HARDWOOD USE IN CHINA'S WOOD FURNITURE INDUSTRY: A SMALL SAMPLE ASSESSMENT

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(ABSTRACT)

In this study, over two hundred furniture manufacturers throughout China were surveyed regarding their raw wood material use in 1996 and their estimated use in 1999. Personal interviews were conducted after a mail survey to get interviewees' perceptions of the Chinese furniture market and raw wood material use. Forty-one overall responses were obtained which included 26 from personal interviews. The results from this study indicate general trends in the industry, and provide some important insights into China's furniture industry.

In 1996, total wood materials used by responding firms were approximately 140,000 cubic meters. On average, hardwood dimension accounted for 25% of the total volume of the wood materials used by wood furniture makers. This was followed by particleboard (24%), hardwood lumber (22%), and medium density fiberboard (MDF) (17%).

Domestic species grown in temperate regions were found to be the dominant types used in all responding firms. Chinese oak, ash, and birch were the major species used in 1996. U. S. red oak was the most popular temperate hardwood species imported. Interviewees reported that they prefer temperate over tropical hardwood species because they're predominantly light colored.

Sampled furniture manufacturers purchased hardwood lumber/dimension either from domestic sawmills or from wholesalers. On average, imported wood materials

accounted for less than 7% of the total by volume. Most companies thought that price and quality of materials were most important factors affecting their importing decision. Delivery terms and species availability were important to a lesser degree.

Approximately one-half the responding firms reported that their wood material demand would increase 5 to 10% annually through 1999. The other half estimated that their wood material needs would remain at or near the 1996 level. In the near future, high quality hardwood lumber, dimension, and wood veneer will need to be imported to supply upper-end solid furniture manufacturing. However, panel products, such as MDF and particleboard will retain their dominant positions in furniture making to meet the needs of consumers with low to middle incomes.

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INTRODUCTION

While much attention has recently been focused on forest products markets in the People's Republic of China, available research has been limited to a relatively few documents and papers published in English outside of China. Since the late 1980s, however, China has increasingly played a major role in world forestry, both as a producer and consumer market. The booming construction industry, along with the double-digit annual growth of the Chinese economy, has led to an ever-increasing demand for high quality, value-added wood products. Demand for furniture, flooring, wall panels, and moldings are all expected to rise. With the growing number of middle and upper class homeowners, and the upgrade of millions of homes, the market for high quality furniture has increased dramatically.

In order to keep pace with the rising demand for wood products, China has instituted reforms in forestry policy and a major afforestation drive, to expand the forest resource base and timber supply. China has also embarked on major policies to discourage wood use in many applications and thus reduce demand. However, despite these efforts, a gap between domestic supply and demand exists and is likely to continue to grow.

To make up for its growing deficit in wood supplies, China is spending great amounts of foreign currency to import wood products. For instance, from 1990 to 1994, imports of lumber have increased by 3.8 times in total volume. This significant increase is indicative of the growing demand of China's forest products industries, such as the furniture industry. Based on current forest resources data and predicted market growth, this situation will not change in the near future.

As a major user of wood products, China's furniture industry consumes large quantities of hardwood lumber, plywood, particleboard, hardboard, medium density fiberboard, and a number of other wood products. Furthermore, the furniture industry uses both domestic and imported wood materials. Southeast Asian countries, such as Indonesia and Malaysia, have traditionally supplied China's with hardwood plywood and

tropical hardwood lumber products. U.S. hardwood exporters have only recently focused on China. However, U. S. suppliers often lack information concerning markets in China. Key questions that need to be answered include:

- How do Chinese furniture manufacturers perceive U. S. wood products versus wood products from Southeast Asian sources?
- To what extent can U. S. hardwood exporters expand their market share in China?
- What species of wood do Chinese furniture manufacturers desire, and why?

A better understanding of China's wood material use in its furniture industry is necessary before U. S. suppliers can expand exports and effectively serve this growing market. This study was designed to explore current and future wood use trends by a sample of furniture manufacturers in China. Information from this study provides valuable insights into this market and provides the basis for future research in China.

OBJECTIVES

While much attention has recently been paid to China's forest products market as a whole, very little information has been available concerning wood products consumed by Chinese furniture industry. The primary goal of this study was to gain insights into hardwood use in China's furniture industry. Specific objectives included:

1. examine current hardwood use and opportunities for material substitution in China's wood furniture manufacturers,
2. provide breakdowns of hardwood products use by firm location, firm size, and manufacturer type,
3. determine the sources of hardwood products purchased by wood furniture manufacturers, and
4. identify future trends of hardwood use in China's furniture industry.

CHAPTER ONE: LITERATURE REVIEW

It is believed that China's industrial wood use is driven by both economic development and the availability of timber resources. The rapid expansion of China's furniture industry, along with the growth of the Chinese economy, requires plenty of wood products. However, as for a large population with relatively limited forest resources in China, the amount and types of wood products used in furniture industry are primarily dependent upon available resources. Because of this, in addition to the furniture industry, domestic timber resources and wood products supply are reviewed here to assess to what extent China's forest resources can meet the need of its furniture industry. As hardwood products are preferred by Chinese furniture industry, their supplies got increased attention.

1.1 China's Timber Supply

1.1.1 Timber Resources

Data on China's forest resources was first published in 1943 (Zhang 1998). According to this publication, China's forest cover ranged from 5% to 8.9% (8.9% was the figure most often used). These figures are erroneous, resulting from incorrect estimates and varying definitions (such as definition of forest, forested land, etc.) (Zhang 1998). The data based upon the four national forest resources inventories: 1973-1976, 1977-1981, 1984-1989, and 1989-1993 is considered to be more reliable (see Table 1). As shown in Table 1, there have been changes on forest resources over years. A trend is evident that China's forest coverage has been increasing for the past two decades. This is result of the extensive afforestation efforts.

China's afforestation has been increasing at an accelerated rate. During the 1980s, the most significant changes have occurred in the South due to massive plantation campaigns and the financial and technical involvement of the World Bank. According to the most recent forest inventory, covering the period of 1989-1993, the total forested land

was 133.7 million hectares, equaling 13.9 percent of land area (MOF 1994). This forested area included an estimated forest growing stock volume of 10.1 billion cubic meters. Although large in absolute volume, the forests in China are very limited given the size of the country and the huge population of over 1.2 billion. Per capita forest coverage is estimated at only 0.11, or about one-sixth of the worldwide average (Waggener et al. 1996).

Forests are classified into six types according to their purposes and functions. They are the productive timber forest, the economic forest, the fuelwood forest, the protective forest, the bamboo forest, and the special purpose forest. Productive timber forest or commercial forest accounts for more than 66 percent of forested land (Table 2).

China's forest resources are geographically diversified. The forests are primarily concentrated in three regions: the Northeast, the Southwest, and the Southern ten-province region. These three regions account for over 80% of the total forested area. About 82% of the timber stand area is in these regions, including 74 million hectare of the total 84.9 million hectare of productive timber forest area (87%). While natural forests are mainly located in the Northeast and the Southwest, much of the forest in the South consists of plantation forests scattered in smaller blocks throughout the ten provinces.

China has aggressively pursued a program of forest plantations, particularly for the last ten years. China has established an estimated 34 million hectares of plantations as of the completion of the last forest inventory in 1993 (MOF 1994). Twenty-one million hectares of plantations are for timber production, while 11.8 million hectares are economic plantations with about 1 million hectares of bamboo plantation area (MOF 1994). According to the Ministry of Forestry (MOF 1994), the Southern region accounts for over one-half of the timber plantations and almost 53% of the plantation timber growing stock volume.

The Northeast, which includes the provinces of Heilongjiang, Jilin, Liaoning, and Inner Mongolia, is known for its Korean pine, Chinese ash, larch, cedar, red pine, elm, walnut, chestnut, and Mongolian oak. Most of broadleaf (hardwood) species growing in

this region, such as Chinese ash, walnut, chestnut, and Mongolia oak, are desirable for furniture manufacturing.

Both the Southwest and the South regions of China produce small amounts of tropical hardwood and a variety of softwood and temperate hardwood. From these regions, species such as Chinese beech, birch, paulownia, alder, maple, rosewood, and mahogany are used for furniture. The Southwest, including the provinces of Sichuan, Yunnan, Guizhou, and Tibet, has the most diverse mixture of species. For example, there are more than 60 timber species in Sichuan province, and 40 timber species in Yunnan. These species range from the tropical hardwood species found near the borders of Burma and Thailand, to alpine varieties of cedar, fir and pine in the Western highlands of Sichuan province. The Southwest, however, plays a small role in China's timber industry as its transportation infrastructure is highly underdeveloped. The Southern ten provinces (Anhui, Guangdong, Guangxi, Fujian, Jiangsu, Jiangxi, Hainan, Hubei, Hunan, and Zhejiang provinces) are developing plantations of fast-growing species. These species include eucalyptus and Masson pine for the pulp and the wood based panel industry, and Chinese fir for the construction industry.

It should be pointed out that distribution of both hardwood and softwood timber age classes is far from uniform. While the timber is skewed heavily towards young and mid-aged stands, much of the volume is concentrated in near mature, mature, and over mature stands. According to the recent forest inventory (MOF 1994), the volume of mature and over mature forests that can be easily harvested has been dropped to less than 2 billion cubic meters, and could dissipate within a decade if the current cutting rate is maintained. By the turn of the century, there would exist no close to mature (ready to harvest) forests containing such primary species as larch, Korean pine, Masson pine, Yunnan pine, basswood, ash, and walnut. Instead, poplars, aspen, birch and Chinese fir would then become the dominant species (Yin 1995). This means there will be a shift in wood species use in the near future.

According to China's National Forest Resources Inventory 1989-1993, hardwood forests cover is 53.6 million hectares, with stocks of 3.98 billion cubic meters (MOF

1993). About 34% of the mature standing timber in China are hardwoods, which is also widely dispersed. In the Northeast forest regions, temperate hardwood accounts for 64.2% and 58%, in terms of land area and timber stock, respectively. Most of them are natural forests. On the other hand, in both the Southwest and the Southern provinces, tropical hardwood is a major resource with 50.9% of the total land area and 44.5% of the total timber stock (MOF 1994).

China's hardwood forests contain a variety of commercially important species. In terms of land area, standing stocks and mature timber stocks, oak and birch are the most dominant group of species present (MOF 1994). Oaks comprise about 27.7% of the volume of mature hardwood timber, and birch comprises 25% of the volume (See Table 3 and Figure 1). Poplar is the third dominant species present which accounts for 8.5% of the mature hardwood timber volume. These species are used heavily by Chinese

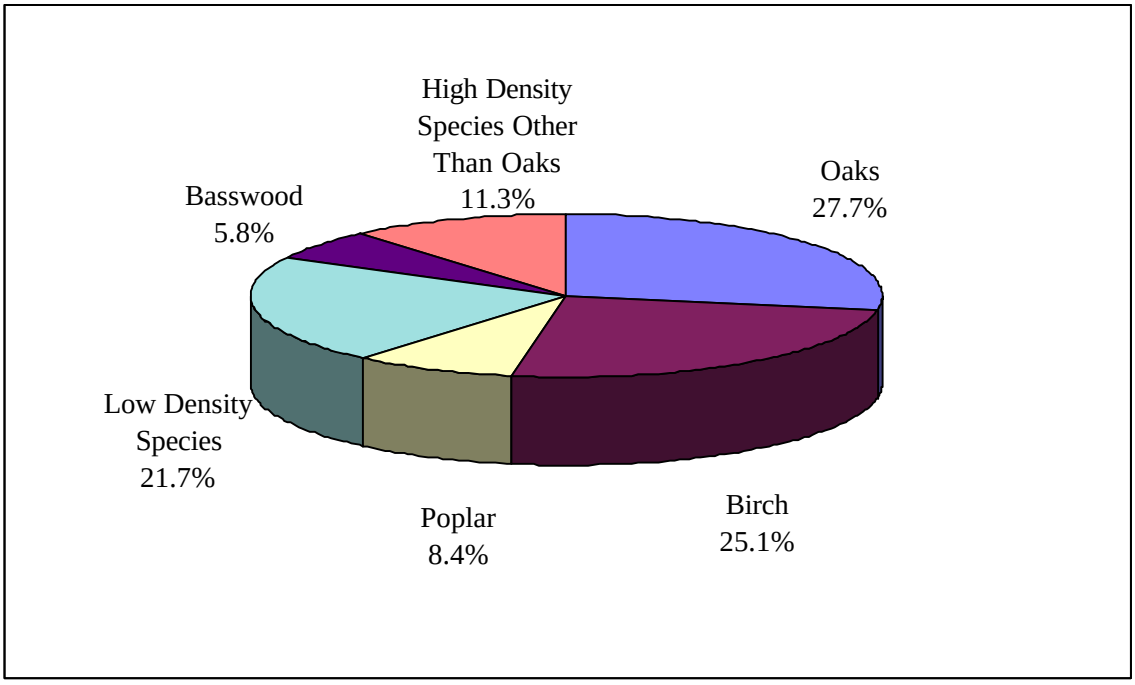

Figure 1. Mature Hardwood Timber Species in China (% by stock volume)

Source: MOF, 1994. China National Forest Resources Inventory (1989-1993).

furniture manufacturers. The remaining mature hardwood timber volume is comprised of a variety of medium-to-high density species which are good for furniture. These species include ash, maple, walnut, beech, rosewood, mahogany, and elm. This group of species collectively accounts for 11% of the volume. The remaining 21.7% is made up of a wide variety of low-density commercial and non-commercial species, such as camphorwood, sassafras, paulowina, and eucalyptus. Among this group, paulowina is used by furniture industry and may be suitable for less expensive furniture manufacturing.

As mentioned earlier, in the next 3-5 years, there will be few, if any, mature forests containing species desirable for furniture manufacturing. This indicates that furniture manufacturers will have to either adjust accordingly their wood raw materials in terms of species, or turn to importing similar species from other countries. Instead ash and walnut which are primary species traditionally used for furniture, domestic poplar and birch are ready to be accepted by Chinese furniture industry. Another alternative might be importing the species similar to Chinese ash and walnut from other countries, or using panels products as a substitution.

In summary, China has a large forest resource base which includes natural forests located in the Northeast and the Southwest, and plantation forests in the South. This is the major wood raw material source of China's furniture industry. However, forest resources in China are limited especially considering the size of the country and its needs. This constrains the wood usage in furniture manufacturing. Hardwood resources which the Chinese furniture industry mostly depend on, follow the dynamics of forest resources as a whole. They are geographically diversified and some are not yet accessible. Hardwood forests are dominated by a group of commercially important species, such as Chinese oak and birch. The changes in species available will have significant impacts on the wood used in furniture industry.

1.1.2 Timber Production

Several factors contribute to the difficulty of getting reliable data on timber production. First, the structure of the forest sector combines the centrally organized State

Plan allocations, the role of the Ministry of Forestry and its linkages to the major Timber Bureaus, and the growing importance of State Forest Farms and Collective Farms. Secondly, the relatively undocumented harvest of timber in rural areas outside the State Plan. Finally, there are reported relatively large volumes of illegal or unauthorized harvest. This combination of factors makes detailed information reporting timber production difficult. Nevertheless, it is evident that timber harvest and production have slightly increased over years.

Data on industrial roundwood or commercial timber production is provided by the Ministry of Forestry. During the last ten years, commercial timber production ranged from 55 to 70 million cubic meters (MOF 1995a, 1995b, 1996a, 1996b, 1997b) (see Table 4). The figures indicate that Southern China has replaced Northern China as the dominant source for timber supply since 1992. This change reflects the massive campaigns for the plantation of fast-growing species in the Southern China.

According to China's forest laws, annual forest resources consumption should not exceed the growth of the national forests. There is a quota for allowable cut every year. According to the Ministry of Forestry, the annual forest resource allowable cut is 266 million cubic meters. Among them, 135 million cubic meters standing stocks will be used as resources for commercial purposes to produce about 80 million cubic meters of timber (MOF 1995a).

Unpublished data from FAO cited by Waggener et al. (1996) shows that nearly 40% of total industrial roundwood production is hardwood. This suggests that the ratio of hardwood and softwood timber production is similar to the ratio of their respective resource stocks.

The Ministry of Forestry has recently enforced a plan to ensure the sustainable development of state-owned natural forests. As a result, by the year 2010, annual allowable cuts will drop 22.86 million cubic meters. Timber production in all state-owned forest enterprises will drop 38.8% from the 1996 level. This gives those state-owned firms an annual timber production of 18.25 million cubic meters in 2000, and 15.20 million cubic meters in 2010 (MOF 1997b). This plan will have significant

impacts on the wood products market and will eventually influence the patterns of China's wood product supply and demand. For example, as some of most popular species used in furniture manufacturing, such as oak, walnut, and ash, are from those state-owned natural forests, the magnitude and species of wood materials used in China's furniture industry will be directly affected by this plan.

1.1.3 Forest-related Policies

China provides a unique example of forestry reforms for other developing countries and countries in economic transition. Being aware of the past trends contributing to the decline in forest resources, the Chinese government has set a target of increasing forest coverage to 15% (approximate 160 million hectares) by the end of this century, and increasing to 20% forest coverage (192 million hectare) within 25 years.

The Ministry of Forestry in China has established a comprehensive forest policy and planning process outlined in the *Forestry Action Plan for China's Agenda 21* (MOF 1995c). This plan identified key issues for forestry development in China, set goals to resolve the issues, and detailed an action plan necessary to achieve these goals.

In order to maximally meet the increasing demand for forest products, China is pursuing a program of establishing fast growing plantations to expand its timber base. Meanwhile, China has also sought to more efficiently use the available timber resource by increasing the level of comprehensive utilization. This has been in the form of both reducing waste in logging and processing as well as the greater use of by-products and residues for wood based panel products. In order to save the remaining forest resources, the government encourages wood consumers to use alternative materials, such as cement, metal, and plastic instead of wood.

Changes in forest land ownership are the emphasis of China's current forest reform. Table 6 summaries these changes since 1949. To encourage more direct responsibility for the forest at the lower levels of administration, collective forest farms and individual contract tenure arrangements have been used. Table 6 also shows the transition of timber market which was strongly influenced by the economic reforms as

well as political reform. The stumpage and timber market system has been changed from a free market (before 1960s) to a centrally controlled market (1958-1981) and eventual movement towards free market (1990s).

To a great extent, the future outlook of China's forestry will depend upon the economic development and macro-economic policies. In the Northeast state owned forest region, the transition has been very painful as the heavy population depends on the natural forest resources. The strict allowable cut quota fixed by the government and the newly enforced protection plan, along with the reduced investment from the government make the regional economy worse now than in previous decades. It is reported that more than 40% of the forest enterprises in this region are currently losing money (Waggener et al. 1996). The unemployment has become a serious problem in the region.

According to Professor Jiang of Chinese Academy of Forestry (Anonymous 1998), China will need to undertake profound forestry reform to incorporate the large scaled forest cultivation and protection planned and to develop forest productivity as its core. Because of China's size and in order to satisfy the growing domestic demand for wood products and the need to improve the ecological environment, China will actively develop its forest resources in accordance with the principles of sustainable development. The flood in the Southern and Northeast China that occurred during the summer of 1998 has caused Chinese government to further control timber harvest. External forest resources, such as the Eucalyptus plantation base in New Zealand, are sought and will continue to be developed to ease the pressure of the domestic wood supply.

1.2 Wood Products

1.2.1 Lumber Production

The primary use of industrial roundwood in China is for the production of sawnwood (lumber) (Waggener et al. 1996). As with information regarding the timber production in China, it is difficult to determine consistent estimates of lumber production.

The estimated lumber production reported by the Ministry of Forestry is shown in Figure 2 for the period 1985-1996.

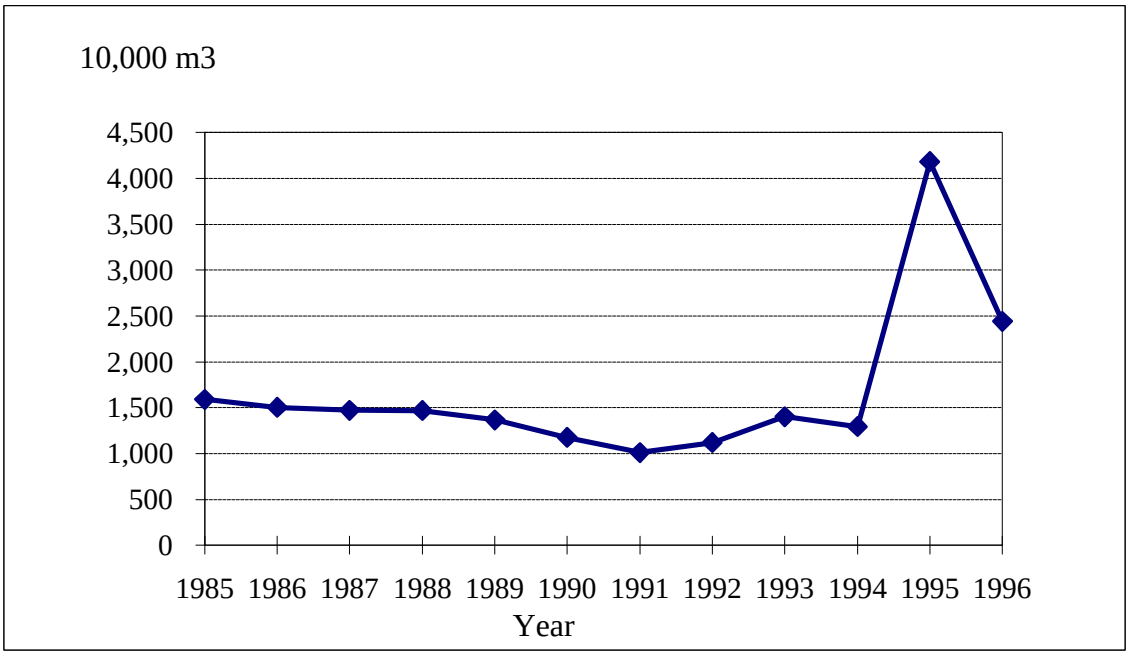

Figure 2. China's Sawnwood Production: 1985-1996

Source: MOF. China's National Forestry Statistical Materials (1985-1996).

In the mid-1980s, lumber production reached the highest level in history. The most important reason for the increasing production was the large price gap between logs and sawnwood, which were both fixed by the government. As lumber prices were much higher than logs', sawmills got large profit margins on lumber manufacturing. After 1985, the gap between log and sawnwood prices was narrowed. In addition, the government used annual removal quota for timber harvesting and increased the log price. So, the output of lumber was dramatically decreased.

As is evident in Figure 2, there was a dramatic jump in lumber output in 1995. This was mainly caused by inconsistent statistical methodologies and approaches. Before 1995, China's statistics on production of lumber and other forest products included only the enterprises at and above the township level. However, the Third National Census of

Industrial Enterprises, conducted in 1995, expanded the statistics to include village-run and private firms with annual sales exceeding one million Yuan. Therefore, there is a great difference between the 1995 statistics and the statistics before 1995 for the production of forest products. It is believed by Chinese researchers that the 1995 data best reflects China's actual output, and is best used for comparison and projection of future production.

In 1996, there were more than 2,200 Chinese sawmills, about the same number as in 1985, with a total capacity of 27 million cubic meters (MOF 1996b). About 50% of sawmills are located in the Northeast, 20% in the South, 20% in the North and Shanghai area, and the remaining 10% in the West. The most important sawmill operations are in the cities of Harbin, Jiamusi, Mudanjiang, Shanghai, Beijing, Chengdu, and Guangzhou. It is estimated that about 70% of the equipment used in sawmills was made in the 1950s. Most firms are operating at no profit, and great numbers of sawmills were closed or decreased production in the early 1990s (Dai 1997). This situation has recently improved as the economic reforms go deeper in these regions.

Hardwood lumber supply is more important to China's furniture industry. As indicated for the harvest and production of timber in China, information concerning hardwood lumber production was incomplete or conflicting. No detailed data on hardwood lumber production was available from Chinese sources. Nevertheless, data from FAS showed that hardwood lumber production was about 3 million cubic meters in 1994 (FAS 1996), which is roughly 30% of total lumber production. This suggests that hardwood lumber production is in proportion to its resources. FAO sources cited by Waggener et al. (1996) showed that the production of hardwood lumber was estimated at 7.7 million cubic meters in 1992, 40.8% of total. The FAO figure is much larger than that of FAS, which is due in part to the fact that China's data in FAO statistics is the sum of data from both the People's Republic China and Taiwan.

1.2.2 Wood-based Panels

The supply of wood based panels is examined here, because of the wide use of panels in China's furniture industry. In accordance with China's market conditions, the wood based panels mentioned here include plywood, particleboard, hardboard, and medium density fiberboard (MDF).

During the late 1980s and 1990s, raw material industries, including the forestry industry, were given priority by the government. Between 1986 and 1990, the government's total investment equaled to $3 billion in forest industry. Half of this investment was in wood based panel industries. Foreign capital, advanced technology, and modern equipment have also contributed to the increased production capacity and new products, such as MDF, OSB, and other specific use panels. There were about $30 million foreign investment in China's wood based panel industry between 1978 and 1993, accounting for 40% of total foreign investment in the forestry sector (Li 1996). These investments were in the forms of providing technologies, equipment, or forming joint ventures such as MDF plants. As the technology and materials for surfacing improved, the end-use of wood based panels has increased dramatically in the 1990s.

The production of all panel types has increased exponentially since 1985, with no indication of slowing (see Table 6). In 1996, total panel production was more than 12 million cubic meters. Most of this production came from small sized mills that manufacture less than 30,000 cubic meters annually.

The modern plywood industry in China began in the early 1950s. Production remained static through the late 1970s, when capacity began to increase significantly. In 1996, China's plywood production was in excess of 4.9 million cubic meters. At the provincial level, Shandong was the major plywood producer, making 1.6 million cubic meters of plywood in 1995. This accounted for 21% of the total plywood output.

Particleboard production began in China during the early to mid 1960s. The production experienced a stable period of 15 years, then began to increase rapidly. By 1997, there were 17 particleboard plants with an annual capacity of more than 50,000 cubic meters, and most of their equipment was imported from Germany (Lu et al. 1997).

The production capacity of domestically made equipment was less than 30,000 cubic meters. At the provincial level, Shandong was again China's major province for particleboard production, with an output of 1.2 million cubic meters, or 27% of the national output.

The first MDF mill was built in the early 1980s. MDF production increased considerably from 1990 to 1992. Nevertheless, MDF is the smallest sector of Chinese panel industry, and most MDF production mills have not yet reached their capacities. Statistics showed that there were 40 MDF mills in 1995, of which there were only 14 mills with a capacity of above 30,000 cubic meters. Most of the equipment in these mills was imported. At the provincial level, Guangdong was the major province that provided 1.4 million cubic meters MDF in 1995, accounting for 27% of the total production (Lu et al. 1997).

As a traditional wood based panel product, hardboard witnessed rapid growth in the 1960s and the early 1970s. However, the rapid development of particleboard since the late 1970s, particularly from the 1980s, has slowed down hardboard development.

OSB production in China is new and quite small. Currently, China has five OSB plants either operating or in startup stages (Wolcott et al. 1997). It is not clear how large this newly emerged sector will become, or what its influence will be.

The Chinese Academy of Forestry conducted a comprehensive analysis on panel production and consumption (Lu 1997). It concluded that the supply/demand ratio of various panel products in China by the year 2010 would be as follows:

plywood:particleboard:MDF:hardboard = 8:4:2:1

For example, the production of plywood will be eight times as much as of hardboard. Domestic demand for particleboard will be two times as much as for MDF.

In summary, highly developed wood-based panel industry has provided alternative raw materials for China's furniture industry. There are many types of panel products that could substitute for hardwood lumber used in furniture manufacturing.

1.3 Supply From Imports

1.3.1 General

Rapid economic growth along with a huge population of 1.2 billion put a lot of pressure on China's forests. Consequently, China has become a net importer of wood products, a trend that is not expected to change in the near future. For instance, Table 7 shows China's sawnwood production, trade and consumption for the last ten years. As mentioned earlier, sawnwood production was quite flat over years, while imports have been increased rapidly during the last 5 years, driven by the increasing demand.

Since the 1980s, China has become an important wood products importer (see Table 8). The structure has greatly changed as the international wood products market and domestic demand have changed. For instance, log imports have dropped while imports of veneer and panels have been increasing.

Imports expanded steadily through 1988, when China imposed strict economic controls to cool the economy and slow inflation. Softwood logs have traditionally been the leading import item, reaching a peak of 9.5 million cubic meters in 1988, thereafter declining to 0.6 million cubic meters in 1996 as Chinese government cool its economy tighten the controls over wood used in construction industry. Imports of hardwood logs have been steadily increasing from 1.2 million cubic meters in 1988 to 2.5 million cubic meters in 1996. This increase has met the needs of the plywood plants, furniture mills, moulding, and other interior applications.

Sawnwood imports have been much smaller during the 1980s. As indicated in Table 8, imports of sawnwood increased significantly after 1991, reaching a volume of 933 thousand cubic meters in 1996. This increase indicates a trend that China's wood product imports are changing from importing only raw materials (logs) to importing more processed products. Imports of other wood products have been quite limited except for plywood. Plywood imports reached a peak of 2.5 million cubic meters, and have been declining continuously through 1996. The decline was due to the fact that domestic

plywood capacity has been increased during the same period of time. Veneer, particleboard, and fiberboard imports, however, all increased significantly, showing the expanding demand by China's forest products industry. While more than half of the total imports of logs, lumber and veneer are hardwood, nearly half of the total plywood imports are softwood plywood for construction purpose, mainly concrete forming (Wolcott et al. 1997). China's MDF imports were relatively small, but the United States ranked second behind New Zealand as a supplier of MDF in 1993 (Wolcott et al. 1997).

1.3.2 Hardwood Product Imports

China imports both temperate and tropical hardwood products. A majority of the imported hardwood products were used for furniture and other interior applications. Import volumes for major hardwood products during 1993-1995 are shown in Table 9.

Temperate hardwoods accounted for the majority of the total hardwood log imports (about 80%). The major suppliers of temperate hardwood logs were New Zealand, Russia, and the United States. Most hardwood lumber was temperate and came from similar sources. Indonesian and Malaysian wood panel products imported by China greatly exceeded imports from any other country. Most of these were hardwood plywood. Indonesia was also a major supplier of particleboard, followed closely by Russia. However, severe economic crises in these Southeast Asian countries caused a shift in origin of China's imports of hardwood plywood and particleboard. Imports of hardwood veneer were relatively small, 25,600 cubic meters in 1995. Nevertheless, it is believed that imports will expand as Chinese furniture manufacturers prefer to have hardwood veneer on some surface applications to serve as an alternative to high priced hardwood lumber.

1.3.3 Hardwood Products Imported From USA

In general, the United States was not a significant source of China's wood products imports (see Table 10). In the 1990s, the value of imported U. S. wood products represented only 3-5% of total China's wood product imports annually. Nevertheless, the

total value of hardwood products imported from the United States represented 5-7% of China's hardwood product imports, according to China's Customs Bureau.

China has imported a wide variety of U. S. hardwood species to meet Chinese species preferences. U. S. oak, particularly red oak, dominated the hardwood lumber imported from the United States, followed by maple and ash. The percentage of oak lumber imports has been decreasing over years, while the share of imported U. S. maple and ash has been increasing rapidly (see Table 11 and 12). This change might be explained by the Chinese species preferences.

As for hardwood products which are preferable in furniture and interior applications, Chinese species preferences are quite diverse. For interiors, the Chinese prefer light-colored woods, such as ash and maple, for their homes in order to create a larger sense of space. Oak and birch are used for flooring, though birch panel products are aimed to satisfy lower-end market demand. For furniture, on the other hand, domestic furniture manufacturers prefer to use dark or auburn stains to cover defects for low-quality furniture and to apply rich violet and auburn stains on traditional furniture using imported tropical hardwoods (FAS 1995). Although most U. S. hardwoods are comparable to Chinese hardwoods, Chinese oak logs are more competitive in the market. It was believed by Chinese furniture manufacturers that Chinese oaks have finer grain than U. S. oaks, which makes it more desirable to consumers.

1.4 China's Wood Products Market Conditions

1.4.1 Current Market Situation

For almost 20 years, China's economy has enjoyed an average growth rate approaching double digits. At this rate, China is expected to become the world's largest economy by 2010 (Wolcott et al. 1997). With increased economic activity comes a need for new housing and additional commercial buildings. For the last twenty years, the Chinese government has built an estimated 10 billion square meters of new living space (FAS 1995a).

While most Southeast Asian countries have recently suffered economic downturn, the Chinese economy continues to grow. The booming construction industry, along with the development of the Chinese economy, has lead to an ever-increasing demand for high quality wood products. Demand for furniture, flooring, wall panels, and moldings are all expected to rise. With 11 million newly married couples each year, the upgrade of millions of homes, and a 30 percent annual increase in the residential housing industry since 1990, the wood products market for furniture and interior decoration increased dramatically (Zhang et al. 1998). As a result, in 1996, timber prices rose by 1.4 percent, with prices for hardwood species remaining high, showing no sign of declining (FAS 1997). Log prices increased by 6.8 percent (FAS 1997), driven by the growing demand of upholsterers and furniture makers. Sawntimber and plywood prices dropped by 0.3 percent and 7.5 percent, respectively. In 1996, the Northeast forest region shipped 18.1 million cubic meters of logs for interior applications and rural infrastructure in other parts of the country. Official estimates of total consumption of wood in 1996 and 1997 were 58.96 million cubic meters and 61 million cubic meters respectively (FAS 1997).

The wood products market in China is becoming more open to the rest of world. As an effort to join the World Trade Organization (WTO), China implemented a tariff reduction in 1996 and 1997, which included most wood products. Tariffs on wood products were cut by 12-57% in 1996 (CCB 1997). The only items which maintained the previous tariffs were plywood and laminated wood products.

1.4.2 Wood Products Marketing System

Before the economic reforms of the 1980s, China managed its wood products marketing system via highly centralized planning, with each provincial government covering every aspect, including logging, transportation, distribution, and sales. Timber prices were controlled by the government.

Since China initiated its economic reforms in the early 1980's, its wood industry has gradually become more independent from the government. This is particularly obvious at the retail level. For example, by the early 1990's, Shanghai was supporting no

less than 7,000 timber dealers. The forestry and wood products sector continued to be affected by the evolution of the government's economic reforms and the transition to more market-oriented economic activities. Timber distribution under the central and provincial controls has declined, with greater reliance on market-based wholesale distribution networks.

China employs a unique wood supply system (Hammett and Sun 1997). As shown in Figure 3, wood producers use various channels to sell their products, and Table 13 describes the scope of business conducted by these timber producers. A three-tiered system is used to describe their marketing transition: first, a state forest land system is managed at the provincial level, with a mixture of market pricing and quotas; secondly, the collective system has management and pricing at the local level; and lastly a newly emerged market-based system at the wholesale level with market-determined pricing (Waggener et al. 1996).

Wood processing firms receive raw materials (timber) directly from either state-owned forest firms, wood trading centers, or timber companies, and market their products to end-users. For this reason, they are considered part of a distribution channel which connects wood producers and end-users in Figure 3.

Wood trading centers are newly established wholesalers. These new players have emerged as a result of market-oriented economic reform. Until the end of 1994, there were one nationwide, nine provincial or regional trading centers. By the year 2000, more trading centers will emerge, including one national, six regional, and five provincial centers (Jiang et al. 1994). Currently, these centers trade very limited amounts of wood because they lack adequate management. However, there is much potential for further development, and their impact on the markets could be great.

An important wholesale market, the Beijing National Timber Trading Market (BNTTM) was funded by the Ministry of Forestry and the Beijing municipality in 1993. It is a national timber transaction agency with sectional management functions. The main forms of trading include competitive bidding, contracting, and auction. The BNTTM is also responsible for organizing timber trade fairs and business negotiations at fixed

periods of time. Following the principles of openness, fairness, and standardization, BNTTM organizes both spot trading and forward trading for timber and other forest products. The products traded include timber, bamboo, bamboo products, wood based panels, forest chemical products, forest machinery, and other products.

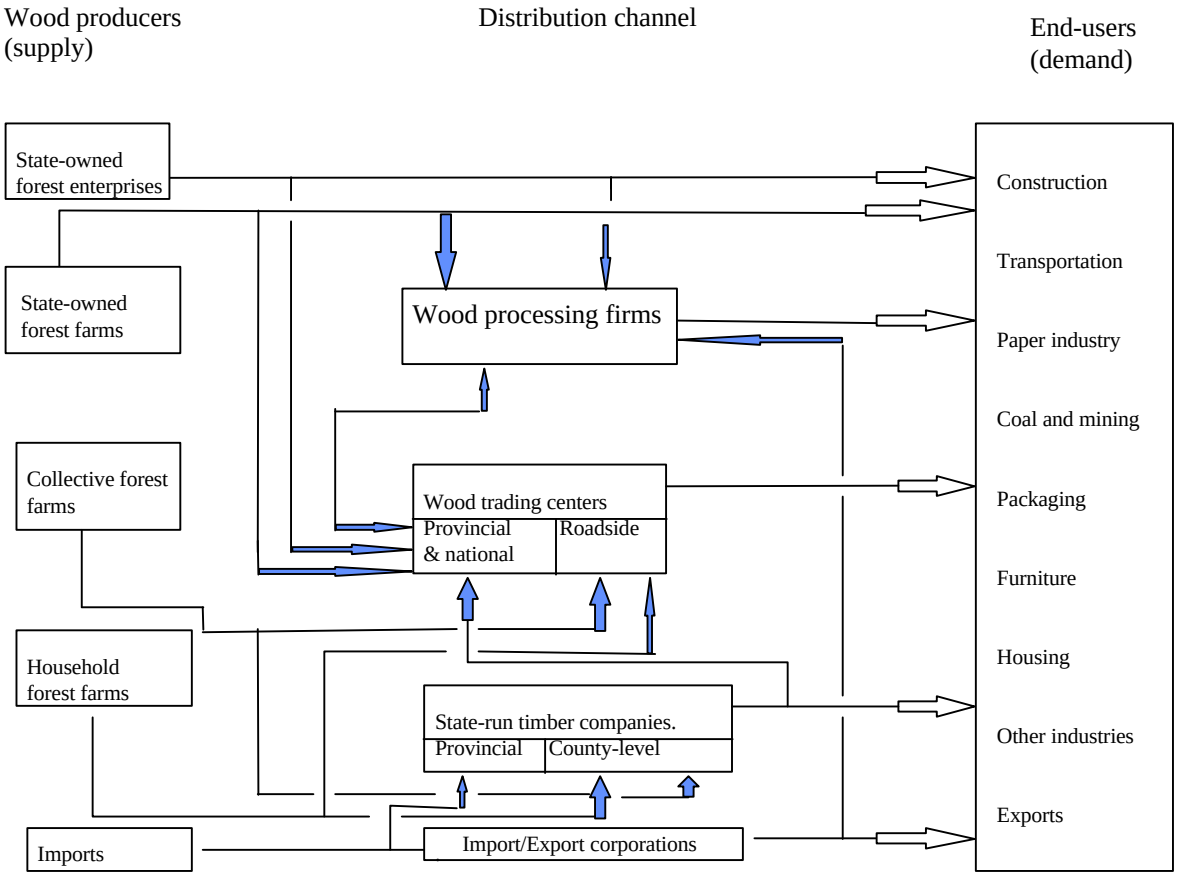

Figure 3. China's Wood Products Marketing System

Source: Hammett and Sun 1997.

State-run timber companies exist mainly in the ten Southern provinces and focus on selling wood products procured within and outside their own areas. These companies, on behalf of the Ministry of Forestry, monopolize wood procurement purchasing wood products at lower than market prices.

End users in the wood products market system are individual industries who manufacture products, such as furniture. Although each individual industry has its own growth driven by the respective market, they all face wood material constraints to some extent. Nevertheless, as the new wood products distribution system has been implemented, end users, such as furniture manufacturers, have greater flexibility to purchase their wood raw materials. Further, timber is being increasingly allocated to national markets in response to market prices rather than local enterprise demand or production capacity. The furniture industry as well as other end-users may pay lower prices for their wood material purchases in the future.

1.5 Wood Furniture Industry in China

1.5.1 Current Status

China's furniture industry has been developing rapidly since the economic reforms initiated in the early 1980's. There are more than 30,000 furniture manufacturers, with 70 billion Yuan[1] sales (about $8.7 billion) in 1996 (Anonymous 1997a). The annual furniture output for both the furniture industry and the wood furniture segment has increased significantly for the last five years (see Table 14).

As China's furniture industry has become more market-oriented, its types of ownership have also diversified. Furniture companies are either state owned, or owned collectively by township, joint venture, or a private party. This makes the furniture market more competitive, and increases the capacity for various types of furniture products. According to the Ministry of Light Industry, among the 30,000 furniture firms, about 15,598 firms are either owned by a township or a party at higher level (CSC 1997).

[1] 1 Yuan = 8.5 US$

Moreover, these firms have annual sales of more than one million Yuan. These firms dominate the furniture industry.

Chinese Furniture manufacturers are classified by the government into three categories: large, medium, and small firms, according to their initial capital investment[2]. More than 80 percent of all furniture companies are small sized firms. However, medium and large firms dominate the industry by their production, product quality, as well as modern equipment and management skills (Anonymous 1997a).

Many Chinese furniture companies focus on both domestic and international markets. According to China's Custom Bureau, China exported $870 million worth of furniture in 1996, a rise of 25 percent over the previous year (Wu 1997). On average, China's furniture exports increased 52 percent annually from 1990 to 1994 (Zhang 1997). While traditional marketing measures, such as sales promotions and show room displays, were used by China's furniture manufacturers, some firms have started to use Internet to sell their furniture. Companies like *Rizhao Sanmu (group) Corporation in Shandong province* have established homepages to serve their broad customers (Sanmu Co. 1996).

The major furniture categories classified by their raw material use include wood furniture, plastic furniture, steel furniture, glass furniture, and bamboo furniture. Wood furniture accounts for more than 80 percent of the total furniture output, and it will likely retain this dominant position in the future (Anonymous 1997a). According to the 1995 census of manufacturers, there were 13,349 wood furniture manufacturing establishments. Among them, 8,760 firms were owned by a township or a party at higher level, with a total employment of more than 500,000 people. The remaining 4,689 furniture makers were village owned and/or private firms. About 300,000 people were employed in these firms. Figure 4 shows the distribution of wood furniture firms at township or above level by their respective ownership. As shown in Figure 4, the majority of wood furniture firms (83.5%) are collectively owned. Decentralization of

[2] According to the Chinese government, Large firms are those firms with an initial capital investment of 50 million Yuan and above; Medium firms are those with an initial capital investment of 20-50 million Yuan; All others are small firms.

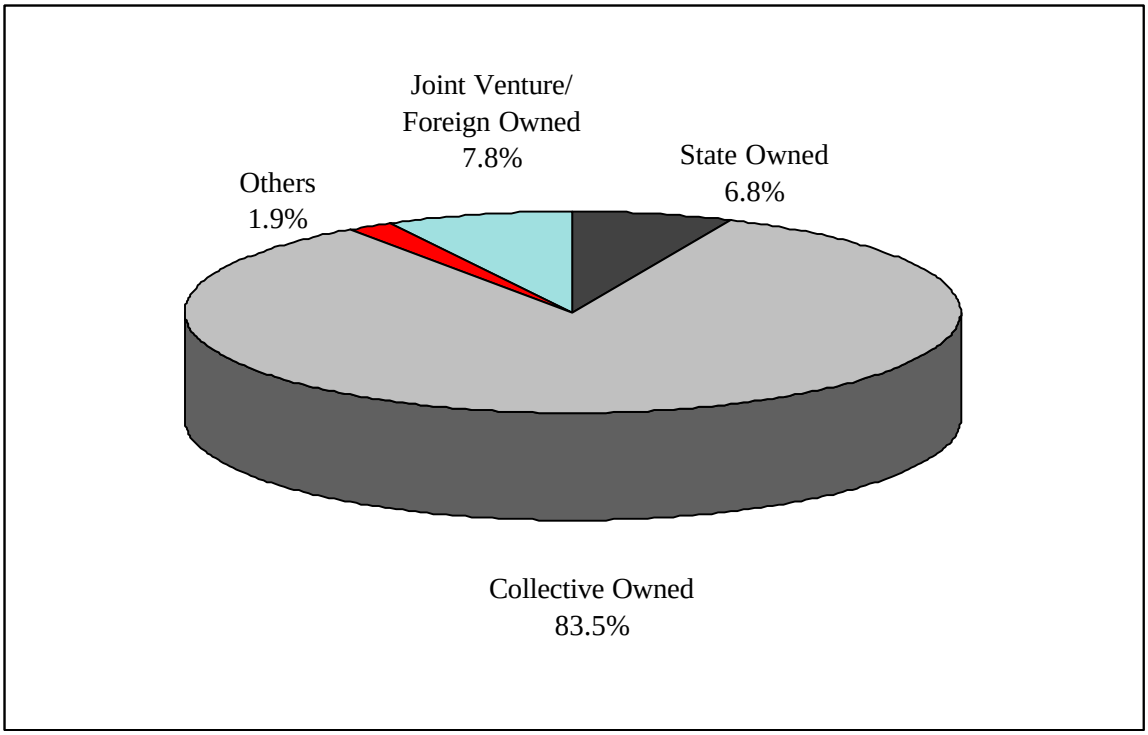

Figure 4. Ownership of China's Wood Furniture Firms (% of the numbers of firms)

Source: Compiled from the 1995 Census of Manufacturers, CSB 1997b.

Chinese economy has been gradual since the economic reform started in the early 1980s. State owned companies accounted for only 6.8% of whole industry, a significant drop over last two decades. They were large sized firms established far before the economic reform. Other types of ownership (1.9%) include privately owned and share holding, which are newly growing patterns. Joint venture and/or foreign owned furniture firms, though not many (7.8%), are playing an important role in China's wood furniture industry, particularly in their product exports. Exports accounted for 46% of these firms sales in 1996 (CSC 1997). The investments came from more than twenty countries (regions), mostly from Singapore, USA, Japan, Hong Kong, and Taiwan. Figure 5 shows the breakdown of these firms by the origins of foreign partners.

As indicated in Figure 5, most partners were in Taiwan and Hong Kong (64%). Many Taiwanese furniture manufacturers have been moving their facilities to the

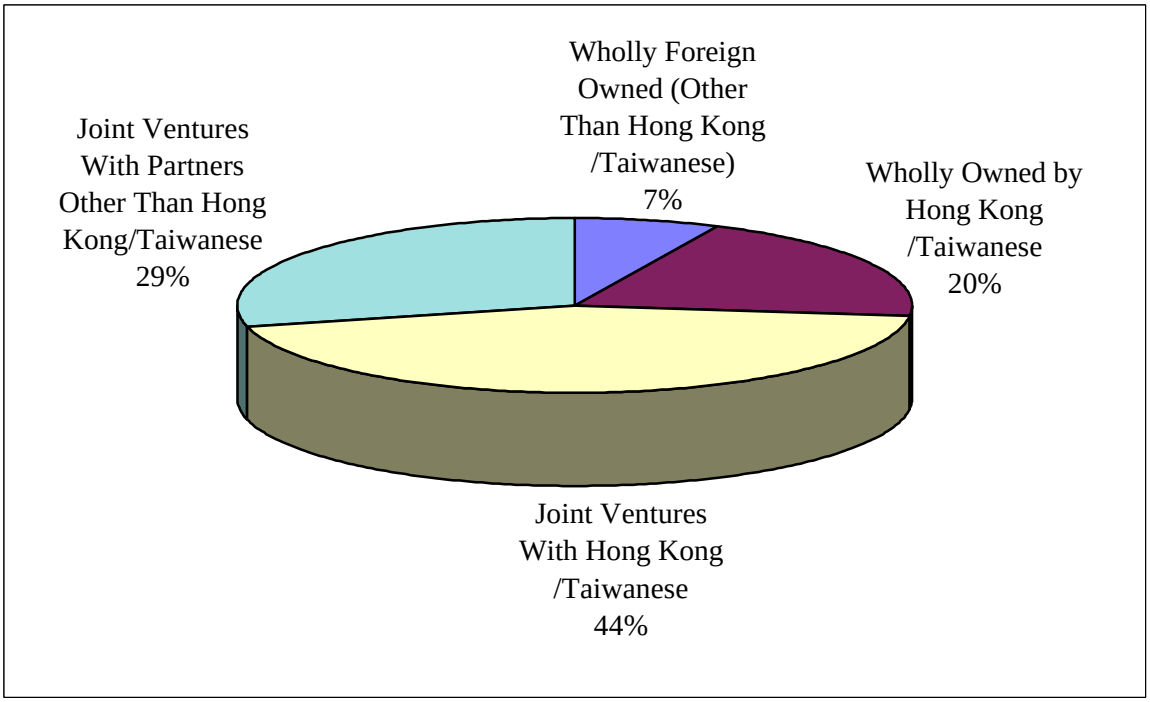

Figure 5. Breakdown of Joint Venture/Foreign Owned Furniture Firms in China (% of total numbers of joint venture/foreign owned firms)

Source: Compiled from the 1995 Census of Manufacturers, CSB 1997b.

mainland China to have better access to wood raw material bases. As a joint venture in China can take advantage of both cheap domestic labor and advanced technology associated with foreign investment, joint ventures are more popular than wholly foreign owned type, and collectively account for 73%.

Wood furniture firms are geographically diversified. The major locations of Chinese wood furniture manufacturers are shown in Figure 6 (also refer to the map in Appendix C). The South and the East are the first two regions to have adopted an open-door policy, and experience a higher economic growth than other regions. Furniture establishments in these two regions account for nearly 70% of national total (36% from the South and 33% in the East).

A few provinces and cities play an important role in wood furniture output (sales). Table 15 and 16 show the top ten provinces and cities, respectively. Most firms located

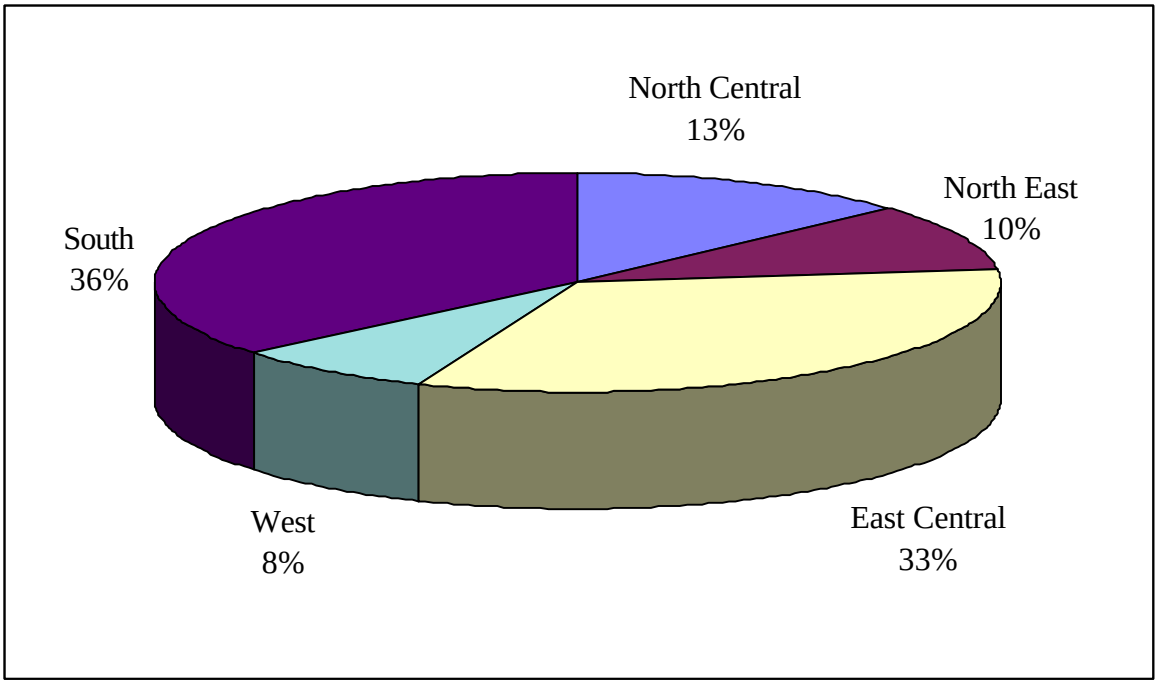

Figure 6. Geographic Distribution of China's Wood Furniture Industry
(% of total numbers of wood furniture firms)

Source: Compiled from the 1995 Census of Manufacturers, CSB 1997b.

in coastal regions, such as Guangdong, Zhejiang, Jiangsu, Shandong, and Shanghai, were in Free Trade Zones. In these regions, government programs give high priorities to attracting foreign investment, developing imports of raw materials and exports of finished products. Thus, firms in the regions were better equipped and managed than those in other regions. These provinces and cities contributed more to the total furniture output. Guangdong province, for instance, accounted for over 20% of the national furniture sales in 1995.

1.5.2 Source of Demand and Future Trends

The extent of the furniture industry's growth primarily depends upon housing starts, which depends on economic development. China's economy has been experiencing high growth since the1980s, and continues to grow at an annual rate of 8% of GDP (CSB 1997a). As a result, demand for furniture will increase by approximately

10% annually for the next ten years (Wu 1997). This is based on the following facts: first, on average, most households have more income to spend on furniture; second, the tourism industry has been expanded and more furniture is required for hotels; third, there have been more housing starts for office and public buildings, particularly in large cities such as Shanghai, Beijing, and Guangzhou; and finally, living space for urban households increases as residential housing starts increase at a rate of 15% annually (Wu 1997).

According to Wu (1997), 50% of total furniture sales in 1997 went to households, while office furniture accounted for 25% to 30% of total furniture sales. This distribution will hold for the next 3-5 years.

Increasing furniture exports also contributed to the rapid growth of China's furniture industry. Although accounted for only 10% of annual sales of national furniture, furniture exports increased at a much higher rate annually than domestic demand. The top importer of China's furniture was the U. S. For example, between 1992 and 1994, furniture exports to the U. S. were more than doubled (Zhang 1997).

1.5.3 Wood Material Use

China's furniture industry consumes a variety of wood products, such as lumber, plywood, medium density fiberboard (MDF), and particleboard. Solid wood products have been traditional materials used in furniture manufacturing. Prior to the 1970s, China's furniture industry was very small. Solid wood products, such as hardwood lumber, were major materials used at that time. Over the past two decades, however, other wood materials have become increasingly important in the manufacture of furniture. In the early 1980s, hardboard was an acceptable alternative to thin-veneer-core hardwood plywood, and used in drawer bottoms, dust bottoms, and chest backs in lower and middle-price furniture. Hardboard is still commonly used with the application of vinyl overlays. Since the mid 1980s, MDF has been used in place of solid wood, hardwood plywood, and hardboard, especially in drawer bottoms and chest backs for lower priced furniture. After 1986, particleboard has been widely accepted as an alternative substrate for core materials in furniture tops and sides. Today, hardwood

lumber and dimension, hardwood plywood, MDF, and particleboard are the four largest wood material inputs for furniture manufacturing (Shi 1998).

The consumption of forest products in China is frequently used to identify gross 'removals' from the forest, including estimates for natural losses (disease, insects, and fire losses), losses in harvesting and transportation, and illegal cuts. This makes the information concerning wood used in end user markets (e.g. furniture) and consumption of specific products (e.g. lumber) unavailable. Nevertheless, the approximate allocation of timber by major market segments was estimated by some experts (MOF 1993, Li 1996, and Waggener 1996). According to these estimates, China's furniture segment consumes some 5% of total timber annually.

Few sources are available to provide estimates of the extent and magnitude of increased material usage in the furniture industry. China's Ministry of Forestry (MOF) has been the traditional source for information on wood production and consumption. However, as mentioned earlier, the MOF is unable to provide detailed data on wood used in the furniture industry. The Ministry of Light Industry provided the estimates of wood materials used in furniture firms it managed or administrated. The estimates of wood used in the furniture industry as a whole can be based on these estimates. According to the Ministry of Light Industry, the furniture industry consumed about 1.1 million cubic meters of solid wood products (logs and lumber), 597,000 cubic meters of plywood, 398,000 cubic meters of fiberboard (including MDF), and 989,000 cubic meters of particleboard in 1995 (Li 1996). These figures are believed to be smaller than what was actually consumed because underreported data on wood furniture production was used. Research done by the National Forestry Economics and Development Research Center showed that the furniture industry will consume 1.5 million cubic meters of solid wood products annually through the year 2000 (Research Group 1997).

The estimates shown in the publication *China's Light Industry Statistical Material* (MLI 1997) seem more acceptable than those in other sources. According to this source, China's furniture industry consumed about 2.23 million cubic meters of solid wood

products in 1995, while this figure increased to 2.83 million cubic meters in 1996. However, there was no data on hardwood products and various types of panels.

It was estimated that 50-70% of total wood-based panel products were consumed annually by the furniture industry for the last ten years (MOF 1993). To simplify the estimates, Chinese industry experts used the wood consumption index to estimate the amount of panels consumed by the furniture industry. The wood consumption index for plywood, particleboard, and fiberboard used in furniture manufacturing was estimated based on the industry's actual performance. In order to produce one piece of furniture, on average 0.003 cubic meters of plywood, 0.006 cubic meters of particleboard, and 0.002 cubic meters of fiberboard respectively was needed (Li 1996, MOF 1993). Therefore, the furniture industry consumed 5.28 million cubic meters of panel products in 1996, of which plywood accounted for 1.44 million cubic meters, particleboard 2.88 million cubic meters, and fiberboard (including MDF) 0.96 million cubic meters. These estimates are quite acceptable when compared with the panel production data. For example, the furniture industry consumed about 56% of national total panel production.

1.6 Summary

In summary, the Chinese furniture market is very large with sales of $8.7 billion in 1996. This large market has many opportunities for both domestic and foreign wood products industries. U. S. wood products industry needs information about this market to best serve and compete.

Information has been provided about the Chinese furniture industry, its size, development, and wood material needs. Similar to other Chinese forest products industries, the furniture sector consists of geographically diversified firms with different ownership. Because of this, individual firms are quite different from one another. It has been determined that differences in geographical locations can affect firms ownership, size, and product lines. The wood products industry could best serve them through a different marketing mix, which includes the products, promotion, distribution channels as

well as pricing. There is a lack of detailed information regarding hardwood products used in China's furniture industry. However, this information is critical for hardwood producers to meet the needs of furniture manufacturing.

Wood products, especially hardwood supplies both from domestic sources and by importing have been reviewed in order to examine the potential for hardwood usage in China's furniture industry. Domestic resources are limited given the size of the country. Environmental problems caused by heavy timber cutting force the Chinese government to give the protection function of forests more serious consideration. Consequently, timber removals from natural forests are strictly controlled, and domestic hardwood supply will be reduced accordingly. Hardwood products imported may be the good substitution. Also, the rapid growing wood-based panel industry is a proven source to supply raw materials for China's furniture industry.

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Tables

Table 1. China's Forest Resources

Years	Forest Land		Forest Coverage (%)
	Area (million ha.)	Stocks (billion m3)	
1973-1976	121.9	8.7	12.7
1977-1981	115.3	9.0	12.0
1984-1988	124.7	9.1	12.3
1989-1993	133.7	10.1	13.9

Source: MOF. China National Forest Resources Inventory (1973-1976, 1977-1981, 1984-1988, 1989-1993).

Table 2. China's Forest Types

Types	Area (Million ha.)	Percentage of Forest Land (%)	Inventory (Million m^3)
Productive timber forest	84.93	66.08	6743.4
Economic forest	16.10	12.53	N/A
Protective forest	16.07	12.50	1778.0
Fuelwood forest	4.29	3.34	69.2
Bamboo forest	3.79	2.95	N/A
Special purpose forest	3.35	2.60	496.6

Source: MOF, 1994. China National Forest Resources Inventory (1989-1993).

Table 3. China's Hardwood Species

	% of Hardwood Timber		
	By Mature Timber Stock	By Standing Stock	By Land Area
Oaks	27.7	21.7	25.4
Birch	25.1	8.3	10.6
Poplar	8.4	2.8	5.3
Basswood	5.8	-	-
Camphorwood	1.3	0.9	0.6
High-density HW Other than Oaks[1]	11.3	3.3	6.8
Low-Density HW	20.4	63.0	51.3

Source: MOF, 1994. China National Forest Resources Inventory (1989-1993).
[1] Includes ash, walnut, beech, maple, elm, and others.

Table 4. China's Timber Production by Region (In million cubic meters)

	1988	1989	1990	1991	1992	1993	1994	1995	1996
Northeast	31.8	30.9	27.1	25.0	23.8	23.7	24.2	24.9	25.6
South & Southeast	19.7	17.5	18.0	20.0	24.4	25.7	26.9	27.7	26.0
Southwest	8.1	7.0	6.4	7.1	7.7	8.5	9.1	8.8	8.9
North & Northwest	2.6	2.6	4.2	6.0	5.9	6.0	6.0	6.4	6.6
Total	62.2	58.0	55.7	58.1	61.8	63.9	66.2	67.8	67.1

Source: MOF, 1989-1997. China's National Forestry Statistical Materials (1988-1996).

Table 5. Forest-related Policy Changes in China

Period	Institution Changes	Tenure System	Stumpage & Timber Market	Notes
Before 1949		Landlords, bureaucrats, merchants, self-sufficiency farmer, common and open access	Free market, but some degree of Monopoly	The People's Republic of China was founded on the first of October 1949.
1950-1956	Land reform and economic recovery	Government confiscated all forest lands owned by landlords and bureaucrats and evenly distributed to the farmers within the community, or as state-owned lands	Free market	
1956-1958	Towards socialist	Transition to collective owned, and/or state owned	From free market to centrally distribution system	
1958-1981	People's commune system	Collective within the community for those private trees and land, state owned	Central planned prices production and distribution	
1981-1984	Stabilization and consolidation of ownership	Contracted timberland collective timberland state owned	Dual system: compulsory delivery and free market	
1985-1992	Early privatization and decentralization	Private timberland; contracted timberland, collective timberland state owned	Price controls lifted in the part of free market, but tax and fees increased, government retained monopoly on the procurement	
1993-1997	Towards market economy	Longer term contract for forest and forest land, auction of the non-forest land for long term (up to 100 years) holding, state owned	All price controls lifted and free competition in collective forest areas, bigger share of timber traded by market (90%) for state owned forests.	

Source: Zhang 1998.

Table 6. Production of Wood-based Panels in China (In 1,000 cubic meters)

Year	Total	Plywood	Particleboard	MDF	Hardboard
1951	16.9	16.9	0	0	0
1955	517.5	517.5	0	0	0
1960	207.2	147.6	0	0	59.6
1965	220.6	139.0	31.4	0	50.2
1970	240.4	170.7	15.0	0	54.7
1975	373.7	192.1	26.7	0	154.9
1980	914.4	330.0	78.2	0	506.2
1985	1,615.8	538.7	182.1	50.0	845.0
1990	2,266.5	758.7	428.0	86.9	992.9
1991	2,724.4	1,054.0	614.0	137.0	919.4
1992	4,025.2	1,564.7	1,158.7	285.6	1,016.2
1993	5,338.4	2,124.5	1,571.3	312.3	1,330.3
1994	6,085.7	2,606.2	1,682.0	289.2	1,508.3
1995	13,612.1	7,592.6	4,351.0	536.9	1,131.6
1996		4,903.0	3,383.0		2,055.0*

Source: MOF, 1986-1997. China's National Forestry Statistical Materials.
*Total amount of all types of fiberboard.

Table 7. China's Sawnwood Production, Consumption, and Trade: 1985-1996 (In 10,000 cubic meters)

Year	Production	Exports	Imports[1]	Estimated. Consumption
1985	1,591		38.5	1,629.5
1986	1,505		23.2	1,528.2
1987	1,472		23.3	1,495.3
1988	1,468		52.1	1,520.1
1989	1,368		9.5	1,377.5
1990	1,176	8.8	25.2	1,192.4
1991	1,012	9.8	30.6	1,032.8
1992	1,119	74.5	97.4	1,141.9
1993	1,401	31.3	131.8	1,501.5
1994	1,294	36.6	95.5	1,352.9
1995*	4,184	40.8	85.1	4,228.3
1996	2,442	38.3	93.3	2,497.0

Source: MOF, 1986-1997. China's National Forestry Statistical Materials 1985-1996;
China's Customs Bureau, 1986-1997. China's Customs Statistics Yearbook 1985-1996.

[1] Imports figures from 1985 to 1989 were net imports.

* Includes small manufacturers at village or township level, not previously included in estimates.

Table 8. Major Wood Products Imports[1]

	1981	1985	1988	1990	1991	1992	1993	1994	1995	1996
Logs	1,871	9,820	10,585	4,193	4,097	4,670	3,467	3,335	2,583	3,185
Hardwood Logs			1,198			2,381	1,886	2,032	1,965	2,532
Sawnwood	75	148	460	252	306	974	1,318	955	851	933
Hardwood Lumber			182			554	841	698	698	758
Plywood	259	824	878*	1,377	1,463	2,516	2,229	2,177	2,083	1,775
Hardwood Plywood						1,110	1,060	1,026	1,068	538
Particleboard						14	86	56	55	108
Veneer	0	2	18*	6	28	241	350	239	342	380
Hardwood Veneer						223	271	236	257	333
Hardboard						7	29	36	44	54
MDF						13	26	32	32	38

Source: China's Customs Bureau. China's Customs' Statistical Yearbook, 1982-1997.

[1]All figures are in 1,000 cubic meters except where noted otherwise.

* In million tons.

Table 9. Hardwood Products Imports (In 1,000 cubic meters)

	1993	1994	1995
Temperate HW Logs	1,547	1,599	1,464
Tropical HW Logs	339	432	400
Temperate HW Lumber	614	557	650
Tropical HW Lumber	224	139	538
Temperate HW Plywood		662	1,089
Tropical HW Plywood	640	599	481
Hardwood Veneer		175	256

Source: FAS 1995b, 1996. China Forest Products Annual Report.

Table 10. Major Wood Products Imported From USA:1992-1996

	1992		1993		1994		1995		1996	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Logs (1,000 m3)	1,308.8	165,893.0	810.2	140,536.1	382.1	64,266.0	93.2	21,178.5	101.4	18,164.4
SW Logs	1,028.5	129,296.0	540.5	94,053.0	176.7	29,084.6	55.9	11,904.3	26.7	4,678.6
HW logs	280.3	36,597.0	269.8	46,483.0	205.4	35,181.3	37.3	9,274.3	74.6	13,485.7
Lumber (1,000 m3)	10.9	3,560.0	22.8	7,527.8	31.7	8,905.2	64.3	16,954.5	113.2	33,619.9
SW Lumber	5.1	1,051.0	1.3	315.6	1.7	504.2	8.9	3,046.6	9.1	2,655.6
HW Lumber	5.8	2,509.0	21.5	7,212.2	30.0	8,401.0	55.4	13,908.0	104.2	30,964.3
Veneer[1]	1.3	680.0	4.8	1,952.0	6,590.7	3,613.9	5,240.6	4,615.3	5,470.8	4,880.1
SW Veneer	0	18.0	0.2	91.8	196.0	209.7	497.2	617.9	392.9	487.4
HW Veneer	1.3	662.0	4.6	1,860.2	6,394.6	3,404.2	4,743.4	3,997.4	5,078.0	4,392.7
Particleboard (ton)	1,670.9	751.0	1,882.0	623.2	3,640.9	1,162.3	8,428.5	2,007.3	16,491.1	4,303.0
Fiberboard (ton)	2,759.8	1,348.0	32,720.1	10,236.7	42,517.7	12,686.5	43,478.6	12,534.2	54,938.9	14,967.0
Plywood (1,000 m3)	137.1	5,001.0	25.5	6,505.5	17.8	6,323.4	9.4	2,521.8	8.6	2,229.7
HW plywood	1.5	737.0	4.8	1,972.4	6.9	2,294.0	5.7	1,345.4	4.5	969.8
SW plywood	136.7	4,264.0	20.7	4,533.1	10.8	4,029.4	3.7	1,176.4	4.0	1,259.9
Total Value		177,233.0		33,582.5		32,854.4		38,648.0		60,249.7

Source: China's Customs Bureau, 1993-1997. China's Customs' Statistical Yearbook.

[1]Volume figures in 1992 and 1993 are in cubic meters, while figures in 1994-1996 are in kilograms.

All value figures are in 1,000 US$

Table 11. Imported U. S. Hardwood Lumber Species (Including Hong Kong)

	1990		1991		1992		1993		1994		1995		1996		1997	
	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.
Oak	45.0%	45.0%	59.0%	61.2%	55.5%	63.2%	49.0%	52.1%	51.0%	51.0%	47.2%	45.3%	40.9%	38.0%	38.4%	34.1%
Beech	0.4%	0.6%	0.1%	0.1%	2.2%	2.1%	3.7%	3.3%	5.4%	5.4%	4.1%	3.7%	5.7%	6.3%	5.5%	6.6%
Maple	8.5%	10.6%	5.9%	5.8%	12.6%	11.2%	15.1%	13.4%	13.1%	11.8%	14.7%	13.0%	17.8%	15.2%	19.4%	16.5%
Western Red Alder	2.0%	3.5%	0.6%	1.0%	0.2%	0.5%	1.3%	2.1%	1.8%	3.3%	5.7%	8.7%	7.0%	8.6%	8.8%	11.2%
Cherry	1.1%	0.9%	0.9%	0.4%	1.1%	0.8%	3.7%	2.2%	3.3%	2.1%	3.6%	2.7%	3.3%	1.8%	3.7%	1.9%
Yellow Poplar	0.3%	0.4%	1.9%	1.9%	0.5%	0.7%	1.3%	1.8%	3.6%	5.9%	4.0%	6.1%	4.9%	8.1%	7.6%	10.8%
Birch	0.9%	0.7%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.5%	0.5%	0.2%	0.2%	0.4%	0.4%	0.5%	0.4%
Ash	36.6%	28.7%	22.7%	16.1%	21.8%	16.6%	19.8%	19.4%	14.1%	12.5%	12.2%	10.0%	9.3%	8.1%	6.9%	6.6%
Hickory & Pecan	1.9%	4.1%	4.7%	9.3%	0.1%	0.1%	0.1%	0.1%	0.8%	0.9%	2.0%	3.8%	1.3%	2.2%	0.9%	1.6%
Walnut	0.4%	0.3%	0.3%	0.3%	0.3%	0.2%	0.4%	0.4%	0.3%	0.2%	0.5%	0.3%	0.5%	0.2%	0.3%	0.2%

Source: USDA Forest Service 1998.

Table 12. Imported U. S Hardwood Lumber Species (Not Including Hong Kong)

	1990		1991		1992		1993		1994		1995		1996		1997	
	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.	% by Value	% by Vol.
Oak	59.3%	46.4%	69.5%	60.9%	91.6%	93.2%	72.5%	77.5%	70.1%	75.1%	47.2%	46.9%	47.6%	48.1%	47.6%	43.5%
Beech	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.8%	0.7%	0.6%	2.4%	2.9%	4.8%	6.5%
Maple	6.6%	7.2%	0.0%	0.0%	5.7%	3.2%	6.1%	5.1%	4.8%	4.7%	7.5%	6.3%	10.0%	8.9%	12.0%	11.2%
Western Red Alder	12.5%	11.0%	2.1%	3.1%	1.7%	2.8%	0.0%	0.0%	1.8%	2.9%	9.3%	13.1%	7.9%	5.9%	13.8%	16.2%
Cherry	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	2.0%	5.7%	3.3%	1.5%	1.0%
Yellow Poplar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	2.3%	4.7%	5.5%	2.4%	3.7%	4.1%	5.8%
Birch	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.3%	0.1%	0.2%
Ash	2.9%	5.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.9%	3.8%	3.2%	20.0%	16.8%	17.4%	20.1%	10.5%	11.8%
Hickory & Pecan	18.4%	30.4%	25.3%	34.1%	0.9%	0.8%	0.7%	0.6%	5.6%	3.9%	2.0%	2.8%	1.4%	1.7%	0.8%	0.9%
Walnut	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	1.7%	4.4%	1.4%	0.0%	0.0%	0.6%	0.3%	0.2%	0.1%

Source: USDA Forest Service 1998.

Table 13. Description of Timber Producers in China

Producers	Major Location	Timber Resources and Major Tree Species	Timber production*	Operation and Market-related Issues
State-owned Forest Enterprises 140 in total	Northeast	2.6 billion m3 (41.8%) 57% coniferous Larch, Korean pine, fir. Main deciduous: oak, birch, Poplar	23	Have rights to market products directly. Sale products mainly through trade fairs by signing contracts at government guidance prices.
	Southwest	1.4 billion m3 (22.86%) 69.4% coniferous: Fir, Yunnan pine. Main deciduous: oak, birch.	9.1	10% products are price central-controlled.
State-owned Forest Farms (about 4,000)	Nationwide typically NW	1.0 billion m3 (16.88%)	2.0 (NW only)	Multiple-way to market products, government set the guidance prices.
Collective Forest Farms	South	1.1 billion m3 (18.45%) 55.8% coniferous: Mason pine, Major deciduous: oak.	5.7 (Fujian only)	Products procured at county/province level stations by state-run timber companies at government set price.
Household Forest Farms	South Plain regions		25.2 (South only)	

Sources: Compiled from MOF 1989 and 1995a.
* Production in 1994, in million cubic meters.

Table 14. Furniture Production: 1992-1996 (In million pieces)

Year	Total	Wood Furniture
1992	217	192
1993	310	274
1994	505	429
1995	618	424
1996	602	480

Source: CSB. China Statistical Yearbook 1993-1997.

Table 15. Top Ten Provinces (In Terms Of Furniture Sales)

No.	Provinces	1994		1995	
		Sales (Million Yuan)	% of National Sales	Sales (Million Yuan)	% of National Sales
1	Guangdong	3,588	24.22	4,376	21.74
2	Shandong	1,503	10.14	1,963	9.75
3	Jiangsu	1,249	8.43	1,813	9.01
4	Zhejiang	917	6.19	1,296	6.44
5	Beijing	803	5.42	1,075	5.34
6	Hubei	536	3.62	936	4.65
7	Shanghai	779	5.26	929	4.62
8	Hebei	651	4.39	894	4.44
9	Anhui	536	3.62	879	4.37
10	Sichuan	444	3.00	758	3.77

Source: CSB 1997a.

Table 16. Top Ten Markets (In Terms Of Furniture Sales)

No.	Cities	1994		1995	
		Sales (Million Yuan)	% of National Sales	Sales (Million Yuan)	% of National Sales
1	Guangzhou (Guangdong)	986	6.66	1,189	5.91
2	Beijing	803	5.42	1,075	5.34
3	Shanghai	779	5.26	929	4.62
4	Suzhou (Jiangsu)	458	3.09	608	3.02
5	Tianjin	379	2.56	550	2.73
6	Chengdu (Sichuan)	222	1.50	468	2.33
7	Nanjing (Jiangsu)	301	2.03	446	2.21
8	Foshan (Guangdong)	390	2.63	373	1.85
9	Zhaoqing (Guangdong)	245	1.66	364	1.81
10	Jiangmen (Guangdong)	341	2.30	315	1.57

Source: CSB 1997a.

CHAPTER TWO: METHODS

2.1 Data Sources and Sample Design

In order to identify all previous studies and locate secondary data, a literature review both in English and in Chinese was undertaken. There is little literature available in English, so an extensive review of numerous research studies published in Chinese was conducted. These publications also identified industry trends and gaps which were helpful for developing survey questions.

For this study, both secondary data and primary data were collected. Secondary data from government documents such as Census of China's Forest Resources was used to examine hardwood supply potential. Hardwood import and export information was obtained from China's Custom Bureau and the Ministry of Forestry in Beijing. The Ministry of Light Industry in Beijing was one of the major sources of information on furniture industry development. Statistics on number, size, and location of furniture manufacturers from the Ministry of Light Industry in Beijing were used to develop a sample frame for the study.

According to the 1995 census of manufacturers (CSB 1997b), there were 15,598 furniture manufacturing locations in China, of which about 13,000 firms were wood furniture manufacturers. Among these, 8,760 independent firms exist at township or above level with annual sales of more than one million Yuan. They were listed by the Bureau of Statistics. However, another source shows that there were about the same number of furniture firms at the village and/or township level, giving a total number of roughly 30,000 firms in the furniture industry (Dai 1997). Since those firms at village or township level were mostly small, and had little impact on the furniture industry, they were not included in this study. Therefore, the population of interest for this study is wood furniture manufacturers with annual sales of more than one million Yuan. Wood furniture includes wood household furniture, wood office furniture, upholstered furniture and commercial furniture.

As of now, there is no other complete list of wood furniture manufacturers in China. The Directory of Chinese Manufacturers published by the Bureau of Commerce included only large firms (those with annual sales of 100 million Yuan or more). China's Furniture Association will soon publish a directory of furniture manufacturers. However, it will include only 2,000 member firms. Because of the above, the sample frame consists of all 8,760 firms listed in the Census.

2.2 Data Collection

As it is difficult to get accurate data, It was decided to use more than one method. To achieve this study's goal, two methods of data collection, mail survey and personal interviews, were developed and used to collect primary data. Mail surveys are the most efficient and cost effective method of obtaining data from geographically dispersed population (Dillman 1978). As such, primary data for this study was obtained from a mail survey. In order to add depth to the quantitative findings, individual interviews were conducted after the mail survey. Interviews involve personal contact between interviewer and respondents, and are the most versatile method of primary data collection. Ultimately, the objectives were met by the interpretation of combined results from the mail survey and personal interviews.

2.2.1 Mail Survey

In China, using such a survey instrument is not common. Firm managers are reluctant to cooperate as they regard company information as secret. They are also very busy with day to day operations, and are not willing to deal with academic surveys. Therefore, it is sometimes very difficult to get managers to complete questionnaires. This is indicative of present-day Chinese business culture, and is the major reason why Chinese researchers do not conduct mail surveys as often as American counterparts. Nevertheless, as current statistics available in China was not sufficient to meet this study's goal, mail survey was chosen as one of the methods used to collect primary data.

The sample size for this study was limited by the officials in Chinese Forest Economics Society in Beijing which helped to administer the survey instruments. To ensure better representation of larger users, all 12 officially large firms (as mentioned earlier, designated by the level of initial capital investment) were included in the sample. An additional two hundred twenty firms were randomly selected from the remaining small and medium firms. The resulting sample size was a workable 232 firms.

A structured mail questionnaire was designed for and directed to decision makers of wood furniture firms in China. These decision makers included CEOs, vice presidents of materials procurement, and plant managers. Prior to sending the survey, it was reviewed by the faculty in Virginia Polytechnic Institute and State University and the Chinese Forest Economics Society, then translated into Chinese. A pretest with two firms in Beijing was conducted in the early October 1997. This pretest was done by personal interviews with two individuals from each firm about the questionnaire. These individuals were asked to examine the questionnaire and identify any problems in the wording to make sure the questions were easy to understand and answer. Minor changes concerning the wording and the flow of questions were then made. An English version of the questionnaire is included in Appendix A.

The survey was mailed in the late October 1997 through the Chinese Forest Economics Society in Beijing with an official cover letter and prepaid return envelopes. No correspondence stated that this study was being conducted by Virginia Polytechnic Institute and State University, as it was thought such statement would bias some respondents answers or have a negative effect on the response rate. To encourage response, ten days after initial surveys were mailed, telephone calls were made to remind recipients to return the survey, based on Dillman (1978). This did not work well as only 15 out of 232 returned their surveys. During November 1997, a second follow-up mailing was conducted to those who did not respond to the earlier survey. In all, a total of 41 usable responses were received. After adjusting for undeliverable, the response rate was 18%. Below is a summary of the responses.

Summary of Responses

Mailing	Responses		
	Usable	Not usable	Undeliverable
First	13	4	4
Second	28	1	1
Total	41	5	5

The adjusted response rate was calculated as:

$$\text{Response rate} = \frac{\text{Number of usable responses}}{\text{Adjusted number of surveys mailed}}$$

Where:

Number of usable responses = Number of questionnaires received from furniture firms that are completed

Adjusted number of survey mailed = All questionnaires mailed minus (the number of questionnaires returned due to bad addresses (undeliverable) plus the number of questionnaires mailed to companies not involved in wood furniture manufacturing)

2.2.2 Personal Interviews

The mail survey results were not as fruitful as to explain some quantitative data. Therefore, personal interviews were carried out after the mail survey to explore opinions and views of furniture manufacturers toward current and future markets, and raw material

use. Interview information was used to help explain survey findings. The interviews were designed to:

1. poll mill decision makers on what influenced their hardwood use;
2. discover how firm managers perceive the market conditions his or her company faced; and
3. describe their perceptions of factors affecting hardwood use and import decisions.

To conduct these interviews and ensure all the important aspects to be covered, an interview guide with both open-ended and pre-coded questions was developed (see Appendix B). As interviews are time-consuming and expensive to conduct, a total of 26 firms in 4 representative regions (Dalian, Beijing, Shanghai, and Guangdong) were randomly selected to be interviewed. To ensure that responses were accurate and comprehensively recorded, some of the interviews were tape recorded with the permission of interviewees. The results from the interviews were much better and supported the data obtained from the mail survey.

2.3 Data Analysis

Although the sample size is relatively small, data from the survey should allow insights into China's furniture industry and meet the study goal. To accomplish this, quantitative data from the mail survey was analyzed statistically. Data from the surveys was first coded and entered/tabulated using spreadsheet software. Data entry errors were checked using the following descriptive statistics: range, mean, and the number of observations. Next, one-way tabulation, cross tabulation, and descriptive statistics were used to analyze the data. One-way tabulation is used to examine the variables of the study separately, and cross tabulation is used to study the relationships among and between the variables. Descriptive statistics were used to find the means and the standard deviations of respondents demographic data, such as employment and sales levels.

In order to determine the differences between the groups of responding firms on several perspectives, Analysis of Variance (ANOVA) was used. ANOVA is a multivariate analysis technique, one of the most popular statistical methods used by marketing researchers (Suskie 1992), used to explore and define the relationships between several categorical independent variables (e. g., the responding firm groups by size) and metric dependent variables (e. g., perception ratings of hardwood purchase). Differences between groups were then determined (Parasuraman 1991). For example, ANOVA would be used to test for differences of perception ratings for hardwood purchase by all manufacturer types. An example of this would be to test the hypothesis that there were differences in perception ratings for hardwood purchase between all groups of furniture manufacturers. Like most of the statistical research, a significance level of 0.05 was used throughout the study.

In addition to quantitative analysis of survey data, qualitative analysis of interviews was conducted. Qualitative research involves generating information that can not be summarized in the form of numbers. It should be viewed as complementing to the quantitative research (Parasuraman 1991). It can be a valuable, and sometimes necessary prelude to quantitative research.

Analysis of qualitative data is subjective and impressionistic (Aaker et al. 1998). Qualitative research conveys insights into people's attitudes and feelings. Results of qualitative research, therefore, should never be expressed in terms of percentages, since it would imply that results are somehow representative quantitatively of what a wider sample of respondents might say (Parasuraman 1991). In this study, qualitative data from interviews was integrated with quantitative data from the survey by segmenting interviewees into two geographic regions, the North and the South. Within each segment, generalized perceptions were given.

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