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AN ASSESSMENT OF THE SOUTH KOREAN MARKET FOR VALUE-ADDED WOOD PRODUCTS

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September 1999

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EXECUTIVE SUMMARY

The South Korean (Korea) market for wood frame housing and building materials has gained more attention from US manufacturers and exporters in recent years. From the end of the Korean War until the recent Asian economic crisis, the Korean economy demonstrated strong growth, making it the eleventh leading economy in the world. Rising consumer incomes have enabled more families to purchase single-family homes. Within this sector, wood frame homes are becoming more prevalent. The Korean government has almost reached its goal of providing a 100% housing supply. The Ministry of Construction and Transportation (MOCT) is redirecting its previous mission to focus more attention on building and promoting higher quality housing and more aesthetically pleasing living environments. As such, attention to wood frame housing as an alternative to high-rise concrete construction is increasing.

Despite the Korean government's activities to allow greater access to its consumer markets, US exporters still face many challenges. Some of these obstacles are specific to wood construction, such as inadequate building codes and lack of technical training. Other obstacles are more generic, including limited information about the import and distribution process, limited port facilities, and domination in the housing sector by concrete construction. Few market reports regarding the wood frame housing industry exist; many that exist are outdated. In order for US exporters to improve their competitiveness in this market they must develop a better understanding of the residential construction industry, business practices, and consumer and government perceptions regarding wood frame housing in Korea. The US wood products industry is also in need of information regarding building codes and safety and testing requirements for wooden building materials as a means to encourage the MOCT to modify Korean building codes to accept wood as a safe building material.

The Asian economic crisis has had a profound impact on consumption of luxury goods, particularly wood frame homes and building materials. The Korean economy suffered a loss in investor confidence as a series of corporate bankruptcies occurred and the accumulation of bad loans revealed unstable business practices among several of the country's largest corporations and lending organizations. Consequently, domestic production and consumption declined, unemployment increased, and the overall health of the economy declined. The Korean won devalued against the US dollar, causing the price of imported goods to double. Industry experts estimate that the economy will begin to recover within 2-4 years. Therefore, this report has been written in light of this assumption and describes the wood products industry for the most part during its growth phase, which immediately preceded the Asian economic crisis.

This report is the result of a market research project conducted in Korea from February 21-March 6, 1998. Two researchers traveled to Korea and interviewed builders, importers, and members of academia involved in the wood housing construction sector to learn about tariff and non-tariff barriers to wood frame housing and wood construction materials. The researchers also investigated the prevailing building codes related to wood frame housing and future market opportunities. This report offers background information about the Korean market for wood products, the building construction sector, and the environment for foreign businesses, in addition to suggestions for approaching this market.

Findings from this project indicate that the consumer perception of wood frame homes is generally positive. Korean people view wood homes and wood in general as healthy and aesthetically pleasing. However, the high cost of building materials and restrictive financing limits single-family home ownership to the affluent.

Although a mortgage system exists, interest rates are approximately 20% and the terms are for only a few years. Korean mortgages require the consumer to pay 70-80% of the home cost at the time of purchase and pay the remaining debt within 5-20 years. Recently, some banks have started extending special loans of up to 70% of the home price. However, even though personal savings rates are high, the typical income of a potential buyer cannot support high monthly payments. Efforts to make wood frame homes and townhomes affordable could increase the expansion of wood frame housing.

Aside from the fact that many families cannot afford wood frame homes, there are several non-economic factors that affect the widespread adoption of wood frame housing in Korea. One issue that hinders the expansion of US

wooden building materials in Korea is limited product promotion in print advertising and home shows. The American Forest and Paper Association (AF&PA) Korea office has been very active in promoting the US wood products industry in Korea through trade shows, trade missions, an annual carpenter training program, wood frame construction seminars, and technical and promotional publications. These activities have contributed to the perception that US manufacturers produce high quality building materials. However, there still appears to be a general lack of knowledge among Korean construction firms regarding what specific products and services are available and which US suppliers exist. Thus, many Korean housing companies use multiple suppliers from around the world. This indicates that there is a need for individual firms to place more emphasis on marketing their goods and services in this market as a means of developing name or brand recognition. In addition, homebuilders, architects, and homeowners lack understanding of the proper use, storage, and maintenance of wood products. It is important that US product literature be translated into Korean so Korean builders will understand proper material handling, storage, and product use. The AF&PA Korea office currently distributes technical information in Korean on the use of specific species and engineered wood products with information from The Western Wood Products Association, the Softwood Export Council, APA-The Engineered Wood Products Association, and the Southern Forest Products Association.

Technical transfer is another important issue. Korean carpenters are either good at concrete work (very rough carpentry) or good at finish work (very fine carpentry); they are less skilled with framing. Framing training, in addition to instruction regarding proper handling and storage of materials is critical to the long-term success of wood frame construction in Korea. One way to disseminate information about proper construction techniques within Korea is to train architects, professors, and construction workers in the US. Training should include architectural design, engineering design, framing techniques, and maintenance. For the past three years the AF&PA Korea office has organized an annual two-week long 2x4 construction training program near Seoul in cooperation with the Korean Wood Frame Construction Institute and the Home Builders Institute. The program trains approximately 40 to 50 students about US wood frame construction techniques through classroom and hands-on instruction. Carpenter training is also being taught by a private architect who owns and operates a wood frame design studio in Seoul. However, there are still many carpenters who do not understand the engineering and construction principles associated with properly building a 2x4 wood frame home. It is important for technical transfer to be an integral part of promoting wood frame construction in Korea.

The Korean building code represents another challenge to the widespread adoption of high-quality wood frame housing in Korea. The existing building code places restrictions on the accepted height and total floor area of the building, yet it does not include detailed requirements for structural aspects such as proper engineering principles, material use, and foundations (Appendix A). The lack of a detailed building code leaves room for the possibility that construction companies that do not have a complete understanding of wood frame housing may build substandard homes. The impact of poorly built homes may be compounded by the absence of building inspectors for wood frame housing. Instead, Korean law mandates that the builder or architect is liable for any damages resulting from substandard construction. While builders who construct dangerous homes can be criminally charged for any gross injuries, it may be that building codes are enforced only after major damages are incurred. A more likely scenario associated with poor construction is a dissatisfied customer. Given the small size of the wood frame home industry and the reliance on word of mouth advertising, the reputation of a few poorly constructed homes can be widespread.

Discussions with MOCT engineers indicate that there may be genuine interest in developing a more complete wood frame building code. The Ministry of Finance has asked the director of the Architecture and Housing Bureau of the MOCT to identify problems associated with accepting a wood frame building code. It must be understood that the MOCT is not staffed to undertake such an effort. Therefore, it is incumbent upon those interested in such a project to push it forward by demonstrating the safety aspects of wood-frame construction through fire and stress tests first applied in the US then again for MOCT in Korea. Encouraging MOCT to expand its wood frame construction building code would be greatly aided by support either from a large construction company or the industry as a whole. There appears little willingness for the MOCT to act unless there is a request from an influential Korean company or organization for such action. MOCT engineers and the division director made it clear that political pressure from non-Korean sources to change the building code would not be effective.

The Korean-based Wood Frame Construction Association (WFCA) is working with the AF&PA to promote proper 2x4 wood frame construction in Korea and to help develop a more comprehensive wood frame building code. The committee has drafted a proposed wood frame building code and submitted it to the MOCT for review and approval.

In addition to developing working relationships with Korean 2x4 wood frame construction advocates such as the WFCA, the US should begin fire and structural testing in the US, in order to be prepared to replicate these tests in Korea. Such tests would demonstrate to the MOCT that wood construction can be fire and earthquake resistant. Fire tests of wall and floor assemblies using the Korean fire standard should be implemented. The Korean fire standard differs from the US standard, and it is imperative that American engineers understand the performance of US systems under the Korean test procedure. These tests may be initially conducted in the US, where researchers can design a system to meet the Korean code. However, final fire testing must be conducted at a Korean testing facility.

In the meantime, trade missions that bring members of Korea's wooden home industry to the US should continue. There is a need to educate Korean experts, particularly those proposing to write Korean building codes. It may also be an opportune time to introduce large construction firms (e.g., Samsung, Daewoo) to wood frame housing as opposed to steel frame construction. Support from large Korean conglomerates may help influence the MOCT to focus more attention on modifying existing building codes to accept multi-story wood frame housing.

Four recommendations for US industry in the Korean market are made. First, the US should initiate fire and earthquake testing of wooden wall systems using Korean testing standards to take place in the US. These findings can be replicated later in Korea to demonstrate to the MOCT the safety of wood frame homes. Second, additional housing demographic surveys should be completed in order to assess Korean consumer preferences. There is still a gap of knowledge between what consumers report they want and their actual spending behavior regarding wood homes. Third, cooperative training programs should be established to educate Korean professors, architects, and carpenters at technical schools in the US. Finally, US manufacturing companies should focus on marketing their products in Korea through print ads and trade-shows even in light of the Asian economic crisis. Korean consumers are greatly influenced by advertising, yet there is limited advertising featuring US wood products. While economic recovery is not predicted to begin for at least two years, US producers may use this time to increase awareness of US products in Korea.

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INTRODUCTION

During the past 30 years, the Republic of Korea (Korea) has enjoyed phenomenal economic growth. Despite the Asian economic crisis, it is the 11th leading economy in the world and the 4th leading export market for US wood products, importing almost $900 million in wood products in 1997. Solid wood products constituted one-third of 1997 wood product US exports to Korea. Unprocessed logs represent 86% of the solid wood product exports; however, primary product exports are declining as secondary product exports increase. An improved standard of living accounts for an increase in wood housing and secondary processed wood product imports. Secondary processed wood products imported from the US increased 178% from $15.7 million in 1989 to $43.8 million in 1997. As a result, value-added products, as a share of total US solid-wood forest product exports to Korea, increased 375% during the same time period (US Department of Commerce 1998).

The Korean Ministry of Construction's interests in dispersing urban populations and promoting wood frame construction, and an increase in consumer demand for wood frame housing are encouraging factors for the wood frame housing industry in Korea. Current building codes that outline only basic requirements for wood frame construction allow wood as a structural material in single-family homes, yet several impediments still remain. Limited building codes that do not include oversight for building approaches, high material costs, scarcity of qualified carpenters, and the perception that wood is a structurally inferior building material are obstacles to its widespread use. Despite these barriers, public opinion surveys indicate a strong interest in wood frame housing for both main residences and vacation homes.

While the Korean government is allowing greater access to its consumer markets as a result of International Monetary Fund (IMF) requirements, US exporters still face many challenges. Some of these obstacles are specific to wood construction, such as building code restrictions and lack of technical training. Other obstacles are more generic, including limited information about the import and distribution process, limited port facilities, and domination in the housing sector by concrete construction. Few market reports exist regarding the wood frame housing industry and most that do exist are out-dated. For US exporters to be competitive in this market they must develop a better understanding of the Korean residential construction industry, Korean business practices, and consumer and government perceptions regarding wood frame housing. US exporters are also in need of information regarding government building codes, safety requirements, and testing requirements for wooden building materials in order to operate successfully within the Korean construction industry.

ECONOMIC GROWTH AND CURRENT ECONOMIC SITUATION

Since 1962, when the Korean government instituted its first in an ongoing series of Five-Year Economic Development Plans, the economy has grown at one of the fastest rates in the world. The Korean government promoted economic growth by providing incentives for high value-added, capital-intensive domestic manufacturing. Given the limited size of the domestic market, the Korean government promoted exports through several initiatives. A single exchange rate was adopted, short-term export financing was made available, and foreign investment was encouraged. Customs procedures were simplified, and exporters could more easily import raw materials. The Korean government also encouraged businesses to focus on key industries by providing incentives such as tax breaks, subsidies, low interest loans, and workforce training (Yoo 1997).

Economic stimulus initiatives have had significant positive impacts on Korea's economy. Since the first Five-Year Economic Development Plan, the country's real Gross National Product (GNP) has grown at an average rate of more than 8% per year. Between 1960 and 1996, per-capita GNP increased from less than $150 to over $10,500 (Table 1). As a result of the Asian economic crisis, per capita GNP declined during the second half of 1997, lowering the annual average. Prior to the economic downturn, the US government predicted per-capita income would reach US $15,000 by the year 2000 (Korea Army Area Handbook 1997). Korean consumers have directly benefitted from economic growth. Korea traditionally has a very high rate of personal savings, yet the gross savings ratio increased from below 30% of gross consumer income in 1985 to 34% in 1996. Growing personal incomes, high average savings rates, increased overall housing supply, and a ban on government imposed price ceilings on newly constructed apartments have enabled consumers to consider wood frame homes as an alternative to apartments in concrete high-rise buildings.

Table 1. Leading economic indicators 1975-1998.

Year	Population (million)	Real GNP Growth Rate (%)	Per Capita GNP (US $)	Unemploy-ment Rate (%)	Gross Savings Ratio	Exports as a % of GNP	GNP (100 bill. won)	GNP (US $ mill.)
1975	35.3	n/a	$594	n/a	n/a	n/a	n/a	$20,928
1980	38.1	n/a	$1,597	n/a	n/a	n/a	n/a	$60,631
1985	40.8	n/a	$2,242	n/a	29.8	32.6	n/a	$91,095
1990	42.9	9.5	$5,883	2.4	35.9	n/a	1,782	$251,793
1991	42.9	9.1	$6,757	2.3	36.1	24.6	2,142	$292,039
1992	43.2	5.1	$7,007	2.4	34.9	25.1	2,404	$305,702
1993	43.6	5.8	$7,513	2.8	35.2	24.8	2,655	$330,769
1994	44.5	8.4	$8,508	2.4	35.4	25.4	3,037	$378,005
1995	44.8	8.7	$10,037	2.0	36.2	27.6	3,489	$452,609
1996	45.2	6.9	$10,548	2.0	34.0	27.0	3,864	$480,430
1997	45.9	8.1	$9,500	2.6	33.4	30.8	4,509	$442,600
1st half	45.9	5.6	$5,213	n/a	n/a	n/a	2,102	$239,300
2nd half	45.9	4.5	$5,120	n/a	n/a	n/a	2,406	$235,600
1998	46.1	-1.7	$6,823	6.9	33.2	42	4,431	$318,500
1st half	46.1	-2.8	$3,117	6.3	n/a	n/a	2,154	$143,700
2nd half	46.1	-5.3	$3,792	7.4	n/a	n/a	2,277	$174,800
1999	46.9	n/a	n/a	8.6	n/a	n/a	n/a	n/a
1st qtr.	46.9	n/a	n/a	8.6	n/a	n/a	n/a	n/a

Sources: Foreign Agriculture Service 1998; Korea Army Area Handbook 1997; Korea Overseas Information Center 1998; Korean Embassy 1998; Ministry of Finance and Economy, Korea 1999; National Bureau of Economic Research 1998; National Statistical Office, Korea 1999; Bank of Korea 1999; Korea Trade Investment Promotion Agency 1999.

During the late 1980's and early 1990's, the Korean economy began to slow under the government-guided economic system. Inflation increased and the balance of payments declined as international competitiveness escalated and Korea's once plentiful supply of low-cost skilled labor began to disappear. In 1993, Korea's government adopted a new economic program called the "New Economy." As part of the plan to revitalize the economy, Korea not only strengthened its trade relations with its main trading partners such as the US and Japan, but also expanded its trading partners to include Southeast Asian nations, Eastern Europe, and Third World countries (Yoo 1997). Since this program was adopted, Southeast Asia has become a major supplier of raw and finished wood-based products and has become a major source of competition for the US in trade with Korea.

The Asian economic downturn had an immediate and profound effect on the residential construction sector and the wood frame housing and wood-based building materials industries in Korea. Private sector housing orders declined 43% from 1997 to 1998, and 100,000 new apartment units remained unsold by April 1998 (AF&PA 1998d, KOTRA 1999). The impact on the wood frame housing sector has been profound, forcing approximately half of the wood frame construction companies in Korea to declare bankruptcy from the time the economic downturn began to the first quarter 1998 (AF&PA 1998a). During the first quarter of 1998, total imports of pre-packaged wood frame homes declined 69% to $2.5 million, from the same period in 1997. Imports of pre-packaged wood frame homes from the US declined from $6 million during the first quarter 1997 to $1 million during the first quarter of 1998 (AF&PA 1998b).

The recession in Korea started as many of the country's largest corporations declared bankruptcy and bad loans were accumulated by many of Korea's leading lending organizations. These failures revealed unstable business practices among many of the country's largest companies, and the Korean economy incurred a loss in domestic and international investor confidence. By June 1998, the Korean stock market fell to its lowest level in eleven years (*The Korea Times* 1998). The value of the Korean won rebounded to around 1,300 won per US dollar in July 1998, after dropping to 1,960 won per US dollar during the last quarter of 1997. However, the weakened purchasing power of the won caused prices of products imported from the US to double over mid-year 1997 prices. Total import expenditures declined almost 15% during the fourth quarter 1997 and by January 1998, import spending had declined by almost 40% to an all time low (Bank of Korea 1998).

Rapid depreciation of the Korean won impacted the Korean economy in two ways. Not only did the reduced spending power of the won limit the volume of imports of value-added goods, but it was also more difficult for Korean manufacturers to purchase raw materials in order to manufacture goods for export and, in turn stimulate the domestic economy. Declining production created a trade surplus of US $3.3 billion during the fourth quarter of 1997 and US $3.1 billion by January 1998 (Bank of Korea 1998). Higher raw material costs caused the price of Korean goods to increase sharply in early December 1997. Producer prices increased 8.3% during December 1997 and 4.9% during January 1998. From 1997 to 1998, consumer prices increased from 4.5% to 7.5%, yet by April 1999 consumer prices increased only 0.4% as the economy began to rebound (Bank of Korea 1998, Korean Embassy 1999).

While the economic crisis sharply curtailed financial growth in Korea, it appears that the economic decline may have positive long-term impacts on future foreign investment and trade. President Kim Dae Jung and his cabinet launched one of the most aggressive economic restructuring campaigns in Asia. Many of the Korean government's reforms are supplementary to reforms required by the International Monetary Fund (IMF). In an effort to stimulate the domestic economy by attracting foreign capital, the Ministry of Finance and Economy (MOFE) instituted several economic reform policies that relax real estate and foreign investment laws. First, the MOFE instituted a policy to increase the maximum allowable foreign ownership of domestic companies from 55% to 100%. The limit on government-run companies has been increased from 25% to 30%. Second, new legislation called the "Law on Land Acquisition by Foreigners," adopted in May 1998, allows foreign companies to purchase and develop land in Korea. Residential land development, which was strictly confined to government and public land development, is now open to both domestic and foreign private sector development and all land ownership restrictions imposed on foreigners have been removed. Fourth, administrative procedures for foreign investment in real estate are being streamlined. To facilitate land transactions of government-held debt properties, a series of asset-backed securities was issued starting in July 1998, after receiving approval from industry experts and foreign investment banks. Fifth, the Korea Trade Investment Promotion Agency (KOTRA) was established as a one-stop office for processing and facilitating real estate transactions for foreign investors (Construction and Economy Research Institute of Korea (CERIK) 1998a). Finally, hostile mergers and acquisitions by foreign corporations of domestic firms are now allowed (Korea Trade and Investment 1998).

The Korean economy has not been restored to pre-recession conditions, yet economic reform measures are causing the economy to recover at a faster rate than projected. Economic recovery is in part a result of US $58.35 billion in relief funds from the IMF, the World Bank, and the Asian Development Bank. In an effort to restructure the banking system, the MOFE also announced that unstable banks will be merged with relatively healthy banks or will be obliged to transfer their assets and liabilities to viable banks. Financial institutions and large corporations were also required to establish cost accounting systems as a means of making their business operations more transparent (Korea Trade and Investment 1998).

The combination of foreign financial aid and domestic restructuring in the financial sectors has resulted in tangible changes in Korea's economy. Since first quarter 1998, the Korean government converted US $21.8 billion of outstanding foreign short-term debt to medium-term debt (AF&PA 1998b). By May 1999, the Korean stock market reached 842 points, or 1.4 million won, the highest point in almost three years. The purchasing power of the won has also rebounded. The won-US dollar exchange rate increased from low of 1,960 won per US dollar in December 1997, to 1,184 won per US dollar in June 1999, Korea's strongest exchange rate since November 1997 (US Federal Reserve Board 1999). Market interest rates also dropped from a peak of 40% to 10-12% in July 1998. Projections for further economic recovery are also promising. The Organization for Economic Cooperation and Development (OECD) raised its growth forecast for the Korean economy from a 0.5% to 4.5%, while other official and private researchers also agreed on a 4% range of growth for Korea in 1999 (Korea Times 1999). J.P. Morgan, a US-based investment firm, forecasts 4% growth for the Korean economy for 1999, and 4.5% growth for 2000 (Korean Trade and Investment 1999).

Foreign investment has also surged. According to Korean Ministry of Commerce, Industry, and Energy analysts, foreign investment is expected to reach US $15 billion by the end of 1999 after reaching a record US $8 million in 1998 (Korea Trade and Investment 1999).

The consumer market is also starting to improve. Consumer prices increased 8.6% during first quarter 1998 compared to first quarter 1997. However, by March 1998 consumer price increases decelerated slightly due to the decline in domestic consumer demand and a gradual improvement in the stability of the won (Bank of Korea 1999). Despite a 0.05% decrease in the monthly average income per household, average consumption in urban households rose 8.9% during the first three months of 1999 compared to 1998, according to the National Statistical Office. This was the first time since the onset of the economic crisis that consumption in urban households recorded positive growth (MOFE 1999a). Imports have also increased. By the end of 1998, total imports had declined almost 36% and imports of wood products almost 60%. During the first quarter 1999, however, imports of wood products increased from 30% to 200% (depending upon product) from year-end 1998 levels. Forecasts for housing starts predict that 460,000-500,000 will be constructed during 1999, an 80% increase from 1997. Industry analysts expect the demand for wood products from the US to follow the upward trend in the housing sector (AF&PA 1999).

Despite improvement in consumer prices and spending, the unemployment rate continues to increase. Unemployment reached 1.88 million or 8.6% by first quarter 1999, the highest since July 1982 when Korea started to record employment statistics (MOFE 1999). Analysts state that the increase is the result of the aftermath of the economic slump combined with impacts of business restructuring (Digital Chosun 1999). Government officials expect that the unemployment rate will begin to contract following the overall strengthening of the economy starting during the second quarter 1999 (MOFE 1999a).

Financial analysts predict a minimum of two years for the Korean economy to recover fully, with a three to five year time range more likely. Recovery will be stimulated by restructuring in the financial sector, which should result in a broader availability of credit throughout the economy. The construction sector in Korea is heavily dependent upon the availability of credit and has the highest debt/asset ratio and the highest rate of bankruptcies among all Korean industries (Foreign Agriculture Service 1998).

Opportunities Created by Korea's Economic Reform Program

In addition to relaxed real estate and foreign investment laws, several new programs have been developed to stimulate domestic spending on housing. Given the recent oversupply of approximately 100,000 unsold new apartments, the Korean government established a US $23.5 million (~27.8 billion won) loan fund. The fund provides buyers with loans up to US $21,200 (25.1 million won) to purchase already completed new apartments. Loans up to US $25,340 (30 million won) will be available to consumers to purchase apartments that are either planned or under construction (AF&PA 1998b). As of June 1999, The National Housing Fund (NHF) has also been increased by 1.7 trillion won so that planned housing construction for this year can be increased from 400,000 units to 500,000 (MOFE 1999a). The NHF also allows individuals who want to buy new houses to borrow approximately 70% of the purchase price in long-term loans (AF&PA 1999a).

Restructuring the tax system may particularly benefit the wood frame housing and interior wood product market. Prior to the recent economic restructuring, purchasing a home was associated with ownership, registration, property, and transfer taxes. As of July 1998, the transfer tax, which is applied to owners of multiple homes, was removed (AF&PA 1998c). Abolishing the transfer tax may make multiple homeownership easier and may potentially make more funds available for more expensive homes constructed with high-quality wood materials.

Forest Resources: Demand and Supply

With a land size slightly larger than the state of Indiana (38,031 mi^2), Korea is populated by almost 46 million people. The country is primarily mountainous, with approximately 80% of the country's population concentrated in lowland urban areas (Encyclopedia Britannica 1996). Migration to urban areas has increased in recent years and by 1998 Korea's population density reached 1,185 people per square mile in urban centers, making Korea one of the most densely populated countries in Asia (World Almanac 1998). Korea's largest cities include Seoul (10.9 million), Pusan (3.8 million), Taegu (2.2 million), Inchon (2.1 million), and Kwangju (2.0 million) (US Department of State 1998).

Almost two-thirds of the country is covered by forestland, yet forestland totals only 1,594,324 acres, or 0.37 acres per capita, one-quarter of the world's average (Korea Overseas Information Service 1997). Much of Korea's timber resource was depleted as a result of the Korean War, increasing demand for fuel wood, and population growth. Since the 1960's, the Korean Forestry Administration has embarked on a replanting effort. The Korean Forestry Administration initiated the National Forest Extension Policy with the long-term goal to increase the size of national forests from 30% to 40% of total forestland in Korea (Yoo 1997).

Approximately 46% of Korea's forestlands are coniferous, predominately Korean white pine, red pine, larch, and Japanese cedar. In addition to limited production levels, the majority of the timber supply is low quality due to earlier over-harvesting and forests comprised of slow-growing, immature timber. A majority of the domestic growing stock is under 30 years old, with the greatest proportion made up of coniferous trees between 11-30 years old (Table 2). Small diameter logs (below 30 cm) represent 97% of total log production. Because the timber resource quality is low and the majority of trees are small diameter, domestic roundwood is primarily processed into pitprops, lumber and plywood, and wood chips for pulping. A further limit on domestic harvest is a government imposed cutting restriction of 11% of the annual timber volume increase (Yoo 1997). The timber that is harvested for processing equals only 20-30% of total timber volume, much of which is low quality. Inferior and pest-damaged tree cutting equals more than 50% of total timber harvested.

Table 2. 1996 Growing stock by age of trees.

Growing Stock Type	11-20 years	21-30 years	31-40 years	41-50 years	51 years +	Total
Conifers	57,956	57,042	20,212,	3,506	1,925	140,641
Non-conifers	16,129	37,083	18,474	11,431	2,557	85,674
Mixed	32,072	33,551	11,936	3,494	1,457	82,510
Subtotal	106,157	127,676	50,622	19,431	5,939	308,825
Percent of total	34.3	41.3	16.4	6.3	1.9	--

Source: Korea Forestry Administration 1997

Domestic timber production in Korea has historically been low (Figure 1), with just under 1,200,000 m^3 of timber produced in 1996. Pulpwood and pitprops were once a leading domestic product. However, production peaked in 1987 and has declined steadily since. Wood for general use has increased substantially, however, increasing 116% from 1982 to 1997. Lumber and other product production demonstrated the greatest apparent increase during this period, increasing more than 150% between 1982 and 1996. Current domestic production of lumber and other products totals almost 700,000 m^3 (Korea Forestry Administration, 1997).

Despite limited domestic timber resources, Korea has been one of the world's leading producers of plywood and veneer. Consequently, it is also one of the world's leading consumers of timber. According to Forestry Administration statistics, the demand for logs used in primary wood processing and the domestic log supply declined between 1982-1991 (Korea Forestry Administration 1997). Korea's rate of self-sufficiency declined during the 1990's, and reached 13% in 1996 (Figure 2). One explanation for the decline in demand for logs is that higher domestic wage and capital costs have forced many sawmills out of operation. Therefore, the market for imported processed wood products appears promising.

Prior to the Asian economic crisis, the Korea Forestry Administration predicted that increases in population and annual income would increase demand for total "timber" (which includes all wood products such as chips, pulp, logs, and lumber) to 26.42 million cubic meters by 2000 (Table 3) (Korea Forestry Administration 1997). While demand is projected to increase, self-sufficiency is also projected to increase. Due to a massive replanting effort started in the 1960's, timber volume per acre has steadily increased and foresters project continued increases in inventory (Table 4). Table 5 illustrates projections of domestic timber resources to the year 2040 by the Forestry Administration and the Korean Rural Economic Institute (Yoo 1997). Because the two agencies use different assumptions their forecasts are not identical, yet both predict that forest area will decline approximately 173,000-247,100 acres by 2040. At the same time, domestic timber volume will increase approximately 220% compared to 1992, so average volume will be approximately 53-55 m^3 per acre (Yoo 1997). Even with Korea's advances in the

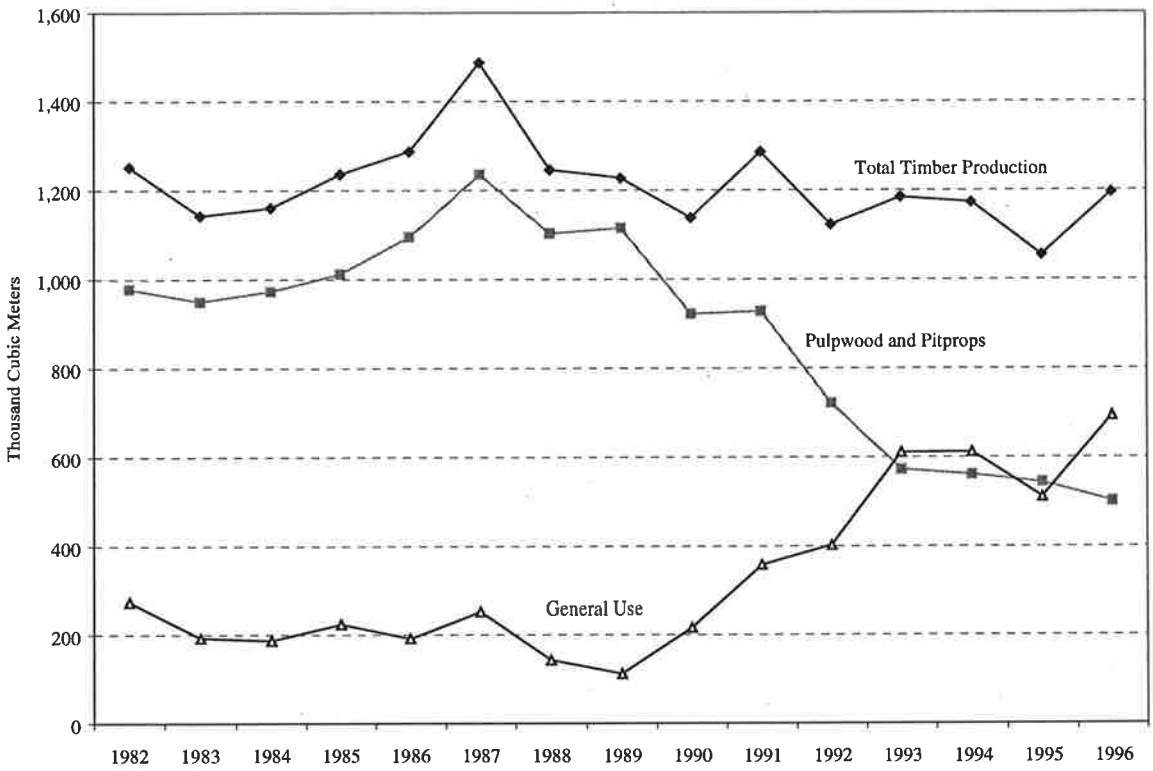

Figure 1. Domestic wood products production, 1982-1996 (Korea Forestry Administration 1997).

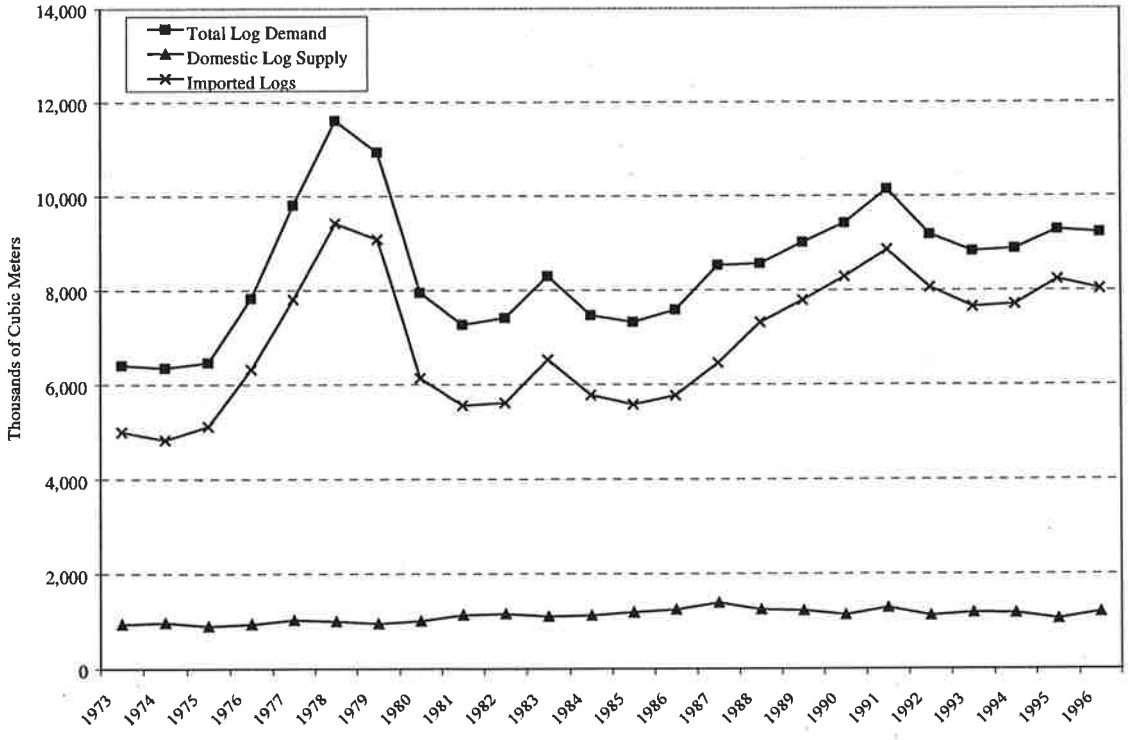

Figure 2. Domestic log demand, supply, and imports, 1973-1996 (Korea Forestry Administration, 1997).

Table 3. Projected demand and supply for timber (million m^3)

Classification	1992	2000	2010	2020	2030	2040
Demand	22.28	26.42	30.74	34.56	37.39	38.80
Supply	22.28	26.42	30.74	34.56	37.39	38.80
Domestic supply	1.12	2.54	4.79	7.53	10.85	13.80
Import	21.15	23.88	25.95	27.03	26.54	25.00
Self-sufficiency (%)	5.00	9.60	15.60	21.80	29.00	35.60

Source: Yoo 1997

Table 4. Change of forest area and inventory.

		Year						
Classification	Unit	1910	1945	1960	1970	1980	1990	1996
Area	mill. acre	38.80	40.77	16.56	16.34	16.23	16.00	15.93
Volume	mill. m^3	71.00	21.90	6.40	6.88	14.57	24.84	32.38
Vol. per acre	m^3	18.30	5.37	3.86	4.21	8.98	15.52	20.32

Source: Korea Forestry Administration 1997

Table 5. Projected forest resource change.

			Year					
Agency	Forecasting units		1992	2000	2010	2020	2030	2040
FA	Area	mill. acres	15.97	15.83	15.72	15.65	15.63	15.63
	Volume	mill. m^3	272.00	413.00	563.00	686.00	781.00	854.00
	Vol. per acre	m^3	17.00	26.00	36.00	44.00	50.00	55.00
KFRI	Area	mill. acres	15.97	15.88	15.79	15.71	15.64	15.58
	Volume	mill. m^3	272.00	405.00	524.00	642.00	714.00	830.00
	Vol. per acre	m^3	17.00	25.00	33.00	41.00	46.00	53.00

Source: Yoo 1997

forestry sector, a 64% gap between demand and domestic production is expected. Therefore, while domestic timber resources will increase, Korea's domestic production is projected to remain lower than demand and Korea will continue to rely heavily on imported logs and processed wood.

Domestic Production, Supply, and Imports of Wood Products

Korea imports almost 88% of the wood it consumes. In 1996, Korea imported 6.8 million m^3 of softwood logs, 1.4 million m^3 of hardwood logs, and 366,000 m^3 of softwood lumber (Foreign Agriculture Service 1997).

Although logs, lumber, and chips are leading imports, the general trend in import revenue indicates a decline in primary products such as logs and chips, and an increase in secondary products such as windows, doors, and prefabricated homes as well as lumber. Revenue from logs, lumber, veneer, and plywood remain much greater than secondary manufactured products, yet sales of secondary processed products exhibit strong growth. According to Foreign Agriculture Service statistics, expenditures on logs, particleboard, and fiberboard have declined since 1992, whereas expenditures on lumber, veneer, plywood, wooden doors and windows, and wood frame homes have increased. Wood frame homes display the most significant growth of all the products tracked, with a 1023% increase since 1992, and US export revenues totaling $29.2 million in 1997 (Table 6). In terms of revenue growth, veneer imports were followed closely by wooden door and windows, which increased 216% and totaled $101 million.

Statistics also show that Korea is becoming an increasingly important market for the US. The US exported $43.8 million in secondary processed products in 1997, a 178% increase since 1989. As shown in Figure 3, the ten leading

products constituted 94% of this secondary product total (US Department of Commerce, 1998). According to these statistics, sales of secondary building products continued to increase for nine years out of the ten-year period shown the Asian economic downturn, at which time revenue from secondary processed wood products declined almost 70%. Total primary products, however, were more volatile during the 1989-1997 time period and declined from $345 million in 1989 to $256 million in 1997. Export revenue declined another $183 million, or 72% from 1997 to 1998, the result of the Asian recession. Revenue from the ten leading primary exports dropped $82 million during 1989-1997 and another $177 million from 1997 to 1998 (Figure 4).

Table 6. Total forest product imports, 1992-1997 (US $ millions).

Product	1992	1993	1994	1995	1996	1997	% Change 1992-1997
Logs	919	1,183	1012	1,047	963	877	-.05
Lumber	250	452	373	409	465	453	81
Veneer	30	37	55	46	64	112	270
Particleboard	72	91	72	91	77	54	-25
Fiberboard	28	56	69	40	26	25	-9
Plywood	351	552	536	594	531	449	28
Doors & windows	32	48	67	80	110	101	216
Wooden homes	2.6	1.9	1.2	11.0	22.6	29.2	1023
Total	1,790	2,599	2,413	2,605	2,568	2,375	33

Source: Foreign Agriculture Service 1998

LOGS

Logs used in the domestic sawmill and manufacturing sectors remain Korea's leading wood import. Domestic processing in Korea has changed dramatically during the past 20 years, impacting consumption level, species used, and timber supply sources. During the 1970's, the Korean plywood industry was one of the largest in the world. As shown in Table 7, 70% of imported logs were used for plywood production in 1975 and more than 70% of all plywood produced in Korea was exported. The remaining logs were used for sawn timber and other products. The size of the Korean plywood industry grew as domestic industry imported inexpensive tropical hardwood logs and exported higher-priced plywood. By the 1980's, rising domestic labor costs and tropical timber prices curtailed domestic plywood production and, subsequently, peeler log imports. Between 1975 and 1996, total round log imports increased 57% and logs used for sawn timber and other uses increased 329%, while peeler log import volume declined 61%. By 1996, only 17% of logs imported to Korea were used for plywood production and 82% were processed into lumber and other products.

Table 7. Log imports by use (1,000 m^3).

	Year					
Logs by use	1975	1980	1985	1990	1995	1996
Total	5,119	6,141	5,578	8,285	8,229	8,030
Plywood/Peeler log	3,579	3,328	2,028	2,321	1,683	1,407
General use log	1,543	2,813	3,550	5,964	6,546	6,623

Source: Korea Plywood Industries Association 1998

Korean processors seeking inexpensive sources for timber have changed suppliers as international harvest volumes and environmental regulations changed. During the 1970's, most of the country's imported logs were hardwood logs from Malaysia and Indonesia. Log export bans in the Philippines and Indonesia led to increased log prices in Malaysia, so Korean manufacturers looked for new suppliers. The effects of high export log prices and low labor costs gave Malaysian and Indonesian producers a competitive advantage in the plywood market and now they are major exporters of plywood to Korea. Rising hardwood log and plywood prices caused Korean manufacturers to shift to using softwood logs. By the 1980's, US softwood species dominated. However, after 1989, log export bans

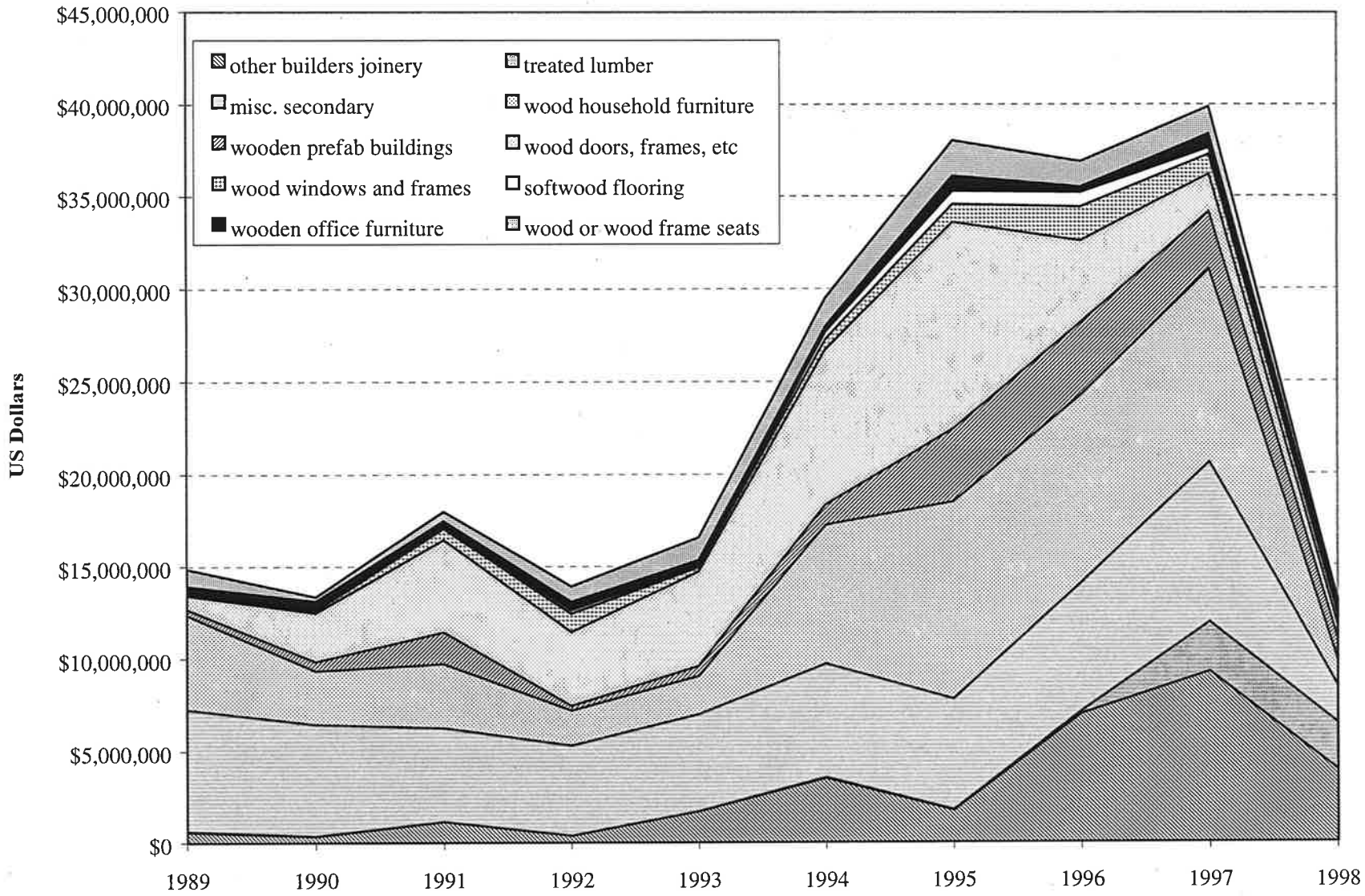

Figure 3. Ten leading US secondary product exports to Korea, 1989-1997 (US Department of Commerce 1998).

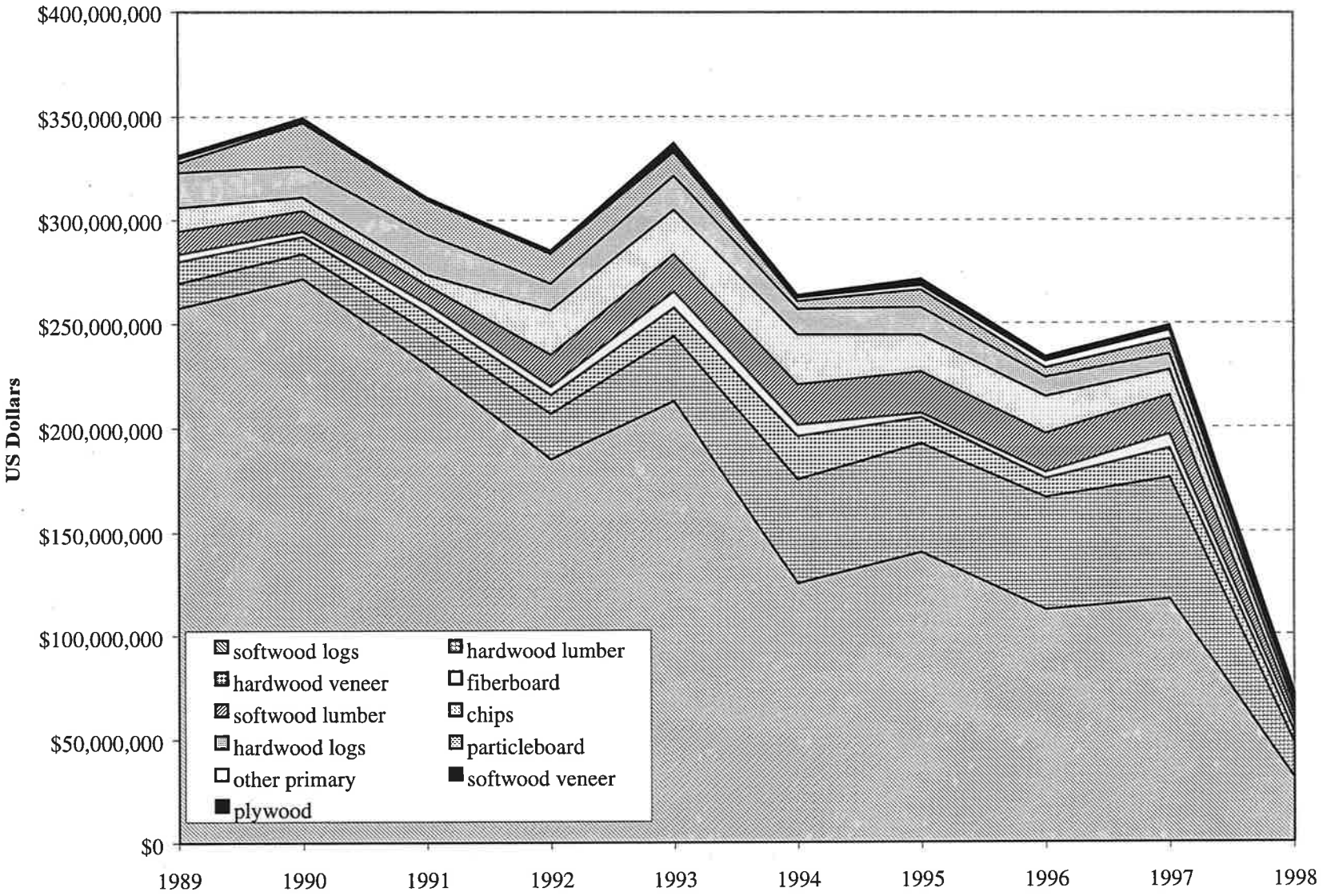

Figure 4. Ten leading primary wood product exports to Korea, 1989-1997 (US Department of Commerce 1998).

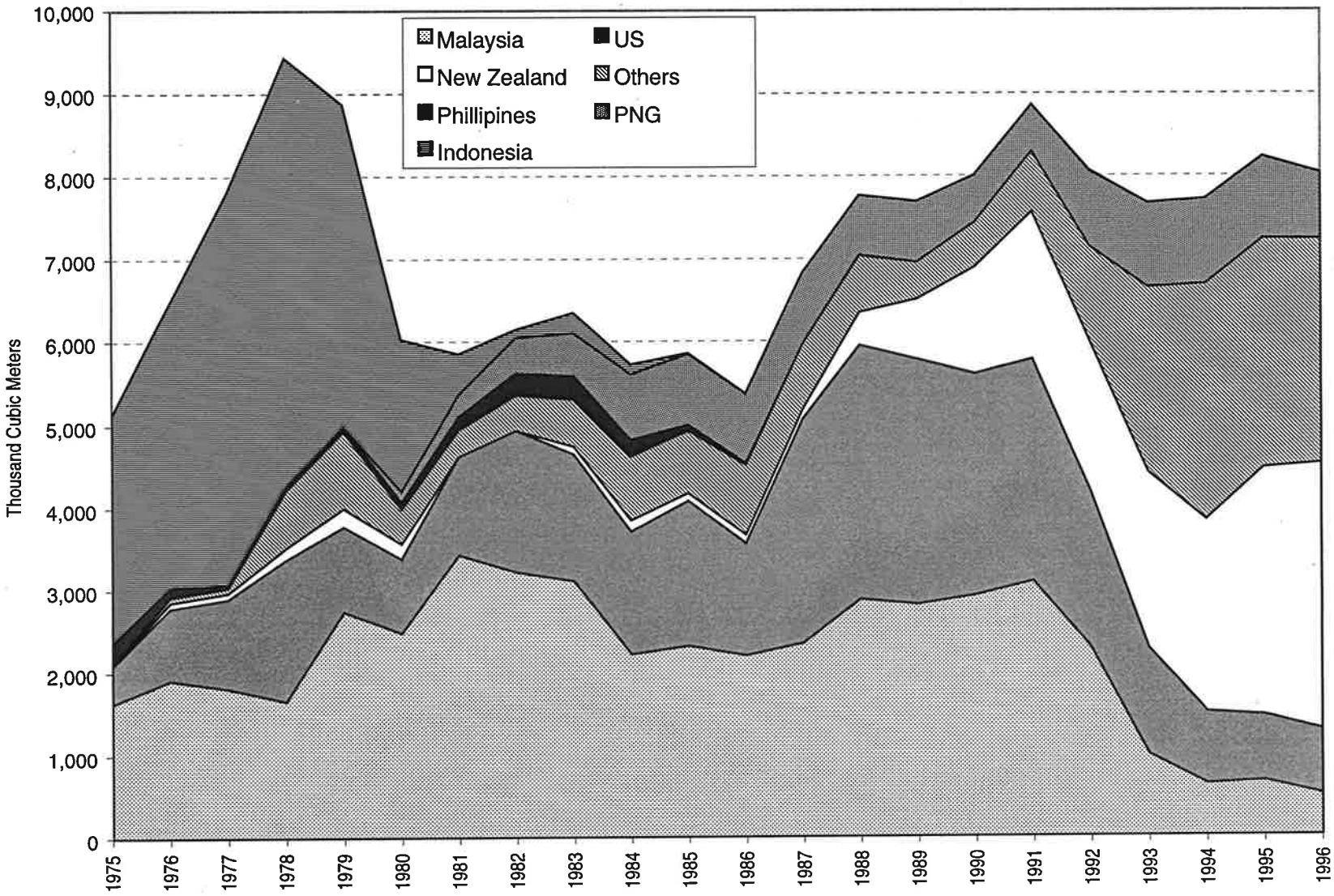

Figure 5. Log imports by country of origin, 1975-1996 (Korea Forestry Administration 1997

increased the price of US logs in the international market. Between 1989 and 1996, US market share of total Korean log imports declined from 39% to less than 10%. Logs from the US were replaced by radiata pine from New Zealand and Chile (Figure 5). In 1997, 49% of Korea's 6.94 million m^3 of imported softwood logs came from New Zealand and 21% originated from Chile (Table 8), making Korea the world's leading consumer of radiata pine. In 1997, the US and Russia supplied 10% and 13% of Korean imported softwood, respectively, with $39.6 million in spruce and $37.8 million in hemlock. During the same year, hardwood log imports totaled 1.3 million m^3, 34% of which originate from Papua New Guinea and 29% from Malaysia (Yoo 1997).

Table 8. Total log imports by country of origin (1,000 m^3).

		Year						
		1975	**1980**	**1993**	**1994**	**1995**	**1996**	**1997**
Hardwood	Malaysia	1,628	2,474	968	622	804	522	371
	P.N.G.	n/a	133	838	856	735	559	435
	SolomonIslands	n/a	n/a	190	179	256	219	193
	Ghana	n/a-	n/a	85	185	n/a	n/a	121
	Indonesia	2,769	1,817	n/a	n/a	3	5	3
	Others	264	82	62	112	113	94	160
	Subtotal	**4,661**	**4,486**	**2,143**	**1,955**	**1,911**	**1,399**	**1,283**
Softwood	NewZealand	n/a-	185	2,147	2,333	2,994	3,281	3,284
	Chile	n/a-	n/a-	902	1,368	1,538	1,461	1,432
	US	448	1,043	1,267	918	756	776	726
	Russia	n/a-	n/a	572	527	700	827	915
	Australia	n/a-	n/a	363	304	273	198	495
	Others	10	427	245	345	162	209	112
	Subtotal	**458**	**1,655**	**5,260**	**5,450**	**6,434**	**6,752**	**6,964**
Total		**5,119**	**6,141**	**7,648**	**7,750**	**8,345**	**8,151**	**8,247**

Source: Yoo 1997

LUMBER

Domestic lumber production in Korea peaked in 1988 at almost 6 million m^3, with domestic sawmills consuming 8.8 million m^3 of logs. By 1996, consumption of logs for lumber production had fallen to 4.6 million m^3. As shown in Table 9, in 1997, 95% of domestically produced lumber was milled from softwood logs (Wood Markets Quarterly 1997). Domestic sawmills and panel manufacturers facing rising overhead costs and dated technology are finding it difficult to compete with imported lumber and plywood. Industry analysts predict the domestic sawmill industry will continue to shrink. One analyst predicts 50% of Korea's sawmills will close during the next few years (Widman's World Wood Review 1997). The loss in competitiveness in low valued wood products processing has also spurred domestic processors to begin to focus on producing higher-value wood products. This may signal a significant source of competition for foreign manufacturers of value-added wood products such as furniture, cabinets, flooring, windows, and doors (Kim 1997).

Table 9. Production of lumber by species (1,000 m^3).

	Year			
Species	**1994**	**1995**	**1996**	**1997**
Softwood	3,190	3,014	3,105	3,073
Hardwood	672	426	275	157
Total	3,862	3,440	3,380	3,230

Source: Korea Plywood Industries Association 1998

Wood frame construction accounts for only a minimal amount of lumber consumption. Approximately 73% is used for concrete formwork or scaffolding, the majority of which is low quality softwood lumber (Table 10). The remaining is used as structural lumber in commercial and residential wood frame construction. Traditional Korean wood frame construction is post and beam style, however, and builders generally prefer the sizes produced by local manufacturers, which limits the widespread use of North American dimension lumber. Domestic manufacturers continue to supply approximately three times the amount of lumber imported (Figure 6).

Table 10. End use markets by product, 1997.

End Use	Sawn Wood	All Wood
Construction & Engineering	73.2%	56.1%
Packaging	10.2%	5.9%
Furniture	n/a	23.5%
Other	16.6%	14.5%
Total	100%	100%

Source: Korea Forestry Research Institute 1998

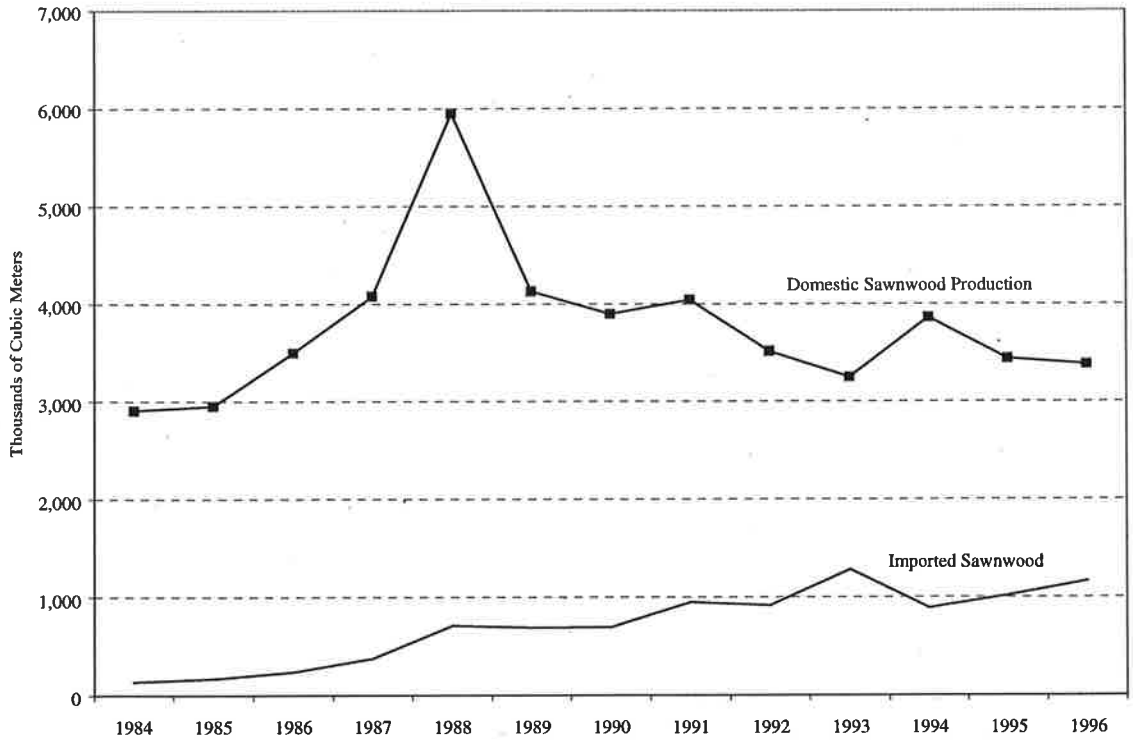

Figure 6. Lumber imports and domestic production, 1984-1996 (Korea Forestry Administration 1997 and Korea Plywood Industries Association 1998).

As the cost of labor in Korea increased, domestic lumber production became less competitive and lumber imports increased. Imported lumber volume increased from 136,000 m^3 in 1984 to 1.16 million m^3 in 1996. At the same time domestic lumber production declined 25%. By 1995, Chile and New Zealand together represented 64% of the imported softwood lumber market, a 27% share increase from 1992 (Figure 7). Radiata pine supplied by these countries is used as temporary construction material and for pallets and packaging, Korea's two largest end-use markets. Softwood lumber imports from the US declined 52% between 1992 and 1995, largely due to US harvest restrictions. Canadian lumber imports have declined as well, but in 1995 Canada was still exporting almost twice as much softwood lumber to Korea as the US (Foreign Agriculture Service, 1997).

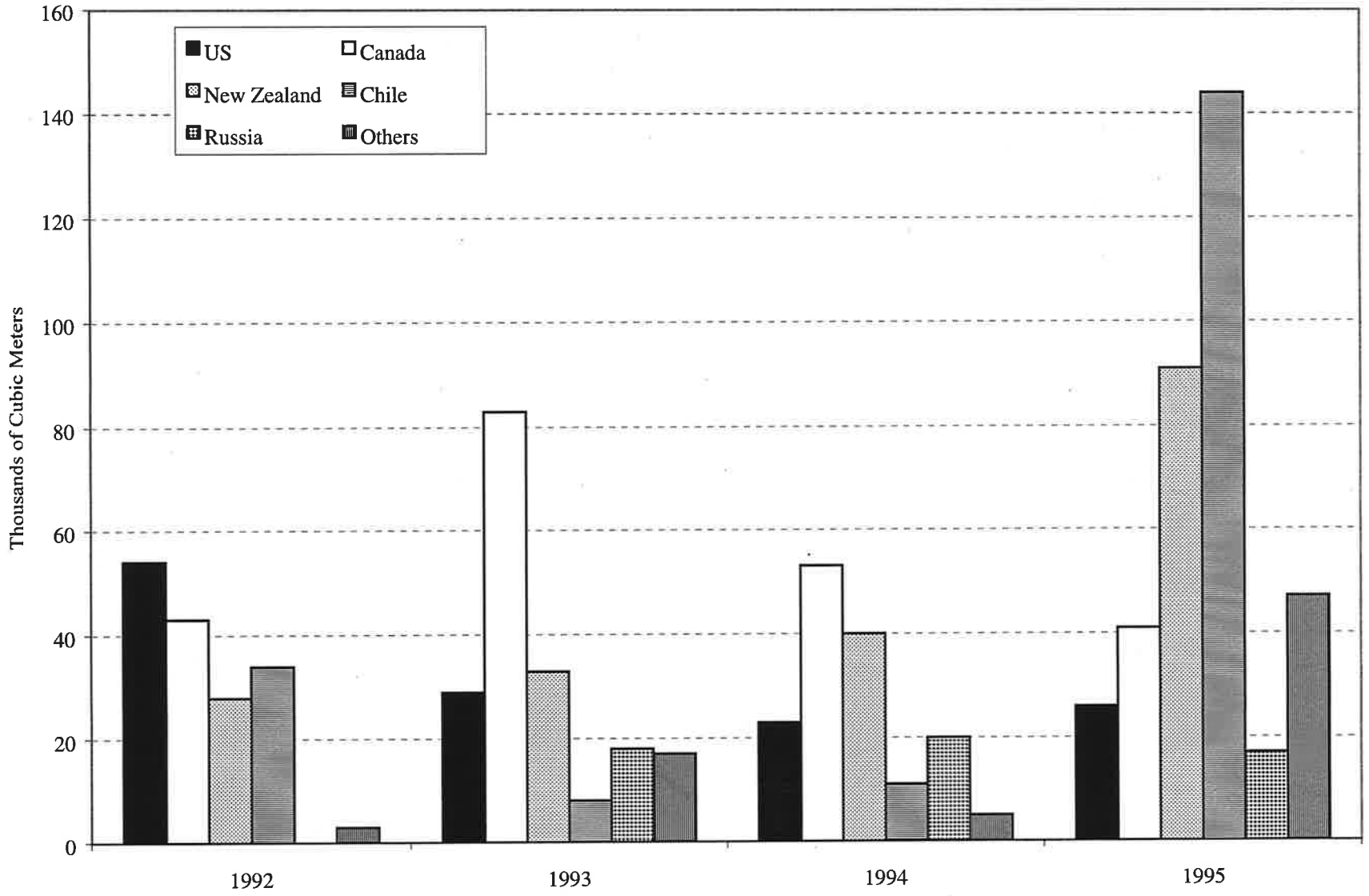

Figure 7. Softwood lumber imports by country of origin, 1992-1995 (Foreign Agriculture Service 1997).

Where quality is not a major concern, the US and Canada can expect to lose market share to New Zealand, Chile, and tropical producers as long as these producers have ample domestic supplies. Domestic policies in the US that impose harvest or export restrictions and consequently drive up prices will have a negative impact on the competitiveness of US products in commodity markets such as logs and lumber. Logs, lumber, and plywood products from Indonesia can also be expected to become more competitive in the Korean market as prices drop in response to Indonesia's economic decline. The US remains far more competitive in non-commodity or niche markets, such as homes and building materials where consumers are looking for high quality as opposed to the lowest price. This is particularly true in the Korean wooden home sector, which caters to a high-income sector of the population.

RESEARCH OBJECTIVES

The information presented in this report is a consolidation of previous market reports, Korean statistical publications, government publications, websites, and findings from February 1998 interviews with Korean construction company representatives, consumers, government officials, and academics. The objectives of this research project are to:

- identify the types of secondary processed wood products that are being exported to Korea.
- identify the distribution channels and export strategies currently being used to export secondary processed wood products and wooden building materials into Korea.
- identify government regulations and policies (including tariff and non-tariff barriers) that impact, or could impact, the competitiveness of US wooden building materials in Korea.
- develop a profile of the residential construction market in Korea.
- identify foreign competitors supplying wood products into Korea.
- assess the future market potential for secondary processed wood products and wooden building materials in Korea.

RESEARCH METHODOLOGY

One researcher from CINTRAFOR and one researcher from Washington State University traveled to Seoul, South Korea, to interview representatives from government, academia, and industry involved in the residential construction market. Interviewees were selected through contacts with the AF&PA Korea office and through industry referrals. Several wood frame homebuilders were selected and interviewed at their displays at the Kyang Hyang Home Show in Seoul on February 22-26, 1998. While all wood frame homebuilding companies are considered small by US standards, an effort was made to select experienced homebuilders.

Builders were questioned about aspects of wood frame housing including the company's level of experience, consumer perceptions regarding wood frame construction, builder perceptions regarding durability of wood frame housing, skill and availability of construction workers, and specific constraints to building wood frame housing in Korea. Government officials and researchers were asked questions about wood frame housing fire performance, product testing protocols, and area and height restrictions for wood frame construction.

HOMES AND BUILDING MATERIALS

MARKET OVERVIEW

Concrete formwork is the leading use of wood in Korea. However, the end-use market with the greatest potential for growth appears to be the wood-frame residential construction industry. While this sector is small compared to other wood imports, it has increased significantly from its introduction to the Korean market. The number of western style wooden housing starts increased from 97 units in 1994 to approximately 800 units in 1996 and an estimated 1,100 homes in 1997 (AF&PA Market Report March 1998). Many importer/wholesalers and industry analysts in Korea expected the number of wood frame homes in 1998 to have reached 1,500 had Korea not entered a recession. Revenues from homes exported from the US, Korea's leading prefabricated home supplier, increased from $2.2 million in 1992 to over $17 million by 1997 (Foreign Agriculture Service, 1998). In addition floor area for wooden buildings increased 79% between 1994 and 1997 (Table 11; Ministry of Construction and

Transportation 1998). Single-family homes and townhomes, also referred to as *link houses* or *row houses*, were also becoming popular prior to the recession. These two types of housing represented 22% of all housing units built in 1996, a 4% increase since 1992 (Table 12).

Table 11. Building permit floor area by construction material (1,000 m^2).

		Construction Material			
Year	**Total**	**Concrete**	**Brick & Stone**	**Wooden**	**Other**
1989	88,600	70,800	17,100	100	500
1990	116,400	92,900	22,200	100	1,200
1991	105,200	88,700	14,100	200	2,200
1992	94,700	80,100	11,400	200	3,000
1993	117,800	99,000	12,200	200	6,400
1994	116,211	102,727	8,527	123	4,854
1995	117,327	103,134	9,086	89	5,022
1996	113,820	101,940	7,193	131	4,557
1997	113,374	104,214	5,105	179	3,881
% Change	28	47	-70	79	676

Source: Foreign Agricultural Service 1998

Table 12. Housing unit construction by type.

		Housing Type		
Year	**Total**	**Detached**	**Apartments**	**Row houses**
1992	575,492	53,276	496,551	52,665
1993	695,319	52,004	540,006	103,309
1994	622,854	42,380	521,322	59,152
1995	619,057	55,710	497,273	66,074
1996	592,132	61,263	462,548	68,321
% Change	3	15	-7	30

Source: National Statistical Office (Korea) 1997

Prior to the Asian crisis, the overall housing construction sector performed well in response to high levels of economic growth, increasing standards of living, a continuing trend of urbanization, and a government plan to create more affordable housing. As part of this plan, construction of two new cities on the outskirts of Seoul, Ilsan to the north and Bundang to the south, was initiated in 1987 and construction is ongoing. Land previously owned by the Korean government was sold to consumers for the express purpose of single-family residential development. These towns are popular locations for single-family wood, steel, concrete, and brick homes, in addition to concrete high rises.

Other ongoing development plans include a World Investment Free City (WIFC), a new suburb of Asan City, and a new development in the Pankyo area. The WIFC will house 300,000 on 16,300 acres surrounding the planned Inchon International airport. The new city, slated for completion by 2020, will be developed as a hub for international business and commodity shipping and receiving. Construction of the second development, Asan City, was slated to begin during the first half of 1998. The 7,4000 acre development is expected to be completed by 2011 and will house approximately 250,000 individuals. According to the plan, the new town will be developed as a medium density city with ample green space. Finally, the Pankyo area, located 12 miles south of Seoul, was recently re-zoned from a green preservation area to a "future development area" in the City's Master Plan. The City of Sungnam, which holds jurisdiction over Pankyo, may revise this "future development area" zoning to a "residential development zone" at any time. The city is considering developing the area as a *garden city*, or city with medium density housing and plentiful green space. This development is slated to accommodate 85,000 upper income residents (Construction and Economy Research Institute of Korea 1998b).

Government housing plans such as the satellite city programs in Ilsan and Bundang boosted the housing supply ratio to 92% by 1997, a 21% increase over the 1980 level (Figure 8). In order to attain a 100% housing supply by the year 2002, the MOCT's 1998 housing plan calls for 500,000 new housing units to be built during 1998 and 1999, although this plan may have been revised since the 1997 economic downturn. Popularity of the suburban areas of Ilsan and Bundang led to plans within the MOCT to develop four new suburbs surrounding Seoul (Foreign Agriculture Service, 1997). While these housing plans are considered successes in the goal to provide housing, the market is now oversupplied. Recent reports estimate that 90,000 units remain unsold. This oversupply, exacerbated by the Asian economic crisis, created financial difficulties for small and medium size construction companies and forced many into bankruptcy. The number of registered construction companies dropped from 4,000 in 1996 to 2,800 in January of 1998 (AF&PA Market Report March 1998). This oversupply of housing and the economic crisis has directly impacted home prices. Nationwide home prices dropped 2.8% in March 1998, the largest decline since January 1996. The housing market in urban areas has been significantly impacted. Prices in Seoul dropped 3.4% followed by Pusan, Inchon, Kwangju, and Taegu, where home prices fell 3.1% (Construction and Economy Research Institute of Korea 1998b). However, by late 1998, housing prices showed a slight increase and analysts expect prices to continue to increase (Construction and Economy Research Institute of Korea 1998a).

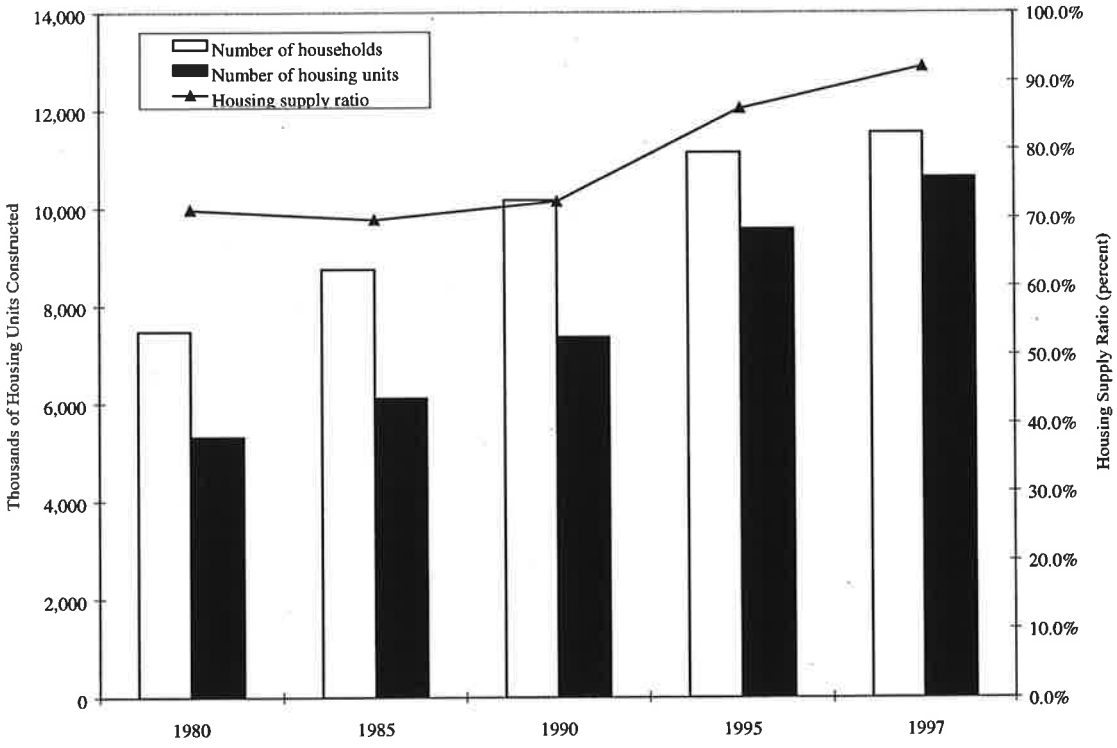

Figure 8. Housing supply ratio, 1980-1997 (Korean Ministry of Construction and Industry 1997).

An oversupply of housing, coupled with a decline in housing prices, can be considered advantageous for the wood frame-housing sector. The increased supply of housing stabilized escalating housing prices so that, prior to the Asian economic crisis, consumers were able to start considering alternatives to high rise concrete apartments. In addition, interest rates following the Asian economic crisis increased to approximately 14-17%. Therefore, individuals with substantial savings actually became more affluent. Declining consumer confidence and devaluation of the won are primary factors slowing sales of wooden homes. The oversupply of housing has led the Korean government to consider modifying its old policy to build primarily high rise apartments as a means to catch up with demand. The MOCT is now investigating single-family and low-rise multi-family houses for the newly established satellite cities neighboring Seoul.

While satellite cities may provide the most immediate opportunities for wooden home developments according to industry experts, rural retirement or vacation communities offer promising prospects for wood frame construction. By 1997, approximately 50 towns consisting of over 1,000 wood and non-wood units were under development (Foreign Agriculture Service 1997).

Results from two independent surveys also revealed interest among Korean builders and consumers in wood frame housing. Findings from a 1997 survey of builders by the Korea Housing Institute survey report that approximately 40% of registered home builders planned to become involved in wood frame construction and over 80% of these builders reported that they planned to build housing developments as opposed to single custom homes. A more recent survey of consumers conducted by the *KyungHuan Daily Newspaper* and LG Advertising found that the desire for a wooden home is strong, particularly among young people. According to the survey, young people interviewed indicated that they would prefer wooden homes in a suburban setting even if it means a long commute to their jobs (AF&PA 1999).

IMPORTS

The leading countries supplying wood-based building materials and pre-packaged wood frame homes to Korea are the US, followed by Canada and Northern Europe (Figure 9). The US maintains 59% of the Korean imported wooden home market, although Canada is a strong competitor. Canadian government-sponsored trade delegations, industry-sponsored model home projects, and trade show activities have had a positive impact on end-user consumption. Revenues from Canadian wood homes increased 649% since 1992, totaling US $8.6 million in 1997 (Foreign Agriculture Service 1998). Northern European style homes have also become increasingly popular and are most often used as recreation homes or cabins. Prefabricated homes from Finland, Sweden, and Russia, which were nonexistent in the Korean market in 1992, totaled $1.7 million in 1997.

While North America dominates the prepackaged wood frame home industry, the market for building components used in a wide variety of home and apartment construction projects is more price sensitive and is dominated by tropical wood suppliers. For example, in 1997, the Korean market for wooden doors and windows reached $100 million with the US supplying $18.8 million. Doors and windows from Indonesia however, represented 62% of the wooden door and window market, followed by Malaysia, which supplied 17% of the market. The inability of US manufacturers to compete on the basis of price is reflected by the low market share for US doors and windows relative to the prefabricated home market. US share of the Korean wooden window and door market has declined 29% since 1992 (Figure 10). Individuals who live in apartments are often unable to afford these higher priced components. However, single-family homeowners who are often less restricted by price frequently select products mainly on the basis of quality and appearance. According to representative of Korean and US wood frame construction companies, consumers generally buy prefabricated wood frame homes and interior finishes from the same country or supplier. For example, Scandinavian homes are often used as cabins or recreational homes. As such, the homeowner often uses Scandinavian interior finish work, windows, and doors to maintain a consistent appearance. Owners of wood frame homes are influenced primarily by style, appearance, and quality. They are likely to seek interior and exterior designs that suit their taste as opposed to the lowest price available. Therefore, while no market statistics exist regarding the proportion of US-made interior wood products used in 2x4 wood frame homes, it is estimated that the US share of the interior and building components used in prefabricated homes is similar to the US share the wooden home market in Korea.

Beginning in 1998, the MOCT instituted a policy to lift the price ceiling previously imposed on condominiums, making it possible to sell apartments at market prices. As private construction companies are forced to compete more aggressively for sales, they are using more interior wood details in high-priced apartments as a means to attract customers. Buyers may also now specify that wood be used on the interiors of these apartments as well. Since wood appears to be preferred for interior decor, the ban on price ceilings may be a positive development for the non-structural wood industry in Korea. A point to remember is that not all individuals live in apartments out of economic necessity and they many have the means to purchase higher priced imported components.

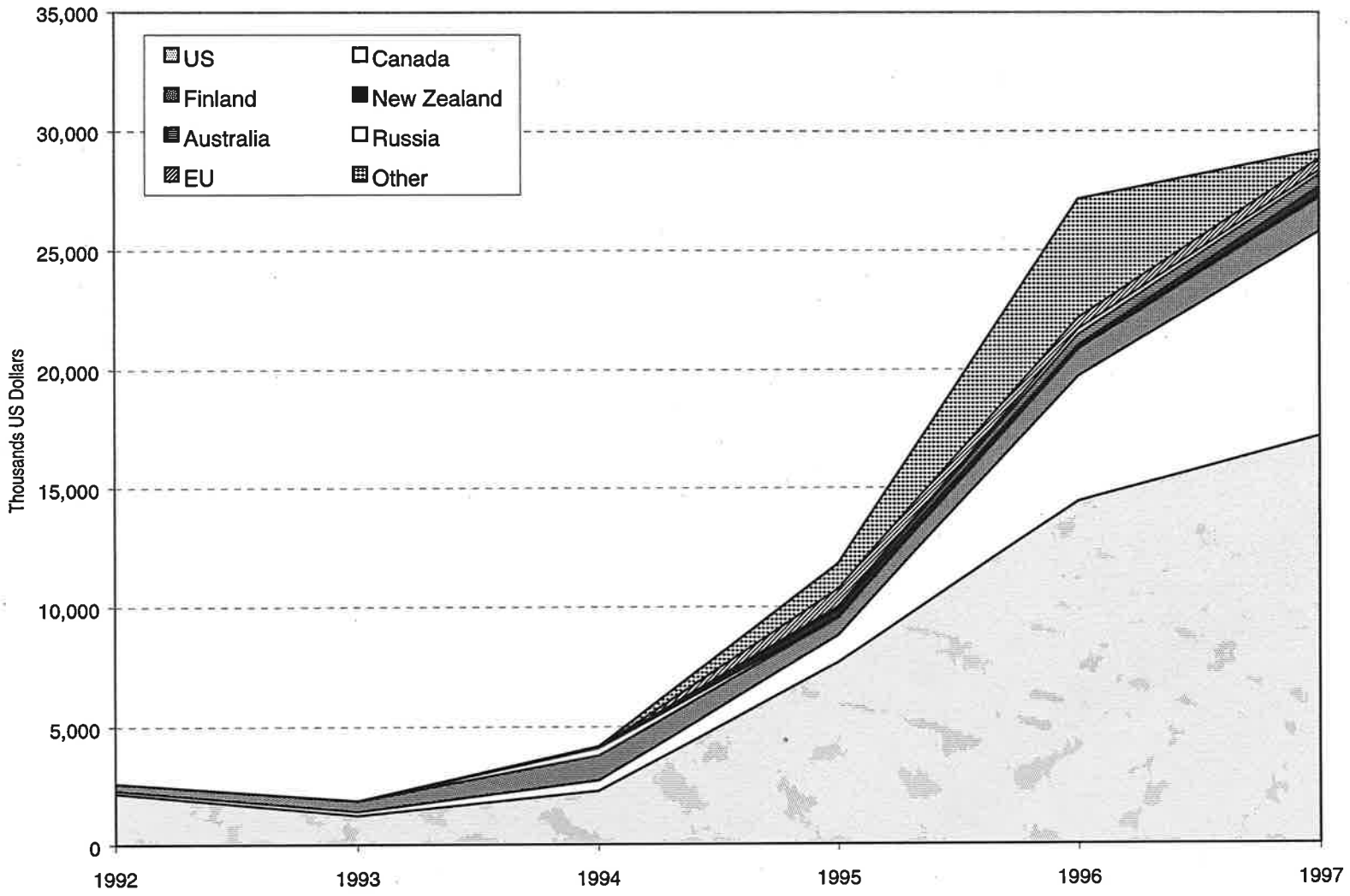

Figure 9. Wooden building imports by origin, 1992-1996 (Foreign Agriculture Service 1998).

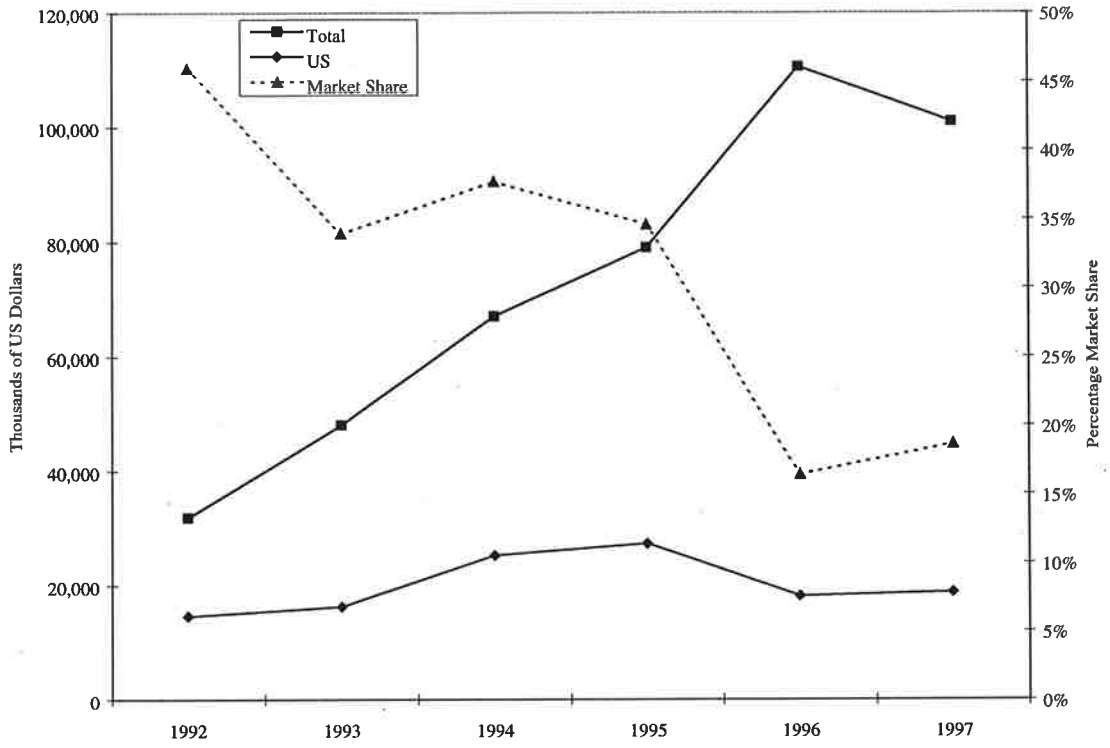

Figure 10. Total Korean wooden door and window imports and US market share, 1992-1997 (Foreign Agriculture Service 1998).

CONSUMER PERCEPTIONS OF WOOD FRAME HOUSING

Stable land prices, an ample supply of housing, and increased consumer affluence have contributed to the popularity of wood frame homes in Korea, yet single-family wood frame homes are still considered housing for the affluent. An example of a typical western-style wood frame home in Korea is shown in Figure 11. The typical 2x4 homeowner is between 40 to 50 years old and either self-employed or in a professional occupation. Half of these homeowners earn between 20 million to 40 million won (US $17,000 to $34,000) and 29% of 2x4 homeowners earn over 40 million won annually (Han, Kim, and Park 1995). According to a 1990 survey by the Korean Forest Research Institute (KRFI 1995) of 100 consumers, 77% stated that they preferred single family frame housing as opposed to apartments or low-rise multi-family homes. Of these respondents, 58.1% preferred homes between 910 ft^2 to 1,418 ft^2, 33% preferred homes between 1,449 ft^2 to 3,589 ft^2, 5.4% favored homes smaller than 910 ft^2, and 3.2% desire homes larger than 3,622 ft^2.

In addition to high-income single-family homeowners, a growing middle class is beginning to aspire to home ownership. Two story townhomes are increasingly accepted as an alternative to single-family homes. A tour of a townhome development 30 minutes from Seoul showed nicely decorated homes approximately 40 pyong (2,400 ft^2) (~1 pyong = 3.3 m^2 = 35.4 ft^2) with two car garages on a wooded, sloping site. Figure 12 shows the exterior of this development. Although these particular homes are not affordable to the middle class, townhomes may emerge as precursor to single-family home ownership, similar to the situation in the United States.

There are three significant barriers to the widespread adoption of wood frame construction among the Korean public: price, concern for fire susceptibility, and concern about longevity. While consumer affluence is on the rise, wood homes are still considered luxury housing. The majority of consumers polled saw no financial advantage to building with wood. Sixty-eight percent of consumers polled believed that the price of wood frame construction materials is high, 16% perceive the price of materials is relatively low, and 16% believed they were the same as other building materials. According to the KFRI survey, 75% of respondents believed that the risk of fire in a wood

Figure 11. Upper middle class single-family home near Seoul.

Figure 12. Link house development in Seoul suburb.

frame home was great, 7.1% believed the risk was minimal, and 7.9% believed the risk was about the same as other housing types. Consumers also do not have high expectations for the longevity of wood frame houses. The typical concrete apartment building lasts 20-30 years before it is demolished. Researchers and building contractors in Korea believe that wood frame homes can last up to 100 years if maintained correctly; however, the majority of KFRI survey respondents believed the life-span of wood frame homes was either the same or shorter than concrete construction. Only 31.7% of respondents believed wood frame homes last longer than concrete, 35.3% believed the life span is shorter, and 33% believed there is no difference between the longevity of wood frame homes and concrete homes. Most respondents also perceived wood frame housing is less energy efficient than concrete apartments. Thirty-four percent stated that they think wood frame houses consume a lot of energy to heat, 34.1% believed energy consumption in wood frame houses is better than concrete houses, and 34.1% believed it is the same as concrete homes (Han, Kim, and Park 1995).

While Korean consumers do not believe there are cost or energy efficiency advantages to wood frame homes, they do appreciate the aesthetic qualities and perception of health benefits associated with wood fame homes. Wood was a traditional building material for Korean homes, changing only after the Korean War. Many people still have positive memories of wooden homes owned by parents and grandparents and therefore have a positive image of wood frame construction as a whole. As international designs have influenced Korean preferences, North American wood frame homes are increasingly desired. In addition, the demand is high for products that Korean people perceive may improve health. Owners of wood homes interviewed for this project explained that they purchased a wooden home because they liked the design and because the wood surroundings felt pleasing and healthy.

Foreign Investment and Government Policies

Korean economists predict that investment in the domestic construction industry may decline 4.6% compared to 1996 due to a decline in the Korean economy's growth rate and lower levels of public and private investment (Ministry of Construction and Transportation 1998b). The MOCT is relaxing its real estate and foreign investment laws to attract foreign capital as part of the MOCT plan to improve the quality of housing. In order to attain a more market-driven economy, the government also discourages speculative business and is liberalizing the real estate market to allow foreign investment and land ownership, which will have significant implications for the residential housing market.

As part of this liberalization plan, the Ministry of Finance and Economy (MOFE) lifted all remaining barriers to foreign investment in the Korean business sector beginning April 1998. First, a restriction that limited foreign investment in residential and non-residential property sales and rental companies to a maximum of 50% has been removed. Second, both corporate and individual foreign investors are now free to purchase real estate without restrictions or prior permits. The only exceptions are cultural and military land. Third, as of May 1, 1998, land development is open to foreign companies. Residential land development, which was strictly confined to government and public agencies, is now open to both domestic and foreign private sector development.

Several new programs directly impact home sales. In an effort to sell the oversupply of approximately 90,000 new apartments, the Korean government established a US $23.5 million loan fund for potential homebuyers. Individual buyers may be eligible for loans up to 30 million won (US $25,300) for apartments to be built or under construction or 25 million won (US $21,100) for existing apartments (AF&PA Korea Market Report July 1998). The tax system has also been restructured to encourage homeownership. As of July 1998, the transfer tax applied to owners of multiple homes was removed (AF&PA Market Report September 1998). This should affect high-income consumers, who are most likely to purchase either primary or secondary residences constructed of wood.

Administrative procedures for foreign investment in real estate are also being streamlined. To facilitate land transactions of government-held debt properties, a series of asset backed securities was issued in July 1998, after approval from industry experts and foreign investment banks. The Korea Trade Investment Promotion Agency (KOTRA) will be a one-stop office for processing and facilitating real estate transactions with foreign investors (Construction and Economy Research Institute of Korea 1998b).

LAND SUPPLY

In order to increase the supply of available housing after the Korean War, the Korean government imposed strict land-use laws to encourage construction of concrete high-rise apartments rather than single-family residences. Since Korea's rapid industrialization and urbanization in the late 1970's, land prices, particularly in urban areas, have been at a premium. Land prices stabilized during the late 1980's when the MOCT adopted several land development and supply policies to convert more land to residential use (MOCT 1997). Since 1992, these policies helped start a trend of stable land prices, which continued until recently when prices declined significantly. More recently, the government reduced the number of land classifications from ten categories to five, making it easier to develop available land. The Quasi-agricultural and Forestry Area Plans increased the availability of land for development from 15% to 42% of Korea's total land area (MOCT 1997).

Land prices declined 0.18% in 1997 and 9.49% during the second quarter of 1998 (Figure 13). Prior to the Asian economic crisis, many individuals and large business conglomerates placed their money in speculative land investment. Since the crisis, conglomerates have sold large volumes of land to raise cash to solve their liquidity problems, which drove the average price down (CERIK 1998a).

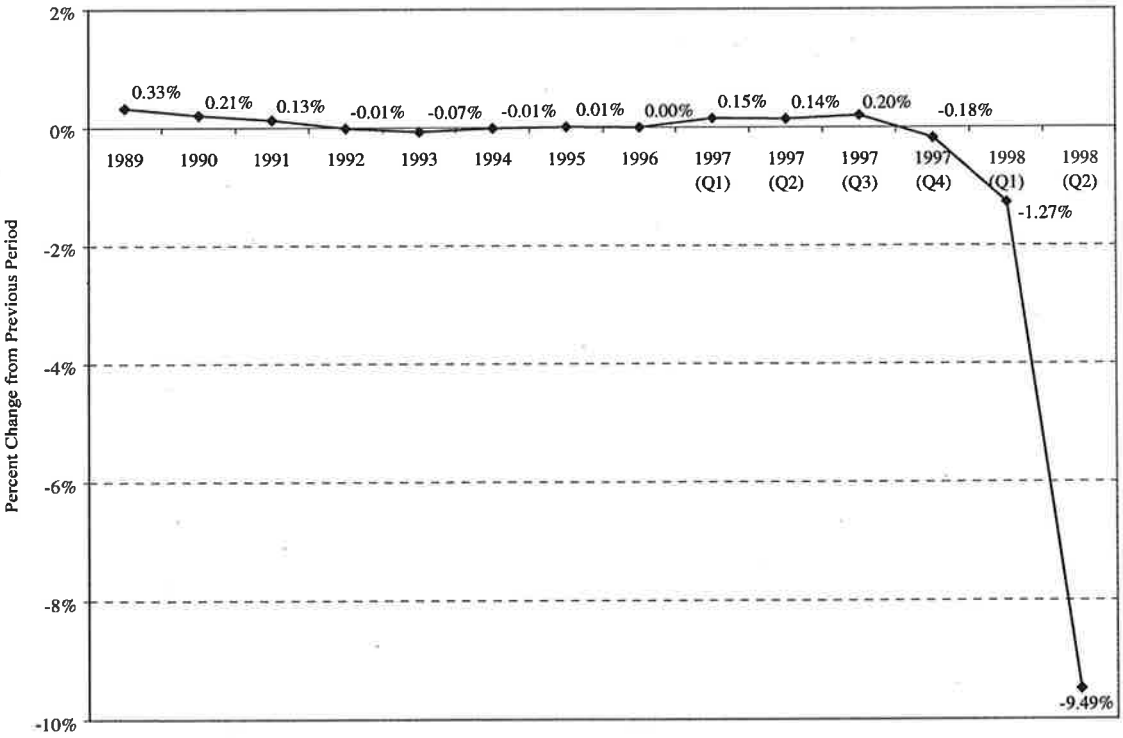

Figure 13. Land price fluctuations 1989-1999 (MOCT and CERIK 1998b).

Low market prices have many experts stating that there has never been a better time to invest in land, although prices have started to recover. The Korea Land Corporation estimates shortages in the long-term supply of industrial and residential land. While speculative investment always has a degree of risk, current depressed land prices coupled with tax reforms and removal of previous restrictions on foreign land owners have increased the amount of land in Korea owned by foreign interests. During the two months after the real estate market was opened to foreign investment, foreign investors purchased 4.4 million m^2 of real estate valued at US $350 million. These land transfers occurred in 483 transactions, double the number of transactions in July, when the Law on Land Acquisition by Foreigners was passed (CERIK 1998b). More recently, from the end of June 1998 to the end of March 1999, foreign real estate investment totaled an estimated at US $1.7 billion (17 million square meters), a 450% increase over the previous nine months (KOTRA 1999b).

KOREAN BUILDERS

As previously noted, wood frame homes in Korea represent only a small percentage of the total housing stock. The market share of wood frame homes has been further restricted by the Asian economic crisis, which has made the price of imported homes higher. However, even though wood frame home sales have declined, interest remains high in both potential homeowners and builders. It is therefore likely that the number of wood frame homes will increase as the economy improves. Over the past decade, numerous wood frame homebuilders have come and gone. Most of those who are no longer in business were small builders or undercapitalized divisions of larger companies.

Large Korean conglomerates, or *chaebol* do not generally compete in the wood frame construction market since it is a small sector of the construction industry. Instead, *chaebol* concentrate on concrete high rise apartments or expensive non-wood single-family or low-rise multi-family "villa" homes. Samsung and Daewoo, two very large construction companies, were considering entering the wood frame housing industry; however, these plans have been put on hold due to the current economy. It is important to note that large companies such as these have great influence on the actions of government agencies such as the MOCT. It is also important to remember that few changes occur in building codes without a request from a Korean company or industry association.

Korea National Housing Corporation (KNHC), a quasi-government housing provider, built 35,000 units in 1997. These were typically medium to low-income high-rise concrete apartments 15 stories high and 60 m^2 (659 ft^2) per unit. The typical low-income unit rents for less than US $500/month with rent often subsidized by government funds. Past history has shown that the KNHC loses money on government subsidized rentals. Because it is charged with making a profit, it is attempting to move its production to middle-income units.

KNHC does not build wood frame housing and uses only a moderate amount of wood in its units. However, it is required by the Korean government to make a profit from apartment sales. Therefore, when a higher profit margin may partially subsidize its low-income apartments, KNHC's plans may include apartments with interior detailing and wooden multi-story residential housing if the MOCT approves of this type of construction. KNHC is not averse to working with wood products, but it must see profit potential.

One company actively pursuing the wood frame housing market in Korea is planning a 12-lot luxury home development outside of Seoul. A total land area of 3,600 pyong (2.9 acres) is being converted from farm and forestland. To maintain a connection with nature and provide a lower-density community, 600 pyong (4.9 acres) are being set aside for parks and roads and only 30% of the lot area will be covered by the home. Lot sizes will average approximately 250 pyong (8,850 ft^2). This is in contrast to other developments closer to Seoul where 80% of the lot can be covered by the home. Floor plans from a major US homebuilder are being used in their advertising literature. Homestyles™ software is used to generate floor plans shown in the literature and to assist customers in visualizing the home.

This company claims the fastest construction time in the country, completing a home in 12-14 weeks. This is accomplished by using US framing crews. The company has found that Korean construction crews need more detail than is typically given on US home plans. Even though US framing crews are paid twice the Korean wage rate, their efficiency is such that total project costs are lower. For example, US carpenters earn $25/hour for 10 hours of work per day in Korea. Korean crews are paid $13/hour for 10 hours of work. With frequent breaks taken by a typical Korean crew and the need for constant supervision, construction companies report that the workday consists of only 4-5 actual hours of work. US crews work without supervision and as a team. Even with a 7% income tax for foreign workers who stay in Korea more than two weeks, the home is completed faster, better, and ultimately at lower cost. For a nicely decorated home of 68 pyong (2,400 ft^2), this company reports a cost of US $65,000 ($27.08/ft^2) excluding land costs. Total home cost breakdown is approximately one-third each for material, labor, and overhead and profit. Other costs for home construction include permit fees. For example, the building permit fee for this particular housing development is 12.25 million won (US $8,750).

A medium sized design/build company that specializes in commercial construction, manufacturing plants, housing, and interiors was also interviewed. Residential construction is relatively new for this company. It has built 50 Western style wood frame homes since 1994. The president of the company seemed pleased with his experiences

with wood frame construction and plans to build more as soon as the market returns. For the near term, much of the company's business will be focused on interior remodeling for both commercial and residential buildings. It also appears to be well connected with the banking community and the MOCT.

A third, reasonably small homebuilder has been in business since the early 1990's, building homes primarily in Ilsan, a suburb of Seoul since at least 1995. Figure 14 is an example of one of the company's homes in Ilsan. The neighborhood is a closely packed mix of architecturally diverse, high-end single-family residences, occupied primarily by celebrities, politicians and other well-to-do homeowners. A majority of the homes are reinforced concrete with numerous wood frame homes interspersed. Homes in this neighborhood range in size from 56 pyong (2,000 ft^2) to more than 127 pyong (4,500 ft^2).

Figure 14. Wood frame home in Ilsan built by a small contracting company.

Since the beginning of the financial crisis in Korea, this company has only completed homes that were in progress prior to the economic downturn. The company claims that the IMF crisis in Korea has raised imported materials costs 60% and domestic materials costs 40%. Under normal conditions, the company's representative suggested that building materials (lumber, panels, windows, doors, etc.) represented 30-40% of the cost, labor 30-40% of total cost using Korean crews, and overhead and profit 20-30%. Land costs are much greater than the cost of the home and typically depend on proximity to Seoul. This company estimates the price of wood frame homes are 3.55 million won/pyong (US \$43/ft^2), nearly twice the cost of concrete construction. This is a 40% increase since the economic crisis. Korean framing and finishing crews trained either by US or Canadian carpenters are used exclusively. Carpenters were paid approximately 60,000 won per day (US \$45/day) before the Asian crisis, yet current pay is 45,000 won per day (US \$34/day) for 8-9 hours of work. This is quite a bit less than other companies pay for Korean labor. These homes were generally less elaborate than most in the Ilsan development and the finish work (at least in one of the homes) had some obvious flaws, particularly in gypsum wallboard and moulding installation (Figures 15-17).

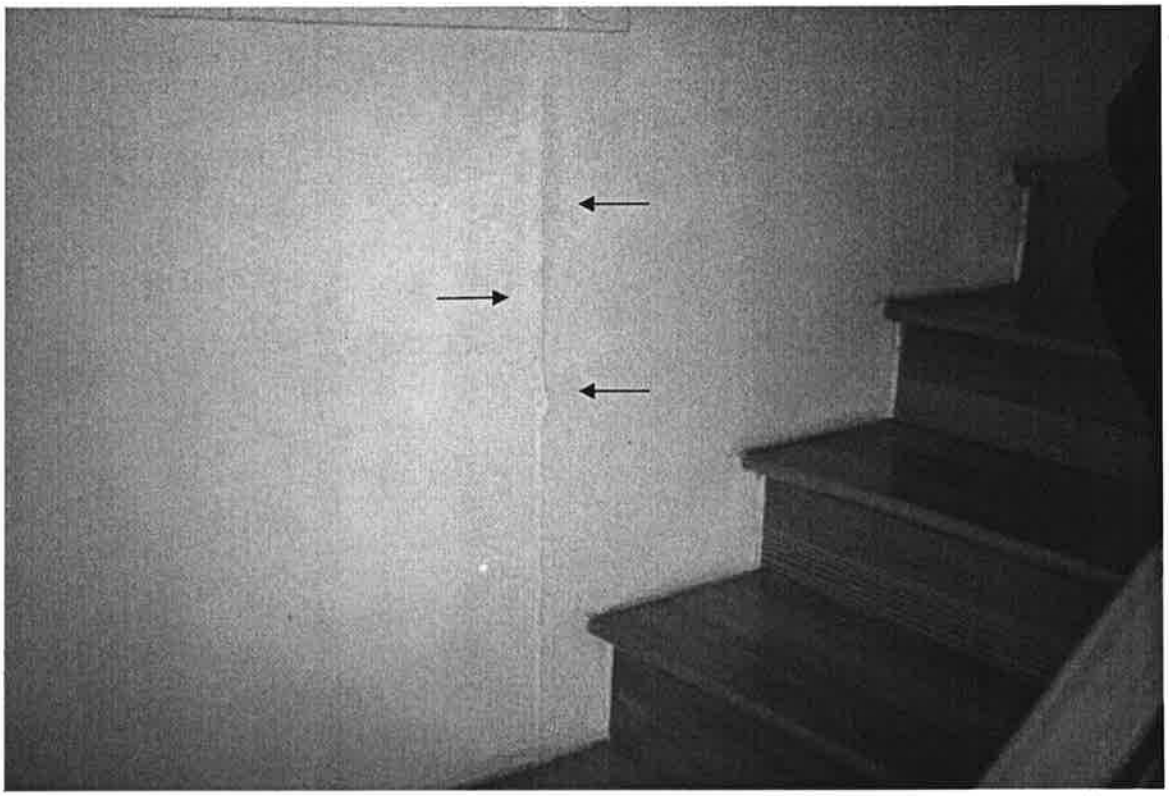

Figure 15. Gypsum wall board joint failure.

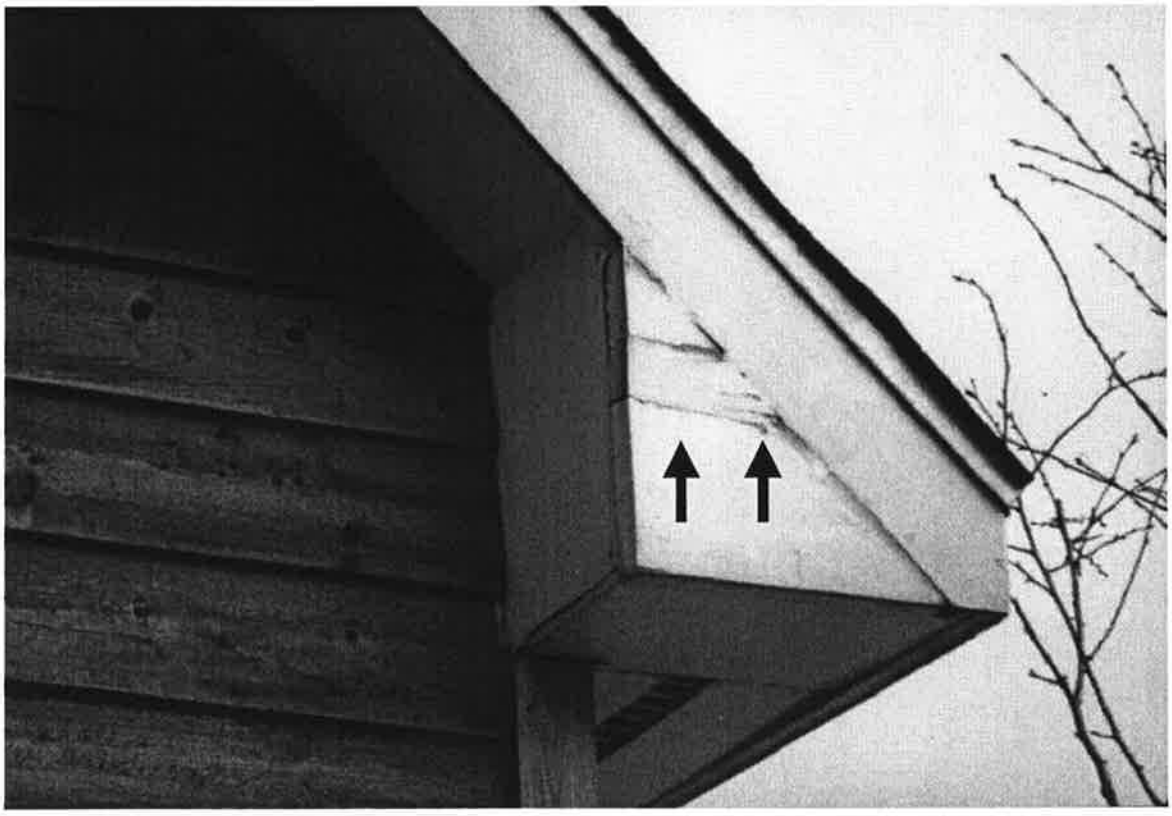

Figure 13. Product quality and paint failure.

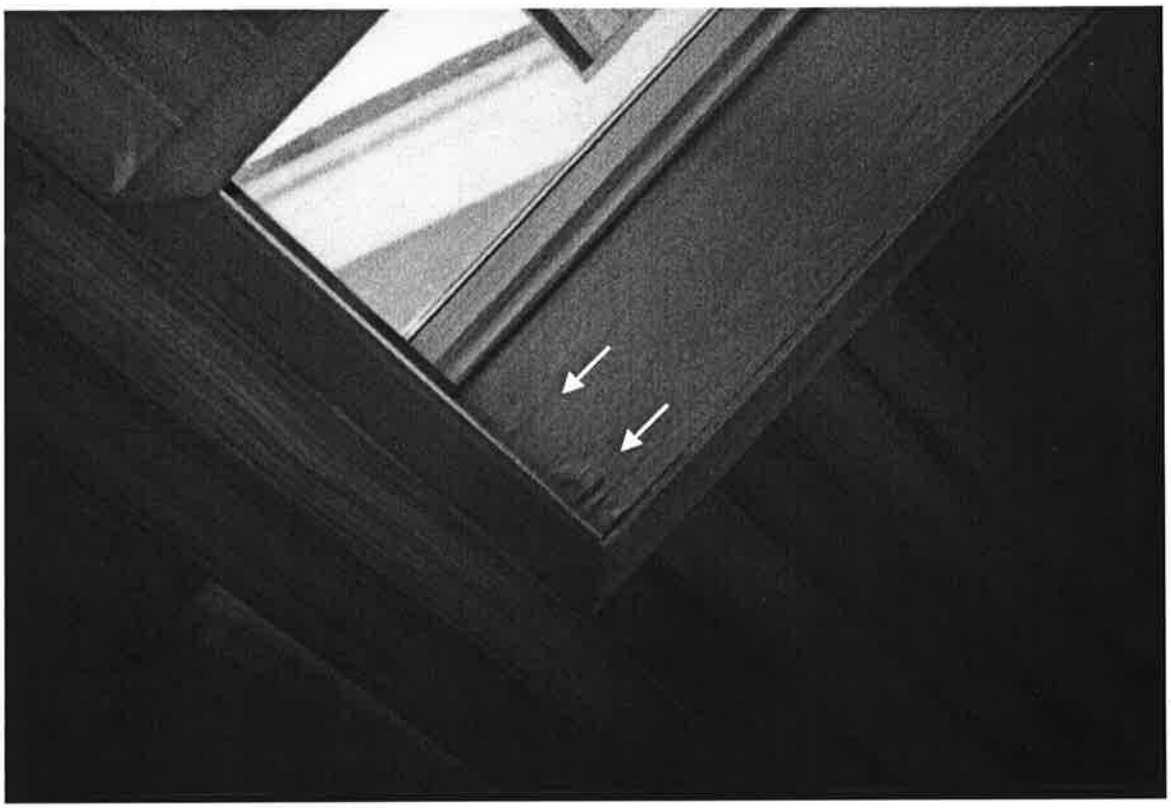

Figure 147. Damage due to poor skylight installation.

Figure 18. High-end wood frame home in Ilsan.

Figure 19. Stucco finish on high-end wood frame home in Ilsan.

A fourth company with several homes currently under construction in the Ilsan development uses American framing crews exclusively for its construction projects, because they can finish more quickly with a higher quality final product than Korean crews. Korean crews install siding, roofing, windows, doors, and interior finish work. These projects appeared to be high-end homes (Figures 18, 19). While we were not able to view the actual framing of these homes, the interiors and finish work in this company's homes appeared to be adequate with a few exceptions involving poor installation of moulding, gypsum wallboard, and flooring.

As the Korean population begins to age, retirement communities appear to be attracting interest. One Korean architect, who has worked extensively in Canada, is promoting a senior citizen or *silver* community located approximately one hour from downtown Seoul. This development plan includes approximately 1,000 units for *younger silver* (ages 55-60) and *ordinary silver* (senior citizens more than 60 years old). It should be noted that the term *silver* is acquiring a negative connotation from a marketing perspective. The term "senior citizen" may become preferable.

In this retirement community, unit sizes are planned to be between 1,000-1,200 ft^2 for "younger" senior citizens and 400-500 for "ordinary" senior citizens. Selling price is expected to be 4 million won per pyong (US \$48/ft^2). This community will also have 65 single-family homes and/or townhouses, medical facilities, walking paths, and recreational amenities. The site is a picturesque location at the edge of a national recreational area. A new highway is being constructed to a nearby town that is expected to reduce the driving time from Seoul.

Among all the builders/developers interviewed, the concept of a wood frame home was viewed as a strong marketing tool. Respondents report that customers who have the money prefer wood frame construction. There is a common belief that living in a wood home is superior to living in a concrete home in terms of comfort, aesthetics, and health benefits.

Figure20. Three story apartment building at Nyung Ji University.

MATERIALS DISTRIBUTION

Korea is currently a net importer of construction materials and will likely remain so. The import and distribution process for wooden homes and building components is relatively simple. Builders with operations in Korea import their components and packages directly from the manufacturer, then transport the materials to the home site themselves. The distribution system can become more complicated when wooden building components are used in the non-wood construction sector or in large construction projects. As this point, materials enter the larger distribution system of wholesalers, construction companies, subcontractors, retailers, and domestic manufacturers. As wooden building materials are more widely used in building construction in Korea, more in-depth research into the details of the distribution system may be useful.

Small retail centers to serve the housing market are beginning to form. There are currently areas in and around Seoul where a series of independent specialized shops supply moulding and millwork, lumber, panels, bath fixtures, kitchen appliances, and other materials for decorating and upgrading existing homes. One small retail center that opened in July 1998 contains a 2,400 ft^2 showroom dedicated to kitchen cabinets, windows, bathroom fixtures, siding, and structural building materials including lumber, structural panels, and I-joists. Both US and Korean companies are interested in establishing similar mini-distribution centers.

US companies such as Simpson and Bosch have already made inroads into the Korean market by supplying metal connectors and fastening supplies. Bosch, for example, is a supplier of staple guns and materials to the furniture industry, so the company may easily move into supplying the housing market. A company such as Simpson that sells metal connectors designed specifically for wood frame construction may encounter a greater degree of risk because it has limited prior business exposure and fewer business contacts in Korea. Even so, it appears that Simpson has instituted an effective marketing program because most builders are aware of its product offerings. Building material and prefabricated home importers make up the bulk of the wooden housing materials suppliers in Korea. Companies such as PGL Korea and Setzer Forest Products are significant participants in the building

materials and housing supply chain. These companies purchase products from various sources in North America as well as other countries to service the demand in Korea. Obviously, they try to provide the best value for their customers, which does not always mean selling products from the US.

HOMEBUILDER FINANCING

Construction financing in Korea is much different than in the US. The Korean Housing Bank (KHB), one of the country's largest home loan banks, funds primarily high-rise housing projects. Typically a "qualified" developer/builder can obtain a construction loan from the bank. It appears that to become qualified, a builder must have contacts in the construction industry. This suggests that larger construction firms have an advantage over smaller homebuilders in obtaining financing.

Interviews with Korea construction companies revealed an interesting approach to obtaining construction financing. One construction company purchases materials from a US supplier, which in turn obtains a construction loan from a US bank. The Korean firm agrees to buy materials from the US supplier and the US supplier provides a guarantee on the construction loan with a US bank.

A similar and equally creative approach to obtaining foreign capital has been used by others. A Korean contractor/builder convinces a Korean bank that the proposed project is a good investment, probably something along the lines of being "qualified" as previously discussed. The Korean bank then convinces a US bank that the Korean bank is reputable, and enters an agreement with the US bank for a construction loan. The Korean bank guarantees the loan with the US Bank. The Korean bank can borrow money at a lower interest rate than the Korean contractor, thereby making a profit on the difference in interest rate paid by the Korean builder.

FINANCING FOR THE HOMEBUYER

The home finance system for consumers consists of both public and private sector lenders. The public sector is represented by the National Housing Fund (NHF), while the KHB primarily provides private sector loans. The remaining lending organizations are comprised of the National Agricultural Cooperatives Federation, life insurance companies, and commercial banks, although their market share is very small. The KHB extends loans for homes and apartments 100 m^2 (1,098 ft^2) and smaller. Homeowners purchasing homes larger than 100 m^2 must borrow from private lenders. Table 13 illustrates funding agencies by target group and housing type. These lending limits were instituted to encourage people to live in smaller homes because past government administrations believed that large homes were excessive given the small size of the country and the high population density in urban areas. This policy may be discontinued under the new presidential administration.

Table 13. Funding agencies by target group and housing type.

Target Groups	Housing Types	Funding
Low-Income	Public Rental Housing (23-40 m^2)	Government Budget
Low Middle-Income	Public Rental Housing (40-60 m^2)	National Housing Fund
	Worker's Sale Housing	
	Company's Rental Housing	
	Small-sized Sale Housing (<60 m^2)	
Middle-Income	Medium sized Sale Housing (60-85 m^2)	Private Housing Loans (KHB)
Upper-Income	Large sized Housing (>85 m^2)	Private Housing Loans (KHB)

Source: Ministry of Construction and Transportation 1997b.

Mortgages typically require a 70-80% downpayment, with the remaining loan to be paid in 5-20 years. Interest currently accrues at a rate of 14-17%. This limits homeownership to individuals who have accumulated substantial savings. However, organizations such as the Housing Finance Credit Guarantee Fund and the Korea Fidelity and Surety Company provide creditor guarantees and more accessible loans for borrowers who do not have sufficient collateral (MOCT 1997a).

IMPEDIMENTS TO TRADE

Although access to the Korean market has improved considerably, US exporters still encounter some barriers. In 1993, the Korean government announced a series of tariff reductions to lower the rate for wood products to zero for logs and 8% for plywood. In the meantime, the tariff for softwood strips thicker than 5 mm has been raised to 17%. More recently, the Asian-Pacific Economic Cooperative (APEC) proposed that members eliminate tariffs on wood and paper products, including primary, semi-finished, and finished products, by January 1, 2000. The Korean government, however, is reluctant to join this agreement, fearing that a zero tariff on all wood products could threaten the competitiveness of small domestic producers. Even with existing tariffs, importers and builders report that they do not consider this a significant barrier to importing and using imported wood products.

BUILDING CODES

One of the most difficult barriers to expanding the market for wood frame construction is the Korean building code for wood frame construction. This code restricts the height, total floor area, and type of construction material used, yet does not outline detailed engineering requirements to ensure structural soundness of the building (Appendix A). Equally as restricting as the codes that do exist is the absence of a complete building code. Builders who do not have a thorough understanding of wood frame construction may build substandard or structurally unsound homes, which can have a negative impact on the entire industry. Since relatively few wooden homes exist in Korea, the homes that do exist serve as models for the entire industry and play a pivotal role in its future success. Unfortunately, while there is growing interest in wood frame housing within the MOCT, few experts in wood frame housing construction exist within Korea.

The Korean system of building inspections and code enforcement also leaves the wooden housing industry unregulated. There are no building inspectors for wood frame homes. Instead, the builder or architect is liable for any damages resulting from improper construction. While the builder can be criminally charged for gross wrongdoing resulting from improper or dangerous construction, only after major damages are incurred are building codes enforced. At this point, the entire industry can be negatively impacted. To a lesser and more probable degree, the homeowner will likely have to deal with the consequences of improper construction. Given the industry's reliance on word of mouth advertising in Korea, the reputation of a few improperly constructed homes will spread further than their immediate neighborhood. There appears to be a need to regulate builders, or at least to hold them accountable. Most owners and some architects do not have enough knowledge of wood frame construction to know if something is wrong. Therefore, an improved form of inspection by those trained in wood frame construction is needed.

Building codes are intended to maintain a specified level of safety and serviceability in a structure. All countries establish codes to protect homeowners from harm or discomfort. Codes evolve in each region of the world based on experience, tradition, and good engineering judgment. Products and practices that perform well are endorsed and those that do not are restricted. The process to change a building code varies greatly between countries. In most of Asia, building codes and standards are developed and implemented by a government agency such as the MOCT, and therefore changes must be approved by these organizations.

While only one building code exists to either accept or reject wood frame construction in Korea , discussions with MOCT engineers reveal a genuine interest in developing a more complete wood frame building code. The Ministry of Finance has asked the director of the Architecture and Housing Bureau of the MOCT to identify the problems associated with accepting a wood frame building code. It must be understood that the MOCT is not staffed to take on such an effort. Therefore, it is incumbent upon those interested in such a project to push it forward. As previously mentioned, this process is greatly aided by support from either a large construction company or the industry as a whole. There is little incentive for the MOCT to act unless there is a request from an influential Korean company or industry association. This is not to say that data from fire and structural tests of wood frame construction performed in Korea would be automatically dismissed by the MOCT. The MOCT may be more accepting of information regarding wood frame construction however if it is submitted by a Korean organization. Developing and maintaining relationships with organizations such as KFRI and the Korea Wood Frame Construction Association (WFCA) can be extremely beneficial to advancing wood frame construction in Korea.

The AF&PA Korea office has already participated with the WFCA on writing the draft building code submitted to the MOCT for review.

A professor at Seoul National University (Suwon campus) who is an expert in wood frame construction stated that the Korean wood frame building code is based on portions of the Japanese building code. He suggested that it is likely that the Korean MOCT will rely heavily on the Japanese code for wood frame construction as opposed to guidelines provided by the US. He also stated that "it would be easier [for US interests] to change the Japanese code than it would be for the US to change the Korean code." This suggests that a request solely from US interests to amend the Korean wood frame code will not likely have much impact.

During the past several years the Ministry of Forestry (MOF) has been interested in promoting wood frame housing in Korea. In fact, KFRI received funds from MOF to research wood-based building materials used in wood frame construction. However, the new head of MOF reportedly has no training or knowledge of wood-based building materials and will not likely pay much attention to the needs of wood frame construction research. It is not anticipated that the new leadership will consciously block advancement of wood frame construction, yet funding for wood-based building material research will no longer be available. It was indicated however, that KFRI would continue to receive funding to develop processes to use domestic species for construction purposes. Depending upon the success of this research and the volume of timber available, competition from domestic Korean resources may appear in the future (KFRI personal interview 1998).

A professor of architecture from Seoul National University (Seoul campus) with some knowledge of engineered wood products such as LVL and I-joists was asked by MOCT to be an advisor when the draft wood frame building code developed by the Korean-based Wood Frame Construction Association is reviewed by MOCT. This professor believes that engineered wood products have great market potential in Korea, yet technical information about engineered wood products must be widely disseminated throughout the construction industry.

Technical transfer and education regarding 2x4 wood frame construction will require an extensive effort at both the university and trade school level, as well as within the construction industry. It is important to recognize that the MOCT will rely on individuals such as professors to review the draft wood frame building code and formulate recommendations for acceptance. In this case, it is fortunate that the professor selected to review the draft code believes wood-based building materials are appropriate for the Korean construction industry. Others selected by the MOCT may not have a positive view of wood frame construction and wood-based building materials.

To date there is very little in the Korean building code that either accepts or rejects wood frame construction. The code that does exist limits wood frame construction to a maximum ceiling height of 9m (29.5 ft) and a roof ridge height of 13m (42.6 ft). It also limits wood frame construction to less than 3,000 m^2 total area (approximately 30,000 ft^2). It is not clear if this is total area or total floor area. Either way, the existing code does not restrict US style three-story single or multi-family housing. For multi-family housing, each housing unit must have a complete fire separation wall. It is also possible for a builder to obtain special approval for a single project, similar to Article 38 in the Japanese code. Article 38 in Japan allows a company or organization to get special "one of a kind" approval to build a project that may not fit strictly within the country's building restrictions.

With the exception of fire performance, the criteria in the draft code are not significantly different than US building codes. Typhoon wind loads are similar to Florida criteria, and earthquakes do not seem to be a concern in Korea. MOCT representatives have expressed concern about the absence of adequate fire and structural testing for wood frame homes in Korea. To encourage the Korean government to accept wood frame construction, US framing systems must pass the Korean one-hour fire test, which requires wood studs resist igniting after exposure to fire for one hour. MOCT has already evaluated the traditional US framing system according to their test method and it failed to meet their acceptance criteria because the studs ignited. It is obvious that the Korean test is more severe than the US test. Construction systems meeting the Korean one-hour test must be designed and tested in the US according to Korean standards and then introduced to the MOCT. In order to obtain building code approval in Korea, it may be necessary to replicate the fire and earthquake test conducted in Japan several years ago. This was a test of a three-story building that was mechanically subjected to an earthquake and then burned to evaluate the

impact of an earthquake on fire performance of typical wood frame construction. The study passed the Japanese criteria allowing three story wood frame housing in Japan.

One final observation is salient. In Korea, the architect designs the building, supervises the construction, and is the building inspector for structures less than 5,000 m^2 (54,875 ft^2). The architect of record is responsible for inspecting his or her own project. If any problems arise with the building, the architect can lose his or her license to practice. This is obviously different than in the US and suggests that the architect is key to product and technology acceptance in any building construction.

EDUCATION AND TRAINING

As more builders enter the wood frame construction market, another factor restricting market growth is a lack of skilled carpenters and architects. Korean carpenters are very skilled in masonry work and interior finish work. Although several training programs are underway, few carpenters have experience with 2x4 wood frame construction. Similarly, Korean architects are highly educated in concrete construction, but only a few classes on wood frame design and engineering are taught in Korea and no degree programs exist.

The key to implementing long-term change in building codes, home quality, and customer satisfaction is an appropriate level of education and training. These efforts must take place at all levels in the process of supplying a home. This includes engineers, architects, builders, materials suppliers, homeowners, and educators.

The most immediate need is for basic carpenter training and home maintenance education for homeowners. It is equally important to make instruction available to both instructors and students at universities and technical schools. In addition, education at the MOCT level is also appropriate. Figures 21-25depict serious flaws observed in the use of lumber, I-joists, and wood frame construction that represent potentially dangerous details. Figure 21 illustrates 2x6 wall studs cut too short. In an effort to utilize short studs, short pieces of 2x6 were nailed into the wide faces of the studs. As a bearing wall this connection will not support the second level floor and roof loads. Figure 22 depicts a header that will not support the load over an opening. The header itself is not designed to be a structural member and there are no support columns holding the header in place. The detail shown in Figure 23 is either not yet complete or inadequate. Either way it will be very difficult to securely attach the wall to the foundation. As highly engineered products enter the market it is important that the proper installation procedures be employed. The I-joist shown in Figure 24 shows a splice between two I-joists that is ineffective. No significant load carrying capacity is provided by this detail. Normal design loads (or less) will cause failure. Figure 25 shows additional misuse of I-joists. In this case the center-to-center spacing of the joists is approximately four times the proper spacing. In addition, numerous ceiling joists resting on the I-joists have no support at butt joints. This will not carry the design loads.

Dr. Jang of Chungnam University and Dr. J. J. Lee of Seoul National University are two of the few timber-engineering experts in Korea. They both trained in the US and understand wood frame construction engineering. Currently, forest products departments in agricultural colleges teach wood engineering, but no engineering schools in Korea teach wood design. Therefore, few professionals in Korea understand design engineering of timber structures.

Industry experts suggest that architects believe wood is an adequate structural material, but is not durable with regard to fire, decay, and termites. Experts also stated that Korean architects and engineers have minimal understanding of wood frame connection design. Since the architect is responsible for the design and inspection of the construction, it is critical that architects are trained in wood frame construction.

Dr. Jang and his associates, sponsored by AF&PA Korea, teach a two-week wood frame housing course at Chungnam University that includes constructing a demonstration house. Scot Simpson, a US framer, collaborates with Dr. Jang on the home building portion of the course. Softplan™ house design software and WoodWorks™ engineering design software are used in the class. Mr. Simpson covers all aspects of framing and finishing a home. Students learn design and engineering principles and use these skills in a practical application. The 1998 class

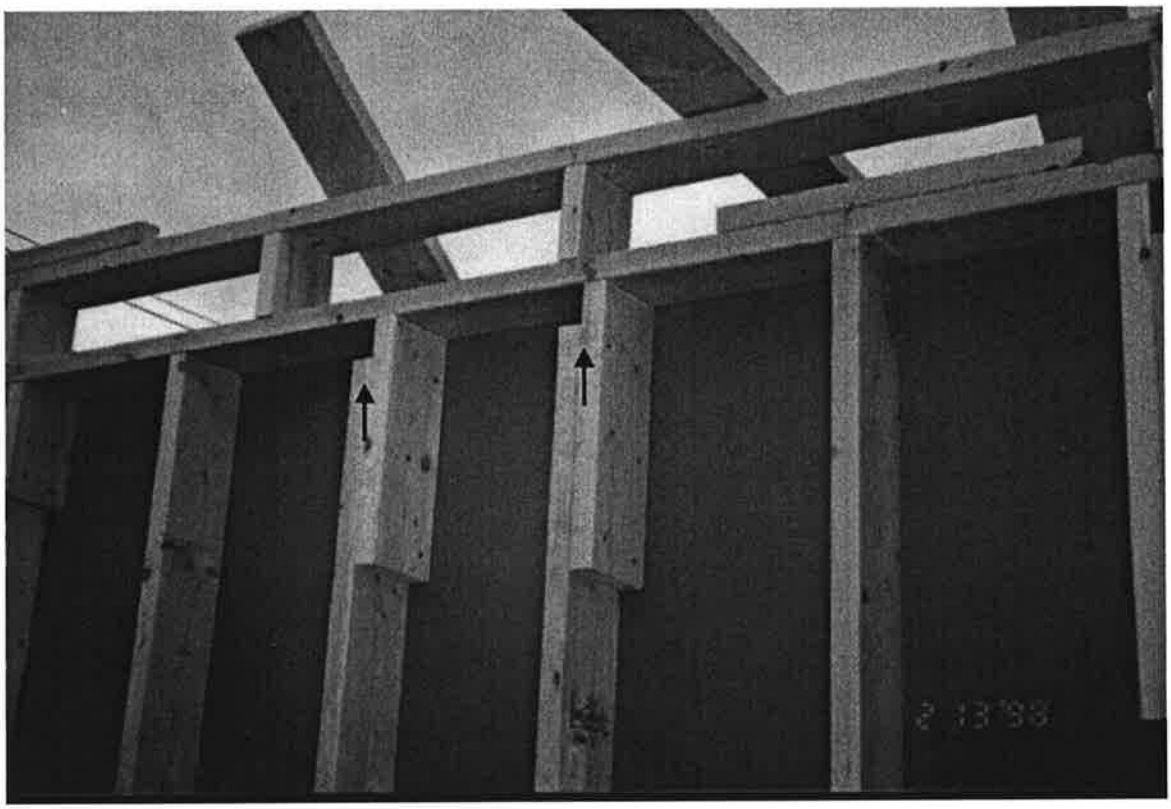

Figure 21. Improper framing detail.

Figure 22. Non functional header detail.

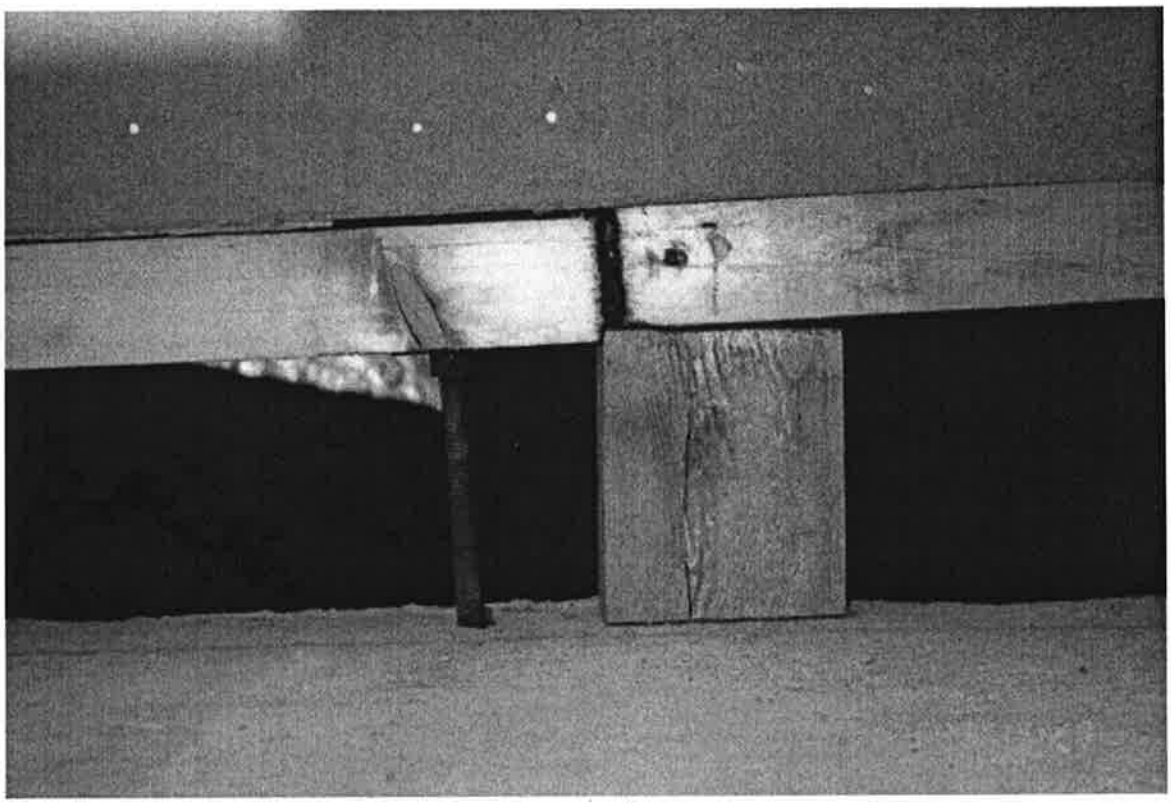

Figure 23. Improper wall/foundation detail.

Figure 24. Inadequate connection between I-joists.

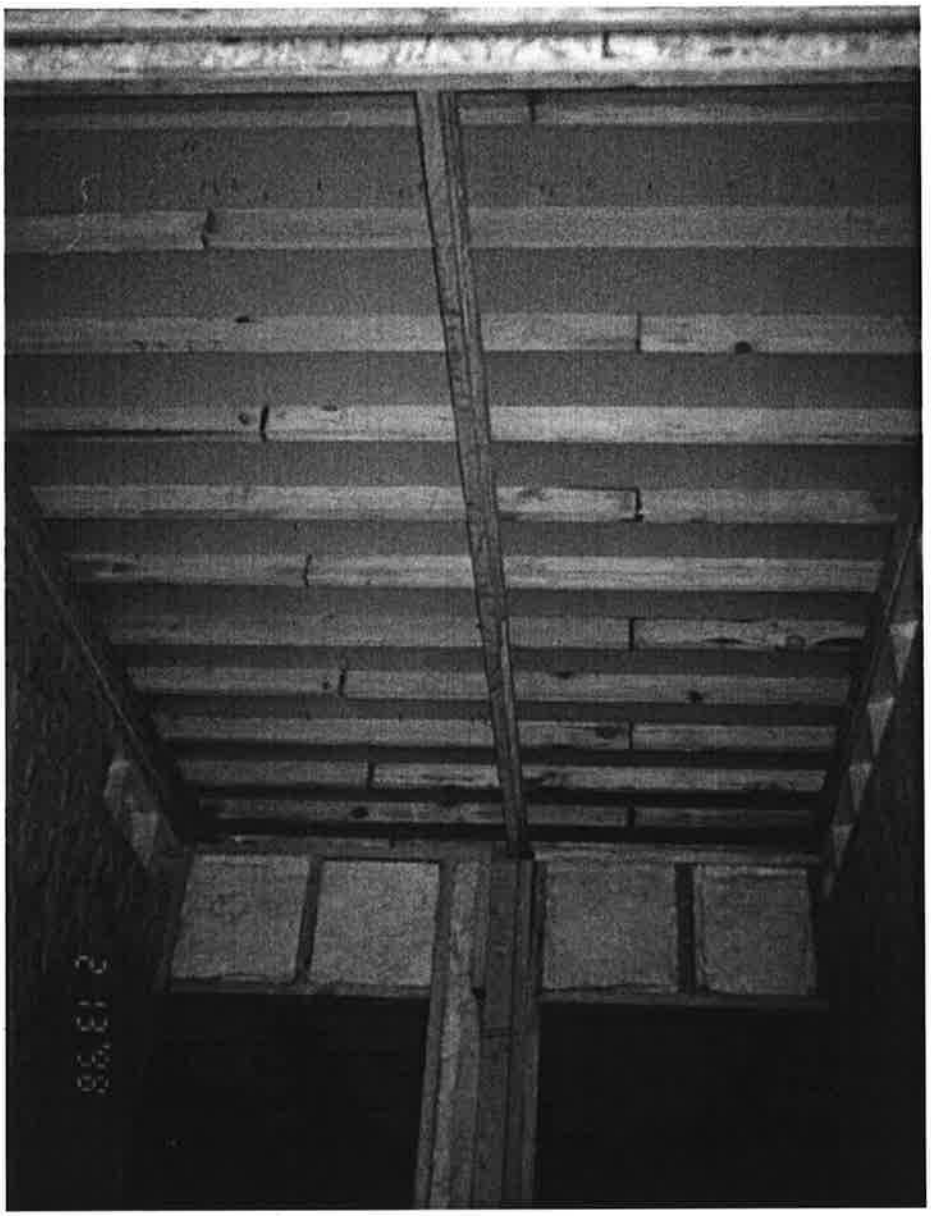

Figure 25. Incorrect I-joist spacing and improper ceiling joists.

worked on a two-story building for commercial use as a physical rehabilitation center. Attendees of the course are typically architects and builders, and occasionally engineers attend.

Industry experts suggest that architects believe wood is an adequate structural material but is not durable with regard to fire, decay, and termites. Experts also stated that Korean architects and engineers have minimal understanding of wood frame connection design. Since the architect is responsible for the design and inspection of the construction, it is critical that architects are trained in wood frame construction.

An example of where training at the university professor level could be helpful is a Seoul National University architecture professor who has been asked by the MOCT to be a technical expert for the forthcoming wood frame

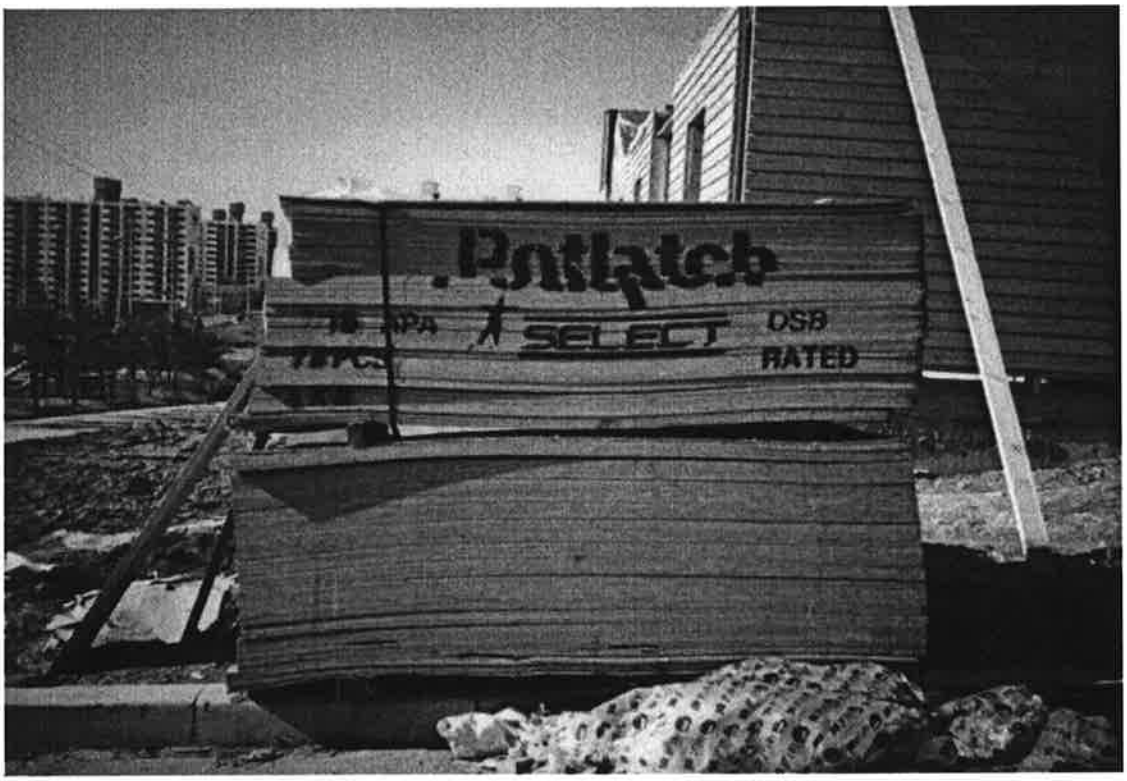

Figure 26. Improper site storage of OSB panels.

Figure 27. Inadequate site storage of building materials.

code. At this stage this professor is knowledgeable about many wood-based building materials but not the home building process. As an advisor to the MOCT his opinion will be influential.

In addition to a limited understanding of the structural design of wood frame construction, there appears to be a major deficiency in the level of understanding of the handling, storage, and use of wood and wood-base building materials. Figures 26 and 27 show building materials improperly stored on the job-site. Training regarding proper handling, storage, and use of wood building materials will be beneficial to materials suppliers, builders, architects, and homeowners.Another wood frame construction class is taught by a Korean architect with an extensive background in Canada and experience as a part time instructor of wood frame construction at Inha College near Seoul. The class is conducted on Saturdays for eight weeks, three hours per day and concludes with a tour of the US to see applied building products and processes. The cost for the instructor to hold this class is approximately US $2,000 per student, yet he charges students only 21,240 won (US $230) The class is well attended with more applicants than space available, indicating a strong demand for wood frame construction training. The instructor feels that a vocational training school should be established in Korea with support from both the Korean and US governments. He also suggests that the US should develop a 6-8 week course in addition to the AF&PA wood frame construction training program, to be taught in Korea and include architectural design, structural engineering, and construction methods and management.

MONETARY ISSUES

Wood frame homes cost 1-1/2 to 2 times the cost of concrete homes, a condition exacerbated by the IMF crisis. The cost of imported building materials has increased more than domestic materials, making traditional domestic construction materials and procedures more attractive. However, in an effort to attract foreign capital, the Korean government announced in March 1998, that foreign builders could bid on construction jobs in Korea. To date there is no indication that any significant investments of foreign capital have occurred, particularly in the wood frame housing area.

Since January 1998, 14 small banks have closed. It is rumored that of the ten largest commercial banks in Korea, four or five may also shut down. During the week of July 2, 1998, five of Korea's major banks announced they would be closing, and the remaining financial institutions would take over their assets. Financial restructuring of such major proportions will result in little interest in tending to a fledgling wood frame housing market for some time. It is possible that when financial order is restored pent-up demand for housing may emerge. Home sales may also result from by a series of economic stimulus plans that include tax breaks for multiple home owners, price ceiling bans on new apartments and home loans for apartment owners. While analysts initially projected it would take 2 to 4 years for the Korean economy to rebound, recently, several financial analysts have revised those projections. The Organization for Economic Cooperation and Development (OECD) raised its growth forecast for the Korean economy from a 0.5% to 4.5%, while other official and private researchers also agreed on a 4% range of growth for Korea in 1999 (Korea Times 1999). J.P. Morgan, a US-based investment firm, forecasts 4% growth for the Korean economy for 1999, and 4.5% growth for 2000 (Korean Trade and Investment 1999). While imports of wood products increased from 30% to 200% from year-end 1998 levels during the first quarter 1999 (depending upon product), exports of wood-based building products and prefabricated homes are still well below 1996 levels.

It appears that for the short-term expansion of wood frame housing in Korea is limited. However, as the Korean economy improves, the housing market could accelerate rapidly and those prepared to service the demand may benefit greatly. This is an excellent opportunity to lay the foundation for rapid growth of wood frame housing in Korea. It is important for the US wood products industry and individual companies to continue to advertise in Korea. The Korean population is heavily influenced by advertising, and companies who develop a market presence now may benefit from customer awareness and loyalty after the economy improves and spending increases. Journalists from major daily newspapers are also very influential in guiding consumer preferences. Therefore, newspapers can be very effective in terms of educating Korean consumers about products. Product literature, articles, and advertising should focus on the benefits that can be derived from using US products in general or a particular company's product. Advertising that highlights innovations, particularly innovations that benefit individuals' health, has been related to product success. Since individuals did not have a wide range of high-quality

affordable products prior to the market restructuring, special features and benefits derived from the product should be highlighted.

COMPETITORS

Concrete, steel, and to some degree masonry construction represent a major share of the housing market. Many of these companies aim marketing programs toward the single-family housing market. Last March, a large steel manufacturing firm announced its intention to enter the single-family and multi-family housing market with steel framing systems.

Consumer surveys conducted by housing related research organizations and home magazines reveal that most Korean consumers prefer wood frame homes to steel frame homes, yet the popularity of steel frame homes is increasing. Steel frame homes have been introduced to the Korean market more recently than 2x4 style wood frame homes. However, the Korean steel industry has launched an intensive promotional program, resulting in increased consumer awareness about steel frame homes. One of the leading companies promoting steel frame housing is the Pohang Steel Company (POSCO), a government funded corporation and the second largest domestic steel manufacturer. Statistics reported during a recent Korea Steel Manufacturers' Association (KSMA) seminar project that steel homes are expected to increase to 150,000 units annually by 2010, making up 20% of all new single family homes and 45% of multi-family homes (AF&PA Market Report March 1998). As previously stated, building codes are more likely to be changed when a Korean company or industry association requests the change. A Korean steel manufacturer will likely affect code changes much more quickly than foreign interests promoting wood frame construction.

In addition to the domestic challenges for the export housing business, competition from other countries importing to Korea is increasing. As mentioned earlier, houses from Canada have been the most significant competition, and Northern Europe is increasing its share of the market. South Korea has been a strong economy in the past and growth is expected to return after some adjustments. Coupled with the strong desire by Koreans to own their own homes, great opportunity exists for those willing to commit to the market.

CONCLUSIONS AND RECOMMENDATIONS

The consumer perception of wood frame homes is generally quite positive. Consumers believe wood homes are healthier and aesthetically pleasing. At the same time, wood homes are viewed as a luxury that most cannot afford.

Primary issues related to wood frame housing that were uncovered through interviews, meetings, and site visits are: 1) critical technical knowledge and technology transfer for wood frame housing construction are absent; 2) the building codes for wood frame housing are inadequate, and therefore, quality control is questionable, which may jeopardize the entire industry; 3) a lack of adequate fire test data limits expansion of wood frame multi-story construction; and 4) wood frame housing is cost prohibitive at this time for the average Korean consumer.

- AF&PA Korea actively promotes US wood-based building materials through trade shows, seminars, promotional literature, and trade missions, yet it appears that a general lack of knowledge among Korean builders remains regarding what products and services are available and which US suppliers exist. Korean housing companies use multiple suppliers from around the world. In addition to AF&PA promotional and educational activities, US materials suppliers need to work to educate Korean housing companies about their products and services. In addition, many homebuilders, architects, and homeowners lack understanding of the proper use, storage, and maintenance of wood products. It is important that product literature accompanying products exported to Korea be translated to Korean. The AF&PA Korea office in cooperation with the Western Wood Products Association and APA-The Engineered Wood Association has translated technical and promotional literature and distributes it at trade shows. The National Design Specification should also be translated into Korean and distributed after the new building code is approved.

- Develop and implement training courses in Korea. The AF&PA Korea office offers an annual carpenter training program for 40-50 students that includes classroom and hands-on training. A private organization also teaches a short course on wood frame housing design and construction. However, given the number of homes being built and the growth of the wood frame home sector, more teaching programs are needed. These programs should include architectural design, engineering design, framing techniques, and maintenance (after-service). Framing techniques and maintenance are the most critical at this time. Training curricula should be developed at the builder/designer level as well as for universities.

Technical transfer is another issue that must be addressed:

- Korean carpenters are either good at concrete work (very rough carpentry) or good at finish work (very fine carpentry), but less skilled with framing. Framing training, with training about proper handling and storage of materials is critical to the long-term success of wood frame construction in Korea. Interview respondents suggested that the Ministry of Labor and Industry might provide funds for this training. This must be verified. If not, other aggressive plans to provide such training are necessary. Another way to disseminate more information about proper construction techniques within Korea is to train architects, professors, and construction workers in the US. For example, an exchange program could be developed between Chungnam University in Korea and a technical college in the US to teach proper building techniques for wood frame construction.

- MOCT engineers and the Division Director made it clear that political pressure from non-Korean sources to change the building codes would not be effective. Based on this information it is recommended that no attempt be made to force the MOCT to accept anything until after the draft wood frame building code has been reviewed.

- A continuing priority should be placed on funding efforts to promote the adoption of the wood construction building code through Korean entities such as the Korea WFCA. A draft of the building code has been completed and submitted to the MOCT for review and a public hearing and a final report was submitted to the MOCT at the end of July for review.

- Fire tests of wall and floor assemblies using the Korean fire standard should be implemented. The Korean fire standard differs from the US standard, and is imperative to understand the performance of US systems under the Korean test procedure. These tests may be initially conducted in the US where researchers can design a system to meet the Korean code. However, final fire testing must be conducted at a Korean testing facility.

- There appears to be a need to regulate builders, or at least hold them accountable. Most owners and some architects do not have adequate knowledge of wood frame construction to know if something is wrong. An improved form of inspection is needed by those trained in wood frame construction.

- Continue with Korean trade missions to the US. There is a need to educate the Korean experts, particularly those proposing to write Korean building codes. It may be an opportune time to introduce large construction firms (e.g., Samsung, Daewoo) to wood frame housing as opposed to steel frame construction.

- There is a common belief that living in a wood home is superior to living in a concrete home in terms of comfort, aesthetics, and health benefits. Homeowners view wood homes as healthier and more aesthetically pleasing. In Korean culture, there is a definite marketing advantage to promoting products or practices that are considered healthy or good for one's health.

- The most significant barrier to the use of wood frame construction in Korea is cost. The high cost of materials and financing restricts home ownership opportunities. This is particularly true following the recent Asian financial crisis, which has caused the price of imported goods to double.

- Although a mortgage system exists, the interest rates are approximately 14-17% and the terms are for only a few years compared to US mortgages. Efforts to encourage banks to take longer-term loans could increase home ownership opportunities. However, even though savings rates are high, the typical income of a potential buyer cannot support high monthly payments.

- To cut costs the WFCA discussed the idea of creating a builder's cooperative within the WFCA to purchase building materials in large quantities. This idea is still in the early planning stages.

FUTURE RESEARCH

Housing Demographics Survey: Define the difference between what potential homeowners say they want and what they will pay for. Define the impact of the changing land use and construction investment options. The Korean government recently released some restrictions on land use and now allows foreign firms to build housing in Korea.

Product Distribution Study: Investigate how wood-based building materials are distributed through the non-wood construction sector. The distribution system for wood frame houses is relatively direct. However, little is known about the various routes that structural and non-structural wood products go through to get to their final use in concrete high rise apartments and low-rise multi-family structures. This type of information would benefit US manufacturers interested in distributing their products in a larger arena than the wood frame home market.

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APPENDIX A

EXCERPTS FROM CURRENT WOOD FRAME BUILDING CODE

From: A Study on Utilization Structure of Softwood Timber and Development of Wood Frame Housing in Korea (Han, Kim, Park 1990).

FIRE CODES

The portions liable to combustion such as outer walls and the eaves of the wood frame house over 1,000 m^2 in its total floor space shall be of incombustible material (Article 15, Building Act, MOCT).

The second story of the building with a floor space of over 400 m^2 and the third story of the building to be used as an apartment or a row house shall be of fire-proof material in the major structural parts thereof (Article 19, Enforcement Decree, Building Act, MOCT).

The partition wall between the households of an apartment or a row house shall be of the structure capable of insulating the sound of over 50db and the thickness thereof shall be over 12cm in the case of PC board (Article 7, Article 20, Enforcement Decree, The Regulations on the Housing Construction Standard, MOCT).

The building with an aggregate total aboveground floor space of over 200 m^2 (85 m^2 metropolitan area) in the municipal area with a population of over 200,000 shall be provided with reinforced steel concrete structure for each use (Article 17, Enforcement Decree, Building Act, MOCT).

STRUCTURAL CODES

The slenderness ratio of the pressure treated lumber at a load-bearing portion shall be below 150, while the cross section thereof shall be over 45 cm^2. The corner columns of the building of two stories or higher shall be of continuous column and shall have bearing force equivalent thereto and larger in the case of jointed columns (Article 17, Regulations on Building's Structural Standard, MOCT).

In case the lumber in use for the load bearing portion is in contact with a moisture-content body, the portion shall be applied with preservatives or otherwise treated for anti-decay (Article 20, Regulations on the Building's Structural Standard, MOCT).

Such portions as columns, braces and sills below 1 meter from the ground surface and liable to decay shall be applied with preservatives (Article 20, Regulations on the Building's Structural Standard).

HEIGHT RESTRICTIONS

Major structural portions of the building over 13 meters in total height or over 9 meters in height at its eaves or with a total floor space of over 3,000 m^2 are prohibited for wood frame structures (Article 11 of the Building Act, MOCT).

APPENDIX B
MAP OF SOUTH KOREA

APPENDIX C.
TRADE AND INVESTMENT CONTACTS

Agency	Division	Address	Telephone	Function
Ministry of Finance & Economy	International Investment Division	1, Jungang-dong, Kwachon, Kyonggi Province	82-2-503-9149	Investment policy, registration of foreign investment enterprises, & post investment supervision
Ministry of Finance & Economy	International financing Division	1, Jungang-dong, Kwachon, Kyonggi Province	82-2-503-9267/8	Established branch of foreign enterprise
Ministry of Construction & Transportation	Land Administration Division	1, Jungang-dong, Kwachon, Kyonggi Province	82-2-504-9123/4	Foreigner land ownership policies
Investing in Korea Service Center		#303, 3rd Fl, Trade Tower, KWTC Samsung-dong, Kangnam-gu, Seoul	82-2-551-7378/9	
Ministry of Justice	Sojourn Examination Division	1, Jungang-dong, Kwachon, Kyonggi Province	82-2-503-7102	Foreigner registration
National Tax Administration	International Tax Bureau	Nonhyun-dong, Kangna-gu, Seoul	82-2-397-1320	Tax information
National Statistical Office	Data Management Bureau	647-15, Youido-dong, Kangna-gu, Seoul	82-2-769-6702/5	Statistical information
Small & Medium Industry Promotion Corp.	International Cooperation Dept.	24-3, Youido-dong, Kangna-gu, Seoul	82-2-769-6702/5	Comprehensive support for foreign investment
Korea International Trade Association	Investment Inducement Dept.	159-1, Samsung-dong, Kangnam-gu, Seoul	82-2-551-5234	Trade assistance
Bank of Korea	Forex Authorization Dept.	110 Namdaemunro 3ga, Jung-gu, Seoul	82-2-759-5779	Central Bank
Korea Chamber of Commerce & Industry	International Affairs Dept.	45, Namdaemunro 4ga, Jung-gu, Seoul	82-2-316-3537	Foreign investment assistance services

APPENDIX D.
WEB SITES: KOREAN ECONOMY AND CONSTRUCTION SECTOR

Site Name	Address	Information
Site by Site Global and Domestic Investment: Korea	www.site-by-site.com/asia/korea/astock.htm#stats	Links to statistical bureaus, economic reports, and banks.
Korea's Pool of International Economists	http://kiep.kiep.go.kr/ENGLISH/ebro1.html	Links to financial institutions, reports and statistical information.
Korea Ministry of Finance and Economy	www.mofe.go.kr	Statistical and narrative information on the economy.
Construction and Economy Research Institute of Korea	www.cerik.org	Research papers on the construction sector in Korea.
Korea Overseas Culture and Information Service	www.kocis.go.kr	Cultural and Business information.
Korea's Economic Reform Update	www.kiep.go.kr/IMF/hot.html	Reports regarding policy changes following the IMF.
Governments on the WWW: Korea	http://inetsp1.jri.co.jp/research/asia/links/korea.html	Links to Korean Government and Education websites.
Ministry of Construction and Transportation	www.moct.go.kr/e-frame1.html	Official Ministry site including Housing Plans and programs.
Korean Embassy	korea.emb.washington.dc.us	Population and economy statistics, cultural information.
Korea Web Weekly	www.kimsoft.com/korea.htm	Recent articles about Korean news events and economy with links to other news sources.
Tradecompass: Korea	www.tradecompass.com/library/books/com_guide/Korea.toc.html	Statistics, and information on trade, investment, and political climate.