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Forest Products Sector Profile of South Korea

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FOREST PRODUCTS SECTOR PROFILE OF SOUTH KOREA

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1. INTRODUCTION

Historically, South Korea has played a key role in global forest products trade. In the seventies for example, it was one of the world's greatest producers of plywood. Presently however, recent events have compromised this position. One of these has been the ban of log exports by Indonesia, once South Korea's primary source of supply for domestic plywood production.

Another factor concerns S. Korea's existing forest inventory. Much, if not all, of the timber of merchantable diameter was cut during World War II and to a lesser extent during the Korean War. This event, coupled with a post war intensive reforestation effort, has produced a nearly even aged composition of standing inventory of no more than 12 inches in diameter.

Questions concerning the implications of the country's forest products sector, domestic requirements and sources of supply have arisen.

This paper will examine some of these issues and their effects on Korea and its position in global forest product trade flows.

2. COUNTRY DATA

2.1 Basic Country Data

Land Area	98,824 KM
Population	39,95 million (mid - 1983 est.)
Population Centers	(000) (1978)
Seoul	8,364
Pusan	3,159
Taegu	1,601
Inchon	1,083
Kwangju	727
Taejon	651

Climate: Continental with extremes of temperatures
Languages: Korean
Currency: The won exchange rates on April 29, 1987
$1 = W

South Korea is a peninsula measuring about 500 km long and 250 km wide. Of the total land area, much of which is steep terrain, approximately 2/3 is forested.

2.2 Demographic Data

South Korea has a population of approximately 40 million people concentrated primarily in urban centers (Figure 1). The capital, Seoul, contains over 1/5 of the population. This concentration of people concerns the government because of the city's strategic proximity to North Korea. The population density of 1,051 persons per square mile makes South Korea the third highest in the world after Taiwan and Bangladesh (Economic Intelligence Unit, 1985).

After nearly four years of recession in the years 1978-1982, South Korea's economy saw vigorously in 1983. The gross national product (GNP) grew by an inflation adjusted rate of 9.6% in the first half of 1983 compared to the first half 1982 rate (Figure 2). This high growth in GNP has continued and is attributed primarily to an increase in domestic demand. Consumption rose 7.7% over 1982-1983 compared to only 2.2% from 1981 to 1982 (ASIA yearbook, 1984 Far Eastern Economic Review).

Over the past two decades forestry and agriculture contributions to South Korea's GNP have declined dramatically. Combined, from 1965 to 1984, their contribution declined from 43% to 15%. Forestry sector contribution declined from 2.6% to 0.9% over this period (Schreuder, 1985). As stated this represents a relatively insignificant contribution that will continue to decline.

2.3 Currency

A new currency was introduced in 1962, the won, with an equivalent value of 10 Kwon (the previous currency) and 130 to the US dollar. In the two years since 1962, the won had depreciated 49 percent against the dollar and an additional 22 percent depreciation occurred from that time until 1971. Continued depreciation has followed and presently the exchange rate is W 886.5 = 1 $ US (on May 8, 1985) (Economic Intelligence Unit, 1985) (Figure 3).

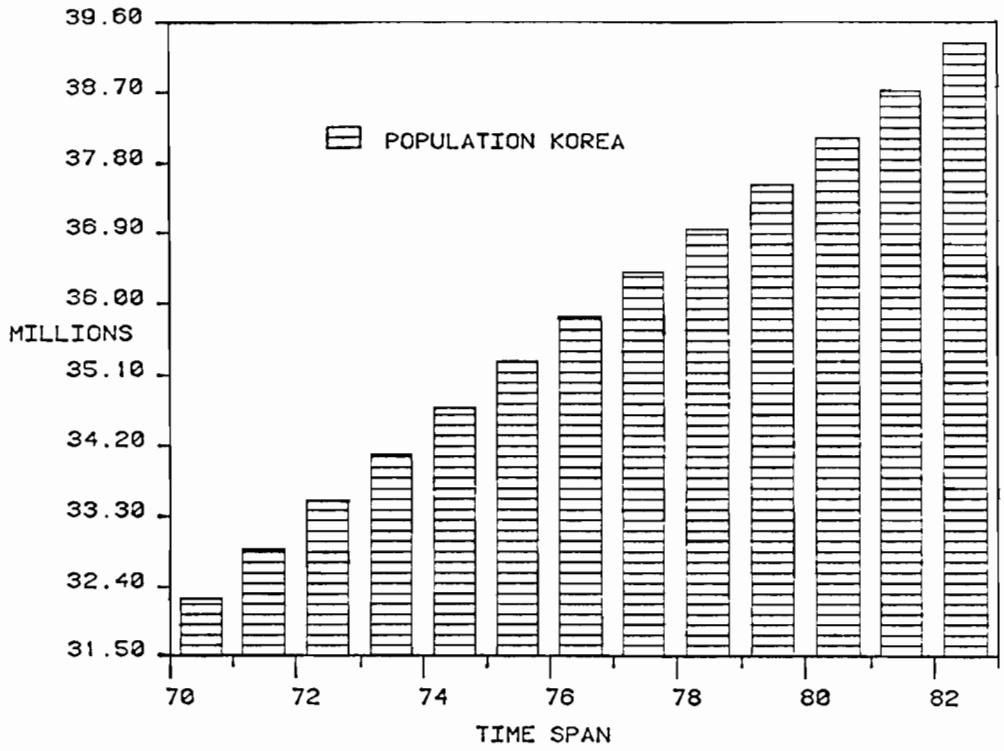

Figure 1. Korea Population 1970-1983.

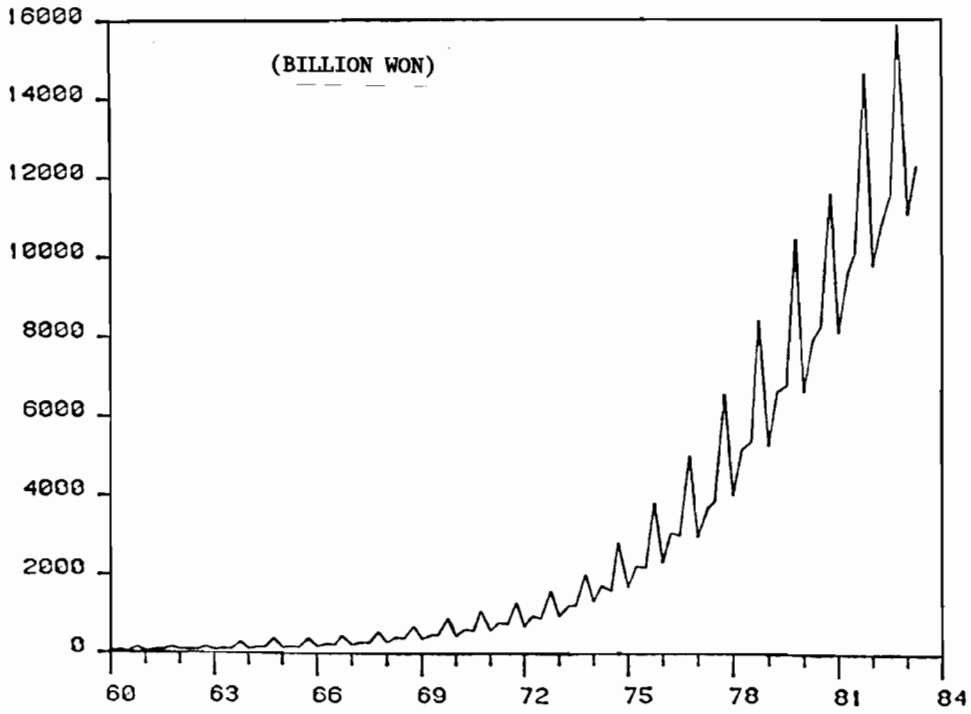

Figure 2. Korea GNP 1960-1983.

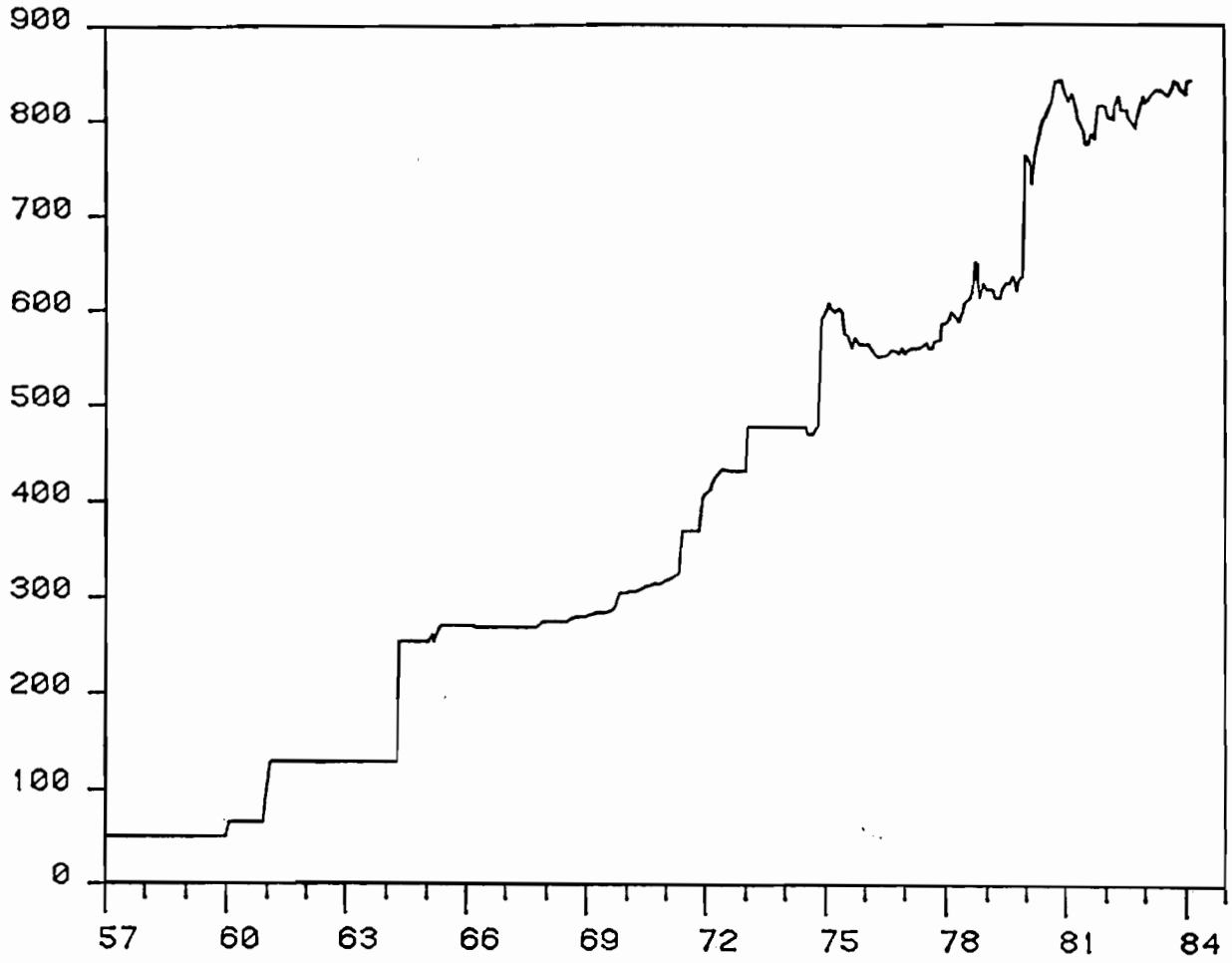

Figure 3. Exchange Rate Won/$US 1957-1984.

2.4 Imports/Exports

Tables 2-1, 2-2 and 2-3 show the trade balance of South Korea from 1978-1984, the composition of trade from 1981-1984, and South Korea's main trading partners in 1983 and 1984. This table indicates that forest products are not a significant component of South Korea's foreign trade. The United States by far is the largest market for South Korean exports and is also nearly equal with Japan as the main source of imports. Both export and import volume and values have been increasing rapidly in the past 15 years as a result of great strides made in domestic industrial expansion and increases in domestic demand (Figure 4, 5). Also in Table 2-3 it should be noted that South Korea has been running a net trade deficit for the past 10 years but the gap between exports and imports is narrowing. According to a forecast by the authors, a trade surplus should occur by mid 1986 (Figure 6).

Table 2-1. Main Trading Partners (% of total trade).

Exports to:	1983	1984	Imports from:	1983	1984
USA	33.7	35.8	Japan	23.8	24.9
Japan	13.9	15.7	USA	24.0	22.4
Hong Kong	3.3	4.4	Saudi Arabia	7.7	4.5
Saudi Arabia	5.9	3.4	Australia	3.7	3.6
UK	4.1	3.3	Malaysia	3.0	3.3
West Germany	3.2	3.2	West Germany	2.5	2.6
Canada	2.6	3.0	Indonesia	1.5	2.1
Panama	0.9	1.8	Canada	1.7	2.1
Singapore	2.2	1.7	UK	1.8	1.8

Source: Bank of Korea, Monthly Economic Statistics.

Table 2-2. Composition of Foreign Trade ($ million)

	1981	1982	1983	1984
Manufactured goods of which:	2,775.3	2,610.4	2,997.7	3,761.9
textile yard and thread	166.8	187.2	157.8	191.0
woven textile fabrics	212.8	198.8	210.8	258.7
iron and steel ingots	380.5	200.2	347.8	484.0
Machinery and transport equipment of which:	5,999.5	6,008.5	7.548.2	9,796.6
power generating machinery	563.7	495.2	487.7	627.7
office machines	179.0	247.9	353.4	388.4
metal working machinery	258.5	121.0	173.7	175.2
textile machinery	186.1	211.3	189.4	221.3
electric power machinery	438.3	486.0	523.3	643.8
telecommunications equipment	461.9	514.4	584.0	523.0
transistors	611.6	637.9	922.6	1,295.4
aircraft	419.7	71.1	138.1	295.2
ships, etc.	873.0	1,119.2	1,797.9	2,704.2
Professional and scientific instruments	395.7	391.8	462.3	527.0
Total (including others)	26,131.4	24,250.8	26,192.2	30,631.4

Source: Bank of Korea, Monthly Economic Statistics.

Table 2-3. Foreign Trade and Payments. Total Value of Foreign Trade ($ million; exports fob, imports cif)

	Exports	Imports	Balance
1978	12,710.6	14,971.9	-2,261.3
1979	15,005.5	20,338.6	-5,283.1
1980	17,504.9	22,291.7	-4,786.8
1981	21,253.8	26,131.4	-4,877.6
1982	21,853.4	24,250.8	-2,397.4
1983	24,445.1	26,192.2	-1,747.1
1984	29,244.9	30,631.4	-1.386.5

Source: Monthly Review, Korea Exchange Bank.

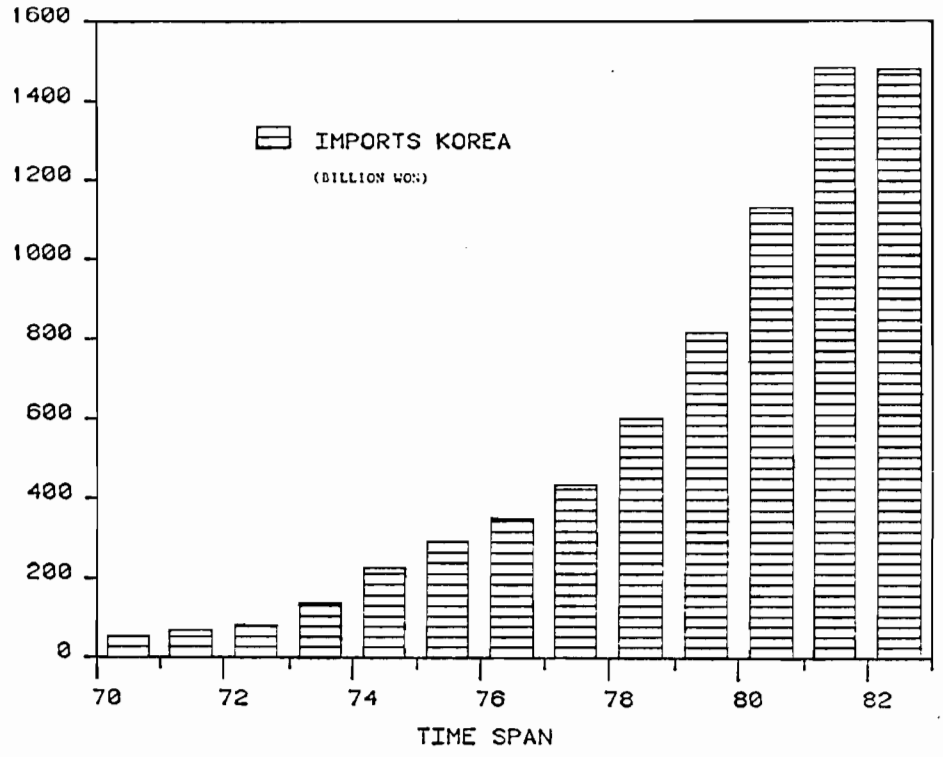

Figure 4. Total Imports Value 1972-83.

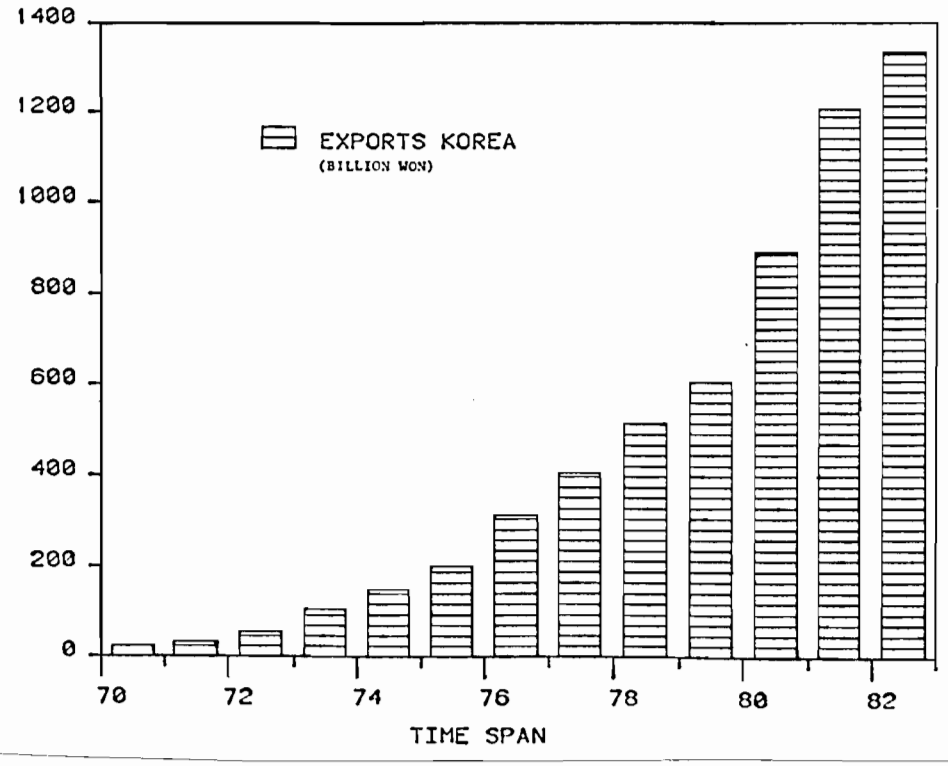

Figure 5. Total Exports Value 1972-83.

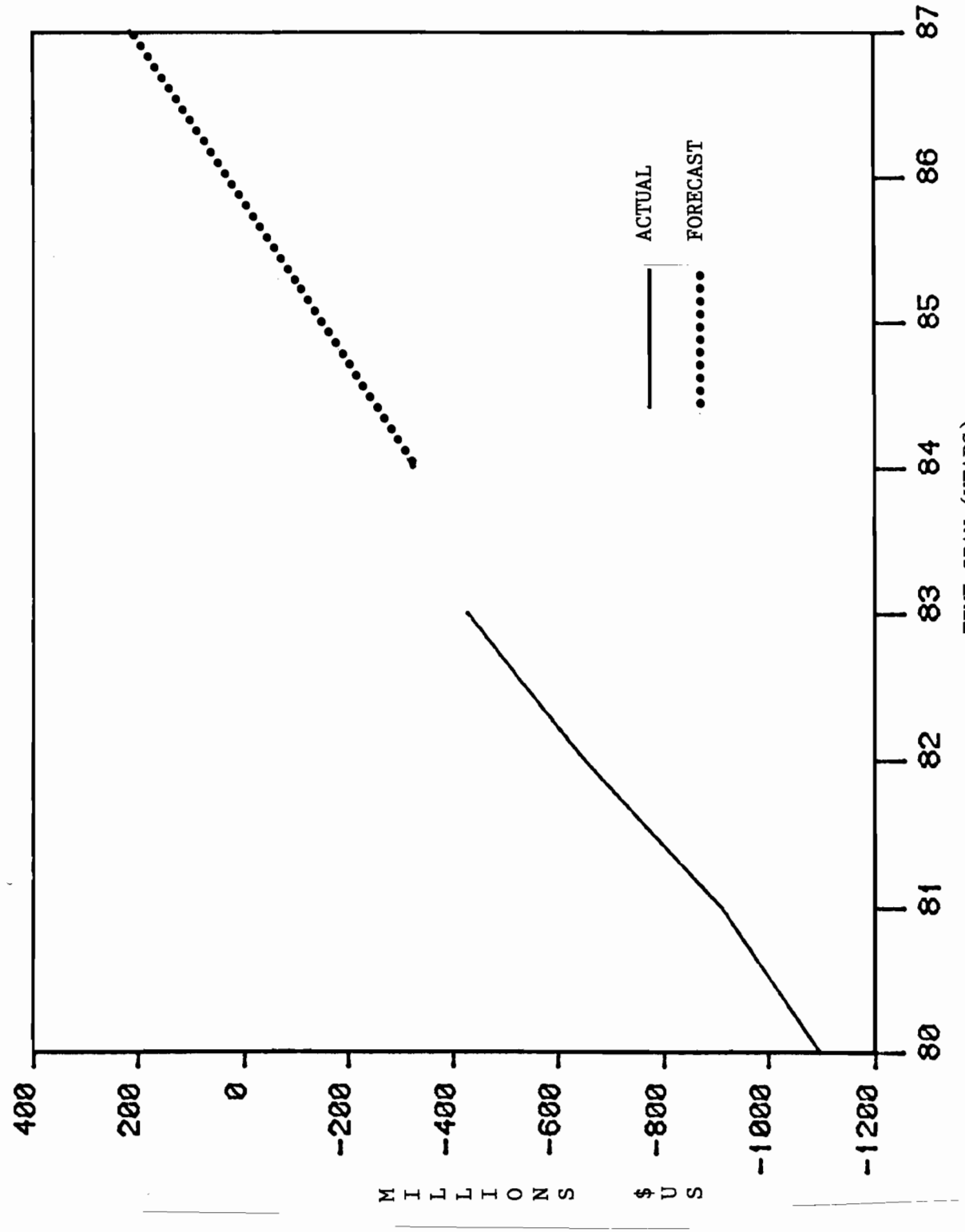

Figure 6. Trade Balance 1980-1986.

3. SOUTH KOREA'S FOREST RESOURCES

3.1 Forest Base

Of the total land area of South Korea, 66% has been classified as forest land (Table 3-1). However, only 2% of the inventory on this forest land is over 40 years old. Ninety percent is under 20 years old--a direct result of the past use of fuel wood, South Korea's traditional fuel source until recent modernization (Schreuder, 1985). The dimensions of wood produced over the next two decades will be small. The ratio of forest stock (1000 m^3) to each 1000 ha of forest area had been continually declining until 1970 when the first ten-year forest plan precipitated an increase in this ratio (Table 3-1) (Truitt, Lee, 1985). Current plans call for rotation areas of 25-30 years for pulpwood and up to 50 years for dimension timber.

Table 3-1 also shows the pattern for forest land ownership. In 1982 72 percent of the forest land was privately owned. This component contains over 55% of the standing timber volume. This has created a problem for management of forest lands because most of these private holdings are less than 10 ha in size. Also, many of these private holdings are used as traditional family burial sites which precludes other uses.

In general, South Korea can be expected to continue its decline in timber production over the next 20 years. What is produced will be of small dimensions. Rough terrain, combined with problematic ownership patterns, will make extraction costly and delivered prices high creating a disparity between domestic and import prices for wood.

Table 3-1. Forest Land and Forest Stock in Korea.

	Forest Land (1000 ha)					Forest stock	Stock per hectare
	State owned A	Publicly owned B	Privately owned C	Total D	% of total land area E	(1,000 m^3) F	(m^3 ha) F/D
1967	1,306	496	4,838	6,640	67.4	63,746	9.6
1972	1,287	497	4,813	6,597	67.0	72,696	11.0
1977	1,308	502	4,703	6,593	66.9	111,011	16.8
1978	1,308	502	4,768	6,578	66.7	114,000	17.3
1979	1,307	501	4,763	6,571	66.5	117,281	17.9
1980	1,314	495	4,759	6,568	66.3	145,694	22.1
1981	1,310	495	4,758	6,563	66.3	151.550	23.0
1982	1,314	493	4,746	6,553	66.2	157.756	24.0

Source: Office of Forestry, Ministry of Interior Affairs.

3.2 Dominant Commercial Species

The technical characteristics of the five main commercial timber species are given in Table 3-2. Following is a brief description of each species' role in South Korea's forest products sector.

3.2.1 *Pinus densiflora* (red pine)

Red pine is a very desirable species for both pulp manufacture as well as construction purposes. However, the form of this species is generally poor

Table 3-2. Properties of Five Major Commercial Tree Species Grown in Korea.

Species	Specific gravity (12%)	Shrinkage (%)		Mechanical Strength (kg/cm^2)		
		Radial	Tangential	Bending	Compres-	Tensile
Pinus densiflora	0.50	4.9	9.1	890	480	101
P. koraiensis	0.48	2.8	7.4	770	430	95
P. rigida	0.54	5.5	7.9	950	470	103
Laris leptolepis	0.52	5.4	8.4	900	530	87
Quercus spp.	0.79-0.84	5.0-7.6	8.3-13.6	1010-1480	510-560	109-154

Species	Pulping characteristics					Chemical properties (%)			
	Total yield (%)	Breaking length (km)	Burst factor	Tear factor	Kappa No.	Holo-cell-ulose	Lignin	Pen-tosan	Alcohol benzen extra-tives
Pinus densiflora	46	10.8	10.9	156	24	76	28	14	5
P. koraiensis	40	9.5	7.8	257	42	77	29	14	6
P. rigida	47	10.6	12.4	214	27	71	27	13	4
Larix leptolepis	42	11.7	6.0	183	34	68	30	11	3
Quercus spp.	46-50	8.4-10.1	6.5-7.8	99-125	11-20	70-82	19-23	21-24	3-5

Source: Forestry Handbook (written in Korean) pp. 768-771, published Forestry Administration, Republic of Korea.

resulting from insect attacks, lack of adequate silvicultural practices and negative genetic selection. This poor form material is best suited to pulp production. It is found in all parts of the country and is planted.

3.2.2 Pinus koraiensis (white pine)
White pine is a very desirable species. Its form is generally good. It is a very desirable species for pulp production, and because of its moderate strength, slow growth and narrow rings it is also a good wood for construction purposes. It has been planted extensively in the northern part of the country and could probably be planted more extensively in the southern part of the country.

3.2.3 Pinus rigida (pitch pine)
Pitch pine is not a desirable species from a utilization or marketing standpoint even though it has been planted extensively in the past for fuelwood purposes. It has a very high resin content making it undesirable for both pulping and manufacturing purposes. As modernization continues, this species presence will decline as the demand for fuelwood also declines.

3.2.4 Larix leptolepis (Japanese larch)
Japanese larch is also an undesirable species even though it has been planted extensively throughout the country. Its pulp yield is low and its dimensional stability is marginal making it inadequate for both pulp and construction purposes where strength for structured support is required. Present uses are for chopsticks and matches as well as for scaffolding.

3.2.5 Quercus spp. (oak)
Oaks generally are very desirable from a utilization point of view, but the form of oak in South Korea is very poor due primarily from lack of silvicultural management practices. Small dimensions could potentially be used for furniture parts, molding, flooring, etc., but no larger dimensions exist for structural purposes. It occurs extensively throughout the country and is a good candidate for future management practices.

3.3 Forest Development Plan
The forest resources in South Korea have been controlled by the government and this is expected to continue. Each tree is cut with explicit permission from the government. The government therefore holds direct control over the timber supply from domestic sources. As stated in the Second 10-Year Forest Development Plan, the harvesting of domestic timber will be maintained at a minimum level for the next 2 decades. This clearly indicates that the country will rely on the foreign timber for its domestic wood consumption (Table 3-3).

Table 3.3 Long-term plan of timber demand and supply.

Unit: 1000 m^3

Period	1980s		1990s					
Demand and Supply	'78	'80	'88	'90	2,000	2,010	2,020	2,030
Demand	10,584	12,282	17,985	19,335	22,542	25,179	26,560	27,100
Domestic use	6,111	7,664	13,191	14,541	19,542	22,679	24,560	25,600
Pitprops	617	717	718	670	--	--	--	--
Pulpwood	203	783	1,630	2,074	--	--	--	--
Veneer logs	1,603	2,209	4,528	4,729	--	--	--	--
General use	3,688	3,955	6,315	7,068	--	--	--	--
Export use	4,473	4,618	4,794	4,794	3,000	2,500	2,000	1,500
Supply	10,584	12,282	17,985	19,335	22,542	25,179	26,560	27,100
Domestic timber	1,270	1,321	2,289	2,950	6,416	9,000	11,000	13,000
General spp.	1,200	1,200	1,400	1,500	2,000	4,000	6,000	8,000
Poplar spp.	70	121	889	1,450	4,416	5,000	5,000	5,000
Imported timber	9,314	10,961	15,696	16,385	16,126	16,179	15,560	14,100
Purchase	8,714	10,211	14,746	15,385	--	--	--	--
Exploitation	600	750	950	1,000	--	--	--	--
Rate of Self-sufficiency (%)	12	11	13	15	28	36	41	48
Self-sufficiency for domestic use (%)	21	17	17	20	33	40	45	51

Source: Office of Forestry, Republic of Korea. The Second 10-Year Forest Development Plan, 1977-1988.

4. PRODUCTION, CONSUMPTION, IMPORTS, EXPORTS OF FOREST PRODUCTS

4.1 Overview

The forest products sector in South Korea is an interesting sector from an economic and market point of view. Neither forestry nor agriculture have been what is commonly referred to as the engine of growth. Though both agriculture and forestry have increased tremendously in absolute terms since 1965, their respective relative shares of GNP have decreased very sharply. The inescapable conclusion is that the forestry sector is a negligible part of the total economy. And there is very little chance that this will change.

Still, the forestry sector as of 1984 is a half billion dollars per year (428 billion won) business. And this amount has been increasing yearly in a very cyclical manner: 2-3 years of growth followed by a decline. In some years the forestry sector would grow by as much as 27% per year, in others it would decline by as much as 19%. The overall trend over the last 20 years, however, has been up. One also has to keep in mind that in one aspect at least, the forestry sector plays a dominant role in Korea: 2/3 of its land area is covered with forests. The numbers referred to above only concern themselves with the most tangible output of the forests: wood.

The domestic production of wood has increased from about 1/2 million m^3 per year in 1964 to about 1.1 million m^3 in 1984. Over the same period total consumption has increased from 1 million m^3 to 7.5 million m^3 in 1984 (a peak was reached in 1978 of 11.6 million m^3). This means that although the domestic production doubled in 20 years, imports went up ten times. Stated differently, the percentage of the domestic supply over total domestic consumption went down from 47% to 15%; Korea has become more dependent on imports. If one nets out of the domestic consumption the wood which is exported or re-exported (especially in plywood form), the self-sufficiency rate goes up from 15% to 17% (in 1984).

4.2 Trends: Past and Prest

4.2.1 Logs

South Korea imports most of its logs mainly for use in its sawmilling and plywood manufacturing industries. Historically, South Sea hardwood logs have contributed the greatest share of imported timber. In volume terms in 1983, 64% of all imported wood was hardwoods (mostly Lauan) from Malaysia, Indonesia and the Philippines (Schreuder, 1985).

Overall demand for log imports has been declining in recent years due to the slumping plywood industry, a direct result of the log import ban from Indonesia, previously South Korea's number one supplier. Imports declined 12% from 1983 to 1984 and an additional decline occurred in 1985 (FAS 1985).

The United States and Malaysia have become and will remain South Korea's main suppliers of softwood and hardwood logs respectively. In 1984 the U.S. supplied 23% of South Korean log imports and 66% of softwood log imports.

U.S. Market share may erode in the future as radiata pine plantations in Chile and New Zealand continue to be harvested and exported.

Domestic logs, as previously stated are of small diameter and are used primarily for mine timber and pulp production. In 1984, domestic log production was 1.1 million cubic meters. Tropical hardwood logs are still used to supply the declining plywood industry. The sawmilling industry on the other hand has increasingly been using softwood logs for construction and carpentry purposes. Figures 7 and 8 show the trends in imports of both softwood and hardwood logs.

Of the domestically produced wood, almost 60% is used for pit props (in 1984), 25% for pulp rpdocution and 16% as general timber (construction). In terms of total wood consumption, about 40% is consumed as sawn timber, 5% as mine props, 30-40% as plywood and 20% as pulp wood. Between 2/3 and 1/2 of these plywood figures are exported, most of the other products are indeed consumed domestically (a dwindling percentage of newsprints, crates and boxes is exported also) (see Table 4-1).

4.2.2 Sawnwood

The consumption of sawnwood has increased at about 7 percent per year in Korea for the last two decades. The major uses of sawnwood are building construction (54.2%), crates (13.5%), furniture (11.0%), and civil construction and others (21.3%) (Shim et al. 1982).

The domestic species used for sawmilling are red pine (85%), Japanese larch (9.5%) and oaks (5.5%). The imported species are western hemlock (33.9%), Radiata pine (27%), Lauan (15.6%), Douglas-fir (5.4%), and other South Seas species (about 14%) (Lee, C. O. et al. 1983)

South Korea is almost totally independent upon wood imports for construction purposes. Once again logs are generally imported and converted to dimension lumber, boards and construction grade lumber in country. Severe foreign competition and the uneconomical domestic operations have caused many closures in the sawmilling industry. Total sawmilling capacity is estimated to be 8 million cubic meters of logs, but a capacity utilization of only 56% has existed for the past 2 years. Sixty percent of softwood lumber is used for housing construction of which 220,000 units were built in 1984 (FAS, 1985).

Total lumber imports did, however, increase 33% in volume between 1983 to 1984. Three-quarters of all lumber is hardwood supplied from South Sea sources (Indonesia, Malaysia). Softwood lumber, 1/4 of lumber imports, comes mainly from Japan and the U.S. Douglas-fir lumber is making inroads in the manufacture of joinery which may step up demand for this species.

Table 4-2 shows the pattern of sawnwood imports from 1977 to 1981.

4.2.3 Plywood

South Korea has suffered a truly devastating blow to its plywood industry over the past 10 years. The country's once numerous plywood mills were installed anticipating an uninterrupted inflow of South Sea logs to fully utilize capacity. This assumption proved false when, in 1981, Indonesia began implementing a total ban on log exports and installing truly phenomenal domestic plywood manufacturing capacity. Table 4-3 and Figure 9 clearly show the rapid decline of a once prosperous industry. Conversion to softwood oriented machinery has proven to be extremely costly, resulting in a selling off of existing plants. In essence, the industry's exports have been declining about 30% per year and this is expected to continue (FAS, 1985).

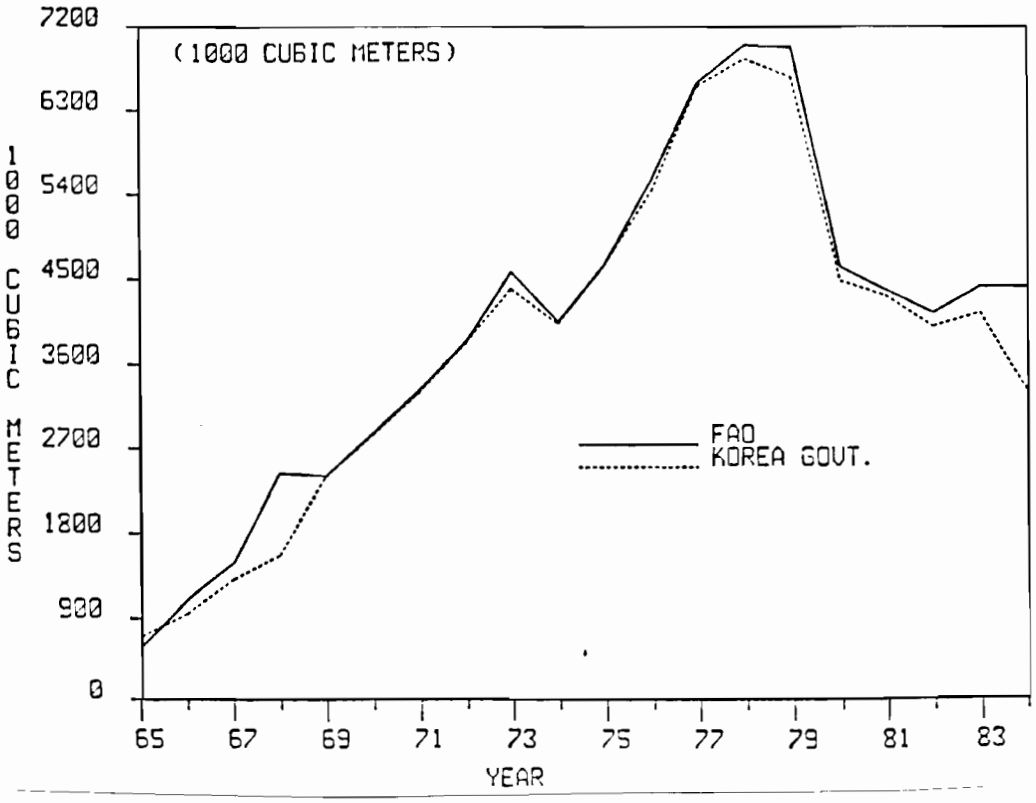

Figure 7. Korea Non-Conifer Sawlog Imports 1965-1984.

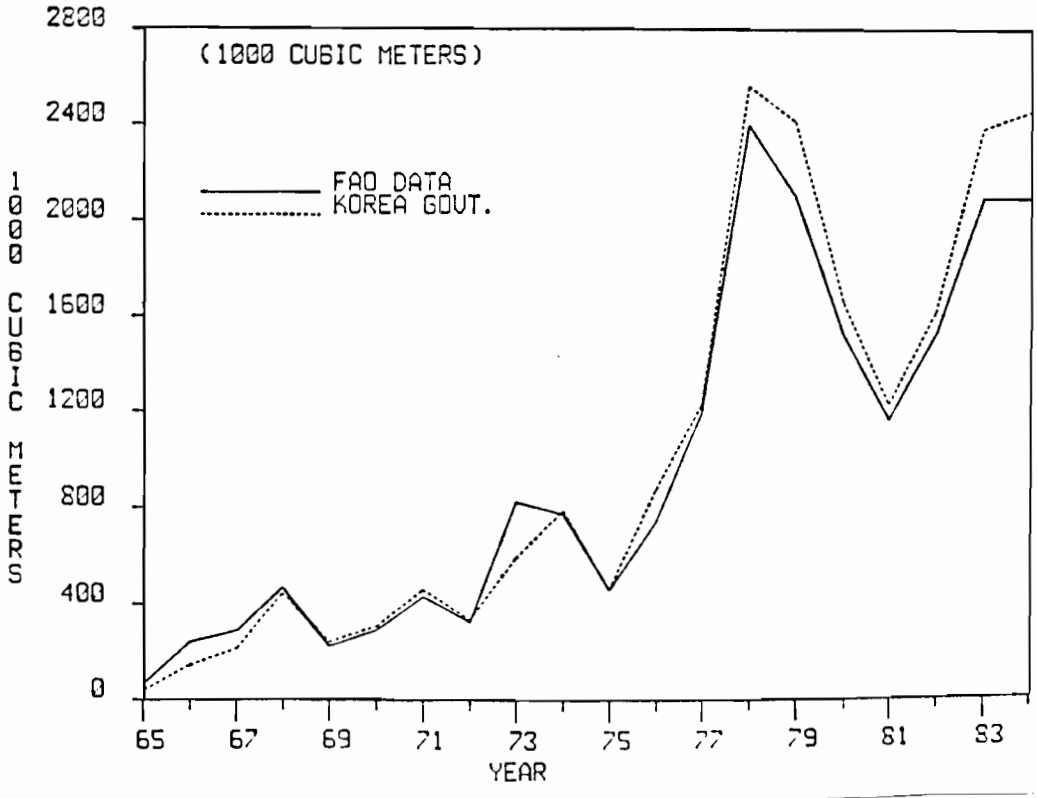

Figure 8. Korea Conifer Sawlog Imports 1965-1984.

Table 4-1. Trends in roundwood consumption by use (unit: $1000m^3$).

Year	Demand								
	Total	Domestic use					Export		
		Subtotal	Pit props	Pulpwood	Plywood	General use	Sub-total	Plywood	Sawn timber and secondary product
1964	1,058	750	281	36	--	433	308	308	--
1965	1,259	748	304	41	--	403	511	511	--
1966	1,877	1,169	313	83	--	773	708	707	1
1977	2,320	1,324	335	111	--	878	996	993	3
1968	2,810	1,550	367	158	--	1,025	1,260	1,259	1
1969	3,534	1,510	386	200	--	924	2,024	2,020	4
1970	4,000	1,713	450	206	--	1,057	2,287	2,270	17
1971	5,060	2,192	470	265	--	1,457	2,868	2,851	17
1972	5,348	2,293	395	216	--	1,682	3,055	2,979	76
1973	6,412	2,782	418	204	--	2,160	3,630	3,205	425
1974	6,356	2,873	456	239	--	2,178	3,483	3,003	480
1975	6,465	2,889	542	188	--	2,159	3,576	3,226	350
1976	7,825	2,700	498	254	--	1,948	5,125	4,368	757
1977	9,817	4,406	534	241	318	3,313	5,411	4,887	524
1978	11,611	6,346	617	313	541	4,875	5,265	4,528	737
1979	10,940	6,616	626	233	1,792	3,965	4,324	3,031	1,293
1980	7,750	5,785	515	546	1,603	3,121	1,965	1m753	212
1981	7,265	4,585	628	497	1,345	2,115	2,680	2,497	183
1982	7,417	5,661	650	546	1,556	2,909	1,756	1,499	257
1983	8,302	7,340	635	533	1,928	4,244	962	771	191
1984	7,472	6,727	685	536	1,528	3,978	745	488	257

Source: Office of Forestry, Republic of Korea, Forestry Statistics 1985.

Table 4-2. Republic of Korea: imports of sawnwood, by origin, 1977-1981.

Quantity (Q): '000 cu.m
Value (V): $'000

Origin	1977		1978		1979		1980		1981		Index 1981 1977 = 100	
	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
Total	14	1,380	22	2,464	21	6,177	166	4,913	183	15,267	1,316	1,105
Of which												
From developing countries/ areas	..	152	2	412	4	952	14	2,060	118	6,435	n.s.	n.s
Of which:												
Indonesia	..	13	..	22	3	571	13.5	1,917	110	5,193	n.s.	n.s.
Malaysia	--	--	2	275	1	207	0.4	67	8	1,102	--	--
Burma	--	--	--	--	..	8	..	11	..	66	--	--
Singapore	--	--	--	18	--	8	0.1	17	..	39	--	--
Thailand	..	139	..	77	..	144	..	15	..	20	13	14
From other countries	14	1,228	20	2,052	17	5,225	152	2,853	65	8,832	472	719
Of which:												
United States	4	885	7	1,376	11	2,710	3	1,250	53	6,502	1,350	735
Japan	10	343	13	626	6	2,317	20	1,246	9	1,080	91	314
Canada	--	--	..	44	..	86	3	200	2	737	--	--
China	--	--	..	5	..	106	101	97	..	485	--	--

Source: Ministry of Finance, Office of Customs Administration, Statistical yearbook of foreign trade, 1977-1981 (Seoul).

Table 4-3. Plywood Exports (Units: mn sq. ft.).

	Total	U.S.	Saudi Arabia	Libya	U.K.	Netherlands	Belgium	Nigeria
1977	4619	2693	6	7	232	144	91	19
1978	4353	2500	274	7	277	311	147	38
1979	3518	1896	354	9	211	300	140	27
1980	2564	1133	470	53	32	182	18	147
1981	2701	983	621	161	189	128	82	166
1982	1588	525	454	9	11	30	9	68

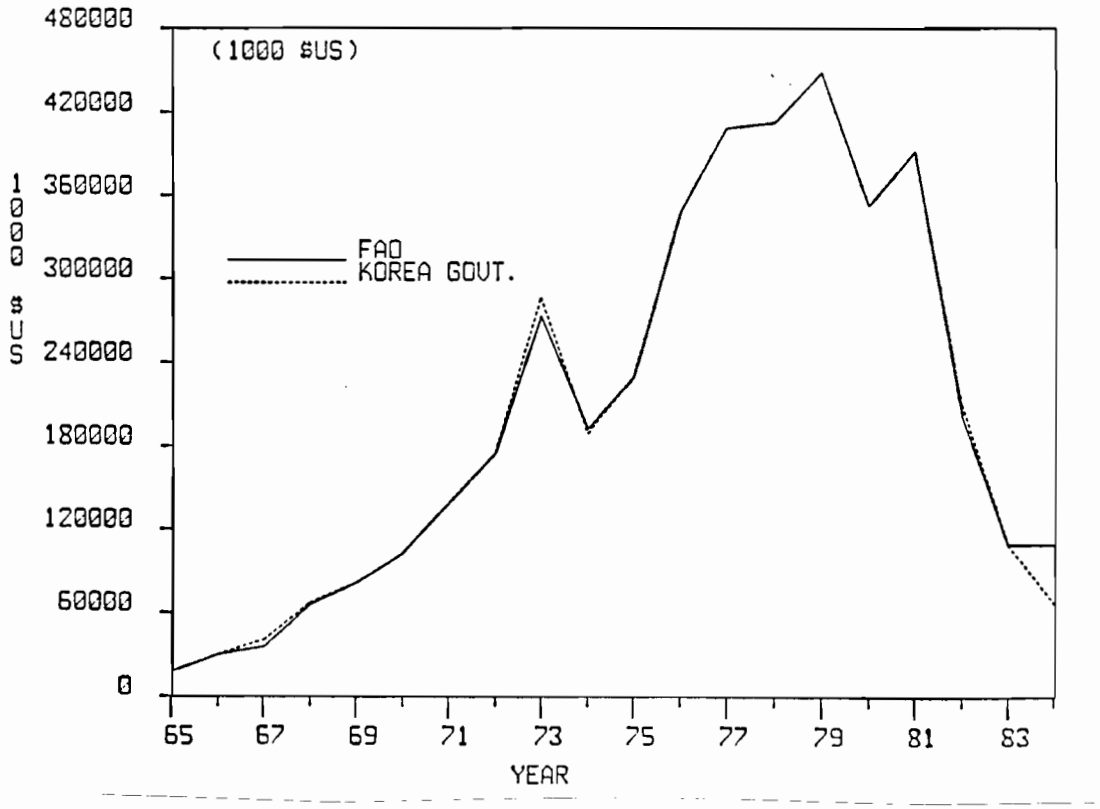

Figure 9. Korea Plywood Exports Value 1965-1984.

A 30% tariff on plywood imports has discouraged imports and is an attempt to bolster waning domestic production.

4.2.4 Other Board Products

Presently, all hardboard consumed in South Korea is produced by one domestic plant which supplies primarily the electronics and automobile industries. As these industries expand, production is expected to increase.

Medium density fiberboard (MDF) is used extensively in South Korea's furniture industry and demand for this material is increasing rapidly. One MDF plant is currently being built with a capacity of 60,000 cubic meters/year. Production is expected to begin in 1986 and it is anticipated that the plant will adequately satisfy domestic demand for the near future.

Most particleboard consumed in South Korea goes into furniture production with the domestic furniture marketing being considerably larger than the export market. Presently there are two particleboard plants in South Korea with a combined capacity of 150,000 cubic meters/year. In 1984 103,806 cubic meters of particleboard were imported to South Korea with the United States supplying 60% followed by Chile (16%), New Zealand (14%) and Japan, Indonesia and Singapore with less than 3% each. United States particleboard is highly desired because of quality characteristics although less expensive material can be found from other sources.

4.2.5 Pulp, Paper and Paper Products

There are a number of mechanical pulp mills, many paper mills and only one chemical pulp mill in South Korea. The mechanical pulp mills generally use domestic pines and the chemical pulp mill (in Ulsan) uses both domestic softwoods and hardwood in log and chip form as well as imported chips primarily from Australia. Pulp plant capacity has been increasing steadily in the last 2 decades with a 53% increase in 1980 and a leveling off since then to about 307 metric tons/year. Imports of pulp have been rising over the last 15 years with the United States consistently capturing about 32 percent of market share followed by in 1983 Canada (14%), Sweden (13%), Japan (7.1%), and most recently Chile with 11.2%. It is noteworthy that Chile has become the number four supplier of pulp to South Korea having had virtually no pulp exports fifteen years ago.

There are a large number of paper and paper product mills in Korea. Korea has become more or less self sufficient in paper production with sometimes a small exportable (to the Middle East) surplus.

5. CONSUMPTION PROJECTIONS

Historical wood products consumption figures for Korea since 1961 are presented in table 5-1 together with the corresponding GNP and population figures. To derive consumption projections it was decided to use some very simple relationships rather than the more theoretically correct (and more complicated) econometric approaches. There are several important reasons for this.

a. The emphasis in this section is on obtaining some hopefully reasonable future consumption estimates rather than on attempting to understand the economic behavior of the forest products sector. The projected figures for independent variables are scarce in most countries; as is the case in Korea, they are in fact often limited to projections for GNP and population (see Table 5-2). This in itself limits the relationships that can be used for forecasting purposes.

b. No one will deny that consumption and production are influenced by price. Supply and demand are price related functions; a market clearing price for a given product is established at the intersection of these 2 functions. Hence a simultaneous equation approach is the preferred way of estimating production and consumption. Or, short of this, a set of functions which relate consumption and production to price as one of the independent variables. However, there is much less agreement how these functions should look in centrally planned economies or in those economies where price is a rather insignificant variable in determining production and consumption. It is here not argued that price is irrelevant in Korea in the forest product sector. However for the specific period (1961-1984) for which consumption and production figures are available, the Korean forestry sector faced some very unusual situations greatly limiting the role of prices as a market guiding mechanism. Korea found itself after several wars in 1955 not only with a totally depleted forest resource but with an urgent need for reforestation to control a very severe erosion problem. Also the need for such basics of life as firewood and shelter was great enough that what little wood available was used for these purposes (either through the market place or not). Finally the government played a strong central planning role in the Korean economic miracle, which only recently is being relaxed. Also Korea still levies tariffs on forest product imports which are among the highest in the Pacific Rim, ranging generally from 5-30%; it even taxes log imports at the rate of 5-15% (with the recent exception of luan or meranti logs). To maintain that price is an important determinant for production and consumption figures in this period is dubious at best; more probably it is unrealistic. This situation is now changing rapidly in Korea and in the future price will undoubtedly be an important predictor.

Consequently it was decided at present to limit the relationship of consumption to GNP, per capita GNP, population or a combination of these parameters. The usual scatter grams revealed linear or log linear relationships. Nine relations were hypothesized and fitted to the data presented in Table 5-1. The results, with the corresponding R-square and

Table 5-1, Historical Wood Products Consumption in Korea
(1961-1984)

Year	Paper (1000 M/T)	Pulp (1000 M/T)	Sawnwood (1000 m^3)	Plywood (1000 m^3)	Pitprops (1000 m^3)	GNP (Billion Won)	Population (Million)	Per capita GNP (1000 Won)
1961	85	73	1,147	71	302	297.08	25.8	11.51
62	105	73	873	127	331	348.89	26.5	13.17
63	105	80	1,431	88	353	488.54	27.3	17.90
64	120	94	1,329	90	358	700.20	28.0	25.01
65	125	87	1,315	91	369	805.32	28.7	28.06
66	153	122	1,504	157	387	1,032.45	29.4	35.12
67	171	117	1,875	212	367	1,269.95	30.1	42.19
68	231	191	1,739	337	313	1,598.04	30.8	51.88
69	265	239	2,032	534	312	2,081.52	31.5	66.08
70	354	249	1,995	429	373	2,589.26	32.2	80.41
71	435	289	2,110	562	386	3,375.09	32.9	102.59
72	477	390	2,105	332	377	4,154.02	33.5	124.00
73	514	360	2,672	748	415	5,378.46	34.1	157.73
74	612	373	2,960	1,000	436	7,503.10	34.7	216.23
75	644	292	2,871	973	519	10,092.23	35.3	285.90
76	656	375	3,401	822	516	13,881.11	35.8	387.74
77	1,082	468	4,069	1,064	528	18,115.41	36.4	497.68
78	1,331	532	6,355	1,840	644	24,225.30	37.0	654.74
79	1,571	600	5,546	2,014	651	31,248.72	37.5	833.30
80	1,558	632	4,386	1,310	631	37,204.98	38.1	976.51
81	1,640	723	2,115	1,345	628	45,775.09	38.7	1,182.82
82	1,660	670	2,909	1,556	650	51,786.60	39.3	1,317.73
83	1,935	743	4,244	1,928	635	58,428.40	40.0	1,460.71
84	2,183	829	3,825	1,665	651	65,344.95	40.6	1,609.48

Table 5-2, Parameter Projections

Year	Population (Million)	GNP (Billion Won)	Per Capita GNP (1000 Won)
1985	41.2	72,376	1,576.70
86	41.8	80,120	1,916.75
87	42.4	88,692	2,091.79
88	43.0	98,183	2,283.33
89	43.6	108,688	2,492.84
90	44.1	120,635	2,735.49
91	44.6	133,905	3,002.35
92	45.2	148,634	3,208.36
93	45.7	164,984	3,610.15
94	46.3	183,132	3,955.33
95	46.9	203,277	4,334.26
96	47.4	225,637	4,760.27
97	47.8	250,458	5,239.71
98	48.3	278,008	5,755.86
99	48.8	308,589	6,523.55
2000	49.4	343,093	6,945.20

Source: Korea Development Institute

F-values, are presented in Tables 5-3 through 5-7. The estimated relations were then used with the values for the independent variables presented in Table 5-2, to estimate consumption for the years 1987-2000. The resulting forecasts are also presented in Tables 5-3 through 5-7 and summarized in tables 5-8 and 5-9. Rather than select the most "appropriate" function for forecasting purposes, Tables 5-8 and 5-9 summarize the results of the best fitting equation and an average between the highest and lowest value forecasted for each product category.

Finally simple annual and compound annual growth rates in consumption forecasts were calculated. With the exception of pitprops where consumption is generally forecasted to be rather level, the consumption of pulp, paper, sawnwood and even plywood is expected to grow annually by about 10% (simple rate) or 6-8% (compound rate) between 1984 and 2000. Finally Table 5-9 shows that the aggregate consumption of all 5 forest product categories examined is nearly identical whether one uses the best fit equation for each category or the average of the maximum and minimum projected levels. The total aggregate forest product consumption can be expected to grow by about 10% annually (simple rate) or 6.5% annually (compound rate).

A final important note relates to the absence of some wood product consumption forecasts for products such as hard board, fiber board, firewood and wood used for mushroom cultivation (still very important in Korea), matches, chopsticks, artifacts and others. This, of course, is due to the absence of data rather than to their relative unimportance. It does mean that the total consumption forecasts presented in Table 5-9 will tend to underestimate the actual consumption amounts.

Table 5-3, Paper Consumption Forecast by Year
(1000 M/T)

Estimated equations of paper consumption	R^2	F-value	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	2000
$Y = -3926.63 + 139.58\ X_1$	0.86	131.38	1991.6	2075.3	2159.1	2228.8	2298.6	2382.4	2452.2	2535.9	2619.7	2689.5	2968.6
$Y = -14902.57 + 4468.52\ \ln X_2$	0.82	96.94	1841.6	1904.4	1966.3	2017.3	2067.7	2127.4	2176.6	2234.8	2292.4	2339.8	2524.4
$\ln Y = -21.18 + 7.80\ \ln X1$	0.98	1040.28	3126.8	3489.0	3887.2	4248.8	4639.3	5149.0	5610.3	6211.2	6867.4	7459.6	10297.1[1]
$Y = 238.75 + 0.03\ X_2$	0.94	362.58	2422.0	2706.7	3021.9	3380.3	3778.4	4220.3	4710.8	5255.2	5859.6	6530.4	10054.0
$Y = -2330.29 + 360.51\ \ln X_2$	0.88	154.50	1777.0	1813.6	1850.3	1887.9	1925.5	1963.1	2000.7	2038.4	2076.0	2113.6	2264.7
$\ln Y = 0.92 + 0.61\ \ln X_2$	0.99*	1699.79	2616.7	2784.2	2962.2	3156.8	3364.3	3585.4	3821.1	4072.3	4340.0	4625.2	5972.4
$Y = -1213.73 + 46.98\ X_1 + 0.92\ X_3$	0.98	468.34	2702.7	2907.1	3128.0	3374.7	3643.7	3935.1	3643.7	3935.1	4977.2	5392.6	7496.7
$Y = 23919.25 - 8160.67\ \ln X_1 + 1074.3\ \ln X_3$	0.92	128.15	1554.5	1533.9	1515.2	1521.9	1529.9	1518.6	1599.2	1520.8	1514.0	1528.2	1596.8[2]
$\ln Y = -3.96 + 2.16\ \ln X_1 + 0.48\ \ln X_3$	0.99	854.80	2707.6	2910.9	3128.4	3352.6	3592.3	3862.5	4136.7	4445.6	4776.1	5111.7	6700.1

Note: X_1: Population X_2: GNP X_3: Per capita GNP Y: Total consumption

* = best fit
1 = maximum
2 = minimum

Table 5-4, Pulp Consumption Forecast by Year
(1000 M/T)

Estimated equations of pulp consumption	R^2	F-value	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	2000
$Y = -1375.93 + 51.75\ X_1$	0.93	281.41	818.3	849.3	880.4	906.2	932.1	963.2	989.0	1020.1	1051.1	1077.0	1180.5
$Y = -5502.21 + 1673.04\ \ln X_1$	0.90	197.43	766.9	790.4	813.6	832.7	851.6	873.9	892.3	914.1	935.7	953.4	1022.6
$\ln Y = -15.02 + 5.89\ \ln X_1$	0.97*	650.58	1153.7	1253.2	1359.8	1454.3	1554.1	1682.4	1793.9	1937.2	2089.8	2224.5	2837.6
$Y = 182.97 + 0.01\ X_2$	0.87	150.20	1069.9	1164.8	1269.9	1389.3	1522.1	1669.3	1832.8	2014.3	2215.7[1]	2439.3	3613.9[1]
$Y = -773.05 + 132.40\ \ln X_2$	0.93	291.20	735.4	748.8	762.3	776.1	789.9	803.7	817.6	831.4	845.2	859.0	914.5
$\ln Y = 1.73 + 0.45\ \ln X_2$	0.95	387.54	950.3	994.8	1041.4	1091.4	1143.9	1198.9	1256.5	1317.0	1380.3	1446.7	1746.9
$Y = -790.52 + 31.78\ X_1 + 0.20\ X_3$	0.97	365.11	975.3	1032.7	1093.7	1158.1	1227.3	1303.6	1383.9	1472.0	1566.8	1667.9	2168.5
$Y = 2400.55 - 897.83\ \ln X_1 + 218.71\ \ln X_3$	0.94	152.00	708.5	715.0	721.8	731.8[2]	742.1	750.0	760.5	768.8	777.2[2]	788.2	833.7[2]
$\ln Y = -19.58 + 7.37\ \ln X_1 = 0.13\ \ln X_3$	0.97	320.96	1144.3	1254.8	1373.9	1476.4[1]	1585.0	1728.5	1851.9	2014.7	2189.1	2338.3	3019.0

Note: X_1: Population X_2: GNP X_3: Per capita GNP Y: Total consumption

* = best fit
1 = maximum
2 = minimum

Table 5-5, Sawnwood Consumption Forecast by Year
(1000 m^3)

Estimated equations of pulp consumption	R^2	F-value	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	2000
$Y = -5547.97 + 246.16\ X_1$	0.60	33.25	4889.7	5037.4	5185.1	5308.2	5431.3	5579.0	5849.7	5997.4	6120.5	6120.5	6612.8
$Y = -25617.48 + 8083.96\ \ln X_1$	0.60	33.36	4674.3	4787.9	4899.9	4992.1	5083.2	5191.3	5280.2	5385.7	5489.7	5575.5	5909.6
$\ln Y = -3.83 + 3.31\ \ln X_1$	0.77	74.26	5287.3	5539.0	5799.0	6022.0	6251.0	6533.7	6776.0	7075.0	7383.0	7646.8	8767.8
$Y = 2030.23 + 0.04\ X_2$	0.37	12.66	5577.9	5957.6	6377.8	6855.6[1]	7386.4	7975.6	8629.6	9355.5	10161.3[1]	11055.7	15754.0[1]
$Y = -2824.54 + 646.51\ \ln X_2$	0.64	38.44	4541.1	4606.8	4672.5	4740.0	4807.4	4874.9	4942.4	5009.8	5077.3	5144.8	5415.7
$\ln Y = 5.57 + 0.26\ \ln X_2$	0.77	75.46	5075.4	5211.3	5350.9	5498.0	5649.2	5804.6	5964.2	6128.3	6296.8	6470.7	7214.9
$Y = -2616.12 + 97.51\ X_1 + 0.36\ X_3$	0.87	67.53	2271.3	2398.8	2532.7	2668.8	2813.7	2975.1	3139.7	3322.5	3517.4	3719.6	4701.1
$Y = 16761.09 - 5795.57\ \ln X_1 + 861.55\ \ln X_3$	0.90	93.15	1631.4	1625.5	1620.8	1634.8[2]	1649.6	1650.6	1667.2	1670.3	1674.5[2]	1693.8	1779.8[2]
$\ln Y = -26.10 + 9.41\ \ln X_1 - 0.13\ \ln X_3$	0.93*	136.20	3521.8	3974.1	4476.2	4923.4	5408.6	6061.2	6641.2	7419.9	8276.6	9034.3	12690.1

Note: X_1: Population X_2: GNP X_3: Per capita GNP Y: Total consumption

* = best fit
1 = maximum
2 = minimum

Table 5-6, Pulp Consumption Forecast by Year
($1000\ m^3$)

Estimated equations of pulp consumption	R^2	F-value	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	2000
$Y = -3678.07 + 133.76\ X_1$	0.85	120.33	1993.4	2073.6	2153.9	2220.7	2287.6	2367.9	2434.8	2515.0	2595.3	2662.2	2929.7
$Y = -14370.14 + 4331.79\ \ln X_1$	0.82	102.44	1861.7	1922.6	1982.6	2032.0	2080.8	2138.7	2186.4	2242.9	2298.7	2344.6	2532.6
$\ln Y = -21.49 + 7.91\ \ln X_1$	0.93	282.99	3463.2	3870.3	4318.7	4726.3[1]	5167.1	5743.2	6265.4	6946.4	7691.1	8364.1	11598.2
$Y = 368.43 + 0.03\ X_2$	0.73	60.69	3029.2	3313.9	3629.1	3987.5	4385.6	4827.5	5318.0	5862.4	6466.7	7137.5	10661.2
$\ln Y = 1.01 + 0.61\ \ln X_2$	0.91	221.03	2863.2	3046.3	3241.2	3454.1	3681.1	3923.1	4181.0	4455.8	4748.5	5060.8	6534.9
$Y = -2616.12 + 97.51\ X_1 + 0.36\ X_3$	0.87	67.53	2271.3	2398.8	2532.7	2668.8	2813.7	2975.1	3139.7	3322.5	3517.4	3719.6	4701.1
$Y = 16761.09 = 5795.57\ \ln X_1 + 861.55\ \ln X_3$	0.90	93.15	1631.4	1625.5	1620.8	1634.8[2]	1649.6	1650.6	1667.2	1670.3	1674.5[2]	1693.8	1779.7[2]
$\ln Y = -26.10 + 9.41\ \ln X_1 - 0,13\ \ln X_3$	0.93	136.20	3521.8	3974.1	4476.2	4923.4	5408.6	6061.2	6641.2	7419.9	8276.6[1]	9034.3	12690.1[1]

Note: X_1: Population X_2: GNP X_3: Per capita GNP Y: Total consumption

* = best fit
1 = maximum
2 = minimum

Table 5-7, Pitprops Consumption Forecast by Year
(1000 m^3)

Estimated equations of pitprops consumption	R^2	F-value	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	2000
$Y = -424.92 + 26.52\ X_1$	0.83	105.75	699.5	715.4	731.4	744.6	757.9	773.8	787.0	803.0	818.9	832.1	885.2
$Y = -2527.57 + 853.96\ \ln X_1$	0.80	86.20	672.3	684.3	696.2	705.9	715.5	272.0	736.3	747.5	758.5	767.5	802.8
$\ln Y\ -0.31 + 1.83\ \ln X_1$	0.81	95.40	697.3	715.5	733.9	749.4	765.5	783.9	799.9	819.2	838.7	855.2	922.3
$Y = 372.65 + 0.0056\ X_2$	0.80	88.62	869.3	922.5	981.3	1048.2[1]	1122.5	1205.0	1296.6	1398.2	1511.0[1]	1636.2	2294.0[1]
$Y = 130.84 + 69.59\ \ln X_2$	0.87	151.12	662.0	669.1	676.1	683.4	690.7	697.9	705.2	712.4	719.7	727.0	756.1
$\ln Y\ 4.83 + 0.15\ \ln X_2$	0.88	162.61	691.6	702.2	713.0	724.2	735.6	747.2	759.0	771.0	783.2	795.5	847.1
$Y = -68.58 + 14.36\ X_1 + 0.12\ X_3$	0.88	79.94	791.3	822.9	856.7	893.0	932.2	975.1	1020.9	1070.9	1125.0	1183.3	1474.2
$Y = 6673.32 - 2139.19\ \ln X_1 + 254.63\ \ln X_3$	0.96*	258.00	604.3	596.6	589.3	588.5	588.1	582.7	582.9	578.3	574.0[2]	575.2	583.0[2]
$\ln Y\ 17.34 - 3.92\ \ln X_1 + 0.49\ \ln X_3$	0.95	187.32	600.4	593.2	586.5	587.0[2]	587.8	583.2	584.8	581.0	577.8	580.3	593.9

Note: X_1: Population X_2: GNP X_3: Per capita GNP Y: Total consumption
*= best fit
1 = maximum
2 = minimum

Table 5-8, Summary of consumption projections by major product category for best fit case and average of maximum and minimum projection case (in 000m^3) and growth rates (in %)

Product	Year				Annual Growth %	
	1984 (actual)	1990	1995	2000	Simple	Compound
Paper (best fit)	3,340	4,830	6,640	9,138	10.9	6.5
Paper (average)	3,340	4,415	6,412	9,099	10.8	6.5
Pulp (best fit)	1,749	3,069	4,409	5,987	15.1	8.0
Pulp (average)	1,749	2,330	3,157	4,692	10.5	6.4
Sawnwood (best fit)	3,825	4,923	8,277	12,690	14.5	7.8
Sawnwood (average)	3,825	4,295	5,918	8,767	8.1	5.3
Plywood (best fit)	1,665	2,221	2,595	2,930	4.8	3.6
Plywood (average)	1,665	3,281	4,976	7,235	20.9	9.6
Pitprops (best fit)	651	588	594	583	negative	negative
Pitprops (average)	651	819	1,042	1,438	7.6	5.1

Table 5-9, Total estimated consumption* of paper, sawnwood, plywood and pitprop consumption (1000 m^3)

					Annual rate of	
Using average of maximum and minimum projections	9,481	12,809	18,348	26,539	11.2	6.6

* Estimates are derived from equations and figures presented in Tables 5-3 to 5-7, assuming all pulp goes into paper and assuming a conversion of 1 metric ton of paper = 1.53 m^3 of wood and 1 metric ton of pulp = 2.11 m^3 of wood.

6. PRODUCTION PROJECTIONS

In this section several production projections will be presented and discussed. These projections are made using purely biological and physical information. Economic considerations play no (or only a very minimal and indirect) role. The reasons for this unrealistic approach are mainly because of lack of information and data. Instead, these projections are followed by an analysis of prices, costs and profitability as well as some observations about species, grades and dimensions.

A. Production projections by Forestry Administration

Table 6-1 presents production forecasts made by the Forestry Administration in 1979. It is worth noting that the production levels are projected to increase by 38% and 13% simple and compound annual rates respectively from 1984-2000. These figures, of course, say nothing about species, grades and dimensions. But they are useful global guideposts.

B. Production projections based on management plans

Tables 6-2 through 6-6 present in summary form the volume removals for 2 major forest units in Korea according to detailed 10-year management plans drawn up by FRI in cooperation with Sohlberg. The northern pilot management unit, situated in north central South Korea and east of Seoul, covers an area of about 15,000 ha, all of which is public. The southern pilot management unit, situated in the south central South Korea, covers an area of 18,000 ha, almost all of which is in private hands; here there are over 3,000 owners with an average forest ownership size of about 3 ha, aggregated in about 120 cooperatives each averaging 80 ha. The figures for the northern unit were available by species and volume removals were broken down by final cut and thinning and by whether the final cut and thinnings come from plantations or natural forests.

Such a detailed breakdown was not available for the southern unit. Finally it should be noted that the management plan presented its figures mostly in 1985 volume terms, the most recent year of survey and inventory for the 2 units. Using annual growth rates of about $2m^3$/ha or 2-5% of standing volume depending on age class, these figures were converted to actual volumes expected to be cut in each year. Finally the assumption was made that the northern unit was representative of all public forest lands and the southern unit of all private forest holdings. This allowed the construction of table 6-7, forecasting removals for all of South Korea through 1995.

In order to later evaluate these projections it is necessary to briefly review the physical and biological characteristics of the 2 management units as well as the management plans. About 83% of the area of the northern or national unit has slopes over 30° (classed as steep or very steep); these are areas where cutting has to be severely limited, if possible at all. Furthermore, the management plan works with a 5% unproductive forest land area but states that the actual percentage may be as high as 30%. Naturally grown stands make up 73% of the total area and account for 91% of the standing volume, averaging 75 m^3/ha, and with only 7% of the area in the 40-year and older age class. Plantations account for 27% of the area or 9% of the standing volume, averaging 21 m^3/ha and with 93% of this area less than 20 years old. Overall 31% of the standing volume is in coniferous stands, 43% in broadleaves and 26% in mixed stands. In plantations, 61% of the area is covered by larch (accounting for 74% of the standing volume);

Table 6-1, Production forecasts by year for all Korea by Forest Administration (in 000m^3)*

Year	Standing volume		Removals	
		As % of standing volume	Gross	Net
1984	171,946	0.6	10,291	853
1990	234,342	1.0	2,340	1,989
1995	260,002	1.8	4,740	4,029
2000	285,662	2.5	7,140	6,069
2010	348,220	2.5	8,700	7,395
2020	404,124	3.0	12,120	10,302
2030	469,002	3.0	14,070	11,960
2040	544,296	2.6	14,150	12,028
2050	631,678	2.3	14,520	12,342
2060	697,765	2.1	14,650	12,453
2070	770,767	2.0	15,410	13,100
2080	851,406	2.0	17,020	14,474

* Note: These forecasts amount to an annual increase in production from 1984-2000 to 38.2% (simple rate) or 13.0% (compound rate).

Table 6-2, Final cut volumes according to Sohlberg Management Plan for NPU.

Plantations

Year	Species	Area (ha)	Volume
1986	Larch	12.0	2,044
87	"	18.0	3,132
88	"	25.2	4,132
90	"	17.78	2,795
92	"	18.0	4,139
93	"	5.8	974
95	"	1.6	333
Total	Larch		17,549 (100%)

Natural Forest

Year	Species	Area (ha)	Volume
1989	Red pine	59.3	6,343
91	"	47.2	6,245
92	"	3.0	372
93	Oak	14.9	1,719
	Red pine	16.4	1,186
95	Oak	27.4	3,141
	Red pine	7.6	1,289
Total	Red pine		16,065 (77%)
	Oak		4,860 (23%)

1986-1995

Plantation & Natural Forest

Larch	17,549	(46%)
Oak	4,864	(12%)
Red pine	16,065	(42%)
Total	38,474	(100%)

Table 6-3, Thinning volumes according to Sohlberg Management Plan for NPU.

Plantations

Year	Species	Area (ha)	Volume (m^3)
1986	Korean pine	32.0	452
	Larch	45.3	693
87	Larch	42.28	645
	Rigida	2.0	26
88	Larch	12.56	199
	Rigida	11.20	164
89	Larch	35.0	422
	Rigida	43.92	890
90	Korean pine	32.0	274
	Larch	36.58	655
91	Larch	47.72	1,015
	Rigida	17.56	261
92	Korean pine	8.0	36
	Larch	37.84	761
93	Larch	55.0	1,065
94	Korean pine	1.4	13
	Larch	33.6	542
95	Larch	43.9	875
Total	Larch		6,782 (76%)
	Korean pine		775 (9%)
	Rigida		1,341 (15%)

Natural Forest

1986	Red pine	8.4	275
87	"	130.0	3,246
91	"	41.8	721
92	"	19.0	612
93	"	15.3	457
Total	Red pine		5,331 (100%)

Plantations and Natural Forest

Larch	6,872	(49%)
Korean pine	775	(5%)
Rigida pine	1,341	(9%)
Red pine	5,331	(37%)
Total	14,319	(100%)

Table 6-4, Special operations according to Sohlberg Management Plan for NPU.

1. Older forest noncommercial thinnings

Year	Species	Area (ha)	Volume (m^3)
1989	Mixed	55.8	4,733
1990	Mixed, Oak	148.5	12,198
	"	33.0	3,392
		237.3	

2. Young stand noncommercial thinning

Year	Species	Area (ha)	Volume (m^3)
1986	Oak, Red pine	33.2	2,214
1988	Red pine	252.0	5,035
		285.2	

Table 6-5, Total removals (Final cut & Thinnings) for NPU according to Sohlberg Management Plan for 1986-1995 period (in m^3).

	Final Cut		Thinning		Total	
	Plantation	Natural Forest	Plantation	Natural Forest	m^3	%
Larch	17,549		6,872		24,421	46
Oak		4,860			4,860	9
Red pine		16,065		5,331	21,396	41
Korean pine			775		7751	
Rigida			1,341		1,341	3
Total (in m^3 and %)	38,474 = 73%		14,319 = 27%		52,793	100%

Total removals from plantations 26,537 m^3 (=50%)
Total removals from natural forest 26,256 m^3 (=50%)

Table 6-6, Total removals (Final cut & Thinnings) for SPU according to Sohlberg Management Plan for 1986-1995 period (in m^3)*.

	Final cut		Thinning		Total
	Plantation	Natural Forest	Plantation	Natural Forest	
	53,775	30,334	72,707	30,752	187,568
Total	84,109 m^3 = 45%		103,459 = 55%		

Total removals from plantation	126,482 m^3 = 67%
Total removals from natural forests	61,086 m^3 = 33%

*Note: no species breakdown was available

Table 6-7, Production Forecast Using Sohlberg 1986-1995 Management Plan (in m^3)

Year	Northern PMU					Forecast for all national forest (m^3)	Southern PMU					Forecast for all private forest (m^3)	forecast for all Korea (m^3)
	Final cutting		Thinning		Total removals (m^3)		Final cutting		Thinning		Total removals (m^3)		
	Natural forest	Plantations	Natural forest	Plantations			Natural forest	Plantations	Natural forest	Plantations			
1986	-	2,044	295	1,145	3,484	286,556	2,766	4,912	2,717	6,428	16,823	5,413,414	5,699,970
87	-	3,132	3,246	671	7,049	579,774	2,825	5,017	2,796	6,615	17,253	5,551,782	6,131,556
88	-	4,132	-	363	4,495	369,710	2,885	5,123	2,875	6,803	17,686	5,691,116	6,060,826
89	6,343	-	-	1,312	7,655	629,617	2,944	5,229	2,955	6,990	18,118	5,830,128	6,459,745
90	-	2,795	-	929	3,724	306,296	3,004	5,335	3,034	7,177	18,550	5,696,140	6,275,436
91	6,245	-	720	1,276	8,241	677,815	3,063	5,440	3,113	7,364	18,980	6,107,508	6,785,323
92	372	4,139	611	798	5,920	486,915	3,123	5,446	3,192	7,552	19,313	6,214,663	6,701,578
93	3,535	974	457	1,065	6,031	496,045	3,182	5,652	3,271	7,739	19,844	6,385,531	6,881,576
94	-		-	555	555	45,648	3,241	5,758	3,350	7,926	20,275	6,524,221	6,569,869
95	4,430	333	-	875	5,638	463,721	3,301	5,863	3,429	8,113	20,706	6,662,911	7,126,632

Footnote: 1) Forest area in Korea (1985)
- Total 6,539,558 ha
- Unstocked 266,354 ha
- Stocked 6,273,204 ha
  - National 1,254,300 = 20%
  - Private 5,018,904 = 80%

2) Northern PMU
- Unstocked 32 ha
- Stocked 15,250 ha

100% of all forests is public.

3) Southern PMU
- Unstocked and protection forest 2,465 ha
- Stocked 15,597 ha

98.4% of all forest is private.

4) Production forecasts for all national forest, all private forest and for all Korea are made by assuming NPU is representative of all public forests and SPU of all private forests.

most of the remainder is Korean pine. If classed by possible utilization, 34% of the standing volume is classed as sawtimber (with diameters of at least 6 cm) about 40% of the area and standing volume require logging distances over 1 km. Current annual growth rates are estimated at 1.7 m^3/ha or 2.9% and could be raised to an upper boundary of 2.8 m^3/ha assuming no damage and proper tending. The management plan envisions selective cutting to remove an average of 43 m^3/ha while clear cutting would remove about 131 m^3/ha in the natural forest and 178 m^3/ha in the plantations. The thinning schedule calls for removing about 19 m^3/ha in average; also the plan doubts that thinnings will be commercial.

The southern or private unit shows that 58% of the area is in natural forest, containing 49% of the standing volume; plantations cover 42% of the area and account for 51% of the volume. Larch, red pine and broadleaves each account for about 25% of standing volume and area. Most of the remainder is coniferous of various species. About 1% of all stands by area or volume is older than 30 years, the bulk is in the 10-20 year age class. About half of the area is classed as steep or very steep (slopes over 30°) but all of the area necessitates logging distances of less than 1 km. Annual growth rates are estimated at 5%. There are over 3,300 owners, and the average holding is 2.9 ha in size. Even when aggregated into 119 cooperative management units, the average size is only 81 ha.

Finally it has to be pointed out that the northern unit is considered to be in much better forestry condition than the overall public forests. The southern unit is considered to be in somewhat better shape than most private forest holdings.

C. Production projection based on Timplan

Originally it was envisioned to use the most plausible assumptions available about volumes, growth rates, species composition, prices, costs, etc. to project harvest levels and net present value levels over the next 100 years for each of the 2 management units as well as for Korea using a computer simulation model called Timplan, developed by Gane. Although this model was run for both units using a variety of assumptions for the different runs, the low level of familiarity with the model and a lack of data in the right format combined to produce only very unrealistic production levels.

More specifically, the model tended to produce a very high cut in the first year, (the level depending on the rotation employed), followed by an even flow during the rest of the decade. Consequently it was decided not to pursue this at the moment. The model, however, was very useful in providing insight about the net discounted revenue flow over time (see next section).

D. Evaluation of production projections

This section will evaluate the production levels and projections purely on the basis on which they are made, i.e. on purely physical and biological grounds. The next section will bring economic considerations into play. The upshot of sections A-C, coupled with visual observations made in the field, discussions with Korean foresters and a review of existing studies and information on forestry, can perhaps best be summarized by the following points.

1. Table 6-7 shows production projections for 1990 and 1995 which respectively are 3 and 2 times higher than those of Table 6-1. These differences can in part be ascribed to the fact that the northern and southern management units are not as representative of public and private ownership as originally assumed. Consequently Table 6-7 projections would tend to overestimate future production levels for Korea as a whole.

2. Thinnings probably are not commercial; the management plan says as much, at least for the northern unit. Since thinnings account for 27% and 55% of the production levels in the northern and southern units respectively (see Tables 6-5 and 6-6), the overall forecasted production levels for Korea should be reduced by 0.27 * 0.20 + 0.55 * 0.80 or by almost 50%.

3. A number of questions can be raised about the actual volumes which can be removed in selection or clear cuts, especially in the natural stands.

Figures presented in the management plan appear to be on the high side. Also, considerable uncertainty exists about the actual percentage of forest lands which can productively be managed, especially in view of the high percentages of areas in the 2 units classified as steep or very steep and given the high erosion danger.

4. In the northern unit some important information is available about the projected final harvest volumes in that a rough species breakdown is available. It is note worthy that larch is expected to account for nearly 50% of the harvested volumes, with red pine and oak accounting for 42% and 12% respectively.

The plantations are expected to produce only larch, the natural stands a mixture of red pine and oak. Thinning removals show a similar dominance of larch, followed by red pine. The inescapable conclusion is that reforestation and management greatly favor larch. Similarly oak as a species is deemphasized. Though a similar detailed breakdown is not available for the southern unit, the species composition shows a more balanced representation of larch, red pine and broadleaves. Even here larch and red pine appear to be favored by management at the expense of oaks and white pine.

5. No breakdown of projected volume removals by grade or dimension is available for either the northern or southern unit. Given the present age class distribution in both management units, the dimensions of logs harvested will be small to very small. Certainly no dimension timber for heavy construction or plywood/veneer logs can be expected. Wood harvested over the next 10-30 years will be mostly of pulp wood size or suitable for small lumber dimensions. Even a casual observation of forests in Korea reveals that grades produced will be of low quality because of the poor shape of the oaks and many pines; only larch and poplar appear to be relatively straight.

6. Considerable uncertainty exists presently about the correct rotations to be used for pulpwood, sawnwood or pole production. Administrately mandated rotations are available but appear to have little relation with site qualities, growth rates, management regimes, utilization objectives, let alone with economic considerations or markets. In addition, until 2005, Korea still follows a legal mandate to build up growing stock by cutting much less than growth.

7. Harvesting is likely to be difficult in both units but especially so in the northern management unit because of the steepness of the terrain and the relative lack of forest roads.

8. Labor for forest operations, reportedly, is increasingly hard to get. This is partly due to the rural migration to the cities and partly due to the relative attractiveness of non forest work (being both less arduous and higher paying). The harvesting report commented on the large number of abandoned farm houses encountered in the rural areas. In this dynamic country with rapidly rising wage rates, the labor problem will tend to become worse rather than better for forestry.

9. A final conclusion relates exclusively to the private forest lands. As remarked elsewhere, the average forest holding is super small, less than 2 ha. Owner objectives very often relate to its use as burial grounds. Moreover, as mentioned in the harvesting report and further documented by FRI studies, any tree felling, even in the form of thinning, is greatly restricted, and subject to licensing by the county administration.

These licenses appear to be issued mostly to timber contractors (not directly to forest owners) which are better informed, have better access to financing, in short which have greater market power than the forest owners. This means that forest owners would tend to have to sell their standing timber too cheaply.

In other words, owner objectives coupled with a low rate of return will tend to dramatically inhibit forest management, investments and harvesting on private lands (all counting for 80% of all forest lands in Korea).

E. Prices, costs and profitability

Up to this point very little, if anything, has been said about the costs involved in growing trees, the cost of capital, prices received and profitability in general in the forestry sector. Since, ultimately decisions are made in one way or another based on a comparison of the costs involved and revenues generated, this section will address this issue, even if only rather superficially.

A very good starting point is the study by Mr. H. K. Lee, J. W. You, S. I. Kim and J. Y. Kim entitled Financial analysis of major tree species by their management survey (FRI 1983). Basically this study calculates internal rates of return when growing each one of a large number of trees species in Korea on average sites and using average management regimes. An obvious short coming from a purely economic point of view is that the study assumes a rotation (40 years for white pine, 30 years for larch, white pine, pitch pine

and oak; and various other rotations for other species); it is more usual to determine the rotation which maximizes net present value. Calculations are made using constant nominal prices and costs and soil rent is determined at 10%. White pine shows the highest internal rate of return at 9.1% but principally because of its edible seed production which over the 40 year rotation generates more than twice the revenue of the timber. Larch, pitch pine, red pine and oak show respective internal rates of return of 6.1, 4.9, 5.8% and 4.3%. Of the other species, Paulownia, Poplars, Crystomeria show rates of 5.2, 10, 5-12.6% and 5.8% respectively. At the present, the prime rate in Korea is 10-12%. The inescapable conclusion is that growing trees for financial reasons is a loosing proposition. In reviewing the cost data it appears obvious that planting costs are very high, indicating that traditional ways of reforestation (including digging an elaborate hole and carefully planting a rather large and costly seedling) need be examined; these methods might have been warranted when hillsides were denuded and eroded but need to be carefully reexamined. Similarly the advisability of investing so much in fertilization needs to be examined from a financial point of view.

In general, the optimal financial rotations using realistic discount rates of 10-15%, employing management regimes ranging from "no management" to "very intensive management", and assuming different product categories ranging from pulp wood to veneer logs, should be determined with a cold eye on costs. The FRI, in cooperation with a pulp mill, is presently engaged in analysing possible pulp wood rotations. Certainly there should be nothing sacred about the administratively mandated rotations of 30 or 40 years.

The harvesting report points out another problem which forest managers have to face squarely. Making some plausible price assumptions for delivered wood prices per m^3 at the road side (ranging from about 36,000 won - 55,000 won ($41 - $62) for large wood and half these amounts for small wood), a harvesting and transportation to roadside cost of about 15,000 won ($17), it shows that the annual cost of road construction alone in the northern management unit will cause an annual loss of almost 41 million won (or 419 million won for the whole 1986-1995 period).

Several runs with the Timplan model show large to very large financial losses over a 100 year period for each one of the 10 decades considered and employing reasonable assumptions supplied by the FRI. It is interesting to note that runs with the Timplan also show large losses incurred in the manufacturing end of the forestry sector. It is possible to analyze these returns separately since Timplan presents separate financial net present value statements for forestry, harvesting and manufacturing, using a range of discount rates, in addition to a consolidated or overall statement.

The financial statement analysis for 1984, prepared in 1985 by the Bank of Korea shows a very mixed if not rather unattractive net profit picture for a variety of forest product firms at least in the years 1982, 1983 and 1984. A cursory comparison with other sector firms shows that for these 3 years, pulp and wood manufacturers produced losses or small profits while furniture firms did much better.

Does all this information mean that Korea should give up on its forestry sector? Of course, the answer is an emphatic no. But careful attention has

to be focused on costs. The manufacturing part, and to a less extent the harvesting part, will naturally be driven to do this since they are run by the private sector with a strong profit motive; especially as tariffs are further eliminated (presently they still range from 5-15% for sawlogs, 10-20% for lumber and 20-30% for plywood and thus are among the highest in the Pacific Rim) and these firms have to compete on the world market, delivered wood prices at mill side, lumber, plywood and pulp and paper prices will have to measure up. However, as shown in the previous sections, this is much less true in the timber growing part of the forestry sector. The profit motive is much weaker in the forestry part, partly because of public ownership, partly because of an undue emphasis on the biological aspects of growing trees which evolved from the situation following a series of disastrous wars leaving Korea totally denuded and with a tremendous erosion problem. However, the situation following the wars has been remedied; now it is time to begin to focus on economic efficiency and to place biological considerations in their proper place. The forestry sector is in a favorable position to do this. As Table 6-8 shows, both the solid wood product component as well as the fibre product part of the forestry sector, have increased much less in relative price than all commodities. This means that these products relatively have improved their position in the overall economy.

At the same time, both product categories since 1970 have lost ground interms of their production share of total manufacturing activities. In 1983 the solid wood and wood product manufacturing share was 1.5% while paper and paper products, including printing, made up 4.2% of all manufacturing activities in Korea. In 1984, the pulp and paper industry (now the third largest in Asia) contributed 1% of GNP.

Table 6-8, Relative price trends (1980 base = 100) for solid wood products, fibre products and all commodities

	All commodities	Lumber and wood products	Pulp, paper and allied products
1972	23.1	22.2	31.2
1973	24.7	25.7	34.8
1974	35.1	32.8	53.4
1975	44.4	37.1	61.1
1976	49.8	41.4	63.6
1977	54.3	46.0	66.2
1978	60.0	49.4	68.0
1979	72.0	72.2	78.1
1980	100.0	100.0	100.0
1981	120.4	100.4	113.6
1982	126.0	101.6	118.2
1983	126.3	100.3	118.5

7. PAST AND FUTURE BALANCE BETWEEN PRODUCTION AND CONSUMPTION

Tables 7-1 through 7-5 show the balance between production and consumption for different forest product categories. Table 7-6 shows the projected balance between production and consumption through the year 2030.

In Table 7-1 it is worth noting that over all forest product categories, the domestic production expressed as a percentage of net domestic consumption (or total gross domestic consumption minus exports) has been declining steadily since 1965 from a high of 67% to a 1984 figure of 17%. This figure is projected to reach 50% again in 2030; in other words in 2030 Korea is expected to produce about one half of its net domestic needs in forest products. Since forest product exports were relatively substantial until 1979, the self sufficiency percentage when expressed in terms of gross consumption was considerably lower; it in fact reached a minimum of 9% in the peak plywood export years of 1978 and 1979. With exports drying up in the years 1980-1084, the 2 self sufficiency percentages (net and gross) have become much closer and are expected to remain so through 2030.

A closer look at Table 7-1 shows that Korea is nearly self sufficient in the production of pitprops for mining and seaweed cultivation; in fact since 1965 more than ½ of its domestic timber production is used for this product (a very low value added product). Korea's biggest deficiency occurs in the timber for general use and peeler log (plywood) categories; these products come almost totally from imports. Finally Korea has to import a bit more than 50% of its pulpwood needs.

Table 7-2 portrays some of the ups and downs of the panel markets. Plywood capacity and production reached a peak in the late seventies and then collapsed. In 1984 this sector operated at 50% of established capacity.

Though it is presently recovering a bit because of domestic demand, it will probably never return to its peak export days. The hardboard sector shows also a slump over the last 5 years after a steady increase of 15 years, but it supplies the local market only. Particle board, finally, shows a very steady growth in domestic production and consumption with 2 boom years in 1973 and 1974. Again domestic production and consumption are nearly in balance over the last 5 years.

Table 7-3 shows that Korea's self sufficiency in pulp (chemical & mechanical) has been running at the rate of ¼ to 1/3 of its net domestic needs since 1965. In fact, in 1983 Korea was the world's tenth largest importer of pulp. Until 1980 most of the pulp produced was of the mechanical variety; in 1984 almost equal amounts were produced. It should be realized that Table 7-3 considerably overstates Korea's self sufficiency in pulp since it also imports a rapidly increasing amount of waste paper. While the waste paper imports were zero in 1970, they amounted to 600,000 metric tons in 1983, 90% coming from the USA. Korea has an inefficient waste paper collection system relative to the Japanese, so this amount may increase rather than decrease in the near future. This is important because the 1983, average percentage of secondary fiber in Korean paper manufacturing amounted to 63.5%.

Table 7-4 shows the breakdown of Korean paper and paper board consumption over time while Table 7-5 shows the import and export situation for the pulp and paper sector. It is clear that Korea imports a very small percentage of

Table 7-1, Korean domestic wood production (P), net domestic wood consumption (NC) = gross consumption (GC) minus exports (E), and waste wood (all in 1000 m^3) self sufficiency (in %)

	Pit props		Pulpwood		Timber for general use			Plywood			Wastewood	Total				Self sufficiency		
Year	P	NC	P	NC	P	NC	E	P	NC	E	NC	P	NC	E	GC	P/NC	P/GC	NC/GC
1965	304	304	41	41	158	403	-	0	-	511	-	503	748	511	1,259	67	40	59
66	313	313	83	83	383	773	1	0	-	707	-	779	1,169	708	1,877	67	41	62
67	335	335	111	111	345	878	3	0	-	993	-	791	1,324	996	2,320	60	34	51
68	367	367	158	158	275	1,025	1	0	-	1,259	-	800	1,550	1,260	2,810	52	28	55
69	386	386	200	200	298	924	4	0	-	2,020	-			2,024	3,534	59	25	43
70	450	450	206	206	189	1,057	17	0	-	2,270	-	945	1,713	2,287	4,000	49	21	43
71	470	470	265	265	299	1,457	17	0	-	2,851	288	1,016	1,904	2,868	4,772	53	21	40
72	395	395	216	216	184	1,682	76	0	-	2,979	399	782	1,894	3,055	4,949	41	16	38
73	418	418	204	204	337	2,160	425	0	-	3,205	467	943	2,315	3,630	5,945	41	16	39
74	456		239	239	305	2,178	480	0	-	3,003	557			3,483				
75	542	542	188	188	178	2,159	350	0	-	3,226	450	896	2,889	3,576	6,465	31	14	45
76	498	498	254	254	207	1,948	757	0	-	4,368	559	943	2,700	5,125	7,825	35	12	35
77	534	534	241	241	272	3,313	524	0	318	4,887	983	1,027	4,406	5,411	9,817	23	10	45
78	617	617	313	313	83	4,875	737	0	541	4,528	1,188	996	6,346	5,265	11,611	16	9	55
79	626	515	206		26			0	1,792	3,031	902	952	6,616		10,940	14	9	60
80	515	628	393	546	105	3,121	212	0	1,603	1,753	601	1,008	5,785	1,965	7,750	17	13	75
81	628	650	287	497	286	2,115	183	0	1,345	2,497	577	1,130	4,585	2,680	7,265	25	16	63
82	639	635	339	546	274	2,909	257	0	1,556	1,499	645	1,157	5,661	1,756	7,417	20	16	76
83	633	685	317	533	193	4,244	191	0	1,928	771	677	1,101	7,340	962	8,302	15	13	88
84	683		290	536	187	3,978	257	0	1,528	488	581	1,118	6,727	745	7,472	17	15	90

Note 1) Timber for general use involves waste wood.
2) Total domestic production does not always equal a the sum of domestic production categories due to waste wood treatments.
3) P/NC = % of net domestic selfsufficiency. P/GC = % of gross selfsufficiency.
Source: Forestry statistics (Forestry Administration).

Table 7-2, Production and Gross Domestic Consumption of Processed Wood (in 1000 sq. ft.)

Year	Maximum Production Capacity	Output	Domestic Consumption	Output	Domestic Consumption	Output	Domestic Consumption
1965	1,200,000	129,208	181,314	436,674	420,308	309,250	309,250
66	1,500,000	1,198,158	261,209	452,614	532,029	738,654	738,654
67	1,670,000	1,490,367	390,112	543,380	493,787	1,076,130	1,076,130
68	2,620,000	2,383,994	561,857	554,652	554,652	1,140,000	1,140,000
69	3,220,000	2,783,781	614,998	695,689	685,689	964,655	938,062
70	3,900,000	2,872,000	628,887	671,326	671,326	906,640	712,186
71	4,300,000	3,471,000	631,000	926,504	600,644	1,071,858	832,000
72	4,668,000	3,703,314	554,954	400,354	400,354	1,525,989	547,187
73	6,056,000	5,022,463	800,691	767,250	437,700	4,232,000	918,000
74	6,435,000	4,260,000	1,144,000	809,900	329,850	4,230,043	682,738
75	6,528,000	4,867,000	1,347,000	755,000	358,600	2,180,115	1,015,348
76	6,831,000	5,664,542	1,404,948	898,600	404,500	2,214,250	999,094
77	6,813,000	6,153,084	1,725,837	900,000	392,850	3,177,156	1,455,644
78	7,500,000	6,880,833	2,445,606	864,250	640,050	2,545,000	1,489,500
79	7,500,000	6,285,331	2,625,530	836,650	836,650	2,414,562	1,098,520
80	6,773,000	4,238,137	1,796,632	649-350	526,089	3,788,031	2,687,218
81	6,300,000	4,302,955	1,562,980	351,250	343,800	5,863,750	5,288,250
82	6,602,000	3,828,955	2,060,332	496,868	496,868	3,052,281	3,037,020
83	5,381,000	4,012,237	2,894,958	537,571	537,571	3,687,500	3,784,288
84	6,961,000	3,563,896	2,839,914	444,912	444,912	4,779,438	4,580,969

Source: Forestry Administration

Table 7-3, Pulp Production in Korea (metric tons) and Rate of Selfsufficiency (%)

Year	Total	Chemical Pulp	Mechanical Pulp	Rate of self-supply*
1965	33,117	1,413	31-704	35.8
66	43,290	692	42,598	30.9
67	49,241	1,243	47,998	32.1
68	45,098	3,376	41,722	23.2
69	65,598	4,517	61,081	27.5
70	80,204	4,813	75,391	32.0
71	84,458	5,067	79,391	28.7
72	84,284	5,141	79,143	27.2
73	81,551	4,750	76,810	21.4
74	96,771	4,613	92,161	36.0
75	83,802	6,693	87,109	28.8
76	104,476	15,206	89,270	29.0
77	129,968	20,337	109,631	28.1
78	96,006	3,940	92,066	18.8
79	131,319	-	131,319	22.5
80	185,620	48,179	137,441	26.9
81	221,671	84,483	137,188	33.8
82	235,208	107,790	127,418	36.6
83	241,846	115,988	125,858	35.7
84	258,081	121,384	136,697	32.7

* Overstated because of huge and increasing amounts of waste paper imports (see Table 7-5).

Source: Korea Paper Manufacturers Association

Table 7-4, Paper Production (in 1000 metric tons)*

Classification	Total	News Print	Wood free paper	Wood containing	Art Paper	Kraft Paper	Manila board	Corrugated board base	Board paper	Others paper
1965	120.4	45.4	19.0	9.4	-	20.7	9.1	3.4	7.4	6.0
1966	164.1	54.8	27.7	9.0	0.9	20.1	13.1	5.7	11.3	21.3
1967	189.4	57.6	37.8	7.6	3.8	26.7	20.2	6.4	11.8	17.5
1968	236.9	62.2	39.8	8.2	6.3	37.2	26.0	20.3	11.2	25.7
1969	285.4	79.3	47.0	9.9	6.4	44.4	25.0	29.3	12.3	31.8
1970	329.6	101.7	52.7	11.2	9.1	47.9	33.2	45.6	4.8	23.4
1971	374.9	104.6	58.9	14.4	10.9	62.6	37.8	37.9	13.6	34.2
1972	417.0	108.4	65.3	20.2	15.8	70.6	52.2	38.9	14.1	31.5
1973	511.1	119.6	89.4	25.2	22.6	83.5	76.9	41.4	14.7	37.8
1974	617.5	152.0	86.8	31.5	21.6	99.5	93.0	76.8	12.8	43.5
1975	661.7	155.2	73.4	32.2	26.1	87.2	98.3	125.5	12.3	51.3
1976	906.7	164.6	102.5	23.6	32.4	119.0	153.3	240.9	7.1	63.3
1977	1,124.8	198.3	116.4	32.4	38.4	148.8	164.0	325.8	18.5	82.2
1978	1,365.1	182.8	138.6	58.8	49.5	146.2	198.7	422.5	34.0	134.0
1979	1,593.7	193.8	166.3	68.3	63.2	179.8	235.3	511.8	33.8	141.4
1980	1,680.0	249.3	159.6	68.5	64.4	184.2	237.0	514.2	37.9	164.9
1981	1,782.9	270.2	174.9	58.9	69.1	152.6	259.1	582.9	42.4	172.8
1982	1,736.6	243.7	163.9	88.2	80.6	152.2	258.5	534.1	51.6	163.8
1983	1,982.2	231.6	185.6	127.0	103.1	182.4	288.4	589.1	69.6	205.4
1984	2,206.8	219.9	182.7	166.5	125.6	174.3	302.5	701.3	84.1	249.9

Source: Forestry Administration

* Note: Very little of these products are exported except for those that are used in packaging. Also Korea imports paper products. In fact, on balance imports and exports of total paper and paper boards are nearly in balance (Table 7-5).

Table 7-5, Imports and exports of wood pulp and paper plus paperboard in 1000 metric tons

Year	Wood pulp imports	Paper plus paperboard Imports	Paper plus paperboard Exports
1970	169	24	-
1973	278	33	31
1978	429	25	59
1982	435	38	115
1983	501	52	99
% annual growth	8.1	5.7	11.1

Note: Missing are the rapidly increasing imports of waste paper, amounting to 600,000 tons in 1983, up from zero in 1970.

Table 7-6, Consumption and Production Projections According to the Second 10 Year Forest Development Plan (1) for Chapter 5 and 6 Projections (2) in 1000 m^3

Period	1988	1990		2000		2010		2020		2030	
Demand and Supply		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Gross domestic consumption	18.0	19.3	-	22.5	-	25.2	-	26.6	-	27.1	-
Net domestic consumption	13.2	14.5	12.6	19.5	25.3	22.7	-	24.6	-	25.6	-
Pitprops	0.7	0.7	0.6	-	0.6	-	-	-	-	-	-
Pulpwood	1.6	2.1	4.8	-	9.1	-	-	-	-	-	-
Veneer logs	4.5	4.7	2.2	-	2.9	-	-	-	-	-	-
General use	6.3	7.1	4.9	-	12.7	-	-	-	-	-	-
Export	4.8	4.8	-	3.0	-	2.5	-	2.0	-	1.5	-
Domestic wood production	2.3	2.9	6.3	6.4	6.1	9.0	7.4	11.0	10.3	13.0	12.0
General spp.	1.4	1.5	-	2.0	-	4.0	-	6.0	6.0	-	8.0
Poplar spp.	0.9	1.4	-	4.4	-	5.0	-	5.0	-	5.0	-
Imported timber	15.7	16.4	-	16.1	-	16.2	-	15.6	-	14.1	-
Rate of gross Self-sufficiency (%) (domestic wood produc- divided by gross domestic consumption)	13	15	-	28	-	36	-	41	-	48	-
Rate of net Self-sufficiency (%) (domestic wood production divided by net domestic wood consumption, i.e. net of exports)	17	20	50	33	24	40	-	45	-	51	-

Sources: Forestry Administration, Republic of Korea. The second 10-year Forest Development Plan, 1977-1988 and Chapter 5 and 6.

- means not available

its total paper needs and similarly exports very little of its total paper and paper board production (5% of total production was exported, 2½% was imported in 1983); on balance in 1983, there was a small positive trade balance of 47,000 tons in paper and paper board products. Korea now has the third largest pulp and paper industry in Asia.

In summary, overall Korea is expected to become more self sufficient in its domestic production of forest products but not over the next 10-20 years. Its needs to import are especially large in the saw timber and peeler log categories and in pulp and waste paper. Again, it has to be emphasized that these figures say very little about species and grades; also most of the forecasts are based on physical/biological data rather than on costs and prices. As Korea moves away from a centrally planned economy and as its markets open up to world competition, and finally if its GNP continues its remarkable growth, these projections will change dramatically.

8. FOREST PRODUCTS MARKET STRUCTURE

8.1 Market Analysis

Korea is not a large country, roughly 500 km long and about 250 km wide. An excellent east-west and north-south road network is in place, including a number of speedways. The main port areas for forest products are well distributed: Inchon (near Seoul) in the NW accounting for almost 60% of all log imports, Kunsan in the SW responsible for 12% of all log imports, Ilsan and Pusan accounting for 25% of all log imports in the SE and Pohang in the mid-eastern section of Korea. Because of this, in principle most domestic logs and forest products flow throughout the country and there exist no sharply delineated regional markets. This is somewhat different for imported logs: they come mostly into Inchon and Pusan to be processed locally before distribution to consumers. A review of product flow by product follows.

Sawmills using domestic logs tend to draw these from a small region within which they are located. This is especially true for the small sawmills. Sawmills using imported logs tend to be in or near the above named port cities and tend to be larger. In both cases, lumber produced is transported to the big consuming centers, mainly the large cities; again, the lumber of the small mills tends to move a shorter distance than that of the big sawmills. However, no major price differentials either for logs or for lumber were encountered, indicative of one national market rather than of a number of fractionated regional markets (see a 1985 unpublished study by Mr. Yoo, Mr. Sung and Mr. Kim).

Consumers for posts are primarily the mines, and these are located predominantly in the north-central area. The northern forest area sees most of its wood going into mine posts and to this extent its raw material stays in the north of Korea. However, the southern forest area also supplies posts, some being used in the production of seaweed (needing long posts) and some for mines located both in the south as well as in the north. Again one can speak of a rather homogeneous single market for this product with geographically dispersed producers supplying the more concentrated mines (consumers). The same study by Mr. Yoo, Kim and Sung showed no price differences at all for this product in 5 different regions.

Plywood is produced predominantly from imported logs, formerly from Indonesia, lately from Malaysia and PNG. Plywood mills are heavily concentrated in or near the port cities of Inchon and Pusan. The product, plywood, is consumed nationwide but because of the usage in industry and construction, the same big cities consume the lion's share (also a large but dwindling percentage is re-exported).

There are a number of mechanical pulp mills, many paper mills, but only 1 chemical pulp mill in Korea. The mechanical pulp mills tend to use primarily domestic pine wood (the Changsoo mill close to 100%), obtained from a rather large area (almost national in fact). Again the study by Mr. Yoo, Kim and Sung indicates almost totally identical prices for 5 different geographic areas for pulpwood, indicative of a single national market. The one and only chemical pulpmill in Ulsan uses domestic hardwoods and conifers, logs as well as chips, and a good percentage of imported chips (mostly eucalyptus and mostly from Australia). The paper products move

throughout Korea to consumers while a diminishing percentage of paper, especially newsprint, is exported.

It is interesting to note that discussions with product manufacturers as well as the study by Mr. Yoo, Kim and Sung reveal almost no price differences per m^3 of wood delivered at mill site between sawn timber, mine posts (pit props) and pulpwood, almost no differences between the 5 geographic regions and almost no differences between the different suppliers of the wood (i.e., felling contractors, log wholesalers and industry's own operations). This again reinforces the impression of a national, fairly homogenous (and probably fairly competitive) market.

Having said this, an exception has to be mentioned: wood used for fuelwood and (oak) wood used for mushroom production, tends to stay very close to the area where it is produced; its low value in use cannot stand expensive handling and transportation. Delivered prices per m^3 at the site where these woods are used amount to only about 2/3 of the delivered m^3 prices of the wood used for the other products. Fuelwood consumption has decreased dramatically in Korea and is expected to decrease further; outside rural mountainous areas its use is practically zero. Consumption statistics on wood used for mushroom production show only a slight decline but with increasing GNP, wage rates and migration to the cities this low value use of wood is bound to decrease sharply in the future.

In summary then, the market for domestically produced wood is largely a single national one, not a series of fractionated regional ones. Imported wood tends to be processed very close to the port of entry. Wood prices for all products except for fuelwood and wood used for mushroom production, differ very little between products, between geographic area and between the log suppliers.

8.2 Distribution Channels of Forest Products

There are three distribution channels for domestically produced logs: 1) forest owners → end users, 2) forest owners → felling contractors → end users, 3) forest owners → felling contractors → log assemblers → end users.

The end users of logs are composed of mining companies, pulping companies, sawmills, and others (Figure 10).

The timber imported from foreign countries is distributed through brokers and sawmills as well as directly sold by importing agents (Figure 11).

8.3 Market Survey Results

To gain some appreciation of the wishes, problems and opportunities in the forest product market a representative number of manufacturing firms was visited and their managers interviewed. It is here not claimed that the sample had any statistical validity. Rather, the objective was to get a glimpse of the forest product sector. The survey was begun in August/Sept. 1985 and completed during June/July 1986. The results are presented in this section by product category.

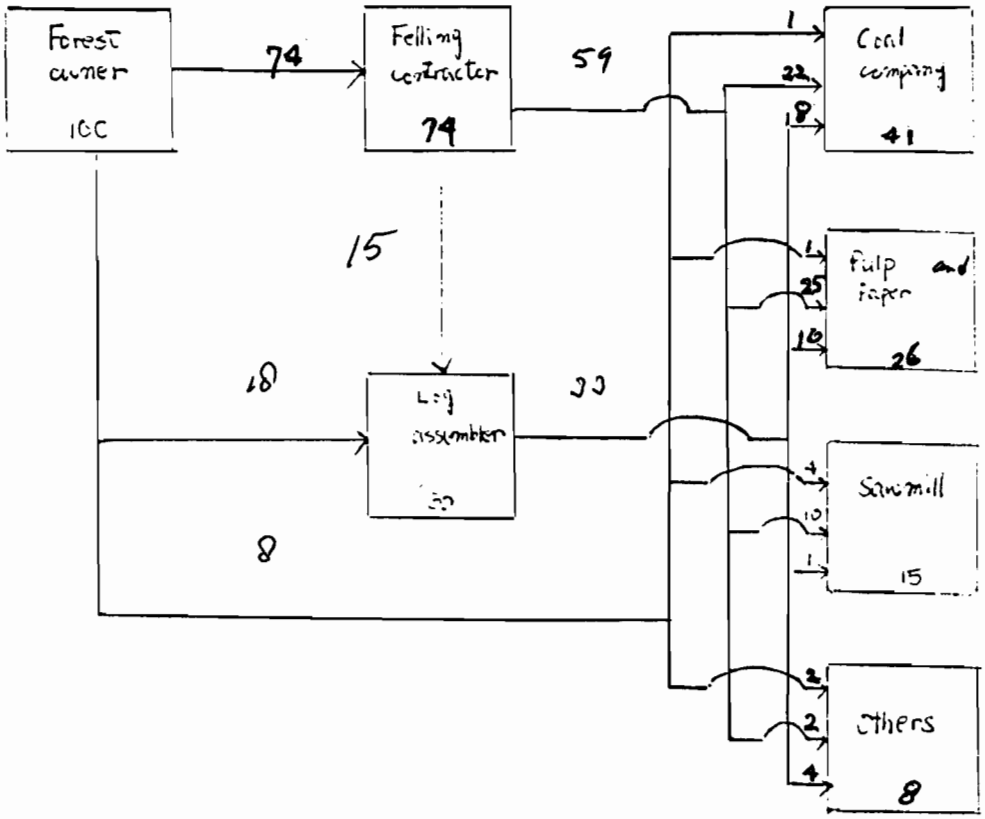

Figure 10. The distribution and uses of domestic timber in Korea. (Source: Yoo, BI., et al. 1985, A study of domestic timber marketing).

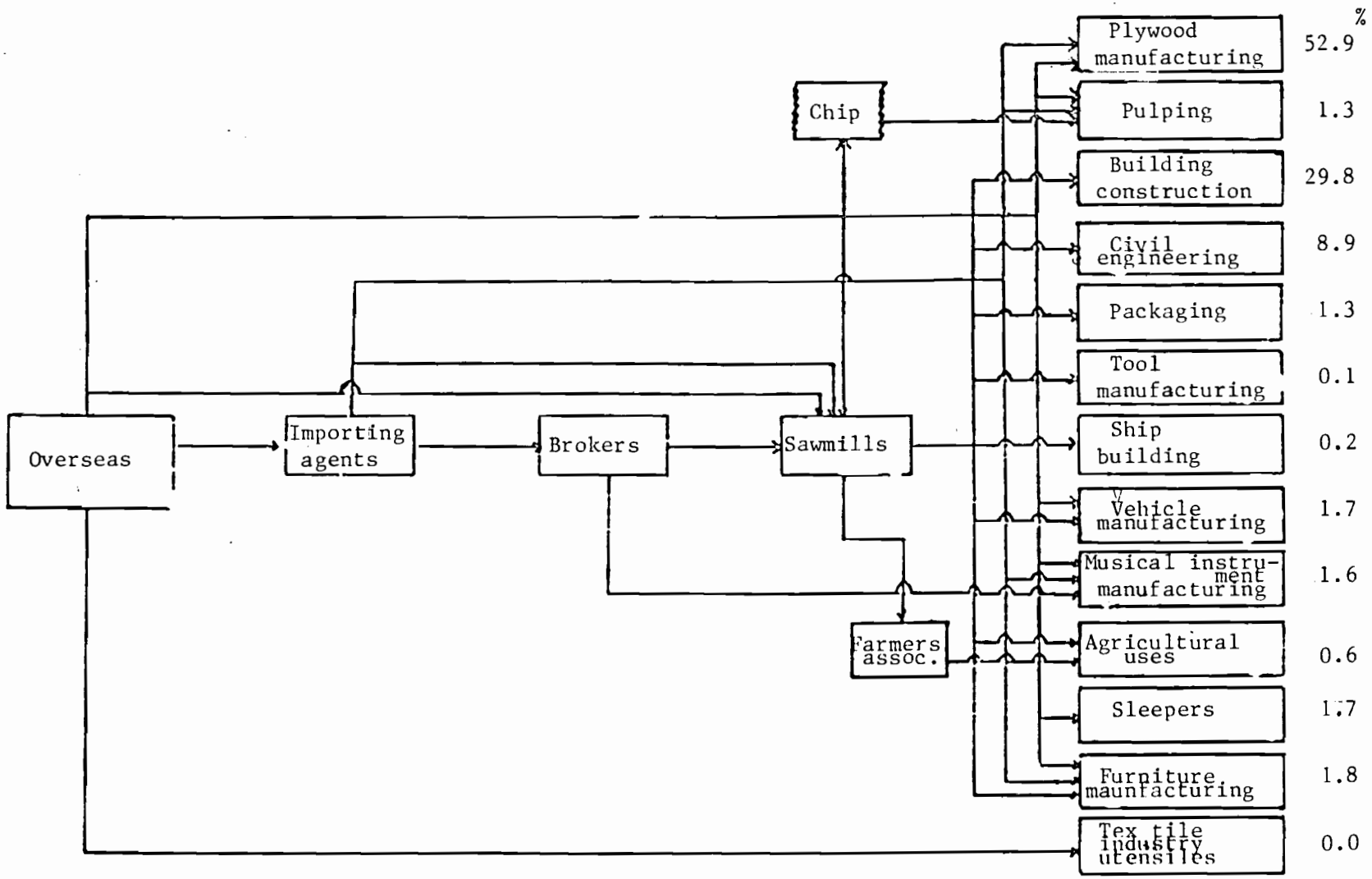

Figure 11. The distribution and uses of imported timber in Korea. (Source: Lee, C. U. et al. 1983. The utilization structure of forest products in Korea)

A. Lumber

Three sawmills were visited in 1985 and 1986. One was a rather large one, using only imported hardwood logs, one of medium size using up to 95% imported softwood and hardwood logs and finally a very small one using about 60% imported logs. All 3 were independent in the sense that they were not connected with another forest product manufacturer.

There are about 2000 sawmills in Korea at present. Reportedly they are operating at between 40-50% of capacity.

All 3 mills visited were producing lumber for the domestic market. Investment capital was 100% Korean. Machinery was mostly Korean made. Raw material costs amounted to about 70-75% of final product (lumber) costs, indicative of relatively low value added. Labor costs amounted to another 20%. All 3 mills listed raw material supply (log availability) as their biggest problem. They were willing to use domestic logs but complained about the quality, dimensions and unreliable supply. They were either unaware or not troubled by import tariffs on logs. Finally they had no trouble selling their product (lumber), generally to wholesalers and were not engaged in any conscious marketing effort; they felt that in the near future (next 5-10 years) they would be able to sell whatever they produced as long as they could get logs. This outlook is not surprising since Korea has to import most of its lumber (see chapter 7).

In summary, these producers do not have major marketing problems. Their biggest and very pressing problem is the raw material supply so that they can produce a product which can compete with cement, brick and steel. They can use and are willing to use the species produced in Korea but not unless the dimensions and grades improve substantially.

B. Plywood

Two mills were visited, both using only imported hardwood logs. The plywood sector, of course, has gone through a very turbulent period. Plywood capacity was built up very quickly starting in 1968, to reach a peak in 1979. Most if not all of it was built to process hardwood logs from Indonesia, the Philippines, and Malaysia. Korea became one of the largest hardwood plywood exporters in the world in the 1977-1979 period. However, the Philippine and Indonesian log supplies dried up and the Indonesians spectacularly built up their own plywood supply. The Korean plywood sector hit on very hard times and is presently operating at 50% of capacity. (see chapter 7).

The mills visited had a capacity of about 20,000 m^3 per month and imported 100% of their raw material needs. They were very worried about the future supply of logs and one, in fact, reported that they have started hardwood plantations in the Solomon Islands. They also are experimenting to shift over to softwood plywood production. One firm was already importing softwood logs and had an office in Washington State but exclusively for its attached softwood sawmill. This same firm was considering producing core board instead of plywood.

These mills were, of course, aware of the 30% import tariff on plywood and opposed any change. They were also aware of attempts by the furniture

industry to change or eliminate these tariffs. They reported some imports of plywood from Indonesia.

Raw material accounted for 60-65% of their product costs and labor for another 8-10%. One firm employed almost 1000 persons and reported a relatively high labor turnover. Their older machines were made in Japan, the more recent ones in Korea.

While not negative about the market outlook for their product, they did not see it in rosy terms either. They assumed that they would survive the continuing shake-out. Finally they saw no future potential in obtaining any significant amounts of raw material from the domestic markets. Size, price and quality reportedly were just not right.

C. Medium density fibre board and particle board

Only 1 mill was visited which produced medium density fibre board, particle board as well as lumber. It produced only for the domestic market and reported that it was the big producer in Korea. Its product goes into furniture and other uses. Both products reached a production peak in the early seventies but then fell back. Overall production in step with domestic consumption has risen steadily and smoothly since 1965. The manufacturer predicted a faster rising consumption in the future and was adding capacity.

It used only imported logs, reportedly paying $\$80/m^3$ FOB mill side (down from $100 a few years ago). Species used were primarily Keruing, Kapur, Luan, Ramin (which they preferred) and some others. Logs came primarily from Malaysia and Papua New Guinea. It also used some (cheaper) imported soft wood logs from the US and Canada. It figured that domestic logs of comparable quality were running 20% higher in price FOB mill and complained rather bitterly about the bureaucracy involved in cutting and transporting domestic logs from the forest to the mill; while the reported aim of the paper work was to avoid illegal cutting, it raised prices and delayed deliveries and made deliveries unpredictable. It had experimented with local species and liked the oaks, the pines (except pitch pine), and poplar but did not like larch.

It reported also that they grossly overestimated the amount of waste material they could get from the sawmills, causing some raw material problems since they had to use logs as well as wood waste for their board production. The import tariff on logs (1% of luan, 5% for other species) was not felt to be important.

The glues used were all produced domestically. Its newest machinery was installed by Germans, Westinghouse patented machines accounting for 70% and the remaining 30% was Korea made. Raw material costs accounted for about 55% of product costs (about 40% was wood and 15% is glue).

D. Hardboard

One firm was visited, in fact the only mill in Korea. It produced hardboard, with and without overlays of paint and prints. It foresaw a good market future for its product. In fact, it has been adding capacity; its first production line was started 36 years ago, while its main capacity was installed 16 years ago. The plant works at full capacity and is 100%

Korean. Presently 40% of its product is used for the interior of cars, taxis and buses (a very rapidly expanding market which is expected to reach 500,000 this year, 650,000 in 1987 and 2 million in 1988). The remaining 60% of its product goes to furniture, cabinets and interiors in houses. The firm produces exclusively for the domestic market but reported that since its product costs are lower than Japan's, it has been approached by potential Japanese customers. Its closest competitor is fiberglass (cloth & resin), which it will start to produce next year.

The raw material used is domestic, primarily coming from sawmill wastes. It uses 70% soft woods and 30% hard woods. Bark is no problem as long as it is less than 20% of volume. Pines are preferred (including pitch pine). Oaks present some problem because they are difficult to debark and a bit harder to chip.

Poplars have not been tried. The only species they definitely do not use is larch because it makes the hardboard warp too much. The firm worries a lot about raw material supply and its costs. Because of the depression in the sawmill industry, raw material was difficult to get and the firm had to use domestic logs; but transportation cost of domestic logs was killing them. The firm had experimented with Albizzia from the South Seas, but it was too expensive. If the firm could get more raw material at the right price it would produce more hardboard since it felt that it easily could sell more.

About 26% of its product costs are made up by wood costs, 32% by energy, 6% by chemicals and 17% by labor (for a total of 130 employees). Labor force was reportedly stable with little turnover.

Machinery was German made and not available in Korea. The chipper was made in Korea.

E. Treated wood

One preservation firm was visited, although there are 13 in total in Korea. Of these 13, 9 are large and 4 are small. The firm visited uses 100% imported wood, mostly hardwoods from the South Seas, some minor amounts of hemlock and douglas fir. It is contemplating some use of domestic larch.

It produces exclusively for the domestic market where its product is used as railroad ties, subfloors for schools, offices and houses, truck floors, etc. It produces primarily on order and thus it has no marketing problems. In fact, its markets have been increasing steadily. Main species are Keruing for floors and Selanga for ties. About 40% is creosote treated, 60% is osmose salt treated. They also treat timber with fire retardant in which case its products are used for the interior and exterior of houses, ships, etc.; in this case the species used are Keruing, Luan, Douglas-fir and Hemlock.

The firm has about 200 people on the payroll. Of its product cost, 80% is made up by the cost of wood and 10% by the cost of chemicals. Thus value added is very low.

F. Small solid wood uses: wood carving, wood artifacts, wooden bowls and dishes, bamboo products, toys and traditional musical instruments

About 7 manufacturers were visited that fit the general description of being very small (with 1 exception) and of producing wooden products that catered to a small regional market (same exception).

One such firm produced primarily small replicas (up to 3 ft.) of traditional harplike musical instruments and other artifacts for 1 department store in Seoul (chess boards, cloth pegs, cutting boards, ginseng containers, wooden figures, toys, etc.). It employed 12 persons and could easily sell all it produced. Consequently it was in the process of moving to a different location to enlarge its production. It used imported as well as domestic species, primarily hard woods such as Paulownia, Ulmus, Tilia and Gingko. Some imported species used were Douglas-fir and oak. Training the people takes a long time, about 1½ years. Machinery used is very small scale (small circular saw, bench top drills, etc.). Its biggest problem: to get the raw material, especially Paulownia and oak.

A similar firm in the south of Korea produced toys, wooden vases, carvings, bowling pins, containers for ginseng, wooden plates, little stools, etc. This firm produced primarily for Pusan (where it had its own retail outlet) and Taegu. The species used included alder, ash, chestnut, Tilia, Luan and Zelkovia (very expensive local wood). The firm has no trouble selling its products but had extreme difficulties getting raw material (logs); in fact, local log supply was so inadequate and unreliable that it purchased most of its logs in Inchon/Seoul, about 300 km. away. Poplar wood had been tried but was too soft. Oaks were good but hard to get in the right sizes.

A bamboo artifact and utensil manufacturing center in Tamyang was visited. Small-sized bamboo (up to 5 cm in diameter) grows around this southern area in Korea, the larger sizes are imported from Taiwan. The producers sell most of their products to dealers in the weekly market; buyers come from the big cities including Seoul (about 300 km. away). The market outlook appeared to be good for the products produced. Reportedly, all products are sold domestically only.

Another plant consisted of a small sawmill to produce parquet floors, table tops of small end- and side-glued wood, and wooden containers for ginseng and other small products. It used primarily imported hard wood logs but was beginning to shift to imported soft wood logs. It also used some of the domestic larch for its parquet floors. Raw material supply was reportedly a problem, except for the domestic larch.

Finally a model airplane maker which produced almost exclusively for the export market (the one exception in this group) was visited. It used only balsa wood, which it buys from Ecuador and only in lumber form to reduce transportation charges. As it is, 80% of its product costs consists of wood and 10% labor. It reported that it ends up using only 25-30% of the wood it imports; the rest is wasted. It reported several other companies like it in Korea; in the world market, Korea has a very small market share since it is dwarfed by Japan, Taiwan and Hong Kong. The firm is shifting to the production of plastic and styrofoam parts. It has 300 employees, is 100% Korean owned. The market is very seasonal and competitive but even though it is only 4 years old it plans to expand production to include model boats and other toys. It does not contemplate using local wood.

G. Furniture

The largest furniture manufacturer in Korea, a medium- to large-sized firm and 1 medium- to small-sized firm were visited. The 2 large ones produced for the domestic as well as for the export market (although one of these produced primarily for the domestic market), the medium- to small-sized one only for the domestic market. The 2 large ones produced furniture for the low- and medium-quality end of the furniture market (the low end only for the domestic market, the medium quality for the domestic and export market). The medium- to small-sized firm produced only for the top end of the furniture market spectrum and only for the domestic market. Since these 3 firms were so different, they will be discussed separately.

Firm 1.

It produced about 60% for the domestic and 40% for the export market, although a different plant in Seoul produces only for the domestic market. It exports furniture in knocked-down form to the USA (where it has its show rooms in 4 major cities but no retail outlets), Japan, Europe, Middle East and Hong Kong. For these markets it uses blue prints from those countries, i.e., it does not do its own designs. It does market its furniture under its own brand name. It reported 1 joint venture in Malaysia. By far its main competitors are in Taiwan.

It uses no domestic wood because its supply is too unreliable, its quality far too low and its price too high. Also the species are of the wrong kind, except oak. Raw material costs account for about 35% of the final product costs (15% for lumber, 15-20% for chipboard and medium-density fibre board). Labor accounts for another 20%. It operates at 92% of capacity. About 30% of the machines are made in Japan, about 70% in Germany and Italy. Energy and labor costs are reportedly higher in Korea than in Taiwan but its transportation costs are lower.

It imports chipboard from the US and also a lot of oak veneer. Under its lacquered products it uses rubber wood from Malaysia. They get raw material from a wholly owned US subsidiary (soft woods) and from a joint venture in the Solomon Islands. Also luan, apitong and kapur from Malaysia and PNG.

Products include furniture, flush doors, fire retardant doors, interior furniture and design items for high rises and ship cabins, parquet floors. Its furniture branch is relatively new. Annual sales run at 120 billion won (=136 million dollars). Market outlook is good but competitive; steady growth both for the domestic and export market is forecasted.

Firm 2.

It produces primarily for the domestic market, but it also exports to the US and Middle East. Its products are exclusively of the traditional furniture type: desks, beds, chairs, tables, chests. In marketing, it feels that the Taiwanese are far ahead and have it somewhat easier because of the many Chinese Americans in the important US market. It has a joint venture with Malayans both to produce furniture and get raw material (50% Korean capital); its Korean plants are 100% Korean owned.

It uses almost exclusively imported wood, mostly tropical hard woods such as meranti, rubber, sepatil and agathis. It also uses oak and maple,

imported in lumber form from the US. About 60-70% of the final product price is made up of wood costs, 12% of labor (about 1000 employees). The firm has complained bitterly about Korean woods: very high costs (about 20-25% higher FOB mill than imported wood of similar quality), very low quality and a lack of grading in Korea, small dimensions. The only useful woods in Korea are the oaks.

The firm feels that it (and others) would benefit greatly by better market information. The furniture market is competitive and presently hurting a bit because construction activity (in the Middle East, where many Koreans carry out projects) is down. But outlook is good to excellent.

Firm 3.
This is a medium- to small-sized firm producing only top quality furniture and only for the domestic market; living room, dining room and bedroom furniture; some kitchen cabinets. It does its own furniture designing. Species used include imported walnut (USA), ebony (Indonesia), rose wood, mahogany, oak and the domestic selkovia (if they can get it; it is for them by far the most expensive wood). It gets its wood through wholesalers, 80% is imported wood, 20% is domestic wood (but this share is going down).

The feeling is that domestic wood prices are so much higher because of the inefficient marketing channels handling the domestic woods and because of low quality. In general, the domestic woods are 25-30% more expensive FOB mill for comparable quality and species.

Of its final product costs, 30% is accounted for by wood, 60% by labor. It employs about 100 highly skilled persons. Skilled labor like it needs is difficult to get. Its labor force is stable, little turnover. Value added obviously is high to very high in this firm.

It is feeling its way in the market as it goes along. In its market niche there is not much competition. It estimates its niche to account for about 5-10% of the furniture market. It expects this share to be growing as Korea becomes richer and people become more demanding of quality. In Korea presently there are about 20 other firms like it, all 100% Korean owned and none of them exporting much.

H. Musical instruments
A major musical instrument manufacturer was visited, producing harmonicas, violins, guitars, pianos, organs, etc. Korea exported in 1986 about 35,000 pianos to the US alone, at a price of about 1 million won or more each. This firm exports its products to 40 countries, mostly the US, Canada and Europe. It usually exports 40% of its production and sells 60% locally. Wholesalers from these countries come to Korea to buy. It used to engage in a joint venture with Yamaha (Japanese) but the ties were severed when Yamaha moved its share to Taiwan. The firm is 30 years old and operates several plants. It will almost double production by opening a new plant next year. It foresees favorable to very favorable and growing markets in the future. It produces for the medium and upper end of the quality spectrum. It turns over its total inventory of finished products at the moment every 3 weeks (indicative of a booming market).

It reported that all its raw materials are imported. The spruce for the back (resounding) part of its products comes primarily from Alaska. Otherwise it uses tropical hard woods (meranti) for its plywood components, maple from the US, alder formerly from Japan but increasingly from the US for the structural parts and mostly walnut and oak veneers from the US for its outside product layer. It is beginning to shift to the use of imported soft woods and alder for its structural components and sides of the pianos, but knots are a problem. The firm does its own log buying although it buys also from wholesalers. The firm does not plan to use Korean woods in the near future because of unreliable supply and poor quality. It worries about raw material supply but has experienced no major problems up to this point. The company is 100% Korean owned. Of its final product costs, wood accounts for 50%, labor for 18-20% and going up. It foresees problems if labor costs make up more than 23% of its total costs. It employs 3,400 persons, 60% women. The labor force is young which is seen as a big advantage over the Japanese competitors; turnover is low. Labor needs 5-year training to reach optimal skill level. The value added obviously is high.

I. Wood chips

Two chipmills were visited in 1985 and one in 1986. There are 26 chipmills in Korea, most of them are producing chips for the one chemical pulpmill or the mechanical pulp mills. Many, in fact, produce under contract for these pulp mills. The average size is about 50 m^3/day or 15,000 m^3/year. The number of employees in the 3 mills visited, ranged from 50-60. All were 100% Korean owned, with an investment capital running at around ½ million dollars.

These mills used only domestic woods. The chemical pulp mill preferred oak chips but also accepted pine chips and poplar chips; it specifically refuses to buy larch chips. Wood has to be debarked but some bark is acceptable. The mechanical mills greatly prefer pine chips, especially red and white pine; they will take poplar and limited amounts of oak, but no larch and preferably no pitch pine. The biggest headache for all 3 chipmills was to get a constant supply of logs. The biggest competition for the logs comes from mushroom cultivators and from some of the mechanical pulp mills which have their own chipping facilities. The minimum size log they will accept is 4.5 cm in diameter. About 40% of the FOB pulp mill cost of chips is made up of wood, 15% is labor and 20-30% is transportation. These mills pay about 50,000 won/m^3 for logs FOB mill. The chipmills receive about 96,000 won per bone dry ton of chips FOB pulp mill site. Finally, they foresee a good and growing demand for their chips in the future. Their main competition comes from New Zealand chips (radiata pine) which are said to be cheaper but also not to yield as much pulp; as a result they end up to be more expensive. Also the Australian eucalyptus chips are competitors but they are somewhat more expensive price wise.

Finally the chipmills had some very small sawmilling capacity associated with them to more optimally use the larger log diameters to manufacture broomhandles and other small dimension stock.

J. Chemical pulp

Korea has only one chemical pulpmill, built in 1980 and supplying 19% of the domestic needs. It is wholly owned by the Korean government who decided to build it because its rate of return was unattractive to the private sector. In fact, the mill lost about 10 billion won annually in the first 3 years of operation but reported profits of 4.1 and 4.7 billion won in 1984 and 1985, respectively. This is partly due to the increasing price for pulp which now (1986) runs at 400 thousand won/ton, up from 90 thousand won/ton a year ago. Also the company started out at a production level of 300 tons/day. It was built with this and additional future increases in capacity in mind.

It is a batch type mill, able to use both hardwoods and softwoods. Initially it was to use waste wood from plywood and sawmills but with the severe downturn in both sectors, the mill had to turn to the use of round woods and chips. It has some of its own chipping capacity but in addition draws on the chips of 26 chipmills, some under long-term contracts and located all over Korea. Last year 70% of its raw material came from domestic wood; during the first 6 months of 1986, 100% came from the domestic supply. It pays about 90,000 won/bone dry ton (or $100) of chips FOB mill. It gets 40% of the raw material in chip form, 60% in log form. About 5-6% is provided by its own forests but it has plans to get up to 30% from forests under cooperative arrangements. Rotations for species are presently a question mark but are being investigated in cooperation with the FRI. A target rotation of 15 years is envisioned for oak sprouts, 15-20 years for pines. Finally, it gets some eucalyptus chips from Australia (reportedly at a delivered price which is 10-15% higher when the 5% import tariff is included than the domestic chips) and some from New Zealand (radiata pine chips are cheaper on a delivered ton basis but more expensive on a yield basis). It can use oak chips as will as pine and poplar chips but it does not accept chips from domestic larch.

About 45-50% of its product costs is due to raw material wood (this is considerably higher than the world average of 20-30%), 5% is due to labor and 6-7% is due to energy (the mill cogenerates but sells no power). The labor force stands at 400. It admitted that its chemical pulp costs run 10-15% higher than imported pulp of similar quality on a CIF basis. Some local paper mills are obligated to buy 40 units of pulp for every 100 units of imports.

Since it has been profitable over the last 2-3 years, the plans to add capacity are being dusted off. However, the raw material supply problem and the long-term profitability, coupled with some technical difficulties, have dictated a go-slow approach.

K. Mechanical pulp

The mill visited produced some of its pulp but imported more than 50% for the manufacturing of its main paper product lines, especially newsprint. It produces pulp from local pine chips where it prefers red and white pine and accepts pitch pine only if needed. It also accepts oak and poplar wood but prefers pines. It does not accept larch. It owns a substantial acreage of land on which it has planted red and white pine which it manages on short 15- 20-year rotations. It is also experimenting with some exotics. It has an arrangement insuring some chip and pulp supplies from New Zealand.

L. Paper

One large paper mill with no pulping capacity was visited. It uses virgin pulp, 33% domestically produced by the single chemical pulp mill in Korea and 67% imported pulp. Its pulp imports come from Scandinavia, the USA and Japan. It reports that the domestic pulp is about 10-15% more expensive than the imported pulp and complained about the requirement forcing it to buy the domestic pulp.

Its main product is coated papers (coating imported from USA) but it also produces tissues, low carbon paper, printing and writing paper. It exports less than 10% of its products to other SE Asiatic countries: Malaysia, Singapore and Hong Kong. There are 6 or 7 companies in Korea like it. Demand for its line of products is fluctuating, but it is generally increasing annually by about 5-10%.

It reports that raw material costs account for about 60% of its final product price, labor 7%. It employs 500 persons and average labor tenure is 7-8 years. It was started in 1958, averages 90% of capacity usage on 3 shifts a day.

M. Joint ventures in forest products

Foreign direct investment in the Korean forest products industry is all in the joint venture form. Two very small investments are from Japan and one is from Switzerland. Three major foreign joint ventures come from US paper companies: Kimberly-Clark, Scott and International Paper (see Table 8-1). Though little information is available about the joint ventures in Korea, they are of the market seeking type. As Korean disposable income rose and as the Korean consumer becomes more demanding and selective, foreign interests in the Korean markets increased. At the same time, strict controls on foreign investments, especially on foreign exchange consuming investments, required foreign investors to share ownership and make an export commitment as conditions of approval.

Virtually all Korean direct foreign investment in the forest products industry is resource seeking type investment. Most of it is in Indonesia, and virtually all (except investments in Papua New Guinea and the Solomon Islands) is in the joint venture form. The inventory in Table 8-2 was obtained from the Korean government agency responsible for approving outflows of foreign investment from Korea.

Table 8-1, Foreign Investment in the Korea Forest Products Industry

Company	Foreign Investor	Products Manufactured	Local Partner	Approval date	Investment Amount (US $1 000) Foreign Equity Ratio
USA					
Yuhan-Kimberly, Ltd.	Kimberly-Clark	Tissues and hard towels	Yuhan Corporation	1969	2 945 60%
Ssangyong Paper Co., Ltd.	Scott Paper	Tissue paper products	Ssangyong Ltd.	1978	5 007 34%
International Paper Korea, Ltd.	International	Paperboard	Canawan Corp.	1982	4 000 80%
Louisiana Pacific Korea	Louisiana Pacific	Chemical Pulp	Korea General Co. Seijin Rayon Co.	1974	10 000 27%
JAPAN					
Korean Buyong	Japan Buyong	Furniture	-	1973	120 50%
Han-Il Tree Planting Co.	Japan	Seeds and saplings of fruit trees and herbs	-	1977	200 49%
SWITZERLAND					
Bum Se Co.	Globex A. G.	Special furniture	-	1980	200 40%

Sources: Ellefson and Stone, 1984 US Wood based industry and predicasts database.

Table 8-2, Korean (ROK) Foreign Investment in the Forest Products Industry

Investor	Local Company Name	Date Approved	Amount Approved (US $1 000) Equity	Loan	Purpose of Investment	Investment Ownership Ratio	Cash EX-IM	Cash Company	Capital Goods	Local Financing	Other	Total Investment
INDONESIA												
Korea South Development	P.T. Korea Development Co. (Ind), Ltd.	1968	2 940		Forestry development	49%		100	1 500		1 340	2 940
Donghwa Enterprise	P.T. Inne-Dong Wha Development Co. Ltd.	1970	5 635	3 765	"	70%		1 715		3 421	101	5 237
Han In Corp.	P.T. Hanni Utama	1973	2 450	1 050	"	70%	858	663		774		2 295
Korea South Development	P.T. Hutan Kintap	1973	1 050	400	"	70%		400		650		1 050
Kyung Nam Trading	P.T. Kenahutani Indonesia	1975	650	1 438	"	65%		250		400		650
Ah Joo Forestry	P.T. Ahju Balapan Timber	1976	1 750	3 900	"	70%				1 357		1 357
Korea South Development	P.T. Emil Timber	1978	700	300	"	70%		500				500
Yoo Won Construction Co.	P.T. You-Lim Sari Co. Ltd.	1983	2 450	19 550		49%	1 372	83				1 455
PAPUA NEW GUINEA												
Halla Resources	Yam Yang Timber (Png) Pty.	1981	6 500	13 000	"	100%	4 030	2 470				6 500
USA-WASHINGTON STATE												
Hyundai Forestry	American Resources Inc.	1982	1 400		"	69%		1 050				1 050
SOLOMON ISLANDS												
Hyundai Forestry	Hyundai Timber Co., Ltd.	1983	500	5 500	"	100%		103			397	500
TOTAL			26 025	48 903			7 334	7 334	1 500	6 802	1 838	23 534

Source: Correspondence with Korean government

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APPENDICES

APPENDIX A

Foreign Investment Opportunities

A. FOREIGN INVESTMENT OPPORTUNITIES

A.1 Present Attitude and Policy on Foreign Investment

Korea welcomes foreign direct investment particularly from the United States. A renewed government policy of trade and investment liberalization has been initiated. 1984 was the brightest year for foreign investment in Korea. All-time highs of 419 million and $171 million were recorded in investment approvals and arrivals respectively. Approvals in that year were triple that of 1980 and 1981. Arrivals also jumped 70 percent of this period.

A special office in the Korean Ministry of Finance assists potential investors in their initial investigations and aids in carrying out the application procedures. A more complete list of S. Korea investment incentives and regulations can be found in Appendix B.

A.2 Foreign Capital Inducement Act

Korea's Foreign Capital Inducement Act effective July 1, 1984 was enacted to help Korea's plans to restructure its industrial sectors to offer opportunities for new foreign investment and technology transfer. The act, which is a general revision of foreign investment guidelines, attempts to open additional areas to foreign participation and streamline investment approval procedures.

The major change in the law is a switch from the system of listing which industries are open to foreign investment to listing those that are prohibited. The so-called "negative list" is intended to remove some of the guess work over which investment proposals will be approved, clearly spelling out which sectors are off limits.

Restricted areas focus on industries which now require protection from competition and government support, those requiring heavy energy consumption and import of raw materials, and sectors affecting the livelihood of farmers and fishermen.

The Foreign Capital Inducement Act offers liberal tax and other incentives to selected foreign investments. Three principles govern approval of foreign investment applications: 1) the contribution which the investment would make to the improvement of Korea's balance of payments position, 2) the contribution which the investment would make to the development of key industries or public utilities, and 3) the contribution which investment would make to the development of the national economy and social welfare.

A.3 Investment Prospects

The optimistic perspective holds that investment prospects in Korea will remain bright for the remainder of this year and into the future as the country gears up to host several international events such as the Asian Games in 1986 and the Olympics in 1988. Continued liberalization of foreign investment can be expected as the country increases efforts to decrease reliance on debt financing and increase equity.

However, this view is not universally held. According to an article by Lee Byung-Soo (Business Week, August 1984), foreign businessmen in Seoul said Korea's investment reform laws will have to go much farther to attract a significant amount of foreign capital and to improve the nation's competitiveness with Singapore or Taiwan or high technology ventures.

Many feel the power of the Ministry of Finance to aid in facilitating new investments may be limited. The new Foreign Capital Inducement Act, as is felt by some, will bring no major immediate lifting of the obstacles to foreign investments aimed at the domestic market.

An outstanding concern not addressed in the act concerns patent rights. Korea does not have a good patent law to protect high technology which will be a deterrent in attracting new high technology investment.

The key point is that market forces will determine whether Korea can attract foreign investment.

A.4 Forest Products Industry Investment

All foreign investments in the forest products industry in South Korea are in the form of joint ventures. U.S. involvement is primarily in the area of paper (Table 7) production. Because Korea has so little domestic forest resources, the emphasis of foreign investment is on supply-oriented arrangements where participating companies can secure offshore supplies.

The greatest opportunities for foreign investment appear to be in the pulp and paper related industries. The capital investment for such facilities often exceeds 1 billion dollars and local enterprises may not have the ability to sink such a large amount of money into an investment on its own. Foreign concerns, particularly firms in the U.S., Canada and other resource-rich countries that have an available resource supply are best suited to enter joint ventures.

As domestic demand for furniture increases the attractiveness of joint ventures in MDF or particleboard production will increase. South Korea could also expand this industry with the goal of becoming an exporter of furniture as Taiwan has done thereby capturing value-added on secondary processed products.

APPENDIX B

Foreign Investment in Korea

From: Overseas Business Report OBR-85-02 Marketing in Korea April 1985

INVESTMENT IN KOREA

U.S. Investment in Korea

At the end of 1983, foreign equity investment approvals since 1962 totalled $1.7 billion in 956 projects--the United States accounted for $471.4 million in 172 projects or 27.6 percent of total foreign direct investment approvals. Japanese investment was $843.4 million in 663 projects or 49.5 percent of the total. Foreign investment in Korea to date has been mainly in the following industries (as a percent of total foreign investment): chemicals (19.3 percent), tourism and hotels (11.5 percent), electrical appliances and electronics (14.7 percent), machinery and parts (7.6 percent), textiles and garments (9.7 percent), and steel and metals (4.8 percent). Total new foreign investment project approvals in 1983 amounted to $267.7 million in 75 projects. The Fifth Five-Year Plan (1982-1986) targets a total of $2.5 billion in direct investment during the plan period.

Major U.S. investments are in electronics, petroleum, and transportation equipment. Some of the larger American investors in Korea are Caltex, Motorola, General Motors, Fairchild Semiconductor, IBM, Sperry Rand, General Foods, Corning International, Union Carbide, and Scott Paper.

Korean Policy on Investment

Korea welcomes foreign direct investment, particularly from the United States. A special office in the Korean Ministry of Finance assists potential investors in their initial investigations and offers help in carrying out the necessary application procedures. In seeking to obtain Korean Government rulings in specific cases, it will often be necessary to refer to special laws, separate regulations and announcements, and case-by-case decisions by the Korean Government. Legal counsel should be retained at a very early stage of the project.

Inquiries may be directed to the Investment Promotion Division, International Finance Bureau, Ministry of Finance, 142-12, Susong-dong, Chorgro-ku, Seoul, Korea. An additional source of assistance is the Korea-U.S. Economic Council located at C.P.O. Box 6754, 10-1, 2-Ka Hoehyun-dong, Choong-ku, Seoul, Korea, or its American counterpart, the U.S.-Korea Society at 725 Park Avenue, New York, N.Y. 10021. Korean Government representatives at its Embassy and Consulates in the United States also stand ready to assist. (See Sources of Economic and Commercial Information Section).

Korea's Foreign Capital Inducement Law offers liberal tax and other incentives to selected foreign investors. Three principles govern Korea's approval of specific foreign equity investment proposals: (1) the contribution which the investment would make to the improvement of Korea's balance of payments position; (2) the contribution which the investment would make to the development of key industries or public utilities; and (3) the contribution which the investment would make to the development of the national economy and social welfare.

The minimum allowable value of foreign investment is $100,000.

The categories of industries in which foreign investment is permitted are classified by the new guidelines as follows:

(1) Large-scale, capital intensive facilities that cannot be built/managed/operated independently by domestic enterprises alone,

and industries for the production of electric/electronic products and chemical products;
(2) Energy-related industries;
(3) Export-oriented projects for which overseas markets cannot be effectively exploited independently by domestic enterprises;
(4) Projects contributing to the development/utilization of domestic resources;
(5) Projects for the manufacture of foodstuffs and pharmaceutical products;
(6) Commodity distribution (wholesale and retail industries) and selected service industries;
(7) Other projects deemed necessary by the Minister of Finance.

On December 16, 1983 the Korean Government simplified the Foreign Capital Inducement Law (FCIL) to attract additional foreign capital and know-how and improve the climate for foreign investment. The main provisions of the new FCIL are summarized below.

The Korean Government has adopted a new Negative List System for foreign investment approvals, whereby all areas are open to investment except those on the list. This replaces a positive list system, which listed only those sectors in which investment was specifically permitted. Under this new system, 66 percent of all industries (up from 44 percent) and 85 percent of manufacturing industries (up from 69 percent) are fully open to foreign investment. Certain other sectors, listed as "partly free," allow investment in specific lines of business only. This brings the total of free and partly free areas to 70 percent of total industries and 90 percent of manufacturing industries.

Another feature of the investment list is that it differentiates between those areas which are permanently "prohibited" and those which are temporarily "restricted" to foreign investment. Consequently, additional areas are expected to become at least partially open as the negative list is revised every 6 months.

Those sectors which are prohibited--meaning foreign investors need not apply--include: operation of irrigation, postal, transport, and communications systems; manufacture of cigarettes and coal briquettes; operation of casinos, publishing; real estate brokerage and property rental; liquor wholesale businesses; and agricultural productions. The restricted list covers areas where the Korean Government is not presently interested in foreign investment, but could be in the future. The restricted list includes projects requiring specific government assistance, producing pollution, depending heavily on energy and other imported materials, and involving investment in underdeveloped areas for which protection is necessary for a certain period. However, according to the selection guidelines, foreign equity investment in the restricted areas may be reviewed for approval in exceptional cases by the Ministry of Finance and may be shifted to the free category in the future. The current restricted category includes: dairy operation, livestock breeding, electric power generation, wholesale distribution of fruits and vegetables, and bakery and confectionery wholesale businesses.

Under the revised FCIL, the Ministry of Finance has the authority to approve foreign investments without prior consultations with other ministries (automatic approvals) if the size of the foreign equity investment is $1 million or less. Another criterion for automatic approval is a foreign equity ownership share of 49.9 percent or less. However, a waiver from the 49.9 percent automatic approval limit is provided if a foreign-invested company exports 60 percent or more of its product or the joint venture produces an item which would otherwise be imported, is subject to a basic tariff of 10 percent or less, and is free of import licensing restrictions.

Although the revised law retains the basic five-year, 100 percent tax holiday (or an option for accelerated depreciation) now available to a foreign investor after a case-by-case review by the relevant ministries, the specific criteria for eligibility will be determined by a Foreign Capital Project Review Committee. Foreign investment in restricted areas or in other low priority sectors, such as consumer products and service industries, will not benefit from the holiday.

Finally, capital goods imported by industries other than those specified under the statute will continue to be exempt from the customs and other taxes. However, a provision was established in the presidential decree which gives the Korean Government some discretion in determining the degree of exemption for certain industries, to be specified in a subsequent ordinance from the Ministry of Finance.

Though the revised law represents some easing of government control over foreign investment, the government's case-by-case approval process for major investment proposals and discretionary authority on tax exemptions create some uncertainty as to whether foreign investment will be boosted substantially. Nevertheless, the revised FCIL indicates a more receptive attitude toward foreign investment which may well translate into significant opportunities for U.S. firms.

Investment Regulations

Application Procedures. With the exception of investments in the free export zones, all foreign direct investments, technology assistance agreements, and the repayment of loans exceeding 3 years and $1 million or more are regulated by the Foreign Capital Inducement Law (1966, amended in December 1983) and its Enforcement Decree (amended on June 30, 1984).

An application for approval of a foreign investment must be submitted to the Investment Promotion Division, International Finance Bureau, Ministry of Finance in quintuplicate, together with necessary supporting documents including the project plan, a certification of nationality, articles of incorporation of the new firm, a proxy authorization, and, when applicable, a joint venture agreement. It is desirable that the application for authorization be submitted in the Korean language. Joint-venture agreements should be in English. Reliable Korean law firms are available to assist in preparing joint-venture agreements and to provide translation services. The applications should include details of the nature and scope of the proposed foreign investment. All ambiguities should be clarified in the initial planning stages, so as to minimize the risk of problems arising once production or operation has begun. Agreements regarding government

concessions and exemptions should be stipulated in writing and affirmed by the responsible government officials.

Under the new FCIL and its enforcement decree effective July 1, 1984, the Minister of Finance (MOF) shall approve a foreign investment without delay unless it falls under one or more of the following categories:

1) in the event that the foreign equity ratio of stock subscribed for or owned shares is 50 percent or more except where a foreign invested enterprise exports self-manufactured products of 60 percent or more, or the foreign investment project is for the manufacture of goods for which an import tariff of 10 percent or less is assessed when there are no import restrictions;

2) in the event that the amount of foreign equity stock subscribed for or owned exceeds $1 million;

3) in the event that the tax benefits under paragraph 1, Article 14 of the FCIL are desired;

4) in the event that an investment is made in a project in which foreign investment is restricted. In this case the Minister of Finance shall select and give public notice of the project in which a foreign investment is restricted after consultation with the competent Minister in accordance with the criteria prescribed by presidential decree.

Any projects falling within these provisions are in every case subject to a case-by-case review by the Minister of Finance, the competent ROKG ministry, and in some cases the Foreign Capital Inducement Deliberation Committee (FCIDC). Following an initial screening by the Ministry of Finance, the application will be forwarded to the competent ministry, depending upon the nature of the proposed investment. The ministry or ministries are required by law to submit an opinion to the Ministry of Finance within 20 days (10 days for a foreign investment of $1 million or less) from the date of the receipt of the application. The investment application will then be forwarded to the Minister of Finance for clearance. In some cases where the proposed investment involves special tax exemptions/reductions or referred to it by MOF, the final clearance comes from the Foreign Capital Inducement Deliberation Committee (FCIDC). The FCIDC reviews the established criteria as well as the comments and recommendations received from the Ministers. If FCIDC approves the application, the Minister of Finance authorizes the proposed foreign investment project and advises the applicant accordingly.

Remittance of Dividends and Capital. Article IV of the Foreign Capital Inducement Law guarantees the overseas remittance of both dividends and capital. When a foreign investor wants to remit abroad, he must file an application with the president of a foreign exchange bank for approval. Approval will be granted after the application is reviewed for legitimacy of the requested repatriation, performance of the conditions stipulated in the investment approval, status of tax payments and other such matters.

Reinvestment of Dividends. A foreign investor may reinvest in the same foreign-invested enterprise and in other new projects. In the case of investment in the same enterprise, the foreign investor is required only to report to the Minister of Finance if the foreign investment ratio does not

exceed the ratio formerly approved. Formal approval of the Minister of Finance is required if the investment ratio of the same enterprise is higher than originally approved and in all cases where the investment is to be made in another project.

Licensing Agreements

Licensing and technical assistance agreements provide another alternative means of entry to the Korean market.

There are no specific limitations on licensing agreements. Approval of agreements is based on internal and unpublished policy guidelines of the Ministry of Finance. It may be said in general, however, the priority is given to technical and licensing agreements in the export and highly sophisticated machinery industries.

On December 16, 1983, the Korean Government revised the Foreign Capital Inducement Law (FCIL)--which became effective July 1, 1984--substantially liberalizing restrictions on the inducement of foreign investment and technology. The revisions change the present approval system for foreign technical licensing proposals to a reporting system. Korean companies are now required only to report technical licensing to the competent minister.

Any applicants for a foreign technology assistance agreement shall file a report with the Minister of Finance, who reserves the right to demand changes in the terms and conditions of the agreement, if necessary. The report will be considered accepted if the applicant is not notified by the Ministry of Finance of any changes to be made in the agreement within 20 days from the date of the filing of the report.

Under no circumstances will the Minister of Finance approve licensing agreements with the following characteristics: 1) contracts providing principally for the use by Korean firms of foreign designs, brands, and/or trademarks, or monopolistic sales rights; 2) contracts intended primarily to promote the sales of raw materials and/or components; 3) contracts which contain unfavorable or unduly restrictive terms, e.g., limitations on licensee access to export markets; 4) contracts for "outdated, low-grade, or declining" technology; 5) contracts for the provision of technology reserved by the Minister of Science and Technology (MOST) for indigenous development under paragraph 2, Article 8 of Korea's Technical Development Promotion Law; and 6) other contracts which are not deemed suitable under other laws.

From 1962 through 1982, 2,281 technical assistance and licensing agreements had been concluded by Korean enterprises. The United States accounted for 533, and Japan, 1,287; 28.2 percent of these agreements were related to machinery and parts, 18.4 percent to the electric and electronics industry, 17.0 percent to petrochemical refining and chemical engineering, 8.9 percent to the metallurgical industry, and 27.5 percent to other industries (textiles, communications, shipbuilding, power generation, etc.). Total remittances of royalty payments since 1962 have amounted to $681.0 million, with 36.4 percent going to the United States and 34.2 percent to Japan.

Forms of Business Organization

In principle, foreigners are permitted to operate in the following types of organizations: joint stock corporation, limited partnership, unlimited partnership, limited company, and branch.

Joint Stock Company. The joint stock corporation (Chusik Hoesa) is the company structure most commonly utilized by foreign investors. The legal concept and regulations of the joint stock company in Korea are similar to those found in the United States, Japan, and Germany. To establish a joint stock company, Articles of Incorporation must be drawn up and notarized. Seven or more promoters, none of which need be Korean, are required for the incorporation of a joint stock company. After incorporation the number of shareholders may be reduced to one. The minimum par value of a share is W500, and shares may be registered as bearer, common, or preferred. Common shares must carry voting rights.

The application for registration must then be submitted to a District Court. Upon registration and payment of the registration tax (two percent of capital for Seoul, Pusan, Taegu, and Inchon and 0.4 percent for other areas), the company acquires the status of a juridicial person. At such time it may enter into contracts, acquire rights and obligations, possess intangible property such as patents and copyrights, own real estate, establish commercial credit, and undertake business transactions.

Within 30 days of the commencement of business a company must apply to a district tax office for a business license. The license must then be certified twice yearly by government authorities.

An annual independent audit by a certified public accountant is not required, except for those companies listed on the Korea Stock Exchange; local banks and branches of foreign banks, foreign investment companies remitting dividends overseas; companies remitting royalties overseas, to the extent of the sales on which the royalties are based; and Korean branches remitting gains of over 100 percent of its authorized operating capital or over 50 million won during a specific business year. A number of international auditing firms are represented in Korea.

Korea is expected to revise its commercial code in the near future for the first time in 20 years to better conform to economic reality and changing business practices. Highlights of the proposed revisions to the Commercial Law, now up for public debate, are: 1) each joint-stock company should have at least 50 million won (approximately $62,500) in paid-in capital (currently, there is no such minimum requirement); 2) the minimum face value of a share should be 5,000 won ($6.25), 10 times the present level (currently, shares have two different face values--500 won and 1,000 won. Under the revised law, there will be only one type of share with a face value of 5,000 won); and 3) joint-stock companies can issue corporate bonds up to twice their paid-in capital and reserves (currently a company can issue corporate bonds only within the level of its paid-in capital and reserves).

Branch of a Foreign Corporation. Licenses issued by the Bank of Korea are required for the establishment of branches (branch offices, branch shops, liaison offices, etc.) by foreign corporations intending to make remittances of gains to their head offices overseas, according to the new Foreign

Exchange Control Regulations amended on July 26, 1982. Formerly no such license was required. However, foreign branches requiring no remittance of gains will continue to be required to simply file "reports on establishment" with the Bank of Korea. Other significant points of the new "Regulations Concerning Establishment of Foreign Enterprises' Branches" are as follows:

(1) the office will engage in activities related to insurance services, the acquisition of securities, management consultant services, or which, other than banks, will conduct financial activities such as the extension of loans or the arrangement/mediation of foreign credits, requires approval of the Minister of Finance rather than a license from the Governor of the Bank of Korea;

(2) the license will have to be renewed every 3 years, unless otherwise approved in accordance with the pertinent law;

(3) the office which will engage in sales of imported goods must register with the Association of Foreign Trading Agents of Korea (ARTAK), and the office which will engage in exports of Korean-made goods must register with the Korea Export Buying Offices Association before their application is submitted to the BOK for establishment of a branch office;

(4) in the case of foreign branches requiring remittance of gains, prior approval of the Bank of Korea will be required for the inducement of over $1 million of operating capital;

(5) remittance of business gains may be made only after 3 years from the date of the approval of establishment, and the annual amount of remittance is limited to a maximum of 20 percent of the total sum of operating funds introduced for five years beginning with the first remittance;

(6) approval of the Governor of the Bank of Korea must be secured for repatriation of liquidation proceeds, and repatriation of such funds is limited to the total amount of operating funds introduced, earned surplus, and other reserves;

(7) no remittance of gains accrued from businesses not covered by the license will be approved.

Appointment of an Agent. Foreign exporters who wish to be represented in Korea but cannot justify an office of their own may appoint an agent to act on their behalf. An individual with special qualifications may be chosen, although the customary practice is to select from among the thousands of offer agents and registered traders currently operating in Korea.

Acquisition of Stocks. Foreign acquisition of existing stocks or shares is prohibited under the Foreign Capital Inducement Law. Investment may be made by subscribing to stock or shares of a newly established corporation or by subscribing to a new issue of an existing enterprise. Capital for subscription may be in cash, kind, industrial property rights, technology related to industrial property rights, and rights to the use of such technology.

Ownership of Land. Foreign investors may legally own and lease land throughout Korea. In practice, however, the purchase of land has not been allowed unless provided for in the investor's contract under the Foreign Capital Inducement Law. Foreign nationals are subject to the regulations of the Alien Land Law, which requires firms with a foreign interest of 50 percent or more to obtain approval for land ownership from the Ministry of Home Affairs.

Property Grantee. All property of foreign-invested enterprises is guaranteed and protected from requisition or expropriation. The same rights, privileges, and protection enjoyed by Korean nationals are extended to foreign nationals and enterprises, except in cases specifically prescribed by law.

Intellectual Property Rights

Patents and Trademarks. Korea acceded to the "Paris Union" International Property Convention effective May 4, 1980, and implemented a revised Trademark Law on January 1, 1980. In addition, through court decisions, Korea is providing greater protection for well-known foreign trademarks. Patents and trademarks fall under the jurisdiction of the Ministry of Trade and Industry.

Patents are granted for a 12-year period and are not renewable. Trademarks registered with the Patent Bureau are protected by law for 10 years and may be renewed indefinitely for 10-year periods. Trademarks must be used to remain valid, and those not used within a year of registration may be subject to cancellation.

Through a reciprocal provision of the Treaty of Friendship, Commerce and Navigation between the United States and Korea, U.S. investors may register patents and trademarks directly in Korea. In the absence of a commercial agreement, foreigners must file for patent or trademark registration through a licensed agent. Firms desiring counsel in patent or trademark matters may obtain a list of English-speaking patent attorneys from the Korea Patent Attorney's Association, 4th Floor Kumsung Bldg. 55-4, Seocho-dong, Kangnam-ku, Seoul. The cost of acquiring patent and trademark rights is nominal.

Items construed as vital to national defense or to the public interest are not patentable. Food, beverages, and pharmaceutical products fall within this category, although related processes may qualify for coverage.

Copyrights. Korea is not a member of the Universal Copyright Convention (UCC), nor has it entered into any other agreement with the United States for mutual protection of copyrights. Under Korea's Copyright Law, only Korean nationals may apply for copyright registration of books and other literary works and enforce such registration against unauthorized users. Although foreign publishers may not apply for copyright protection of their works, the Bureau of Culture of the Ministry of Culture and Information, which administers the Copyright Law, has agreed to a procedure whereby Korean book publishers who have licenses from U.S. publishers to publish in Korea may apply for local copyright protection of the latter's U.S.-copyrighted books. Books copyrighted under these procedures will thereby be entitled to the full protection of the Copyright Law.

Taxation

Korea offers selected foreign investors a number of tax exemptions and benefits under its Foreign Capital Inducement Law and other tax laws. Table B-1 lists the major tax privileges. The foreign investor, creditor, or supplier of technology has the option to request that taxes not be exempted or reduced. In addition, other benefits are provided.

Tax Credit on Investment. In the case of capital invested in six key industries, (i.e., shipbuilding, iron and steel, machinery, electronics, aircraft manufacturing, and naphtha cracking), an additional 100 percent accelerated depreciation allowance is available, except in electronics and machinery industries which are given a choice between a 5 percent invoice tax credit or the 100 percent accelerated depreciation allowance.

Tax Exemption and Reduction for Disaster. In cases where an enterprise is deemed unable to pay taxes because of a loss of more than 50 percent of the total amount of its business assets due to an "Act of God" or any other disaster, the corporate tax and business tax on the enterprise may be exempted or reduced according to the ratio of the value of the lost assets.

Income Tax Holiday for Foreign Engineers. In the case of foreign engineers and technicians with specified job experience or academic background and employed in domestic or foreign-invested firms, an income tax holiday for up to five years is available.

Corporate tax returns must be filed within 15 days from the date of finalization of the settlement of accounts (within 30 days if a taxation adjustment statement prepared by a certified public accountant or a tax accountant is attached). The Ministry of Finance is charged with the ultimate responsibility for fiscal matters, with the enforcement and processing functions of collection handled by the Office of National Tax Administration. Tax audits on foreign investments should be expected each year.

Labor Force

Composition. At the end of 1983, Korea's labor force totaled 15.1 million. The agriculture, forestry, and fishing sectors accounted for 32.0 percent of the employed labor force. Other categories were mining and manufacturing, 21.9 percent; and social and overhead capital and other services, 46.1 percent (construction 5.8 percent and others 40.3 percent).

With a very young population and women increasingly entering the labor market, Korea today has an estimated 16 million economically active people out of a total population of just over 40 million.

Productivity increases in the last ten years have averaged over 10 percent per year, while real wage increases have averaged 8.5 percent.

The labor force is one of Korea's main resources. With a 93 percent literacy rate and an emphasis in the school system on technical education and vocational training, there is a good supply of well-trained, skilled workers and competent supervisory personnel. From the middle managerial level down to novice production line workers, Korean job holders are known to be very meticulous and hard working and have high productivity.

Payments and Benefits. Korea has no legal minimum wage system, although the Labor Standards Act authorizes the Ministry of Labor Affairs to set a minimum wage according to industry. Base wages make up only part of a worker's income. Fringe benefits make up 50-60 percent of a wage-earner's salary and, in some cases, may amount to 80 percent of total compensation. In 1982, average monthly earnings for all workers were about $283. Highest average monthly earnings were paid by the petroleum refining industry ($744) and the lowest by the wearing apparel industry ($182).

In addition to an employee's base salary, bonuses of 100 percent of monthly salary or higher are paid several times a year. Many companies provide meals at lunch and commuter services. A minimum of one month's average salary for every year of employment is given as severence pay by employers employing more than 16 workers.

Working Hours. The standard work week is 48 hours--8 hours a day for 6 days. Working hours may be extended to 60 hours per week by mutual agreement, a practice that has become common in manufacturing and export industries. Further extension of overtime hours requires the prior approval of the Ministry of Labor Affairs. Eight hours of work a day should be accompanied by at least one hour of rest. Anything above the standard work week is considered overtime and is subject to compensation at 150 percent of the standard hourly rate. Minors, ages 13-18, are permitted to work 42 hours a week (7 hours a day). There are 14 legal holidays in Korea. In addition, employees are entitled by law to eight paid holidays a year if they have at least 90 percent perfect attendance.

Social Benefits. An employer employing more than 16 workers must provide at least one physical examination a year. For an on-the-job injury, industrial accident compensation practice provides that the employer pay medical costs, 60 percent of the employee's ordinary wages during the period of medical treatment, and compensation for physical handicaps. In case of death, 1000 days of wages and funeral expenses (90 days wages) must be furnished to the employee's family. For firms employing 16 or more workers, industrial accident compensation insurance is mandatory.

Labor Relations

There are three basic laws concerning labor: The Labor Standards Law, the Labor Union Law, and the Labor Dispute Settlement Law.

These laws provide the framework for labor-management relations. Enacted in 1953, the laws have been amended several times, most recently in December 1980. The revisions severely limit the ability of unions to organize to represent workers' interests. They prescribe that union shop contracts may be negotiated only with management agreement; collective bargaining may take place only at the individual enterprise level; and enterprise unions are forbidden from accepting assistance or advice from outside the local union membership. The authority of labor-management councils was increased, and every business employing 100 employees or more was required to establish a labor-management council to deal with day-to-day labor-management problems. A total of 4,865 businesses had labor-management councils in 1983, and Ministry of Labor Affairs officials reportedly have plans to extend the councils to businesses with only five or more employees in 1985.

In addition, there is a special law which provides for the establishment of a Foreign-Invested Enterprises Labor Dispute Settlement Committee in the Ministry of Labor Affairs. This Special Law on Labor Dispute Adjustment for Foreign-Invested Enterprises, enacted in 1970, requires that most disputes at foreign-invested businesses be brought immediately to the attention of the Minister of Labor Affairs for compulsory arbitration. Foreign-invested businesses affected include those in specified industries and all those producing exclusively for the export market. In case of a suspension of operations for the closing of a foreign enterprise, the Korean Government must adjudicate labor disputes within 20 days.

The labor union movement is still in the developing stage. Under the Labor Union Law, workers are entitled to form and participate in the activities of labor unions, to conduct collective bargaining, and to take collective action in order to maintain and improve working conditions. Use of violence and destructive acts in labor disputes are prohibited, and conciliation, mediation, and compulsory arbitration are the approved means of settlement. At the end of 1982, there were 16 industrial unions, all affiliated with the Federation of Korean Trade Unions (FKTU). The number of companies with a labor union chapter was over 2,100 with total membership over 960,000, most of which had concluded collective bargaining agreements. Agreements that have been concluded must be registered with the Ministry of Labor Affairs within 15 days from the date of conclusion of the agreements.

Between 1961 and 1979, FKTU grew from 14 affiliated national unions representing 128,000 workers to 17 national unions representing 1,100,000 workers. Jurisdictional disputes were avoided by laws that ban activities hampering the operation of existing unions. Revised labor legislation in 1980 was one factor that led to a precipitous decline in FKTU membership in 1981. FKTU membership, which includes only dues-payers, declined again in 1983 after some recovery in 1982.

Investment in Industrial Estates

Korean law permits the building of new plants only in industrial areas. The Government's policy of decentralization, aimed at relieving congestion in Seoul, entirely prohibits new factor construction in the city. There is, however, no problem in selecting industrial estates. The Korean government is guilding many industrial estates and is providing the necessary infrastructure facilities in coastal and inland areas. There is particular interest in attracting foreign investment to these areas.

There are 24 industrial estates classified in six groups: 6 specialized industrial estates, 14 local industrial estates, 2 private industrial estates, and the Iri and Masan Free Export Zones. All offer low land costs, adequate power and water, transportation and support facilities, and special administrative assistance. All of the industrial estates are open to foreign as well as local enterprises.

Some of the more interesting estates to potential foreign investors are the Gumi Electronics Zone, established for the assembly of electronic items and the manufacture of electronic components, materials, and related industrial products; the Iri and Mason Free Export Zones (described in the Trade Regulations Section); the Changwon Industrial Complex designed as an integrated machinery manufacturing base; and the Yochun Petrochemical Industrial Estate designated as a petrochemical products manufacturing base.

Additional information on the industrial estates may be obtained from the Director, Bureau of Industrial Promotion, Ministry of Trade and Industry, 4th Floor, Unified Government Bldg., 77 Sejong-ro, Chongro-ku, Seoul.

Table B-1
Major Tax Reductions and Exemptions Applicable to
Selected Foreign-invested Enterprises in Korea

	Taxation Basis	Tax Rates	Tax Reduction or Exemption
Income Tax on Unincorporated Enterprises	Amount of Income or Earnings	6-55%	Exemption for 5 years in proportion to the ratio of stock or shares owned by the foreign investors.
Corporation Tax	(1) Income in Each Business Year (2) Liquidation Income	20-33%	Exemption for 5 years in proportion to the ratio of stock or shares owned by the foreign investors.
Wages and Salary Income Tax	Salary or Wage of Foreign Employee Working in Foreign Invested Enterprise	6-55%	Exemption for 5 years
Dividend Income Tax	Amount of Dividends Received	Private: 6-55% Corporate: 20-33%	Exemption for 5 years on foreign investors
Tax or Technology Income	Amount of Income Received from Supplying	Private: 6-55% Corporate: 20-33%	Exemption for 5 years
Interest Income Tax	Interest or Other Income Accruing from	Private: 6-55% Corporate: 20-33%	Full exemption for foreign loans approved
Value Added Tax	Amount of CIF Value plus Customs Duty	10%	Full exemption on imported capital goods
Customs Duty	Ad Valorem Basis (c.i.f. Price) for	1-100% by commodity	Full exemption on imports of capital goods approved
Property Tax	Assessed Value of Land, Buildings, Vessels, Mining District, etc.	(1) Land 0.3-5% (2) House and vessels 0.3-5% (3) Per/ha of mine Lot W50	Exemption for 5 years in proportion to the ratio of stock or shares owned by the foreign investors
Property Aquisition Tax	Acquisition Price of Real Estate, Motor Vehicles, Land, Buildings, and Ships	2%	Exemption for 5 years