

C I N T R A F O R

Working Paper

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**The Role of Manufacturing Clusters in the
Pacific Northwest Forest Products Industry**

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August 1998

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Executive Summary

Interest in manufacturing clusters has increased since the recognition that inter-firm cooperation has helped develop internationally competitive industries in several European countries. Manufacturing clusters, defined as groups of firms located within a defined geographic region that have developed cooperative links with each other, have been established successfully in industries ranging from textiles to robotics.

Manufacturing clusters can provide a region with the basis for economic diversification and competitive advantage even when that region at first glance might not appear competitive in a specific industry. The emergence of manufacturing clusters is not restricted to urban areas or technology-based industries. In fact, manufacturing clusters can provide a substantially greater contribution to the economic development of rural areas than urban areas.

Several rural value-added wood products manufacturing clusters have been identified in the Pacific Northwest, including the log home industry in western Montana, to moulding and millwork industry in Bend, Oregon, and the wooden boat building industry in Port Townsend on the Olympic Peninsula of Washington. These examples provide evidence that manufacturing clusters represent an opportunity to promote the economic development of rural areas in the Pacific Northwest. Rural locales, many of which are characterized by a high dependence on timber resources, have perhaps suffered the greatest economic hardship as a result of public policies that have slashed the volume of timber harvested from state and forests.

To date there appears to be little empirical research that assesses the emergence and development of value-added wood products manufacturing clusters. This project was designed to develop insights into factors that help clusters form and survive (*i.e.*, geographic location, proximity to raw materials, availability of other resources, industry specialization, firm-specific competencies, and the availability of support services). The specific objectives of this project were to: identify clusters of value-added wood products manufacturers in the Pacific Northwest, develop a spatial map of these clusters based on their geographic location, identify factors that contribute to cluster development, determine how specific factors impact the development of a cluster, identify value-added services (*i.e.*, marketing expertise, product design, or manufacturing technology) that support to manufacturing clusters, and provide a set of suggestions to assist local economic development groups to identify local clusters and assess their competitive advantages.

To better understand how rural manufacturing clusters originate and survive economic cycles and resource supply changes, three wood-based manufacturing clusters in three rural communities were examined. Local business people and industry experts were interviewed in order to assess: how each cluster originated, why each cluster was located in a particular location, what role government and industry associations played in the development of the cluster, and how the cluster survives in light of market fluctuations and supply changes. Opinions regarding interaction between firms and associations, the role of government, and recipes for individual firm success varied widely; however, many common elements were repeated during interviews.

While the manufacturing clusters presented in this report became established under different circumstances, each encountered common factors that were crucial to their success. An important point to consider is that these clusters did not develop overnight. Each existed for several years with a few small businesses earning moderate profits. As more individuals moved to the area, a cluster of businesses began to form. With the exception of the moulding and millwork industry in Bend, Oregon, the communities examined did not systematically set out to create an industry and the company founders do not appear to have been motivated by the prospect of making large profits.

The first common element observed between clusters was proximity and easy access to regional markets. The moulding and millwork industry in Bend, Oregon, originated as a group of mills located near railroad lines. The Bitterroot Valley in western Montana is not only located along interstate highways, but also in a region where log homes are a fashionable form of housing. Finally, Port Townsend's maritime industry capitalized on its proximity

to Seattle, an established boating community, and the boating traffic that cruises among the San Juan Islands and the Straits of Juan de Fuca.

A second common element in firms' decisions to locate in their respective locations was the plentiful supply of raw materials and potential customers. While respondents commented that resources were plentiful when their respective clusters emerged, they all emphasized that there is now a shortage of available timber. Firms are forced to obtain materials from other regions or to develop other technologies for using the available resource. For example, the moulding and millwork industry incorporates medium density fiberboard, finger-jointed lumber, and veneer-overlaid lumber into the products it produces. Respondents also reported spending more time locating suppliers that can supply them with raw materials.

Third, skilled labor has been critical to the formation and survival of manufacturing clusters. In the cases of Bend and the Bitterroot Valley, skilled workers already resided in the area, employed either as loggers or sawmill workers. Port Townsend, a long-time port, had a mix of individuals employed in both the maritime and timber industries. The concentrated group of firms and the community's internationally renowned boat building school continue to draw of skilled workers to the area, which in turn helps the cluster thrive.

Each cluster originated with a few firms led by energetic owners. While, these individuals did not set out to create a cluster of similar businesses, they did recognize the advantages of having related companies locate in the same area. They were also generally civic minded and open to working with other firms, either through joint marketing, sourcing materials from neighboring firms, or referring customers to other businesses in the area. For example, the Port Townsend and the Bitterroot Valley clusters started with a few individuals who enjoyed living in their respective area and were looking for a way to earn a living. Because these communities were small, people knew each other socially and in the business arena, and recognized that it was in their best interest to work together. In Port Townsend, business owners worked together to gain city government support and draw more businesses and workers to the area. In the Bitterroot Valley, cooperation took the form of purchasing specially milled logs from neighboring firms and exchanging workers in times of boom and bust among firms. The business environment in all three clusters extends beyond depending upon each other for survival. While businesses are still in competition, it was reported that there is an open exchange of advice, referrals between businesses, and at times, equipment is even loaned. As more companies move to the area, the cluster benefits from its reputation as a regional center for a specific product or service.

Another key component in the emergence of these clusters appears to be low levels of competition initially. Each cluster was the first in their respective region to provide their particular good or service. An important point to note is that as the cluster grows, new businesses identify unique niches with either a slightly different product or an entirely new product that complements existing products. While there is some overlap in product offering between firms, it appears that business owners attempt to compete with each other by offering unique products and services. For example, the major log home builders in the Bitterroot Valley specialize in different construction style or log type. For example, one company specializes in large-diameter logs which no other firm in the area uses and concentrates on building high-end log homes or lodges. Another company has developed a planer that enables its workers to process long logs. Other businesses in the area specialize in hand-hewn logs.

Respondents in Port Townsend and Bend also indicate that innovation is vital to the success of their clusters. Port Townsend business owners report that spin-off ventures by former employees are not uncommon. It is rare that these new firms are direct competitors of the original company. Rather, the new entrepreneur often identifies a product or service that does not exist. Similarly, innovation in the millwork industry maintain a comparative advantage by developing innovative products such as finger-jointed door jambs that utilize lumber manufactured from small diameter logs.

Each cluster's relatively small size and relationships within the local business community help it adapt to industry changes. Employees working in local businesses are more adept at identifying an industry need and creating a business to fill that need. Spin-off ventures appear to be important to a cluster's ability to adapt to market fluctuations and regulatory changes. Owners of fledgling businesses in each of these clusters have identified gaps or shortcomings in the industry and work to supply the industry with missing products or services. For example,

Edensaw Woods in Port Townsend supplies regional boat builders and woodworkers with hard-to-find, high-quality or exotic wood and veneer. As changes in fishing regulations required commercial fishermen to fish off-shore, other companies that build refrigeration systems or lengthen boats emerged. Similarly, there are several small businesses located in the Bitterroot Valley that specialize in supplying complementary products to the log home industry, such as furniture and cabinets.

Unlike the boat building and log home clusters, the millwork industry was developed and nurtured by government. Local government developed the business infrastructure and promoted the millwork industry. While the boat building industry in the Port Townsend cluster originated independently of local government assistance, it now receives below market-value rental space at the Port, community education programs in marine trades, and the town's Economic Development Council offers business advice and works to draw visitors to the area. The log home industry appears to be the most self-sufficient of the clusters with member firms reporting little government assistance.

While government may have helped the clusters in some respects, respondents were quick to point out instances of government interference which they feel restricts their operations. The boat building industry maintains an ongoing debate with local government over issues such as pollution cleanup and abatement costs, potential funding for a large vessel crane, and what industry views as city government's promotion of the tourist industry at the expense of the maritime trade. Business owners both in Port Townsend and Montana reported that the costs imposed by the state for workman's compensation are excessively high and represent an industry impediment. Respondents in all industries note that federal and state timber harvest restrictions adversely impact their competitiveness.

Industry associations, on the other hand, tend to be viewed more positively, possibly because of the voluntary nature of membership. Associations help establish and maintain contacts within the industry and lobby for the industries at state and federal levels. The Marine Trades Association organizes an annual boat show and makes booths available only to members. Other associations have helped set industry standards and promote their members' products both nationally and internationally. Cluster members also appear to benefit from non-membership organizations. Port Townsend's business owners benefit from the independently-run, non-profit Wooden Boat Foundation, which promotes the area's industry through an annual Wooden Boat Festival. Members of Montana's log home industry reported that they receive free advertising from log home magazines that often feature their homes in their articles.

The results of this exploratory project indicate that manufacturing clusters have been important to the economic development of rural communities in the PNW. Further, a range of factors that have helped in the development of local manufacturing clusters were identified and discussed. This information should prove helpful in providing economic development groups in rural timber-dependent communities with a framework for identifying and assessing the potential of promoting the development of manufacturing clusters in other rural areas. In addition, this research should be useful in helping public policymakers interested in promoting the economic development of rural communities adversely impacted by timber harvest restricted by providing guidance in identifying communities where economic and development assistance have the greatest chance of supporting the development of a competitive industry cluster.

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Manufacturing Clusters and the Forest Products Industry

Interest in manufacturing clusters has increased since business people recognized that inter-firm cooperation helped develop internationally competitive industries in several European countries. Manufacturing clusters, which can be defined as groups of firms located within a defined geographic region that have developed cooperative links with each other, have been successfully established in industries ranging from textiles to robotics.

Manufacturing clusters can provide a region that at first glance might not appear to be competitive in a specific industry with the basis for economic diversification and competitive advantage. The emergence of manufacturing clusters is not restricted to urban areas or technology-based industries. In fact, manufacturing clusters can provide a substantially greater contribution to the economic development of rural areas than urban areas.

Several rural value-added wood products manufacturing clusters exist in the Pacific Northwest, ranging from the log cabin industry in western Montana to the moulding and millwork industry in central Oregon, to the wooden boat building industry on the Olympic Peninsula of Washington. These examples provide evidence that manufacturing clusters represent an opportunity to promote economic development of rural areas in the Pacific Northwest. Rural locales, many of which are characterized by a high dependence on timber resources, have perhaps suffered the greatest economic damage because of timber harvest restrictions that have slashed the harvest levels on state and federal timber lands.

Changes in natural resource legislation at the federal and state levels have adversely impacted the volume of timber harvested from publicly-owned forests in the PNW. In Washington and Oregon, public ownership of timberlands represents 44.8% and 60.2% of the total resource, respectively (WWPA 1996). The impact of harvest restrictions on public forest lands from legislation and litigation is the primary factor behind the substantial decline in lumber production in the PNW. For example, from 1987 to 1996, total lumber production in Washington and Oregon declined by 15.6% and 39.2%, respectively, while during the same time period, the percentage of timber harvested from public lands declined from 38% to 23% in Washington, and from 60% to 20% in Oregon (Warren 1997).

In addition to reducing harvest volumes, timber harvest restrictions have made the majority of the remaining resource on public lands inaccessible, contributing to a decline in the quality of lumber produced in the PNW region. The primary timber species in the PNW are Douglas-fir, ponderosa pine and the hemlock-fir-spruce group collectively known as hem-fir. Between 1972 and 1996, for example, recovery of higher quality lumber grades declined from 22% to 11% for Douglas-fir, from 15.1% to 7% for ponderosa pine, and from 11.3% to 3.9% for hem-fir (Warren 1997). Harvest restrictions have further contributed to price increases and price instability.

Timber harvest restrictions have significant implications for the economies of timber-dependent rural communities. An unintended consequence of these policies has been the deterioration of infrastructure and loss of jobs in rural areas. Over the period of 1990-1996, a total of 288 wood processing facilities were closed in the Pacific Northwest, resulting in the loss of an estimated 24,409 wood products manufacturing jobs and over 5,000 timber harvesting jobs (Ehinger 1997). The loss of indirect jobs supported by these industrial activities is considerably larger, resulting in continued high unemployment levels in rural timber-dependent communities. Perhaps the most important impact is that the vast majority of mill closures are small- to medium-sized firms located in rural communities where their closure had a devastating effect on the local economies. These rural economies in turn affect the larger state economy through unemployment costs, loss in revenue contributions, and reduced buying power of rural residents.

In order to survive in this changing environment, rural communities must develop ways to revitalize their economies. The literature on manufacturing clusters will be discussed in a later section but it suggests that collaboration between firms can provide them with a significant competitive advantage through both formal and informal inter-firm collaboration. The result of this type of cooperation is the acquisition of information to identify new business opportunities that enhance the core service provided by the cluster, and in turn increase the

area's economic attractiveness in areas such as technological innovations, marketing, and new product niches. This need for "value-added" ancillary services provides the basis for expanding the cluster, resulting in a cluster which begins to take on some of the characteristics of a market. By facilitating access to business support services, development groups may have a greater impact in economically-depressed rural areas.

There appears to be little empirical research that assess the emergence and development of value-added wood products manufacturing clusters. This project was designed to develop insights into the relationship between cluster development and the factors that influence their development (*i.e.*, geographic location, proximity to raw materials, availability of other resources, industry specialization, firm-specific competencies, and the availability of support services). The specific objectives of this project were to: identify clusters of value-added wood products manufacturers in the Pacific Northwest, develop a spatial map of these clusters based on their geographic location, identify the factors that contribute to cluster development, determine how specific factors impact the development of the cluster, identify those value-added services (*i.e.*, marketing expertise, product design, or manufacturing technology) that appear to be important in promoting the development of manufacturing clusters, and enumerate a set of suggestions to assist local economic development groups identify local clusters and accurately assess their core specialties.

Review of the Literature on Industrial Clusters and Industrial Districts

"Industrial clusters" are groups of similar, nearby enterprises. "Industrial districts" are distinguished from clusters by the greater frequency of contracting and collaboration within them, which are thought to foster the success of more firms and generate competitive advantages. Throughout this report, we refer to the study cases as clusters to avoid prior judgment about whether and how these groups of firms interact.

How to achieve economic development in small communities has been of interest to researchers and policy makers for years. Over the past decade, manufacturing network strategies have been promoted as an option for revitalizing rural areas (Fossum 1992; Malecki and Tootle 1994; Rosenfeld 1992; Waits and Howard 1996). Manufacturing networks, as a set of economic development tactics, are influenced by recent studies of industrial districts.

Broadly, we expect the results of this exploratory study to show that firms within industrial districts are better able to adapt to shocks and new market opportunities. More specifically, if an industrial cluster has developed into an industrial district, we would expect to find:

- a) trade relationships between local firms, divisions of labor (*i.e.*, specialization), and the emergence over time of complementary production capacities;
- b) growth in specialized suppliers of material inputs, machinery, repair, and specialized producer services;
- c) development of specialized agents and distribution channels;
- d) labor advantages, in the form of a pool of workers with specialized skills and expertise in the industry;
- e) significant examples of horizontal cooperation between similar firms that would help these firms undertake larger projects or manage fluctuations in demand.

Within the study of industrial districts are two main streams of research. The first concentrates on large-firm led districts and is characteristic of recent American research on the topic. The second concentrates specifically on "the small firm variant," where dynamic local competitiveness "results from the clustering or networking of small firms, often in rural and developing areas" (Schmitz 1992). This second stream focuses specifically on understanding how small firms work collectively to develop an ability to capture the benefits of design, production, and marketing (Brusco 1982; Piore and Sabel 1984; Pedersen *et al.* 1994; Hansen 1991; Fossum 1993; Schmitz 1992, 1990; Rasmussen *et al.* 1992; Benton 1992; Longhi and Quere 1993; Crevoisier 1993; Sabel 1989).

A shortcoming of the American research is that most of it is concentrated on industrial restructuring in the urban (Scott 1986, 1993a, 1993b; Storper 1991, Gertler 1988), national (Harrison 1994; Glasmeier 1991), and international (Porter 1990; Glasmeier *et al.* 1992, 1993) settings. This reinforces a view of rural manufacturing

as being largely confined to basic raw material processing and routine manufacturing processes. The irony is that renewed interest in industrial districts springs from European studies, where many of the cases have been in relatively rural locations (Piore and Sabel 1983).

Lacking specific studies of specialized industrial centers in the rural US, there is a broad expectation that rural and peripheral manufacturers will shift production to lower-cost locations abroad in order to maintain their competitiveness. In many industries, rural locations appear to face declining opportunities for growth by simple attraction of routine branch plants (Glasmeier 1991, 1992, 1993).

Another theory that highlights the role of clusters, particularly in relatively rural or semi-peripheral areas, is that they help firms within them to adapt to disruptive circumstances in the business environment (Schmitz 1990, 1995). Among these “disruptive circumstances” are market instability, resource supply changes, and the ability of major industrial purchasers to search the globe for cheaper sources.

Industries often develop in regional concentrations. Initial location can often be traced to natural resource, transportation, or market access advantages. As industries develop, however, additional advantages develop based on the proximity of similar producers, including a skilled and specialized workforce, infrastructure investments, and the attraction of specialized service and components producers. In some cases (such as where orders are highly variable) these firms will more readily develop contracting relationships with neighboring firms, reinforcing specialization and divisions of labor between them. Critical information about products and markets flows more freely, quickly, and in multiple directions among nearby firms, in contrast to more distant firms where the flow of information is more costly, slower, and tends to be one-directional.

Another issue concerns the causal roots behind the rise in flexible forms of industrial organization. Why are “flexible” forms of industrial organization becoming more prevalent? There are three main schools of thought: a) changing demand, b) changing production technology, and c) the changing role of labor.

The first factor, changing demand, is attributed to the globalization of markets, combined with consumer demands that are increasingly fragmented and specialized (Piore and Sabel 1984). The argument suggests that the growth in demand for highly specialized goods has fostered a disproportionate rise in craft production complexes. Moreover, rapid changes in demand have favored a change in some vertically integrated production to vertically disintegrated production (*i.e.*, contracting and outsourcing) practices. Along these lines, Porter (1990) notes that regional demand is important to the emergence of specialized competitive advantages. It is worth noting that increasing population growth in the West and Northwest regions of the US means markets for many types of specialty wood products are growing.

A second main school of thought relates to changing production technologies. The rise of flexible process technologies, the programmable properties of which offer industrial producers greater versatility and ease of product changes is the main element of this argument (Gertler 1995). The nature of production technology and the role of access to suppliers and repair centers is an issue that in the past did not favor the emergence of rural industrial clusters. However, long term declines in the costs of transportation and communication tend to offset this disadvantage. Wardwell (1980) suggests that declining transport costs have enabled firms to achieve economies of scale and agglomeration in smaller communities.

The third factor concerns the role of labor in industrial organizations. This school of thought recognizes that labor skills are often a key advantage driving industrial concentration. It also notes that outsourcing and disintegration can be a means of reducing costs and enforcing discipline within a labor market (Scott 1993).

Finally, some researchers have identified factors that foster efficiencies within industrial clusters on a cumulative level (Malecki and Tootle 1994; Porter 1990; Schmitz 1990; Storper 1991). This research emphasizes the significance of the community in which industrial clusters take shape and grow, focusing not only on actual trade between firms in an industry, but also on the supporting services offered by other institutions and relationships that underpin these inter-firm transactions.

Manufacturing network initiatives are economic development strategies designed to help clusters of firms improve their competitive position. While there are many types of network initiatives, their common goal is to provide a cluster of firms with the competitive advantages that are inherent within industrial districts. The range of services provided by network initiatives is highly variable and can range from training programs, to infrastructure development, to marketing and management assistance. Common to network initiatives is that they aim to facilitate joint contracting and collaboration between firms. A key question for rural community and industrial development concerns whether network initiatives can use existing clusters of small firms in rural areas as the basis for promoting self-sustaining rural industrial development. In this respect, Michael Porter, in *Competitive Advantage of Nations*, maintains that “government policy will be far more likely to succeed in reinforcing an existing or nascent industry cluster than in trying to promote an entirely new one. Being preoccupied with ‘new’ industries obscures the fact that clusters always represent a mix of traditional and new industries” (1990, p.655-6).

Public policy leaders at the state and local levels are implementing a new wave of public and quasi-public sector revitalization initiatives intended to foster economic development by promoting cooperation within clusters of firms (Fossum 1993; Malecki and Tootle 1994a, 1994b; Rosenfeld 1992, 1993; Rosenfeld and Bosworth 1993; Lichtenstein 1992). Network initiatives help firms work with each other to mutual advantage. Small firms may join together to fill large orders, thus increasing their ability to compete with larger firms. Producer cooperatives and associations often do precisely this, or they may organize their members products into a product line that can be marketed jointly. The Italian shoe, textile, and furniture industries provide examples of this. Participants may also collaborate to produce goods that are too complex for individual firms working alone to produce (e.g., motion pictures, electronics, and residential construction) (Cortright 1990).

Public policy efforts that attempt to weave industrial districts into economic development policy tend to start with clusters of neighboring firms that show some potential for developing agglomeration economies and collaborative efficiencies (Schmitz 1995). A recent contribution to the study of industrial districts is the recognition that firms can gain a competitive advantage by working together outside the strict bounds of market exchange (Harrison 1991; Scott 1995; Schmitz 1995). Collaborative efficiencies (Schmitz 1995) or cooperative competition (Harrison 1991) include the development of inter-firm trust and reciprocal exchange that facilitate innovation and joint production. They also include efforts by external institutions that provide group services in marketing, design, training, or basic management. Harrison (1991, 1994) warns about the hazards of overeager generalizing but concludes that inter-firm collaboration can provide a distinctive, and very real, source of competitive advantage.

Industrial clusters can provide gains that may foster further competitive advantage and innovation. Such gains do not necessarily result from clustering, but they do facilitate a pattern of development that may have cumulative effects on growth and innovation. Malecki and Tootle (1993) conclude that the success of local networks must be considered in the context of their local settings, with attention to relations not just between kindred firms, to also to local sources of financial support and other basic institutions.

Longhi and Quere (1993) suggest that two aspects of small towns help transform a cluster of similar firms into an industrial district: a concentration of exchanges and collaborations, and the emergence of local markets and institutions that foster labor training and movement of skilled production workers between firms.

Schmitz (1992, 1995) found that a number of characteristics help promote the evolution from an industrial cluster to an industrial district. Among those characteristics are divisions of labor and specialization among producers; provision of specialized products at short notice or high speed; emergence of suppliers of raw inputs, machinery, and services; growth of agents and distribution channels; and development of a pool of workers with specialized skills and expertise. The more frequently such characteristics are found within a cluster of firms, the greater the gains from collective efficiency, which Schmitz (1995) defines as the competitive advantage derived from local external economies and joint action. The flow of information and learning among firms in close proximity is relatively free, fast, and multiplex; at greater distance, it tends to be more costly, slower, and more unilateral (Crevoisier 1996). Moreover, clustered firms may influence policy and be a target of purposeful public actions in ways that dispersed firms are not. This is of course the aim of industrial parks and business incubators. The role of the Port of Port Townsend in the development of that community’s marine trades cluster is a striking example

of this. Competition and cooperation between firms, and particular forms of collective action and governance, have been noted as features of the most successful and dynamic industrial districts (Saxenian 1991). Where these activities are underdeveloped, firms appear to be at greater risk of deepening difficulties within the cluster, and the erosion of their position in the larger market (Scott 1995).

In essence, joint action and collaboration become embedded in the form and function of an industrial district. Harrison (1992) notes that close inter-firm relations appear to be more common, or at least more effective, in cases where friendship, kinship, or community ties are strong. Schmitz (1995) describes cases in which personal and community-based norms gradually give way to more professional ones. This broad observation leads us to anticipate the direct expression of community norms in the competitive practices of clustered firms. The influences of community norms on industry practice tend to be more marked where firms are predominately smaller and are operated by longtime area residents.

The role of clusters in subcontracting and vertical and horizontal integration represents a departure from traditional thinking about the firm as the primary object of economic development policy intervention.

Not long ago, the mass production firm was the prime embodiment of a highly developed manufacturing industry. Today, as subcontracting replaces internal production, it is clear that webs of producers and suppliers, both globally dispersed and locally concentrated, have become the rule in many industries. However, where industrial clusters exist, industrial districts do not necessarily follow. Piore and Sable and the surge of scholarship that followed their landmark work, *Second Industrial Divide* (1984), conclude that renewed local competitiveness is a possible but not certain outcome of the decentralization of production. The idea that some clusters form in a setting that encourages firms to innovate and diversify, where others in apparently similar settings fail to do so is of intense interest to policy makers (Harrison 1991; Crevoisier 1993). Benton summed up this realization by stating that "if sweatshops and economic backwardness would result from industrial restructuring in one place, while technological innovation and the revival of craft might emerge in another, one challenge was clearly to understand the factors responsible for shaping different patterns of industrial change" (Benton, 1990, p.7).

Studies of industrial districts attribute their rise in importance to the growth and unpredictability of international markets (Piore and Sabel 1984), technological change (Gertler 1995), and labor flexibility and wage control (Scott 1993). Whatever the motive, the net result is the decentralization and vertical disintegration of many types of manufacturing firms. Many industries appear to be moving away from a strategy of vertical integration. Rather than promote the outright ownership of the discrete stages of production, there is growing reliance on subcontracting in many industries and regions of the world.

This trend towards subcontracting appears to apply in cases where markets are large, manufacturing is routine, and cost competition is intense. In industries such as high technology, textiles and apparel, and food processing, recent industrial development includes growth of a wider circle of subcontractors, partnering firms, and distributors. This aspect of contemporary industrial development highlights the role of "command centers" in exerting market discipline on independent and globally dispersed producers. Many benefits of industrial development accrue to those places that succeed in becoming centers for innovation and production.

Vertical disintegration is also seen within geographically concentrated industrial centers, where it may have a powerful role in district formation. One instance is the high technology agglomeration of Silicon Valley, an often-cited industrial district (Saxenian 1991, 1995). One interesting aspect of Silicon Valley is that no one or two major firms dominate its production. Rather, production is characterized by fluid interactions between large, mid-sized, and small establishments. Other specialized industrial centers (*e.g.*, Detroit's auto industry and Los Angeles's motion picture industry) have become industrial districts as the result of the process of restructuring by a few powerful firms. In all such cases, district formation is the product of a continuing process of industrial development.

Where industrial complexes exist, competitiveness is based on the communal industry of districts themselves, not the sum of firms' individual technologies, workers, and markets (Porter 1990). Understanding the ability of a

small firm to compete in a global marketplace requires that we consider its relationships with other firms. A small manufacturer might become a big firm, but it already is an integral part of a network of firms.

What has emerged from this research is a view of industry as a web of production agglomerations, linked in a system of interregional contracting and sales transactions (Scott 1995). Therefore, there is good reason to pay close attention to where, why, and how industrial districts emerge.

Case Studies of Industrial Clusters in the Pacific Northwest

In this study, we ask how industrial clusters are shaping development in an industry that is deeply embedded in, and indigenous to, the rural Northwest--the secondary wood products sector. The project seeks to determine the role of industrial districts as a basis for developing competitive advantage in the rural Northwest. The broader question, which this study begins to address, concerns whether such clusters may serve as a point of entry for economic development policy and practice.

This project employs three case studies to examine whether industrial districts are a viable strategy for creating competitive advantages in rural Northwest communities. At issue is how competitive advantage in value-added specialties emerges within the context of rural economies. There has been an increase in interest about promoting manufacturing clusters, yet few case studies exist that examine the emergence and transformation of industrial clusters as well as the factors that contribute to the survival of these rural manufacturing clusters. Using a four-state (Washington, Oregon, Idaho, and Montana) database of secondary wood products firms, we identified concentrations of specialized wood products manufacturers. After mapping several clusters, we interviewed academics, policy and development leaders, and industry representatives to help identify sites for further examination. Three clusters were selected for study on the basis of their regional and industrial diversity.

Three manufacturing clusters were identified and we interviewed managers of key businesses within each cluster. Managers or owners of establishments centrally involved in the production of specialized goods were asked to participate in an interview (Appendix A). A number of studies (Malecki and Tootle 1994a, b; Benton 1990; Storper 1991) have emphasized the need to understand the processes of specialization, innovation, and inter-firm relations within the broader local context. The analysis of each cluster draws upon the social, economic, and industrial history of the cluster locations. We also interviewed local institutional leaders who might provide some insight into how the clusters interact with primary wood products suppliers and small town economies.

While some industrial clusters are publicly supported by economic development initiatives, Harrison concludes that programs promoting inter-firm production networks have “far outpaced our critical knowledge of what works and what does not” (1994, p. 242). Different network initiatives are often patterned after approaches used in Europe and US major metropolitan areas – areas that are far from the experience of most timber towns in the rural Northwest. This study examines industrial clusters in the Pacific Northwest and aims to answer three main questions:

- a) Where and how have specialized clusters of wood products firms developed in the Pacific Northwest?
- b) Have they created competitive niches for value-added wood products in their localities?
- c) Have local and regional public sector institutions been involved in the formation and growth of those clusters?

This study assesses whether the cases presented are simply groups of similar firms, or whether local firms interact in synergistic ways that result in a more dynamic industry. There are identifiable habits and institutions that facilitate trade and reciprocity and improve the odds of flourishing. With this in mind, we expect to see developments within clusters that facilitate growth and adaptation to market changes.

While the idea of a “rural center” may seem like an oxymoron, it is not. The economic landscape is made up of more than big cities and scattered farmsteads, there is a multi-tiered structure of settlement sizes. Specialization does not radiate from the largest to the smallest. To the contrary, relatively small places can and do have specialties of their own, with markets that bear little relation to those of nearby cities. The three clusters studied here are located in non-metropolitan cities and towns around Northwest: Hamilton, Montana; Port Townsend,

Washington; and Bend, Oregon. Each is a significant producer of highly specialized wood products: log homes, wooden boats, and millwork, respectively.

In some respects, these rural industrial centers are smaller versions of those found in major metropolitan areas, but in many ways they are not. All centers of industrial specialization follow their own logic, shaped by a unique combination of product mix, markets served, industry history, an evolving local business environment, and ways of doing business. While these industrial clusters considered individually exert little or no impact on the national economy, they are integral to the rural economies within which they operate. The exploratory portion of this research suggests that small, specialized industrial clusters exist and thrive in the rural Northwest.

More importantly, small businesses and industrial clusters can be engines of growth and change for rural communities. A key question concerns whether industrial clusters are growth engines as industrial district theory would suggest and, if not, what factors might help to make them so. The restructuring of the wood products industry in the Pacific Northwest, the expansion of the value-added wood products industry, and the current interest in exploring the role of industrial clusters in promoting rural economic development make this a perfect time and place to examine these processes at work. While this research is of an exploratory nature, the project begins to fill a substantial gap in the understanding of the relationship between industrial district formation and rural economic development.

Structural Change in Pacific Northwest Wood Products Industries

Michael Porter bases his techniques for analyzing competition on "identifying the basic, underlying characteristics of an industry rooted in its economics and technology that shape the arena in which competitive strategy must be set" (Porter, 1980: pp. 6-7), suggesting that industry structure can gradually shift over time. Those involved with the forest industries in the Pacific Northwest over the past several years might point out that the shift in underlying industry structure has been anything but gradual, and that the impact of this shift has been dramatic. Over the last decade, continuing technological intensification in primary wood products processing coupled with environmental and policy pressures have "brought significant pressure to bear on firms and citizens of those rural communities traditionally reliant on forest products employment (Fossum, 1993)."

In this section, we present literature describing the structure of the solid wood products industries in the PNW. We will present social and economic indicators for the industries of interest in this study to summarize some of the structural changes occurring within them and their external operating environment. While linkages, especially raw material supply linkages, exist between the two major "branches" of forest products manufacturing, namely the pulp and paper and solid wood products sectors, the pulp and paper industries will not be considered in detail. Likewise, companies or individuals involved in the special forest products industry—commercial harvesters of wild mushrooms, ornamental plants, flowers, nuts, fruits, and other forest-based products—will not be considered. Of particular interest in this study is the secondary or value-added wood products industry.

Industry Structure

A working definition of an industry is a "group of firms producing products (and services) that are close substitutes for each other" (Porter, 1980, pg. 5). The wood products manufacturing sector therefore comprises a complex of industries producing non-substitutable products as diverse as construction lumber, utility poles, and kitchen cabinetry. Numerous industries in fact exist within the wood products sector that may have little more in common from a manufacturing or marketing perspective than their use of wood or wood fiber as raw material inputs. The wood products processing sector, although dominated by large producers of commodity lumber products, is fragmented and comprised of 1,912 firms (not including the logging or forestry industries nor self-employed individuals involved in wood products processing) in 24 different industries in Washington and Oregon in 1996 (Oregon Employment Division, 1997; Washington Employment Security Department, 1997).

Industrial Groups

The following conceptual framework segments the solid wood manufacturers into three large groupings: primary processors, remanufacturers, and secondary manufacturers. These descriptive categories are useful for grouping industries, but should be used with caution as much overlap occurs between the groups, especially in industries

where vertical integration backward into raw materials or forward into higher value-added products is commonplace.

Primary Processors

Primary wood products are manufactured from logs or cants which are then manufactured into standardized products, usually differentiated by manufacturer. Primary products include most sizes and grades of softwood and hardwood lumber, plywood, shakes, shingles, composite panel products such as particleboard, waferboard, and oriented strandboard. Primary products generally include unprocessed logs if marketed as end-products (Dirks and Briggs, 1991). The bulk of employment in the Pacific Northwest wood products industries is in primary processing.

Remanufacturers

Remanufacturers are producers of special sizes or dimensions of lumber or boards usually marketed through industrial channels to secondary manufacturers for further processing. These operations may be separate enterprises or may be integrated into a primary processing facility. Remanufacturers specialize in cutting custom products for specific markets such as window manufacturers, door plants, and furniture companies. Currently, published economic data about remanufacturing is rare, making the study of this industry sector problematic.

Secondary Manufacturers

A secondary wood products manufacturer is a producer of specialty or non-commodity wood products using previously-processed wood products as one or more of the major raw material components (Dirks and Briggs, 1991). While the terms secondary and value-added wood products manufacturers are often used interchangeably, we refer to the secondary wood products industries as a set of identifiable industrial categories that manufacture and/or market semi-finished or finished products such as millwork or cabinets. The term specialty wood products producers refers in this case to secondary wood products firms within specific industries that make highly differentiated, artisan-oriented products such as musical instruments, fine custom furniture, and arts and crafts.

SIC Categories

Federal and state governments use the Standard Industrial Classification (SIC) system to publish data and other information about industrial activity. Most of the secondary wood products industries selected as the focus of this study fall into one or more of the SIC categories shown in Table 1. Industries considered by the authors to be primary wood products manufacturing industries (including remanufacturers) are also shown. To the extent that data are available, these categories will be used in presenting employment, production, and export information.

Table 1. Primary and secondary wood products manufacturers according to Standard Industrial Classification codes for Group 24: Lumber and wood products and Group 25: Furniture and fixtures.

SIC Code	Description
Primary Manufacturing Industries and/or Remanufacturers	
2421	Sawmills and Planing Mills*
2426	Hardwood Dimension and Flooring Mills*
2429	Misc. Special Product Sawmills
2435	Hardwood Veneer and Plywood
2436	Softwood Veneer and Plywood
2493	Reconstituted Wood Products
Secondary Manufacturing Industries	
2431	Millwork
2434	Wood Kitchen Cabinets
2439	Structural Wood Members
2441	Nailed and Lock Corner Wood Boxes and Shook
2448	Wood Pallets and Skids
2449	Misc. Wood Containers
2451	Manufactured Housing
2452	Prefabricated Wood Housing and Components
2491	Wood Preserving

2499	Misc. Wood Products
2511	Wood Household Furniture
2512	Upholstered Wood Household Furniture
2517	Wood TV and Radio Cabinets
2521	Wood Office Furniture
2531	Public Building Furniture
2541	Wood Partitions and Store Fixtures
2599	Misc. Furniture and Fixtures

*most remanufacturers are included in these two industries

Source: Standard Industrial Classification Manual, 1987

The Concept of Value Added

The term "value added" is often used interchangeably or in conjunction with secondary manufacturing. Value added is a measure of the difference in value between a firm's finished products and the raw materials it uses to produce them (Ringe and Hoover, 1987). A strict definition of value added at the firm level is the difference between the delivered cost of raw material inputs and the total (FOB plant) value of all the products obtained from them. Value added can be thought of as a measure of the amount of return available to cover production costs, including profit (Ringe and Hoover 1987). Thus, Williston (1991, pg. 1) defines value added with respect to the forest products industry as "any product, land use, or resource that promises an increased return to the operator."

While this definition is useful in explaining how value is created through various business activities, the concept of a "value chain" is relevant to strategic marketing planning whereby a firm decides where and how to compete along a continuum from "upstream" manufacturing operations to "downstream" service functions (Porter, 1985). In fragmented industries such as wood products manufacturing, "an effective strategy may be to increase the value added by the business by providing more service with sale, by engaging in some final fabrication of the product (like cutting to size or punching with holes), or by doing sub-assembly or assembly of components before they are sold to the customer" (Porter, 1980, pg. 208). The business press abounds with references to value-added resellers, value-added manufacturers, and value-added processors within wood products and many other industries.

Industrial Linkages

It is clear that material supply and service relationships exist between firms in the primary and secondary forest products industries, creating interdependencies among the various industrial sectors. For example, while much of the output of the primary sawmilling industry is based on the demand for lumber in residential and commercial construction, a significant proportion of output is used by secondary manufacturers (US Department of Commerce, 1990).

Conway (1994) assessed current conditions in his study of the economic impact of the forest products industry on the Washington State economy. Basing much of his analysis on the Washington State Economic Input-Output Model, the author quantifies some of the linkages that exist between the forest products industry and other sectors of the economy. According to this analysis, about one in every thirteen jobs in Washington State is currently dependent upon the forest products industry. By 2000, the number is expected to decline to about one in every eighteen jobs (Conway, 1994).

Change in the Primary Processing Industries

While it is not our intention to analyze structural change in Pacific Northwest wood products manufacturing industries in depth, some of the changes that have occurred over the past few years are important as a backdrop to studying secondary wood products manufacturing clusters in rural areas. Other concepts such as timber dependence play an important role in understanding changes that are occurring in rural communities throughout the Pacific Northwest.

Brunelle (1986) studied the structural change occurring during the late 1970s and early 1980s in Oregon-based national, regional, and independent sawmills and plywood mills. Plant closures and employment losses occurring during that time were put into the context of industry concentration in fewer mills, productivity gains (often

decreasing employment) due to improved technology, the trend of some national firms to shift operations away from solid wood into paper production or to the southern US, decreased demand for certain commodities, uncertain timber supply, and high transportation and labor costs. The story the author presents is not entirely grim, however, as anecdotal evidence suggests that some companies find success through innovative management, investments in new technology, or accessing new markets.

Timber Harvest

Changes in timber supply over the past six years have been dramatic in Oregon and Washington, where efforts to protect the habitat of the endangered northern spotted owl have restricted the timber available for harvest on public and private lands. Figure 1 shows two large reductions in timber harvest in the four-state region between 1978 and 1995. The first major reduction took place during the early 1980s and was largely a response to weak timber markets, which suffered along with the rest of the US economy during a major recession. While other demand factors are also important, US and to some extent Japanese housing starts are two drivers of wood products demand, and hence timber harvests. US total, western US, and Japanese housing starts are shown in Figure 2 for the period 1978-1995 to illustrate changes in potential demand for timber-based products.

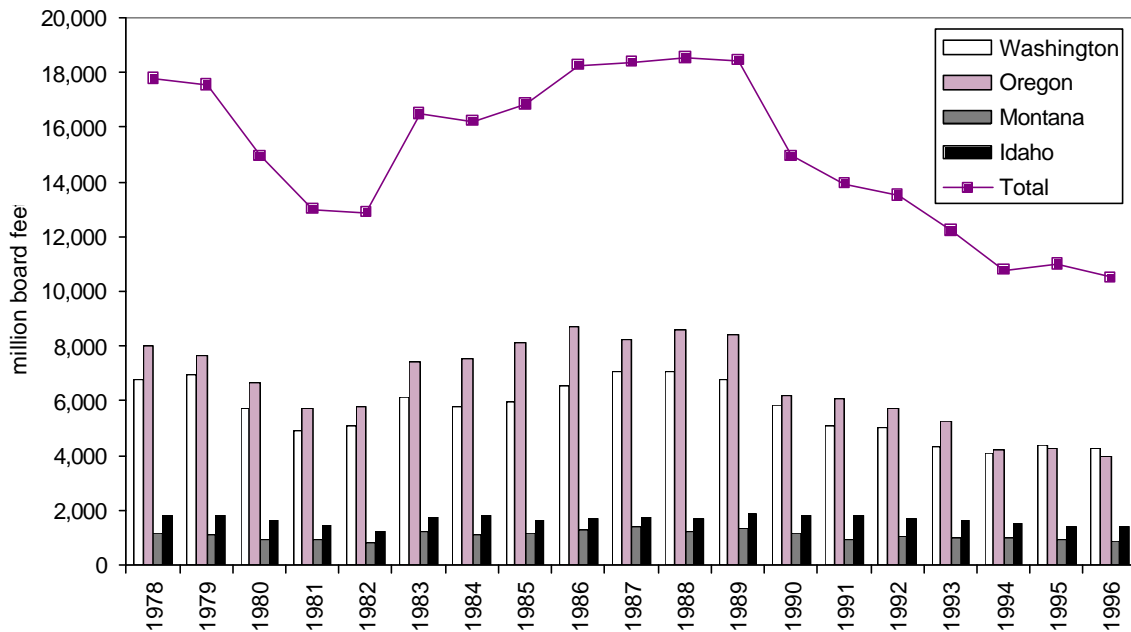


Figure 1. Regional timber harvests, 1978-1996

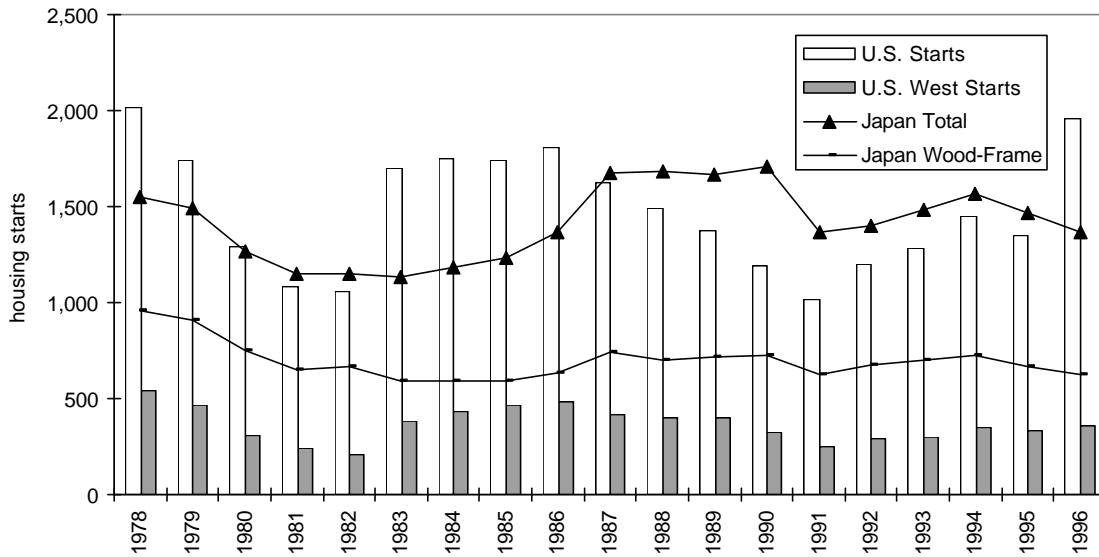


Figure 2. US total, western US, and Japanese housing starts, 1978-1996

Timber harvests in the four-state region dropped from 18.4 billion board feet in 1989 to 10.9 billion board feet in 1996 (Warren, 1997). This was a slight gain over the 1994 harvest level of 10.8 billion board feet. While this reduction in regional timber harvest was partially driven by reduced housing demand in the US during the early 1990s, it is more fully explained by incorporating supply-side restrictions on timber harvest. Japanese housing starts remained strong through 1994 and US housing starts began to recover in 1992, but regional harvests continued their downward trend from 1992 through 1996 despite increased domestic and international demand for wood products. The most recent harvest reductions, at least in the Oregon and Washington forests affected by timber-production restrictions in habitat areas, appear to be policy related and a function of supply limitations as opposed to the demand-driven reductions experienced in the early 1980s. Regional supply-oriented harvest constraints have been used in recent long-term forecasts of timber supply conditions in Washington State and in projecting trade flows of forest products in the Pacific Rim (Adams *et al.*, 1992; Bare *et al.*, 1994; Perez-Garcia *et al.*, 1994).

Lumber Production

The volume of softwood lumber produced by regional mills tells a similar but slightly different story than the regional timber harvest. Both bottomed out in 1982 and recovered to peak levels in the late 1980s, but instead of declining rapidly to new lows in 1994 as did the timber harvest, regional lumber production has fallen, but not as precipitously as the timber harvest (Figure 3). Production increased slightly in 1994 to about 13 billion board feet. One explanation for this trend is that logs were diverted from export markets to domestic producers during this period (Perez-Garcia *et al.*, 1994).

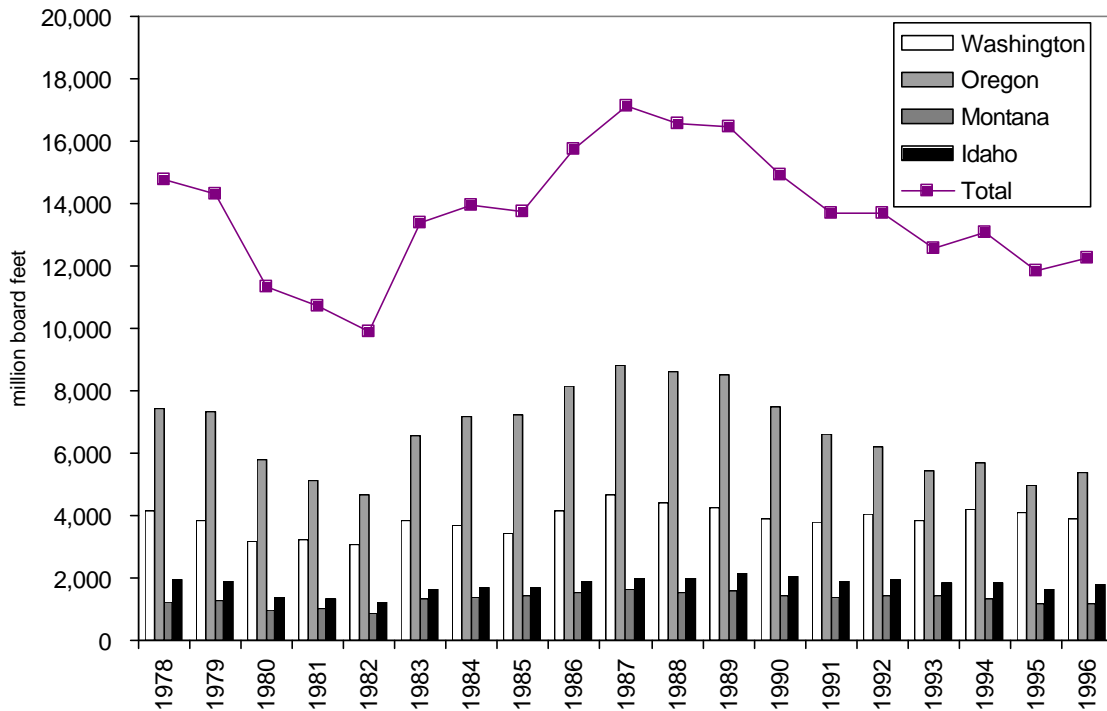


Figure 3. Lumber production in the Pacific Northwest, 1978-1996

Mill Closures

Decreases in harvest levels (as opposed to short-term reductions in response to decreased market demand) impact communities through primary processing plant closures. According to Ehinger and Flynn (1997), 288 primary forest products mills (including two pulp mills) closed in Oregon, Washington, Idaho, and Montana between 1990 and 1996, resulting in 24,409 lost manufacturing jobs (not including logging and other woods-based jobs). Ehinger and Flynn estimate that 391 lumber, plywood, veneer and board plants remain in the region: 185 in Oregon, 108 in Washington, 59 in Idaho, and 39 in Montana.

Employment

Job losses are also reflected in state employment reports. Figure 4 shows employment in the lumber and wood products industries for the four-state area between 1978 and 1996. Approximately 108,000 people were directly employed in solid wood products harvesting or processing in 1996 (Warren 1997), a 16% decline from regional lumber and wood products employment in 1989 which was 130,800. Structural change in the industry is also evident in employment trends, as technology and productivity gains led to increased production with fewer workers during the recovery from the early 1980s recession, while decreased harvest levels and processing led to further declines in the late 1980s and early 1990s. Regional employment in lumber and wood products increased slightly in 1994 for the first time in six years, even as the timber harvest continued its decline. Increased lumber and log imports from Canada and other regions may now be providing sufficient raw materials to help stabilize regional production and associated employment levels.

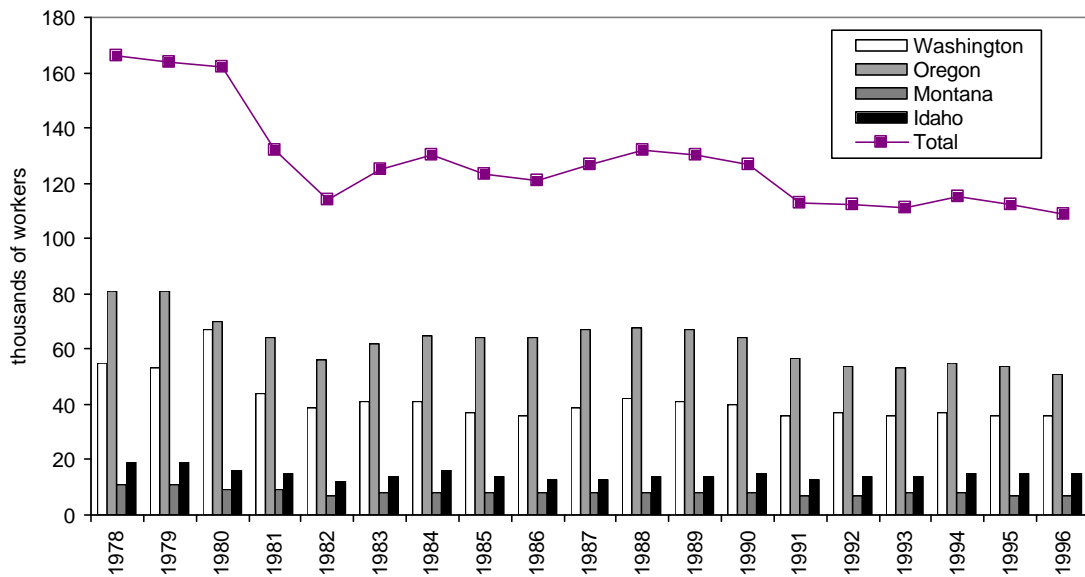


Figure 4. Regional lumber and wood products employment, 1978-1996

Impacts upon Timber-dependent Areas

Primary forest products job losses tend to be concentrated in rural areas that depend upon timber for a large share of employment (Dolbeare *et al.* 1983). Thus, certain counties and communities are described as "timber dependent," based on the proportion of jobs stemming from the timber industry and the lack of alternative employment opportunities. Structural unemployment has clearly impacted the vitality of many timber-dependent communities in the Pacific Northwest, wherein traditional forest-based or primary timber processing jobs have become obsolete due to the changing economic and social environment. The human dimensions of this impact and the limited alternatives for the most traditional of producers, communities, and families were examined by Strange *et al.* (1990), who found that the most resource-dependent communities appear to be far less successful than their more diverse counterparts at generating outside investments and diversifying into other industrial sectors. Lee (1995) analyzes county-level employment changes between 1988 and 1992 in the spotted owl region of the Pacific Northwest and concludes that the "counties most reliant upon federal wood supplies are also the most challenged by the need for economic revitalization." The author also finds that family-wage jobs in wood processing industries are being replaced by lower-paying service sector jobs.

Classifying Counties for Timber-dependency

Counties in the four-state region were classified based on their degree of timber dependency. Data from County Business Patterns (Anonymous 1996) were used to determine the percentage of each county's total employment within Standard Industrial Classification (SIC) categories including logging, lumber, and wood products (SIC 24). A range of direct employment quotients was developed and a mapping of timber-dependent counties is presented in Figure 5.

A major limitation to this classification approach is that geographical differences within counties tend to be masked, especially in the larger counties. Within any given county, one area may be urban or suburban and another rural and/or forested. Individual communities within counties may be dependent upon timber and forest products processing regardless of whether or not the county as a whole is classified as forest products dependent. Because employment and business data are rare and inconsistent at the community level, we use the county classification approach as a starting point to identify clusters. This data may be modified to include clusters in known timber-dependent communities and areas whether or not the county that they fall within is classified as economically dependent upon timber and forest products processing.

Change in the Secondary Manufacturing Industries

Few economic indicators are available to assess the secondary manufacturing industries in the Northwest. The measures that exist indicate that as a whole the secondary wood industries in the region have not been as severely impacted as the primary manufacturing sector in terms of plant closures or employment losses from raw material declines and other underlying structural changes occurring during the late 1980s and early 1990s. In fact, production, employment, revenue, and export data all indicate that this sector has been relatively stable and has even experienced modest growth in recent years.

Production

Production data for the secondary manufacturing industries is not readily available outside of individual companies. Many of the industries in this sector do not produce goods that lend themselves to the measures that are prevalent in the commodity-oriented industries. For example, while linear measures of moulding production may be available from industry association data, it is irrelevant to report the volume of pallets, or even worse, furniture, that a company produces without knowing more about the products themselves. Is it a single-use low-grade or reusable high-grade grocery pallet? Is most of the value of the furniture in the wood itself or in the labor used to produce it? It is not uncommon for a secondary product with very little volume to be of very high value.

Employment

Washington and Oregon lumber and wood products industries in aggregate (classified as SIC Group 24) experienced a 34% regional decline in direct employment between 1979 and 1996. Taking the subset of secondary processing industries from this industrial group and adding to them the wood furniture and fixture industries, the secondary manufacturing industries in Oregon and Washington experienced an overall employment increase from 28,722 persons in 1979 to 31,560 persons in 1996 (Figure 6). While employment decreased with the business cycle and a drop in housing starts in the early 1980s, the sector rebounded and grew throughout the rest of the decade, slipping only slightly with the recession of the early 1990s.

Despite these impressive overall employment gains, it is difficult to differentiate benefits of secondary industry growth to rural and/or timber-dependent areas. Dirks and Briggs (1991) reported that the majority of Washington's secondary manufacturing firms are located in the more economically diverse urban or suburban counties of the state. Polzin *et al.* (1992) built a spatial distribution model of value-added manufacturing firms aggregated at the state level and found a strong correlation between state secondary manufacturing employment and population levels. Based on a statistical analysis, these authors further divided industries into those which are located closer to the resource base, those which are both resource- and market-oriented (located near population centers and near resource supplies), and those which are market-oriented (using population levels as a proxy for market demand). While millwork and structural wood members manufacturing firms were found to be both resource- and market-oriented, most of the other secondary manufacturing categories listed in Table 1 were found to be statistically more likely to locate in populated counties. Lee (1995) reported that between 1988 and 1992, employment gains in secondary manufacturing within the spotted owl region were taking place in or near urban centers or transportation hubs rather than in timber-dependent counties facing the need to diversify their economic base.

Table 2 summarizes employment and payroll information for logging, primary processing, and secondary processing for Washington and Oregon between 1989 and 1995. Despite dramatic employment and payroll declines in the logging and primary products sectors, the secondary products industries as a group grew by 18% in

employment and by 34.6% in payrolls over the six-year period. The large increase in payroll in secondary manufacturing indicates

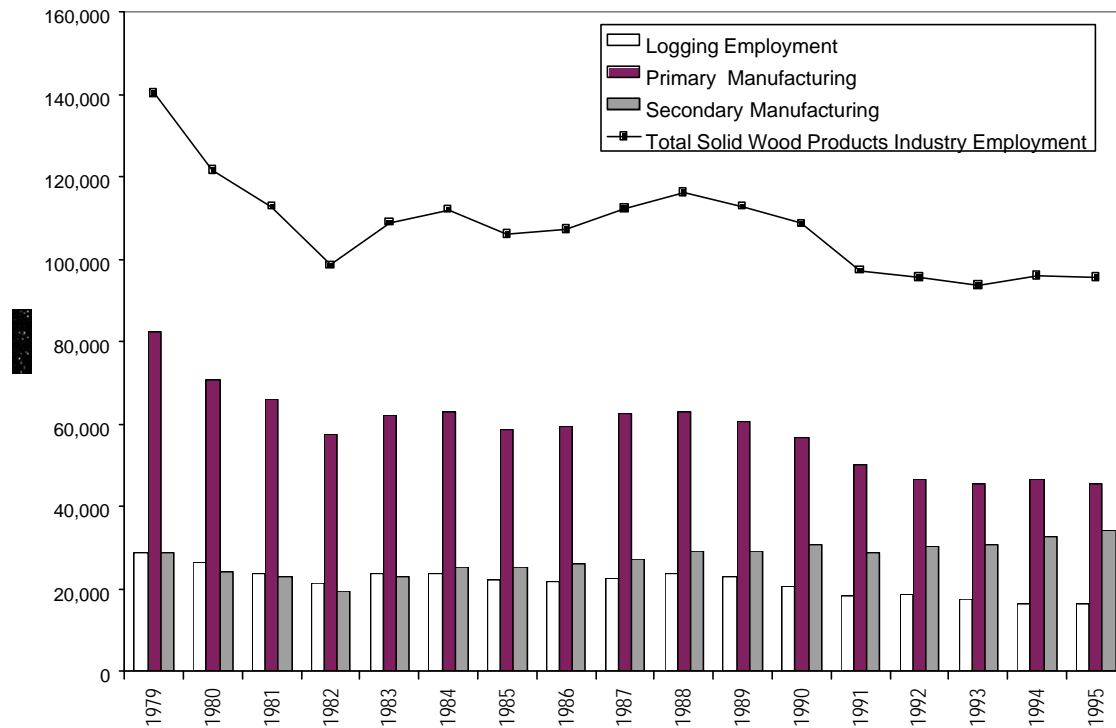


Figure 6. Washington and Oregon wood products industry employment, 1979-1995

Table 2. Employment changes in the Washington and Oregon logging and wood products industries by industry groups, 1989-1995

Sector	1989 Employment	1995 Employment	% Change, '94 vs. '89	1989 Payroll	1996 Payroll	% Change, '95 vs. '89
Logging	22,979	16,481	-28	\$571,317,532	\$508,915,003	-11
Primary wood products	60,556	44,072	-27	\$1,064,933,436	\$1,560,332,354	-47
Secondary wood products	29,345	31,560	8	\$574,005,801	\$812,169,047	41
Total	112,880	92,114	-18	\$2,210,256,769	\$2,881,416,404	30

Sources: Washington State Employment Security Department, "Employment and Payrolls in Washington State by County and Industry;" Oregon Employment Department, "Covered Employment and Payrolls by Industry and County."

that this sector has responded well to cost-of-living increases as well as to its overall increase in employment. Secondary employment increases did not compensate for all the losses in the logging and primary wood products sectors, and job growth is not likely to be in the same geographic area as the job losses experienced in the logging and primary manufacturing sectors. Therefore, jobs lost in the primary sector, especially in those in timber-dependent rural areas, were probably not replaced by new jobs in the secondary sector.

Export Growth

Porter (1990) presents a model of competitive advantage showing how growing industries become exporters of goods outside of a particular region. As a firm or collection of firms gains competitive advantage, regional exports (goods shipped outside of the region whether to another country or another state) typically increase. The lack of economic indicators for the secondary wood processing sector makes measuring changes in domestic production and product shipments difficult if not impossible, but fortunately product shipments outside of the country are easily tracked through an analysis of export statistics.

The secondary manufacturing sector has experienced remarkable growth during the past several years. In 1996, the US exported \$1.9 billion in secondary wood products compared to just \$767 million in 1989. Secondary wood products exports from the PNW increased for the sixth year in a row to reach \$392 million, a change of 258%. The share of Northwest exports to the national total grew from 14% in 1989 to 21% in 1996, reflecting both growing Asian markets and a growing local manufacturing and service sector that has been able to capture new market opportunities.

Figure 7 illustrates the growth of the Pacific Northwest's total secondary wood products sector during the past six years. Figure 8 shows the ten leading secondary wood product exports from the PNW and their market growth over the past six years.

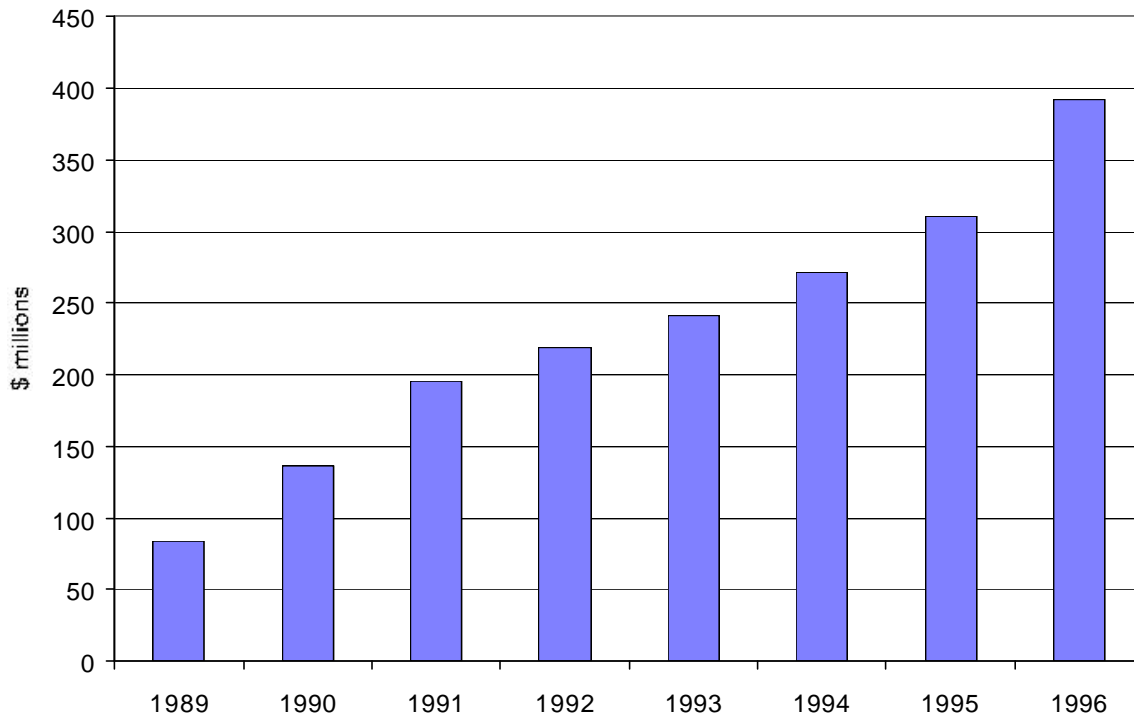


Figure 7. Total secondary wood products exports from the Pacific Northwest, 1989-1996

In contrast to export growth in the secondary manufacturing sector, most primary wood product exports from the Pacific Northwest decreased as a result of the changing raw material structure and regulatory policies (*i.e.*, log export bans) in the region. Figure 9 shows primary wood exports with major products highlighted.

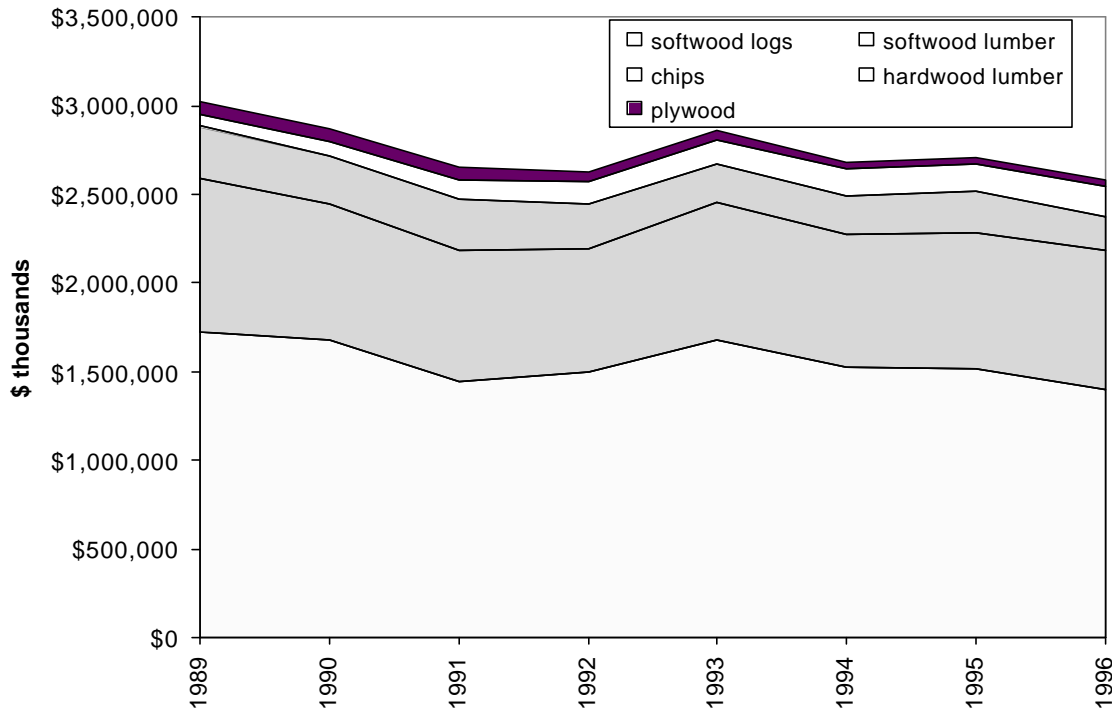


Figure 9. Leading primary wood product exports from the Pacific Northwest, 1989-1996

Economic Development and Value-Added Wood Products

Several studies and reports have addressed economic development issues concerning the secondary wood products manufacturing sector in the Pacific Northwest. Rufolo and Strathman (1990) wrote that state governments in the Pacific Northwest have responded in two major ways to help timber-dependent areas weather the decline in public timber available for harvest: 1) by limiting export of logs from state-owned lands, and 2) by encouraging more secondary processing. The authors presented a shift-share analysis of regional changes in the secondary forest products industries between 1974 and 1987 and concluded that growth in the sector throughout the period is more likely due to growth in aggregate national demand than to any positive structural changes that created competitive advantages for regional secondary manufacturing. They cautioned against initiating full-fledged economic development efforts without first analyzing demand factors that determine industrial growth.

The Northwest Policy Center found significant differences between sub-sectors within Washington's wood products industry and reported that existing state programs failed to adequately address these differences (Sommers *et al.*, 1989). The Northwest Policy Center proposed that the state implement a business assistance program to provide market information and export assistance services. The proposed project would include sector specific service centers and a network of trained field agents who could provide market information and export services, transfer technology and needed skills to improve competitiveness, and foster the development of manufacturing networks to individual small businesses or groups of small business throughout the state. The need to exchange manufacturing capability information vertically between primary and secondary manufacturing firms was identified as a primary component to develop better inter-industry linkages and to encourage local processing. The study recommended that policies that target the primary products sector should "encourage the development and utilization of more modern, flexible technologies," while policies designed to assist the secondary manufacturing sector should, among other things, be aimed at helping local firms "access the high-value, high-quality, and high-income product niches" in domestic and international markets.

Following extensive focus group interviews with primary and secondary wood products industry participants throughout the state of Oregon, the Northwest Policy Center recommended a menu of seven policy options to

stimulate the state's secondary wood products industries (Sommers and Birss, 1990). Four principles guide their policy recommendations: 1) that state policy should focus on helping existing firms rather than attempting to attract new industries, 2) that programs or strategies should be selected with full industry involvement, 3) that a variety of programs or strategies would be appropriate given the diversity of the secondary manufacturing sector, and 4) that the state should facilitate the competitive abilities of companies but should not get involved in identifying products with expansion potential (Sommers and Birss, 1990). With the goal of making Oregon's secondary wood products industries "the best in the nation," private industry and state government have adopted several of this study's policy recommendations, including the formation of Oregon's Northwest Wood Products Association, now a private non-profit that promotes the competitiveness of the state's secondary wood products industries.

An assessment of Washington's secondary processing sector found a diverse and active collection of companies, with some industry segments steadily adding employment throughout the mid- to late-1980s (Dirks and Briggs, 1991). The authors assessed the stability of the sector and found it relatively susceptible to downturns in US construction. Other issues relevant to economic development addressed in this study included the special needs facing rural manufacturers of value-added products, the implications of differences in distribution channels served by various manufacturers, the extent of domestic and international marketing, and the dependency of the sector on locally-produced raw materials.

Several studies have been initiated by states, provinces, counties, and other local governmental organizations to foster value-added processing and/or develop new industrial sites and facilities (Campbell, 1983, Rufolo, 1990).

Service Sector and Support Organizations

An industry does not begin and end with firms that manufacture products. Companies that provide specialized services are often a driving force within the industry, including firms that buy or represent products and sell them to other businesses or consumers, companies that manufacture and sell equipment used by the industry, and business consultants that help the industry answer specific questions. Associations representing the industry, analysts and observers, and public sector support organizations also develop over time, depending on the industry's size and economic impact. Linkages between rural forest products manufacturers and these service providers are often essential to their marketing efforts outside of the rural areas in which they are located.

Many service firms and support organizations increasingly target value-added wood products. In Washington, at least two major banks have targeted value-added wood products businesses for lending and public service programs. State organizations such as the Washington State Department of Community, Trade and Economic Development, the Oregon Department of Economic Development, and university research and extension programs throughout the region have developed business assistance programs or have been involved with such efforts as sponsoring promotional directory projects or trade shows. At least two industry-centered organizations, the Evergreen Partnership and the Oregon Wood Products Competitiveness Corporation, actively recruit and provide trade and business services to value-added wood products firms.

Wood Products Networks

Manufacturing networks have been formed in several parts of the world by small firms which recognize the competitive advantage that they can gain from these arrangements (Hatch, 1988). These networks, often initially formed around shared services such as marketing promotion or joint materials purchasing, can develop into positive collaborative relationships whereby networked firms:

- engage in joint production to serve large-scale purchasers;
- specialize in some phase of production from component manufacture to assembly of finished goods;
- become flexible enough in production to serve a variety of new market niches; and
- create economies of scale in administration or shared overhead expenses (*Ibid.*, 1988).

Several studies have focused on wood products networks as a strategy for coping with change, especially in rural, timber-dependent communities, and for creating sustainable industries in the long term. Sommers and Leinbach (1989) surveyed the wood products industry in Washington State to explore the potential for developing flexible manufacturing networks.

Syme and Duke (1994) reported a methodology and strategy for implementing a market-based wood products network in two rural counties in South Carolina. Pointing out the lack of success of many rural development efforts due to a lack of situation- and site-specific planning, they developed a plan by first assessing market potential for specific product types that could be produced in the region and then matching this potential against the region's current wood products operations and its development objectives. Finally they assessed operational barriers and opportunities to develop a slate of existing and potential producers and service providers that could form a sustainable network of manufacturers. The authors assert that their "growth from within and without" approach differs from many economic development efforts in the Southeastern US that concentrate exclusively on recruiting firms from outside of the area in question to relocate. The eventual network envisioned by the authors would consist of a combination of existing businesses, new businesses developed, and recruited workers both from within the area and outside of it.

Wood Products Clusters

In an early white paper addressing the policy directives for building manufacturing networks in the Pacific Northwest, Hatch (1988) wrote that network-building should begin by targeting key sectors and then identifying clusters of related firms within those sectors. He added that "at a later stage, in-depth research—at the establishment level—will be required to assess the technological level, workforce skill, product capabilities, markets, and linkages within target sectors and geographical areas." Despite the subsequent formation of rural wood products networks in the region, very little published research has addressed geographically-concentrated clusters of value-added wood products producers in the Pacific Northwest other than "industry studies" typically conducted at the state level.

Keegan *et al.* (1991), in writing about the status and development of Montana's log home industry, indicated that the availability of dead lodgepole pine logs from forests in western Montana was a factor promoting the geographical concentration of 35 companies that produce hand-hewn, machined, and sawn log homes or log home packages and generate that \$30 million in sales. Logging companies and sawmills had adopted the practice of sorting out highly valued "house logs" for resale to local log home producers, implying a positive or synergistic interaction between complementary industries.

Promoting the secondary wood products sector in the Pacific Northwest, particularly in rural areas, is a complex regional challenge. This study identifies and examines existing geographic clusters of value-added wood products producers in rural areas to discover how manufacturing, marketing, and service interactions between firms create deliberate or unintentional linkages that ultimately improve the competitiveness of each cluster.

The Marine Trades Industry of Port Townsend, Washington

Port Townsend, Washington, is located in Jefferson County at the northeastern tip of the Olympic Peninsula, approximately 45 miles across the Puget Sound from Seattle. The town, with a population of 7,000, is a center for repair and construction of commercial and recreational wooden boats, and fiberglass and composite yachts. By 1992, more than 400 individuals were employed throughout Jefferson County by the marine trades industry (Economic Development Council of Jefferson County, 1992). The current directory of the local Marine Trades Association (MTA) lists 70 firms in the Port Townsend area which specialize in vessel repair and related services. Of 20 towns in Washington, California, Oregon, and Alaska which have large-vessel haul-outs, Port Townsend is one of only two communities which have multiple full-service boat repair firms clustered around this type of facility.

Cluster Development

The maritime industry has been present in Port Townsend for many decades, but grew into a concentrated industry in the 1970's with an influx of boatbuilders and recreational boaters, and with increased support from private and public institutions. Erik Andersson, Executive Director of the Economic Development Council of Jefferson County (EDC), stated that the Port Townsend boat building cluster was "definitely not by design" and instead occurred in a somewhat "haphazard way."

The boat-building cluster appears to have developed in Port Townsend for a mix of disparate reasons that include lifestyle, infrastructure and services, and proximity to strong regional markets. First, a few key businesses with owners who were active in community and interested in promoting public interest and education about boating and the Port Townsend boat-related industry, moved to the area. Second, the Port of Port Townsend rents business space at below market value, providing small, emerging firms with relatively low financial barriers to entry, and attracting larger firms to the area. Third, public and private non-profit organizations such as the EDC, the Wooden Boat Foundation, the Northwest School of Wooden Boatbuilding, the Magnet Center, and the MTA, have offered services to encourage and promote the boating industry in the area, train workers, and organize interaction with firms in other regional markets. Fourth, Port Townsend, which is located at the intersection of the Puget Sound with the Strait of Juan de Fuca, is easily accessed by commercial and recreational boaters from Canada, Alaska, Washington, Oregon, and California. The town's scenic location also helps draw over 20,000 visitors each year to the Wooden Boat Festival. Finally, the semi-rural lifestyle attracted both craftspeople and potential customers to the area. One of the major attractions for people living and working in Port Townsend is the lifestyle. Most of the individuals involved in the wooden boat building business have not chosen their occupation based on the goal of making a lot of money. Instead many have chosen to exchange higher-income occupations in order to live in a rural community and pursue a craft-type occupation.

Business Environment

The larger firms in Port Townsend tend to be full-service wooden and fiberglass boat builders and repair firms. However, the cluster extends far beyond basic services. The existence of the cluster has helped foster new niche firms which provide specialized products and services to the market and fill in with services that the larger firms do not provide. Port Townsend is known particularly for its high-end custom services such as sailmaking, custom interior woodwork, component manufacturing, rigging systems, design, and suppliers of high-quality raw materials.

As a community of small firms which offer specialized services, there is a high level of cooperation among the businesses and organizations in Port Townsend, described by one respondent as a "fraternal type of interaction." Referrals between businesses are the norm, which has helped Port Townsend become known as a one-stop location for high-quality workmanship. One business owner summed up the benefit of having many related businesses in the area by stating that "When a boat comes to town for one job, that often leads to other jobs for other businesses. Because there are so many boat businesses in Port Townsend, it draws consumers, then keeps them going from shop to shop." Consumers are directed to particular businesses primarily by referrals from boat businesses. The referral practice and close contact between maritime businesses and community organizations are critical to maintaining the town's reputation for high-quality work. Individuals or businesses which do not do good work quickly become known among other business owners and consumers as such. A member of the business community noted that contact within the cluster was integral to maintaining the community's reputation. He stated: "[Port Townsend boat service businesses] are not cheap. What brings people to Port Townsend is quality. So the fact that I have enough trust in who I refer customers to says a lot."

Some business also comes through referrals from outside of Port Townsend, including referrals from former customers, affiliated businesses, trade shows, advertising in trade publications, and MTA involvement. While most businesses have a regional customer base, some firms extend into more distant markets. Admiral, a large yacht building and repair company, has an international reputation and customer base. The company's intent is to sell yachts to international markets and draw customers back to Port Townsend for yacht repair and servicing. Port Townsend receives more international business as the Pacific Northwest draws more yachters. Other examples of companies that rely upon outside referrals include Edensaw Woods, which draws much of its business from national sales of exotic hardwoods and marine plywood. Port Townsend Sails produces hand sewn sails which are internationally known for their quality workmanship. Integrated Marine invented a refrigeration system which it markets nationally, and Pygmy Kayak produces wooden kayak kits that are sold nationally. The ability for firms to expand to more distant markets appears to be partly dependent upon having a distinctive or new product. It also appears that firms in a cluster have the ability to identify and expand more readily into new product or service niches, which in turn contributes to the success of the entire cluster.

While there is close cooperation in terms of referring customers to neighboring businesses and sharing advice, there are limits to cooperation, and companies generally do not share equipment or space. One exception is the

Port Townsend Shipwrights' Cooperative, where boat builders share a common workspace. Referring customers to other businesses helps keep customers coming to Port Townsend and generally does not take business away from neighboring firms.

The referral practice extends to area institutions. The Northwest School of Wooden Boatbuilding and the Wooden Boat Foundation regularly refer consumers to various area businesses. More formal referrals come through insurance surveyors in the area, who assess work needed and help identify qualified companies to repair damaged boats. These people can be integral to the referral process, and at least one surveyor has extended his insurance business to become a broker for repair contracting among area businesses.

Port Townsend's workforce is as specialized as its range of businesses, and the diversity and flexibility associated with this workforce have contributed to the cluster's ability to adapt to market changes. One interview respondent described Port Townsend's workforce as a three-tier arrangement. The first tier is full-service boat builders and repair businesses, including Admiral Marine Works, Baird Boatbuilders, the Port Townsend Shipwrights' Cooperative, and Galnikoff Marine. These primary boat builders and repairers range in size from 3 to 150 employees. Some of these businesses, such as Baird Boatbuilders, a general contracting firm, also subcontract to independent craft people.

The second tier consists of firms which produce components, supplies, or service specialties, such as Port Townsend Sails, which makes hand-stitched custom sails; Cecil Lange Boatworks, which rebuilds wooden hulls; Edensaw Woods, a high-quality domestic old-growth and exotic wood supplier; and Integrated Marine, a manufacturer of refrigeration systems for fishing boats. All of these companies employ less than 20 employees, and most are on the lower end of this range.

Tailgaters make up the third tier. These one-person businesses are a highly flexible workforce of independent contractors who have little overhead except for their tools. They work in a wide variety of specialties ranging from interior woodwork to boat restoration. Because the services in this group overlap with services of the second tier of businesses, tailgaters are viewed in two ways by formal businesses: some believe tailgaters are uninsured free-riders who gain from the benefits brought to town by formal businesses; others view them as highly skilled and seasonally flexible workers who can fill in when business is busy. While it may seem that this informal workforce is easily taken advantage of, many craftspeople prefer its flexible hours and seasonal down times for its fit with their lifestyles.

Capacity to Adapt to Change

An important factor in Port Townsend's ability to remain and grow as a business center in a relatively rural area is the industry's ability to adapt to changes in regional economic situations and in the fishing industry and recreational boating. Part of Port Townsend's business longevity can be attributed to individuals and firms which identify gaps in the cluster's services and develop or fill a niche with a new business. There are several variables that Port Townsend has had to adapt to since the cluster's emergence, including regulatory changes in the fishing industry, timber supply limitations, and seasonal business. In almost all cases, innovation and flexibility within the cluster have helped the industry survive.

While emergence of the cluster in the mid-1970s can be traced to the attraction to the area of firms from other parts of the region, introduction and growth of new firms today appears largely due to the spin-off ventures by skilled craftspeople from other local businesses. Often these new businesses are not in direct competition with the originating firm, but fill an open niche in the community. For example an employee of Port Townsend Sails started a company named Artful Dodgers, which produces canvas covers for sailboat cockpits. The company is now widely renowned. The owner of Port Townsend Sails reported that Artful Dodgers has drawn a lot of work to Port Townsend because the dodgers are custom fitted to the sailboat. The fitting process takes approximately one week, and during this time the boat owner often has the sailboat serviced at other businesses in Port Townsend. Baird Boatbuilders, a well-established firm in the Port Townsend boatbuilding cluster, began after the owner left Port Townsend Boatworks. Port Townsend Shipwrights' Cooperative is the result of its founding members leaving Port Townsend Boatworks to start their own operation.

One significant area of adaptation involves regulatory changes. Changes in fishing regulations require fishing boats to fish further from shore and have created the need for operations that “stretch” or insert midsections to make the vessels larger. In addition, a refrigeration system invented by Integrated Marine is sought by fishing boat owners to maintain the quality of the catch and its freshness. One respondent noted that there are fewer fishing vessels coming to Port Townsend from Alaska and British Columbia, possibly because of revenue declines in the fishing industry, and as a result, businesses which once specialized in commercial boat services are expanding their focus to include recreational boats. Port Townsend is also working to attract more recreational boaters through increasing the popularity of the Wooden Boat Festival and by participating in the Seattle Boat Show. The locale is also becoming an increasingly popular location for yachting as international locations become more dangerous.

Logging restrictions and declining supply of old-growth timber have limited the price and supply advantage that Port Townsend once had over other areas’ tropical hardwoods. Prices for area lumber have risen approximately two-and-one-half times since logging restrictions were instituted and raw materials are more scarce. Wooden boat repair requires raw materials of high quality. Dimensional and structural lumber must be clear, have a high ring count, and be free of knots. Local vessel repair businesses refuse to use second-growth wood because they cannot guarantee the workmanship and durability of the repair and consequently have concerns about liability. When these supply limitations began, another member of the business community identified a niche and a new business emerged. Edensaw Woods supplies the immediate area and national market with high-quality domestic old-growth and exotic woods. Almost all respondents interviewed indicated that they purchase wood from Edensaw, and would buy from Edensaw even if the company was not located in the community. It is also common practice for boatbuilders to invest a great deal of time in finding and establishing relationships with mills that produce high-quality wooden planking.

The commercial and recreational boat building industry is by nature seasonal and the workers and businesses have adapted to survive in this environment. In fact, part of the draw of Port Townsend and the boatbuilding industry in general is the seasonal work and independent lifestyle associated with it. It appears to be a general agreement between business owners and workers that work is not constant throughout the year. This is not to say that the businesses in this cluster do not take their businesses seriously or are content to have business slow at particular times of the year. Rather, they have learned to survive in spite of business fluctuations. Some of the first tier firms market themselves as “full-service” boat repair firms to draw more business and hire additional subcontractors who specialize in particular services such as refrigeration if business in that area increases. Valuable components in this industry are the tailgaters, who work during the boating off-season when repair and service work is in demand, but employers do not have to worry about providing work when business slows.

Role of Associations, Institutions and Governments

Public and private organizations have contributed to the cluster in many ways. They offer business assistance, attract and train workers, encourage industry interaction, and draw business to the area through trade show involvement. Government, as in almost any business cluster, impacts business prosperity and the ability for the Port Townsend cluster to thrive. Public funding and support for the boating industry has been an important component in the success of Port Townsend’s boat building and repair business. Facilities such as the Port of Port Townsend, which leases space at below-market prices, enable individuals to open businesses with relatively little capital.

Public and private training programs have helped draw and develop a skilled labor pool that changes with demands in the maritime and forest industries. The now-defunct Magnet Center was a free training program held at the high school to teach people in the community practical work skills. One of the four components in the program was marine trades. Interview respondents stated that the Magnet Center was valuable to the community because it provided a place for loggers and millworkers displaced by logging restrictions to receive re-training. It introduced young people to the marine trades industry, and local companies which would have had to send workers to Seattle for training could keep their employees in town. After federal funding for the program ended, the EDC and the Forest Service funded the program for a time.

The Northwest School of Wooden Boatbuilding, which started in the 1980’s, is the community’s primary training organization. The school draws an international student base and teaches wooden boat construction as well as

cabinetmaking, finishwork, and sailmaking. While only a small portion of the students become part of the local workforce, over time the numbers have become significant. The school's far-reaching reputation also helps draw attention and business to Port Townsend. The school also promotes interaction in the business community. Local business owners are regular teachers at the school and do this as their way to participate in community service.

Another organization that draws the community together is the Wooden Boat Foundation. This private group is an educational organization, the goal of which is also to promote the boat building craft and industry in Port Townsend through educational outreach, a library, and the annual Wooden Boat Festival. Several respondents reported volunteering with the Foundation. It is viewed widely as a very positive contributor to the cluster.

The MTA is a major source of marketing and inter-regional interaction within the industry. Members participate as vendors in the Seattle Boat Show, which is important in drawing business to the cluster as a whole. The MTA represents the industry in state and local public affairs. Respondents stated that a drawback of the MTA is its somewhat inconsistent activity. As a result, the EDC now staffs the MTA as part of the services it offers. The EDC is also an advocate for the maritime industry in its negotiations with city government. It was a proponent in the battle over the new large-vessel haul-out years before it was actually built. The EDC is the only organization in the area main purpose of which is business development. It provides business counseling and promotes export assistance and education programs.

While the city has encouraged the maritime industry through initiatives and business development plans, some individuals interviewed stated that Port Townsend's city government is averse to industrial growth. While Port Townsend's large-vessel haul-out facility is now under construction, the city's reluctance to approve the project resulted in lost revenue and jobs when Port Angeles built its own large-vessel haul-out in 1996. As a result of the stalemate, Admiral Marine Works, a luxury yacht builder and one of the major employers in Port Townsend, moved a major portion of its operations to Port Angeles. Admiral is keeping a portion of its operation in Port Townsend with the addition of the large-vessel haul-out. In addition, the port is issuing a request for proposals for a marketing company to draw additional business. Falcon Marine, a ferry repair business, is also moving to Port Townsend as a result of the large-vessel haul-out and port expansion. The port's Executive Director explained that the city, state, and federal economic development programs fund projects that create more jobs fairly readily, but are reluctant to fund actions required to ensure environmental health and policy compliance. He stated that:

Generally, government grant programs in support of infrastructure development are pretty good. The heavy lift-out facility is an example and was largely funded by Community Economic Recovery Board (CERB) funds. The biggest problem is in generating economic development in 'brown' areas. Public policy mandates and supports creating jobs and requires waste runoff management, but city and state government will not help financially with environmental cleanup. To generate economic development in older areas, you have to do environmental cleanup, and there is no money for that, so we can't comply with the environmental regulations. The state will approve projects such as the pier because it creates jobs, but won't give money to put into environmental compliance, such as the stormwater system, because it doesn't [directly] 'create jobs.'

In addition to the debate over cleanup of closed sites, there is a dispute between industry and local government over financial responsibility for on-going waste emitted by boats and repair shops. The city believes local industry should be fully responsible for cleanup of these wastes as a cost of doing business. Business owners on the other hand, state that they cannot afford to bear the entire cost of cleanup. The business owners also note that runoff from streets contributes to the water pollution problems and for that reason the city should share a portion of remediation and pollution abatement costs.

A final issue concerns local tensions over the area's gentrification and the difficulty of balancing industrial with amenity-based growth and development. A respondent emphasized the importance of preserving working ports and marine trades in the face of burgeoning tourism and residential development. In communities such as Sausalito, for instance, condominiums and hotels have replaced waterfront maritime businesses and land has become too expensive for the previous business owners. Similarly, some condominiums have been built along the waterfront

in Port Townsend. There is still support in the community for this industry as marine trades are part of the area's draw for tourists. Waterfront development has stopped for the time being.

Another initiative suggested by business owners to help maintain the boatbuilding cluster in Port Townsend is for the Forest Service to develop a way to operate small-volume timber sales. Respondents stated that logging restrictions have eliminated the competitive advantage that Port Townsend used to have over wood-based industries in other locations. Several respondents also noted the positive role played by the Magnet Center in training workers for the area industry.

The Moulding and Millwork Industry in Central Oregon

Cluster Development

Unlike other segments of the wood products industry, the moulding and millwork industry shifted to follow the westward migration of sawmills as they utilized new sources of high-quality timber resources. Originally operating in the white pine forests of the northeastern US during the late 1700s and the first half of the 1800s, part of the moulding and millwork industry slowly moved westward as this resource became depleted. By 1870, the center of the moulding and millwork industry shifted to the river mills located in the northern Midwest (Michigan, Wisconsin, and Minnesota). These mills used high-quality white pine to produce moulding and millwork products for the Victorian mansions and more traditional houses of the period. In addition, the river mills took advantage of the Mississippi River to raft logs to their mills from the upper Midwestern states, (primarily Minnesota, Wisconsin, and Michigan) and transport finished products to their customers.

The river mills reached their peak during the late 1880s. By the start of the twentieth century the declining white pine resource in the Midwest forced manufacturers to look westward for a more plentiful resource. The combination of the westward expansion of the railroads and the discovery of an abundant, high-quality timber resource in the west promoted the westward expansion of the moulding and millwork industry. The timber resource of greatest interest to moulding and millwork manufacturers was located on the slopes of the Cascade and Sierra Nevada Mountains in the north and the other mountain ranges that extended further south. The mix of species found in the inland forests that extended from Montana to New Mexico consisted primarily of fine-grained, old-growth ponderosa pine with smaller volumes of lodgepole, sugar and western white pine. The continued importance of ponderosa pine to the moulding and millwork industry is illustrated by the fact that in 1996, 85% of the shop-grade lumber and 76% of the moulding-grade lumber produced in the western US was ponderosa pine.

Moulding and millwork firms planning to set up manufacturing operations in the west tended to establish themselves in areas that were in close proximity to both the timber resource and the railroad system. While moulding and millwork products are produced across the entire western US, the majority of these products are manufactured by firms that are grouped together in relatively small geographic regions. The most important regions of moulding and millwork production in the western US are central Oregon, northern California, and the southeastern region (consisting of eastern Arizona and western New Mexico). This case study will focus on identifying factors that have influenced the development and competitiveness of the moulding and millwork industry in the central Oregon region.

The same factors that influenced the moulding and millwork industry's decision to locate in the western US (an abundant high-quality timber resource and easy access to the railroads) also influenced the moulding and millwork industry in the central Oregon region. However, two other factors were also instrumental in promoting the millwork industry in this region. First, following the extension of the railroad system into the western territories, an active sawmill industry was established to provide lumber for the continued extension of the railroad system and to supply building materials for housing construction in the growing urban areas.

The second factor is related to a policy referred to as "milling-in-transit" that was initiated by a number of city governments in central Oregon as an incentive to encourage the establishment of wood processing firms in their

cities. Milling-in-transit refers to the practice of city governments building railroad spurs from the main Burlington Northern Railroad into their cities to provide local firms with direct access to the main trunk line. Many of these cities also provided firms with subsidies to cover the cost of transporting their products to and from the main railroad line, in essence providing them with free access to the railroad as an incentive to establish value-added manufacturing operations in the city. Some cities (*e.g.*, Prineville, OR) even went so far as to build and operate their own spur railroads in order to provide reliable access to local firms. In addition, prior to the deregulation of the railroads in the late 1970s, low railroad transportation costs allowed moulding and millwork firms in the west to transport their products to customers in the eastern US via rail at costs that were well below alternative forms of transportation.

A number of respondents mentioned that the absence of competition helped the newly-developing moulding and millwork industry in the west to establish itself without the challenge of competing with more established firms from other regions or countries. This was usually attributed to the fact that given the period of rapid development occurring in the US during the late 1800s and early 1990s, most competitors in the forest products industry tended to focus on regional markets rather than national markets. Several respondents also indicated that a pool of skilled labor was readily available to moulding and millwork firms given the large sawmilling industry in central Oregon. Since the skill requirements were very similar for workers in both the sawmilling and moulding and millwork industries, labor tended to be mobile, with workers moving between firms and industries based on demand fluctuations and economic conditions.

The moulding and millwork industry in central Oregon is well established and most of the managers interviewed indicated that their firms had been in business for more than 35 years. The moulding and millwork industry manufactures a wide array of value-added products such as decorative mouldings, doors and door jambs, windows and window frames, and stairs and stair parts. While many firms manufacture finished products, others produce components or a mix of finished products and components.

Capacity to Adapt to Change

Although the moulding and millwork industry was established to utilize the high-quality pine resource located in central Oregon, all of the respondents indicated that this is changing. The declining inventory of old-growth pine and the harvest restrictions on timber from federal forests have forced the moulding and millwork industry to broaden its mix of raw material inputs and look to other regions, including foreign suppliers, for raw materials. While second-growth ponderosa pine timber is available to manufacturers, this resource is now located farther from the manufacturing facility, increasing the transportation cost of this resource. Note that the lower-quality, second-growth ponderosa pine resource provides the raw material source for a new developing industry that utilizes new processing technologies (*e.g.*, finger-jointing and veneer wrapping) to produce a high-quality value-added product from a lower-quality raw material.

Respondents indicated that while ponderosa pine is still the preferred and predominant species used in the moulding and millwork industry, they are now using non-traditional species such as southern pine, spruce, fir, and hemlock. It is estimated that approximately 25-30% of moulding and millwork manufacturers are now using some southern pine in their production process (WMMPA 1997). Not only has the moulding and millwork industry begun using a broader mix of domestic softwood species, but it is also using substitute products and imported raw materials.

In addition, respondents indicated that they are using a large amount of composite substitute material in their manufacturing processes, both in the production of appearance-grade products and primed, paint grade products. These composite products include finger-jointed lumber, edge-glued panels, veneer overlaid lumber, and medium density fiberboard. Finally, all of the respondents reported that they are incorporating imported lumber into their raw material mix. While the bulk of this material consists of radiata pine lumber from New Zealand and Chile, respondents were also using ponderosa pine from Mexico, southern yellow pine (*e.g.*, *Pinus elliotta* and *P. taeda*) from southern Brazil and northern Argentina and red pine from Russia. It is estimated that almost 70% of the moulding and millwork industry is using radiata pine as a raw material input (WMMPA 1997). In addition to importing solid sawn lumber, several managers reported that they were importing finger-joint blocks, lineal blanks, and edge-glued panels as well.

Business Environment

Given the nature of their products, industry, and corporate structure, most firms sell to industrial customers rather than directly to consumers. Surprisingly, a number of the firms interviewed, while initially established as independent firms, had since been acquired by larger, more horizontally-integrated corporations. These respondents indicated that while the moulding and millwork industry is still dominated by independent firms, there has been a trend towards consolidation within the industry in general, and within the central Oregon region in particular.

This trend toward consolidation has changed the nature of distribution channels. Within the context of the moulding and millwork industry it is important to differentiate between office wholesalers and jobber wholesalers (jobbers). Office wholesalers generally operate out of a small office (hence their name) and contract sales of moulding and millwork products before they leave the mill. Once the sale is completed the mill is responsible for shipping the product to the customer. Office wholesalers essentially function as a mill sales department, a practice that is generally discouraged within the moulding and millwork industry. In contrast, jobbers purchase products direct from the manufacturer and maintain a broad inventory of products for resale to retailers, building contractors, and other customers.

In the past, moulding and millwork products were sold to three types of customers: retailers, jobbers, and industrial customers. While the exact distribution of products is unknown, several respondents estimated that in the past approximately one-half of the production in central Oregon was sold to retailers with the remainder being sold primarily to jobbers (approximately 30-40%) and industrial customers (10-20%). Today it appears that a much higher proportion of the product manufactured is sold to industrial customers, either to other divisions within the parent corporation or to other industrial customers. While a substantial volume of production is still sold to jobbers, it appears that direct sales to retailers have declined.

Interestingly, all of the respondents indicated that the primary markets for their products were located in the midwest, south, and northeast. Several respondents also indicated that their firms were exporting products, primarily to Japan and Canada. The lack of involvement in western markets was surprising, particularly given the high cost of transportation to the eastern markets. This distribution structure appears to be related to several factors: the recognition by customers in the east that ponderosa pine is a premier species for moulding and millwork products, the traditional relationship with customers in these markets, and the fact that these have generally represented the primary growth markets for new construction and residential repair and remodel projects. The focus on eastern markets may also be related to the fact that most of the firms included in these exploratory interviews were larger firms that on average employed more than 150 workers and generated between \$10,000,000 and \$60,000,000 in annual sales.

Respondents indicated that despite the moulding and millwork industry's extreme competitiveness, the general relationship between most firms in central Oregon was fairly cooperative. For example, several respondents reported that if they needed a spare part on short notice they would consider borrowing the part from a competitor until it became available through a supplier. They also indicated that there was more informal cooperation at the technical level than at the managerial level, and that a production supervisor from one mill would often maintain an informal dialogue with counterparts at other mills. As a result, if one mill were to get a new piece of equipment it was usually possible for the production managers of other mills to visit and observe how the new piece of equipment performed.

This informal cooperation was particularly useful in the area of technical information sharing. Not only does it facilitate information dissemination in the area of new processing equipment and technology, but also in the critical area of evaluating new raw materials and their processing characteristics. As a result of the disruptions in the traditional resource supply, moulding and millwork manufacturers have responded by experimenting with a broad mix of non-traditional timber species and new composite lumber products in their production processes. Given the critical nature of this information with respect to product quality and performance, it is important that the processing and finishing characteristics of these new materials be identified and understood before they can be incorporated successfully in the production process. Because most of the moulding and millwork firms in central Oregon are producing similar products using similar processing technology, information on these non-traditional species and new composite products is often disseminated at the technical level between firms.

Most managers suggested that their customers are now focusing more on the price of their products, causing them to make efforts to reduce their production costs in order to remain competitive with newer mills using more advanced processing technologies, and foreign competitors which often have a lower cost structure. As a result of declining customer loyalty and an effort by industrial customers and jobbers to diversify their sources of supply, the business environment in the domestic moulding and millwork industry has become more competitive, leading some manufacturers to export their products.

The role of supporting industries in the region was perceived as being an important factor in the success of the moulding and millwork industry. Both the smaller, local banks and regional equipment manufacturers were cited as being supportive of firms in this industry. In particular, the smaller, local banks were singled out for maintaining, and in some cases expanding, their commitment to provide financial resources to firms in the moulding and millwork industry.

Role of Associations, Institutions and Governments

Participation, or at least membership, in industry associations appears to be important to firms in the moulding and millwork industry. All of the respondents indicated that their firms were members of the Wood Moulding and Millwork Producers' Association and the Oregon Wood Products Competitiveness Corporation. In addition, all of the participating firms were members of at least one other industry association, including the Western Wood Products Association, the National Sash and Door Jobbers Association, and the National Wood Window and Door Association.

Respondents indicated that the industry associations were helpful in establishing and maintaining industry standards as well as providing lobbying efforts at both the local and national level. In addition, membership in an industry association was seen as a way to maintain and expand contacts within the industry and wholesalers. Finally, the Wood Products Competitiveness Corporation was identified as an example of a private non-profit institution that has been effective in providing a broad range of useful services to small and medium-sized firms in the moulding and millwork industry in Oregon.

Without exception, the respondents indicated that there have been very few public or private initiatives or programs and little legislation that has been beneficial to their firms. The responses of most participants can perhaps best be characterized by the response of one manager who reported that his firm "would prefer that there were no programs or intervention by government at any level."

In contrast, there was no lack of example of how public or private initiatives or legislation had hurt firms in the moulding and millwork industry. First and foremost on the list of government policies that have hurt the industry and rural communities were the timber harvest restrictions that have been applied to federal forests. While these harvest restrictions have reduced supply and increased raw material costs for moulding and millwork firms, an equally important impact has been the resultant uncertainty in terms of future resource supply as firms are forced to adjust to the supply discontinuity and identify new sources of raw material supply in both the short-term and long-term.

Surprisingly, there was virtually no support for the US tariff on lumber exported by Canadian firms. This is a reflection of the fact that the tariff was primarily pushed by lumber producers who view Canadian firms as competitors. In contrast, firms in the moulding and millwork industry generally regard Canadian lumber as an important source of raw material supply, particularly given the timber harvest restrictions in place in the federal forests in the Northwest. Not surprisingly, managers in this industry have a different perspective on the trade of lumber between the US and Canada. This view is perhaps influenced by the fact that the US imports very little moulding and millwork from Canada.

While many of the respondents do not regard Canadian firms as a competitive threat, they also indicated that they did not support the North American Free Trade Agreement and felt that it had put the industry at a competitive disadvantage. This might be attributed to the fact that Canada is viewed primarily as a supplier of raw materials for the moulding and millwork industry, while Mexico, with its lower raw material costs, labor rates, and environmental standards, is viewed as a competitive threat to US firms.

When asked if there were any public or private initiatives that might be useful to the moulding and millwork industry, all respondents suggested withdrawing the timber harvest restrictions on federal forests in the US west. In addition, a couple of respondents felt that developing a technical training program at the local community college level would be useful in providing young workers with appropriate job skills.

The Log Home Manufacturers of Western Montana

Log home manufacturing has been called western Montana's "dream industry" (Pulcini 1991). Manufacturers purchase timber and export finished home shells, generating in the process as much as ten times the direct employment of routine sawmilling and plywood production (Wichman *et al.*, 1994). A large and growing segment of the industry requires high-skilled, high-wage crafters to hand-fit logs together. By competing successfully in national and international markets, the industry in Montana grew at an average rate of 7% per year between 1976 and 1993. Its expansion has encouraged a broader complex of firms in design and engineering, chinking and finishes, doors, windows, cabinetry, and post and pole specialties.

To develop a better understanding of this industry, interviews were conducted with 13 log home manufacturing firms in western Montana. Interviews were focused in Hamilton and the Bitterroot Valley, which lies south of Missoula in western Montana. This area is arguably the center of the state's log home manufacturing industry. It is by far the dominant center for this industry in the western states, and may be the largest such concentration in the nation. Recent estimates place the log home manufacturing industry in Montana at over 60 firms and 660 employees with the Bitterroot Valley accounting for nearly 40% of the state's firms (Wichman *et al.*, 1994, 1995). The relative abundance of larger firms in the Bitterroot Valley indicates that the area's share of state employment in the industry may be substantially more than 40%.

Log home manufacturing is a residential construction specialty. Firms in the industry purchase timber from loggers, mills, or brokers, then process and sell it in the form of building shells to home owners, contractors, and commercial (*i.e.*, resort) developers. The industry has thrived in recent years on general economic growth and population increase in the western mountain states.

There are two distinctive methods of production: machined and hand-crafted. In the first method, logs are machined (*i.e.*, lathed or milled) to uniform dimensions, notched, and in some cases complex finished cuts are made. These milled logs are then cosmetically hand peeled with a draw knife or hewn with an adze. The yard labor is primarily milling work. Production entails high customization and low volume runs. In the Bitterroot Valley, this work pays in the range of \$6-11 per hour. Firms in this industry note that this segment tends to compete on the basis of higher volume and lower profit margins than the hand-crafted side.

The hand-crafting method is more labor intensive, and therefore results in a higher-cost product. In this method logs are peeled, notched, and fit together with hand tools by teams of skilled workers. In Montana the home shell is constructed on the industrial site, then disassembled and shipped to the building site. This method of centralized construction is different from the historic practice of hewing raw logs on the building site, and is a key innovation of early hand-crafters in the Hamilton area. Centralized construction affords economies in log inventory and administrative management and facilitates greater specialization in training, skills, and equipment. It also enables hand-crafters to reach distant markets and generate sales comparable to those of the larger machined log home firms. Yard labor in this segment brings \$9-18 per hour in the Bitterroot Valley. The few interviews outside the Valley suggest that pay for hand-crafters is lower outside the Bitterroot Valley.¹

Cluster Development

In the late 1960's only about five log home manufacturing firms operated in Montana, dispersed around the state. Among them were Rocky Mountain in the Bitterroot Valley, National in Thompson Falls, Rustic in Seeley Lake,

¹ In respect of their confidentiality, the names of log home firms outside the core area of Victor-Hamilton, are withheld from the informant list.

and Model in Gallatin Gateway. Another historically important firm, Alpine, moved its small operations from Colorado to the Bitterroot Valley in 1973. In the following years this small group of firms grew into an industry, expanding from five to 19 firms during 1976 (Wichman *et al.*, 1994). Early expansion was concentrated in the Bitterroot Valley. In essence, the emergence of log home manufacturing as a locally concentrated industry can be placed in the middle 1970's.

Early expansion of firms in the Bitterroot Valley is largely attributable to the spin-off of partners and workers from the early core of firms. Alpine is almost certainly the most prolific parent firm. It began with three investors: founder and mentor Ray Vandecar in partnership with Ken Theurbach and Keith Robinson. Upon arriving in the Valley, Robinson split off as Mountain Logs, and for a time specialized in marketing and distribution for Alpine. By 1976, Vandecar split off to form a separate firm, Custom, which was sold a few years later to Steve Peckinpaugh. In similar fashion, each of these firms has further shed new businesses in the immediate area and beyond.

Ken Thuerbach, owner of Alpine and one of the industry's leading experts, characterizes this process as the conscious revival of a once-endangered craft in which "old timers" pass skills along to younger workers. Particularly on the craft side of the industry, it seems clear that hand-crafters form a pool of potential entrepreneurs. Today, the emergence of new firms often represents the fledging of skilled hand-crafters. Though many of these businesses fail, others continue as small operations and some emerge as significant players. The story is similar on the machined log home side, though the nature of this subsector favors higher mechanization, scale, and volume, which raises the barriers to entry.

The attraction to the area of investors from distant locations appears to be a smaller but still important force in the industry's growth. In many cases the line between outside investment and the creation of new firms from old is unclear. For instance, Garland owner Jon Sellers came to the Bitterroot Valley with the western expansion of a Michigan log home firm. When the parent firm fell on hard times Sellers continued as an independent operator, producing homes and doing specialized cutting and lathing for other area firms on both the machined and hand-crafted sides.

Rocky Mountain, the largest of the area's machine manufacturers, diversified into hand-crafting with the establishment of Pioneer. Idaho-Montana was formed with investment of an outside design firm. Each of these attracted key management and craft laborers from other Bitterroot Valley firms.

We asked informants to characterize what conditions give log home manufacturers in this area an advantage over other places. Clearly, an early impetus to growth was the centrality of this area to vast forests of lodgepole pine, the preferred species. In the early days of the industry, standing dead house logs were close, cheap, and plentiful. In addition, climate and buyer-market centrality were also favorable. Winters in the Bitterroot Valley are less severe than many other locations in the Rocky Mountain zone, permitting year-round work with few weather closures. In addition, the Valley is relatively central and accessible to alpine amenity markets in Idaho, Wyoming, Colorado, Montana, and Utah.

As the area industry has grown it has generated its own advantages. Probably the most important of these is the pool of skilled laborers. One firm owner, a hand-crafter, reported that he had not needed to train a wholly "green" worker for a long time. The ready availability of skilled workers and the good labor relations in the Bitterroot Valley are points remarked upon by producers elsewhere. That its workers earn a premium wage over other parts of the state may be taken as a measure of their higher unit-labor productivity.

Also important is the market gravity exerted by the collective reputation and promotional investment of these firms. The area's standing as a center for high-quality homes reinforces its attraction among buyers, but does not necessarily draw them to "shop" the area. Most firms report that only a small percentage of business comes from actual buyer visits to the area. The elegant showrooms of a few companies, however, suggest that at least some target this walk-in consumer market.

A broader complex of firms has developed. On the material and product input side is a diffuse set of loggers, house log brokers/distributors, and specialty mills. The service sector includes designers, architects, and engineers, as well as general finance, insurance, and accounting. Related goods providers include log shell assembly contractors, chinking and coating firms, specialty cabinet and door producers, windows, and post and pole manufacturers (which produce railings, decks, and other components). Area machine shops fabricate parts and equipment, and produce structural materials such as reinforcing plates for rafters. Recently, a small furniture industry emerged and markets itself in conjunction with the log home industry. Since log home manufacturers rely on distant markets, the complex could be broadened to include a network of trucking, assembly, and marketing outside the immediate area.

Ancillary goods and services—such as rails and porches, doors and cabinets, windows, masonry, or chinking—are typically sold directly and not included in the log home package. Design is the most frequent exception to this. Home buyers tend to work principally through contractors at the destination to purchase and install finishing components such as windows, railings and interior work. This helps keep shipping costs down. While many designers, chinkers, and cabinet makers report getting their start on the strength of referrals from, and direct sales to, log home manufacturers, most producers survive or fail on the strength of their own outside market development.

Finally, area firms benefit from the presence of other business with similar or complementary products. The benefit may be derived from trade between them or more generally in terms of reciprocity and greater ease of learning. As such interactions have been thought to be critical to the ways industry development is understood and encouraged, we return to it below.

Business Environment

The latest census of log home manufacturers counted 60 firms in Montana, with 24 of these in the Bitterroot Valley² (Wichman *et al.*, 1995). They may be categorized by size in three tiers. There are a few firms over 50 workers; there is a broader middle size, employing between 25 to 50 workers; and there are many with fewer than 25 workers. Nearly all log home manufacturers are incorporated, and all are privately held.

Firms' different product and market niches may be framed as distinctive combinations of materials, designs, techniques, and market areas. The two main methods of production—machined and hand-hewn, were described above. In both, custom design is the norm. Often, the two processes are complementary and producers consciously blend them with other construction techniques. One example entails hand-worked joinery on sawn cants of two, three, or four sides. Another incorporates post-and-beam construction with log materials and design. Many homes leave the area with both hand-worked and machined components. Log home manufacturers differentiate themselves by different styles of notching and coping, fulfillment services at the home site, and by their ability to obtain or mill logs of specific diameter and length.

Many of these product distinctions reflect the firms' different geographic markets. For instance, dovetail joinery is traditionally produced in the eastern states (as opposed to the saddle notch more typical of this region). Firms using that technique tend also to be active in those markets.

The group of larger firms competes for the largest and highest ends of the market. In this arena the term “log home” becomes a figure of speech for major projects that run from mansions and complexes to resort lodges.

As for technology, small hand-craft home manufacturers may begin with rather modest equipment investment: a mobile crane, a forklift, a truck, and hand tools. As they grow equipment needs expand to include additional cranes, trucks, forklifts, and sawmills. While the equipment used by handcrafters is rather basic—facilitating, but not supplanting, hand-crafting—larger firms emphasize that their investment in machinery and equipment is substantial. Many firms employ mechanics and report turning to area machine shops and distributors for parts and

² Those firms listed in the cited directory in Ravalli, Missoula, and Beaverhead counties, *and* reporting Bitterroot Valley addresses were tabulated to this area by the researchers.

repair. Machined log home manufacturers begin with a higher investment in lathing and milling devices. Most of those we spoke with reported designing their own equipment and having it fabricated by area machine shops. While many have trucking capacity sufficient to move logs throughout the area, transportation of products in and out of the area is provided by private vendors.

House logs bring a premium price. For obvious reasons, straight logs with minimum taper and no rot are needed. The majority of log home manufacturers in the Bitterroot Valley report a preference for standing dead logs for environmental reasons and for the materials' better dimensional stability and reduced shrinkage. Firms outside the Valley more often report using green house logs. We speculate that these firms rely more on area forests, and compete more on the basis of lower production cost. While once practically free, dead house logs have for at least a decade exceeded the price of green wood, and that gap has grown in recent years. Today, standing dead trees suitable for log home building cost producers 50 to 100% more than comparable green house logs. Consequently, log homes have shifted from low to high cost.

Firm owners and managers consistently report log supply as their most crucial problem. It may account for the failure of many firms, both large and small. Log acquisition appears especially strategic to firm expansion, and for some sourcing wood of a certain quality, species, girth, or length is a specialty.

Almost none of those we interviewed reported having serious difficulty finding logs in recent years. Only one of our informers reported having turned away work for lack of needed supply in the last two years. Several firm strategies may account for this.

Smaller firms carefully nurture relationships with loggers, mills, or distributors, taking pains to remain preferred customers and guarding their best log sources as one owner put it, "like a good fishing hole." Many larger firms have integrated backwards into direct forest management by purchasing forests or harvest rights, and even distributing logs themselves. High demand for house logs has led to the emergence of independent house log brokers. While few firms report buying through brokers routinely, many use brokers as a source of safety stock inventory. Firms buy and sell slack logs to one another. Finally, many firms in the Bitterroot Valley report buying house logs from further afield—from sources in Idaho, Washington, Oregon, and British Columbia. Responses outside the Valley suggest a greater reliance on the local forests.

Bitterroot Valley log home manufacturers seldom report that the Montana is a primary market for them. Wichman (1995) estimated the in-state market at 20% in 1993; our interviews suggest this cluster exports all but 5 to 10% of their production beyond state lines. It is worth reiterating here that our informants were selected for their knowledge of the area and are not a representative sample of the industry in general. Nonetheless, our interviews reinforce the conclusion that this industry has thrived on the strength of markets beyond the local area.

For many area firms regional log home markets have been vital from early on. Growth of the cluster may be attributable both to booming regional markets and market development in more distant locations. That said, the proliferation of small firms in other areas is among the competitive challenges reported by area firms.

The primary external markets identified were the alpine areas: Aspen and Telluride, Colorado, Sun Valley, Idaho, and Jackson Hole, Wyoming. The dramatic influx of new residents to many parts of the mountain west means that comparable growth areas are becoming more common and diffuse, and the in-state market is joining this general trend. Manufacturers actively maintain ties to outside markets through relationships with contractors, salespeople, and past customers. Some firms have strong markets in the upper-Midwestern states of Minnesota, Michigan, and Illinois, others have links to Texas, Washington, and California.

We asked how the market area has changed over the last five years. The broad picture is of the regional markets growing; the coastal states and Pacific export destinations declining due to relatively soft economic conditions and increasing competition from producers on the west coast and Canada; and markets in the midwestern, southern, and eastern regions expanding. The cost of shipping log packages somewhat limits the prospects for expansion the far south and east US. Nonetheless, some firms have developed competitive advantages that allow

them to compete with firms in Kentucky and Tennessee based on the strength of their service, design, and hand-crafting.

In terms of marketing, firms experiment with different forms of market representation. The common denominator is that all expanding firms advertise in national media. Most work closely with building contractors in growth areas to generate repeat business. Some of the larger firms have taken a more formal approach to franchising marketing subsidiaries; while others maintain a local sales staff. Word of mouth referrals from happy customers are important, and many firms retain past buyers as market representatives. Not all manufacturers see the need to market aggressively, however. Some get ample business from customer referrals, from established contractor relationships, and by contracting their services to other log home producers.

In summary, log home manufacturers face three interrelated management challenges: sourcing logs, developing markets, and keeping workers. Sourcing logs is universally noted as the single most significant problem. Ensuring log supply is of such importance that it warrants firms paying premium prices and expending considerable time to ensure that log supply is available. Moreover, firms' ability to find, finance, and manage a larger log inventory may be crucial to their expansion.

The market development challenge appears simple, but must be coordinated to match sales to the type of homes, timing of promised delivery, and cost of logs available. Diversification into new market areas is an essential response to at least two competitive challenges: growth in the numbers of small log home producers elsewhere; and variations, both stochastic and structural, in the demand for log homes.

While keeping a stable, skilled work force does not cause day-to-day crises for firms in the Bitterroot Valley, this seems to reflect rather good pay and labor relations. Highly-skilled crafters are potential competitors: they can and do strike out on their own. There is a certain imperative on the part of manufacturers to design homes, get logs, and develop markets on a pace that skilled workers could not themselves. Manufacturers in other parts of the state are somewhat more emphatic about worker spin-offs as a problem, and this may reflect a different state of labor relations elsewhere. In one case, a major firm was crippled when several workers, suppliers, and staff followed a worker-turned-entrepreneur to a new business.

Bitterroot area firms appear to have developed reciprocal relationships that help them harmonize efforts between firms as they balance the three main constraints described above. The following section describes those formal and informal business relationships.

Capacity to Adapt to Change

The flexible specialization thesis anticipates that trade and reciprocity within the industry are sources of area advantage. This section examines the roles of cooperation and exchange within the area industry in the development of new products and markets. Competitive advantages are more than the sum of native and developed advantages (*e.g.*, plentiful logs and skilled labor markets). Contracting between area firms enhances the scope and scale of production. Divisions of labor reflect and intensify their specialization, with accelerator effects on product and market development. Learning among neighboring firms is freer, faster, and more multidirectional than it is among their more isolated counterparts. Local norms of trust and reciprocity may dampen certain risks among otherwise competing producers. The focus here is on horizontal relationships between neighboring log home manufacturers that are competitors.

Firms' different presence in geographic markets as well as their specialized capacities in milling, construction, and design reduces head-to-head competition among them. Nearly all producers readily refer surplus business to peer firms. Moreover, since firms' markets and production capacities are often complementary, there are opportunities for contracting. Many area firms contract milling, components, or even whole homes to one another as a means of expanding both the scale and scope of their offerings, and in turn increase the competitive positions of their firms and the area at large. While there may be significant variations in firms' willingness to sublet the production of homes and components, a small level of contracting among competing businesses was reported by nearly all informants. Relationships with distant building contractors and field representatives are also important.

Our informants unanimously described conditions among area producers as “friendly,” not “fierce.” This does not mean that pointed rivalries are absent—competitive tension between firms was routinely reported. Our informants emphasized the strategic importance of keeping good relationships with other area firms. Most report interacting routinely with a small number of peers. Six basic forms of reciprocal exchange were noted.

Ancillary goods and service producers often reported that they established a market niche on the strength of referrals and contracts from area log home manufacturers. As noted above however, local subcontracting does not sustain them. Many log home manufacturers experiment with packaging subcontracted goods into their products, but most avoid subcontracting routinely. For planning services, smaller firms tend to work closely with a few designers, architects, and engineers outside their own firms, while larger firms tend to internalize these functions, and mid-sized firms blend in-house with subcontracting. Decks and railings, stairs, and to a lesser extent, chinking, doors, and windows, are subcontracted. Some firms specialize in delivering a more complete package to the home site, and work with a cadre of goods and services producers to deliver the package. Most informants, however, avoid acting as a subcontracting hub for other producers. This controls their own risk of damage and workmanship. But more importantly the manufacturers leave most design and component choices to home buyers and building contractors as a means of maintaining the high-end “custom” appeal of their products.

Frequently, log home manufacturers reported trading logs among themselves. In some cases larger firms source and sell logs to others to smooth their own process of inventory and production expansion. More often manufacturers turn to each other when a few logs or specialized logs are needed. Lacking the right piece at the right time can stop progress on a job. Manufacturers reported the ability to turn to each other to find needed logs as a driving reason for keeping good relations with their peers.

Manufacturers often refer log home jobs to each other. Often this entails simply recommending a neighbor when a producer is booked to capacity or when a buyer seeks a technique that is another’s specialty. In some cases the process of job trading is raised to the level of formal subcontracting. In one case a manufacturer with ties to a distant region developed orders for a certain hand-crafted technique, and then sublet those jobs to a trusted neighbor.

Manufacturers similarly contract among each other for components. This may entail the purchase of some milled logs for use in a hand-crafted structure, or it may entail contracting final on-site assembly of the shell.

Finally, smaller firms especially reported lending or exchanging equipment and workers. Workers specialized in hand peeling, may for instance, work as subcontractors to other businesses. Skilled workers may be lent to another firm as a means of minimizing layoffs and reducing worker turnover. Mobile cranes and other heavy equipment may be deployed to help competitors.

The various forms of referral and subcontracting appear to play only a modest role in the day-to-day operation of the industry. Log home producers at critical times do turn to each other for logs, jobs, components, equipment and workers. They also appear to support expansion of the area industry into ancillary goods and services actively. These things appear to play a significant role in enhancing the scope of product offerings, extending market reach, reducing the cost or uncertainty in logs, labor, or equipment, and enhancing the extent of the area industry.

The Role of Organization and Institutions.

While most informants were dubious about the benefits of formal local (or even national) organization, some noted the need to form a local coalition to manage issues of log supply. The main industry organization noted by business owners is the National Association of Log Home Builders. Informants also noted that some trade publications have taken the role of advocate. While a few in the Bitterroot Valley actively speak for the broader industry, most do not.

We asked informants to note specific areas public policy has helped or hurt. Four main issues came up: (1) log grading, (2) forest management for house log supply, (3) energy and structural building codes for log homes, and (4) workers’ compensation insurance. In each of these areas, the status of the problem appeared to be “better, but not good.”

Worker compensation is a state-level issue in Montana, and one in which efforts at the state level to reform program management had helped every producer at least to some extent. The first three issues are industry-level problems that had been focal issues in the industry nationally. National log grading systems have been promulgated by the national industry. They are wholly voluntary, and there is no norm on use among area producers. On the matter of forest management, Keegan *et al.* (1991) note that the small size of firms and their market may make it difficult or impossible to develop a large scale program directed at log home manufacturers.

Questions of the energy efficiency and structural stability of log homes have been significant problems in the past. Efforts at the national scale have blended scholarly research with public information. Growing consumer demand for log homes in many markets has hastened the dissemination and use of technical data in policy. On each of these issues, the result is slow-but-sure progress in the ease with which log homes are designed, permitted, and financed.

Conclusions

To understand how rural business clusters originate and survive market fluctuations and supply changes, three rural communities were examined for this project. Local business people and industry experts were interviewed in order to assess how their cluster originated, why business people chose their particular location, what role government and industry associations play in the business community, and how the cluster survives in light of market fluctuations and supply changes. Opinions regarding interactions between firms and associations, the role of government, and recipes for individual firm success varied as widely. However, many common elements were repeated during interviews.

Cluster Development

While the manufacturing clusters presented in this report may have originated under disparate circumstances, all had common factors that were crucial to their success. An important point to consider is that these clusters did not develop overnight. Each existed for several years with a few small businesses earning moderate profits. As more individuals moved to the area, the group of businesses gradually began to form a cluster. With the exception of Bend, Oregon, the communities did not set out to create an industry and the original owners do not appear to have been motivated by the prospect of making huge profits.

The first element is proximity and easy access to regional markets. The millwork industry in Bend, Oregon originated as a group of mills which supplied lumber for westward railroad expansion. Existing mills expanded their operations into moulding and millwork when the railroad provided easy access to regional and East coast markets. Local governments improved access to market by building railroad spurs that connected small towns to the main railroad line. Some communities even built and maintained their own spurs to ensure reliable transport for local mills and millwork companies. The Bitterroot Valley in Western Montana is not only located along interstate highways, but also in a region where log homes are a fashionable form of housing. Some of the cluster's market extends to the southern or far eastern US, but most home sales remain in the western mountain region of Colorado, Idaho, eastern Oregon and Washington, and to a lesser extent, Montana. Port Townsend's maritime industry capitalized on its proximity to Seattle, an established boating community. When the boat building and repair cluster originated, many Alaskan fishing boats were already coming to Seattle during the off-season and Port Townsend drew a portion of the area's repair business. Since then, the picturesque location has become a draw for recreational boaters and the area's sailboat maintenance sector has grown. The town regularly draws commercial and recreational boaters from British Columbia, Alaska, Oregon, California, and some international locations.

A second common element in firms' decisions to locate in their respective locations was the plentiful supply of raw materials and potential customers. While respondents commented that resources were plentiful when their respective clusters emerged, they all emphasized that there is now a shortage of available timber. Firms are forced to obtain materials from other regions or to develop other technologies for using the available resource. For example, the moulding and millwork industry incorporates medium density fiberboard, finger-jointed lumber, and veneer-overlaid lumber into the products it produces. Respondents also reported spending more time locating suppliers that can supply them with raw materials.

Third, skilled labor vital for clusters to form and survive. In the cases of Bend and the Bitterroot Valley, skilled workers already resided in the area, employed either as loggers or sawmill workers. Port Townsend, a long-time port, had a mix of individuals employed in both the maritime and timber industries. The concentrated group of firms and the community's internationally renowned boat building school continue to draw of skilled workers to the area, which in turn helps the cluster thrive.

Each cluster originated from a few firms led by energetic owners. While these individuals may not have set out to create a cluster of like businesses, they did recognize the advantages of having related companies locate in the same area. They were also generally civic minded and open to working with other firms, either through joint marketing, sourcing materials from neighboring firms, or referring customers to other businesses in the area. For example, the Port Townsend and Bitterroot Valley clusters started with a few individuals who enjoyed living in their respective areas and who were looking for a way to earn a living. Because these communities were small, people knew each other socially and in the business arena, and recognized that it was in their best interest to work together. In Port Townsend, business owners worked together to gain city government support and draw more businesses and workers to the area. In the Bitterroot Valley, cooperation took the form of purchasing specially milled logs from neighboring firms and exchanging workers in times of boom and bust among firms. The business environment in all three clusters extends beyond depending upon each other for survival. While businesses are still in competition, it was reported that there is a friendly exchange of advice, customer referrals between businesses, and at times, equipment is even loaned. As more companies move into the area, the cluster benefits from the reputation regional center for a specific product or service.

Another key component in the emergence of these clusters appears to be low levels of competition initially. Each cluster was the first in its respective region to provide a particular good or service. An important point to note is that as the cluster grows, new businesses identify unique niches with either a slightly different product or an entirely new product that complements existing products. While there is some overlap in product offering between firms, it appears that business owners attempt to compete with each other by offering unique products and services. For example, the major log home builders in the Bitterroot Valley specialize in different construction style or log type. For example, one company specializes in large-diameter logs which no other firm in the area uses and concentrates on building high-end log homes or lodges. Another company has developed a planer that enables its workers to process long logs. Other businesses in the area specialize in hand-hewn logs.

Respondents in Port Townsend and Bend also indicate that innovation is vital to the success of their clusters. Port Townsend business owners report that spin-off ventures by former employees are not uncommon. It is rare that these new firms are direct competitors of the original company. Rather, the new entrepreneur often identifies a product or service that does not exist. Similarly, innovation in the millwork industry maintain a comparative advantage by developing innovative products such as finger-jointed door jambs that utilize lumber manufactured from small diameter logs.

Each cluster's relatively small size and relationships within the local business community help it adapt to industry changes. Employees working in local businesses are more adept at identifying an industry need and creating a business to fill that need. Spin-off ventures appear to be important to a cluster's ability to adapt to market fluctuations and regulatory changes. Owners of fledgling businesses in each of these clusters have identified gaps or shortcomings in the industry and work to supply the industry with missing products or services. For example, Edensaw Woods in Port Townsend supplies regional boat builders and woodworkers with hard-to-find, high-quality or exotic wood and veneer. As changes in fishing regulations required commercial fishermen to fish off-shore, other companies that build refrigeration systems or lengthen boats emerged. Similarly, there are several small businesses located in the Bitterroot Valley that specialize in supplying complementary products to the log home industry, such as furniture and cabinets.

Role of Associations, Institutions, and Governments

The millwork industry stands apart from the other two case studies in the respect that it was an industry developed and nurtured by government. Local governments developed the business infrastructure and promoted the millwork industry. While the boat building industry in Port Townsend originated independently of government assistance, it now benefits from below-market rental space offered at the Port, community education programs in marine trades,

and the town's Economic Development Council offers business advice and works to draw visitors to the area. The log home industry appears to be the most self-sufficient of the clusters with its member firms reporting little government assistance for their industry.

While government may have helped the clusters in some respects, respondents were quick to point out instances of government interference which they feel restricts their operations. The boat building industry maintains an ongoing debate with local government over issues such as pollution cleanup and abatement costs, potential funding for a large vessel crane, and what industry views as city government's promotion of the tourist industry at the expense of the maritime trade. Business owners both in Port Townsend and Montana reported that the costs imposed by the state for workman's compensation are excessively high and represent an industry impediment. Respondents in all industries note that federal and state timber harvest restrictions adversely impact their competitiveness.

Industry associations, on the other hand, tend to be viewed more positively, possibly because of the voluntary nature of membership. Associations help establish and maintain contacts within the industry and lobby for the industries at state and federal levels. The Marine Trades Association organizes an annual boat show and makes booths available only to members. Other associations have helped set industry standards and promote their members' products both nationally and internationally. Cluster members also appear to benefit from non-membership organizations. Port Townsend's business owners benefit from the independently-run, non-profit Wooden Boat Foundation, which promotes the area's industry through an annual Wooden Boat Festival. Members of Montana's log home industry reported that they receive free advertising from log home magazines that often feature their homes in their articles.

Future Research

As noted, the three clusters presented in this study share components outlined as important factors by location theory: easy access to regional markets, ready workforce, and low overhead. Many areas impacted by timber harvest restraints, however, are not located near regional centers nor do they have easy access to these markets. For example, Oregon's greatest concentration of timber dependent counties lies in the southeastern region of the state, significantly removed from urban markets. Further research could identify successful business clusters in rural areas with more difficult access to regional markets in order to identify common factors between these selected communities.

Another important common factor between the examined clusters is that business owners reported that they are surviving in spite of timber shortages. While respondents reported that plentiful raw materials played a large role in selecting a business location, the shortage of timber makes doing business more difficult. Even though these clusters are in somewhat rural areas, easy access to raw materials gave them a competitive advantage over more urban areas for their particular industries. With this in mind, it would be valuable to identify timber-dependent business clusters that have developed since timber harvest restrictions have been passed since 1989 and investigate common elements in the business owners' decision to locate their business and why these clusters are succeeding.

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Appendix: Project Survey

Company Name: _____ Date: _____
Headquarters Location: _____ Interviewer: _____
Position of person being interviewed: _____ Respondent: _____
 President
 Owner
 Vice President - Sales/Marketing
 Other (Please specify) _____

SECTION I FIRM SPECIFIC FACTORS

1. What type of products does your firm manufacture?
2. How long has your firm been in business? at this location? do you have operations at other locations?
3. What percent of your production is in finished goods vs. component products (*i.e.*, sold to other producers)? How has this proportion changed over the firm's history?
4. What percent of your production is purchased or contracted? What types of products? Location and size of the suppliers?
5. Why is your firm located where it is (proximity to raw materials, proximity to markets, availability of labor, availability of support services, desirability of life style, capital/tax incentives, ready access to transportation)?
6. What type of cooperation exists between wood manufacturing firms in the area? is it informal or more cooperative and structured? are firms receptive to cooperation? is there an opportunity for increased cooperation?
7. What type of firms do you cooperate with?

SECTION II CLUSTER DEVELOPMENT FACTORS

8. Is there a ready supply of raw materials available in this area? Is there a supply of specialized raw materials in this area? Do they give your firm a competitive advantage over firms in other locations?
9. Are do you sell your products? What is the relative importance in percentage sales to the following markets: (Same question five years ago, one year ago? Describe historic change)
international (where?)
national, beyond the PNW (where?)
regional, PNW
Western Washington
local area
10. Is there a ready supply of specialized labor available in this area? Are training programs available?

11. Are there any support services available that contribute to the competitiveness of the firms in this area (marketing, machinery suppliers, financial, component manufacturers, specialization of labor, others)?
12. What other factors contributed to the establishment of this cluster of firms? Is there a key factor that influenced the development of the firms in this area (resource, market, lead firm,...)
13. Define the nature of competition within the cluster/industry. (Is competition fierce or friendly?)
14. Does your company interact with other businesses in your region (*e.g.*, raw materials, processing equipment, finance...) Does your company interact with companies in other regions? Why?
15. Does your firm belong to any industry groups or associations? Which ones? Why did you join this association? Are they useful? In what ways?
16. Are there any public/private initiatives or programs in this area that benefit your firm? Are there any that *could* benefit your firm if developed?
17. Are there any public/private initiatives or programs in this area that hurt your firm?

SECTION III. FIRM DEMOGRAPHICS

18. What type of distribution channel(s) does your firm use? (to retailers, wholesalers, industrial customers or consumers)
19. What markets does your firm serve?
20. How many people does your firm employ?
 Full time _____
 Part time _____
 Seasonal _____
21. Please estimate your firm's total sales in 1995?
 ___ \$0 - \$500,000
 ___ \$500,001 - \$1,000,000
 ___ \$1,000,001 - \$2,500,000
 ___ \$2,500,001 - \$5,000,000
 ___ \$5,000,001 - \$10,000,000
 ___ more than \$10,000,000
22. What type of ownership structure does your firm have?
 Single owner/Family
 Partnership
 Corporation