

SOURCES OF COMPETITIVENESS FOR SECONDARY WOOD PRODUCTS FIRMS: A REVIEW OF LITERATURE AND RESEARCH ISSUES

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ABSTRACT

More than 1 million U.S. workers in some 45,000 firms are employed in the lumber, wood products, furniture, and fixture industries. Wood household and office furniture (SIC 251 and 252) are the largest manufacturing segments, adding \$13.851 billion per year to raw product value. During the 1980s, U.S. furniture manufacturers lost sizeable market share to Pacific Rim countries. To improve their performance in increasingly global markets, U.S. manufacturers must have a clear understanding of how to assess their competitive position and how to affect its strategic determinants. This paper reviews existing information on the performance of the U.S. secondary wood products industry and summarizes current models regarding competitiveness and its sources. A review of the literature suggests that both internal firm processes and external market and government policy factors affect firm and industry competitiveness. However, these are rarely linked in a comprehensive analysis. This paper argues that in order to better understand the factors affecting global competitiveness in this industry, research is needed that combines engineering and economic analyses of competitiveness.

Primary and secondary wood products are important U.S. industries in terms of both total production value and export income. At \$77 billion in 1992, the value of primary wood products¹ production was larger than any other single U.S. agricultural crop and accounted for almost 15 percent of the value of all U.S. agricultural exports (63,65). Furniture and fixtures², most of which contain wood, added an additional \$40 billion to national production and \$2.5 billion to annual U.S. exports in 1992 (63).

While U.S. wood products manufacturers have had important comparative advantages in the past, today many are facing threats to their competitiveness and survival. During the 1980s, U.S. furniture manufacturers lost sizeable market share to the Pacific Rim, particularly Taiwan. In 1978, imports accounted for 8.6 percent of total U.S. wood household furniture shipments. In 1990, imports

accounted for 24 percent of total wood household furniture shipments (Table 1),³ approximately one-third from Taiwan (61). Taiwan, China, Malaysia, Indonesia, Thailand, and the Philippines were leading exporters to the United States throughout the early 1990s. From 1991 to 1995, these six countries provided a combined average of 46 percent of all U.S. wood furniture imports each year, peaking in 1993 with 49 percent of U.S. wood furniture imports (64).

In Taiwan, manufacturers import logs, especially oak, from the United States, produce wood furniture and components, then ship finished wood products back to U.S. consumers. Conventional wisdom suggests this is another example of U.S. business lost to low-wage foreign competition, similar to textiles, shoes, and electronics. Wood-based raw materials and products, however, are typically bulky and have relatively high transportation costs. Moreover, Taiwan is facing labor shortages and less favorable terms of trade than in the past (49). Wage differentials and exchange rates alone cannot explain the significant rise

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¹ SIC 24 series.

² SIC 25 series.

³ The value of U.S. wood household furniture imports in 1990 was \$2.57 billion, compared to \$0.56 billion in 1978. After adjusting to 1982 dollars, this translates into approximately \$1.9 billion in 1990 and \$0.7 billion in 1978 (33).

TABLE 1. — U.S. wood household furniture shipments, 1990.

Type of shipment	Year					
	1987	1988	1989	1990	1991	1992
Domestic wood household furniture shipments ^a	6,811	6,761	6,636	6,304	5,828	5,975
Wood household furniture imports ^a	1,805	1,720	2,012	1,949	1,798	1,874
Total wood household furniture shipments ^a	8,616	8,481	8,648	8,253	7,626	7,849
Imports/total shipments	0.21	0.20	0.23	0.24	0.24	0.24

^a Figures represent millions of dollars.

in U.S. furniture and wood products imports from countries such as Taiwan. Other factors must contribute to determining a firm's ability to compete in the global secondary wood products industry.

With rising furniture demand and the passage of the General Agreement on Trade and Tariffs (GATT) and the North American Free Trade Agreement (NAFTA), the U.S. furniture industry could increase its global sales (25,26,70,71). How can U.S. wood furniture manufacturers take advantage of these opportunities?

To improve their performance in increasingly global markets, U.S. manufacturers must have a clear understanding of how to assess their competitive position and how to affect its strategic determinants. The objectives of this paper are to:

- review existing information on the performance of the U.S. secondary wood products industry, and wood furniture in particular;
- discuss divergent definitions and measures of competitiveness;
- summarize previously identified sources of competitiveness;
- identify knowledge gaps that need to be addressed in order to better understand the factors affecting global competitiveness in this industry.

PERFORMANCE OF THE U.S. WOOD PRODUCTS INDUSTRY

STRUCTURE AND OUTPUT

More than 1 million U.S. workers in some 45,000 firms are employed in the primary wood products (e.g. logs, lumber, cants, ties, posts, and pilings) and secondary wood products (e.g. millwork,

furniture, cabinets, containers, veneer, flooring, and fixtures) industries⁴ (58). The largest segment of the secondary wood products industry, wood household and office furniture (SIC 251 and 252), employs over 130,000 people in approximately 3,000 firms and generates approximately \$13.9 billion per year in value added manufacturing (62).

As with most of the secondary wood products industry in the United States, wood furniture production is characterized by a large number of small firms using labor-intensive operations while incurring high raw material and transportation costs. To offset these costs in the past, furniture manufacturers have located close to forests in regions such as Virginia and North Carolina that have adequate transportation networks and abundant, cheap labor skilled in industry-specific practices (48,58,59). Today, policy makers, researchers, and community development officials are interested in promoting wood products with a high potential for adding value as an avenue to strengthen rural economies and to offset job losses in the primary wood products sector (51,52). As a result, rural communities across the United States depend on the competitive success of secondary wood products firms.

INTERNATIONAL TRADE

Global trade in furniture and related products has grown rapidly in the last two decades (14). Worldwide exports to Organization of Economic Cooperation and Development (OECD) countries, which account for the majority of world furniture trade, grew from \$1.2 billion to \$14.4 billion between 1972 and 1986 (48). By 1991, furniture exports to OECD countries rose to \$27.9 billion (35). The largest furniture exporters in 1989 were Italy, West Germany, Taiwan, France, and Canada. The United States was eighth among world exporters, accounting for 4.5 percent of world exports.

A 1991 literature review concluded that until the late 1970s, U.S. wood products industries retained absolute advantages within the U.S. market due to "abundant wood resources, significantly lower transportation costs, superior production capabilities and knowledge of consumer preferences" (14). However, when domestic furniture demand increased after the recession of the early 1980s, foreign producers captured most of the growth. Between 1980 and 1989, furniture imports more than tripled, from \$658 million to \$2 billion (1982 dollars) (33). In 1993, the United States imported \$3.4 billion and exported \$1.2 billion in household furniture. Wood furniture accounted for 60 percent of all household furniture imports in 1993 (63).

Taiwan was the largest furniture exporter to the United States during the 1980s (48,50). Since then, other Asian countries have entered global markets with low and mid-priced furniture (Table 2). U.S. furniture imports from China, Thailand, Malaysia, and Indonesia are increasing rapidly, in part fueled by Taiwanese investment. For example, furniture imports from China increased 60 percent in 1993 (10,49,63). Taiwanese manufacturers also are investing heavily in capital improvements to offset labor constraints and take advantage of their well-educated labor force. This will shift their production into better quality and higher priced wood products (48).

Much of the growth in international household furniture trade is due to packing and shipping innovations such as ready-to-assemble and knock-down furniture. Decreasing U.S. and world trade barriers promise to accelerate this trend (63). As international trade in furniture increases, analysts are both predicting and promoting cross-national product and part standardization that contributes to economies of scale in production and marketing (49).

⁴ Primary Wood Products = SIC 2421, 2429; Secondary Wood Products = SIC 2426, 2431, 2434, 2435, 2436, 2439, 2441, 2448, 2449, 2451, 2452, 2491, 2499, 2511, 2512, 2517, 2521, 2541.

PROBLEMS FACING THE INDUSTRY

Recent surveys reveal that secondary wood products manufacturers identify government regulations and insurance (workers' compensation) among their major concerns (31,52). In addition, U.S. manufacturers report increasing difficulties with raw material supplies, such as grade degradation and rapidly increasing prices⁵ (23). Sommers and Leinbach (52) and Dirks and Briggs (15) discovered that raw material supply and high raw material costs were among the top general concerns facing Washington's secondary wood products industry.

Concerns regarding government regulations are likely to increase as recent amendments to the Clean Air Act in 1990 are expected to require \$300 million to \$2 billion in investments to control volatile organic compound emissions in the furniture finishing process. The Department of Commerce predicts this will cause some firms to close or merge with larger firms that are better able to incur the required expenses (63).

A comparison of the Arkansas and Washington surveys reflects regional differences in access to raw materials. However, competition or lack of sales and government regulations are significant concerns for wood products manufacturers in both regions (31,52). While government regulations were cited as a top concern by Washington's secondary wood products manufacturers, insurance (workers' compensation) was by far the greatest concern among Arkansas secondary wood products manufacturers (31).

With today's global competition for raw materials and finished goods, the many small firms in the U.S. wood furniture industry need to have a broad view of the forces that shape growth and change in their industry. This requires a clear understanding of the meaning of competitiveness in the secondary wood products market and how it is measured. From this, each firm can develop a strategy for its own success.

COMPETITIVENESS

Most wood products research is designed to improve industrial competi-

TABLE 2. — U.S. furniture (SIC 251) imports by source, 1992.^a

Source	Value ^b (million \$)	Share (%)
Taiwan	969	32.4
East Asia (excluding China, Japan, and Taiwan)	528	17.6
European Community	593	19.8
Canada	357	11.9
Mexico	221	7.4
South America	51	1.7
Japan	6	0.2
Other	271	9.0
World total	2,995	100.0

^a Source: U.S. Department of Commerce (63).

^b U.S. dollars.

tiveness and economic sustainability (32,49). Researchers have focused on technology adoption and market analysis (67) or characterizations of some aspect of wood products manufacturing, such as wood utilization, technical change, factor substitution, or marketing and distribution channels (11,16,30,42,65). Empirical studies are of limited value because competitiveness and its causes are not clearly defined or easy to measure.

DEFINITIONS OF COMPETITIVENESS

The term competitiveness can be applied to firms, industries, markets, and nations. The relationship between firm competitiveness and market, industry, or national competitiveness is not well understood. In fact, economists have not yet devised a formal definition or theory of competitiveness (1,46). Neoclassical economists tend to associate competitiveness with external, market-based concepts such as comparative advantage, market distortions, and price (1,28,46).

In addition to the external components of a firm's competitiveness, internal determinants of efficiency and quality are cited as aspects of competitiveness by people concerned with industrial organization (13,21,45). Juran (21) suggests that any competitive analysis must include 1) an evaluation of competitiveness of *product* features; and 2) an evaluation of the features of the *process* or internal operations used to produce the products and the subsequent process yields. Skinner (47) also contends that competitiveness is connected to the internal operations of a firm and the technology used in those operations. Emphasizing the connection between external market factors and internal process fac-

tors, Deming (13) asks the question: "How many years will pass before government regulatory agencies learn that the forces of competition for price do not solve the problems of quality and service?"

Martin et al. (24) define competitiveness as the "sustained ability to profitably gain and maintain market share." Cook and Bredahl (12) argue that an adequate definition of competitiveness must include place, product, and time. They suggest "being competitive is the ability to deliver goods and services at the time, place and form sought by buyers, in both domestic and international markets, at prices as good or better than those of other potential suppliers, while earning at least opportunity costs on resources employed."

Taking all of these definitions into account, it appears that competitiveness is the ability to:

- produce goods or services that meet or exceed quality expectations of the customer;
- deliver these goods or services at the time, place, and price required by the customer;
- deliver these goods or services in the form and quantity required by the customer.

Competitiveness means that customers will elect to purchase these goods or services over those available from other potential suppliers. The production and delivery of these goods or services is accomplished using processes that ensure profitability, quality, and efficient use of scarce resources (particularly natural resources).

MEASURES OF COMPETITIVENESS

A survey of recent literature shows that international competitiveness, measured by stable or increasing market

⁵ Dick Udouj, wood products manufacturing specialist, Winrock International, personal communication, January 20, 1994.

⁶ Computer Aided Design/Computer Aided Modeling.

share, results from some combination of national endowments, imperfect competition, government policies, and business strategies (1,2,38,46). Sharples (46) suggests that comparative advantage is theoretical while competitiveness is empirical. If firms maintain or increase market share, they are competitive.

Porter (38) rejects market share as a measure of competitiveness because some nations experience solid increases in per-capita income with declining global export shares. Porter argues that the only meaningful measure of national competitiveness is national productivity, broadly defined to include improved product quality, design, technology, and production efficiency.

HYPOTHESIZED SOURCES OF COMPETITIVENESS IN WOOD PRODUCTS MANUFACTURING

According to Porter (38), the sources of competitiveness must be analyzed at the firm and industry level. Firms can gain competitive advantage by lowering their costs or differentiating their product with improved quality or service. Likewise, the National Research Council's Committee on the CAD/CAM⁶ Interface proposes "The keys to regaining competitiveness in most U.S. manufacturing industries are quality, productivity, and responsiveness in bringing new products to the marketplace" (6).

Porter identifies four sources of competitiveness/innovation: 1) factor conditions, including resources and factors of production; 2) quantitative and qualitative demand conditions, particularly in the home market; 3) the competitive status of related and supporting industries; and 4) firm strategy, structure, and rivalry, particularly as influenced by national institutions (27,38).

Building on Porter's framework, Martin et al. (24) categorize determinants of competitiveness according to sources of influence:

- 1) uncontrollable factors, including the natural environment, resources, and climate;
- 2) "quasi-controllable" factors such as input prices and demand conditions;
- 3) factors governments can affect such as taxes, exchange rates, and trade policy;
- 4) factors firms can determine such as strategy, products, technology, training, research, development, and linkages; i.e., "the manner in which they combine their

resources, the quality and distribution channels they choose through which to distribute their products and, particularly, the use of strategic alliances with their customers or suppliers."

Among models of competitiveness, studies that build on Porter's analyses combine a comprehensive definition of competitiveness with industry-level studies (4,24,39,67). A study of Canadian agribusiness identified 30 aspects of competitiveness including capacity, production costs, cycle time, scale, flexibility, product enhancement, new products, facility quality, new process technologies, marketing, and organization (24). In a survey of 90 small U.K. firms, sources of competitiveness were considered to include product development, scale of production, scale of firm, efficiency of production, overhead costs, marketing expertise, channels of distribution, quality of services, wages and salary rates, technology, proximity of suppliers, and flexibility (39). Product development and quality of customer services were most often cited as the most important sources of competitiveness.

Smith and West (49) surveyed U.S., Taiwan, and Korean furniture manufacturers regarding perceived competitive advantages and disadvantages in the U.S. furniture market. Both Taiwanese and Korean firms identified product value (the combination of higher quality and lower price) as their primary advantage in U.S. markets. Product design and service (including credit, warranties, and on-time deliveries) were the second and third most important perceived advantages. The primary disadvantage identified by firms in both countries was exchange rates. Korean manufacturers cited lack of marketing expertise as their second most important competitive disadvantage. Raw material costs and availability, labor costs and availability, and design and technology were identified as other areas where Taiwan and Korea lacked competitive advantage (49).

In recent years, analysts have recommended that wood products manufacturers improve their competitiveness by adding value to their products through product differentiation, quality improvements, and technology investments (2,32,49). West and Smith (68) believe that potential sources of competitiveness for U.S. furniture manufacturers include sustainable forest resources and practices, excellent transportation networks,

moderate labor costs relative to Europe, and healthy capital markets. The United States also has advantages in popular American product designs, communications technology, and strong relationships with American retailers, but these do not apply to foreign markets. American manufacturers miss opportunities to export secondary wood products because they fail to consider who their foreign customers are and what they want. For example, many Europeans want bedroom suites that include wardrobes because they do not have built-in closets. Yet most American furniture manufacturers fail to make wardrobes for this market. This highlights the importance of the linkage between manufacturing efficiency and the ability, and willingness, to deliver what the market wants. Competitiveness has to encompass all of the processes in getting a product that the customer wants into a market where the sale can take place.

SIZE AND COMPETITIVENESS

Historically, analysts have associated greater size with economies of scale and assumed that this implied greater competitiveness (19). Concentration ratios, which measure the percentage of production or shipments accounted for by the largest firms, increased for many U.S. secondary wood products industries in the last two decades (60). The Department of Commerce suggests that furniture industry consolidation will improve the competitiveness of these firms through production and marketing economies of scale (61).

However, there is a growing body of literature to suggest that small firms have competitive advantages in industries characterized by rapid product cycles, heterogeneous consumer demand, and advanced production technologies (19,39,43,52). More and more, these attributes characterize successful firms in wood furniture manufacturing. Researchers explain that small firms are able to capture economies of scale through collaborative relationships with suppliers, distributors, and other manufacturers. At the same time, they retain critical flexibility in design, production, and marketing (19,39,43,52). Consequently, small firms still dominate the secondary wood products industry.

Like the United States, Taiwan's wood products industry is dominated by small manufacturers. In a survey of 764

Taiwanese non-metal furniture factories, approximately 80 percent of the firms employed fewer than 50 workers and only 7 percent employed more than 500 workers (48). Similarly, small firms predominate among other major U.S. importers, such as Canada and Italy (14,37,48). Despite the abundance of small firms in these countries, Taiwan and Italy have captured more of the international export market than the United States, and Canadian firms have captured nearly as much as U.S. firms (48). This suggests that small size is not a disadvantage in secondary wood products manufacturing.

TECHNOLOGY AND COMPETITIVENESS

Most policy makers believe adoption of advanced technologies is fundamental to wood manufacturers' competitiveness in global markets. Productivity growth and technology adoption have been relatively slow for many segments of the U.S. secondary wood products industry (3,11,33,57,66,69). But this may be changing. Recently, researchers have been reporting signs of a shift towards greater capital investments and productivity gains in U.S. secondary wood products manufacturing (8,18,42,51,52,59). Successful wood products manufacturers must respond quickly to changing, and sometimes divergent, customer demands. Advanced manufacturing technologies can aid in the timely and successful response to these changing demands.

Rising raw material costs have encouraged technological innovation, particularly in countries with limited forest resources. Innovations in wood products manufacturing include the development of smooth-surfaced composite materials (such as medium density fiberboard) that use lower quality woods. This has led to the development and application of increasingly thin veneers since the problems of telegraphing have been reduced. Furthermore, use of thin-kerf saws has been spurred by the promise of increased lumber yield and reduced sawdust amounts (57).

TABLE 3. — Most important technological advances in wood furniture manufacturing.^a

Manufacturing processes	Percent adopting (%)
Wide belt sander	60
Computer-numerically-controlled equipment	30
Electronic glue-up system	29
Materials requirement planning system	26
Embossing process	23
Feed-through moulder	20
Computer-aided design	19
Computerized back gauges	10
Bar coding system	8
Automatic crosscut system	7
Computerized dry kiln	5
Electrostatic finishing	5

^a Source: West, C.D., K.D. Bahn, and S.A. Sinclair. 1991. Competitive policy paradigm of technology adoption: an empirical investigation. *In: Proc. Technology Transfer Soc. 16th Annual Meeting and Symp. Technology Transfer Soc., Indianapolis, Ind. pp. 318-332.*

America's major competitors, such as Taiwan and Italy, have invested more heavily in advanced production technologies. In their survey of Asian manufacturers, Smith and West (49) found that technology investment plans for the next year were similar for U.S., Taiwan, and Korean firms, but Asian firms budgeted greater investments in numerically controlled equipment when considering the 5-year planning horizon. Furniture and cabinet makers in European countries, such as Italy and Denmark, also employ state-of-the-art automated computer technologies, as well as use the 32-mm system of standardized parts to improve quality and efficiency (49).

Advances in production technologies for the wood products sector include improvements in computer controlled (CNC and DNC⁷) machinery. Table 3 lists the most important innovations based on a survey of leading U.S. secondary wood processors (68).

Many studies of U.S. firms show that both technology investments and export activity are associated with larger firm size (5,9,17,20,36,40,44). However, small Asian and European manufacturers are adopting improved product designs, new equipment and process technologies, and advantageous marketing arrangements to improve their global competitiveness (14,48,49).

In fact, adoption of new technologies may be more suited to smaller firms since they seem able to capitalize more on the benefits of the new technology than do larger firms. The benefits include factors that small firms typically depend on for market share, such as fast cus-

tomers response, quick production, more customization, and greater variety (29).

There is a strong consensus that technology investments are needed in order to regain and maintain U.S. competitiveness in secondary wood products. While their major foreign competitors were investing in technology, many U.S. firms lagged behind. Further research is needed to better understand this paradox. Existing work provides important clues. In a survey of Washington state furniture and cabinet makers, the cost of capital was the most important deterrent to technology investments. Investment risk was the second most important limitation, and the cost or unavailability of skilled workers was cited as third most important (14).

MANAGEMENT SYSTEMS AND COMPETITIVENESS

Soft technologies also may contribute to competitiveness. One such soft technology is management systems that provide production and financial data to control operations. The relationship between management and innovation or competitiveness is only now receiving attention in wood products research.⁸ However, studies in other industries demonstrate that management information systems can substantially improve firm performance (53,54). When considering strategic technological investments, it is important for a firm to identify specific competitive objectives, as well as significant environmental, structural, technological, individual, or task-related factors that facilitate or inhibit the successful adoption of new technologies (22,34).

⁷ Computer numerically controlled and direct numerically controlled.

⁸ Juett Cooper, personal communication. Dept. of Business, Marshall University, Huntington, W. Va. January 20, 1994.

MARKETING ARRANGEMENTS AND COMPETITIVENESS

Several researchers suggest that marketing arrangements are key to the competitiveness of small- and medium-size wood manufacturers. Market decisions hypothesized to affect competitiveness include product design, market intelligence, distribution channels, and customer service (41,67). Efforts to encourage value-added wood products increase the importance of marketing, product differentiation, quality, and higher-margin products (42,56). Marketing arrangements may be a particularly important source of competitiveness in secondary wood products manufacturing because of the high fragmentation and lack of coordination in distribution channels. Surveys in some states have found that most small secondary wood products manufacturers sell to individual contractors, homeowners, or retailers. Of these, independent local retailers account for the largest volume of sales (16,30,56).

Marketing arrangements allocate risk and transfer information along the marketing chain. Historically, U.S. furniture manufacturers have borne the majority of the marketing risk. However, they have had a good understanding of customer demand because they sold to local markets. Now markets are global and available information technologies allow firms to compete based on better information from consumers (7,55). Smith and West (49) found that Taiwanese manufacturers decreased their risk and acquired market information and access through original equipment manufacturer (OEM) arrangements, where firms contract to make products sold under U.S. brand names. Manufacturers may not need internal economies of scale in marketing if they are able to establish effective contractual relationships with other firms. Taiwanese manufacturers have accomplished this through U.S. furniture trade shows, marketing consultants, agents, and distributors (49).

CONCLUSION

Narrow definitions of competitiveness based on natural resource endowments, labor costs, or exchange rates alone are no longer adequate for most industries, including secondary wood products manufacturing. Manufacturers also may gain competitive advantages through product development, strategic marketing arrangements, and sophisticated management and technology sys-

tems. Broader definitions of competitiveness are emerging but still lack adequate empirical documentation. Research is needed on the relationship between industry structure and firm competitiveness that sorts out the impacts of various industry attributes, including size, location, and interfirm collaboration. An effective model for research on competitiveness must include product information, factors of production, industry structure, consumer demand (including customer perceptions and taste), marketing channels, manufacturing processes, quality, and service.

To address the needs of most secondary wood products manufacturers, researchers must develop measures and a framework that are applicable to small firms. Small- and medium-size manufacturers dominate this industry. These firms are often located in rural areas where economic development is needed. They also tend to be less able to access public and private sources of information and technical assistance. Competitiveness research must address factors that these small- and medium-size firms can affect. Otherwise, manufacturers may be left with the impression that competitiveness is beyond their control.

Our examination of the literature suggests that future research on the issue of eroding competitiveness of the secondary wood products industry needs to be a multidisciplinary approach, combining engineering and economic analyses to provide concrete information on how small firms can use innovative marketing arrangements, management systems, and other technologies to deliver what consumers want at the lowest cost possible. Future studies are needed to look at the whole chain of production/demand, because the competitiveness of each link depends on the performance of other links in the chain.

Future research also must integrate the sources of competitiveness that previous studies have examined individually. Engineering and business studies that analyze competitiveness strategies internal to the firm must be linked with economic research investigating sources of competitiveness that are external to individual firms. Only then will we understand the ways in which firm decision making affects industry competitiveness and international markets affect firm decisions.

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