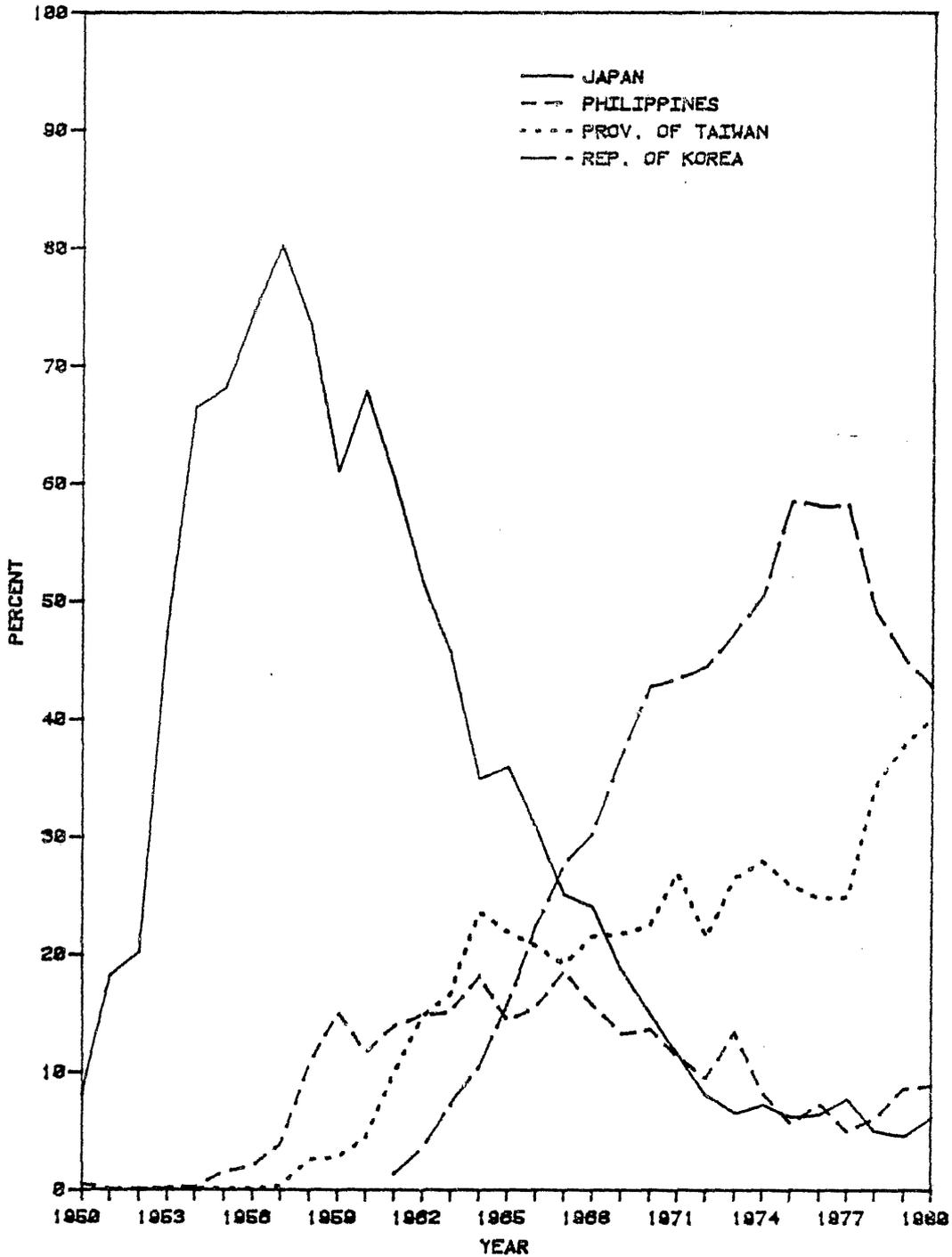
Table 3.6: HARDWOOD PLYWOOD PRODUCTION, EXPORTS, IMPORTS, APPARENT CONSUMPTION AND THE SHARE OF IMPORTS IN CONSUMPTION IN THE US, 1951-1979

Period	Production	Exports	Imports	Apparent Consumption	The Share of Imports in Consumption
	-----1,000 m3 per annum <u>/a</u> -----				---Percent---
1951-1954	1,055.8	0.7	126.3	1,181.4	10.3
1955-1959	1,130.2	1.6	552.7	1,681.3	32.5
1960-1964	1,332.6	1.8	763.6	2,067.4	36.7
1965-1969	1,758.2	9.2	1,336.1	3,085.1	42.6
1970-1974	1,587.9	36.7	2,112.2	3,663.4	57.3
1975-1979	1,000.3	48.9	1,966.2	2,917.6	67.3

/a Converted to cubic meter units at the ratio of: 1 million square feet (3/8 inch basis) = 886.290 m<sup>3</sup>.

Sources: U.S. Department of Commerce, Bureau of Census: Softwood Plywood; Hardwood Plywood; U.S. Exports: Schedule B Commodity by Country; U.S. Imports for Consumption and General Imports: TSUSA Commodity by Country of Origin.

FIGURE 3.1: PERCENT SHARES OF MAJOR ASIAN SUPPLIERS IN TOTAL US IMPORTS OF HARDWOOD PLYWOOD, 1950-1978



SOURCE: STATISTICAL APPENDIX TABLE SA23

3.12 During this period (1946-1960), Japan was the only country in Asia where the government rigorously promoted exports.<sup>1/</sup> In contrast, the Province of Taiwan, the Republic of Korea, Malaysia, the Philippines and Indonesia were still in the process of consolidating their statehoods, having become independent only after the war. They were following the so-called "inward-oriented" trade and industrial policies.<sup>2/</sup> In Singapore, the government's initial industrial policy had no particular bias (inward-/or outward-oriented), but the economy was oriented toward commercial rather than industrial activities. Only after the People's Action Party won the May 1959 elections did the government start to focus on the need for industrialization.<sup>3/</sup> The fact that Japanese hardwood plywood was exported to US at very competitive prices is attested to by the repeated attempts of the US hardwood plywood industry to get protection during the 1950s. There was an appeal to the US Tariff Commission in 1954-55, an investigation of suspected dumping by US Treasury Department in 1955, another appeal to the Tariff Commission in 1958-59, and repeated attempts to introduce bills in the Congress to restrict imports from Japan.<sup>4/</sup>

3.13 In the second half of the 1950s, plywood exports from the Philippines reached significant proportions (Table 3.4). These were mainly sent to the US market where Philippine plywood had preferential access under the Laurel-Langley agreement, although the preferential edge began to erode gradually beginning in 1956. The Philippines accounted for over 10% of US hardwood plywood imports in 1960 (Figure 3.1). At least one of the

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1/ A brief, well-balanced account of the role of external trade policies in postwar Japanese economic growth is provided in Lawrence Krause and Sueo Sekiguchi, Japan and the World Economy.

2/ Bela Balassa, The Process of Industrial Development and Alternative Development Strategies; See also Don Keasing, Outward-Looking Policies and Economic Development; Anne O. Krueger, Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences; and Ian M.D. Little et al., Industry and Trade in Some Developing Countries: A Comparative Study.

3/ Lee Soo Ann, Industrialization in Singapore, pp. 7-34; see also Augustin H.H. Tan and Ow Chin Hock, "Incentive Policies and Economic Development in Singapore".

4/ Nihon Mokuzai Yunyu Kyokai, Niju-nen no Ayumi, op. cit., p. 143, pp. 157-160, and pp. 179-182; and U.S. Tariff Commission, "Hardwood Plywood," Report on Escape-Clause Investigation No. 39, Washington, June 1955.

reasons why the Philippines failed to expand its plywood exports is believed to have been the "inward-oriented" nature of its industrial and trade policies at that time, e.g., the implicit overvaluation of its currency.<sup>1/</sup>

C. Developments from 1960 to 1973

3.14 After peaking in 1959, Japanese exports of plywood stagnated at around 350,000 m<sup>3</sup> during the 1960s, except for the second peak year of 1968. In the meantime, Philippine exports increased to around 150,000 m<sup>3</sup> in the mid-1960s and further to a peak of 390,000 m<sup>3</sup> in 1973.

3.15 A new development in the early 1960s was the emergence of first the Province of Taiwan and then the Republic of Korea as major exporters of plywood. Their exports kept increasing rapidly until the boom year of 1973, when the Province of Taiwan and the Republic of Korea exported 1.1 and 1.3 million m<sup>3</sup>, respectively (Table 3.4).

3.16 Exports of plywood from Japan, the Philippines, the Province of Taiwan and the Republic of Korea during this period were closely geared to the US market. The dramatic changes in the positions of the leading plywood exporters are clearly reflected in the changes in the exporters' relative shares in US imports (Figure 3.1 and Statistical Appendix Table SA23).

3.17 One important factor that led to large increases in the exports of plywood (and other "light" manufacturers such as textiles) from the Province of Taiwan and the Republic of Korea in the 1960s was the industrial policy reforms carried out around 1957-1962. The Province of Taiwan began to change its overall industrial and trade policies in 1957, and by the early 1960s was pursuing completely outward-oriented policies with emphasis on labor-intensive exports.<sup>2/</sup> Similarly, in 1961 shortly after President Park took charge, the Republic of Korea shifted from an inward-looking industrial strategy to an outward-looking one of industrialization, with emphasis on all-out promotion of light-manufacture exports.<sup>3/</sup> These aggressive export promotion policies involved substantial effective export subsidies as well as various unquantifiable incentives for exports of manufactures and in both countries, plywood exports benefited.

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1/ John H. Power and Gerardo P. Sicat, The Philippines: Industrialization and Trade Policies (Oxford University Press, 1971), Chapter 5.

2/ Most authoritative analyses of the policy reform in the Province of Taiwan are provided in: Ching-yuan Lin, Industrialization in Taiwan, 1946-72: Trade and Import-Substitution Policies for Developing Countries; Mo-Huan Hsing, Taiwan: Industrialization and Trade Policies; Gustav Ranis, "Industrial Development"; and T.H. Lee and Kuo-shu Liang, "Incentive Policies and Economic Development in Taiwan".

3/ Kwang Suk Kim, "Outward-Looking Industrialization Strategy: The Case of Korea", Wontack Hong, Trade Distortions and Employment Growth in Korea, especially Chapter 3.

3.18 In the Province of Taiwan, as early as July 1955, the government promulgated the Regulations for Rebate of Taxes on Export Products, providing for the rebate of import duties, defense surtaxes, and commodity taxes to encourage the processing of imported materials for export. However, this was not sufficient to promote exports. Starting with the devaluations in 1958 and 1959, a series of policy changes on rebates and subsidies was put into effect, resulting in a 62% change of "real effective exchange rate for export" from 1957 to 1959.<sup>1/</sup> The process of currency devaluation and increasing rebates/subsidies continued until mid-1960. The total of (a) interest subsidy, (b) rebates of custom duties on imported inputs and (c) indirect tax rebate had increased steadily, reaching 8.3% of the official nominal exchange rate in 1962 and the peak of 14.3% in 1971.<sup>2/</sup> Other export incentives given were exemption from business and related stamp taxes, 2% tax reduction for manufacturing, mining, or handicraft corporations that exported more than 50% of their output.

3.19 Perhaps the most important incentive for exporting plywood was that which provided the rights for retention of foreign exchange earnings in order to import raw materials and machinery and the privilege of selling these rights to other firms. Unfortunately, detailed data on the "worth" of such exchange entitlements are not available with respect to plywood exports in the early 1960s. However, Lee and Liang estimate that the margins paid to the transferees generally amounted to 2.5-10.0% of the official exchange rate.<sup>3/</sup> Lin reports that, in 1968, in the case of wood products, 70-85% of export earnings were approved as "import exchange entitlements," and that 66% of these foreign exchanges were transferred to other firms, yielding premiums equivalent to 6.2-8.2% of the official exchange rate.<sup>4/</sup> Since the free US dollars were more valuable in the earlier part of the 1960s, it is reasonable to assume that higher premiums were paid in the early 1960s.

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1/ T.H. Lee and Kuo-shu Liang, "Incentive Policies and Economic Development in Taiwan", Table 10.3. The official nominal exchange rate "declined" by 54% in 1957-59.

2/ Ibid. Rebates of custom duties on imported inputs and indirect tax rebates are not subsidies. Nevertheless, they had the effect of promoting exports.

3/ Ibid., footnote 14.

4/ Ching-Yuan Lin, Industrialization in Taiwan, 1946-72, pp. 97-100, 113-114. According to Lin, in 1966, exporters of cotton yarn received a total of 48% over the official exchange rate in the form of all the incentives.

3.20 The Republic of Korea, which had been preoccupied with domestic reconstruction and stabilization after the Korean War, underwent two consecutive changes of government in 1960 and 1961. In 1963, Korean development strategy began to change radically, focusing on export promotion for manufactures.<sup>1/</sup> A most significant change among the series of new policy measures for outward-oriented industrialization strategy was the devaluation in 1964 of the exchange rate from 135 won to 256 won per US dollar. Since 1965, however, the purchasing-power-parity-adjusted, real, effective exchange rate has been maintained at an almost constant level.<sup>2</sup>

3.21 Westphal and Kim summarize the most important price incentives to exporters as of 1967 as follows:

"unrestricted access to and tariff exemptions on imported intermediate and capital goods; exemption from payment of indirect taxes both on major intermediate inputs, whether imported or purchased domestically, and on export sales; generous wastage allowances in determining duty and indirect tax free raw material imports, which permitted the use of some of these imports in production for the domestic market, reduced prices for several overhead inputs including electricity and railroad transport, which were intended at least in part to compensate for payment of indirect taxes included in the normal charges for these inputs; a 50% reduction in direct taxes on income earned in exporting, along with accelerated depreciation; and, immediate access to subsidized short and medium term credit to finance working capital and fixed investment respectively. In addition, the export-import link system entitled selected exporters to import certain popular items that were not otherwise approved for import....this system was used to subsidize exports during the late 1950s and much of the 1960s."<sup>3/</sup>

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<sup>1/</sup> For details of the process of policy change, see Kwang Suk Kim, "Industrialization and Structural Change in Korea," especially Chapter II.

<sup>2/</sup> Ibid., p. 21.

<sup>3/</sup> Larry Westphal and Kwang Suk Kim, Industrial Policy and Development in Korea, pp. 1-10. Among the various incentives, the most important for plywood appears to have been the benefit derived from the wastage allowance (Song Son, The Growth of the Plywood Industry, pp. 71-72).

3.22 Westphal and Kim recognize that some of these incentives are not genuine subsidies. They distinguish two effective exchange rates for exports: a "gross" rate, which includes indirect tax and tariff exemptions per dollar of exports, and a "net" rate, which does not include them. They believe that the "gross" rate is the more relevant concept for measuring the extent of overall incentive to export the product instead of selling it in the domestic market. In addition to generally applicable export incentives, plywood and sawnwood received extremely generous wastage allowances. According to the estimates prepared by Westphal and Kim, the effective export subsidy as a percentage ratio to value added in 1968 for plywood, lumber, and lumber and plywood combined was 95.6%, 25.1% and 94.7%, respectively. Thus, the export incentives given to the mechanical wood processing industry in the Republic of Korea in the mid-1960s were, indeed, very substantial.

3.23 Another factor that contributed to the Korean success in increasing plywood exports to the US during this period was that ocean freight costs to the US were significantly lower from the Republic of Korea than from the Philippines, the Province of Taiwan and even Japan. Table 3.7 illustrates the freight cost differences among various points in Asia that exported to the US market in 1968.

3.24 The reason why the actual freight costs for plywood from the Republic of Korea to US destinations were so much lower than those from Japan and other Asian exporters is not fully known. But, it appears that most Korean exports were shipped at cheap nonconference rates. The Pumoo Steamship Company associated with the Retla Steamship Company of Long Beach, California, dominated the transport of Korean plywood, carrying 99% of the Korean plywood shipped to the US in 1970.<sup>1/</sup> Also, one US company, Evans Products Company, of Santa Ana, California, which owns Retla Steamship Company, purchased from 44% to 60% of all Korean exports to the US. The remaining exports were purchased mainly by three other companies.<sup>2/</sup>

3.25 In contrast to both the Province of Taiwan and the Republic Korea, industrial policy in Indonesia continued to be extremely inward-oriented. The overall policy in the Philippines also remained inward-looking, although the government did make some attempts to encourage industrial exports.<sup>3/</sup> Indeed, while the extreme inward-orientation of Indonesia's export policy has softened since the government changed in 1967, both Indonesia and the Philippines have never made a clear switch to an outward-oriented industrial strategy.

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1/ US Agency for International Development, "Survey of the Korean Hardwood Plywood Industry and International Plywood Markets, p. 77.

2/ Ibid., p. 42.

3/ John H. Power and Gerado P. Sicat, The Philippines: Industrial and Trade Policies, pp. 102-104.

**Table 3.7: COMPARISON OF ESTIMATED COSTS OF TRANSPORTING PLYWOOD FROM THE PHILIPPINES, JAPAN, PROVINCE OF TAIWAN AND REPUBLIC OF KOREA TO THE UNITED STATES, 1968**

From	To	Transport Cost/ <u>a</u>	Cost comparison with the case of:			
			Trip from Philippine Customs Port		Trip from Philippine Out-Ports	
			\$ difference	% Ratio	\$ difference	% Ratio
		---US\$---	---US\$---	---%---	---US\$---	---%---
(A) Philippine/ <u>b</u> customs port	Pacific-OCP/ <u>d</u>	11.60	-	100	-	-
	Pacific-local	12.32	-	100	-	-
	Atlantic/Gulf	15.44	-	100	-	-
(B) Philippine/ <u>b</u> out-ports	Pacific-OCP/ <u>d</u>	12.00	-	-	-	100
	Pacific-local	17.72	-	-	-	100
	Atlantic/Gulf	15.84	-	-	-	100
(C) Japan/ <u>b</u>	Pacific-OCP/ <u>d</u>	9.96	22.64	74	3.04	75
	Pacific-local	10.07	2.25	82	2.65	79
	Atlantic/Gulf	12.87	2.57	83	2.97	81
(D) Prov. of Taiwan/ <u>c</u>	Pacific-OCP/ <u>d</u>	8.54	3.06	74	3.46	71
	Pacific-local	8.80	3.52	71	3.92	69
	Atlantic/Gulf	11.12	4.32	72	4.72	70
(E) Republic of Korea/ <u>c</u>	Pacific-OCP/ <u>d</u>	6.98	4.62	60	5.02	57
	Pacific-local	7.58	4.62	62	5.04	60
	Atlantic/Gulf	8.32	7.12	54	7.52	53

/a Transport cost per 800 sq. ft. 1/4 inch plywood, equivalent to approximate recovery volume from 1 m<sup>3</sup> of logs.

/b Conference rates.

/c Nonconference estimated rates.

/d OCP, overland common points; rates which apply to shipments destined to the area east of the Rocky Mountains.

Source: National Economic Council of the Philippines, based on information supplied by Plywood manufacturers Association of the Philippines.

Cited from UNCTAD, "Level and Structure of Freight Rates; The Maritime Transportation of Tropical Timber", TD/B/C.4/59, Jan. 5, 1970, p. 126, Table IV-16.

3.26 By the mid-1960s, plywood exports from Malaysia and Singapore reached modestly significant proportions and they have risen steadily ever since (Table 3.4.). Their export destinations have been well diversified including (a) neighboring countries such as Laos, Thailand and Vietnam, (b) the UK and other European countries, (c) the US and (d) oil-exporting countries in the Middle East such as Kuwait. But, the UK has always been an important destination for them (partly because of the Commonwealth preference), and it could probably be said that without their special connections with the UK market, their plywood exports would never have developed as much as they did.

3.27 Most of Malaysia's plywood exports, however, have been from the relatively better developed Peninsular Malaysia and not so much from the states of Sabah and Sarawak, which have been the more important sources of log production. Peninsular Malaysia, along with Singapore, were successful in improving the product quality to meet the strict requirements of the UK market.

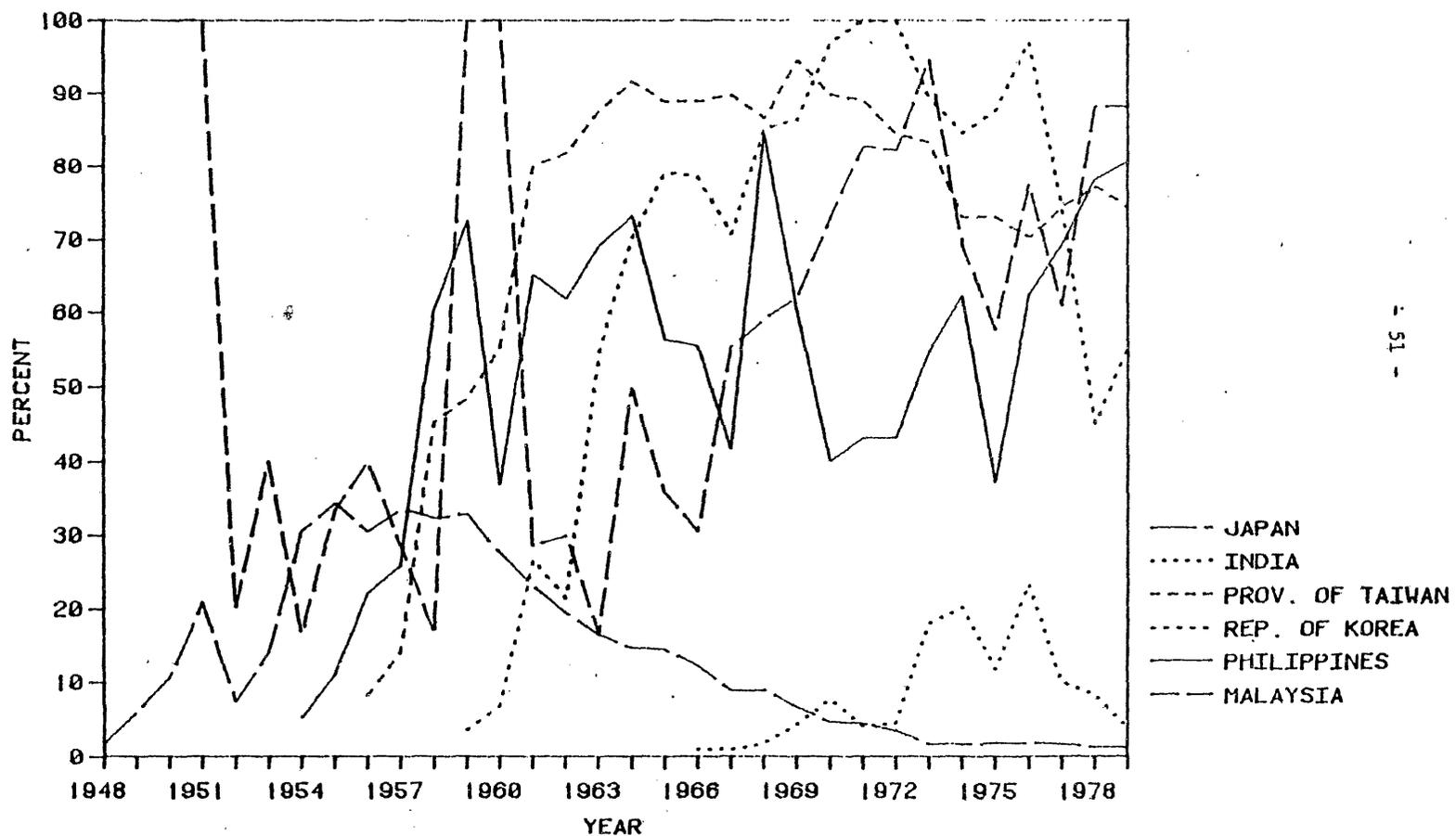
3.28 An important factor that affected developments in the plywood trade during this period (1960-1973) was the growth of domestic demand in Japan. Economic growth in Japan during this time was running at above 10% per annum and the expansion of building and construction activities was phenomenal. Consequently, apparent domestic consumption of plywood (virtually all hardwood) increased from 1.15 million m<sup>3</sup> to 7.61 million m<sup>3</sup> in 1961-1972,<sup>1/</sup> or at 19% per annum. In 1972, Japan accounted for 19% of world plywood consumption. Indeed, although expanding exports were an important factor in the growth of the Japanese plywood industry, the share of exports in total production rose only to 30-35% in 1955-1959 and then declined to less than 20% by 1973.

3.29 In contrast, in the Province of Taiwan and the Republic of Korea, the ratio of exports to production was very high because their exports increased tremendously in the early 1960s. However, the ratio has decreased somewhat in recent years. In the Philippines and Malaysia, because of the continued inward-oriented industrial policies export dependence has remained well below the levels achieved by the Province of Taiwan and the Republic of Korea during the period concerned. Figure 3.2 shows the evolution of the ratio of exports to production for the selected countries in 1948-1979 (see also Statistical Appendix Table SA24).

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<sup>1/</sup> 1972 is chosen as the end period rather than 1973, because consumption in 1973 was so abnormally high because of the exceptional boom conditions in that year.

FIGURE 3.2: PLYWOOD - RATIO OF EXPORTS TO PRODUCTION  
IN SELECTED ASIAN PRODUCERS



SOURCE: STATISTICAL APPENDIX TABLE SA24

D. Trade in Processed Tropical Hardwood, 1974-1977

3.30 Because of the worldwide recession following the oil crisis in 1973-74, export trade in plywood collapsed in 1975 and the recovery has been rather slow. Because of the stagnant growth in demand and the sharp appreciation of the yen against the US dollar, plywood exports from Japan decreased sharply in 1973-75 and subsequently declined further (Table 3.4). Japan still exports plywood made from imported lauan logs but it is mainly in the form of specialty products, e.g., "prefinished" with uniquely Japanese fancy species, printed, laminated, waterproofed, fire-proofed, etc. Since the domestic market also collapsed and stagnated, the Japanese industry has been trapped in "structural stagnation." Table 3.8 shows how the "gross value added to the wood material" in the plywood sector was squeezed in Japan after 1973.

3.31 While the Province of Taiwan's plywood exports stagnated in 1974-77, the Republic of Korea's continued to rise although at a slower pace than before. In the meantime, exports of plywood from Malaysia (mainly Peninsular Malaysia) and Singapore increased steadily, with their exports to the Middle East rising rapidly. Since these two countries had been exporting sawnwood to the UK for a long time, they had already established quality standards for sawnwood and marketing channels. Beginning in the late 1960s, sawnwood exports from Malaysia and Singapore to other European markets also increased rapidly primarily on the basis of their dependable quality. The Timber Industry Boards in the two countries played a key role in promoting exports of sawnwood and plywood.

E. Developments from 1978 to the Present

3.32 In recent years, the Philippines, Malaysia and Indonesia have taken progressive steps to restrict log exports. There are three main reasons for this trend. First, the governments of major log exporting countries have become increasingly aware of the possible exhaustion of prime tropical hardwood resources in their natural forests. Second, they have reconfirmed their determination to step up the growth of local timber processing industries in order to replace their log exports by processed products such as sawnwood, veneer sheets, plywood and other processed wood products (e.g., mouldings, doors, window-frames, flooring materials and "knockdown" furniture). Third, having observed the spectacular success of the OPEC actions in petroleum exports, the major log-exporting countries have come to realize the opportunities for extracting greater economic rent from their government-owned forest resources. This subsection reviews the recent policies of the major log-producing countries, i.e., the Philippines, Malaysia, Indonesia and Papua New Guinea,<sup>1/</sup> and then discusses the impact of these policies on the processing industries in log-importing areas.

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<sup>1/</sup> Table 3.9 summarizes the broad changes in the shares of major countries in tropical hardwood log exports in the last 25 years.

**Table 3.8: TRENDS IN GROSS VALUE ADDED TO LOG MATERIAL IN PLYWOOD PRODUCTION IN JAPAN, PER CUBIC METER OF LAMIN LOG INPUT, 1970-1980**

Year	(A) Price per sheet of plywood /a	(B) Value of 34 sheets of plywood /b	(C) Price of lauan logs /c	(D) Gross value added per m <sup>3</sup> of logs	(E) Japan wholesale price index (1979=100)	(F) Gross value added per 1 m <sup>3</sup> of logs	(G) Exchange rate Yen/\$	(H) Gross value added in current \$ US\$	(I) World Bank Index of International Inflation (1979=100)	(J) Gross value added per m <sup>3</sup> of logs in 1979 US\$
	-----Yen-----		---yen per m <sup>3</sup> of logs---		(1979=100)	1979 Yen	Yen/\$	US\$	(1979=100)	US\$
1970	990	33,660	13,400	20,260	56.98	35,556	357.60	56.66	33.5	169.13
1971	880	29,920	13,300	16,620	56.52	29,405	314.80	52.80	36.3	145.45
1972	870	29,580	11,400	18,180	56.98	31,906	302.20	60.16	40.2	149.65
1973	1,370	46,580	17,800	28,780	66.04	43,500	271.22	106.11	48.3	219.69
1974	1,060	36,040	22,900	13,140	86.77	15,143	291.51	45.08	60.2	74.85
1975	900	30,600	17,600	13,000	89.37	14,546	296.80	43.81	69.4	63.13
1976	1,160	39,440	23,600	15,840	93.92	16,865	296.55	53.41	70.7	75.54
1977	1,100	37,400	24,100	13,300	95.62	13,909	268.51	49.53	76.2	65.00
1978	940	31,960	19,200	12,760	93.21	13,690	210.47	60.63	88.3	68.66
1979	1,500	51,000	35,500	15,500	100.00	15,500	219.17	70.72	100.0	70.72
1979 June	1,610	54,740	34,400	20,340						
1979 November	1,620	55,080	46,100	8,980						
1980 February	1,890	64,260	46,600	17,660						
1980 April	1,830	62,220	47,800	14,420						

/a Wholesale price in Japan (national average).

/b 1 m<sup>3</sup> of roundwood can be converted into 34 sheets of plywood (12 mm, 90 cm x 180 cm).

/c Wholesale price, national averages, for veneerlogs.

(D) = (B) - (C)

(F) = (D) deflated by (E)

(H) = (D) - (C)

(J) = (H) - (I) X 100

Source: Forestry Agency of Japan, Mokuzai Shikyo Geppo, various issues. IMF, International Financial Statistics, various issues

3.33 In 1972 the Philippine government decided to ban log exports in principle and announced a program aimed at gradually reducing log exports until they were phased out completely by 1976. However, due to recurring balance-of-payments difficulties, the government has repeatedly postponed the complete cessation of log exports and has permitted them on an exceptional basis by quota allocation. Nevertheless, according to official statistics, Philippine exports of logs have declined quite dramatically-- e.g., from 9.6 million m<sup>3</sup> in 1970 to 1.25 million m<sup>3</sup> in 1979 (Statistical Appendix Table SA9) and to below 1 million m<sup>3</sup> in 1980.1/

3.34 Philippine forest resources have been depleted far more than the official Bureau of Forest Development data indicate. The country's forest resources have been intensively exploited for over 30 years since World War II. Unless a policy of strict conservation and rational utilization is implemented, forests in the Philippines will not be able to sustain any substantial growth of the wood processing industry or perhaps even the present level beyond a few years.2/

3.35 In Peninsular Malaysia, also, the policy of restricting log exports was established in 1972 when a ban on the exports of logs was imposed, first on 11 species and later on 16 species. Although the ban was somewhat liberalized in 1977, log exports were allowed only on a quota basis. Exports of logs from Peninsular Malaysia declined steadily from 1.6 million m<sup>3</sup> in 1970 to practically nil in 1979 (Statistical Appendix Table SA9). Indeed, Peninsular Malaysia has recently been suffering from log shortages. Despite abolishing in late 1978 the 15% import duty and the 5% surtax on log imports, imports of logs into Peninsular Malaysia have not increased dramatically. Although the overall level of log production in Peninsular Malaysia has not decreased since 1970, it clearly has now become a log-importing region.

3.36 In the State of Sabah in Malaysia, exports of logs peaked (in volume) in 1973, declined during the "oil crisis" years of 1974-75, and then sharply increased to over 12 million m<sup>3</sup> in 1976-1978. However, in 1979 the State government established the policy of reducing log exports

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1/ It is widely believed that unrecorded exports of logs have increased in recent years. Even if such "extra-official" exports are allowed for, it is undeniable that Philippines' log exports have decreased substantially over these years.

2/ Wood Industry Development Study Group and Atlanta Industrie-und Unternehmensberatung GmbH, "Wood industry Development Study Base Survey I: Forest Resources Base Study", prepared for the Philippine Ministry of Natural Resources, October 1980.

Table 3.9: SHARES IN WORLD EXPORTS OF TROPICAL HARDWOOD LOGS, SELECTED YEARS IN 1955-1979

Tropical Region/country	1955	1961	1970	1973	1975	1978	1979
	-----percent-----						
<u>Asia-Pacific</u>	<u>50.0</u>	<u>60.8</u>	<u>80.3</u>	<u>81.1</u>	<u>84.3</u>	<u>86.3</u>	<u>85.0</u>
Indonesia	0	0.8	21.4	37.3	36.8	42.7	44.0
Malaysia	12.4	21.5	31.0	26.0	31.7	37.2	36.5
Papua New Guinea	0.1	0.1	0.5	0.9	1.0	1.0	1.0
Philippines	32.4	35.8	26.2	15.6	13.5	4.9	2.8
<u>Africa</u>	<u>43.2</u>	<u>36.9</u>	<u>18.7</u>	<u>17.7</u>	<u>15.5</u>	<u>13.6</u>	<u>14.8</u>
Gabon	13.7	9.6	4.5	3.5	2.9	2.7	2.7
Ghana	8.2	6.1	1.6	2.8	1.6	0.7	0.3
Ivory Coast	4.1	8.0	6.8	7.0	7.1	6.0	7.3
<u>Latin America</u>	<u>6.7</u>	<u>3.0</u>	<u>1.0</u>	<u>1.1</u>	<u>0.1</u>	<u>0.1</u>	<u>0.2</u>

Source: Statistical Appendix Table SA9.

gradually, and export quotas have since been applied.<sup>1/</sup> In the meantime, the royalty rates were increased sharply around mid-1979. These new royalty rates have had the effect of raising the share of government revenue in FOB log prices dramatically--i.e., from the previous 32% to 60%. Log exports from Sabah declined sharply from 12.4 million m<sup>3</sup> in 1978 to 9.8 million m<sup>3</sup> in 1979 (Statistical Appendix Table SA9). Log exports declined further to 8.2 million m<sup>3</sup> in 1980.

3.37 According to Mr. M. Munang, Acting Senior Assistant Conservator of Forests of Sabah, the theoretically appropriate level of log production "under conditions of full allocation" (based on 70 year rotation) would decline from the peak 10 million m<sup>3</sup> in 1975, to 8 million m<sup>3</sup> in 1980, to 5 million m<sup>3</sup> in 1985 and 3.7 million m<sup>3</sup> in 1990. <sup>2/</sup> Although the basis for setting these "annual allowable cut" targets appears to be rather arbitrarily conservative, it is safe to assume that if log production in Sabah continued at the rate of over 10 million m<sup>3</sup> per annum, commercially attractive forest resources would become very scarce within the next 5 to 10 years.

3.38 The declared objective of the Sabah government is to reduce annual log exports to nil by 1985. Although substantial slippage can be anticipated in the implementation of this program of phasing out log exports completely, there is no doubt that log exports from Sabah would be reduced sharply by mid 1980s.

3.39 In the State of Sarawak, where logging conditions are not as favorable as in Sabah or Peninsular Malaysia, log exports declined in 1970-1975 from 3.1 million m<sup>3</sup> to 1.3 million m<sup>3</sup>, but they have been rising rapidly since 1976, reaching 6.7 million m<sup>3</sup> in 1980. There have been modest exports of processed timber, but they have not been increasing in volume terms.

3.40 Sarawak has taken a rather liberal log export policy. The government charges (royalty, export tax, etc.) have been rather low--around 10-15% of FOB charges (royalty, export tax, etc.) have been rather low--around 10-15% of FOB prices, depending on species--and there is not much discrimination against log exports in favor of processed timber exports.

3.41 Commercially attractive virgin forests in Sarawak are estimated to last for another 20 years at the current rate of exploitation, but the

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<sup>1/</sup> According to the Constitution of the Federation of Malaysia, forestry is a State matter. Therefore, forestry policy including trade and tax policies relating to forest products is autonomously decided by the State authorities of Sabah. This principle also applies to Sarawak.

<sup>2/</sup> M. Munang, Forest Resources Base, Policy and Legislation of Sabah, p.32.

second round of cutting is expected to yield substantially less than the first round. If the present liberal log export policy is continued, log exports from Sarawak could rise to 8 million m<sup>3</sup> by 1983.

3.42 In Indonesia, hardwood log production, having peaked in 1974 (at 26.2 million m<sup>3</sup>) and having plummeted in 1975 (to 16.3 million m<sup>3</sup>), recovered to 26.9 million m<sup>3</sup> in 1979. <sup>1/</sup> However, during 1980 and 1981, it declined, due, at least partly, to the significant changes in the log export policy introduced in 1979-81. Logs produced in Indonesia are exported largely in log form although very recently exports of sawnwood and plywood began to increase. Fluctuations in the country's log production thus reflect the variations in its log exports, which in turn reflect the fluctuations in demand and, more recently, the effects of the restrictive log-export policy.

3.43 Indonesia's forestry policy has been based on three principles-- export quotas, selective cutting and domestic processing. These principles were incorporated into laws in the late 1960s and early 1970s and also were written into forestry concession agreements. The general objective of the forestry policy has been to maximize the long-term benefits arising from forestry-related activities to the Indonesian economy. The more specific objectives have been to make sure an adequate resource rent is collected from logging activities and to encourage the growth of domestic wood-processing industries. The government, however, did not enforce these principles until 1978.

3.44 Around the beginning of 1978 the government of Indonesia decided to take steps to increase fiscal revenue from the forestry sector and also to give stronger incentives to increase local processing. In February 1978, the government increased the export tax on logs from the previous 10% to 20% of the government-determined "check prices." In the summer of 1979, a new export tax of 5% was imposed on roughly sawn timber. This was to extract some resource rent from sawn timber and also to discourage the practice of exporting simply roughly squared logs (which can hardly be called "processed") solely to avoid the 20% export tax and other changes imposed on round log exports. There are currently about eleven separate government charges on log exports, and the "tax" burden of log exports in Indonesia now seems to be as high as 40-45% of the FOB prices of logs (See Annex D).

3.45 In April 1980, the ministers of agriculture, trade and industry announced their joint decision to restrict log exports through linking the

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<sup>1/</sup> Statistics on forestry and forest industries in Indonesia vary widely depending on the sources. It is difficult to reconcile production, export, local processing, etc. The figures cited are based on data reported in FAO, Yearbook of Forest Products 1978. Published statistics on annual log production are not always in agreement. See C.E.M. Keil, Logging and Log Processing in Indonesia, April 1978, p.17. See also Statistical Appendix Table SA25.

log export quota allocations to the "industrialization" performance of concessionaires. The quantitative export restriction system works through the assignment of allowable quotas for annual cuttings and exportable log quotas for each individual concession holder on the basis of the concessionaire's recent performance in local processing.

3.46 The overall effects of these policy initiatives have been remarkable. Indonesia's log exports were down in 1980 and 1981. Log export prices climbed sharply in 1979 and stayed high until the fall of 1980 (although prices have been lower since). At the same time, a substantial differential between the prices of export logs and local market logs has been created. Export prices ranged around US\$125-135 per m<sup>3</sup> (FOB Kalimantan) during a good part of 1980, while logs of almost comparable quality were available in the local market at US\$70 per m<sup>3</sup>, or at roughly half price. This price differential, if it is expected to persist, would provide a powerful incentive for local processing so long as exports of processed products are subject to little or no tax. As the capacity to process logs locally is built up over the next few years, the price differential might narrow somewhat, but as long as there are substantial taxes on export of logs, the differential will remain substantial. In fact, Indonesia's exports of sawnwood and plywood have been increasing rapidly (Statistical Appendix Tables SA10 and SA11).

3.47 Also, the determined attitude of the Indonesian government has signaled both the log-importing areas and the potential investors at home that this time the government really means business. This is reflected in the recent rush of applications for the government's approval on a number of wood-processing projects, especially plywood production projects. As of May 1980, 22 plywood factories, with an aggregate capacity of 1.1 million m<sup>3</sup> (plywood) per year, were in operation, compared with 16 plants at the end of 1978. An additional 20 or so had already been approved (as of May 1980) and are expected to bring the country's total capacity to 2.1 million m<sup>3</sup> (plywood) per year by the end of 1982. Reportedly, some 50 to 80 more projects have been proposed and are in various stages of preparation. If all of these projects are implemented, the total number of plywood plants in Indonesia would be well over 100. Although no clear information is available on plans for increased sawmilling capacity, it is believed that many of the planned and proposed plywood plants would accompany sawmills.

3.48 In April 1981 another "radical" policy was announced on log exports.<sup>1/</sup> Essentially, the new policy is to give log export quota allocations only to the forest concessionaires who have processing facilities

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<sup>1/</sup> Joint Decree of Indonesian Director General of Forestry, Director General of Industry, Director General of Domestic Trade and Director General of Foreign Trade, No. 78/KPTS/DJ/I/1981.

(with "concentration" on plywood production) either already in operation or under construction. This means that those concessionaires who have merely filed applications for approval of construction of plywood and other processing facilities would not be given log export quota allocations until the proposed projects are under construction. If this policy is strictly enforced, log exports from Indonesia should immediately decline dramatically. Judging from the reported log-price movements and Japanese log import statistics for May-June 1981, however, the policy does not appear to be strictly enforced. Nevertheless, in all probability, Indonesia's log exports are likely to decrease further in the coming years.

3.49 In Papua New Guinea, log exports peaked around 1974 at 0.4 million m<sup>3</sup> - 0.45 million m<sup>3</sup> per year and have remained at that level since. In early June 1979, the Ministry of Forestry issued the Revised National Forest Policy, which reversed the previous practice of restricting log exports in favor of local processing. The major thrust of the revised policy aims at revenue generation, national ownership, regional development and political stability. The government intends to "concentrate its efforts over the next few years in seeing to the efficient utilization of existing (and firmly proposed) timber processing capacity, and on the formation of a number of Papua New Guinea owned export logging enterprises."<sup>1/</sup> Whether or not log exports from Papua New Guinea could increase substantially in the future depends critically, among other things, on the successful implementation of the last point, namely, the formation of a number of domestically owned export logging enterprises.

3.50 Other countries in the region are only minor log exporters. Thailand has become a net importer. Burma could potentially increase log exports but is likely to do so only gradually. Vietnam is basically a wood deficit country. Thus, with the exception of Sarawak, Papua New Guinea, Burma and possibly Laos, countries in the region are likely to continue to reduce their exports of logs significantly in the future.

3.51 The impact that increased restrictions on log exports in the Philippines, Malaysia and Indonesia have had on the processing industries in Japan, the Republic of Korea and the Province of Taiwan has not been very clear. It is true that production of plywood declined in Japan, the Republic of Korea and the Province of Taiwan in 1980-81, but it seems that the depressed demand for plywood in the United States and Japan has been a more important influence than the restrictions on log supply. However, had there not been a tightening of log export restrictions in the major supplying areas, log prices would have declined much more dramatically than they did in the face of receding demand in 1980-1981. All this, however, represents only short-run repercussions. It is important to assess the long run implications of the recent trends in the timber export policies of the major supplying countries. These will be discussed in Chapter VI.

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<sup>1/</sup> Papua New Guinea, Office of Forests, Facts and Figures 1980 Edition, p. 1.

IV: FACTORS AFFECTING THE LOCATION OF MECHANICAL  
PROCESSING OF TROPICAL HARDWOOD

A. Introduction

4.01 It is clear that incentives provided by governments played an important part in the development of export-oriented plywood industries in Japan, the Republic of Korea and the Province of Taiwan, especially during the initial stages. The most effective incentive measures involved linking foreign exchange allocations for raw material imports to export performance (generous "wastage" allowances constituted an effective subsidy for plywood exports). Exports of processed products from Malaysia and Singapore were facilitated by special ties with the UK. Another important non-cost factor that helped increase processed timber exports from Malaysia and Singapore seems to have been the work of Timber Industry Boards in quality control.

4.02 There are other government actions that affect the location of processing facilities through the cost of production. Trade barriers appear to have affected the evolution of locational pattern of processing industries. Tariff escalation in major importing countries played a role in influencing the locational pattern. Also, differential government charges (export taxes, royalties, etc.) on logs for export vs. logs for local processing as well as restrictions on log exports appear to have influenced the location of processing industries. The purpose of this chapter is to compare the production cost structures of major Asian exporters of processed tropical timber in order to understand the determinants for timber processing locations.

4.03 Our attention is again focused on the plywood sector because a majority (65-70%) of the logs exported from the producing countries are veneerlogs which are used mainly for plywood making in the importing countries. Furthermore, the value added to the log material is generally higher in plywood than in sawnwood, and, therefore, there is a greater interest in plywood than in sawnwood on the part of the major log-exporting countries.

4.04 Cost data have been collected for six locations--i.e., Indonesia, Peninsular Malaysia, Sabah, the Philippines, Singapore and Japan. The cost data collected are rough and their reliability is uncertain. The data are fairly recent, but in the last 2-3 years, there have been rather "radical" changes in the conditions affecting wood material supply, demand for plywood, and thus the profitability of the plywood industry in the region. Therefore, comparison and interpretation of the cost data must be done with extreme caution. Unfortunately the field work could not cover two major tropical hardwood plywood producing areas--the Province of Taiwan and the

Republic of Korea. On these areas, no cost data have been obtained, and only spotty, somewhat old information from secondary sources has been utilized for this study.

4.05 The following section examines whether or not entry costs have been an important barrier to the growth of wood processing in the log-producing countries. Then, costs of producing plywood, including costs of delivering it to the Japanese market, are compared for six locations, including log-importing Japan and Singapore and log-producing Sabah, Sarawak, Peninsular Malaysia, Indonesia and the Philippines.

#### B. Entry Costs

4.06 Estimates for costs of entry into mechanical processing of tropical hardwood seem to vary considerably, depending on the type of machinery used, whether or not kiln drying is involved, the number of workshifts employed and the extent of need for supporting facilities (transportation, housing, medical service, etc.). Some estimates are given below. On the whole, in the context of the Asia-Pacific region, entry costs required to start operations on a minimum economic scale in sawmilling and veneer/plywood production do not seem to have been the key obstacle to establishing processing plants. Entry costs involved in starting economic scale particle-board production are substantially higher than entry costs for sawmilling and plymilling. In establishing particleboard plants, entry costs have been at least one of the major problems--although not the most important problem.

4.07 Entry costs have never been a serious problem in sawmilling. A typical modern sawmill with the rated annual capacity of 15,000 m<sup>3</sup> of sawnwood output would today require a total investment of US\$2.0-\$5.0 million (constant 1980 dollars). In other words, initial investment requirements range from US\$130 to \$330 per cubic meter (sawnwood) of annual production capacity.

4.08 Similarly, entry costs for establishing a modest but efficient modern plywood factory donot seem to be a major problem unless an extensive infrastructure needs to be created. Estimates for investment requirements for building a modest but reasonably efficient modern factory for plain plywood making would range widely from US\$110 to \$540 per each cubic meter (plywood output) of rated annual production capacity (in constant 1980 dollars). Table 4.1 provides estimated entry costs for five separate projects sited, or to be sited, at different locations. One possible reason for the vast differences in the magnitudes of investment requirements per cubic meter (plywood output) of annual capacity might be the type of machinery involved. On the one hand, data for the project in northern East Kalimantan have been taken from a feasibility study, in which the most expensive machinery seems to be assumed. On the other hand, the hypothetical example for Peninsular Malaysia may have assumed the use of the

simplest and least expensive type of machinery. The examples for Balikpapan, East Kalimantan, and Sabah assume medium quality equipment. In any case, given the wide range of possibilities, it cannot be concluded that entry costs have been a serious problem in establishing plywood plants.

4.09 Production of wood-based panels other than plywood seems to require much larger entry costs for an economic scale operation. One recent feasibility study for a modest scale wood-based panel complex to be sited in a central African country indicates entry costs of about US\$1,940 (constant 1980 dollars per m<sup>3</sup> (output) of annual production capacity. The proposed project involves an annual production capacity of 15,000 m<sup>3</sup> of particleboard, 3,000 m<sup>3</sup> of waferboard, 6,500 m<sup>3</sup> of hardboard and 500 m<sup>3</sup> of insulation board. The total capital cost required is about US\$36.6 million for the capacity to produce a total output of 25,000 m<sup>3</sup> per year (60% particleboard), while the total financing required is estimated at US\$48.5 million (including infrastructure).

4.10 Although the capital cost required for the wood-based panel plant mentioned above seems to be overestimated, it is undeniable that production of wood-based panels other than plywood involves substantially higher capital requirements per m<sup>3</sup> of output of annual capacity. At least in the past, entry costs seem to have been among the key constraints on the development of the wood-based (non-plywood) panel industry in tropical hardwood-producing countries.

#### C. Plywood Production Costs up to Ex-Factory

4.11 Table 4.2 compares costs of producing plain plywood in Indonesia (East Kalimantan), Peninsular Malaysia, Sabah, the Philippines, Singapore and Japan. Assuming that plywood is to be delivered to the Japanese market, the table shows not only the cost of physical production but also the costs of delivering to the vessels at export points, ocean freight and insurance for shipping to Japan, and Japanese import duty. All estimates refer to the cost conditions as of the first half of 1980, although some estimates are derived from data that are dated earlier.

4.12 The estimates given in US dollar terms in Table 4.2 are then shown in percent share terms in Table 4.3. In all countries except Japan, the production cost up to ex-factory accounts for about 68-75% of the total cost of plywood delivered to Japan. In the case of Japanese factories, production up to ex-factory accounts for practically 100% of cost by definition, ignoring the cost of shipping to customers that are typically located nearby. This means that the overseas producers are "handicapped" by "post-factory" costs of some 30% in competing with the domestic producers in the Japanese market. These costs will be discussed later.

Table 4.1: ESTIMATED ENTRY COSTS OF PLYWOOD FACTORIES  
IN INDONESIA AND MALAYSIA IN 1980 US DOLLARS

Country Location	Indonesia		Malaysia		Philippines
	East Kalimantan (I)/a	East Kalimantan (II)/b	Sabah/c	Peninsula/d	/e
Product size	4-25m x 1.25m x 2.50m	4m x 1.21m x 2.42m			1.21m x 2.42m thickness 5.5mm(?)
Capacity (plywood m <sup>3</sup> /year)	81,500 m <sup>3</sup>	36,000 m <sup>3</sup>	43,000 m <sup>3</sup>	110,000 m <sup>3</sup>	Not specified
Investment cost /d Total (US\$ million)	43.8	9.6	11.8	12.1	Not available
US\$ per m <sup>3</sup> (plywood) of annual capacity	537	266	275	110	297

/a Based on a proposed integrated project to be sited in northern East Kalimantan. Investment requirements appear to be too high.

/b Based on a proposed plywood project to be sited in Balikpapan.

/c Based on a recently established operating plant in Sandakan area.

/d Based on data provided in Michael Roemer, Report on Industrial Strategy Studies.

/e Based on an estimated replacement cost (national average).

Source: Estimates based on information provided by industry sources.

Table 4.2: ESTIMATED COST OF PRODUCTION FOR PLYWOOD AT SELECTED LOCATIONS IN ASIA AS OF EARLY 1980

	<u>Indonesia</u>	<u>Sabah</u>	<u>Peninsular Malaysia</u>	<u>Philippines</u>	<u>Singapore</u>	<u>Japan</u>
	A Hypothetical Plant East Kalimantan /a	A Plant Operating at 65% Capacity /b	A Model Plant to Operate at 70% Capacity /c	An Operating Plant (perhaps not so typical) /d	A Plant Operating at Full Capacity /e	"Typical" Cost Conditions of Existing Plants /f
Capacity (m <sup>3</sup> of plywood per year)	36,000	43,000	110,000	80,000	5,000	not available
Product size	4mm x 1.2m x 2.42m	4mm x 1.2m x 2.42m	4mm(?) x 1.2m x 2.42m	4mm(?) x 1.2m x 2.42m	1.0-1.6 mm x 1.2m x 2.42m	12mm x 0.91m x 1.82 m
US\$ per (m <sup>3</sup> ) of plywood output						
Wood recovery rate	52.0%	52.0%	45.0%	50.1	50.0%	67.0%
Fixed cost	57	53	41	53	38	25
Depreciation/g	24	21	11	5	13	5
Interest	14	20	12	6	5	4
General management/h	19	12	18	42	20	16
Variable cost	233	237	173	203	304	177
Logs	152	127	100	99	201	286
Glue	28	30	28	34	26	32
Other supplies	22	38	8	22	27	20
Labor, direct x service	24	20	24	25	35	36
Packaging	5	9	6	10	8	3
Transportation to the port	0	4	3	8	3	0
Charges at the port/i	2	9	4	5	4	0
Local taxes						
Sales tax	4	0	0	0	0	0
Total cost up to FOB (Export price)	294 (323)	290 (310)	214 (270)	256 (303)	342 (358)	402 (385)
Ocean freight & insurance to Japan	43	26	31	23	26	-
Ocean freight	40	23	28	20	23	-
Insurance	3	3	3	3	3	-
Japanese import duty	73	67	60	65	77	-
Cost of plywood, delivered Japan						
Without Japanese import duty	337	317	245	279	368	Not wholly comparable due to difference in product (size) /k
After import duty (20%) /j	410	383	305	344	445	

/a A hypothetical project in East Kalimantan. Most of the log input is to be supplied by the associated companies engaged in logging. Assumes three-shift operations. Over two thirds of output is to be exported. Wood residues are to be used as fuelwood at the plant.

/b A joint venture company operating in Sabah. The plant is located in the vicinity of a port. All output is exported. About 55-60% of log input is from the company's own logging concession in Sabah. The plant is operated on a two-shift basis. Wood residues are used as fuelwood at the plant.

/c Estimated cost data provided in the "Report on Industrial Strategy Studies," by Michael Roemer and Malaysian Economic Planning Unit, are used to obtain the estimates in 1980 dollars. The model plant is assumed to be located about 60 km from Kuala Lumpur, in Seremban.

/d Estimates based on data supplied by a consulting company, with a warning that the data's reliability is questionable. The data provided have been adjusted for inflation to obtain the estimates in 1980 dollars. Log inputs are supplied by the firm's own logging concession. The unusually high general management cost must be noted. 27% of it is attributed to "office in Manila". 80% of output is exported. The plant is operated on a two-shift basis.

/e A plant in operation for over five years. Operated on a three-shift basis. Log input is entirely imported.

/f Estimates based on the partial data provided by industry and government sources in Japan. Most of the log input is presumed to be "South Sea" tropical hardwood. The product is used mainly for concrete forms. Therefore, the quality of logs used tends to be below average.

/g Includes amortized pre-investment expenses.

/h Including some "welfare" costs such as health room facilities and technical fees (outside engineers, etc.).

/i Includes the cost of loading the ship.

/j The amount of duty is calculated on the "import price" (i.e., the export price plus freight and insurance), not on the cost up to FOB plus freight and insurance.

/k Somewhat more comparable price would be that for 4 mm thickness plywood, whose wholesale price averaged \$468/m<sup>3</sup> in January-July 1980. But note that the Japanese size is 0.91m x 1.82 m rather than 1.2m x 2.42m.

Source: Author's estimates based on information made available by industry sources.

1. Fixed Cost

4.13 The fixed cost of producing plywood, i.e., depreciation, interests and general management, seems to vary widely, ranging from US\$25 to \$57 per m<sup>3</sup>, or 6-15% of total cost. The financial charges (depreciation and interests) are relatively small in the cases of Japan, Singapore and the Philippines because the plants referred to have been operating for at least seven years and are well depreciated by now. The projects in Indonesia and Malaysia are either recently established or proposed. While this difference does affect the current competitiveness of individual producers, for the purpose of determining the location of future processing facilities costs involved for new projects should be used as the basis of comparison. "General management" accounts for 3-6% of total cost except for the case of the Philippines. The underlying data for the estimated costs at an average Philippine plant are of very uncertain reliability. The obviously high cost of \$42 per m<sup>3</sup> of plywood for general management there includes expenses attributed to "office in Manila," the nature of which is not clear. In any case, allowing for the inevitable inconsistencies involved in attributing cost items, the cost of general management seems to be fairly similar everywhere except in the Philippines.

2. Variable Production Cost

(a) Logs

4.14 The most important cost item in all the cases is raw material logs, accounting for 41-53% of ex-factory cost in the log-producing countries, and for 60% and 71% in log-importing Singapore and Japan respectively (not explicit in Table 4.3). The enormous variation in the dollar cost of log material among the cases under review is striking because all the plants involved are using essentially similar material in terms of species and sources. The wood cost ranges from \$100 in the Philippines and Peninsular Malaysia to \$200 and \$286 in log-importing Singapore and Japan respectively. This variation is due to differences in the prices of logs and not to differences in the wood material recovery rate.

4.15 The implied log prices are shown in Table 4.4. The prices paid for logs by different plywood producers differ considerably for two basic reasons. First, for the producers who are located in log-producing regions and obtain logs from their own logging concessions, the pricing of the logs is a rather arbitrary accounting decision, while for those producers who actually procure them from independent suppliers market prices prevail. Second, producers in log-importing countries such as Singapore and Japan must pay international market prices which are substantially higher (even on FOB basis) than local market prices in log-producing countries because of (a) various charges that are not imposed on locally sold logs (e.g., royalties, export taxes) and (b) substantial ocean transport and other costs involved in moving logs to the plywood factories.

**Table 4.3: THE STRUCTURE OF COST OF PRODUCING PLYWOOD IN INDONESIA, MALAYSIA, PHILIPPINES SINGAPORE AND JAPAN, INCLUDING COST OF DELIVERING TO JAPANESE MARKET, 1980**

	A Indonesia	B Peninsular Malaysia	C Sabah Malaysia	D Philippines	E Singapore	F Japan	G Average of A, B, C, and D
	-----Percent-----						
<u>Production costs (up to ex-factory)</u>	<u>70.3</u>	<u>72.5</u>	<u>67.9</u>	<u>70.6</u>	<u>75.3</u>	<u>100.0</u>	<u>70.3</u>
Depreciation	5.9	5.5	3.6	1.5	2.9	1.2	4.1
Interests	3.4	5.2	3.9	1.7	1.1	1.0	3.6
General Management	4.6	3.1	5.9	12.2	4.5	4.0	6.5
Logs	37.1	33.1	32.8	28.8	45.2	71.1	33.0
Glue	6.8	7.9	9.2	9.9	5.8	8.0	8.5
Other supplies	5.4	10.0	2.6	6.4	6.1	5.0	6.1
Labor	5.9	5.3	7.9	7.3	7.9	9.0	6.6
Packaging	1.2	2.3	2.0	2.9	1.8	0.7	2.1
<u>Distribution (up to (FOB))</u>	<u>1.5</u>	<u>3.3</u>	<u>2.3</u>	<u>3.8</u>	<u>1.6</u>	<u>0.0</u>	<u>2.7</u>
<u>Ocean freight and insurance</u>	<u>10.4</u>	<u>6.7</u>	<u>10.2</u>	<u>6.7</u>	<u>5.9</u>	<u>-</u>	<u>8.5</u>
Ocean freight to Japan	9.8	6.0	9.2	5.8	5.2	-	7.7
Insurance	0.6	0.7	1.0	0.9	0.7	-	0.8
<u>Japanese import duty</u>	<u>17.8</u>	<u>17.5</u>	<u>19.7</u>	<u>18.9</u>	<u>17.3</u>	<u>-</u>	<u>18.5</u>
Total cost, delivered Japan (incl. Japanese import duty)	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Table 3.2

Table 4.4: THE IMPLIED LOG PRICES PAID BY PLYWOOD PRODUCERS AT DIFFERENT LOCATIONS

Location of Plant	\$ US per m <sup>3</sup> of logs
Indonesia	80
Sabah	66
Peninsular Malaysia	45
Philippines	50
Singapore	100
Japan	192

Source: Table 4.2.

4.16 While transport costs for logs will be discussed later together with transport costs for plywood, the price differential between internationally marketed logs and locally sold logs is explained here briefly. The three countries that have served as major sources of log exports in the Asia-Pacific region - i.e., the Philippines, Malaysia and Indonesia - have recently taken measures to restrict log exports because of heightened concern for the environment, forest resource exhaustion and resource rent appropriation, as explained in Chapter III. Because of the dwindling availability of logs and increased government charges on export logs from these traditional sources, international log prices rose sharply in the recent years. The average price of lauan/mercanti veneer logs delivered to mills in Japan, thus, rose from US\$92 per m<sup>3</sup> in 1978 to \$211 per m<sup>3</sup> in April-June 1980.

4.17 Obviously, the discrimination against export logs and in favor of logs destined for local processing in terms of taxation, royalties and other charges amounts to a subsidization of local processing activities at the expense of log exporting. Whether or not such policies are worthwhile from the viewpoint of national economic development will be discussed later. It will suffice here to point out that the "two-tier" prices of logs resulting from these policies are critically affecting the cost competitive positions of the plywood and other processing industries located in the log-producing countries and those located in the log-importing countries.

4.18 Another important aspect of the role of log cost in the plywood production cost structure is the question of the wood recovery rate. As can be seen from Table 4.2, the wood recovery rate in Japan (67.0%) is substantially higher than in the other countries compared (45.0-52.7%). The main reason, according to industry experts, is the difference in the size of the products. Due to the unique specifications of Japanese building/construction design practices, the bulk of Japanese demand in construction/building industries is for the 0.92m x 1.82m size. Wood recovery is much higher in making plywood of the 0.92m x 1.82m size (the so-called 3" x 6") than in making the 1.22m x 2.42m size (the so-called 4" x 8") plywood which is standard elsewhere. According to Japanese industry sources, if 1.22m x 2.42m plywood is made in Japan, the wood recovery rate would be as low as 54% or so. Therefore, if a plant producing the 0.92m x 1.82m size were built in one of the log producing countries (or even in Singapore for that matter), the wood recovery rate should be much higher than the 45-53% indicated in Table 4.2, and it should reduce the cost of logs per m<sup>3</sup> of plywood output substantially (perhaps by up to 25%).

(b) Glue and "Other Supplies"

4.19 There does not seem to be a large variation in the cost of glue used by plywood producers in different locations. Whether the producers use locally produced glue or imported glue does not seem to make much difference.

4.20 The category "other supplies" in Table 4.2 includes miscellaneous items, but the coverage is not always clear. Usually, it includes electricity, repairs and maintenance, machinery parts, tapes for mending damaged veneers, etc. It is suspected that the Peninsular Malaysian "model" calculation may have omitted some items and thus underestimated the cost involved under this category.

4.21 The importance of energy in the cost structure of the plywood industry seems to have been contained well everywhere because of both the swift change to the use of alternative fuels--i.e., substitution of wood residues for oil-based fuels--and energy saving measures. Wood residues that used to be used in particleboard production, pulp and paper production, or simply thrown away, are now being used as fuelwood for veneer drying, hot press and sometimes for electricity generation. Changes in energy consumption for plywood production in Japan in 1973-79 are shown in Table 4.5.

(c) Labor Cost

4.22 The labor costs for plywood production are higher in Singapore and Japan (US\$35-\$36 per m<sup>3</sup>) than in Malaysia, Indonesia and the Philippines (US\$20-\$25 per m<sup>3</sup>). While there may be differences in labor productivity among the different locations, a simple comparison of available rough estimates of wages presented in Table 4.6 leads to the following broad observations. First, there is enormous difference between Japan and all the other countries. Second, wages are substantially higher in Singapore and Malaysia than in the Philippines and Indonesia. Third, within Indonesia, wages in East Kalimantan are 3.5-4.0 times the levels in Java.

4.23 Unfortunately, we do not have enough detailed (and reliable) data to estimate "labor productivity" in different locations to draw further conclusions. However, so far as plain plywood is concerned, it is hard to imagine that the difference in labor productivity between Japan and the other countries is great enough to offset the difference in wages fully.<sup>1/</sup>

(d) Packaging

4.24 Since separate data were not available in some cases, packaging costs for plywood were estimated by the author in several instances. Therefore, accurate comparison of packaging costs is not possible. However, the following observations can be made. Since plywood made in Japan is usually delivered to nearby customers, relatively simple packaging for short-distance trucking is sufficient, and thus, packaging can be presumed to cost less for Japanese producers than for producers located elsewhere who

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<sup>1/</sup> Changes in gross value added to logs, production volume per employee and annual wages/salaries per employee in the Japanese plywood industry in the 1970s are shown in Statistical Appendix Table SA26.

Table 4.5: ENERGY CONSUMPTION IN PLYWOOD  
PRODUCTION IN JAPAN, 1973-1979

Year	1,000 k cal per sheet/ <u>a</u> produced / <u>b</u>			Electricity Consumption per Sheet/ <u>a</u> KWH / <u>b</u>
	Oil-based energy	Wood residues and wastes	Subtotal	
1973	4.1 (100)	3.4 (100)	7.5 (100)	0.73 (100)
1974	4.1 (100)	3.8 (112)	7.9 (105)	0.79 (108)
1975	3.3 (80)	3.2 (94)	6.5 (87)	0.79 (108)
1976	3.0 (73)	3.6 (106)	6.6 (88)	0.68 (93)
1977	2.9 (71)	4.0 (118)	6.9 (92)	0.72 (99)
1978	2.2 (54)	3.5 (103)	5.7 (76)	0.71 (97)
1979	1.8 (44)	3.9 (115)	5.7 (76)	0.66 (90)

/a 4mm x 0.91 m x 1.82m, plain plywood.

/b Indexes in parentheses.

Source: Plywood Information Center of Japan Federation of Plywood Manufacturers' Associations, No.45 (June 30, 1980), pp.14-15.

Table 4.6: WAGES IN PLYWOOD INDUSTRY IN INDONESIA, MALAYSIA, PHILIPPINES, SINGAPORE AND JAPAN, AS OF 1980

	Type of Labor		
	unskilled	semi-skilled	skilled
----- (US dollars per month) -----			
<u>Indonesia</u>			
Java	16	24	40
East Kalimantan I	56	68	128-176
East Kalimantan II	60	72	127-175
<u>Malaysia</u>			
Peninsular Malaysia	102	n.a.	n.a.
Sabah (including housing)	102	n.a.	n.a.
	114	155	273
<u>Philippines</u>			
	47	68	100
<u>Singapore</u>			
<u>Japan</u>	634	1,062	n.a.

Source: Estimates based on information provided by industry sources. Conversion of local currency data into US dollars is based on official exchange rates.

ship their products overseas. However, the apparent variations in the cost of packaging, taken alone, perhaps are not important enough to have a decisive impact on the competitive advantage of the countries considered.

#### D. Post-Factory Costs for Plywood

##### 1. Post-Factory Costs up to FOB

4.25 In addition to the ex-factory costs for plywood including packaging costs, there are usually costs for transportation to ports, various charges at the ports, and possibly some taxes, before the goods are on board ocean-going vessels. The reliability of estimates given in Table 4.2 for these items is uncertain. They represent only broad orders of magnitudes. The costs for the hypothetical plant in East Kalimantan may be somewhat underestimated because a part of such costs seem to be already included under "general management," "other supplies" and "labor".

4.26 So far as the examples chosen are concerned, indicated differences in these costs taken alone do not seem to be important enough to make a critical difference in the determination of the competitive advantage of each location. Plants in Japan, of course, are presumed to enjoy some advantage in this respect over overseas suppliers.

##### 2. Ocean Transport Cost

4.27 Ocean freight and insurance costs account for 6-10% of the total delivered cost of plywood in Japan, depending on the source of supply (Table 4.3). This could be compared with the percent share of shipping costs in the FOB prices of logs, which ranges from 15-23% (as of early August 1980). An interesting and relevant question is, does the price structure of ocean transport encourage or discourage location of plywood production in the log-producing countries, other things being equal?

4.28 The freight-rate structure for log shipments from various log exporting points in Southeast Asia to Japan as of July-September 1980 is shown in Table 4.7. In addition, insurance costs of about 0.7% of the FOB value should be added to freight costs. Also, freight and insurance costs for shipping plywood from Sabah, East Kalimantan and the Philippines are shown in Table 4.2.

4.29 Taking Sabah as an example, comparative calculations can be made. As mentioned earlier, if 1.21m x 2.42m (so-called 4 x 8) plywood were made in Japan, the wood recovery rate would be, at best, 54%. This means that 1.85 m<sup>3</sup> of logs are needed to produce 1.0 m<sup>3</sup> of plywood of that size. The transport cost for 1.85 m<sup>3</sup> of logs is \$47.26. In contrast, the shipping cost for 1.0 m<sup>3</sup> of plywood is US\$26.00. Even if the packaging cost of \$9.00 is added, the total cost for shipping plywood would be only \$35.00 as opposed to the log transport cost of \$47.26. Clearly, for 4 x 8 plywood the transport-cost economics favor the location of plywood plants in Sabah

Table 4.7: FREIGHT COSTS FOR "SOUTH SEA LOGS" FROM SELECTED LOG-EXPORTING POINTS TO JAPAN - JULY-SEPTEMBER, 1980

From	Freight rate	Bunker surcharge	Total <sup>/a</sup>
	-----US\$ per m <sup>3</sup> -----		
Davao	26.60	1.10	27.70
East Kalimantan	29.10	1.10	30.20
Sabah	24.42	1.10	25.52
Sarawak	27.42	1.10	28.52
New Britain Island	31.60	1.10	32.70

<sup>/a</sup> In addition, there is a schedule of currency surcharges which may be positive or negative depending on whether the yen exchange rate against the US dollar is below or above 230-250 yen per dollar.

Source: Japan Lumber Journal, "Nanyogai Freight Agreement", June 30, 1980.

rather than in Japan. Since the wood recovery rate is better for 3 x 6 plywood, the cost saving gained by shipping it instead of logs would be less dramatic.

4.30 How do similar calculations work out for East Kalimantan? The cost of shipping 1.85 m<sup>3</sup> of logs from East Kalimantan to Japan works out to be US\$57.78; the shipping plus packaging costs for 1.0 m<sup>3</sup> of 4 x 8 plywood come to \$48.00. If "liner rates" are used, the plywood shipping cost would be \$10-\$15 higher. On the other hand, if many plants are located near the same exporting point and thus the volume of traffic is increased and the port conditions improved, then the transfer freight cost for plywood can be reduced by \$5-7. Thus, although it cannot be said that under the current conditions there would be a great deal of "cost saving" by shipping plywood instead of the equivalent volume of logs, it is significant that, at least at the margin, transport-cost economics seem to favor locating plywood plants in East Kalimantan rather than in Japan.

4.31 It could be argued that the wood wastes and residues contained in logs have a greater economic value in Japan than in log-producing areas and that the above calculations are misleading. However, since wood residues produced at plants in the log-exporting countries are now economically used as fuelwood at these plants, the relevance of the argument is less important today than a few years ago.

### 3. The Cost of Import Duties in Importing Countries

4.32 As can be seen from Table 4.3, the Japanese import duty of 20% on the CIF value amounts to 17.3-19.7% of the total "cost" of plywood delivered to Japan from the five locations in Southeast Asia. Also, as discussed earlier, this tariff, which is not lessened by GSP as Japan's system of preferences does not include tropical hardwood plywood, represents a rate of over 60% of effective protection. Obviously, this is one of the key factors for the continued survival of the plain plywood production sector in Japan.

## V. THE BENEFITS OF INCREASED PROCESSING IN LOG-EXPORTING COUNTRIES

5.01 Local processing of primary commodities that are now being exported in raw form is considered desirable on the grounds of various macroeconomic benefits for the countries producing the primary products. In the context of mechanical wood processing, these benefits can be discussed under four headings: (a) creation of value added, (b) increased foreign exchange earnings, (c) employment effects and (d) regional development effects.

A. Value Added and Linkage Effects

5.02 Some indications of the gross value added to log material by processing in Indonesia, Malaysia and the Philippines are given in Table 5.1, which shows the estimated "log equivalent" unit values for sawnwood, plywood and veneer exports in 1977 and 1978. The gross value added to logs is indicated by the differences between the FOB export unit values for logs and the "log equivalent" FOB unit values for processed products. It is found that the value added as defined in this manner is equivalent to 23-65% of the log export unit value for sawnwood and 26-150% for plywood, but is negligible for veneer sheets.

5.03 There are several problems in such an approach. On the one hand, log export prices contain substantial elements of resource rents which are collected by the governments in the form of log export taxes (including taxes labelled otherwise) that are not collected on logs processed locally. This can be considered as a form of subsidy to local processing activities. To the extent that the export unit values of logs reflect such charges, the above approach underestimates the "value added to log material" by that amount. Furthermore, the approach ignores "leakages" in value added to other industries (domestic and foreign) that provide non-log materials to the processing industry. On the other hand, the approach ignores "foreign leakages", which are purchases of foreign inputs used in local processing activities that should not be a part of the value added locally.

5.04 In order to estimate the true gross value added in plywood production the cost data for the hypothetical plywood project in East Kalimantan as provided in Table 4.2 have been used. Details of the calculations are shown in Table 5.2. First, the itemized cost data in US dollars per cubic meter of plywood are converted to data in terms of US dollars per cubic meter of log input. Against a log cost of \$80 per m<sup>3</sup>, the gross value added is \$90.12 per m<sup>3</sup> of log inputs. In order to attain the amount of gross value added in a standard sense, the costs of inputs provided by other industries, including logs, are deducted from the total price, which works out to be \$61.63 per m<sup>3</sup> of roundwood. Now, even if the ownership of such an enterprise happens to be 100% local, there is some foreign "leakage", because (a) usually, at least, machinery and equipment are imported, and (b) some funds are provided by foreigners who would collect interest on these funds. So, domestic gross value added works out to be about \$50 per m<sup>3</sup> of roundwood.<sup>1/</sup>

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<sup>1/</sup> If plywood production is undertaken on a joint venture basis with 50% foreign capital and management participation, gross value added excluding "foreign leakages" would be about \$40-42 per m<sup>3</sup> of roundwood (Table 5.2).

Table 5.1: THE ESTIMATED GROSS VALUE ADDED TO LOG MATERIAL BY PROCESSING IN SELECTED COUNTRIES IN ASIA, 1977 AND 1978

(US\$ per m<sup>3</sup> of logs and as % of log unit value),

Country and Product	1977		1978	
	\$/m <sup>3</sup> (r)	Percent	\$/m <sup>3</sup> (r)	Percent
<u>Indonesia</u>				
Sawnwood	(-) 0.5	(-) 1.0	15.9	34.3
Plywood	124.6	82.6	NA	NA
Veneer sheets	NA	NA	NA	NA
<u>Malaysia</u>				
Sawnwood	25.3	65.5	25.6	59.5
Plywood	58.4	151.3	60.3	140.2
Veneer sheets	(-) 8.6	(-) 22.3	(-) 17.3	(-) 40.2
<u>Philippines</u>				
Sawnwood	15.2	23.2	16.0	24.3
Plywood	17.0	26.0	28.6	43.5
Veneer sheets	3.3	5.0	2.7	4.1

Source: Table 2.10.

**Table 5.2: DERIVATION OF VALUE ADDED IN PLYWOOD PRODUCTION:  
A HYPOTHETICAL CASE IN EAST KALIMANTAN**

	Per Unit Cost		Total	Gross Value Added				Backward Linkage Effect	
	Cost per m3 of plywood/a	Cost per m3 of logs		100% Domestic ownership/a		50% Domestic ownership/b		Domestic	Foreign
				Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
Depreciation	24	12.65	12.65	3.80	8.86	3.80	8.86		
Interests	14	7.38	7.38	4.80	2.58	3.69	3.69		
General management	19	10.01	10.01	10.01	0.0	7.00	3.01		
Logs	152	80.10	-	-	-	-	-	(152)	
Glue	28	14.76	-	-	-	-	-	14.76	
Other supplies	22	1.59	-	-	-	-	-	9.27	2.32
Labor	24	12.65	12.65	12.65	0.0	12.65	0.0		
Packaging (including labor)	5	2.64	0.50	0.50	0.0	0.50	0.0	2.14	
Cost from ex-factory to FOB	6	3.16	3.16	3.16	0.0	3.16	0.0		
Profits	29	15.28	15.28	15.28	0.0	10.70	4.58		
<b>Total</b>	<b>323</b>	<b>170.22</b>	<b>61.63</b>	<b>50.20</b>	<b>11.43</b>	<b>41.50</b>	<b>20.14</b>	<b>26.17</b>	<b>2.32</b>

/a Assumes 70% of depreciation represents imported machinery; 65% of financing is domestic; all management staff is Indonesian.

/b Assumes 70% of depreciation represents imported machinery; 50% of financing is foreign; 30% of management is foreign; corporate profit tax of 40%; 50% of after-tax profits goes to foreign owners.

Source: Table 4.2

5.05 Currently, Indonesia, Malaysia and the Philippines together export about 36.7 million m<sup>3</sup> of logs (estimate for 1979). If hypothetically one-half of this volume were exported in the form of plywood, it could mean \$1.1 billion of gross value added, or some \$0.9 billion of gross value added excluding "foreign leakages." Some data on the percent share of value added in gross output in wood-processing sectors are presented in Statistical Appendix Table SA27.

5.06 Since the plywood factory in this hypothetical situation would purchase supplies (apart from logs) from other industries, these purchases would represent partly the value added of other industries. It is estimated that such purchases would amount to about \$26 per m<sup>3</sup> of roundwood from domestic suppliers and \$2-3 per m<sup>3</sup> (roundwood) from foreign suppliers (Table 5.2). The purchases from domestic suppliers may be considered to represent backward linkage effects.

5.07 Although a detailed analysis of value added in the sawmilling industry has not been made, a guesstimate of value added per m<sup>3</sup> of logs in sawmilling is \$15-\$25.

#### B. Foreign Exchange Earnings

5.08 Referring again to the Indonesian case analyzed in Table 4.2, the FOB price of plywood is US\$170 per m<sup>3</sup> in roundwood equivalent compared with the log price of \$80 per m<sup>3</sup>, which implies an additional value of \$90 per m<sup>3</sup> for roundwood equivalent. If the price of logs happened to be equal to the FOB price of export logs, then the extra value of \$90 per m<sup>3</sup> (r) would represent the possible increase in gross foreign exchange earnings, from which the foreign exchange cost representing the "foreign leakage" associated with plywood production should be deducted in order to attain net increase in foreign exchange revenue per m<sup>3</sup> of logs.

5.09 In reality, however, the calculation is not so simple because various "resource rent taxes" are imposed on export logs but not on locally processed logs in Indonesia, Malaysia and the Philippines. Differentials between taxes on export logs and locally processed logs differ in magnitude among various supplying areas such as the State of Sabah, the State of Sarawak, Indonesia and the Philippines. In Indonesia, as an example, various current governmental charges on each cubic meter of meranti logs exported amount to about US\$50. Most of these are not charged on locally processed logs. As a result, there is a price spread of \$50 or more between the FOB export prices of logs and the prices of logs sold locally.<sup>1/</sup> Therefore, on the one hand, it seems that, until this kind of "subsidy" is no longer

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<sup>1/</sup> This differential tax component (which may be considered resource rent) represents a form of subsidy that the Indonesian government is offering to the local processing industry as an incentive.

needed to promote local wood processing, additional net foreign exchange earnings resulting from local processing will be substantially less than the value added calculations shown in Table 5.2 indicate. On the other hand, it might be viewed that, because of the resource-rent-seeking policies and consequent log export restrictions, FOB prices of logs have been raised rather steeply, and, therefore these policies adopted to encourage local processing have had the welcome (from the viewpoint of the log-exporting countries) effect of raising FOB prices of logs.

5.10 Using the export unit value in 1978, some crude calculations of possible extra gross export earnings resulting from complete substitution of log exports by sawnwood and plywood exports for Malaysia, Indonesia, the Philippines and Papua New Guinea have been made; the results are shown in Table 5.3. These calculations indicate that, if all the logs had been processed in these countries, the gross export earnings based on these logs would have been 73% higher; that is, the hypothetical export earnings from these logs would have been over US\$3 billion in 1978 instead of the actual \$1.8 billion. For these calculations, two simplistic assumptions were made: (a) that two-thirds of these logs would have been processed into plain plywood and exported, with the remaining one-third made into sawnwood and exported; and (b) that these processed products would have been exported at the average prices actually received for these countries' plywood and sawnwood exports in 1978.<sup>1/</sup>

5.11 Admittedly, the above calculations exaggerate the potential benefit in terms of extra foreign exchange revenues to be earned. Even if the two key assumptions made were accepted as broadly realistic, machinery and other essential input needed to expand production of sawnwood and plywood would have had to be imported. The foreign exchange costs incurred by importing these "inputs" would certainly represent substantial "leakages," reducing the net effect on the balance of trade.

### C. Employment Effect

5.12 Estimates of direct employment effects of plywood production are given for selected locations in Table 5.4. The rather divergent estimates reflect partly the divergent assumptions made about the operations and sizes of the mills involved. Broadly speaking, it seems that the employment per annual production of 1,000 m<sup>3</sup> of plywood ranges from about 4 to 14 persons including managerial staff.

5.13 As for sawmilling, industry sources estimate that about 3.2-6.0 persons per 1,000 m<sup>3</sup> of annual production of sawnwood are required under current conditions in Indonesia, Sabah and the Philippines.

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<sup>1/</sup> Except in the case of plywood in Indonesia and Papua New Guinea.

**Table 5.3: ESTIMATES OF EXTRA EXPORT EARNINGS (GROSS) FROM HYPOTHETICAL COMPLETE SUBSTITUTION OF PLYWOOD AND SAWWOOD FOR LOG EXPORTS, MAJOR ASIA-PACIFIC COUNTRIES, 1978**

Country	Actual Log Exports	Exports/a		FOB Export Unit Value/b			Actual Value of Log Exports	Hypothetical Earnings/c			Hypothetical Extra Export Earnings (Gross)/d
		Plywood	Sawnwood	Logs	Plywood	Sawnwood		Plywood	Sawnwood	Total	
	1,000 m <sup>3</sup> (r)	-----1,000 m <sup>3</sup> -----		-----US\$/m <sup>3</sup> -----				-----millions of US dollars-----			
Malaysia	16,713	4,870	3,030	43.0	206.5	124.6	719.4	1,005.7	377.5	1,383.2	663.8
Indonesia	19,200	5,590	3,480	46.4	190.0	113.3	890.4	1,062.2	394.2	1,456.4	566.0
Philippines	2,200	640	400	65.9	188.8	148.7	144.9	120.8	59.5	180.3	35.4
Papua New Guinea	445	130	80	35.7	190.0	137.5	15.9	24.7	11.0	35.7	19.8
<b>Total</b>	<b>38,558</b>	<b>11,230</b>	<b>6,990</b>				<b>1,770.6</b>	<b>2,213.4</b>	<b>642.2</b>	<b>3,055.6</b>	<b>1,285.0</b>

/a Based on an arbitrary assumption that two thirds of logs would be converted to plywood at the ratio of 2.3 to 1, while the remaining one third would be converted to sawwood at the ratio of 1.82 to 1.

/b Based on actual exports of logs, plywood and sawwood as reported in *FAO Yearbook of Forest Products*, except for plywood in Indonesia and Papua New Guinea, which as calculated from the *FAO Yearbook* data work out to be much too high - 430 for Indonesia and 500 for Papua New Guinea so that an arbitrary estimate of 190 is substituted for both countries.

/c FOB export unit values times hypothetical export volume estimates.

/d Hypothetical total export earnings minus actual log export values.

Source: *FAO, Yearbook of Forest Products, 1978*; and author's estimates.

Table 5.4: EMPLOYMENT EFFECT OF PLYWOOD  
PRODUCTION IN SELECTED COUNTRIES

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Labor Requirements/a: Number of Persons  
per 1,000m<sup>3</sup> of Annual Capacity of Plywood

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Indonesia (E. Kalimantan, 1980)	10.9
Sabah/Sarawak (1980)	7.2-11.1
Peninsular Malaysia (1979)	3.6-5.2
Japan (1979)	3.9
Africa (1976)	6.2

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/a Includes administration staff.

Source: Indonesia and Sabah/Sarawak - industry sources; Peninsular Malaysia - Michael Roemer, Report on Industrial Strategy Studies; Japan - Plywood Information Center of Japan Federation of Plywood Manufacturers' Association, Newsletter, No. 45; Africa - A. Doffine, "FAO Portfolio of Small Scale Wood-Based Panel Plant-Plywood."

5.14 Estimates of the direct effects of the hypothetical substitution of exports of sawnwood and plywood for logs (referred to in the preceding section) on the local employment of the four log-exporting countries (Malaysia, Indonesia, the Philippines and Papua New Guinea) can be made on the basis of rule-of-thumb labor requirements associated with typical plymilling and sawmilling operations in this region. Such calculations suggest extra employment for the four countries as a whole of 100,000 to 120,000 workers in plywood and 50,000 to 60,000 workers in sawnwood. It should be emphasized, however, that these figures are hypothetical and only represent the possible effects of a hypothetical complete substitution of processed products for log exports. On the other hand, it should also be pointed out that the estimates refer only to direct employment and that there would be additional employment generated through linkage effects.

#### D. Regional Development Effects

5.15 In view of the deliberate policies in the Philippines, Sabah and Indonesia to "subsidize" local log processing at the expense of foreign exchange earnings from log exports and resource rents on logs, the net benefits of local processing on value added and foreign exchange earnings are not likely to be as large as they could be if such "subsidization" is maintained for long. It is also true that the possible direct employment effects of increased local processing of logs in the major exporting countries in the Asia-Pacific region would look rather modest in the context of total population and total labor force in these countries.

5.16 The establishment of processing facilities, however, is likely to be concentrated in the remote areas of these countries because of the location of forest resources. This means that sawmilling and plymilling activities could have a significant impact on employment and industrialization in these remote areas (Kalimantan, Sumatra, Mindanao, Sabah, Sarawak, etc.). Currently, the governments of the log-exporting states seem to attach high political value to the development of such remote regions. Given the scarcity of other opportunities to develop industrial activities in these areas, timber processing seems to be an ideal way to achieve the politically desirable objective.

## VI. POLICY ISSUES AND PROSPECTS

6.01 In considering policy options for tropical hardwood producing countries in the Asia-Pacific region, there are five important features of tropical hardwood resources that must be taken into account. In summary these are:

- (i) The heterogeneity of the current stands, which contain hundreds of species of which only a fraction is currently utilized commercially (see Annex A);

- (ii) The semi-nonrenewable nature of the resources (see Annex A);
- (iii) The strong long-term growth prospects for demand (see Chapter II, Section D, Sub-section 4);
- (iv) The fact that the resources are in the "remote" least developed areas of the countries concerned (Mindanao, Sabah, Sarawak, Kalimantan, Sumatra, West Irian, Papua New Guinea, etc.); and
- (v) Most importantly, the fact that the resources are in state-owned forests.

Furthermore, there are two important features of mechanical wood processing that also deserve to be highlighted in this context, namely,

- (i) that it is a relatively unskilled-labor-intensive activity; and
- (ii) that it is a typically weight-reducing activity, and, in the long run, a transport-cost-saving activity.

6.02 Now, the ultimate policy question for the producing countries is how to utilize their forest resources to the best advantage of these countries. In terms of current policy, the major tropical hardwood-producing areas in the Asia-Pacific region are broadly divided into two groups: (a) states attempting to reduce log exports (the Philippines, Peninsular Malaysia, Sabah and Indonesia) and (b) states with liberal log-export policies (Sarawak, Papua New Guinea, other Pacific islands). The policies of the Philippines, Peninsular Malaysia, Sabah and Indonesia have recently been to apply quantitative restrictions on log exports, to increase government charges per unit of logs exported, and to promote local processing of logs. Their objectives are (a) to conserve the semi-nonrenewable resources, (b) to collect maximum resource rent, and (c) to secure benefits from increased local processing of logs. Increased exports of processed products would presumably result in higher export earnings, higher value added, higher employment and regional development of remote least developed areas. The radical policy measures taken in these areas seem to be making a significant impact on the market, bringing about the desired restructuring of tropical hardwood trade in the Asia-Pacific region. In contrast, the policies of the State of Sarawak in Malaysia, Papua New Guinea and other Pacific island countries have been to encourage log exports. As a result, these areas have experienced rising log exports and foreign exchange earnings, but at the same time only a slow growth in processing and low government revenues from forest utilization.

6.03 It is clear that, in this context, a distinction must be made between two objectives: (a) the objective of deriving various benefits from

local processing such as additional value added, additional foreign exchange revenues, increased employment and regional development, and (b) the objective of deriving maximum resource rent from the semi-nonrenewable resources, taking into account the temporal dimension. The latter objective requires careful consideration of the projected long-term increases in tropical hardwood log prices in real terms and the fact that standing trees grow over time.

6.04 In Peninsular Malaysia and the Philippines, the appropriate policy direction to take is clear. There forest resources have been exploited for more than three decades and the remaining forest resources are severely limited. Wood processing industries are well-established. The appropriate policy prescription would be to phase out log exports completely and to take measures to improve the cost competitiveness of the processing industries. All this is being implemented already. In the light of the historical experience of the plywood industry in Japan, the Republic of Korea, the Province of Taiwan and Singapore, the wood-processing industries in Peninsular Malaysia and the Philippines can be strengthened if the governments adopt more decisively aggressive, outward-oriented industrial policies.

6.05 In the case of Papua New Guinea, the liberal log export policy seems to be the clearly superior policy at this juncture. The timber resources of Papua New Guinea are commercially less attractive than those of the Philippines, Malaysia and Indonesia (excluding West Irian) because of the low incidence of commercially attractive species, the difficult terrain, the long distances from the main markets, etc. At present, therefore, it is more urgent to develop a market for that country's species.

6.06 In Sabah and Indonesia, which are currently the most important log-exporting areas, have more policy options than Peninsular Malaysia and the Philippines or Papua New Guinea. The forests in Sabah and Indonesia have the highest incidence of commercially attractive species per unit area.<sup>1/</sup> This means that the extraction cost per cubic meter of logs is lower than in Sarawak or Papua New Guinea. However, attracting the necessary labor force to Sabah or the Indonesian outer islands is a problem. Creating the infrastructure required for the large scale growth of processing industries in these areas would be a heavy financial burden. Until sufficiently large exports of processed products are built up, transport cost economics works against such processing industries. Furthermore, the substantial resource rent that could be collected from log exports would have to be foregone during the period of establishment of export-oriented processing industries which is likely to take several years, or possibly even a decade.

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<sup>1/</sup> This statement does not apply to the West Irian area of Indonesia.

6.07 However, Sabah and Indonesia may consider it politically desirable to develop some kind of industries in the "remote" regions for the sake of regional development. Given the objective, timber processing seems to provide the best chance of success. Indeed, timber processing along with agriculture could be used as the core of a regional development strategy. Since it is reasonably clear that the basic economics favors local processing in Sabah and Indonesia in the long run, strong protection of the infant export industry may be justified in the light of the Korean and Taiwanese experiences.<sup>1/</sup>

6.08 In order to facilitate the rapid growth of mechanical wood processing industries, the governments of Malaysia and Indonesia should adopt overall export promotion strategies similar to the Republic of Korea's and, more specifically, should take steps to

- (a) Minimize the use of price ceilings and other interventions in the domestic market which have negatively affected the spontaneous growth of wood processing industries;
- (b) Improve the efficiency of domestic transport (especially shipping) and port facilities; and
- (c) Develop a few wood product terminals at strategic locations in order to allow smooth and efficient shipments of locally processed wood products to world markets.

At the same time, the industries in these countries should improve quality control, which is critical to a successful export business. Joint ventures with experienced foreign companies can be effective in ensuring an internationally acceptable quality of products and in securing market access and they should be encouraged at this stage of development.<sup>2/</sup>

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<sup>1/</sup> See Larry Westphal, Empirical Justification for Infant Industry Protection.

<sup>2/</sup> Joint ventures with foreign companies do not necessarily guarantee a faster mastery of technology (see Larry E. Westphal, et al. Korean Industrial Competence: Where It Came From). On the other hand, joint ventures can offer vast opportunities (see Benjamin F. Sanvictores, A Study on the Possibilities of Establishing Trade-Creating Joint Ventures in Wood and Wood Based Products).

6.09 As for Sarawak, it seems that higher resource rents on log exports could be collected. The forests in Sarawak are not as commercially attractive as those in Sabah or in the major forest areas of Indonesia, but in species incidence and location they are superior to those Papua New Guinea. Sarawak may be foregoing not only resource rent on logs but also the benefits of local processing.

6.10 One of the issues in plywood trade is the import duties in industrialized countries, especially the escalated nature of the duties. While the EC offers preferential duty-free access to developing countries under the Lomé Convention and the Generalized System of Preferences, other major industrialized countries (Japan, the United States, Canada, etc.,) do not give any preferential access for tropical hardwood plywood. Furthermore, even the EC's preferential duty free imports from developing countries are subject to quota ceilings, although the quotas have been steadily increased over time. Because of tariff escalation, the effective rates of protection have been very high on tropical hardwood plywood. This has distorted the pattern of trade in tropical hardwood products.

6.11 One reaction of industrialized countries to the recent changes in the log export policies of major log-producing countries has been to reduce import barriers on veneers and sawnwood, either on the Most Favored Nation basis or on a preferential basis. This is, of course, a welcome trend. However, since the basic economics seem to indicate that log-producing labor-abundant countries have the competitive advantage in exporting plain plywood, which has been found to be a relatively unskilled-labor-intensive and transport-cost-saving activity, industrialized countries should, ideally speaking, reduce/eliminate import barriers on tropical hardwood plywood. Until that happens, the second best solution in terms of maximizing world economic efficiency is for log-exporting countries to offset the distortion by subsidizing the plywood industry e.g. through the two-tier pricing of logs based on government charges which are higher on export logs than on logs processed locally.

6.12 Plywood manufacturing should be the core of the development strategy for mechanical wood processing industries. Development of the plywood industry would automatically promote sawmilling and production of other wood-based panels (particleboard, etc.) because these activities compliment plywood manufacturing through improving the efficiency of raw material usage.<sup>1/</sup> The key to a successful export-oriented sawmilling industry is superior marketing. The key to a successful wood-based panel industry is a market large enough to justify operating near full capacity because the panel industry is the most capital intensive of all the mechanical wood-processing activities.

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<sup>1/</sup> Logs unfit for plywood making can be sent to a sawmill nearby; wastes and residues from plymilling and sawmilling can be used for making particleboards, if other conditions justify the economics.

MECHANICAL PROCESSING OF TROPICAL HARDWOOD IN DEVELOPING COUNTRIES

Technical Characteristics of Tropical Hardwood Resources

Tropical hardwood comes from the moist forests in tropical regions. There are three regions where such forests are concentrated:<sup>1/</sup>

- (i) West and Central Africa (mainly Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Gabon, Congo, and Central African Republic; also Zaire, Rio Muni and Equatorial Guinea).
- (ii) Southeast Asia and Tropical Oceania (mainly the Philippines, Malaysia, Indonesia, Thailand, Burma, Papua New Guinea, and the Solomon Islands; also Cambodia, Laos and Vietnam).
- (iii) Tropical Latin America and the Caribbean (mainly the Amazon region of Brazil, but also scattered throughout tropical Central and South America as well as the Caribbean Islands).

While the tropical hardwood species of these moist tropical forests are, theoretically, renewable resources, how long it takes for them to grow into sizes suitable for sawlogs and veneerlogs is not clear. Professional foresters estimate that it takes from a minimum of 40 years to over 100 years but very little is known about the natural re-generation of these commercial species. Large concession forests are "managed" on a 25-35 year cycle basis. It is assumed that in 25-35 years after the first "creaming" of the forest some of the trees that were too small to be removed as sawlogs or veneerlogs will have grown large enough to cut. Presumably in another 25-35 years more trees will be ready to be cut and so on. However, this is not much more than an assumption. In any case, it is quite likely that by the time of the third round of cutting, the species being cut might be quite different from the species in the first round.

Plantation growing of preferred species has been successful for a few species in limited locations. Under plantation conditions, some "white wood" species in West and Central Africa have been grown to a size of 50cm diameter at breast height in 20-30 years, while teak has been grown to a harvestable size in Burma and Indonesia in 40 years. However, at this juncture, it might well be considered that tropical hardwood in general is semi-nonrenewable and that exploitation of commercially preferred species is similar to mining.

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<sup>1/</sup> Annex 1 Table 1 shows the estimated area of natural tropical hardwood forests existing in three tropical regions as of the end of 1975. Annex 1 Figure 1 shows the world's main vegetation zones.

Tropical hardwood consists of a vast number of species with an enormous range of physical properties. This has influenced the marketing and end-uses of tropical hardwood. The total number of tropical wood species is unknown. The majority of the species are indeed shrubs or small trees not usually included in the commercial definition of tropical timber or tropical hardwood. Recent FAO studies indicate that there are about 950 "commercial species" and 840 "lesser-used" species in the tropical forests of West and Central Africa, Southeast Asia and South America.

Although hundreds of species are classified as commercial and additional hundreds as potentially commercial "lesser-used" species, at present only 40 or 50 species are involved in international trade.<sup>1/</sup> It is not likely that, even by the year 2000, the number of major internationally traded species will exceed 100, unless massive attempts are made by the industries and governments concerned to promote the use of other species.

Physical properties differ greatly among tropical hardwood species. For example, compared with temperate hardwood, tropical hardwood shows a wider range of density, the property generally considered as the best criterion of strength. The durability of certain species also varies so that some are liable to rapid deterioration while others are considered indefinitely durable. Furthermore, mechanical characteristics differ from one group of species to another: some are easy to saw, peel or slice, while others are difficult. In addition, tropical hardwood species are diverse in dimensional stability, color and decorative quality of grains.<sup>2/</sup>

Because of the diversity in physical characteristics, tropical hardwood is marketed in terms of species as well as quality and grade. In marketing, species identification is more important in hardwood than in softwood. It is even more so in tropical hardwood than in temperate hardwood.

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<sup>1/</sup> All those species produced at the rate of at least 1,000 m<sup>3</sup> per year are called "commercial" species and all other species are called "lesser-used". Information has been taken from: UNCTAD, Research and Information on Use Properties of Tropical Wood Species, UNCTAD, Consideration of International Measures Relative to Research and Development on Tropical Timber, p. 8. Also see: T. Erfurth and H. Rusche, The Marketing of Tropical Wood: (A) Wood species from African Tropical Moist Forests; (B) Wood Species from South American Tropical Moist Forests; (C) Wood Species from East Asian Tropical Moist Forests.

<sup>2/</sup> UNCTAD, Consideration of International Measures Relative to Research and Development on Tropical Timber, p. 9.

Table 1: NATURAL TROPICAL HARDWOOD FORESTS, 1975

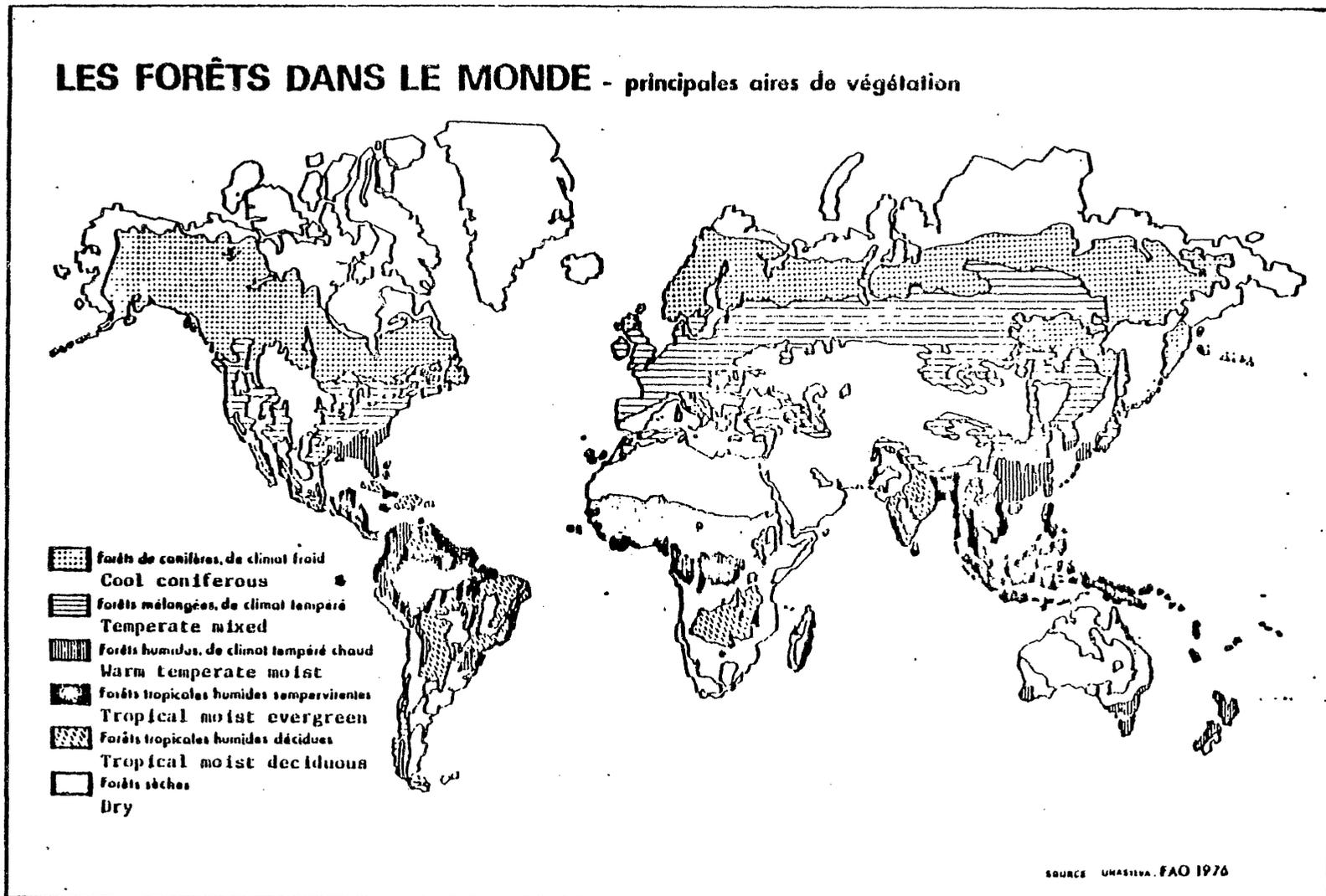
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Region	Productive and Inoperable	Productive Forests Only (closed and open)
Tropical America	789	634
Tropical Africa	645	466
Tropical Asia-Pacific	<u>327</u>	<u>215</u>
Total	<u>1,761</u>	<u>1,315</u>

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Source: J.P. Lanly and J. Clement, Present and Future Forest and Plantation Areas in the Tropics, Table 2.2a.

ANNEX A Figure 1: THE WORLD'S FOREST - MAIN VEGETATION ZONES



Reproduced from: Louis Huguet, "Une Politique Forestière Etrangère Pour la France,"  
Bois et Forêts des Tropiques, no. 191 (Mai-Juin 1980), pp. 7-8.

MECHANICAL PROCESSING OF TROPICAL HARDWOOD IN DEVELOPING COUNTRIES

Identification of Processing Chains

The processing chain for tropical hardwood logs is illustrated in Annex B Figure 1. The first step is the removal of logs from the forests (logging, exploitation, cutting). The logs removed from the forests contain sawlogs, veneer logs and logs for sleepers. Sawlogs and logs for sleepers will go through sawmills and the processed products are sawnwood and sleepers. Sleepers are then ready to be used as railroad ties without further processing. Sawnwood is in a variety of shapes--e.g., boards, squared wood--and usually kiln-dried. Sawnwood then can be used directly in construction or can be sent to molding plants, where various moldings for joinery in building construction or for furniture making are produced. The stages beyond sawmilling are sometimes called "secondary woodworking industries."

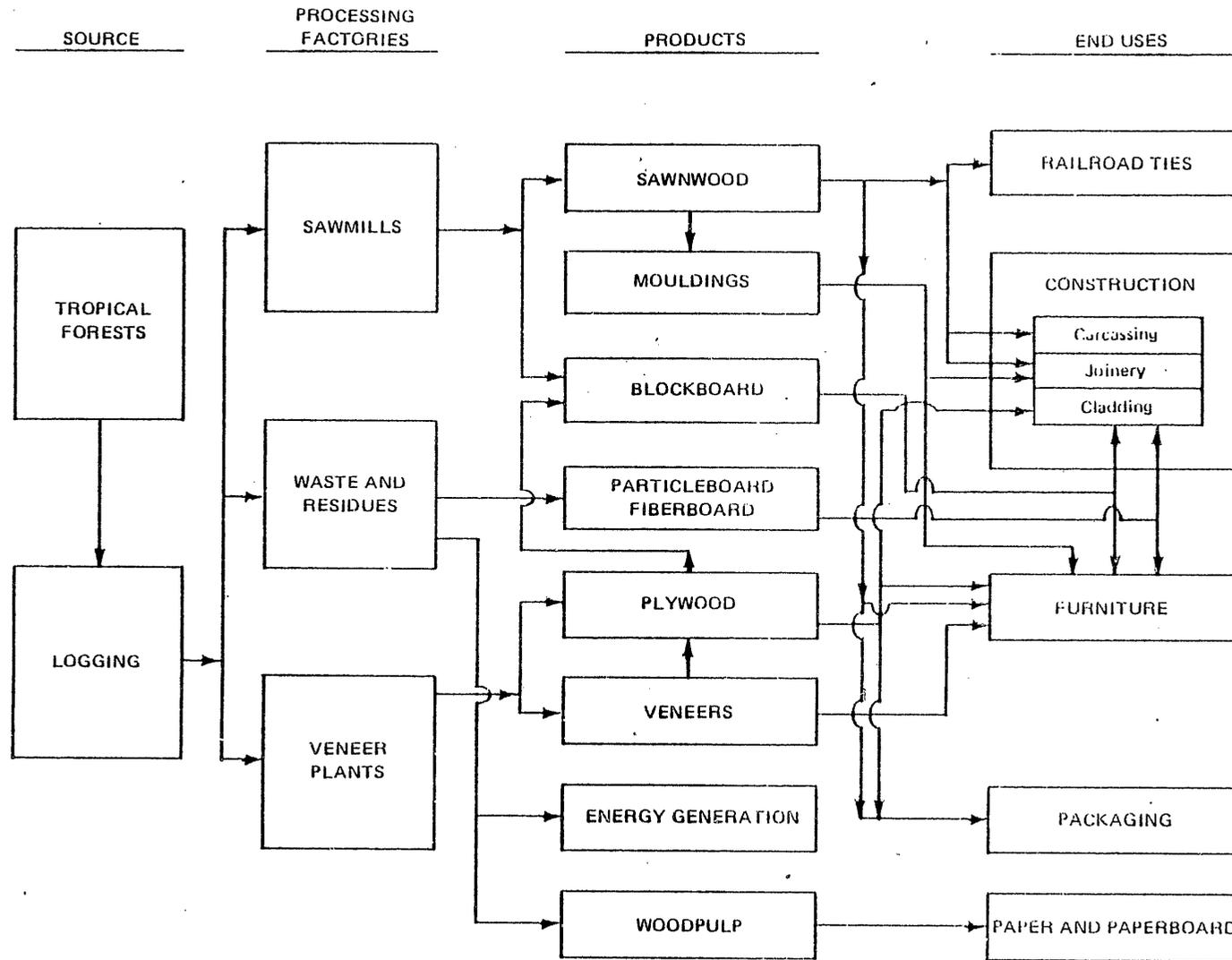
Logs suitable for peeling or slicing go into veneer plants which produce veneer sheets. Some veneer sheets are used for plywood and blockboard<sup>1/</sup> and others are used directly as veneers in furniture making or as cladding in construction. Plywood is used with or without further processing in furniture making and in cladding for construction and packaging.

Logging, sawing and veneer-making activities all produce residues and wastes, a good part of which are used in making particleboard, and pulp. Particleboard in turn is used primarily in making furniture and cladding for buildings. Residues are also used for making fiberboard.

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<sup>1/</sup> Blockboard is a form of plywood in which core layers are blocks of wood instead of veneers.

ANNEX B Figure 1: PROCESSING OF TROPICAL HARDWOOD LOGS



MECHANICAL PROCESSING OF TROPICAL HARDWOOD IN DEVELOPING COUNTRIES

Uses of Tropical Hardwood Products

Tropical hardwood is used in a variety of products, many of which compete with temperate hardwood products and, some of which compete, with softwood products. Furthermore, one tropical hardwood product often competes with another tropical hardwood product, e.g., plywood substitutes for sawnwood and particleboard substitutes for plywood. Finally, tropical hardwood products also compete with non-wood products.

While there are some products that can be made of either softwood or hardwood, are generally used for different purposes, although their uses vary somewhat from country to country. Generally speaking, softwood is used for structural components, pulp and paper and hardwood is used in making furniture and joinery for construction. Hardwood is used also for pulp and paper. While tropical hardwood has its own unique end uses, it is usually put to the same end-uses as temperate hardwood and therefore is often a substitute for temperate hardwood.

The residues created in the process of making sawnwood, sleepers, veneer sheets, blockboard and plywood are often used for making particleboard. Particleboard is in turn used (in some cases, after further processing) in construction, furniture making and packaging.

An analysis of the end uses of tropical hardwood encounters a number of problems. Information on end uses is fragmentary; it is available only for some countries or for certain years, and the coverage of available data is often partial (only for either sawnwood or plywood but not for both). The utilization sectors are structurally fragmented, with a large number of small firms often excluded in statistical returns.

The final products of the wood-using industry are diverse, ranging from household goods, art objects, games, toys and musical instruments, to joinery and structural products for building, furniture, etc. The diversity of wood products is reflected in the fragmentary structure of the industry producing them.

The overall end-use pattern of sawnwood and wood-based panels in Europe is shown for 1969-71 in Annex C Table 1. Sawn hardwood in this table include both temperate and tropical hardwood, and wood-based panels include not only hardwood but also softwood. The corresponding pattern for the United States in 1962 and 1976 is shown in Annex C Table 2. Annex C Table 3

illustrates the major uses of forest products within the building sector in Europe. None of these tables gives clearcut indications of end uses of tropical hardwood, but, it is likely that most of the end uses (especially joinery items) involve processed products of tropical hardwood, except in the cases that are clearly marked for softwood. Most wooden furniture is made of hardwood.<sup>1/</sup>

Some species are considered much more valuable than others for decorative uses such as furniture making, wall panelling, flooring, etc. Thus, among the West African species, apart from the prized ebony, about a dozen species are especially preferred for their decorative characteristics, i.e., acajou, apelli, tiama, makore, mansonia, iroko, framire, dibeton, kosipo, niangon, kokrodua, etc. In Latin America, jacaranda, mahogany, virola, caoba, cedro and andiroba are examples of species preferred whenever attractive and durable wood is desired.<sup>2/</sup> In Asia, rosewood and teak are the classic examples of decorative quality timber. Some species are preferred for certain non-decorative purposes. For example, balsa, which grows all over tropical America and has a very low density and a low thermal conductivity, is used for, among other things, aeroplane manufacture and for cores in sandwich construction. In contrast, lignum vitae and greenheart have very high densities (1.05-1.32) and are suitable for marine construction and wherever extra hardness is required (propeller-shaft bearings, pulleys, rollers, furniture casters, etc.).

Changing fashions affect demand in tropical hardwood. This is especially true in the "high quality" segment of the trade in which demand for certain species fluctuates with changes in fashions.

Furthermore, the nature of the demand for high-quality veneer logs entails a wide variation in price which reflects not only the choice of specific species but also the differences in log quality and color among species from the same area. The best example of this is seen in the teak trade, but even in the case of okoume from Gabon, the price paid for the most superior quality logs is sometimes as much as three times that paid for the lowest quality.

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<sup>1/</sup> For more details on consumption in Europe and the United States, see ECE/FAO, "Study on the Trade and Utilization of Tropical Hardwoods," Chapter 5; and Russell C. Stadelman, The United States Market for Tropical Hardwoods.

<sup>2/</sup> T. Erfurth and H. Rusche, The Marketing of Tropical Wood: Wood Species from African Tropical Moist Forests, and The Marketing of Tropical Wood: Wood Species from South American Tropical Moist Forests.

Table 1: EUROPE: ESTIMATED CONSUMPTION OF SAWWOOD, WOOD-BASED PANELS AND VENEER SHEETS BY MAJOR END-USES SECTORS, 1969-71 (AVERAGE)

	Total Apparent Consumption	of which:			
		Construction	Furniture	Packaging	Other
	----- (million m <sup>3</sup> ) -----				
<u>Sawnwood</u> /a	91.1	54.2	5.9	15.0	16.0
of which:					
Sawn softwood	71.8	48.8	1.9	9.0	12.1
Sawn hardwood	19.3	5.4	4.0	6.0	3.9
<u>Wood-based panels</u>	21.6	10.5	8.0	-	-
of which:					
Plywood	4.8	2.4	1.7	0.2	0.5
Particleboard	12.6	5.4	5.6	-	1.6
Fiberboard	4.2	2.7	0.7	-	0.8
<u>Veneer sheets</u>	1.4	0.2	1.0	0.1	0.1

/a Excluding sleepers.

Source: ECE/FAO, "Study on the Trade and Utilization of Tropical Hardwoods," Supplement 10 to Vol. XXX of the Timber Bulletin for Europe, July 1978.

Table 2: UNITED STATES: ESTIMATED CONSUMPTION OF  
SAWNWOOD AND PLYWOOD, 1962, 1970 AND 1976

	Sawnwood			Plywood /a		
	1962	1970	1976	1962	1970	1976
-----million m <sup>3</sup> (product measure)-----						
New Housing	32.9	29.0	39.1	3.70	5.60	7.44
Residential upkeep and improvements	10.4	11.1	13.4	0.91	2.22	2.96
New non-residential construction	9.3	8.7	7.4	1.13	1.51	1.45
Manufacturing /b	10.0	11.0	10.1	1.66	1.47	1.37
Shipping	10.2	13.5	16.3	n.a.	(0.52)	(0.65)
All Other Uses /c	15.2	20.0	14.5	2.97/d	4.98/d	4.97/d
Total	<u>88.0</u>	<u>93.2</u>	<u>100.8</u>	<u>10.37</u>	<u>15.77</u>	<u>18.20</u>
of which:						
Softwoods	72.7	75.8	85.4	8.24	12.24	15.22
Hardwoods	15.3	17.2	15.4	2.13	3.35	2.98

/a Veneer is included in the estimates for manufacturing and shipping.

/b Includes household furniture; commercial and institutional furniture; consumer goods (sporting goods, musical instruments, boat building and repairs, toys and games, etc.); commercial and industrial machinery and equipment; other products (pallets, prefabricated wooden buildings, containers, mobile homes, millwork, flooring, etc.).

/c Includes upkeep and improvement of non-residential buildings and structures, farm construction, except housing; mining; home-made projects such as furniture and boats; made-on-the-job products like advertising and display structures; and a wide variety of other miscellaneous products and uses.

/d Includes shipping.

Source: US Department of Agriculture, Forest Service, The Outlook for Timber in the United States; and An Analysis of the Timber Situation in the United States 1952-2030, Review draft.

Table 3: PRESENT USES FOR FOREST PRODUCTS IN BUILDING

End-Use	Forest products most used	Remarks
<b>Structural</b>		
Roof structure	Sawn softwood	Concentrated in low-rise dwellings (25-40% of sawn softwood used in this type of building). Quantity used per roof declining (lower pitch, truss rafters).
	Wood-based panels	Sheathing material for under-roofing.
	Glue-laminated structures	Used increasingly, especially for spans over 20 m.
Floor structure	Sawn softwood	Joists and boards, almost exclusively in low-rise dwellings (5-15% of sawn softwood used in this type of building).
	Wood-based panels	Replacing sawnwood as flooring boards in some areas (especially particleboard).
Load-bearing wall members	Sawn softwood	Very important where used of wood frame houses is traditional, or increasing.
	Wood-based panels	Used as sheathing (especially plywood) with sawnwood frame.
<b>Joinery</b>		
Windows and shutters	Sawn softwood, sawn hardwood, often tropical	Windows predominantly of wood in residential building, competition with metal in industrial and commercial buildings. Trend from shutters to blinds or rollers, which use less or no wood.
Doors	Sawnwood, wood-based panels	Usually made of sawnwood with hardboard or plywood face (flush door). Door frame traditionally sawnwood (now also blockboard, veneered particleboard). Recently, strong competition from metal and plastic for door sets.
Partition walls	Sawnwood, wood-based panels	Major use for sawnwood in low-rise dwellings. Sawnwood, wood- or mineral-based panels used as facing. Trend to wood (especially particleboard) partitions in high-rise dwellings and other constructions (for reasons of weight).
Exterior walls	Sawnwood, wood-based panels	Tendency observable to use, in high-rise dwellings, prefabricated elements, with sawnwood for frames and wood-based panels as sheathing.
Exterior wall facing	Sawnwood, plywood, hardboard	Used mostly in wood-frame buildings.
Built-in furniture	Wood-based panels, sawnwood	Expanding sector. Much particleboard used.
Stairs	Sawnwood	Wood use now confined to low-rise dwellings.
Joinery trim	Sawnwood	Little known about trends, but apparently declining.
Floor surfaces	Sawnwood (especially hardwood), wood-based panels (plywood, particleboard)	Strong downward trend in consumption of sawn softwood per volume built. Possibly similar trend for hardwood, but less marked.
Ceiling and internal wall coverings	Sawnwood, wood-based panels	Has decreased where purely economic considerations prevail. In decorative applications, especially in public places (courts, meeting rooms, theaters, etc.), upward, or stable trend.
<b>Temporary Site Uses</b>		
Concrete formwork	Sawnwood, wood-based panels	Major end-use for sawnwood and increasingly for plywood, often treated.
Scaffolding boards Partitions on-site Falsework Other temporary uses	Sawnwood, wood-based panels	Not enough known about use patterns in this significant consumption sector.

Source: ECE/FAO, European Timber Trends and Prospects 1950 to 2000, p. 34.

MECHANICAL PROCESSING OF TROPICAL HARDWOOD IN DEVELOPING COUNTRIES

Taxes on Log Exports in Indonesia as of April 1980

The purpose of this Annex is to show details of the official tax burden on log exports from Indonesia.

Some of the export taxes are related to the levels of check prices (standard prices). As of April 1980, check prices were as follows:

<u>Grade of Logs</u>	<u>US\$/m<sup>3</sup></u>
(a) Premium and first grades	160
(b) Second and third grades	150
(c) Local market grade	125

Because of the prevalent practices of undergrading, only a small portion of total shipments is graded as premium or first grade. Government guidelines dictate that only up to 10% of total export shipments is permitted to be graded as local market grade. Therefore, for all practical purposes, the average check price was US\$150 per m<sup>3</sup>.

The following calculations of the official tax burden on log exports are based on the price of US\$150 per m<sup>3</sup> and the current (April 1980) market price (FOB Kalimantan) of US\$130 per m<sup>3</sup>.1/

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1/ Items and amounts differ somewhat, depending on the source of information.

<u>"Tax" Item</u>	<u>US\$/m<sup>3</sup></u>
ADO (export tax, 20% of check price)	30.00
MPO EXIM (withholding corporate tax, US\$ price x Rp.40)	9.60
Uji Kayu (grading fee, Rp.200/m <sup>3</sup> )	0.45
Simpanan Wajib (compulsory savings for reforestation)	3.20
Fiskal Export (PPD - 17a, withholding personal income tax on wages)	0.32
OPP (transportation tax, US\$1/m <sup>3</sup> )	1.00
Bea Angkutan Langsung (Rp.50/m <sup>3</sup> )	0.08
B/veem (Rp.20/m <sup>3</sup> )	0.03
IHH (royalty, 6% of check prices)	9.00
IHH Tambahan (additional royalty, Rp.620/m <sup>3</sup> )	1.00
Bank charges (0.25% of negotiated amount)	<u>0.38</u>
TOTAL	55.06

Ignoring some small local taxes which are not listed above, the total taxes/ fees paid to the Indonesian government appear to be around US\$55 per m<sup>3</sup>, or about 42-43% of the actual FOB price of export logs.

STATISTICAL APPENDIX

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Table SA1: WORLD PRODUCTION OF WOOD

	1961	1970	1978	1979	Annual Growth Rate 1961-1979 %
------(Millions of cubic meters)-----					
<u>Industrial Wood</u>					
<u>Logs/a</u>	638.3	756.8	856.9	868.0	1.6
<u>Softwood/b</u>	478.6	549.7	614.7	624.6	1.4
<u>Hardwood/c</u>	159.7	207.1	242.2	243.4	2.2
Temperate	112.3	123.5	124.7	122.5	0.5
Tropical	47.4	83.6	117.5	120.9	5.1
<u>Pulpwood/d</u>	213.9	314.2	324.9	346.1	2.6
<u>Softwood/b</u>	175.4	234.5	232.0	249.3	1.9
<u>Hardwood/c</u>	38.5	79.7	92.8	96.9	5.0
Other Industrial Wood/e	167.4	203.5	207.1	206.8	1.1
<u>TOTAL INDUSTRIAL WOOD</u>	<u>1,019.7</u>	<u>1,274.6</u>	<u>1,388.9</u>	<u>1,420.9</u>	<u>1.8</u>
<u>Fuelwood/f</u>	1,209.5	1,338.9	1,565.9	1,599.7	1.5
<u>GRAND TOTAL</u>	<u>2,049.2</u>	<u>2,613.5</u>	<u>2,954.8</u>	<u>3,020.6</u>	<u>2.1</u>

/a Sawlogs, veneer logs, and logs for railroad ties.

/b Conifers.

/c Non-conifers, or broadleaved wood.

/d Includes all forms--roundwood, chips, etc.

/e Includes pitprops, telephone and power transmission poles, roundwood for scaffolding and construction formwork, etc.

/f Includes all firewood and charcoal.

Source: FAO, Yearbook of Forest Products, various issues.

Table SA2: DEVELOPING COUNTRIES' EXPORTS OF WOOD PRODUCTS IN 1979

	SITC Code	Million US\$
<u>Fuelwood and charcoal</u>	245	11
<u>Industrial roundwood</u>	246/247	3,177
Softwood logs	247.1	59
Hardwood logs	247.2	3,069
Pulpwood (incl.)	246	16
Pitprops, poles, etc.	247.9	31
<u>Sawnwood</u>	248	1,676
Sleepers	248.1	36
Softwood sawnwood	248.2	283
Hardwood sawnwood	248.3	1,357
<u>Panel Products/a</u>	634/641	1,458
Plywood/a	Ex. 634	1,282
Veneer Sheets	634.1	110
Particleboard	634.32	17
Fiberboard	641.6	48
<u>Pulp and Paper</u>		666
Woodpulp	Ex. 251	400
Paper and paperboard	Ex. 641	266
Total		<u>6,988</u>

/a Includes plywood exports of the Province of Taiwan.

Source: FAO, Forest Products Yearbook, 1979

**Table SA3: HARDWOOD LOGS (TROPICAL AND TEMPERATE) - PRODUCTION BY REGION**

	1961	1965	1970	1975	1977	1978	Annual	% Share in	
							Growth Rate (1961-78) /a	World Production 1961	1977
	-----million m <sup>3</sup> (r)-----						-----%		
<b>Developing Countries</b>	<b>49.7</b>	<b>61.3</b>	<b>84.7</b>	<b>97.1</b>	<b>114.8</b>	<b>122.1</b>	<b>5.6</b>	<b>31.1</b>	<b>48.8</b>
<b>Asia and Pacific</b>	<b>27.0</b>	<b>36.7</b>	<b>53.6</b>	<b>60.5</b>	<b>75.2</b>	<b>82.7</b>	<b>6.8</b>	<b>17.0</b>	<b>32.0</b>
Tropical	26.9	36.3	53.6	61.7	74.1	80.9	6.8	17.0	31.5
Temperate (Rep. of Korea, Israel)	0.1	0.3	0.0	1.2	1.1	1.8	9.1	0.1	0.5
<b>Africa - Tropical</b>	<b>9.1</b>	<b>11.3</b>	<b>14.8</b>	<b>14.6</b>	<b>17.4</b>	<b>16.4</b>	<b>4.0</b>	<b>5.7</b>	<b>7.4</b>
<b>Latin America and Caribbean</b>	<b>14.7</b>	<b>14.7</b>	<b>17.3</b>	<b>21.7</b>	<b>23.6</b>	<b>24.4</b>	<b>3.4</b>	<b>9.3</b>	<b>10.0</b>
Tropical	12.5	12.3	15.2	20.0	22.0	22.6	4.0	7.9	9.4
Temperate (Argentina, Chile, Uruguay)	2.2	2.4	2.1	1.8	1.6	1.8	1.5	1.4	0.7
Subtotal - Tropical	48.5	59.9	83.6	93.3	113.6	119.8	5.5	30.6	48.3
- Temperate	2.4	2.8	2.1	3.0	2.7	3.6	2.4	1.5	1.1
<b>Industrialized Countries (all temperate)</b>	<b>67.9</b>	<b>79.1</b>	<b>77.5</b>	<b>64.3</b>	<b>71.7</b>	<b>74.3</b>	<b>0.1</b>	<b>42.8</b>	<b>30.5</b>
Canada	2.4	3.9	4.4	4.2	5.1	6.6	3.2	1.5	2.2
United States	31.0	37.8	34.6	27.9	32.5	32.5	-0.4	19.5	13.8
Japan	7.2	6.5	5.9	4.0	4.0	3.9	-3.2	4.5	1.7
Australia, New Zealand	7.4	7.4	7.0	6.5	6.5	6.3	-0.9	4.7	2.8
Western Europe	19.8	23.1	25.2	21.3	23.1	24.6	1.3	12.5	10.0
South Africa	0.2	0.4	0.4	0.4	0.3	0.4	2.7	0.1	0.1
<b>Market Economies Total</b>	<b>117.6</b>	<b>140.4</b>	<b>162.2</b>	<b>161.4</b>	<b>185.5</b>	<b>196.4</b>	<b>3.1</b>	<b>74.1</b>	<b>79.3</b>
of which, temperate	70.2	81.8	79.6	67.3	74.4	77.9	0.6	44.3	31.6
<b>Centrally Planned Economies (all temperate)</b>	<b>41.0</b>	<b>39.6</b>	<b>43.6</b>	<b>48.4</b>	<b>48.7</b>	<b>48.7</b>	<b>1.0</b>	<b>25.9</b>	<b>20.7</b>
<b>WORLD TOTAL</b>	<b>158.6</b>	<b>180.0</b>	<b>207.1</b>	<b>210.0</b>	<b>235.2</b>	<b>245.1</b>	<b>2.5</b>	<b>100.0</b>	<b>100.0</b>
<b>MEMORANDUM ITPMS</b>									
(a) Israel (all temperate)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(b) WDR Developing	54.3	67.7	90.7	103.3	122.0	130.2	5.4	34.2	51.9
of which, temperate	7.2	8.9	7.1	8.2	8.8	10.3	1.1	4.5	3.7
(c) WDR Industrialized (all temperate)	64.4	74.0	72.5	59.1	66.0	67.6	-0.3	40.6	28.1

/a Based on trend growth rates.

Source: FAO, Yearbook of Forest Products Standard Tapes

Table SA4: MAJOR MARKETS: IMPORTS OF TROPICAL  
HARDWOOD LOGS, BY ORIGIN, 1977

Destination	Origin	Africa	Asia- Pacific	Latin America	Total
-----thousand m <sup>3</sup> (roundwood)-----					
<u>Asia</u>					
	Japan	50	21,054	2	21,106
	Republic of Korea	-	6,616	-	6,616
	Province of Taiwan	-	5,956	-	5,956
	Singapore	-	351	-	351
	Hong Kong	-	491	-	491
	Total 5 Asian Countries	<u>50</u>	<u>34,468</u>	<u>2</u>	<u>34,520</u>
<u>Europe</u>					
	France	1,188	298	-	1,486
	Italy	1,120	172	-	1,292
	Germany, F.R.	797	84	1	882
	Spain	775	35	-	810
	Netherlands	182	35	12	229
	Portugal	311	99	10	420
	United Kingdom	121	3	4	128
	Belgium	128	5	-	133
	Greece	257	11	-	268
	Total 9 European Countries	<u>4,879</u>	<u>742</u>	<u>27</u>	<u>5,648</u>
TOTAL MAJOR IMPORTING		<u>4,929</u>	<u>35,210</u>	<u>29</u>	<u>40,168</u>

Source: FAO, Yearbook of Forest Products, 1977.

Table SA5: MAJOR MARKETS: IMPORTS OF TROPICAL  
HARDWOOD SAWNWOOD, BY ORIGIN, 1977

Destination \ Origin	Africa	Asia- Pacific <sup>/a</sup>	Latin America	Total
	-----thousand m <sup>3</sup> (sawnwood)-----			
<u>Japan</u>	-	<u>250</u>	<u>3</u>	<u>253</u>
<u>Europe (Major Importing Countries)</u>	<u>583</u>	<u>1,898</u>	<u>98</u>	<u>2,579</u>
of which: United Kingdom	108	270	46	424
France	93	359	6	458
Germany, F. R.	100	343	21	464
Netherlands	45	482	7	534
Italy	143	236	2	381
Belgium	11	156	4	171
Spain	83	52	12	147
<u>North America</u>	<u>37</u>	<u>290</u>	<u>309</u>	<u>636</u>
of which: United States	34	260	271	565
Canada	3	30	38	71
<u>Australia</u>	-	<u>376</u>	-	<u>376</u>
TOTAL	<u>620</u>	<u>2,814</u>	<u>410</u>	<u>3,844</u>

<sup>/a</sup> Includes exports of 255,000 m<sup>3</sup> from Singapore.

Source: FAO, Yearbook of Forest Products, 1977.

Table SA6: MAJOR MARKETS: IMPORTS OF TROPICAL  
HARDWOOD PLYWOOD, BY ORIGIN, 1977

Destination	Origin	Exporters			Total	
		Africa	Log Producing Asia-Pacific	In-Transit Asian <sup>/a</sup> Producers		Latin America
-----thousand m <sup>3</sup> -----						
Japan		-	1	39	-	40
<u>Europe (major 7 importers)</u>						
	United Kingdom	16	93	224	14	347
	Denmark	-	1	24	-	25
	France	28	32	59	-	119
	Belgium	3	17	24	3	47
	Netherlands	15	18	119	3	155
	Sweden	-	-	11	-	11
	Germany, F.R.	<u>3</u>	<u>16</u>	<u>48</u>	<u>5</u>	<u>72</u>
	Subtotal Europe	<u>65</u>	<u>177</u>	<u>509</u>	<u>25</u>	<u>776</u>
	United States	-	107	1,792	14	1,913
	Canada	-	2	245	-	247
	Australia	-	<u>12</u>	<u>65</u>	-	<u>77</u>
	Total Major Importing Countries	<u>65</u>	<u>299</u>	<u>2,650</u>	<u>39</u>	<u>3,053</u>

<sup>/a</sup> Includes Japanese exports.

Source: FAO, Yearbook of Forest Products, 1977.

Table SA7: MAJOR MARKETS: IMPORTS OF TROPICAL  
HARDWOOD VENEERS, BY ORIGIN, 1977

Importing Countries	Exporters			Total
	Africa	Asia- Pacific	Latin America	
	-----thousand m <sup>3</sup> -----			
United States	7	151	38	196
Germany, F.R.	29	2	9	40
United Kingdom	11	9	-	20
France	40	2	-	42
Netherlands	<u>17</u>	<u>-</u>	<u>-</u>	<u>17</u>
Total Major Importing Countries	<u>104</u>	<u>164</u>	<u>47</u>	<u>315</u>

Source: FAO, Yearbook of Forest Products, 1977.

Table SA8: TROPICAL HARDWOOD - EXPORTS BY CATEGORY AND DEVELOPING REGIONS

	Actual						Growth Rate 1961-78	Regional Shares		
	1961	1965	1970	1975	1977	1978		1961	1977	1978
	-----million m <sup>3</sup> -----						% per annum	-----percent-----		
<b>LOGS</b>	12.8	19.5	36.6	34.0	44.1	45.1	8.1	100.0	100.0	100.0
Tropical Asia-Pacific	7.7	13.3	29.4	28.7	37.6	39.1	10.3	60.2	85.3	86.7
Tropical Africa	4.7	5.6	6.8	5.3	6.5	6.0	1.8	36.7	14.7	13.3
Tropical Latin America	0.4	0.5	0.4	0.0	0.0	0.0	-13.1	3.1	0.0	0.0
Other developing /a	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>SAWNWOOD</b>	1.8	2.6	3.9	4.7	7.0	7.1	9.0	100.0	100.0	100.0
Tropical Asia-Pacific	1.0	1.1	1.8	2.6	4.1	4.3	10.4	55.6	58.6	60.6
Tropical Africa	0.6	0.7	0.8	0.7	0.8	0.8	1.6	33.3	11.4	11.3
Tropical Latin America	0.2	0.3	0.5	0.6	0.7	0.6	8.2	11.1	10.0	8.5
Other developing /a	0.0	0.5	0.8	0.8	1.4	1.4	20.9	0.0	20.0	19.7
<b>PLYWOOD</b>	0.3	0.8	2.2	3.0	4.0	4.5	17.1	100.0	100.0	100.0
Tropical Asia-Pacific	0.1	0.2	0.4	0.4	0.7	0.9	14.0	33.3	17.5	20.0
Tropical Africa	0.0	0.1	0.1	0.1	0.1	0.1	-0.5	33.3	2.5	2.2
Tropical Latin America	0.0	0.0	0.1	0.1	0.1	0.1	10.2	0.0	2.5	2.2
Other developing /a	0.1	0.5	1.6	2.4	3.1	3.4	21.8	33.3	77.5	75.6
<b>VENEER SHEETS</b>	0.1	0.2	0.4	0.5	0.5	0.5	9.0	100.0	100.0	100.0
Tropical Asia-Pacific	0.0	0.1	0.2	0.3	0.2	0.2	9.8	0.0	40.0	40.0
Tropical Africa	0.1	0.1	0.2	0.1	0.2	0.2	5.9	100.0	40.0	40.0
Tropical Latin America	0.0	0.0	0.0	0.1	0.1	0.1	11.9	0.0	20.0	20.0
Other developing /a	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	0.0	0.0	0.0
<b>PROCESSED TOTAL (roundwood equiv.)</b>	4.2	6.9	12.8	16.3	23.0	24.3	10.9	100.0	100.0	100.0
Tropical Asia-Pacific	2.0	2.7	3.5	6.2	9.5	10.3	10.1	47.6	41.3	42.4
Tropical Africa	1.5	1.7	2.0	1.6	2.0	2.1	2.0	35.7	8.7	8.6
Tropical Latin America	0.4	0.5	1.1	1.5	1.7	1.5	8.1	9.5	7.4	6.2
Other developing /a	0.3	2.0	5.1	7.0	9.8	10.4	23.2	7.2	42.6	42.8
<b>LOGS AND PROCESSED: TOTAL (round, equiv.)</b>	17.0	26.4	49.4	50.3	67.1	69.4	8.6	100.0	100.0	100.0
Tropical Asia-Pacific	9.7	16.0	34.0	34.9	47.1	49.4	10.0	57.1	70.2	71.2
Tropical Africa	6.2	7.3	8.8	6.9	8.5	8.1	1.6	36.5	12.7	11.7
Tropical Latin America	0.8	1.0	1.5	1.5	1.7	1.5	3.8	4.7	2.5	2.1
Other developing /a	0.3	2.1	5.1	7.0	9.8	10.4	23.2	1.7	14.6	15.0

/a Includes Hong Kong, Singapore, Rep. of Korea, Israel and Prov. of Taiwan. Exports of temperate Latin American developing countries, Southern Europe and South Africa are not included as their exports are largely based on their own temperate hardwood material.

Source: Yearbook on Forest Products Standard Tapes, 1978; World Bank, Economic Analysis and Projections Department.

**Table SA9: EXPORTS OF TROPICAL HARDWOOD LOGS, BY MAJOR COUNTRIES,  
SELECTED YEARS IN 1955-1979**

	1955	1961	1970	1973	1975	1978	1979	Growth Rate 1961-79
	-----1,000 m <sup>3</sup> -----							% per annum
<b>Asia Pacific</b>	<b>2,930</b>	<b>7,778</b>	<b>29,454</b>	<b>40,245</b>	<b>28,713</b>	<b>38,821</b>	<b>37,491</b>	<b>8.6</b>
Burma	10	73	58	172	66	77	135	3.3
Indonesia	0	105	7,834	18,500	12,532	19,200	19,407	31.6
Malaysia	726	2,754	11,353	12,876	10,792	16,713	16,084	9.7
Papua New Guinea	6	3	193	425	372	445	445	30.1
Philippines	1,898	4,581	9,606	7,759	4,596	2,200	1,248	-6.6
<b>Africa</b>	<b>2,533</b>	<b>4,726</b>	<b>6,842</b>	<b>8,801</b>	<b>5,286</b>	<b>6,096</b>	<b>6,536</b>	<b>1.7</b>
Cameroon	88	165	511	703	472	654	843	9.0
Gabon	800	1,224	1,634	1,749	975	1,200	1,200	-0.1
Ghana	479	775	601	1,387	560	310	124	-9.2
Ivory Coast	241	1,019	2,511	3,497	2,419	2,700	3,199	6.2
Liberia	-	14	144	364	220	311	311	17.7
Nigeria	523	733	219	328	91	27	27	-15.5
<b>Latin America</b>	<b>395</b>	<b>389</b>	<b>362</b>	<b>524</b>	<b>34</b>	<b>64</b>	<b>78</b>	<b>-8.1</b>
Colombia	52	53	78	43	7	7	7	-10.1
Paraguay	171	171	166	1	-	-	-	-32.7/a
Brazil	62	54	84	426	5	10	13	-7.2
<b>Total Developing</b>	<b>5,858</b>	<b>12,792</b>	<b>36,675</b>	<b>49,612</b>	<b>34,070</b>	<b>44,981</b>	<b>44,105</b>	<b>6.7</b>

/a Based on annual percent growth rate, 1961-73.

Source: FAO, Yearbook of Forest Products, various issues.

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Table SA10: EXPORTS OF TROPICAL HARDWOOD SAWWOOD, 1955-1979

	1955	1961	1970	1973	1975	1978	1979	Annual Growth Rate 1961-79
-----thousand m <sup>3</sup> (sawnwood)-----								
<u>LOG-PRODUCING REGIONS</u>	1,270	1,766	3,094	4,942	3,933	5,395	6,367	7.0
<u>Asia-Pacific, log-producing</u>	741	988	1,786	3,184	2,645	5,240	5,256	9.2
Burma	23	80	116	105	104	56	106	1.5
Indonesia	-	11	44	330	394	756	1,321	28.7
Malaysia	540	557	1,356	2,159	1,763	2,787	2,856	9.0
Papua New Guinea	-	3	3	18	16	36	36	14.0
Philippines	132	191	185	427	254	573	915	3.6
Thailand	153	123	38	93	75	16	7	-14.0
<u>Africa</u>	382	569	760	896	717	693	679	0.9
Cameroon	11	99	17	27	38	31	108	0.5
Gabon	-	10	2	4	4	20	20	3.7
Ghana	218	246	241	305	165	69	54	-7.7
Ivory Coast	1	39	183	238	212	318	293	11.2
Liberia	-	-	1	4	23	17	17	32.7 /a
Nigeria	43	62	47	34	13	1	1	-19.5
<u>Latin America</u>	147	210	548	862	571	462	432	3.9
Colombia	5	38	157	100	23	23	29	-1.4
Paraguay	8	31	86	149	149	145	145	8.5
Brazil	38	16	147	367	187	155	80	8.8
<u>LOG-IMPORTING DEVELOPING</u>								
<u>COUNTRIES</u>	10	33	784	1,357	812	1,423	1,664	22.9
Singapore	-	-	721	1,111	626	1,203	1,438	7.2 /a
Taiwan, Prov. of	1	17	40	160	133	178	178	13.2
Hong Kong	9	17	19	15	16	0	0	-0.4 /b
<u>TOTAL DEVELOPING</u>	<u>1,280</u>	<u>1,831</u>	<u>3,883</u>	<u>6,278</u>	<u>4,746</u>	<u>6,818</u>	<u>8,031</u>	<u>8.1</u>

/a Annual percent growth rate, 1970-79.

/b Annual percent growth rate, 1961-75.

Source: FAO Yearbook of Forest Products, various issues.

**Table SA11: EXPORTS OF TROPICAL HARDWOOD PLYWOOD BY SELECTED DEVELOPING ECONOMIES**

	1955	1961	1970	1973	1975	1978	1979	Annual % Growth Rate 1961-79
	-----thousand m <sup>3</sup> (plywood)-----							
<b>LOG-PRODUCING REGIONS</b>	-	196.4	635.8	1,045.4	601.4	1,140.0	1,214.0	10.1
<b>Asia-Pacific, log-producing</b>	6.3	87.6	443.9	826.1	439.6	910.0	979.0	13.6
Indonesia	0.0	0.0	0.0	0.0	0.6	85.0	116.0	186.6 /a
Philippines	7.3	72.6	260.8	388.0	157.0	383.0	406.0	9.5
Papua New Guinea	9.2	9.7	11.9	13.0	12.4	6.0	6.0	-2.5
Malaysia	1.5	2.4	143.7	355.1	232.5	410.0	432.0	31.4
<b>Africa</b>	47.8	84.6	131.2	129.4	98.4	80.0	79.0	-0.4
Nigeria	15.1	18.0	21.0	10.0	1.0	0.0	0.0	-17.5 /b
Ghana	3.3	4.1	21.7	46.9	17.7	1.0	1.0	-7.2
Ivory Coast	0.0	0.2	7.3	12.6	10.8	19.0	19.0	27.1
Gabon	10.5	13.7	11.9	15.5	10.1	12.0	13.0	-0.3
<b>Latin America</b>	18.8	24.2	60.7	89.9	63.4	150.0	156.0	10.3
Brazil	0.0	2.7	29.1	43.0	31.6	79.0	96.0	20.7
Surinam	10.5	13.7	11.9	15.5	10.1	12.0	13.0	-0.3
<b>LOG-IMPORTING DEVELOPING COUNTRIES</b>	8.8	93.7	1,587.1	2,765.0	2,439.3	3,431.0	3,139.0	20.3
Hong Kong	0.8	0.6	0.5	1.8	0.5	0.0	1.0	2.7
Korea, Rep. of	0.0	11.7	821.6	1,321.6	1,258.0	1,605.0	1,297.0	28.1
Singapore	0.0	0.0	131.9	435.7	379.9	553.0	568.0	15.7 /c
Taiwan, Prov. of	0.3	60.7	589.2	953.0	768.0	1,240.0	1,240.0	17.2
Israel	7.7	20.7	43.9	52.9	33.0	33.0	33.0	2.5
<b>TOTAL DEVELOPING</b>	<b>81.7</b>	<b>290.1</b>	<b>2,222.1</b>	<b>3,809.9</b>	<b>3,040.2</b>	<b>4,571.0</b>	<b>4,353.0</b>	<b>15.3</b>
<b>Memorandum Item</b>								
Japan /d	234.0	344.9	322.3	155.4	115.8	105.0	105.0	-6.1

/a Annual percent growth rate, 1975-79.

/b Annual percent growth rate, 1961-75.

/c Annual percent growth rate, 1970-79.

/d Includes domestic hardwood species at an estimated rate of 10,000 m<sup>3</sup> a year during the 1970s.

Source: FAO, Yearbook of Forest Products, various issues.

1 FAO, Yearbook of Forest Products Standard Tables

Table SA12: EXPORTS OF TROPICAL HARDWOOD VENEERS BY SELECTED DEVELOPING ECONOMIES

	1955	1961	1970	1973	1975	1978	1979	Annual % Growth Rate 1961-78
-----thousand m <sup>3</sup> (veneers)-----								
<u>LOG-PRODUCING REGIONS</u>	0.0	112.0	387.2	675.4	440.9	485.0	411.0	7.1
<u>Asia-Pacific, log-producing</u>	0.0	42.1	170.5	382.7	284.9	242.0	163.0	7.4
Philippines	16.4	36.5	121.9	169.3	99.0	31.0	50.0	1.7
Malaysia	1.5	4.3	45.4	204.4	169.5	185.0	88.0	17.2
<u>Africa</u>	0.0	57.3	168.9	212.2	102.3	152.0	166.0	5.8
Zaire	0.8	30.7	31.0	7.8	17.9	4.0	4.0	-10.2
Cameroon	0.0	0.0	24.0	19.1	4.1	14.0	14.0	-5.4 /a
Congo	10.6	9.0	66.7	70.7	41.0	45.0	45.0	8.8
Ivory Coast	0.0	0.3	25.3	86.0	19.9	36.0	46.0	30.3
Gabon	9.9	15.8	20.5	14.0	8.5	37.0	37.0	4.6
<u>Latin America</u>	0.0	12.6	47.8	80.5	53.7	91.0	82.0	10.4
Brazil	2.8	9.1	33.3	57.0	41.6	47.0	36.0	7.5
<u>LOG-IMPORTING DEVELOPING</u>								
<u>COUNTRIES</u>	0.0	0.0	32.0	39.4	26.0	30.0	15.0	-7.3 /a
Singapore	0.0	0.0	31.4	33.4	24.3	26.0	11.0	-10.0 /a
<u>Total Developing Regions</u>	<u>0.0</u>	<u>112.0</u>	<u>419.4</u>	<u>714.9</u>	<u>467.0</u>	<u>515.0</u>	<u>426.0</u>	<u>7.3</u>

/a Based on annual percent growth rate, 1970-79.

Source: FAO, Yearbook of Forest Products, various issues.  
FAO, Yearbook of Forest Products Standard Tapes

Table SA13: TROPICAL HARDWOOD EXPORTS OF SELECTED DEVELOPING COUNTRIES:  
PRODUCT COMPOSITION, 1961 AND 1977

	1961			1977		
	'000 m <sup>3</sup>	% of Total	% Total Processed	'000 m <sup>3</sup>	% of Total	% Total Processed
<b>Indonesia</b>						
Logs	105	84.0	-	18,560	94.5	-
Sawnwood	11	-	100.0	594	-	99.7
Plywood	-	-	-	1	-	0.3
Veneers	-	-	-	-	-	-
Total processed /a	20	16.0	100.0	1,072	5.5	100.0
Total /a	125	100.0	-	19,632	100.0	-
<b>Malaysia</b>						
Logs	2,754	73.1	-	16,099	72.2	-
Sawnwood	557	-	98.8	2,910	-	84.5
Plywood	2	-	0.5	331	-	12.3
Veneers	4	-	0.7	105	-	3.2
Total processed /a	1,015	26.9	100.0	5,199	27.8	100.0
Total /a	3,768	100.0	-	22,298	100.0	-
<b>Philippines</b>						
Logs	4,581	88.7	-	2,047	58.0	-
Sawnwood	191	-	59.1	455	-	55.2
Plywood	73	-	28.8	260	-	40.3
Veneers	37	-	12.1	36	-	4.5
Total processed /a	582	11.3	100.0	1,485	42.0	100.0
Total /a	5,163	100.0	-	3,532	100.0	-
<b>Brazil</b>						
Logs	54	50.5	-	4	0.5	-
Sawnwood	16	-	54.3	305	-	73.9
Plywood	3	-	13.0	44	-	13.6
Veneers	9	-	32.7	49	-	12.5
Total processed /a	53	49.5	100.0	743	99.5	100.0
Total /a	107	100.0	-	747	100.0	-
<b>Colombia</b>						
Logs	53	43.8	-	7	-	-
Sawnwood	38	-	100.0	23	14.0	96.3
Plywood	-	-	-	-	-	-
Veneers	-	-	-	1	-	3.7
Total processed /a	68	56.2	100.0	43	86.0	100.0
Total /a	121	100.0	-	50	100.0	-
<b>Ivory Coast</b>						
Logs	1,019	93.6	-	3,255	81.5	-
Sawnwood	39	-	100.0	332	-	80.7
Plywood	-	-	-	29	-	9.0
Veneers	-	-	-	40	-	11.3
Total processed /a	70	6.4	100.0	740	18.5	100.0
Total /a	1,089	100.0	-	3,995	100.0	-
<b>Ghana</b>						
Logs	775	63.1	-	620	79.6	-
Sawnwood	246	-	97.5	73	-	82.6
Plywood	4	-	2.0	2	-	3.1
Veneers	1	-	0.5	12	-	14.3
Total processed /a	454	36.9	100.0	159	20.4	100.0
Total /a	1,229	100.0	-	779	100.0	-
<b>Gabon</b>						
Logs	1,224	87.6	-	1,139	92.7	-
Sawnwood	10	-	10.5	7	-	14.0
Plywood	54	-	72.1	26	-	66.4
Veneers	16	-	17.4	9	-	20.6
Total processed /a	172	12.4	100.0	90	7.3	100.0
Total /a	1,384	100.0	-	1,229	100.0	-
<b>Liberia</b>						
Logs	14	100.0	-	315	78.2	-
Sawnwood	-	-	-	49	-	100.0
Plywood	-	-	-	-	-	-
Veneers	-	-	-	-	-	-
Total processed /a	-	-	-	88	21.8	100.0
Total /a	14	100.0	-	403	100.0	-
<b>Papua New Guinea</b>						
Logs	-	-	-	370	85.5	-
Sawnwood /b	-	-	-	16	-	46.0
Plywood	-	-	-	9	-	32.9
Veneers	-	-	-	7	-	21.1
Total processed /a	-	-	-	63	14.5	100.0
Total /a	-	-	-	433*	100.0	-

/a In thousand cubic meters of roundwood equivalent.  
/b [To be provided]

Source: FAO, Yearbook of Forest Products, 1977.

Table SA14: PARTICLEBOARD EXPORTS, VOLUME AND VALUE, 1961 AND 1979

	1961		1979	
	Volume	Value	Volume	Value
	('000 m <sup>3</sup> )	(million US\$)	('000 m <sup>3</sup> )	(million US\$)
<u>Developing Economies</u>	<u>25</u>	<u>2</u>	<u>104</u>	<u>16</u>
Asia	3	-	71	7
Africa	7	-	3	-
Latin America	15	1	30	9
<u>Industrialized Countries</u>	<u>355</u>	<u>22</u>	<u>4,880</u>	<u>841</u>
Western Europe	342	21	4,647	812
United States	-	-	178	20
Japan	-	-	-	-
Other	13	1	51	8
<u>Market Economies</u>	<u>381</u>	<u>24</u>	<u>4,984</u>	<u>857</u>
<u>Centrally Planned Economies</u>	<u>28</u>	<u>1</u>	<u>601</u>	<u>44</u>
WORLD TOTAL	<u>409</u>	<u>24</u>	<u>5,585</u>	<u>901</u>

Source: FAO, Forest Products Yearbook, 1972 and 1979.

**Table SA15: TROPICAL HARDWOOD CONSUMPTION BY MAJOR REGIONS**

	1961	1965	1970	1973	1975	1977	1978	Growth Rate 1961-78 (% per annum)	% Share in Total	
									1961	1977
-----million m <sup>3</sup> roundwood equivalent-----										
<b>Developing Countries</b>	33.8	38.5	43.5	54.5	61.0	68.7	76.7	4.9	69.7	60.3
<b>Log-producing regions</b>	33.0	36.8	40.9	50.7	55.1	60.2	66.3	4.2	68.0	53.0
Tropical Asia-Pacific	17.6	21.1	20.3	27.8	27.3	29.0	34.3	3.4	36.3	25.5
Tropical Africa	3.6	4.5	6.7	7.3	8.5	10.0	9.4	6.9	7.4	8.8
Tropical Latin America	11.8	11.2	13.9	15.6	19.3	21.2	22.6	24.3	24.3	18.7
<b>Importing countries</b>										
In transit processor	0.8	1.7	2.6	3.8	5.9	8.5	10.4	1.6	1.6	7.5
<b>Industrialized Countries</b>	14.7	21.3	37.6	52.2	34.2	43.2	45.2	6.8	30.3	38.0
United States	2.3	3.3	5.4	6.7	4.8	5.9	6.0	5.8	4.7	5.2
Japan	5.0	8.5	20.2	28.2	17.6	21.2	22.6	9.3	10.3	18.7
Western Europe (including Southern Europe)	6.9	8.2	10.3	15.3	9.7	13.7	14.1	4.3	14.2	12.1
Western Europe (excluding Southern Europe)	6.8	8.1	9.3	13.3	8.4	11.7	12.1	3.4	14.0	10.3
Southern Europe (excluding Israel)	0.1	0.1	1.0	2.0	1.3	2.0 (est)	2.0	19.3	0.2	1.8
Other industrialized	0.4	1.3	1.7	2.0	2.1	2.4	2.5	11.4	0.8	2.1
<b>Statistical Discrepancy</b>	-	-	2.5	3.2	-0.2	1.5	2.3	-	-	1.3
<b>Market Economies Total</b>	48.5	59.9	83.6	109.9	95.0	113.4	119.6	5.5	100.0	99.8
<b>Centrally Planned Economies</b>	-	-	-	-	0.1	0.2	0.2	-	-	0.1
<b>WORLD TOTAL</b>	48.5	59.9	83.6	109.9	95.1	113.6	119.8	5.5	100.0	100.0
<b>Memorandum Items</b>										
Israel	0.05	0.01	0.08	-	-	-	-	-	0.1	-
South Africa	0.34	0.55	0.68	0.83	0.58	0.19	0.19	3.4	0.7	0.1

Source: FAO, Yearbook of Forest Products Standard Tapes.

**Table SA16: HARDWOOD (TROPICAL AND TEMPERATE) CONSUMPTION BY MAJOR REGIONS**

	1961	1965	1970	1973	1975	1977	1978	Growth Rate 1961-78 (% per annum)	% Share in Total 1961 1977	
-----million m <sup>3</sup> roundwood-----										
<u>Developing Countries</u>	<u>36.3</u>	<u>41.3</u>	<u>45.9</u>	<u>56.7</u>	<u>63.8</u>	<u>70.4</u>	<u>78.5</u>	<u>4.6</u>	<u>22.9</u>	<u>29.9</u>
Tropical producing regions	33.0	36.8	40.9	50.7	55.1	60.2	66.3	4.2	20.8	25.6
Other developing	3.3	4.5	5.0	6.0	8.7	10.2	12.2	8.0	2.1	4.3
<u>Industrialized Countries</u>	<u>82.1</u>	<u>100.1</u>	<u>117.6</u>	<u>135.7</u>	<u>98.3</u>	<u>117.0</u>	<u>119.5</u>	<u>2.2</u>	<u>51.8</u>	<u>49.7</u>
Western Europe (including Southern Europe)	26.9	31.4	36.7	43.0	31.3	38.1	41.2	2.5	17.0	16.2
Western Europe (excluding Southern Europe)	24.0	27.2	31.7	36.6	25.8	32.0	34.6	2.2	15.1	13.6
Southern Europe (excluding Israel)	2.9	4.2	5.0	6.4	5.5	6.1	6.6	5.0	1.8	2.6
United States	33.0	41.4	40.1	43.2	31.6	37.3	37.0	0.7	20.8	15.9
Japan	11.8	14.9	26.0	34.0	21.6	25.4	26.0	5.7	7.4	10.8
Other industrialized	10.4	12.4	14.8	15.5	13.8	16.2	15.3	2.3	6.6	6.9
<u>Market Economies</u>	<u>118.4</u>	<u>141.4</u>	<u>163.5</u>	<u>192.4</u>	<u>162.1</u>	<u>187.4</u>	<u>198.0</u>	<u>3.1</u>	<u>74.7</u>	<u>79.7</u>
<u>Centrally Planned Economies</u>	<u>40.2</u>	<u>38.6</u>	<u>43.6</u>	<u>44.6</u>	<u>47.9</u>	<u>47.8</u>	<u>47.1</u>	<u>1.1</u>	<u>25.3</u>	<u>20.3</u>
<u>WORLD TOTAL</u>	<u>158.6</u>	<u>180.0</u>	<u>207.1</u>	<u>237.0</u>	<u>210.0</u>	<u>235.2</u>	<u>245.1</u>	<u>2.4</u>	<u>100.0</u>	<u>100.0</u>
<u>Memorandum Items</u>										
Israel	0.05	0.12	0.13	0.25	0.46	0.47	0.47	14.5	0.03	0.2
South Africa	0.51	0.92	1.08	1.24	0.97	0.58	0.63	1.2	0.3	0.2

Notes (numbers represent country codes in printout):

- Western Europe (excluding Southern Europe) = WDR Reg 13 - plywood imports from US and Canada.
- Southern Europe (excluding Israel) = WDR Reg 12 - Israel.
- Other Industrialized = Canada, Australia, New Zealand, South Africa (derived as residuals).
- Tropical Producing Regions = Asia-Pacific, Africa, Latin America (287,200,227).
- Other Developing = Processors and Temp. Latin America = 286 + 284.

Source: FAO, Yearbook of Forest Products Standard Tapes.

Table SA17: HARDWOOD SAWWOOD IN WESTERN EUROPE AND JAPAN, 1961 AND 1977

	1961	1977
	in million m <sup>3</sup>	
<u>Western Europe</u>		
Production	9.36	13.39
of which, tropical	n.a.	1.78 /a
Imports (gross)	2.03	5.52
of which, tropical	1.10 /a	2.71
Exports (gross)	0.94	2.73
of which, tropical	n.a.	0.19
Net Imports	1.09	2.73
Apparent consumption	10.45	16.18
of which, tropical	n.a.	4.30
<u>Japan</u>		
Production	5.02	9.46
of which, tropical	1.94 /a	4.36 /a
Imports (gross)	-	0.26
of which, tropical	-	0.24 /a
Exports (gross)	0.25	0.05
of which, tropical	-	-
Net Imports	-0.24	0.21
Apparent consumption	4.78	9.67
of which, tropical	1.95	4.60

/a Estimated on the basis of the percentage share of tropical log imports in sawnwood making.

Source: FAO, Yearbook of Forest Products, except for the figures footnoted "a" which are World Bank estimates based on the share of tropical log imports in sawnwood production. The data on such shares as well as on tropical sawnwood imports have been taken from the following sources:

- ECE/FAO, "Study on the European Trade in Tropical Hardwood", Supplement 10 to Volume XXX of the Timber Bulletin for Europe, Geneva, July 1978;
- Japan Forestry Agency, Ringyo Tokei Yooran (Forestry Statistics Summary), Tokyo, 1970.
- Nanyozai Kyogikai, "Nanyo-zai Tookei (South Sea Timber Statistics)".

Table SA18: CONSUMPTION OF HARDWOOD PLYWOOD (INCLUDING VENEERS) IN  
WESTERN EUROPE, UNITED STATES AND JAPAN IN 1976 /a  
(million m<sup>3</sup> roundwood equivalent)

	million m <sup>3</sup> (r) <u>/a</u>
<u>Western Europe (including veneers)</u>	
Production of all hardwood plywood	6.5
of which, tropical	3.1
Net imports of tropical hardwood plywood	2.1
Apparent consumption of tropical hardwood plywood	5.2
<u>United States (including veneers)</u>	
Production of all hardwood plywood	2.7
of which, tropical	-
Imports	5.2
of which, tropical	5.1
Exports	0.3
of which, tropical	-
Apparent consumption of tropical hardwood plywood	5.1
<u>Japan (plywood only)</u>	
Production of all hardwood plywood	13.9
of which, tropical	12.6
Imports	0.2
of which, tropical	0.2
Exports	0.3
of which, tropical	0.3
Apparent consumption of tropical hardwood plywood	12.5

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/a Figures given refer to the volume in roundwood equivalent. These figures may be roughly converted to plywood volume figures by dividing by 2.3.

Source: FAO, Yearbook of Forest Products 1977 and World Bank estimates based on information available from ECE/FAO Timber Committee and Japan Forestry Agency. Estimates for Western Europe and the United States include veneers while those for Japan are for plywood only.

Table SA19: PRICE OF LAUAN VENEERLOGS IN JAPAN, /a 1955-1980

	In Current Dollars	In Constant 1980 Dollars Deflated by:	
		World Bank IPI /b	US GDP Deflator
-----US\$ per m <sup>3</sup> (r)-----			
1955	25.3	105.4	74.8
1956	24.4	99.5	69.3
1957	23.5	91.5	64.2
1958	22.4	82.6	60.0
1959	26.4	102.4	68.2
1960	29.0	109.8	76.3
1961	30.0	113.2	77.5
1962	32.9	125.4	83.4
1963	32.1	121.5	80.0
1964	27.4	102.0	67.1
1965	31.7	115.3	76.3
1966	33.3	118.5	77.5
1967	35.6	125.0	80.2
1968	36.5	136.8	79.7
1969	35.2	131.0	72.4
1970	37.2	125.5	73.4
1971	38.0	118.2	71.0
1972	37.6	106.3	67.6
1973	65.6	155.6	112.2
1974	78.6	150.6	122.7
1975	59.3	99.2	84.2
1976	79.6	130.9	107.6
1977	89.8	135.9	114.9
1978	91.8	117.5	109.5
1979	160.2	178.9	175.0
1980	192.9	192.9	192.9

/a National average.

/b World Bank International Price Index.

Source: Forestry Agency of Japan, Mokuzai Shikyo Geppo, various issues.

Table SA20: PRICE OF MERANTI SAWNWOOD, /a CIF FRENCH PORTS, 1958-1980

	In Current Dollars	In Constant 1980 Dollars Deflated by:	
		World Bank IPI /b	US GDP Deflator
	-----US\$ per m <sup>3</sup> (s)-----		
1958	74.3	273.9	199.1
1959	68.0	263.7	175.6
1960	84.9	321.5	223.3
1961	68.6	258.9	177.1
1962	71.8	273.7	182.2
1963	76.5	289.7	190.6
1964	82.5	307.2	202.0
1965	81.4	296.2	195.9
1966	73.1	260.0	170.2
1967	76.9	270.1	173.3
1968	84.1	315.2	183.7
1969	90.2	335.8	185.6
1970	92.9	313.5	183.2
1971	92.5	287.8	172.8
1972	109.5	309.6	196.8
1973	156.1	370.2	267.1
1974	143.1	274.2	223.3
1975	166.4	278.2	236.3
1976	168.1	276.5	227.3
1977	154.1	233.2	197.1
1978	205.4	262.8	245.1
1979	339.1	378.8	370.4
1980	365.1	365.1	365.1

/a Dark Red Meranti, standard density, Malaysian.

/b World Bank International Price Index.

Source: Marches Tropicaux et Mediterraneens (L'Exportateur Francais, Paris), various issues.

Table SA21: PRICE OF PLAIN LAUAN PLYWOOD IN JAPAN, /a 1963-1980

	In Current Dollars	In Constant 1980 Dollars Deflated by:	
		World Bank IPI /b	US GDP Deflator
	------(US cents per sheet)-----		
1963	83.3	315.4	207.5
1964	64.7	240.9	158.4
1965	61.1	222.3	147.1
1966	73.6	261.8	171.3
1967	80.0	281.0	180.3
1968	79.4	297.6	173.5
1969	84.4	314.2	173.7
1970	103.1	347.9	203.3
1971	81.8	254.5	152.8
1972	195.4	269.8	171.5
1973	188.8	447.7	323.0
1974	152.7	292.6	238.3
1975	121.6	203.3	172.7
1976	147.8	243.1	199.9
1977	165.1	249.9	211.2
1978	189.5	242.5	226.1
1979	262.5	293.2	286.7
1980	273.8	273.8	273.8

/a Three-ply, extra, 91 cm x 182 cm x 4 mm, wholesale price in Tokyo, spot price.

/b World Bank International Price Index.

Source: Forestry Agency of Japan, Mokuzai Shikyo Geppo, various issues.

Table SA22: US IMPORTS OF HARDWOOD PLYWOOD BY MAJOR SUPPLYING AREAS, 1950-1979

	Japan	Philippines	Prov. of Taiwan	Rep. of Korea	Other Sources	Total Imports
-----million m <sup>2</sup> surface measure /a-----						
1950	0.5	- /b	- /b	- /b	5.4	5.9
1951	1.2	- /b	- /b	- /b	5.3	6.5
1952	1.6	- /b	- /b	- /b	6.3	7.9
1953	9.8	- /b	- /b	- /b	10.7	20.5
1954	26.8	0.1	- /b	- /b	13.4	40.3
1955	39.8	0.9	- /b	- /b	17.6	58.3
1956	49.0	1.4	- /b	- /b	15.2	65.6
1957	63.2	3.1	0.3	- /b	12.0	73.6
1958	62.2	9.4	2.2	- /b	10.9	84.7
1959	75.3	19.8	3.5	- /b	25.0	123.6
1960	63.9	11.0	4.2	- /b	15.1	94.2
1961	61.4	14.2	10.1	1.5	14.7	101.9
1962	68.8	19.9	19.7	4.8	20.5	133.7
1963	68.7	22.9	25.4	11.2	22.4	150.6
1964	63.2	33.0	42.9	19.1	22.7	180.9
1965	71.3	28.6	43.5	31.3	23.4	198.1
1966	72.8	37.0	49.1	53.3	25.1	237.3
1967	58.7	43.8	45.1	65.2	22.5	235.3
1968	85.6	55.9	77.1	108.4	29.9	356.9
1969	74.5	53.1	87.0	147.7	36.3	398.6
1970	57.9	53.0	87.3	166.0	23.0	387.2
1971	55.6	55.0	129.6	209.1	31.6	480.9
1972	48.2	59.8	187.8	266.2	35.1	597.1
1973	31.7	64.6	127.0	227.0	28.4	478.7
1974	22.7	25.9	87.0	157.4	18.1	311.1
1975	22.3	20.8	94.0	212.7	13.1	362.9
1976	29.0	32.8	110.5	258.8	14.6	445.7
1977	33.1	21.5	106.8	248.7	16.4	426.5
1978	23.7	29.0	162.8	231.6	24.5	471.6
1979 /c	17.9	33.9	147.7	176.5	14.2	390.2
1980 /c	13.9	20.0	89.2	94.8	4.1	222.0

/a Converted to 0.092903 m<sup>2</sup> per square foot.

/b Less than 30,000 m<sup>2</sup>.

/c Preliminary estimates.

Source: US Department of Agriculture Forest Service, "An Analysis of the Timber Situation in the United States, 1952-2030", Review draft. US Department of Commerce, Forest Products Review, Spring 1981, vo. xxxvii, no. 1, p. 47.

Table SA23: SHARES OF MAJOR SUPPLIERS IN  
TOTAL US IMPORTS OF HARDWOOD PLYWOOD, 1950-1978

	Japan	Philippines	Prov. of Taiwan	Rep. of Korea	Asia Total <sup>/a</sup>	Canada
	-----percent-----					
1950	8.1	0.5	-	-	8.5	79.0
1951	18.3	0.1	-	-	18.7	67.2
1952	20.3	0.1	0.1	-	20.7	67.2
1953	47.6	0.2	0.2	-	48.3	23.1
1954	66.6	0.3	-	-	67.2	16.4
1955	68.2	1.6	-	-	70.0	15.8
1956	74.6	2.1	0.1	-	76.9	11.5
1957	80.3	3.9	0.4	-	84.8	7.6
1958	73.5	10.7	2.6	-	87.2	4.7
1959	61.0	16.1	2.8	-	81.4	4.5
1960	67.9	11.7	4.5	-	84.5	4.2
1961	60.2	14.0	9.9	1.4	87.7	3.8
1962	51.4	14.9	14.8	3.6	88.2	3.9
1963	45.6	15.2	16.8	7.4	88.1	4.4
1964	34.9	18.2	23.7	10.5	89.7	3.5
1965	36.0	14.4	22.0	15.8	90.6	3.0
1966	30.7	15.6	20.7	22.5	91.2	2.5
1967	25.0	18.6	19.2	27.7	93.0	1.9
1968	24.0	15.7	21.6	30.4	94.2	1.4
1969	18.7	13.3	21.8	37.1	94.3	0.9
1970	15.0	13.7	22.5	42.9	95.9	0.9
1971	11.6	11.4	27.0	43.5	96.4	0.9
1972	8.1	9.5	21.5	44.6	96.7	1.1
1973	6.6	13.5	26.6	47.5	96.4	1.4
1974	7.3	8.3	28.0	50.6	96.4	1.4
1975	6.2	5.7	25.9	58.6	97.4	1.3
1976	6.5	7.4	24.8	58.1	97.3	1.1
1977	7.8	5.0	25.0	58.3	96.8	1.5
1978	5.0	6.2	34.5	49.1	97.0	1.5
1979	4.6	8.7	37.9	45.2	n.a.	n.a.
1980	6.3	9.0	40.2	42.7	n.a.	n.a.

<sup>/a</sup> Includes "other Asia" not separately shown.

Source: Statistical Appendix Table SA22.

Table SA24: PLYWOOD: RATIO OF EXPORTS TO PRODUCTION  
IN SELECTED ASIAN PRODUCERS, 1948-1979

	Japan	India	Prov. of Taiwan	Rep. of Korea	Philippines	Malaysia
	-----percent-----					
1948	1.8	-	-	-	-	-
1949	6.1	-	-	-	-	-
1950	10.7	-	-	-	-	100.0
1951	21.0	-	-	-	-	100.0
1952	7.4	-	-	-	-	20.0
1953	14.2	-	-	-	-	40.0
1954	30.7	-	-	-	(5.3)	16.7
1955	34.3	-	-	-	(11.1)	33.3
1956	30.5	-	8.3	-	(22.2)	40.0
1957	33.5	-	14.3	-	(25.9)	28.6
1958	32.3	-	45.5	-	(60.5)	16.7
1959	32.9	-	48.5	3.7	(72.7)	100.0/a
1960	27.5	-	55.6	6.9	(36.7)	100.0/a
1961	23.0	-	80.0	26.7	65.2	28.6
1962	19.5	-	81.8	21.4	61.8	30.0
1963	16.5	-	87.5	54.5	69.2	16.7
1964	14.7	-	91.6	70.3	73.3	50.0
1965	14.5	-	88.8	79.1	56.4	35.7
1966	12.2	1.0	88.9	78.5	55.5	30.5
1967	8.9	1.0	89.7	70.7	41.7	55.6
1968	9.0	1.8	86.5	85.3	84.5	59.2
1969	6.7	4.5	94.6	86.4	60.4	62.2
1970	4.7	7.8	89.7	97.0	40.0	73.1
1971	4.5	4.2	88.9	100.0/a	43.3	82.7
1972	3.5	4.6	84.3	100.0/a	43.3	82.1
1973	1.7	18.3	83.2	89.3	55.0	94.7
1974	1.7	20.3	73.0	84.6	62.4	69.1
1975	1.9	11.8	73.0	87.6	37.1	57.7
1976	1.9	23.4	70.3	97.1	62.5	77.5
1977	1.7	10.1	74.4	74.4	69.5	60.9
1978	1.3	8.5	77.2	45.1	78.2	88.2
1979	1.3	3.9	74.3	55.5	80.7	88.2

/a Over 100.0

Source: See Tables 3.3 and 3.4.

Table SA25: INDONESIA--PRODUCTION, EXPORTS AND CONSUMPTION OF LOGS, 1970-1979

	Logs		Net Volume Available For Local Processing (3)	Estimated input into Local Processing		Total (6)	Discrepancy (3)-(6) (7)
	Production (1)	Exports (2)		Sawmills/ <sup>a</sup> (4)	Plywood/ <sup>b</sup> (5)		
-----million m <sup>3</sup> (r)-----							
1970	10.78	7.83	2.95	3.40	0.02	3.42	-0.47
1971	13.81	10.82	2.98	3.41	0.02	3.43	-0.45
1972	16.92	13.35	3.57	3.41	0.01	3.42	0.15
1973	26.30	18.50	7.80	2.76	0.02	2.78	5.02
1974	21.73	16.87	4.86	3.84	0.05	3.89	0.97
1975	16.70	12.88	3.81	3.45	0.24	3.69	0.12
1976	23.80	18.11	5.70	3.84	0.44	4.28	1.42
1977	23.49	18.93	4.56	4.02	0.61	4.63	-0.07
1978	27.81	19.46	8.35	5.00	1.05	6.05	2.30
1979	27.50	17.58	9.92	6.21	1.33	7.54	2.38

<sup>a</sup> Assuming 50% recovery.

<sup>b</sup> Assuming 45% recovery.

Source: FAO for Log production 1970-1977 and log exports 1970-1978; production 1978-1979 Indonesian Timber Association for log.

Table SA26: SELECTED INDICATORS FOR PLAIN PLYWOOD PRODUCTION  
IN JAPAN, 1970-73 and 1977-79

	(A)	(B)	(C)	(D)
3-year Average	Gross value added to logs per m <sup>3</sup> of logs	Production volume per employee (4mm basis)	Wood recovery rate	Wages/salaries per employee per year
	(1979 US\$)/ <u>a</u>	m <sup>2</sup> (plywood)	%	(1979 US\$)/ <u>a</u>
1970-73 (index)	154.74 (100.0)	34,836 (100.0)	53.33 (100.0)	6,757 (100.0)
1977-79 (index)	68.13 (44.0)	59,419 (170.6)	64.43 (120.8)	10,687 (158.2)

/a Deflated by the World Bank Index of Inflation.

Source: (A) - Table 3.8

(B), (C) and (D) - Plywood Information Center of Japan Federation of Plywood Manufacturers' Association, "Nichigooren Jihoo," News-letter No. 45, June 30, 1980.

Table SA27: VALUE ADDED AS PERCENT OF GROSS OUTPUT IN WOOD PROCESSING INDUSTRY IN SELECTED COUNTRIES

	Peninsula Malaysia/ <sup>a</sup>	Indonesia/ <sup>b</sup>	Philippines/ <sup>c</sup>	Republic of Korea/ <sup>d</sup>
1959	38.7			
1960			40.6	
1963	37.0			34.7
1966				22.7
1967				23.5
1968	37.8			30.6
1969				20.5
1970	35.6		38.6	
1971		28.4		
1972	34.6			
1973	36.9			
1974	34.2		37.8	
1975				

<sup>/a</sup> MIC (1972) Industrial Group Code 331, "wood, and wood and cork products".

<sup>/b</sup> "Wood and wood product" in 66 order Input-Output Table.

<sup>/c</sup> "Wood manufacturing" (excluding furniture and pulp/paper).

<sup>/d</sup> Plywood and veneer panels.

Source: Malaysia - Vinod Prakash, "A Study of Growth Performance and Outlook of Manufacturing Sector in Malaysia," p.152.

Indonesia - World Bank, "Problems and Prospects for Industrial Development in Indonesia," vol. 1, p. 96.

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