

The North American Hardwood Market: Past, Present, and Future

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Abstract

The North American market for hardwood products has been in a state of evolution during the past 30 years and will continue to evolve over the next several decades. The changes in hardwood markets are perhaps best exemplified by the changes in the eastern U.S. hardwood lumber industry. In 1977, wood household furniture manufacturers consumed 35 percent more lumber than the wood flooring, kitchen cabinet, and millwork industries combined. During this year U.S. hardwood lumber production approached 20 million cubic meters (MCM) and Canadian production was approximately an additional 1 MCM. With the exception of a few mills in Canada and the southern United States, hardwood lumber was manufactured by small mills with an annual production of less than 12,000 cubic meters (CM). U.S. hardwood consumption peaked in the late 1990s and hardwood lumber production peaked at 29.6 MCM in 1999. In 2008, hardwood lumber consumption by the flooring, kitchen cabinet, and millwork industries was equal to or greater than the amount used by the wood household furniture industry. During this year U.S. hardwood lumber production was 21.7 million MCM and Canadian production was an additional 1.1 MCM. The majority of this lumber was produced by mills with capacities exceeding 12,000 CM. To remain competitive in global markets, North American secondary hardwood processors will have to foster more direct connections with the consumers, and will become increasingly reliant on just-in-time delivery to manufacture semi-custom and custom products.

Introduction

There are two broad markets for North American hardwood lumber: appearance applications (graded lumber) and industrial applications (pallets and sleepers). Lumber sold for appearance applications is usually graded under National Hardwood Lumber Association (NHLA) rules or proprietary rules based on the yield of clear cuttings. Lumber sold for industrial application may be sound lumber sold under NHLA rules, log centers or cants, or ungraded lumber. In general, graded lumber is considerably more valuable than lumber sold for industrial applications. The major players in the North American hardwood products industry are U.S. producers and consumers of hardwood lumber. Canada produces the equivalent of approximately 5 percent of the volume of lumber manufactured in the United States but has traditionally been the largest export market for U.S. lumber and has a relatively large secondary hardwood processing industry.

The market for U.S. hardwood lumber has undergone considerable change over the past 30 years as lumber consumption by the furniture industries has declined and consumption by industries associated with home and office construction has increased. Changes in hardwood lumber demand have influenced lumber production on a national and regional level. The objective of this paper is to review changes in the U.S. hardwood lumber markets and sawmill industry, examine differences between U.S. and Canadian hardwood markets, and discuss future changes in these markets.

Changes in Hardwood Lumber Consumption and Production

U.S. hardwood lumber consumption increased by more than 6.7 million cubic meters (MCM) between 1977 and 1987 as kitchen cabinet, millwork, pallet, and flooring industries expanded production. Exports of hardwood lumber tripled during this period due to increased shipments to Europe and Asia. By contrast, consumption of hardwood lumber by furniture and railroad sleeper manufacturers slightly decreased (Table 1).

Table 1 — U.S. hardwood lumber consumption by major industries in 1977, 1987, 1997, and 2008 in thousand M³

Industry	1977 ¹	1987 ¹	1997 ¹	2008 ²
Furniture	6,528	6,370	6,271	1,652
Kitchen				
Cabinets	680	1,298	2,988	2,832
Millwork ³	2,280	2,874	2,985	1,652
Pallets	4,156	7,904	9,697	8,260
Sleepers	1,739	1,815	2,086	2,597
Flooring	1,251	1,602	2,742	1,888
Exports	566	1,624	2,863	2,360
Other	1,954	2,353	1,746	1,180
Total	19,154	25,840	31,378	22,421

¹ Luppold and Bumgardner, 2008a.

² Hardwood Market Report 2009.

³ Includes other building products.

Hardwood lumber is primarily produced in the eastern portion of the United States but a small volume of lumber also is produced in the west. The eastern United States can be divided into four regions based primarily on forest composition (Fig. 1).

The northeast region contains high volumes of more desirable red oak species, hard maple, and black cherry (Luppold and Bumgardner 2008). The north-central region contains large volumes of more desirable white and red oak species and hard maple. The most predominant species in the

southeast and south-central regions are less desirable red oak and gum species.

Hardwood lumber production in the eastern United States increased in a similar manner as hardwood lumber consumption between 1977 and 1987 (Table 2). However, production in the northern regions increased by over 40 percent compared to a 21 percent increase in the southern region. This disparity in regional lumber production is the result of an interaction between forest composition, the growth in the various markets for hardwood lumber, and the location of secondary hardwood processing industries

Table 2 — Eastern U.S. hardwood lumber production by region in 1977, 1987, 1997, and 2008 in thousand M³

Industry	1977 ¹	1987 ¹	1997 ¹	2008 ²
Northeast	4,969	7,085	8,017	6,365
North				
Central	4,084	5,678	6,492	4,685
Southeast	3,912	4,857	5,039	4,099
South				
Central	6,661	7,901	8,718	6,768
Total	19,626	25,521	28,266	21,917

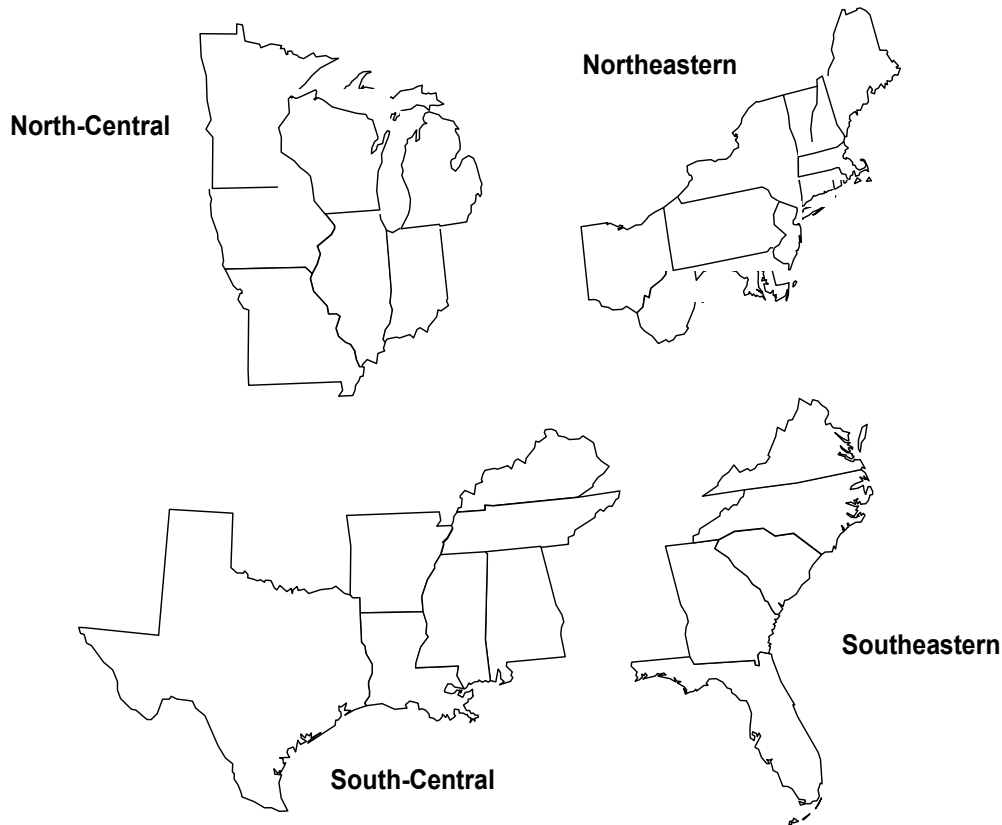
¹ Data source: Luppold and Bumgardner, 2008b.

² Data source: U.S. Census Bureau 2009.

The greatest percentage growth in hardwood lumber consumption between 1977 and 1987 was the export market. The most important species exported during this period were red and white oak. While the southeast has some high quality red oak in its mountainous region and western Tennessee and Kentucky contain high quality white oak, most highly desirable red and white oak lumber is produced in the northern regions.

Two other markets that grew significantly between 1977 and 1987 were pallets and kitchen cabinets. Both these industries are concentrated in the northern regions. By contrast, furniture producers are

Figure 1 – Eastern U.S. hardwood lumber production regions.



concentrated in the southeast region while flooring manufacturers are primarily located in the south-central region.

Demand for hardwood lumber increased between 1987 and 1997 as consumption by kitchen cabinet and flooring manufacturers increased by 130 and 71 percent, respectively, and exports increased by 75 percent. Demand by furniture manufacturers decreased slightly during this period as domestic shipments of wood household furniture remained flat (Luppold and Bumgardner in review). By 1997, the combined consumption of lumber by construction and remodeling product manufacturers (kitchen cabinet, millwork, and flooring) had surpassed that of furniture. However, pallet manufacturers continued to be the largest user of hardwood lumber.

Hardwood lumber production also increased from 1987 to 1997 with large increases in the northeastern, north-central, and south-central regions. Increases in the northeastern and north-central regions were spurred by increased production of kitchen cabinets and pallets and increased exports. Increased lumber production in the south-central region was predicated by increased flooring production. The small increase in production in the southeastern region is indicative of the lack of growth in furniture production.

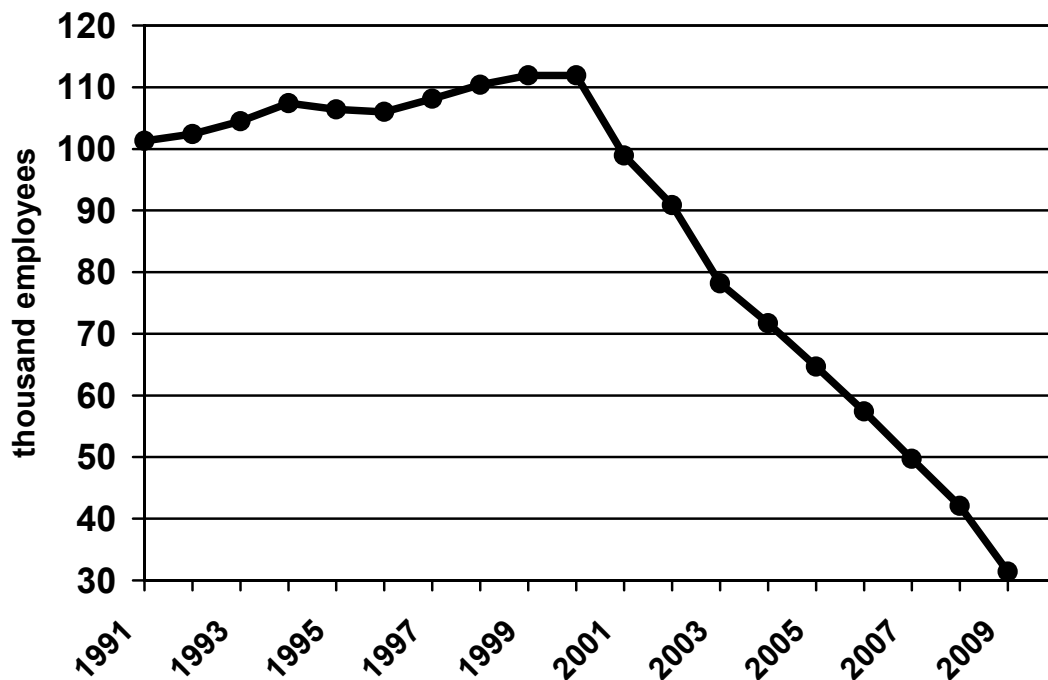
In 1997 apparent U.S. demand for hardwood lumber exceeded eastern production by over 3 MCM. While a small portion of this difference was the result of a reduction in lumber inventories at sawmills and secondary processors, imports (primarily

from Canada) accounted for 1.5 MCM and western U.S. hardwood lumber production accounted for another 1.1 MCM of this difference.

Hardwood lumber demand decreased by nearly 30 percent between 1997 and 2008 and the 4.6 MCM reduction in furniture manufacturers' consumption during this

period accounted for over half of this decline. During this period, numerous U.S. furniture plants closed because they could not compete with offshore producers (Schuler and Buehlmann 2003). This decline in U.S. furniture production is reflected in decline in employment in this industry (Fig. 2).

Figure 2.—Production employment in U.S. wood household furniture industry, 1990 to 2009.



Data source: U.S. Bureau of Labor Statistics 2008. Estimate for 2009 based on employment in May 2009.

While reduced demand for lumber by furniture manufacturers was the most noticeable part of reduced hardwood lumber consumption, the combined decline in lumber demand by the construction and remodeling manufacturers exceeded 2.3 MCM, reflecting the downturn in the U.S. housing market. Lumber consumption by the pallet industry also declined by over 1.4 MCM as a result of reduced industrial activity and increased recycling of pallets and pallet lumber. Export demand declined by over 32 percent during this period with the entire decline occurring after 2006.

Railroad sleepers were the only industry to post an increase in demand between 1997 and 2008.

Eastern hardwood lumber production declined by 23 percent between 1997 and 2008 (Table 2), and western production declined by 20 percent (U.S. Census Bureau 1999, 2009) during this period. The largest decline in eastern production was in the north-central region and was precipitated by a decline in hard maple prices and production, reduced demand by kitchen cabinet and pallet manufacturers, and

reduced international demand. However, lumber production in this region increased by 15 percent between 1977 and 2008 as a result of past markets.

The southeast region experienced a 22 percent decrease in hardwood lumber production between 1977 and 2008. While this region continues to have reductions in furniture production in the current decade, it has had growth in the kitchen cabinet industry. Still, hardwood lumber production in 2008 was only 5 percent higher than in 1977.

Hardwood lumber production in the south-central region has historically been linked to the fortunes of the hardwood flooring industry. As flooring production increased, south-central hardwood lumber production increased. Since the late 1980s flooring production has grown in other regions. The largest manufacturing facility currently operates in the northeastern region. Even though flooring production is significantly greater in 2008 than in 1977, hardwood lumber production in the south-central region is only slightly higher.

While northeastern hardwood lumber production has declined by 21 percent in the last decade, it had increased by 28 percent between 1977 and 2008. This increase can be attributed to a threefold increase in sawtimber volume, a relatively high volume of desirable species, and secondary processors within this region and proximity to Canadian and overseas export markets.

Changes in the Hardwood Sawmill Industry

In general, hardwood sawmills operating in the southern United States are larger than mills operating in the Appalachian Mountains and Plains States primarily because of logistic consideration in the procurement of timber and the distribution of lumber. Canadian mills, on average, are larger than mills operating in the far northern United States because of access to

timber on provincial lands. Over the past 30 years, the number of hardwood sawmills has declined but the average size of these mills has increased in all regions of the eastern United States and Canada. Improved sawing technology and the resulting increased economies of scale have interacted with increased sawtimber supplies allowing sawmill size to increase in all areas of North America. However, changes in logistical variables also have contributed to this change. An example of how sawmill size has changed and the impact of transportation on mill size can be demonstrated by examining changes in the hardwood lumber industry in the state of Tennessee.

Tennessee is in the heart of the eastern hardwood region and is unique in that forest composition is relatively consistent across the state but the topography and elevation differs from west to east. The eastern portion of this state has experienced major changes in its transportation system over the last 30 years. Detailed information of the sawmill industry in this state has also been developed periodically since the 1970s. These attributes make Tennessee an ideal state to examine trends that have occurred in the eastern hardwood sawmill industry over the last 30 years.

The western region is comprised primarily of timberland under 300 meters in elevation with flat to moderate slope (Luppold and Bumgardner 2009). The central region of Tennessee primarily is comprised of timberland under 600 meters in elevation with slopes ranging from 0 to 40 percent. Nearly 60 percent of the timberland in the eastern region of Tennessee is at elevations greater than 300 meters with some portions of this region exceeding 1,500 meters and nearly one-third of this land has slope in excess of 40 percent.

In 1979, only 22 percent of the lumber manufactured in Tennessee was produced by large mills with annual capacities of 12 MCM million board feet or more (Table 3). By 2005, large mills produced more than 66

percent of the lumber. The increase in mill size across all regions is reflective of more efficient sawmill technology providing economies of scale and increased timber supplies. Still, there is a significant difference in the change in the proportional production in eastern Tennessee versus central and western regions of the state, suggesting other models of industry concentration also exist.

Table 3 — Percentage of total annual production for Tennessee hardwood sawmills produced by mills with capacities of greater than 12 thousand cubic meter, by region

Industry	1979	1989	1999	2005
West	21	42	61	59
Central	30	51	61	63
East	6	23	75	75
State	24	45	64	66

Source – Luppold and Bumgardner 2009.

In 1979 only 6 percent of the hardwood lumber produced in eastern Tennessee was produced in large mills. That same year, the interstate system of super highways was completed in this region and other regional highways were upgraded in subsequent years. By 2005, 75 percent of the production in the eastern region was manufactured in large mills. Of the eight large mills in this region in 2005, seven were built as large or very large mills after 1979. Thus, technology and transportation improvements have played roles in increasing hardwood sawmill concentration in the United States. However, perhaps the "mill of the future" will be smaller in size, or a multi-mill model, as increased collection and distribution costs related to fuel prices effectively reduce economically viable production levels at existing individual mills with wide procurement ranges.

Differences in the U.S. and Canadian Hardwood Industry

While the U.S. and Canadian hardwood industries are similar in many respects, there are some significant differences. I have already described regional difference in forest composition in the United States. By contrast the hardwood forests in Canada are primarily northern hardwood species such as sugar maple and white and yellow birch. In the current decade these northern hardwood species have commanded a higher price than oak because of a change in consumer preference.

Canada produces considerably less hardwood lumber than the United States, but the rate of decline in hardwood lumber production in Canada was less than the decline in U.S. production during the 21st century. On the demand side, this difference can be attributed to a better housing market in Canada compared to the United States (Statistics Canada 2009). On the supply side this difference can be attributed to the greater economies of scale of Canadian mills, a more desirable species mix for the current market, and access to timber on provincial lands.

Canada has traditionally imported more lumber from the United States than it has exported. Much of the lumber imported by Canada is comprised of more desirable and defined species (i.e., listed by name in the U.S. Census Bureau production statistics), while a large portion of the lumber exported is of undefined species, which infers low value aspen. The lumber Canada imports from the U.S. is used to make appearance products (Armstrong *et al.* 1993) while much of the aspen imported by the U.S. goes into pallets or construction material. Therefore the volume of lumber consumed by secondary manufacturers producing appearance products relative to the volume of grade lumber manufactured is greater in Canada than the U.S.

An examination of the wood household furniture industries provides a partial explanation for differences in the secondary processing industries in these two countries. Since 2000 century producers of furniture in the eastern United States continued to manufacture furniture in large, highly integrated plants that consumed rough lumber and other raw material. By contrast Canadian furniture plants produced furniture in small batches in smaller plants that utilized just-in-time procurement procedures to obtain semi processed hardwood dimension and other semi- machined materials. The markets served by these smaller plants were not initially targeted by Chinese furniture manufactures while the markets served by large U.S. manufacturers were. As a result, the Canadian furniture industry has not contracted as much as the U.S. industry in the 21st century.

The Future of the North American Hardwood Industry in a Global Market

The market for hardwood products is ultimately controlled by consumers of appearance-grade material and industrial products subject to the timber resource and the production and logistical (material procurement and product distribution) processes that transform timber into the final product. To remain competitive in global markets, the North American hardwood industry must continually improve production and logistical processes while understanding the strengths and weaknesses of global competitors. An example of what defines the aspects of a surviving industry versus an industry in decline can be found by examining the fortunes of the U.S. kitchen cabinet and furniture industries.

In 1977, the value of U.S. wood household furniture shipments exceeded kitchen cabinet shipments by 170 percent. Conversely in 2006, shipments of cabinets exceeded shipments of furniture by 78 percent (Luppold and Bumgardner in review). The most apparent reason for the

decrease in domestic furniture shipments is the dramatic increase in furniture imports since 1999 whereas cabinet demand has increased due to the popularity of larger kitchens and robust investments in housing. However, there also are less apparent controlling factors.

In the United States furniture is primarily sold to consumers from retail stores that order furniture through semi-annual markets. Most U.S. furniture producers that have gone out of business manufactured large batches of individual pieces of furniture in an attempt to reduce cost without sufficient consideration to consumer preference. Meanwhile, a growing volume of cabinets are designed and ordered by consumers and the resulting cabinets are manufactured in small batches allowing quick delivery. Cabinets sold directly to home builders as specified products also are manufactured in small batches for just-in-time delivery. Furniture manufacturers carry large volumes of finished products and raw material in inventory, while cabinet manufacturers carry low inventories of product and increasingly rely on just-in-time delivery of semi-finished materials. Furniture has become a quasi-commodity that is priced within narrow ranges depending on quality whereas sale methods for semi-custom and custom cabinets allow consumers to order the species, finishes, and features they want. The price competitiveness of the furniture industry has allowed low cost imports to become the major source of product available to the consumer. The short delivery time for both semi-custom and contractor specified kitchen cabinets makes these products less vulnerable to imports because of the additional time that is required to transport cabinets from overseas manufacturers.

Producers of hardwood lumber and other primary products are caught between a localized fixed timber base in the short run and a constantly changing market for their product. In the 1990s many producers of hardwood lumber focused on developing

high quality hardwood lumber from high quality hardwood logs. This philosophy resulted in the construction of highly efficient and expensive mills that could process higher grade logs but could not profitably process more abundant mid- and lower-grade logs. Just as many domestic furniture manufacturers assumed a market based on past trends but not the reasons behind these trends, hardwood sawmills assumed trends by examining current prices for random width, random length lumber and not the needs of their customers. In the future, primary hardwood processors must become more flexible in their ability to produce products while considering the fixed nature of hardwood base available to them and the need to control costs. Other service that sawmills and distribution yards may have to offer in the future include sorting based on color and other appearance characteristics and just-in-time delivery. Large capital expenditures must be based on the needs of secondary processors in addition to lumber price trends.

To remain competitive in a global market, North American secondary hardwood processors will have to foster more direct connections with the ultimate consumer and will become increasingly reliant on just-in-time delivery to manufacture semi-custom and custom products. This likely is a reason why sorting for lumber width, length, and color is an increasing priority for large hardwood sawmills in the United States (Buehlmann *et al.* 2007). Hardwood lumber and other primary hardwood product manufacturers must work with secondary manufacturers to reduce logical and secondary processing costs. Just as secondary processors have to manufacture products that fit the needs of appearance and industrial products consumers, primary manufacturers must manufacture products that fit the needs of secondary product manufacturers.

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