THE STATUS OF AND OPPORTUNITIES FOR BUSINESS CLUSTERING WITHIN THE FOREST PRODUCTS SECTOR IN THE U.S.

U.S. Endowment
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THE STATUS OF AND OPPORTUNITIES FOR BUSINESS CLUSTERING WITHIN THE FOREST PRODUCTS SECTOR IN THE U.S.

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CHAPTER 1: INTRODUCTION

This project examined the status and opportunities for business clustering within U.S. forest products and closely-related natural resource-based sectors. The project identified business cluster models adopted in the forest sector, explored partnerships among cluster entities, and examined policies, strategies and support mechanisms that could facilitate successful business. Information collected during the summer and fall of 2008 was also used to develop a template for a national registry of forest business clusters. The project constituted a comprehensive research effort comprised of the following components:

- **A literature review:** to examine adopted business cluster models, determine benefits and challenges associated with business clustering, and identify forest business clusters within the U.S. forest sector reported in the literature. The project reviewed over 100 scientific articles, assessment and industry reports (available at www.fwrc.msstate.edu/cluster/bibliography.asp).
- **A nation-wide online survey:** to seek opinion from U.S. forest sector stakeholders on major drivers, advantages, and disadvantages of business clustering in the forest sector, and determine needed support. The survey was also used to identify existing forest business clusters for inclusion in the cluster registry.
- **Geospatial and econometric analyses:** to examine socio-economic conditions and resources affecting clustering among wood-using mills in the U.S. South. This study analyzed the reasons behind clustering that can be used to guide regional economic development in the industry.
- **Phone interviews with stakeholders knowledgeable of forest business clusters in the public and private sectors:** to develop case studies illustrating clustering approaches in various regions of the U.S. This component helped identify conditions specific to a given cluster that could not be captured in the econometric analysis.
- **A website featuring a registry of forest business clusters in the U.S.** was created and launched in 2009 (available at www.fwrc.msstate.edu/cluster/cluster_search.asp). The registry allows entry of new clusters.

In the following chapters we review key findings of this project. The executive summary and appendixes are available at www.usendowment.org and www.fwrc.msstate.edu/cluster. Our findings are summarized as: Models of business clusters adopted in the U.S. forest sector; Experience from successful forest business clusters; Forest sector stakeholder perceptions on driving factors, advantages and disadvantages of forest business clusters; Business clustering within the forest products sector in the U.S. South; Opportunities and potential strategies for improved competitiveness of forest business clusters; Conclusions and recommendations; Online registry of forest business clusters; and Literature review on business clustering within the U.S. forest sector.

CHAPTER 2: MODELS OF BUSINESS CLUSTERS ADOPTED IN THE U.S. FOREST SECTOR

Concept of an Industry Cluster

An industry cluster is a group of firms and institutions located in close proximity whose businesses are interlinked through value and supply chains, labor, and use of similar inputs, technology, and complementary products. Companies locate close to each other because they have similar production interests and needs, and consequently depend on each other in achieving success as a group. Industry clusters are attractive to related companies because they create new business opportunities that would not be available if the companies operated in isolation.

Potential Benefits to Firms Located in Industry Clusters and Local Economies

Potential benefits include improved communication and interaction among firms, close cooperation, improved logistics, innovation, and positive competition leading to increased productivity. By locating their production and services in the cluster, companies gain ready access to trained workers, infrastructure and specialized suppliers. The result is that companies participating in a cluster can lower their costs compared to non-clustered ones. Some of the specific benefits to industry and local and regional economies include:

Easier and Less Costly Recruitment of Workers – clusters create a pool of workers that often are trained and specialized to work for specific companies in the cluster. Consequently, this reduces the risk of not being able to recruit qualified workers and reduces recruitment costs. It also reduces the cost and time of training such workers.

Easier and Less Costly Access to Production Inputs – by locating production in an industry cluster, companies gain access to specialized inputs and their suppliers. This reduces costs associated with transportation, inventory, and potential delays. Close proximity to suppliers improves both communication and access to support services provided by these suppliers, and allows for faster product modifications.

Better Understanding of Suppliers and Consumers – companies participating in clusters acquire knowledge and experience that is crucial to individual company success. Interactions among companies facilitate exchange of expertise and help solve production problems. Closer interaction with suppliers and consumers permits greater efficiency in the production of goods and services that better meet the needs of consumers.

Companies Provide Complementary Products and Services - many companies produce products that are complementary and, thus, do not compete directly with each other. However, collective success of cluster companies and their productivity depends on the performance of each individual firm.

Improved Access to Public Institutions and Goods – collectively, cluster companies are better able to attract government investments in infrastructure and various educational and training programs. They also can compete more effectively for funding.

Better Motivation for Continuous Improvement – by participating in clusters, companies continuously compare their achievements with others in the cluster, which stimulates positive competition, innovativeness, and increased productivity.

Higher Wages – industry clusters decrease costs and lead to increased productivity and employment. Cluster employers, competing for skilled, workers are willing to pay higher wages than non-cluster employers.

Improved Employment Opportunities – cluster workers tend to specialize in specific jobs, improve their skills, and be more productive. They are more likely to find jobs matching their skills in the industry cluster than in areas without a cluster.

Improved Communication and Company Interaction – clusters can enjoy improved communication and interaction among firms. Firms benefit from closer cooperation, improved logistics, innovation, and positive competition leading to increased productivity.

Increased Economic Growth – successful industry clusters attract establishment of new businesses that result in increased economic activity and employment in the region. This provides a larger tax base and generates greater tax revenues.

Types of Industry Clusters

Industry clusters differ in the way they develop and

operate. Some industry clusters can be easily differentiated because they manufacture specific products or provide unique services. Examples include apparel, automotive, financial, forest products, telecom, and tourism clusters. Businesses concentrate in such clusters because their activity is relevant to the product or service. Typically, they include specialized suppliers of input materials, parts, and services, specifically trained workers, and manufacturers of intermediate and end products.

Other types of industry clusters are characterized for locating production in areas with some desired characteristics. Often, clusters locate in areas abundant with natural resources that serve as inputs to the production process. For example, sawmills locate close to forests because it decreases their transportation costs and ensures continuous and timely supply of logs. In other situations, companies, such as furniture manufacturers locate close to markets for their products. This also helps to decrease transportation costs, ensures access to a large customer base, and allows for faster response to consumer needs. Clusters of primary wood products manufactures and logging operators or secondary wood products manufacturers are common examples of these types of arrangements. In other cases, clusters develop because companies locate in the area due to available trained workforce, suitable infrastructure, and favorable business environment.

More often clusters are defined by interactions among cluster participants and their development. Clusters known as Marshallian typically consist of local, small and medium-sized companies that trade their products and services within the cluster. These clusters are considered local because they locate close to their customers. Forest manufacturing clusters located in Bend, Oregon (moulding and millwork), Bitterroot Valley, Montana (log home manufacturing), and Port Townsend, Washington (marine trade) are examples of such clusters. Secondary wood products manufacturers are most likely to follow this type of business cluster.

Hub and spoke clusters have a different structure that includes one or several large companies serving as anchor companies. The anchor companies interact with numerous small suppliers of products and services. Typically, this is a dual interaction between large and small firms. Small companies rarely interact or cooperate among each other. The Oregon forest cluster shares many characteristics of the hub and spoke industry cluster. It consists of integrated mills that serve as hubs. Mills are served by numerous local logging contractors, suppliers, service businesses, equipment manufacturers and distributors, financial institutions, and legal firms. Firms cooperating with mills and customers serve as spokes. A combination of primary and secondary wood products manufacturers can make this type of business model successful.

Satellite platform clusters consist of large companies with multiple branch plants that act independently. Typically, the cooperation between individual plants is limited. State-anchored industry cluster is an example of a cluster based on an anchoring institution such as a university, government agency, or military installation. Research parks developed by universities or state governments can serve as examples.

Successful Industry Cluster Development

It takes a long time for clusters to develop and attain competitiveness. Most successful clusters have developed over several decades. Their growth and success is based on advantages of their location such as availability of raw materials and qualified workers, positive business environment, research expertise, education, infrastructure, and innovativeness.

In many cases, clusters develop as the result of local entrepreneurship. For example, the Marine trade cluster in Washington and log home manufacturing cluster in Montana started with several small firms established by local entrepreneurs to serve local needs. They were first in their respective fields and, because of that, faced little competition. Numerous spinoff businesses emerged to serve unique and increasingly sophisticated market needs, increasing cluster reputation and contributing to its development.

Some clusters were created by "chance events" such as establishment of a government institution in a particular area. Such an institution would need appropriate infrastructure and external services to function efficiently. This in turn creates the need for suppliers, service providers, financial institutions, and other cooperating businesses. For example, the establishment of land-grant universities resulted in substantial economic development in surrounding areas. In addition, the universities, in cooperation with private companies, established research parks that provided stimulus for further development and perhaps cluster initiation.

Targeting Successful Cluster Development

Targeting development of particular industry clusters requires a detailed knowledge of cluster characteristics, stage of development, competitiveness of the industry, and strengths of the region. Regions with well-established clusters should focus on developing strategies that will help companies identify overlapping interests and new opportunities and develop shared vision for the future of the cluster. Regions with small industry clusters may benefit from focusing on promoting the cluster, offering financial incentives for new firms, developing adequate infrastructure, and developing cost-share training programs.

Regions that intend to develop new clusters where there is no particular cluster initiative already taking place in the area or reinvigorate declining clusters need to be aware that their efforts might have limited success. Declining industries present additional challenges for developing successful clusters. Such regions should focus their efforts and resources on cluster sustenance and expansion through improved

recruitment efforts, development of small companies, improved public infrastructure, and training programs. It is also important to recognize that targeting industry clusters does not necessarily translate into successful economic development in all regions. Nonetheless, new opportunities in the renewable energy and biochemical industries (as examples) provide interesting clustering options to diversify the forest products sector.

Federal, state, and local governments can play an important role in the development and expansion of industry clusters. In many cases, government assistance is needed to provide an adequate stimulus for successful cluster development. The assistance can take many forms but most commonly it includes providing suitable infrastructure (roads, buildings, power lines, etc.), offering educational and training workshops for companies and their employees, assisting companies with collaborative innovation, conducting market assessments, and promoting the cluster. Although government should actively stimulate economic development by promoting industry clusters, it is important to promote more than one cluster or one industry to make the region less vulnerable to economy fluctuations. Examples of this negative outcome from clustering can be drawn from the automotive and automotive parts industry in the Midwest, the steel industry in the Northeastern United States, and the oil exploration industries of Texas and the Gulf Coast. Each of these examples can be used to illustrate the potential for negative outcomes in regions where a single industry cluster dominates during an economic downturn in that industry. Efforts should focus on identifying region strengths and determining feasible industries that would result in more than one cluster.

Social, Economic, and Institutional Conditions Affecting Clustering in the Wood Products Sector

There are different conditions that are common to the successful development of business clusters in general. Regardless of the model followed to develop a business cluster, Michael Porter from Harvard University has suggested a fundamental structure for cluster development that includes four major conditions: (1) context for firm strategy and rivalry, (2) input conditions, (3) demand conditions, and (4) related and supporting industries. This structure is depicted in Figure 1 and is commonly known as Porter's diamond for sources of locational competitive advantage.

Competitive advantage is an advantage over other competitors either locally, nationally or even globally, that is obtained by offering products of greater value to customers. Greater value is derived from offering competitive products at lower prices, or by providing greater product benefits and services at similar or even higher prices. These approaches are known as cost leadership or production differentiation strategies, and are based on whether the business model relies on providing goods and services at lower costs or greater benefits. The location of firms affects how firms can develop competitive advantages by its effects on productivity. The location of firms near their primary inputs with access to markets and potential for collaboration and integration with related firms affects their productivity and ability to improve processes and services. Ultimately, this leads to competitive advantage.

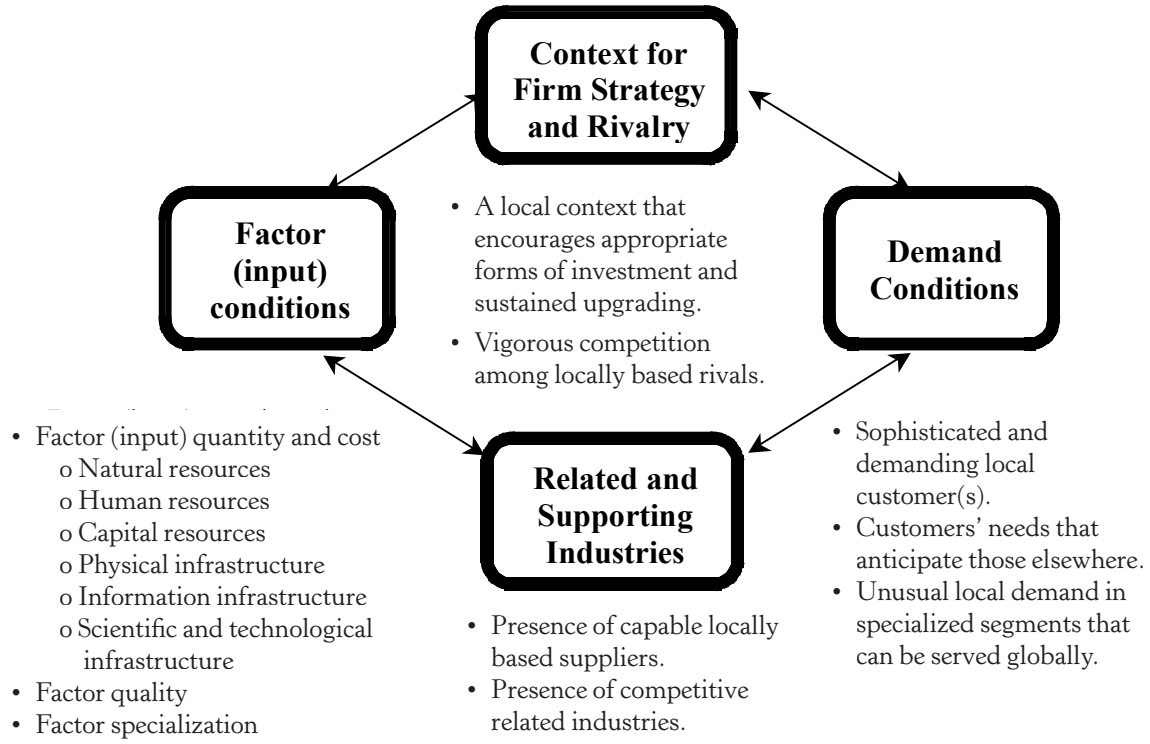

Figure 1. Michael Porter's sources of locational competitive advantage. Source: Porter (1998, 2000).

Below, we elaborate on the factors influencing competitive advantage derived from the location and interaction among firms. This subsection ends with an example of the Swedish wood products industry that illustrates the model of clustering in the industry.

Context for firm strategy and rivalry refers to context of the business environment at the local level that encourages appropriate forms of investment and continued upgrading of wood product manufacturing equipment and techniques. An adequate context for strategy and rivalry should promote vigorous competition among local firms. That competition should improve efficiency and quality of products.

Input conditions are necessary to insure access to sufficient quantities of wood with adequate quality to support a forest business cluster. Thus, it is fundamental for a business to locate in an area that can supply that material. This concept does not simply imply proximity to forestland but to forested lands that are capable of producing crops of industrial wood that are not withdrawn from timber utilization by statute or administrative regulation. In this case, access to timberland, as defined by the Forest Service, is a prerequisite for adequate access to supply of logs.

Other inputs in the forest industry include human and capital resources and administrative, informational, physical, scientific and technological infrastructure. Human resources are at the foundation of any industry and the wood products industry is not the exception. Around the country primary and secondary[1] manufacturers require both skilled and unskilled labor to maintain efficient production processes. In particular, skilled labor trained on the use of machinery, can be scarce and limit the potential for cluster efficiency and growth. This resource is directly related to the availability of local technical and degree granting institutions that can serve as training centers for skilled human resources. Scientific and technological centers for research and development can also be crucial in both the management of timberland as well as improvements in harvesting and product utilization. The Society of American Foresters, Forest Products Society and the Society of Wood Science and Technology, all maintain a list of accredited programs. Other colleges around the country provide technical training and can play an essential role in supporting new industry developments.

Although it is not a production input per se, the availability of adequate infrastructure is another fundamental factor to the development of industry clusters. In particular, the wood products industry needs a suitable transportation infrastructure to keep transportation costs of raw materials and finished products to the lowest possible levels. Transportation costs constitute a major portion of the cost structure of delivered wood. Last but not least, access to capital resources is just as crucial. Investment in state-of-the-art manufacturing equipment, training and continuous upgrade requires sufficient lines of credit. The public and private sectors both play an instrumental role in providing favorable input conditions.

Demand conditions constitute another primary factor behind a successful cluster. Sophisticated demand, or demand for high-value or specialized products by local customers is necessary to market products manufactured in the cluster. Sophisticated demand does not necessarily mean demand for high-end technology products, but it can refer to specific types of products because of their well-known handcraft quality (e.g. Amish furniture – see case study in Appendix B). Demand comes from other firms within the cluster (e.g. furniture manufacturers buying lumber from mills) and customers outside the cluster buying finalized products. Furthermore, when a cluster faces a sophisticated market, companies in that cluster are more likely to sell superior products because the market demands high quality products and services. Forest clusters can build on the positive image of locally manufactured products to gain competitive advantages over other producers outside the cluster. Such competitive advantages can take place in a global scale too. As an example, barrel production in Missouri has been recognized for the quality of manufacturing and the appealing flavors from oak timber procured locally. The cooperage industry in Missouri has been able to grow partly thanks to a strong global demand for their products which are known for quality oak barrels. Wood products industries around the country can identify the salient attributes that customers demand so that they can be better positioned to compete effectively both locally and globally. The model of industry clusters for competitive advantage also stresses the importance of locating near customers. When a cluster is capable of locating in close proximity to customers, firms can better understand their tastes, needs and desires.

Related and supporting industries comprise the last factor in Porter's diamond model for competitive advantage. This factor highlights the complementarities of firms within a cluster. Closer firm interactions can result in the manufacturing of unique products that can find specific segments in a market. Some of the other potential benefits from grouping within a region in a business cluster are the potential sharing of technology and expertise, and formal and informal integration of manufacturers who can more efficiently market their products and potentially earn premium prices. The existence of related and supporting industries also increases opportunities to access and develop a pool of trained workers whose expertise can be used in the cluster and passed on to others as a form of knowledge spillover. The fact that skilled labor is fundamental to successful cluster development was mentioned earlier and the grouping of firms within a region can facilitate the creation of such a workforce pool. Nevertheless, there are also

[1] Primary products are those manufactured directly from raw timber input. Examples include pulp, chips, lumber, veneer, plywood, and their by-products. Secondary manufacturers use primary products as input for remanufacturing. Examples of secondary products include various types of paper, paperboard, panels, engineered composited or dimension stock. Secondary products can also include final consumer products such as furniture.

potentially negative effects from having related industries in close proximity. One is the potential poaching of employees by rival companies especially for specialized positions. The growth of related firms in the wood products industry can also result in increased competition for raw materials and, depending on the availability of the resource and industry demand, even drive prices up. Higher input prices can have considerable financial impact, decrease mark-ups and risk the competitive capacity of firms in the cluster.

The primary objective of a cluster is to improve the competitiveness of firms by working in proximity, sharing common pools of natural and human resources, learning from each other, and building on closer integration. Business clusters can enhance competitiveness in three ways according to Michael Porter. First, firms can improve productivity because the costs of acquiring material from another member of the supply chain can be lower. Second, clusters promote innovation by increasing the ability of companies to identify opportunities for new or improved products, new manufacturing processes, and meeting new customer needs due to the concentration of businesses in the field. Third, clusters ease the expansion of innovative processes by facilitating the creation of new firms via startups, spin-offs, and new business lines of already established firms.

Michael Porter highlights the interaction between related companies including those in pulp and paper manufacturing, sawmills, logging, furniture, silviculture, and others when studying the forest products business cluster in Sweden. Figure 2 illustrates those interactions. Arrows indicate the direction for the flow of materials from one segment of the cluster to another. The interconnection and close collaboration between professionals managing forestlands, loggers, and primary and secondary wood products manufacturers is fundamental to the success of the cluster in its quest to create competitive advantage. Figure 2 shows the interactions of a well-developed and closely integrated model for the wood products industry with large manufacturers as pulp and paper mills. However, this model does not preclude smaller size firms to be part of the cluster or for a cluster to be based on the collaboration between small to medium-size firms. It is important to recall that the two strategies to achieve competitive advantage rely on higher product value derived from lower costs or differentiated products. Forest business clusters can benefit from economies of scale (the ability to reduce average production costs by growing larger) as a tool to be cost competitive. Another option is the ability to differentiate products for their high-quality in order to create value for consumers.

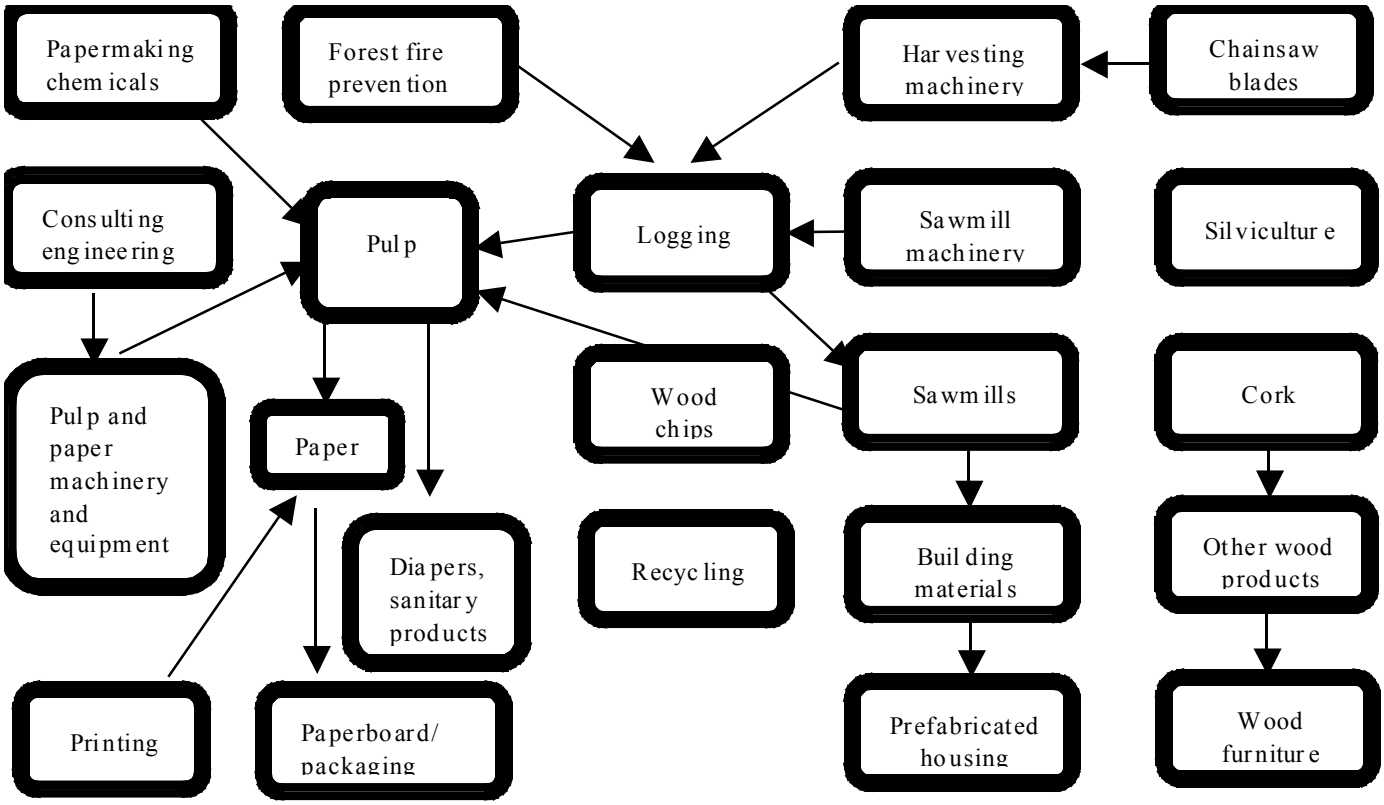

Figure 2. Illustration of interaction between a forest products cluster in Sweden. Adapted from Porter (1998).

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CHAPTER 3: OPPORTUNITIES AND POTENTIAL STRATEGIES FOR IMPROVED COMPETITIVENESS OF FOREST BUSINESS CLUSTERS

Forest business clusters need to continuously evaluate their business strategies in order to stay competitive. An increasingly fierce business environment and changing consumer preferences and needs present clusters with challenges but also offer new opportunities that might help them identify niche markets, develop unique products and services, and consequently gain competitive advantage. This chapter highlights some of the trends and possible strategies that the clusters might consider when revaluating their business models. A full description of the strategies and related references are included in Appendix A (*Opportunities for Increased Competitiveness of Forest Business Clusters*).

Full Circle Clusters

Self-sustaining forest business clusters that provide a range of products and services are more likely to be less affected by adverse economic conditions than clusters focusing only on one component of the manufacturing process. Such clusters provide numerous complementary products and services (for example, education, recreation and entertainment) that help build a strong base of dedicated clients. Clients with a previous positive experience periodically return to the cluster to purchase new products and services. This helps to build cluster reputation and gain competitive advantage. The Wooden Boat cluster in Port Townsend, Washington is an excellent example. This cluster builds wooden boats, provides repair services, training and recreational opportunities. Consequently, this structure helps to create an additional demand for cluster services. Forest business clusters consisting of primary and secondary forest product manufacturers and providing not only pre-processed but also final products can benefit by following this business model. Similarly, forest business clusters specializing in providing diversified recreational services may use this business model.

Incorporating Value-added

Incorporating value-added processing into operations and focusing on value-added markets can help forest business clusters in developing competitive advantages. This strategy helps generate additional revenues and decreases cluster vulnerability to adverse economic impacts. One of the strategies that adds value to processing is utilization of forest biomass for energy purposes. Recovery of forest biomass has been limited by high transportation and extraction costs. However, forest business clusters can decrease these costs by removing forest biomass together with high value products and integrating biomass-to-energy technologies into their processes. There are many examples in the U.S. West of small community projects that use biomass to generate heat for schools and community buildings. Mills across the U.S. have been successfully utilizing mill residues for generation of heat and electricity and for extraction of chemicals.

Product Branding

Branding is a marketing strategy used to differentiate products and services from those provided by competitors. Many forest products have been increasingly promoted based on quality, craftsmanship, and service. The goal of this strategy is to emphasize unique product qualities and create a positive image that appeals to consumers. There are numerous examples of targeted and untargeted activities that resulted in branding of forest products. For example, a Minnesota Wood Campaign promotes a "True North Woods" brand on all their products and materials. Many forest products manufacturers in Maine market their products under a "Maine Made" program that emphasizes high quality of products originating from Maine. Similarly, the "Brand Oregon" campaign strives to promote Oregon-based products by creating a consistent image. Furniture produced by Amish manufacturers from Holmes County, Ohio has gained an exceptional reputation for high quality without a traditional branding effort.

Forest Certification

Consumers are increasingly interested in purchasing goods and services that are produced in a way that minimizes negative environmental impacts. Forest certification offers a unique opportunity to assure consumers that wood products were produced in a sustainable manner. Forest clusters can use this opportunity to develop business models and marketing strategies promoting their wood products. Environmental compliance of wood products can be assured through certification of forest management practices and chain-of-custody certification. The first certification process verifies that all field operations were conducted in a sustainable manner, whereas the second allows for tracking wood products harvested from certified forests through to the final product. Forest business clusters are well positioned to adopt models relying on forest certification. Forest

products manufacturers, in close cooperation with forest landowners and managers, can ensure that their products meet certification standards at each stage of production and label them as certified products. This will help to differentiate these products from competition and increase competitive advantage of the forest business cluster.

Recreation and Eco-tourism

Forest-based recreation is increasingly popular in the U.S. and it is expected that this trend will continue in the future. Recreational activities, including hunting and wildlife viewing, contribute substantially to the U.S. economy - approximately $20 billion in 2006. However, there is still potential for increased economic value because only a small portion of forest landowners provide fee-based recreational activities. Economic potential of forest-based recreation can be increased if more landowners participate and if various recreational activities are jointly marketed to the public. This, however, requires close cooperation between individual forest landowners, local economic development and recreational organizations, lodging establishments, outfitters, and businesses providing supporting services. Forest business clusters focused on recreation can facilitate such collaboration and allow forest landowners and businesses to offer recreational opportunities in a more effective manner. Individual landowners are often limited by available resources. However, clusters can provide a wider range of complementary recreational activities and supporting services that can be offered to the public year round.

CHAPTER 4: EXPERIENCE FROM SUCCESSFUL FOREST BUSINESS CLUSTERS

Phone interviews and a review of reports and scientific papers were conducted to determine business models and strategies adopted by forest clusters in six regions of the U.S. (Pacific Northwest, Southwest, Midwest, Lakes States, Northeast, and South) and internationally (Finland and Sweden). Each cluster was thoroughly examined with respect to its history and development, community involvement, legal status, business structure, resource ownership, partnership with governmental and non-governmental institutions, investment and marketing strategies, offered products and services, and policies that led to the cluster success. Adopted business models and strategies varied between clusters. Differences were influenced by available input of capital resources, economic situation in the region, involvement of external institutions, infrastructure, and available markets. Some clusters have been present for many decades, whereas others are relatively new. Some clusters evolved as a result of local entrepreneurs that discovered and seized new market opportunities. They all offered high quality products and services that gained reputation and led to numerous spinoff businesses that formed a cluster over time. In other cases, clusters were created as a result of a targeted strategy, often coordinated by a development or government agency. In some situations, clusters formed partly because of a strong presence of the forest industry, whereas in others, they were developed to strengthen a declining local forest industry. Each cluster was unique and used different business strategies to utilize available resources and identify potential markets. Complete details of this study component and related references are included in Appendix B (*Case Studies of Successful Forest Business Clusters*).

The strength of forest business clusters relied on entrepreneurship-focused models, innovativeness of offered products and services, willingness to explore and engage in emerging markets, ability of cluster businesses to work collaboratively, and a supportive business environment. Below, we discuss several factors that appeared to be particularly important to the success of examined forest business clusters:

Feasibility analysis needs to serve as a starting point for activities leading to the development of new, or expansion of existing, forest business clusters. To capture market potential, such analysis needs to examine a region's economic conditions, existing infrastructure and labor resources, identify potential markets, and define potential development opportunities — including types of new industries that would complement existing firms, among other factors. The analysis should lead to an implementation plan for the selected strategy. A feasibility analysis is important not only for determining the viability of forest business clusters but also for recruiting new businesses, identifying and securing funding, and gaining political support for the cluster.

Stakeholder cooperation and commitment are crucial for the success of forest business clusters. Stakeholders, representing industry, government, and supporting organizations need to work together to create a long-term vision for the cluster and apply strategies and policies supporting cluster development. Stakeholders need to be aware that cluster development is a long-term process and might take time to achieve first benefits. Commitment is needed not only during development stages but also when the cluster is mature and successful to ensure its continuous competitiveness. Cluster businesses need to understand that close cooperation is needed for individual and collective success.

Leadership by a third party organization is often needed to coordinate activities of stakeholders involved in developing the cluster. An 'umbrella' organization can help cluster businesses identify niche markets, assist with workforce training and development, seek financial resources, improve networking among cluster members, educate businesses about the benefits of clustering, and gain political support for the cluster. A leading organization is needed to represent the cluster and provide a continuous stimulus for cluster development and improvement. Such an organization can facilitate communication between cluster businesses, supporting organizations, and government institutions.

Funding plays a major role in the development of many business clusters. Entry of new businesses is often limited by needed financial capital. Local, state and federal governments can allocate funding to improve the economic climate for business clustering in the forest sector. Important actions created by additional funding (such as project grants, low interest loans, and tax incentives) include start-up assistance to new businesses and incorporation of new technologies. However, other forms are also beneficial. Funding for workforce training workshops, education programs, assistance with research and marketing, and investment in needed infrastructure can also help lower cluster development and operating costs.

Entrepreneurial thinking by the leadership of cluster businesses, governments and supporting organizations is crucial to success. Entrepreneurship is needed to anticipate and understand changing markets and consumer needs and be able to quickly respond to these changes.

Entrepreneurship is instrumental in helping identify niche markets, stimulate innovativeness, and consequently leads to competitive advantage. Stakeholders need to focus on educational programs that help businesses develop entrepreneurial capacity in the cluster.

Access to inputs and markets is crucial to cluster development and long-term viability. A dependable flow of raw materials and stable markets for products and services are key to sustainable clusters. Stakeholders need to focus efforts on ensuring continued access to production inputs and expanding the customer base. Adequate transportation infrastructure is needed to ensure such access. Improving existing infrastructure and locating clusters along major transportation routes will facilitate timely transport of needed production inputs to cluster businesses and final products to customers. Forest inventories and directories of potential suppliers will help cluster stakeholders access availability of raw materials. Participation in marketing activities also can help clusters gain access to information regarding new markets and expand their customer base.

CHAPTER 5: FOREST SECTOR STAKEHOLDER PERCEPTIONS ON DRIVING FACTORS, ADVANTAGES AND DISADVANTAGES OF FOREST BUSINESS CLUSTERS

Introduction

The objective of including an online survey in the project was to collect additional information on business clustering in the forest sector. An online survey provided respondents with an opportunity to identify specific forest business clusters, provide information on their status, and express opinions on primary drivers and needs for the successful development of a forest business cluster. The results are intended to help support and enhance the competitiveness of the U.S. forest products sector. A total of 158 respondents completed the online survey. The respondents provided information about more than forty forest business clusters and clustering examples. Collected information has been incorporated into a publically available online registry of forest sector clusters.

Methods

For the online survey the following **definition of a forest products business cluster** was provided to participants:

Groups of forest-based firms or organizations located within a defined geographic region that have developed cooperative links with each other.

The survey was implemented using the Internet in the fall of 2008. A total of 248 stakeholders were invited to participate in the study via e-mail. At least two individuals were invited from each state to ensure geographic representation and participation. A total of five e-mail communications were conducted to increase participation in the survey. They included an introductory e-mail, first invitation e-mail, reminder/thank you e-mail, second invitation e-mail, and final invitation e-mail.

The first communication included background on the project and notification that a questionnaire invitation would be distributed soon. The second communication included the invitation to participate in the questionnaire and included the link to the online survey and a unique access code. The fourth e-mail communication was a reminder message and was distributed only to those participants that had not yet responded. The fifth and final message consisted of a notification that the questionnaire was now closing and that responses were requested.

Results

Driving Factors, Advantages and Disadvantages of Forest Business Clusters

The study of perceptions on driving factors, advantages and disadvantages of forest business clusters complements findings of the statistical model presented in Chapter 5. As part of the online survey of forest sector, stakeholders were

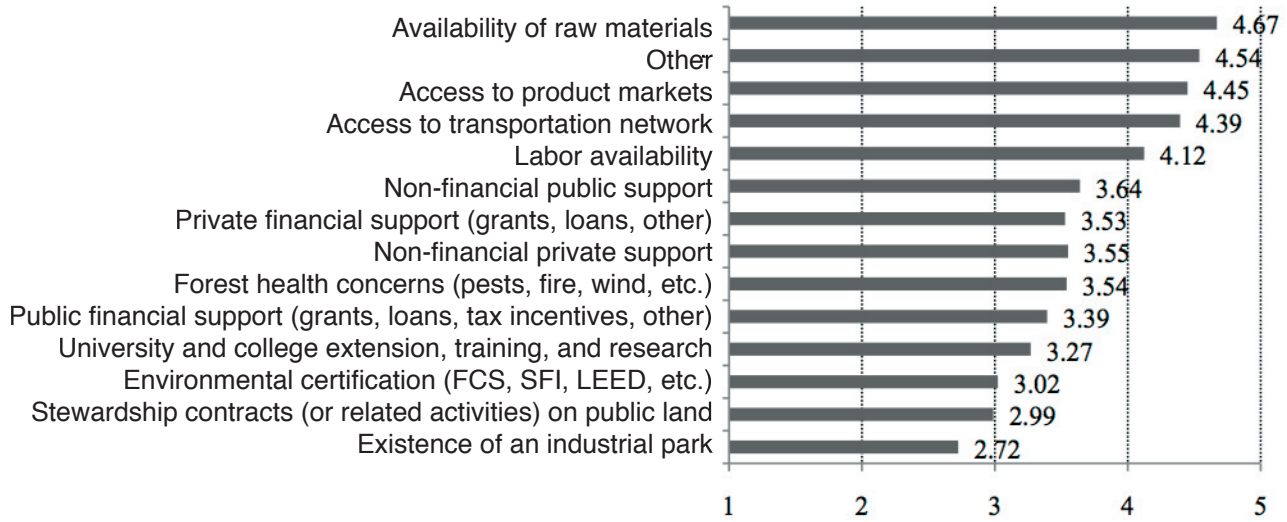

Figure 3. Importance of selected driving factors to the successful development of a forest business cluster (Strongly Disagree=1, Somewhat Disagree=2, Neither Disagree nor Agree=3, Somewhat Agree=4, Strongly Agree=5).

asked to indicate their opinions on three aspects of clustering: importance of selected driving factors to the successful development of a forest business cluster, as well as the advantages and disadvantages experienced by forest business clusters. Each factor was assigned an average importance value based on stakeholder responses. A 5-point rating scale was used to indicate their level of disagreement or agreement with the following importance of each factor: 1 (Strongly Disagree), 2 (Somewhat Disagree), 3 (Neither Disagree nor Agree), 4 (Somewhat Agree), 5 (Strongly Agree). Importance rankings are summarized in the Figures 3, 4, and 5.

Main findings on importance of selected ***driving factors*** to the successful development of a forest business cluster include:

- The most important factor driving business clustering was the ***availability of raw materials***. This factor has a cyclical effect. Areas that can supply large quantities of logs are the most likely to host a cluster of wood manufacturing companies. The geographic agglomeration of companies can facilitate access to adequate raw materials, primarily logs, as more logging and trucking services are made available to a larger cluster of manufacturers.
- Other important driving factors (average values greater than 4) include ***access to product markets, access to transportation network, and labor availability***. Access to product markets is indicative of access to customers. Proximity to customers allows manufacturers better understanding of their tastes and needs. Access to transportation network is critical to maintain transportation costs at the lowest possible levels and facilitate access to inputs and product markets. Labor availability is critical to the manufacturing process; thus, it is a very important factor to the successful development of a cluster.
- Other driving factors reported by respondents included: support from state forestry associations in order to ensure local, state and federal support; clear leadership; regularly scheduled cluster meetings; business insurance; group buying discounts; initial push from umbrella organization; awareness of other potential entities in the cluster; advocacy for statutory and regulatory reform targeted to forest products; willingness of industry to lead; availability of investment capital; and shared values and commitment to triple bottom line. Other driving factors tend to vary from cluster to cluster and represent area-specific drivers for success and creation of competitive advantage (*See Chapter 4 on Experience from Successful Forest Business Clusters*).
- The least important factors (average values less than 3) included stewardship contracts on public lands, and existence of an industrial park.

When asked to what extent respondents disagreed or agreed that forest business clusters experienced particular ***advantages,*** the main findings include:

- The most prominent reported advantages are ***better utilization of raw materials and/or manufacturing, improved cooperation among cluster members,*** and ***more effective product marketing.*** All these advantages are derived from the complementarity of companies and how their cooperation can improve manufacturing and marketing of products and services.
- In a second group, we identify the ability to attract more suppliers, greater opportunity to add value by vertical integration of cluster members, and improved manufacturing innovativeness and competitiveness. All these advantages derive from the better linkage along supply-chain companies in a forest business cluster. A cluster can attract a larger number of suppliers of materials (logging and transportation services), and promote closer vertical integration that can ultimately result in higher rates

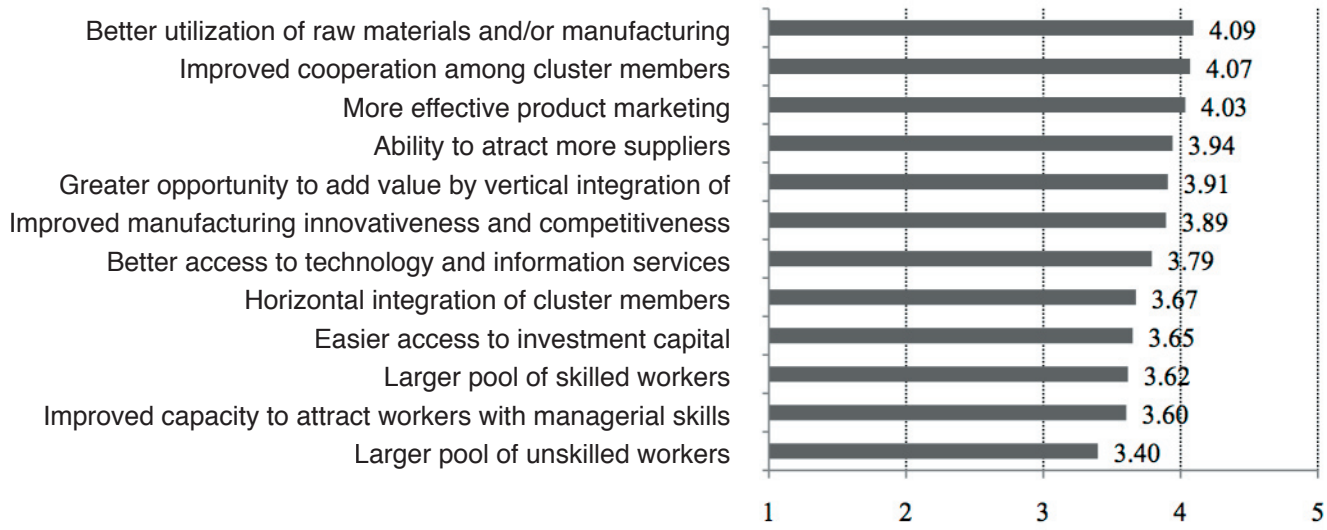

Figure 4. Importance of selected advantages experienced by forest business clusters (Completely Disagree=1, Somewhat Disagree=2, Neither Disagree nor Agree=3, Somewhat Agree=4, Strongly Agree=5).

of innovation and competitiveness.

• Other potential advantages of clustering that ranked at lower levels include better access to technology and information services, better utilization of raw materials and/or manufacturing residues, easier access to investment capital, horizontal integration of cluster members, improved capacity to attract workers with managerial skills, larger pool of skilled workers, and larger pool of unskilled workers. It is worth noting that the potential to have a greater pool of skilled labor is ranked higher than that for unskilled labor. As mentioned previously, labor is an important factor to business development but it is relatively mobile, so people can move more easily from one place to another as compared to companies or infrastructure.

Regarding ***disadvantages*** experienced by forest business clusters, main findings of the survey are:

• No statistically significant disadvantages were reported by study participants. The highest average ranking of 3.24 (corresponding to "Neither Disagree nor Agree") was assigned to ***competition for available labor***. Potential poaching of employees by other companies in the cluster does not seem to be a major disadvantage of clustering as indicated by respondents.

• The second-ranked disadvantage is the ***undesired competition*** between cluster members. Responses suggested that this might be a negative consequence of clustering but it can be inferred that by closer and improved cooperation among cluster members this situation can be avoided or its effect reduced (cooperation was ranked high as an advantage experienced in forest business clusters).

• Another group of potential disadvantages ranked lower includes increased raw material costs, increased labor costs, and more congestion on local roads. Survey results did not find these as major disadvantages. The lowest-ranked disadvantage was increased energy costs from clustering. Respondents tend to disregard the possibility of higher energy costs as a result of clustering.

Although respondents to our survey indicated no major disadvantages to clustering, literature provides opposite conclusions. A report by Francisco Aguilar (University of Missouri), based on a survey of softwood lumber sawmill owners and managers, indicated that clustering in the U.S. lumber industry can result in increased labor costs, higher log prices, and undesired competition. For a resource-based industry, such as forestry, any form of clustering would result in additional competition for main inputs. Although forest business clusters may improve utilization of materials, cooperation between participants and marketing efforts, agglomeration of wood product firms can also result in higher labor costs and log prices as a result of resource competition.

Cluster Collaboration

Respondents were also asked to provide feedback related to cluster collaboration.

A majority said that additional collaboration between clusters should be encouraged. They commented that the following ***was needed to support collaboration***:

• Build upon existing communication networks.

• Commitment of businesses, agencies, and other entities involved in business clusters.

• Need for public, government and individual business support. It takes businesses being supported with monies from all sources to get them marketed, while at the same time it takes support from the public, generating the sales needed to bring these businesses to the point of being self-sustaining. It also takes businesses being open-minded enough to understand that by working together, several small businesses can do the work of one large company.

• Leadership among business community and

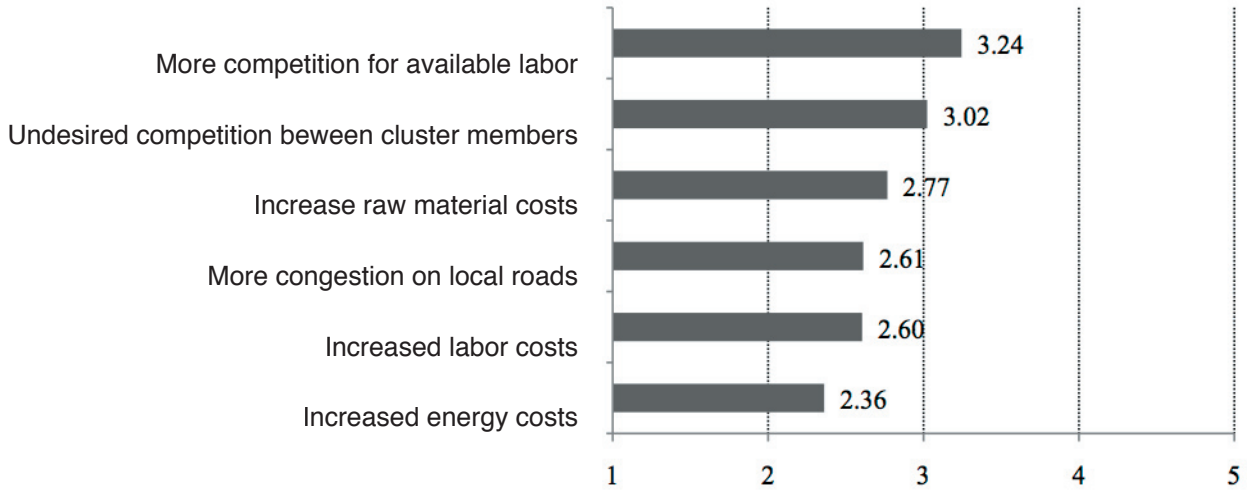

Figure 5. Importance of selected disadvantages experienced by forest business clusters (Completely Disagree =1, Somewhat Disagree=2, Neither Disagree nor Agree=3, Somewhat Agree=4, Strongly Agree=5).

economic developers to develop the business model.
- Collaboration in industry along with strong local support in both the private and public sectors to achieve a common goal.
- Better relationships between wood producers – logging contractors-wood consumers-mills; true partnership.
- Working to ensure quality control to meet customer needs.
- Building public awareness on contribution of the forest industry to the economy.
- Improved supply of wood and raw materials.
- Viable markets for wood residues.
- Outreach and education to industry sectors, policy makers, and other stakeholders about the value of clustering and cooperation.
- Information and templates for promoting successful collaborations.
- A unified strategy for promoting North American forest products.
- Expanded trained labor pool for technical and managerial positions in the forest products industry.
- Recognition of profitability as a component of sector sustainability.
- An effective third party organizer that has a compelling reason or market that encourages cluster development.

Several respondents specifically mentioned the need to know more about the types of existing forest clusters and participating businesses. This project and the resulting online registry of forest business clusters and implemented strategies will help to address this need for shared information. However, some respondents indicated that additional collaboration is not needed, and some of the reasons given included:

- Clustering should be kept local and collaboration at great distances should not be encouraged.
- Firm-to-firm contacts are more useful for supporting research and development.
- Anti-trust concerns.
- No perceived benefit.
- Clusters create confusion and drain resources and should not be too numerous.
- Lack of clarity on who (e.g., government role, private sector, etc) should be responsible for cluster development.

The responses addressing why additional collaboration and forest sector clustering is not needed included reference to the potential downsides of clustering. Specifically, the development of forest sector clusters can be seen as leading to high economic inter-relatedness among firms in a particular geographic region and can expose the region to economic cycles and shocks.

These concerns about the downside of clustering helps highlight the perceived tensions around supporting cluster developments at the expense of individual success and diversification. Essentially, it is a tension between constructive collaboration and unhealthy co-dependence. Several strategies can help reduce the risk of harmful co-dependence in a clustering situation:

- Product diversification.
- Research and development activities to enhance and maintain cluster competitiveness.
- Effective planning and marketing investments.
- Clear membership qualifications and expectations for participating firms.
- Shared investment and commitment to strategies that support economic sustainability.

Concerns were also highlighted around the sense that some clusters are overly dependent on a single source of raw materials (e.g., federal forest) or a single source of funding (e.g., grants). These concerns emphasize the need for balance and sustainable business models that consider the economic viability along with any social or environmental objectives that the cluster may be trying to address. Further, it emphasizes the need for diversification in cluster development by focusing on several key industries instead of just one.

The cluster development models need to consider the supply and demand relationships and how value-added processing can substitute for abundant raw material supplies. For example, the Ohio Amish cluster is largely located in a region that does not have a forest-dominated landscape but through value-added processing the participating businesses are able to make it work.

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CHAPTER 6: BUSINESS CLUSTERING WITHIN THE FOREST PRODUCTS SECTOR IN THE U.S. SOUTH

Information on the location of wood-using mills was collected to study the specific factors affecting clustering in wood products industry. The U.S. South was selected for in-depth statistical analysis of factors driving clustering because of available data. Information from various sources was used as proxies for clustering factors, and analyzed using statistical methods. Results help identify factors influencing clustering in the wood products industry.

Region of Study

We identified a region in the U.S. where information for the specific geographic location (coordinates) was available for the wood products industry. The U.S. Forest Service has generated maps identifying the location of wood-using mills around the country. Wood-using mills include sawmills, pulp mills, composite manufacturing facilities, post/pole, plywood, veneer and others. The study area comprised of the states of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia. Figure 6 depicts a map where each dot represents one of the estimated 1,964 wood-using mills within this region.

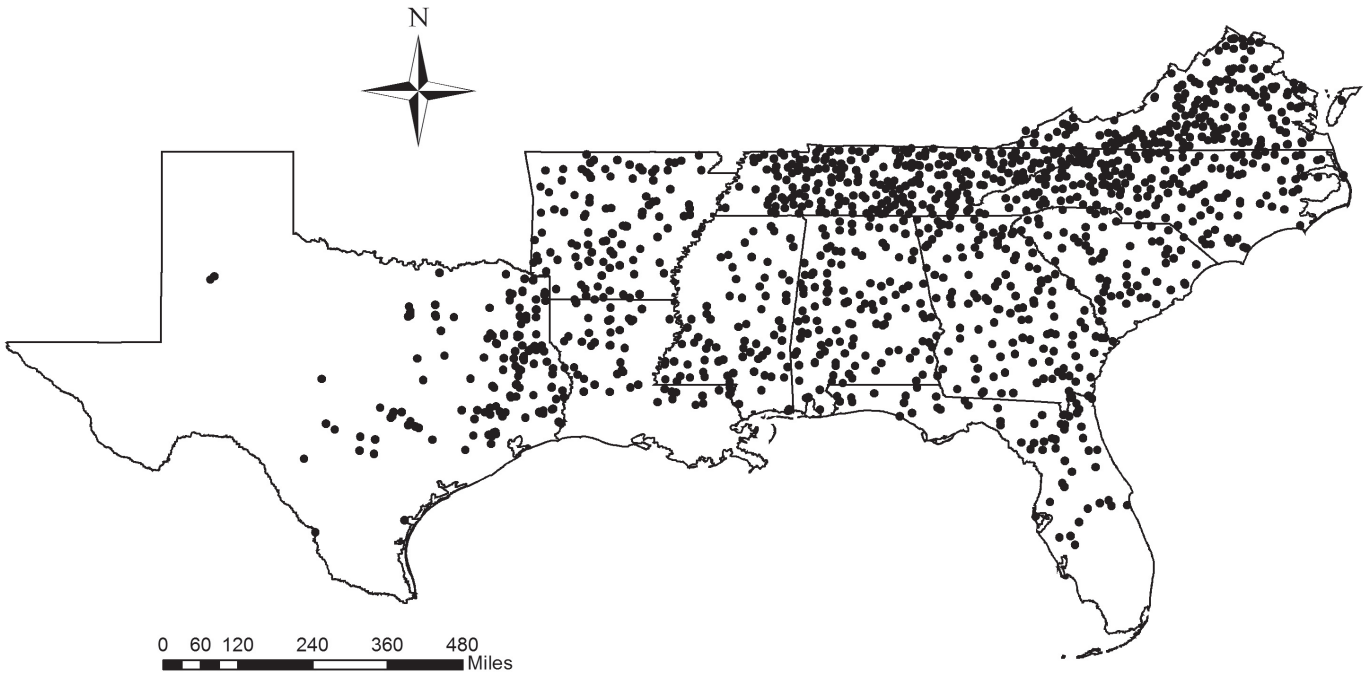

Figure 6. Location of wood-using mills in the U.S. South. Each dot in the map represents a mill. Information obtained from the U.S. Forest Service Southern Research Station.

Selection of Information to Serve as Proxy for Determining Clustering Factors

To study clustering in the primary wood products industry in the U.S. South, we first separated sawmills from other wood-using mills. We then studied how the number of sawmills related to the number of remaining wood-using mills and socio-economic factors within each county. The number of sawmills within a county was used as evidence of clustering (more sawmills in a county suggest industry clustering, whereas fewer sawmills provides evidence against it). To account for socio-economic factors we selected information from various sources. Information included the total population per county, average stumpage price ($/ton), sales of forest products per county, existence of highways and state roads, average industrial price for electricity ($/kilowatt hour), median house value, among others.

Our sources of information included the USDA Forest Service, Profiles of America, Timber Mart-South Notes, 2002 Census of Agriculture, NationalAtlas.gov, and the Energy Information Administration. We used a statistical model to explore how the number of sawmills per county changed as a result of variation in the clustering factors included in the analysis. Table 1 summarizes the clustering factors used in the model, the actual information used as a proxy, and the source of the information.

Table 1. Selected industry clustering factors, proxies and sources of data for the statistical model examining clustering within wood-using mills in the U.S. South.

Clustering factor	Proxy for:	Source
Number of sawmills per county	Total number of sawmills per county using geographic coordinates.	Southern Research Station, USDA Forest Service
Access to labor pool	Total population per county (in thousands)	Profiles of America
Cost of primary input [logs]	Average stumpage price ($/ton)	Timber Mart-South
Linkage with supply-chain industries	Geographic coincidence of forest products sales: sales of forest products, excluding Christmas trees and maple products (in $000s)	2002 Census Of Agriculture
Infrastructure facilitating low transportation costs	Highway infrastructure: presence of a highway in county (includes all principal highways, U.S. and state roads, but excludes country roads, ferry crossings, and other through highways as described by the National Atlas.gov information for national roads)	NationalAtlas.gov
Energy costs	Average industrial price for electricity (dollar per kilowatt/hour) per State	Energy Information Administration
Complementarity with other industries using similar production inputs	Presence of related primary industry: number of related primary wood product manufacturing firms (post/pole, plywood , veneer, and others)	Southern Research Station, USDA Forest Service
Land values	Median house value (in $000s)	U.S. Census 2000

Main findings and implications

The model for studying the number of wood-using mills per county identified the following as primary clustering factors:

Infrastructure Facilitating Low Transportation Costs: Transportation is an important cost element in all wood procurement systems in the forest industry. Transportation decisions by wood products industry firms may be short-term in nature, such as scheduling decisions for immediate delivery of logs to a mill, or they may be long-term and at a government scale, such as designing a road network, barge facilities and railroads[2]. More specifically, an estimated 87% of logs are transported to sawmills on trucks, 11% using barge, and 2% by rail. In the U.S. South hauling distances for wood transported on trucks range from 10 to 150 miles, barge transported wood varies from 50 to 500 miles, and transportation on railway exceeds 100 miles. Figure 7 presents a section within the state of Tennessee that illustrates how wood-using mills have a clear tendency to locate near roads to access logs and supply markets. Our results suggest that a county with access to adequate transportation infrastructure is 38% more likely to attract an additional sawmill than a county that does not have such access. Infrastructure is one of the most critical clustering factors in the primary wood products industry.

Complementarity with Other Industries Using Similar Production Inputs: The model examined the geographic coincidence between sawmills and other mills including pulp mills, composite manufacturing facilities, post/pole, plywood, and veneer mills. Our results indicate that there is a strong relationship in the geographical coincidence of all the above mentioned wood-using mills. All these manufacturers share similar inputs, related technology, and human resources with adequate knowledge of the milling process. The geographic coincidence partly reflects on these commonalities and suggests that counties that already have some established wood manufacturing

[2] Based on a survey among primary wood product manufacturers, the Louisiana Forest Products Development Center reported that truck transportation was the most commonly used method for transporting logs to sawmills in the U.S. South. Trucking was the preferred method because of ease of loading/unloading material and its capacity to transport all forms of wood products from pulp wood and saw logs to wood chips. The second most common mode of transportation was barging. Barge transportation is limited to high quality saw logs because of the elevated cost of this type of transportation. Hauling wood in the U.S. South by rail is restricted to short-wood pulpwood and chips for paper manufacturing.

core can benefit from the presence of other related firms. The potential integration of milling and wood-for-energy facilities may open new opportunities for the wood sector for expansion and development of wood products and energy clusters. Some pulp mills facing critical price challenges due to global competition can potentially turn their manufacturing process to the generation of energy and biochemicals; many mills already recover most wood residues generated during production process. Several wood-for-energy initiatives are emerging around the country driven by higher fossil fuel prices and adoption of policies promoting their use as discussed in Chapter 6 and Appendix A. The model suggests that counties with an already established industry can be 26% more successful in attracting other sawmills.

Energy Costs: Energy costs were estimated based on the cost of electricity. The average price per kilowatt-hour in the U.S. South was 4.84 cents based on data from the Department of Energy. We determined that increases in electricity prices will have a negative effect on county ability to develop forest business clusters. Specifically, a one cent increase per kilowatt-hour in the cost of electricity would reduce the probability of an additional sawmill locating in that county by 22%. The cost of energy is a factor that is external to individual firms and is more prevalent at a state of regional levels. Thus, states and counties with lower electricity costs will be the most likely to host forest business clusters. With increasing fossil fuel prices which translate into higher energy bills, wood-using mills are installing on-site boilers to generate electricity and steam in order to reduce costs and their dependency on electricity from the power grid. A forest business cluster model is better positioned than a single business to implement new technologies in order to adapt to changing input and output market conditions.

Cost of Primary Input [Logs]: The cost of a standing tree in the field is a major location factor that must be analyzed when identifying a forest business cluster. Logs are relatively immobile factors to the wood product manufacturing process. Although logs are harvested and transported to mills, hauling distances are limited by transportation costs. Using stumpage prices for southern yellow pine, we estimated that an increase in prices would have a significant impact on the ability of a county to host a cluster of sawmills. Increases in log prices would affect the manufacturing costs to the industry, thus, reducing the possibilities to remain cost competitive while producing differentiated products. Higher log prices translate into higher prices for final products and, consequently, motivate customers to seek alternative products. Depending on the level of price increases, a cluster structure can have the ability to better handle changing costs of inputs. One of the primary strategies is to create a competitive advantage based on product differentiation. Such strategy mitigates the negative impacts of rising prices because consumers are less sensitive to prices due the unique characteristics of products coming from a particular cluster. The model used for the analysis suggested that a $1 per ton increase in the average price of logs would reduce the probability of having one more sawmill in a county by 4%, thus reducing the possibility of developing a cluster. Similarly, a $5 per ton increase would decrease the probability of an additional sawmill by 20%.

Land Values: As was expected, areas where the cost of land is higher are less likely to host a cluster of wood-using mills. Wood manufacturers require land for the manufacturing process and storage of logs and manufactured products. An alternative to attract firms by providing land at very low cost is establishment of industrial parks. Areas where land is less expensive can facilitate the establishment of related firms and members of the wood products supply-chain. Compared to other factors, land value is not as important. In terms of the impact of higher costs on business, a $1,000 increase in housing value (used as a proxy of land value) would reduce county's probability of attracting additional mill by 0.6%. Compared to other factors such as transportation infrastructure and cost of logs, the effect of higher land value has a much lesser impact on forest business clusters.

Access to Labor Pool: Human resources are critical to the forest industry. The establishment and development of a successful forest business cluster requires a location with existing knowledge on forest management, primary and secondary manufacturing, sales and marketing. Locations near towns that have traditionally provided human resources to the industry can create special advantages over others where work on the forest industry has been non-existent. Nevertheless, compared to other inputs such as logs, labor is mobile and the reduction of forest sector-related employment in one area of the country can provide necessary human resources to growing forest clusters in another area. Therefore, this factor is important but not as critical as fixed conditions such as logs, infrastructure or energy because of the more flexible nature of labor. If county labor availability increased by 1,000 people, the probability of attracting a sawmill would increase by less than 0.1%.

Linkage with Supply-chain Industries: The close linkage with other firms along the supply-chain is an important factor to the success of

forest business clusters. Close integration can add value to wood products and reduce transportation and transaction costs along the supply chain. It also can result in better utilization of wood materials by developing better organized procurement systems (e.g. specific characteristics including timber size, species, color, etc.) that ensure the quality of final products. The existence of a well-integrated supply chain can provide alternatives for new business opportunities such as development of integrated biorefineries and adopting other energy initiatives. Nevertheless, at the county level, this linkage is not as strong as other factors (the probability of attracting a sawmill would increase by less than 0.1%).

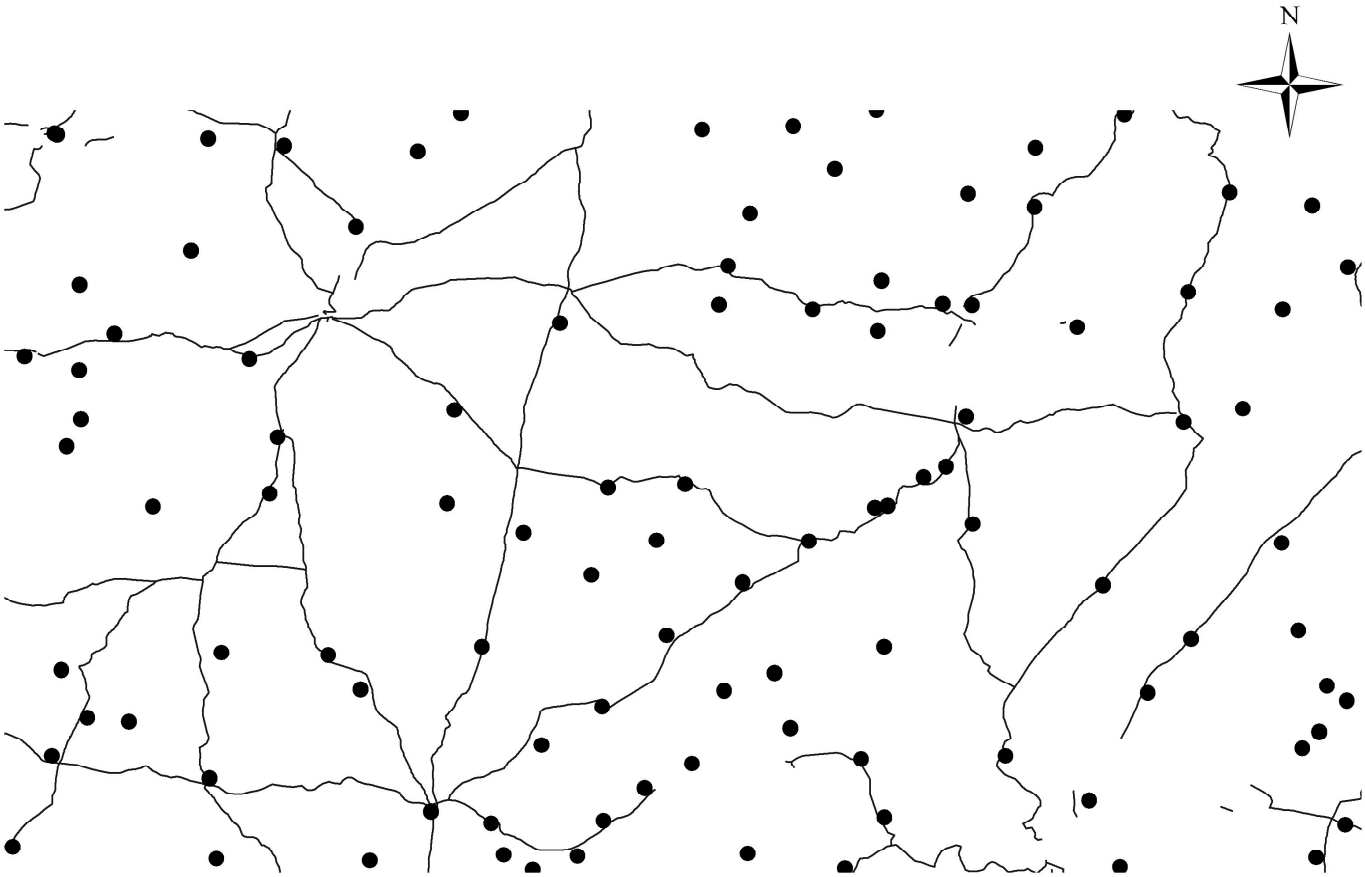

Figure 7. Section of the state of Tennessee with primary roads (lines) and location of wood-using mills (dots).

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

A major finding of this project is the uniqueness of the development strategies adopted by successful forest business clusters. The ultimate objective of a business cluster is to develop competitive advantages that make products manufactured by the cluster of special value to customers based on price, quality, service or other attributes. The business model adopted is dependent on the nature of the cluster, access to input materials, types of products manufactured, and proximity to markets. Certainly, there is no universal model that will fit all business structures and ensure their success. We determined that the clusters shared several common features that seemed essential to their success. Below, we summarize our recommendations related to forest business clusters.

Collaboration Helps Gain Competitive Advantages and Builds Business Resilience:

- The forest sector has experienced significant changes over the last few decades, and changes can only be expected to continue. A forest business cluster can better adapt to such changes and create opportunities to overcome possible future challenges. Close collaboration between members allow for better understanding of processes, cost structures, and opportunities for efficiency improvements.
- One of the main objectives of business clusters is the creation of competitive advantages. Competitive advantage is not static, but rather it has to change continuously to adapt to evolving consumers' preferences, technologies, and prices. The close collaboration between firms can provide resiliency needed to address adverse market conditions and allow for adopting value added technologies. Competitiveness can be enhanced in a cluster by purchase of inputs from other members at lower costs, increased ability to improve processes and products due to closer cooperation and innovation.
- Coordination among cluster members is fundamental to success. Raw materials must flow from forest to factory in a reliable manner. Close working relationships between logging contractors, wood manufacturers, and supply-chain companies should be exercised. Industry sub-sectors must be linked to strengthen competitiveness of all cluster members to ensure supply and quality of raw materials. Closer business collaboration also can facilitate the development of viable markets for wood residues. Collaboration should be complemented with strong local support from the private and public sectors. Coordination of business interactions must work to ensure quality control and provision of products that meet customer expectations. Full circle (self-sustaining) clusters are not as dependent on raw materials and include numerous supporting businesses and organizations. Both, clusters relying solely on private ownership or partnership of private and public businesses and institutions were successful. However, a third party leader institution was crucial to the successful development of many clusters.
- Forest business clusters should build upon existing communication networks to outreach to potential cluster participants and customers. Building public awareness about the role of the forest industry in the local, regional and national economies can be fundamental to promoting locally manufactured products.

Industry, Private and Public Sectors Stakeholders are Important for Successful Forest Business Clusters:

- Stakeholders need to be aware that economic development based on only one business cluster is vulnerable to changing economic conditions and consumer preferences. Any negative changes may have an adverse impact on the cluster and economic development in the region. Whenever possible, efforts should focus on identifying and supporting more than one viable cluster. Full circle clusters offering diversified products and services increase customer base and may help to ease negative economic impacts.
- Key stakeholders must be committed long-term to the cluster. Although leadership styles differ among clusters, it is necessary to have individuals who are committed to the success of the cluster. Commitment to the cluster among business community members and economic developers is fundamental. Cluster building must use the competitive advantages existent in a region (natural resources, technical know-how, transportation systems, etc.). Some regions are endowed with plentiful amounts of softwoods or hardwoods, enjoy a rich network of roads, have a long history of managing and using their forest resources, or possess a unique cultural background expressed through wood products manufactured locally. To be successful, a cluster has to build on the foundation provided by the natural advantages present in a region.
- Individuals, businesses and agencies outside the cluster, particularly those in the public sector, are also important in providing adequate support. A

combination of private and public efforts to develop a unified strategy for promoting North American forest products can be an interesting model to follow. North American manufacturers and related forest-based communities face price pressures and competition from wood product companies around the world. A national strategy that facilitates the development of competitive advantages in forest business clusters could be used as a strategy to promote efficiency in the sector and improve economic well-being of rural communities.

• The public sector, at the federal, state and local levels, can also facilitate the development of clusters by investing in human resources. Funding for workforce training and development helps promote efficiency in the forest sector. Lack of adequately trained labor can halt the development of clusters.

External Support and Funding are Needed to Facilitate Cluster Development:

• Cluster building benefits from a comprehensive economic development strategy supported by government. Business can benefit from easy to access funding opportunities, continuous training, research, and the development of adequate infrastructure facilitating transportation of inputs and final products.

• Successful business clusters enjoy the ability to access information, technology, and external funding. Capital investments and technology from outside a cluster must be encouraged. They can come from other counties, states, regions or even countries. Access to information and funding to the continuous upgrading of technology and know-how is fundamental to maintain competitive advantage.

• Public and private investment in research and development of new technologies and products and acquisition of equipment is another factor fundamental to successful clustering. Sufficient lines of credit to support training, upgrade equipment, and process improvement and development will be necessary to allow clusters to create competitive advantages.

• Colleges, universities, and public agencies are important in developing clusters. Training in forest management, logging, manufacturing, value-added processes, business management, and transportation can contribute to the improved efficiency of the wood products supply chain. Collaboration between educational institutions and the private and public sectors can facilitate provision of necessary and continuous training.

Integration and Diversification are Important for Improved Competitiveness:

• Opportunities for clusters include embracing renewable energy production as part of the business cluster. An existing cluster of forest firms can utilize residues to generate energy for local consumption and export. Pulp and paper plants can consider the adoption of a biorefinery model to maximize the use of wood materials for the production of wood products, chemicals, and energy. As the federal and state governments prioritize locally produced renewable energy, companies that are closely integrated could have better access to programs promoting renewable energy production and be poised to diversify their processes and outputs to add an energy component.

CHAPTER 8: ONLINE REGISTRY OF FOREST BUSINESS CLUSTERS

An online registry of existing forest sector clusters in the U.S. is available at www.fwrc.msstate.edu/cluster/cluster_search.asp. The registry provides information about each cluster including location, contact information, geographic area served, legal status, size (number of firms and employees), duration, and specific strategies the cluster uses to meet its objectives. The registry is not intended to represent all forest sector clusters in the U.S. Instead, it is the "first step" in a process to begin to categorize clusters nationwide and create a structure for monitoring clustering activities in the U.S. forest sector. Visitors to the website can submit information about additional clusters for listing in the online registry. A more detailed description of the online cluster registry is included in Appendix C.

CHAPTER 9: LITERATURE REVIEW ON BUSINESS CLUSTERING WITHIN THE U.S. FOREST SECTOR

An online database of over 100 scientific papers, assessment and industry reports is available at www.fwrc.msstate.edu/cluster/bibliography.asp. Each reviewed document is briefly summarized with respect to its key findings. Visitors to the website can view the entire list of document summaries or search the database by keywords and pre-defined terms. Examined papers and reports relate to the U.S. forest industry, adopted business cluster models, benefits and challenges associated with business clustering, and identify forest business clusters within the U.S. forest sector. A more detailed description of the online database is included in Appendix D.