United States
Department of
Agriculture

Forest Service

Pacific Northwest
Research Station

General Technical
Report
PNW-GTR-703
February 2007

National Forest Economic Clusters: A New Model for Assessing National-Forest-Based Natural Resources Products and Services

Thomas D. Rojas

The Forest Service of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

Authors

Thomas D. Rojas was a research economist, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Alaska Wood Utilization Research and Development Center, 204 Siginaka Way, Sitka, AK 99835. Rojas is currently with the Department of Planning and Development for the City of Seattle, 700 5th Avenue, Suite 2000, Seattle, WA 98124.

Cover Photo Credits

Surf Shop sign, water bottle, and Sitka photos by Maria Stiefel, USDA Forest Service. Visitor's center photo by David Curl, National Park Service. Barge and lumber yard photos by David Nicholls, USDA Forest Service.

Abstract

Rojas, Thomas D. 2007. National forest economic clusters: a new model for assessing national-forest-based natural resources products and services. Gen. Tech. Rep. PNW-GTR-703. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 33 p.

National forest lands encompass numerous rural and urban communities. Some national-forest-based communities lie embedded within national forests, and others reside just outside the official boundaries of national forests. The urban and rural communities within or near national forest lands include a wide variety of historical traditions and cultural values that affect their process of economic development. National-forest-based urban and rural communities participate in numerous economic sectors including nontraded industries, resource-dependent traded industries, and non-resource-dependent traded industries. These communities represent microeconomic environments. Cluster theory provides an explicit framework to examine the microeconomic relationships between national forests and their embedded and neighboring communities. Implementation of economic cluster initiatives in national-forest-based communities could improve their overall social well-being through increased competitive advantage based on innovation and higher productivity. This paper proposes establishing an Economic Clusters research team within the Forest Service. This team would dedicate its efforts to the analysis and improvement of the determinants of competitive advantage affecting national-forest-based communities.

Keywords: National-forest-based communities, economic cluster theory, innovation, productivity, competitiveness.

Introduction

National forests in the United States occupy 191 million acres of land; an area approximately the size of the state of Texas. This area encompasses thousands of urban and rural communities with human populations ranging from low double digits to tens of thousands. For example, on the Tongass National Forest, the largest national forest in the U.S. National Forest System occupying nearly 17 million acres, there exist 32 urban and rural communities (USDA FS 2005c) with populations ranging from 24 inhabitants in Point Baker to 30,966 in Juneau (State of Alaska 2005). The total population of these 32 communities lying within the boundaries of the Tongass National Forest stands at around 73,000 inhabitants.

Additionally, many urban and rural communities are close to national forests, although outside their official boundaries. This proximity to national forests makes these communities closely akin to communities residing within the boundaries of national forests.

The issue of rural community proximity to national forest lands proved a key concern in Donoghue and Sutton (2006). In their discussion, they characterized communities with close connections to forests, both economic and noneconomic, as forest-based. While conducting socioeconomic monitoring of 1,314 rural communities in the Northwest Forest Plan region, they defined proximity as within 5-mile buffers around public lands (i.e., USDA Forest Service and Bureau of Land Management lands). Donoghue and Sutton categorized communities as within or outside the 5-mile buffer of public lands. Among their conclusions, they found that "most of the communities (70 percent in 1990, 71 percent in 2000) with very low or low socioeconomic well-being scores in 1990 and 2000" were within the 5-mile buffer zone of public lands (Donoghue and Sutton 2006: 32). Clearly, as Donoghue and Sutton (2006) indicated, proximity to public lands can represent a substantial socioeconomic disadvantage for many communities.[1]

The urban and rural communities that exist embedded in and close to the national forests represent microeconomic environments.

The urban and rural communities that exist embedded in and close to the national forests represent microeconomic environments. These environments incorporate the local choices made by individuals, firms, and industries as they confront scarcity and incentives in their communities. These national-forest-based urban and rural communities participate in numerous economic sectors including

[1] Donoghue and Sutton (2006) did not, however, explicitly examine communities that existed within the boundaries of public lands. Recent studies that examined embedded national-forest-based communities include Mazza and Kruger (2005), which explored the social dynamics and trends of forest-based communities in southeast Alaska focusing principally on their evolving transition to a tourism- and recreation-based service economy, and Robertson (2003), which tested the economic base hypothesis in 15 communities in southeast Alaska determining no conclusive evidence for its validity.

nontraded industries (e.g., construction, health services, retailing, and utilities), resource-dependent traded industries (e.g., biomass energy, bottled water, fishing and fish processing, logging, mining, and recreation tourism) and non-resource-dependent traded industries (e.g., shipbuilding). For example, according to Alaska Economic Trends (Alaska Department of Labor and Workforce Development 2006), in southeast Alaska, a region in which nearly all the communities are embedded in or in proximity to the Tongass National Forest, the "goods-producing" sectors (i.e., natural resources and mining, construction and manufacturing) had a monthly average employment in 2005 of 4,100 individuals, while the service-providing sectors (i.e., trade; transportation and utilities; information; financial activities; professional and business services; educational and health services; leisure and hospitality; and federal, state, and local government services) had a monthly average employment in 2005 of 32,450. Removing government positions would reduce the monthly average employment in southeast Alaska in 2005 in the service-providing sectors by 13,450. Consequently, one could state that the monthly average private sector employment in 2005 in southeast Alaska registered around 23,100 individuals across a wide array of economic sectors.

The individuals living and working within, and in proximity to, a national forest experience both its hedonic benefits and its development constraints. The national forest lands can present a major challenge to national-forest-based local communities as they seek to modify, expand, or upgrade their economic activities. Communities seeking to exploit the resources and products provided by national forests must contend with a federal agency, the USDA Forest Service, whose mission dictates specific management and multiple-use criteria affecting national forest lands.

Discrete public policy actions can substantially impact the microeconomic environment of national-forest-based communities causing strong discontinuities in their economic performance. For example, the elimination of the 50-year timber contracts on the Tongass National Forest and the related demise of the local pulp mills in the small cities of Ketchikan and Sitka in the mid-1990s had a powerful negative impact on the production, employment, and general welfare of numerous communities throughout southeast Alaska (Morse 1997). The 40-year legacy of southeast Alaska's integrated forest products industry continues today, with a majority of productive sawmills of various sizes operating in different communities on Prince of Wales Island (Brackley et al. 2006).

Managers of national forests in the United States have indicated a strong interest in sustaining the economic feasibility of national-forest-based communities. For example, Dale Bosworth, Chief of the Forest Service, has noted that the

"Forest Service *does* have a role in communities and their economies" and that "our mission is to 'sustain' forests for people, including environmental, social and economic components" (USDA FS 2005a: 5). At the regional level, Dennis E. Bschor, Alaska Regional Forester, has indicated that one of his main regional objectives is to "support and assist in the year-round economic vitality and social well-being of the communities in Southcentral and Southeast Alaska and natural resource-dependent communities throughout the State" (USDA FS 2005d: 32). At the forest level, the leadership team of the Tongass National Forest explicitly stated its obligation to help promote the economic viability of the 32 communities and 19 federally recognized tribes that call the Tongass National Forest home by declaring its commitment to enhance "the health, stability, quality of life, economic vitality, and adaptability of Tongass communities" (USDA FS 2005b: 2).

The particular ties—cultural, economic, emotional, historical, vocational—that compel these communities of individuals, firms, and industries to seek their livelihoods from national forest lands demand a management response from the Forest Service that incorporates their local characteristics into the overall management plan of the national forests. These national-forest-based communities of individuals, firms, and industries constitute microeconomic environments. One approach to enhance the Forest Service's incorporation of community interests in its overall management plan of the national forests could entail explicit partnerships at the microeconomic level with local entrepreneurs.

The conceptual framework presented in this paper suggests adopting a cluster-based economic development strategy to upgrade the microeconomic environment of national-forest-based communities.

The conceptual framework presented in this paper suggests adopting a cluster-based economic development strategy to upgrade the microeconomic environment of national-forest-based communities. For the purposes of this paper, a cluster is a group of firms whose linkages mutually reinforce and enhance their competitive advantage. The members of a cluster could be competitors, customers, partners, suppliers, or research and development contacts.

The cluster-based economic development strategy would focus on improving the welfare of these communities through microeconomic productivity gains principally in resource-dependent sectors. Ultimately, the objective would seek to establish national-forest-based economic clusters representing public-private joint ventures in urban and rural communities existing both within and close to national forest boundaries. The national-forest-based economic clusters, integrating public sector objectives with private sector strategies, would provide natural resources products and services to local, regional, national, and international markets.

Currently, the Forest Service's branch of State and Private Forestry, through its Economic Action Programs (EAPs), addresses the microeconomic needs of rural communities highly dependent on national forest lands for their livelihood. The

EAPs are designed to provide seed money and professional expertise to businesses dependent on natural resources located in rural communities. State and Private Forestry's Urban and Community Forestry Program (UCFP) addresses the microeconomic needs of urban communities in a fashion similar to the EAPs. However, State and Private Forestry does not incorporate a cluster-based economic development approach in its initiatives.

This paper suggests that a cluster-based economic development approach could strongly benefit national-forest-based urban and rural communities by explicitly influencing their determinants of microeconomic productivity and competitiveness, and clearly identifying the role of the national forest in their microeconomic value chains and value systems. The EAPs and UCFP do not make these factors explicit when formulating their integration of natural resource management with urban and rural community assistance. Additionally, individual national forest land management plans could also adopt an economic-cluster-based appraisal approach when assessing the viability of numerous urban and rural microeconomic communities embedded in and close to their jurisdictions.[2]

This paper examines the fundamentals of "cluster" theory and applies this theory to the microeconomic characteristics embedded in the national forests. This effort will explain how cluster theory could explicitly examine the relationships between national forests and national-forest-based microeconomic environments. The enhancement of these relationships could form a core objective of national forest management plans. By doing so, one could expect higher scores in the socioeconomic well-being (SEWB) index, formulated by Donoghue and Sutton (2006), for national-forest-embedded communities and those within a 5-mile buffer zone of national forest lands. The higher scores could emanate from increases in the diversity of employment by industry (i.e., EmD) indicator in the SEWB index (Donoghue and Sutton 2006).[3] These increases could result from economic-cluster-

[2] I contributed research and analysis to the 2006 update of the 1997 Tongass Land Management Plan. Among many other elements, this plan incorporates a derived demand model to forecast future demand of forest products from the Tongass National Forest. Although an important component of the conditions facing local forest product producers on the Tongass National Forest, demand conditions represent only part of the microeconomic environment within which local producers operate. A more comprehensive analysis adding factor conditions, firm strategy, and related industries would provide greater insight into the needs and resiliency of local national-forest-based microeconomic environments on the Tongass National Forest.

[3] Socioeconomic well-being index (SEWB) = diversity of employment by industry (EmD) + percentage of population 25 years and older having bachelor's degree or higher (Ed) - percentage of the population unemployed (Pun) - percentage of persons living below the poverty level (PP) - household income inequality (InIn) - average travel time to work (ATT). SEWB = EmD + Ed - Pun - PP - InIn - ATT. (Donoghue and Sutton 2006: 20).

based initiatives inducing improvements in the microeconomic environments of national-forest-based communities, which, in turn, could attract a wider range of viable industry-specific investments into these communities.

Literature Review of Economic Agglomeration

Both the analysis of the agglomeration of firms and the importance of geography to economic development have formed part of economic theory beginning with the classical economists and continuing into the 21st century. Although both Marshall (1890) and Weber (1929) represent early classical exponents of issues pertaining to industrial agglomeration, this section will focus more on Weber's pioneering effort in location theory and its influence on modern cluster theory.

Both the analysis of the agglomeration of firms and the importance of geography to economic development have formed part of economic theory beginning with the classical economists and continuing into the 21st century.

Marshall (1890) listed three discrete incentives compelling the localization of industries. Firstly, he indicated the operational benefits to industry of creating a pooled market of specialized workers that can satisfy industry's particular skill requirements. These workers would also benefit by having a number of employers to choose from in the case of one firm within the industry becoming idle. Secondly, Marshall denoted the development of secondary, or subsidiary, industries adding to the functional benefits of the concentration of industries, as these provide specialized nontraded inputs and services to the primary industry. Finally, Marshall elaborated on the increasing likelihood of technological innovations occurring in industrial agglomerations, given the relative ease of many experienced minds to gather and solve shared problems.

Weber (1929), considered by some experts in economic geography the pioneer theorist of industrial location theory, captured both economic agglomeration and geographic importance in his research. He focused specifically on the location factors affecting industries. He established an analytical framework based on two primary regional factors of location: costs of transportation and labor. He then proceeded to simplify his model by assuming no labor mobility, an established sphere of consumption, and a predetermined geographical source for raw material. Weber considered transportation cost the initial and principal factor determining the decision to locate industries at specific sites.

The main complexities added to the transportation cost model have to do with the nature of the raw materials and the processing they endure. Fundamentally, the higher the weight of the raw material, or the greater the weight-loss of the raw material during its processing, the closer the industry would locate to raw material deposits. Weber's initial objective was to minimize the producer's transportation cost of collecting and processing the raw material and delivering the final product to consumer markets.

Still, Weber recognized that the other location force, the geographical differences in labor costs, would have to be factored in to determine the optimal choice of situating the production facility. He determined that geographical differences in labor costs become a deciding factor in locating an industry based on minimum transportation cost, when the savings from selecting the minimum labor cost site exceed the increase in transportation cost from this location.

In seeking to make his analytical framework more applicable to industrial reality, Weber added secondary agglomerative factors to his theory on the location of industries. His interest lay in addressing the external economies of scale that result from the agglomeration of industries in a particular location. As Marshall did, Weber specifically noted the benefits of industry-specific labor pools and specialized auxiliary industries that enhance the value of industrial concentration. Weber also discussed the problems eventually arising from agglomeration, such as the increased expenses resulting from greater demand for local factors of production. The balance between agglomerative and deglomerative forces, the latter mostly arising from increasing land values, determines the effectiveness of the particular industrial concentration.

Weber remained very keen on relaxing his theoretical assumptions in order to explain the forces underpinning actual industrial concentration. In particular, he discussed some of the externalities associated with evolving industrial concentrations such as new points of consumption and new uses of material deposits, which would attract additional industries to the location. Finally, his discussion on the stratification of industrial concentration addressed the notion of interrelated layers of "locational" distribution. He identified five interrelated strata: the agricultural stratum, the primary industrial stratum, the secondary industrial stratum, the central organizing stratum, and the central dependent stratum. For Weber, the agricultural stratum functions as the primary force determining the "locational" structure of the economic system.

Scholars interested in industrial agglomeration, industrial location, and economic development continue to reference or paraphrase Marshall (1890) and Weber (1929). Tsournos and Haynes (2004: 8-9) included the following "Marshallian" perspective when assessing development paths in southeast Alaska:

> As many firms agglomerate, as a group they may be able to realize lower input prices that may shift or lower cost curves. This is because when many firms within an industry locate within a concentrated area, it is advantageous for other firms to specialize in providing services to the concentrated industry and to locate near the concentrated industry. Interdependency between

the industry and intermediate or input firms may develop. Concentration of several firms within an industry also offers a pooled market of workers with industry-specific skills.

Tsournos and Haynes (2004: 23) ultimately focused their examination of development paths on the dynamics of socioeconomic change occurring at the community level. Their conclusion remains very much in line with earlier research pertaining to rural communities along the Columbia River basin (Harris et al. 2000). However, the "Marshallian" view in Tsournos and Haynes (2004) of how firms agglomerate and their focus on community dynamics prove insufficient to provide any explicit guidance in formulating competitive economic development paths for national-forest-based communities. What is missing from their assessment is an explicit evaluation of local microeconomic conditions and how they relate to the management of national forests (i.e., how does the management of national forests influence local microeconomic conditions), and how national-forest-based firms respond when these conditions change.

This paper seeks to understand the role that the management of national forests plays in promoting the microeconomic mechanisms for innovation and entrepreneurship that could allow national-forest-based firms and communities to prosper.

This paper seeks to understand the role that the management of national forests plays in promoting the microeconomic mechanisms for innovation and entrepreneurship that could allow national-forest-based firms and communities to prosper. It proposes a model that explicitly outlines the interdependent microeconomic determinants affecting the performance of firms operating in national-forest-based communities. By facilitating the assessment of conditions in the microeconomic environment of these communities, the model would complement the existing work on the dynamics of socioeconomic change occurring at the community level.

Cluster Theory

Over the last 15 years, a growing amount of economic research has focused on understanding the geographic context affecting the microeconomics of competitiveness in the private sector. Building on the work of Marshall, Weber, and many other scholars in economic development and economic geography, Porter (1990) set the tone for a reexamination of the conditions necessary for global economic prosperity with a particular emphasis on the strategies of private firms and how these are influenced by, and have an influence on, public policy.

Porter has led a major worldwide effort to understand the fundamental attributes that characterize successful clusters of firms. His work includes and promotes elaborate case studies of nations, regions, states, and firms that assist in clarifying the powerful attributes of his competitive advantage theory. Bresnahan et al. (2001) in their discussion of clusters of information and communications technology firms

cited Porter as a classical reference for current agglomeration economies. Munnich et al. (2002) in their work on rural knowledge clusters referred to Porter as having meaningfully extended theories of economic development by bringing together theories of business strategy, institutional economics, and the significance of social relationships and social capital.

Porter's seminal work on clusters represents an upgrading of agglomeration theories with business strategy. This section focuses on Porter's work in cluster theory, given his emphasis on understanding and assessing the mechanisms affecting the competitiveness of microeconomic environments. Porter's focus on the microeconomic determinants of competitiveness makes his model very compelling for public agencies, such as the Forest Service, committed to regional prosperity based on the economic revitalization of local communities embedded in and close to their jurisdictions.

A cluster, in Porter's framework, is a critical mass of companies in a particular location. Explicitly, Porter's model examines three interdependent systems: the primary and secondary activities of firms and how firms marshal these activities to secure a profit; the microeconomic system in place that details the chain of events from the supplier of factors of production to the retail sale of a finished good or service; and the systemic determinants of competitive advantage that encompass factors of production, firm strategy, related and supporting industries, and demand conditions.

Value Chain

In the microeconomic environment of market-based economies such as the United States, firms organize to provide a product or service that generates value for a buyer. Firms compete within an industry to provide their products or services to customers. The competitive advantage of a firm emanates from its relative ability to organize its internal activities so as to maximize its profits while providing value to its customers. The key to a firm's profitability in a competitive environment lies with its management of what Porter defined as the "value chain." The management of a firm's value chain defines the firm's strategy. Each element or combination of elements of the value chain—either among the primary activities, the support activities, or both—could generate a competitive advantage for the firm relative to its competitors. All elements contribute to the firm's profit margin. As Porter noted, "firms gain competitive advantage from conceiving of new ways to conduct activities, employing new procedures, new technologies, or different inputs" (Porter 1990: 41). A firm's cost advantages could originate anywhere in the value chain (fig. 1).

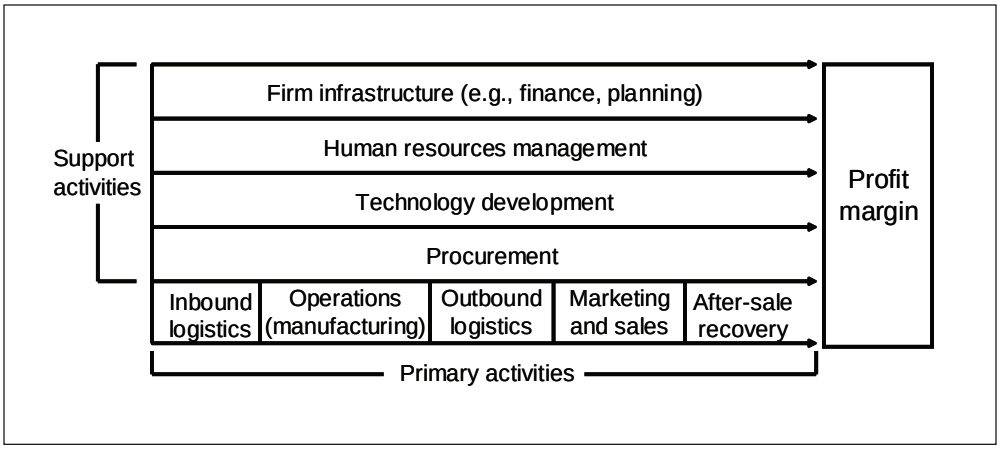


Figure 1—The value chain. Source: Porter 1990.

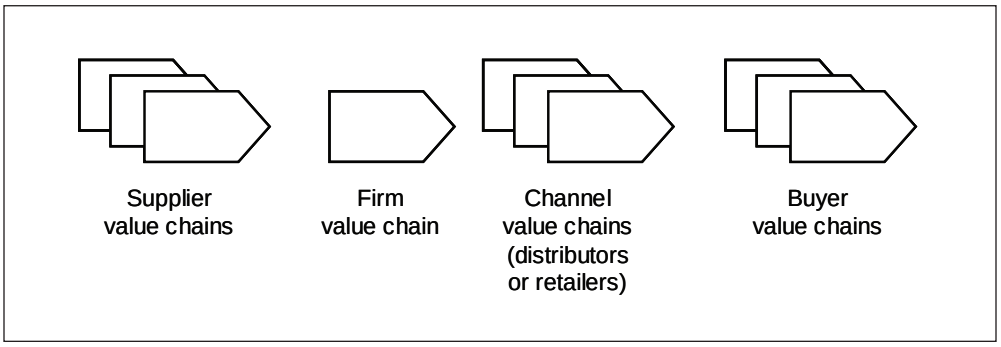


Figure 2—The value system. Source: Porter 1990.

Value System

A firm's value chain is one of many in its industry. As such, it forms part of a much larger set of activities. Porter denoted this larger stream of linkages the "value system." It includes suppliers, producers, distributors, and buyers (fig. 2).

This second tier of linkages that connects a firm's value chain to the larger value system requires additional management skills to foster a competitive producer. The firm must optimize management of both its internal value chain and external value system. Management of the external value system implies understanding the interdependencies among a firm and its suppliers, distributors, and buyers. The relationships of a firm with the different components of its external value system represent opportunities to improve the firm's competitive advantage within an industry.

Fundamental Determinants

Perhaps Porter's most recognizable figure (fig. 3) depicts the "determinants of national advantage" (Porter 1990: 72). Chance and government influence the determinants of competitive advantage but are not considered determinants; chance has a unilateral influence on the determinants, whereas government is both influenced by and influences the four determinants. Choosing this configuration of Porter's "diamond of advantage" facilitates understanding the application of Porter's cluster theory to this paper's proposed interest of enhancing the microeconomic environment of national-forest-based urban and rural communities.

Porter (1990) sought to design a model that improved our understanding of a nation's competitive advantage. He examined the business world and tried to decipher the ingredients that permit some countries to become the hosts for successful firms. He has selected four fundamental interdependent determinants that help explain most of what creates a state's, a region's, or a nation's competitive advantage: factor conditions; demand conditions; related and supporting industries; and firm strategy, structure, and rivalry.

Chance and government influence the determinants of competitive advantage but are not considered determinants; chance has a unilateral influence on the determinants, whereas government is both influenced by and influences the four determinants.

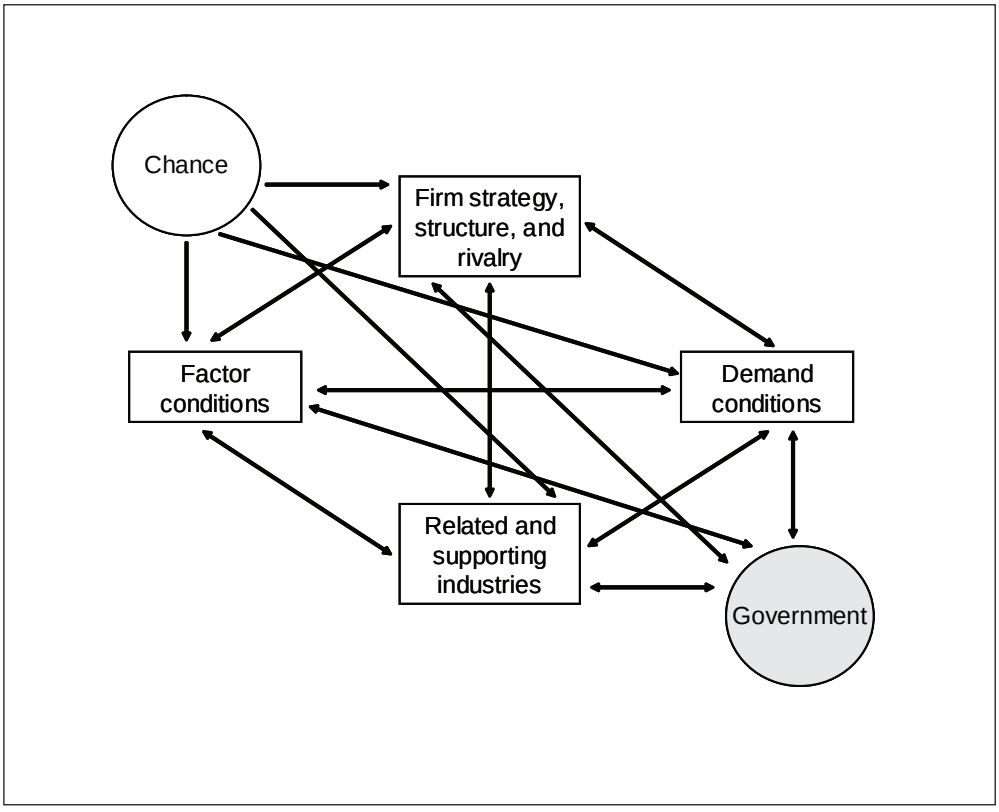


Figure 3—Diamond of advantage. Source: Porter 1990.

Factor conditions—Factor conditions encompass the state of available factors of production. The widely held definition of factors of production essentially lists them as the productive resources used to produce goods and services (i.e., land, labor, capital, and entrepreneurship).[4] Porter agreed that a state's, region's, or nation's endowment of factors of production has a role in determining competitive advantage. However, he elaborated that the role of factors of production is "different and far more complex than is often understood" (Porter 1990: 74). He claimed that the most vital factors are created within the state, region, or nation and not inherited. Additionally, Porter noted that the process of creating factors of production differs substantially among states, regions, and nations. Consequently, the stock of factors of production proves less important for Porter's model of competitive advantage than the rate at which the host site creates and upgrades them.

In exploring the role of factors of production across nations and to address the particular concerns of industry competition, Porter broadened the definition of factors of production into five major categories: human resources (quantity, skills, and cost of personnel); physical resources (abundance, quality, accessibility, and cost of the land, water, mineral, timber, fishing grounds, and other physical traits); knowledge resources (stock of scientific, technical, and market knowledge); capital resources (amount and cost of available capital); and infrastructure (type, quality, and user cost of infrastructure available including transportation, communications, financial, and health care).

Still, according to Porter, a nation's firms acquire competitive advantage not solely by securing low-cost or high-quality factors that prove vital to the competitiveness of a particular industry, but by deploying them in a particular fashion. Choices on how nations mobilize their factors and the technologies used to do so play an important role in the competitiveness of an industry. Furthermore, moving from dependence on inherited basic factors (i.e., natural resources, unskilled and semiskilled labor) to one based on created advanced factors (i.e., modern communications infrastructure, highly educated personnel, research institutes) represents a vital step in enhancing competitiveness. States, regions, and nations decide which advanced factors to create or upgrade. The specific ones identified respond to the interdependence of the other fundamental determinants in the model.

Porter highlighted the dynamic benefits of what he termed "selective factor disadvantages" (Porter 1990: 81-85). He noted that a jurisdiction's disadvantage in

[4] Many contemporary economic textbooks list entrepreneurship as a fundamental factor of production. They treat entrepreneurship as the human resource that organizes land, labor, and capital. Without entrepreneurship the other factors of production would remain unorganized in a productive, economic sense.

factor endowment (e.g., labor shortages, lack of domestic raw materials, a harsh climate) can result in a competitive advantage if firms innovate to overcome the disadvantage. Moreover, according to Porter, the need for certain basic factors (e.g., semiskilled labor) can often be mitigated or made obsolete through innovation.

Competitive pressure compelling firms to innovate in order to overcome their microeconomic environment's disadvantages represents a major theme in Porter's work. The remaining fundamental determinants in the model play an important and powerful role in inciting firms to innovate so as to remain competitive players in their industries.

Competitive pressure compelling firms to innovate in order to overcome their microeconomic environment's disadvantages represents a major theme in Porter's work.

Demand conditions—Demand conditions in Porter's model represent the "home" (i.e., local)[5] demand for an industry's product or services. For purposes of competitive advantage, Porter proved more interested in the quality impact of local demand conditions on firms (i.e., the dynamic demand for product innovation) than in the quantity impact (i.e., the static demand for product volume).

According to Porter, firms primarily respond to local buyer needs. Competitive advantage in a state, region, or nation arises when local demand provides local firms with a "clearer or earlier sense of buyer needs than foreign rivals can have" (Porter 1990: 86). Local buyers can also pressure local firms to innovate quicker than foreign rivals. The differences among nations in terms of the nature of local demand helps account for their dissimilarities in competitive advantage. Porter noted that despite increasing globalization of competition, the local market usually has a "disproportionate impact on a firm's ability to perceive and interpret buyer needs" (Porter 1990: 86). This is primarily due to the proximity and cultural similarity of product management and development teams, which are usually based in the firm's local market.

Proximity to local market plays a key role in potentially increasing a firm's competitive advantage. Timeframes tend to be shorter for responding to local demand pressures, and the firms tend to be more confident in understanding and satisfying local demand requests. Porter mentioned three segments of local demand that represent core forces in a firm's effort to strengthen competitive advantage: segment structure of demand, sophisticated and demanding buyers, and anticipatory buyer needs. These core forces tend to reinforce each other and provide initial and continuous impetus for investment and innovation.

The segment structure of demand plays an important role in focusing the attention and determining the priorities of a firm. According to Porter, segmented

[5] The term "local" is used here to convey both geographically focused and nationally oriented characteristics.

demand exists in most industries. The segmented demand is a function of product variations (e.g., range of aircraft sizes appealing to different route structures). An important implication of segmented demand is that a state, region, or nation can prove competitive in segments representing a large share of local demand but a small share elsewhere. Having a large range of segments in the local demand structure can assist in securing competitive advantage by providing firms with greater exposure to diversified markets for products and services.

Sophisticated and demanding local buyers provide a powerful incentive to local firms to innovate and upgrade their products and services. The presence of such buyers proves just as important to sustaining competitive advantage as to creating it. Buyers tend to prove particularly demanding when their local circumstances are especially stringent and challenging.

Firms can further gain competitive advantage if their local buyers anticipate the needs of buyers from other countries. Such anticipatory tendencies can result from having sophisticated and demanding local buyers. Early warning indicators stemming from sophisticated local buyers can spur firms to upgrade old products and create new ones that could facilitate entry into emerging local demand segments. For example, given Japan's large dependence on imported petroleum, Japanese automobile manufacturers early on faced extremely demanding energy-conscious local buyers. This particular "home advantage" has helped increase international market share for Japanese cars as foreign buyers became increasingly energy-conscious with rising gasoline prices worldwide.

Finally, a sizeable local demand does not necessitate a driving urge for investment and innovation among local firms if the abovementioned core elements of local demand prove weak. A large local demand, though important for economies of scale, could generate less product upgrading and innovation than a relatively small local demand that compels firms to compete in foreign markets. Porter indicated that local market size is most important for enhancing competitive advantage in industries with substantial research and development requirements, major economies of scale in production, or significant generational leaps in technology (Porter 1990: 93). As important as, or possibly more important than, the size of the local demand is the rate of growth of local demand. A rapidly growing local demand provides firms with the incentive to incorporate new technologies faster and to upgrade or expand their capacity with the necessary conviction that they will be used. This pulling force for innovations from the demand side has its complementary pushing force located among related and supporting industries.

Related and supporting industries—Related industries refers to firms that provide complementary products or services to one another (e.g., computers and application software). While competing on the basis of their value chain management within their product- or service-specific industry, they might share or coordinate certain activities such as distribution, technology development, manufacturing, or marketing (e.g., pharmaceuticals and flavorings, chocolates and herbal candy) (Porter 1990: 105). Competitive related industries can provide opportunities for technological exchanges and, possibly, accelerate the development of competitive local supplier industries serving both. However, close working relationships among related industries do not happen automatically. Related industries must explicitly seek to forge alliances that will add to their competitive advantage.

The more innovative and competitive these industries are in a state, region, or nation, the better they can assist the respective local downstream firms in gaining competitive advantage through superior tools or inputs.

Supporting industries include those firms that support or supply downstream companies. For example, supporting industries for the Oregon wine sector would include grape growers/vineyards, manufacturers of grape harvesting equipment, irrigation technology companies, and grapestock producers. The more innovative and competitive these industries are in a state, region, or nation, the better they can assist the respective local downstream firms in gaining competitive advantage through superior tools or inputs. Access to competitive supporting industries with the most cost-effective inputs proves crucial for firms seeking competitive advantage. Firms that secure access early, or through preferential agreements, to innovative inputs should remain ahead of the competition.

However, the real key to leveraging industry-specific innovations emanating from competitive supporting industries is through coordination between downstream companies and their local input providers. Close working relationships between downstream firms and local input suppliers can facilitate the process of innovation and upgrading (Porter 1990: 103). Such symbiotic relationships could manifest themselves with downstream firms operating as test sites for new technologies or innovative intermediate inputs and suppliers benefiting from downstream ideas explicitly focused on solving supplier bottlenecks or enhancing input performance. Again, close working relationships between supporting industries and downstream firms do not happen automatically. Both sides must explicitly seek to make this happen. This is where the fourth fundamental determinant, firm strategy, structure, and rivalry, plays such an important role

Firm strategy, structure, and rivalry—Firm strategy, structure, and rivalry refer to the various approaches to a firm's inception, organization, and management that establish the context for local rivalry and competitive advantage. The strategy and structure of firms contain the cultural and socioeconomic idiosyncrasies of their state, regional, and national settings. Their local advantage results from

synchronizing these idiosyncrasies with the attributes of available competitive advantage in particular industries. Local rivalry assumes a key role in the process of innovation, as well as local and foreign commercial success.

State, regional, and national conditions impact the manner in which firms are managed and how they choose to compete. Management styles and choices differ across localities and are readily recognizable (Porter 1990: 108). There is no universal recipe for the management of firms that can be applied to guarantee commercial success.[6] Differences in management systems and organizational structure offer opportunities for establishing competitive advantage. Relationships between labor and management represent a particularly important element for the firm given their powerful impact on the process of innovation and improvements.

One of the most important empirical findings from Porter (1990: 117-122) established a powerful link between local firm rivalry and the creation and persistence of competitive advantage. Additionally, Porter established that rivalry with domestic firms proved more beneficial in terms of innovation and improvements than rivalry with foreign firms. Local rivals compelled one another to seek effective cost-cutting measures, product/service innovations, and organizational improvements. Local competitive pressure led to commercially successful firms, which in turn, lured new firms to the industry. Porter noted that direct cooperation among competitors tends to weaken competitive advantage: it reduces diversity, incentives, and the rate of innovation. The place for firm cooperation lies in trade associations and other independent organizations accessible to many firms.

Chance and government—The four elemental determinants of Porter's "diamond of advantage" establish the microeconomic environment within which firms operate. Nevertheless, as indicated in figure 3, the roles of chance and government have a very powerful influence on the system.

Chance events play an important role in determining microeconomic environments. These events are largely outside the control of firms, states, regions, or nations. Some prominent examples are wars and natural disasters (i.e., hurricanes, earthquakes, mudslides, drought, flooding). Other examples include major shifts in global financial markets (e.g., "irrational" exuberance and crises), in input prices (e.g., supply shocks in commodity markets), in global demand (e.g., satisfaction of "pent-up" industrial and consumer demand in China and India), and major technological breakthroughs.

[6] Particularly, the training, background, and orientation of leaders; group versus hierarchical style; the strength of individual initiative; the tools for decisionmaking; the nature of the relationship with customers; the ability to coordinate across functions; the attitude toward international activities; and the relationship between labor and management.

Chance events create disruptions, discontinuities, and opportunities. They can affect firms, states, regions, and nations asymmetrically. Some firms will fail in their attempts to adapt to the chance events while others will succeed. Porter (1990: 124-125) noted that competitive firms operating in the microeconomic environments with the most resilient determinants of advantage should demonstrate superior odds for rebounding from the negative consequences related to chance events and, possibly, gain new competitive advantages.

Porter (1990: 126) argued that neither entrepreneurship nor invention, core characteristics defining competitive advantage, are random events. Rather, a state's, region's, or nation's differing determinants of advantage play a fundamental role in defining the location where specific industries could experience greater invention and entrepreneurship. Microeconomic environments differ in terms of the relative attributes of their systemic determinants of advantage. For example, demand conditions generate clearer signals to firms in some areas than in others, factor conditions prove more resilient for firms in some areas than in other areas. Which firm will generate innovations proves harder to predict. Nevertheless, according to Porter, the determinants of advantage of a particular area have a substantial influence over whether a singular invention will ever become a competitive industry.

The interdependent determinants or diamond of competitive advantage, along with the influences of chance events and government policies, represent a complex system that configures the competitiveness of state, regional, and national microeconomic environments.

The role of government in figure 3 differs from that of chance. Government influences and is influenced by the four fundamental determinants, whereas chance has a unilateral impact on the determinants. For example, government influences factor conditions through subsidies and policies affecting education and capital markets. Government regulations affect product standards that determine demand conditions. They also affect related and supporting industries, for example, through limitations on advertising. Government tax policies and antitrust laws have a powerful influence on firm strategy, structure, and rivalry. Finally, government has a direct impact on the fundamental determinants of competitive advantage as a buyer of products and supplier of inputs.

The interdependent determinants or diamond of competitive advantage, along with the influences of chance events and government policies, represent a complex system that configures the competitiveness of state, regional, and national microeconomic environments. The interdependent determinants of competitive advantage influence each other and evolve together in a dynamic manner. According to Porter (1990: 131), two elements have particularly powerful effects on generating the systemic dynamism: domestic rivalry and geographic industry concentration. Domestic rivalry compels innovative operational, strategic, and commercial approaches among competitive firms. Geographic industry concentration incorporates the "Marshallian" attribute of many experienced minds gathering and solving shared problems. In other words, clusters of firms offer the best opportunity to

promote industrial upgrading and to magnify the interactions among and within the state, regional, or national determinants of advantage.

Clusters

As mentioned earlier, a cluster in Porter's framework is a critical mass of companies in a particular location. As the cluster's microeconomic determinants of advantage evolve, certain relationships between the fundamental determinants prove more important than others. General infrastructure development provides the foundation for advanced factor conditions. Elements that usually differ between successful and unsuccessful industrial locations are the rate of investment and the management quality of the institutions involved in the investment process. Sustained investment at a rate that upgrades factor creation assists clusters in gaining competitive advantage.

Domestic rivalry, a key feature of successful clusters, directly stimulates levels of innovation and improvement. According to Porter (1990: 143), it compels firms to maximize the benefits of the other determinants of competitive advantage. It also elevates the profile of the cluster by drawing attention to its activities. Domestic rivalry encourages additional investments by existing firms, their suppliers, and the local institutions, thereby improving the local microeconomic environment. These new investments lead to greater diversity of firms and enhance the rate of innovation within the cluster.

In response to domestic rivalry, clustered firms invest in advanced factor creation. Alone, or through trade associations, they develop skilled human resources, requisite technologies, specialized infrastructure, and market-specific data. The presence of strongly competitive local firms compels public officials to take notice. Many times local efforts focusing on factor creation are joint public-private initiatives to establish special programs in local schools and universities, research institutes, technical training centers, mentoring programs, and other projects that enhance local factor development. The more successful the cluster, the greater the demand by job seekers for advanced training in industry-specific skills and knowledge. Finally, advanced factor creation facilitates the spawning of start-ups in a cluster, as the centers for innovation become sources of entrepreneurship.

Domestic rivalry leads competitive firms to upgrade demand conditions by educating buyers to become more demanding in terms of the sophistication of the products they purchase. Buyers become accustomed to a high degree of attention from clustered firms competing for their business. Demand conditions, in turn, enhance domestic rivalry as buyers search for alternative sources and, thereby, encourage entry of new firms.

A cluster of domestic rivals encourages the formation of more specialized suppliers and related industries. The geographic proximity in the cluster between rival firms and their suppliers and related industries facilitates research exchanges and collaboration. This broadens the depth, breadth, and specialization of the cluster, thereby inducing further investment in advanced infrastructure and factor creation. Suppliers and related industries may establish specialized divisions to serve their clustered clients. As these clustered firms compete aggressively for markets, local suppliers must improve and innovate or possibly suffer replacement with competitors eager to expand their client base.

The competitive nature of the cluster begets expansion into new, related industries serving both broader and ever more specialized segments of the state, regional, national, and international markets.

With the formation of a cluster, the entire constellation of industries mutually reinforces its evolution. The fundamental determinants of advantage affect one another through horizontal, upstream, and downstream industrial relationships. Rivalry in one part of the cluster tends to spread to other parts through bargaining negotiations within the value system, the development of company spinoffs, and other diversification efforts within the cluster. New entrants assist in upgrading and diversifying the cluster through innovative research and development approaches, operational strategies, and management skills. The competitive nature of the cluster begets expansion into new, related industries serving both broader and ever more specialized segments of the state, regional, national, and international markets. The success of the cluster will draw resources toward it and away from isolated industries that are not as effective or productive in deploying them.

Perhaps one of the most outstanding features of the domestic rivalry characterizing successful clusters lies in the degree of information exchanges taking place among buyers, suppliers, and related industries (Porter 1990: 152). Although initially it might appear somewhat counterintuitive, the purpose behind these cooperative exchanges has to do with improving competition. Fluid information flows among and within the cluster's determinants of advantage prove vital to the cluster's competitiveness. Consequently, the formal and informal mechanisms that facilitate these exchanges represent an important characteristic of successful clusters. Some examples of such mechanisms are local trade associations, personal relationships through education, and community links through geographical proximity.

Geographic industry concentration bestows tremendous proclivities toward the success of clusters. Porter's research found that many successful industries across a wide spectrum of nations are concentrated in a single town or region within a country (Porter 1990: 154-159). The principal reason accounting for this, according to Porter, has to do with the manner in which geographic proximity heightens the influence of the determinants of advantage: rivals are more competitive, formal and informal cooperative exchanges between suppliers and buyers are more frequent,

sophisticated customers are more accessible, and research/training centers are more responsive. The impact of geographic concentration on industrial improvements and innovations underscores the importance of location. Locational advantages, embodied in skilled people and effective institutions, thus influence the successful evolution of clusters.

A fully-functioning diamond of advantage rarely exists at the incipient stage of an industry (Porter 1990: 159). Usually, the establishment of a local industry owes its start to one of three determinants in the diamond of advantage: factor of production, related and supporting industries, or demand conditions.

Abundant natural resources, which are factors of production, could provide the original momentum for establishing an industry. Their presence might also have enticed a predecessor industry to the location, thereby creating the initial framework for a subsequent industry. Related and supporting industries could drive the creation of an industry through spinoffs, serving a particular market that is outside the realm of another local industry. Finally, demand conditions can stimulate an industry through local demand for a product that proves viable in regional, national, and international markets.

The ability for an incipient industry to evolve from one determinant of advantage into a competitive industry has to do with the presence and quality of the other determinants. Rivalry is the key element to compel the initial industry to become a competitive one through upgrading and innovation. Chance events—a surge in demand, an input price shift, or a major technological shift—can also play a role in accelerating the evolution of a competitive industry. They can eliminate a competitive advantage of traditional industry leaders allowing smaller competitive firms to leap ahead to a more advanced industry.

Once a successful diamond of advantage—a competitive cluster—has evolved and established the conditions for higher order advantages, Porter (1990: 163) believes that it is very hard to replicate. In other words, once a locality has nursed the cluster through its competitive growth, the cost of entry into the particular industry has risen substantially. The possibility of building a competitive cluster from existing firms, or from existing competitive advantages, in a particular locality is the focus of the next section where this paper examines the potential creation of national-forest-based clusters.

National-Forest-Based Clusters

National forest lands produce a variety of factors of production. These include timber, fresh water, thermal water, nontimber forest products, wildlife, and metals (e.g., gold, zinc, platinum, molybdenum). Local, regional, national, and

international demand exists for all these natural resources. As mentioned earlier, managers of national forests have publicly articulated their commitment to sustain the economic vitality of national-forest-based communities. Cluster theory provides these managers with an explicit framework to help facilitate improvements in the microeconomic environments of national-forest-based communities; improvements that could translate into innovative national-forest-based products and services serving local, regional, national, and international markets.

The urban and rural communities within or near national forest lands encompass a wide variety of historical traditions and cultural values, which affect the process of economic development. Chance events, federal legislative changes, and judicial challenges (e.g., litigation) can have powerful impacts on the national-forest-based microeconomic environments of local communities.

Plaintiffs who would otherwise oppose a manufacturing, processing, or service-oriented endeavor within or near the boundaries of national forest lands might assist in furthering a national-forest-based economic cluster that embodies the highest environmental standards for forest management.

Nevertheless, these communities can gain competitive advantage if they and the Forest Service jointly adopt a new approach to competing. First of all, availability and interpretation of information are central to perceiving opportunities for improvement and innovation. Finding, understanding, and creating appropriate data sources can assist in exploiting a factor advantage, discovering an underserved market segment, creating new products and product features, or enhancing the process by which a product is made or marketed. Secondly, sustaining advantage requires additional improvement and innovation.

National forest lands can allow for a diversity of industries to prosper from the products offered by national forests. National-forest-based economic clusters could turn lessons learned from history, different cultural traditions, environmental litigation, and hard science into products and services that fully meet the interests of local, regional, national, and international markets. Plaintiffs who would otherwise oppose a manufacturing, processing, or service-oriented endeavor within or near the boundaries of national forest lands might assist in furthering a national-forest-based economic cluster that embodies the highest environmental standards for forest management.

The Forest Service, in turn, could directly assist in improving the economic welfare of its national-forest-based communities by fostering investment and innovation in these localities across a wide diversity of natural resource sectors. In essence, the Forest Service could step into the diamond of advantage through its involvement as a local supplier of raw material (i.e., factor conditions), seed capital (e.g., grants), and specialized human capital.

By developing national-forest-based economic clusters, national forests could further their congressionally directed mandate of providing for multiple uses of

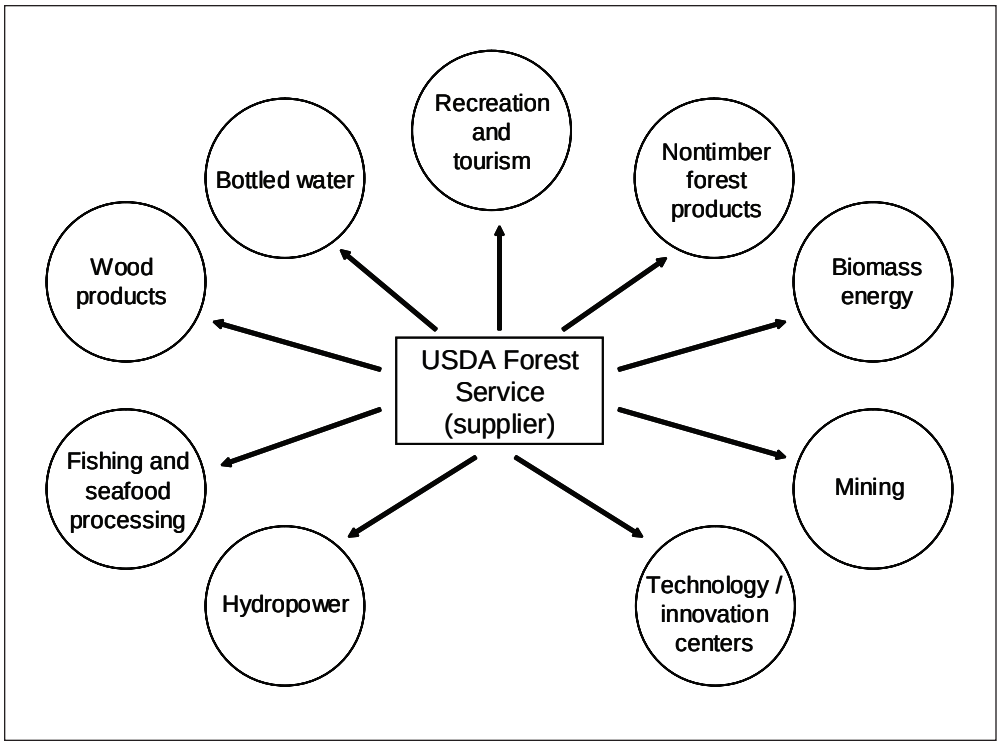


Figure 4—National-forest-based economic clusters.

national forest lands. Figure 4 represents only some of the potential natural resource sectors and opportunities possibly available to firms operating within and close to national forest lands.

Fulfilling this vision requires incorporating innovative elements from the cluster model into the management of our national forests. If national forests supply factors of production to firms, then the Forest Service could explicitly incorporate elements of the value chain and value system into its management plans. The Forest Service could help identify the most competitive firms within or near the national forests to form part of a national forest economic cluster. The Forest Service could establish an Economic Clusters research team. If economic clusters exist embedded in or close to national forests, having a Forest Service Economic Clusters research team would spur the formal documentation of economic cluster activity on national forest lands and facilitate the creation of a microeconomic database of such activity. It would also add to the literature on economic cluster research by examining clusters embedded in and close to public lands. This team would dedicate its efforts to the analysis and improvement of the determinants of competitive advantage affecting national-forest-based urban and rural communities. The Forest Service

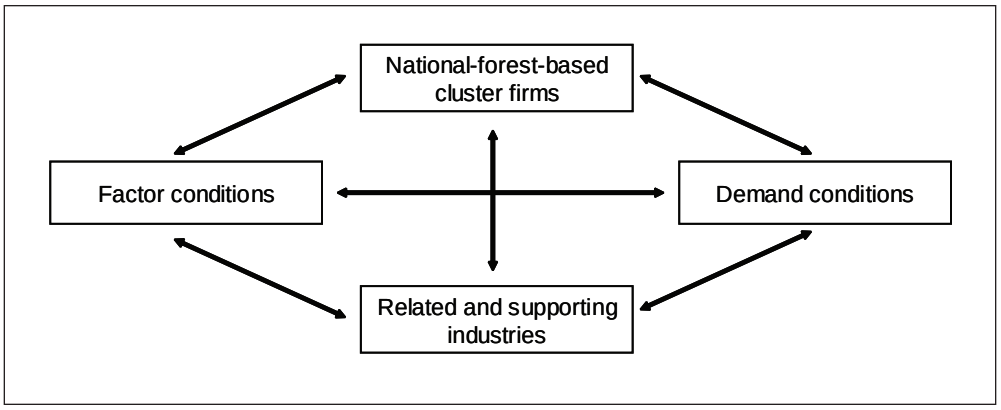


Figure 5—National-forest-based diamond of advantage.

Other public sector agencies have applied cluster theory to their economic development strategies.

Economic Clusters research team would have to think and act as a competitive firm, incorporating the dynamically interdependent determinants of advantage into the factor supplier function of the national forests (fig. 5).

Other public sector agencies have applied cluster theory to their economic development strategies. The U.S. Department of Commerce Economic Development Administration and the U.S. Agency for International Development, as well as the European Union, have researched and implemented cluster initiatives.

In 2005, the USDC Economic Development Administration facilitated the preparation of *Measuring Regional Innovation: A Guidebook for Conducting Regional Innovation Assessments* (Council on Competitiveness 2005). This guidebook discussed the economic-cluster framework used to determine the results of regional innovation assessments undertaken in six U.S. regions by the Economic Development Administration and the nonprofit Council on Competitiveness.

In 2003, the U.S. Agency for International Development (USAID) funded the report *Promoting Competitiveness in Practice: An Assessment of Cluster-Based Approaches* (Mitchell Group, Inc. 2003). This report assessed the performance of USAID-funded cluster-based initiatives in Mexico and Mongolia, in addition to carrying out a comprehensive review of USAID's efforts to enhance competitiveness in 26 developing countries.

The European Union's Thematic Network ACENET represented an intercluster initiative that sought to facilitate cluster-building methodology and relationships among 11 European regions. It published its final report in 2003 (European Union Thematic Network ACENET 2003). The long-term goals of ACENET included

implementing a monitoring system to document the progress and benefits emanating from the regions' cluster initiatives.

A Forest Service Economic Cluster research team, by explicitly analyzing the individual determinants of competitive advantage impacting national-forest-based microeconomic environments, could assist in identifying partners to form specific natural resource cluster initiatives within or near national forest lands. These firms could then leverage whatever value is associated with the quality of the raw material managed by the national forest for their commercial purposes.

Adhering to the banner statement "Healthy Communities in Healthy Forests," national-forest-based economic cluster firms could then seek branding opportunities by possibly placing a national forest cluster logo on their product label. Environmentally oriented venture capital firms, investment funds, and other financial intermediaries would consider national-forest-based economic cluster firms as targets for investment and further innovation (i.e., spinoffs).[7] The creation of national-forest-based economic cluster firms could, thereby, facilitate equity/bond participation in the local economy by residents and nonresidents.

Finally, the creation of national-forest-based economic cluster firms would not only help satisfy the mandate for multiple uses of national forest lands, but also assist in upgrading and diversifying the National Forest System's numerous microeconomic environments, as well as its private-sector-oriented policies and institutions. Donoghue and Sutton (2006: 32) concluded that their assessment of socioeconomic status and change in the Northwest Forest Plan region between 1990 and 2000 did not allow them to ascertain the degree by which public forests contribute to the socioeconomic variation they monitored in the region's 1,314 rural communities. Nevertheless, by incorporating an economic-cluster-based strategy in the management plans of national forests, the Forest Service could achieve higher SEWB scores for communities embedded in and near national forests (see footnote 2). Most of these communities scored low or very low in the SEWB index. By inducing improvements in the microeconomic environments of national-forest-based communities, economic-cluster-based initiatives by the Forest Service could eventually prompt higher SEWB scores. The higher scores could result from increases in the diversity of employment by industry (i.e., EmD) indicator in the SEWB index. Gains in the EmD indicator could stem from the enhanced microeconomic environments of national-forest-based embedded and neighboring

[7] For example, see the Goldman Sachs portfolio strategy report of August 26, 2005, on the growing interest in environmental issues among socially responsible and fundamental investors. (Goldman Sachs Group, Inc. 2005)

communities, which would have attracted a wider range of viable, industry-specific investments into these communities.

Tongass National Forest Wood Products Cluster Initiative[8]

Cluster initiatives have become increasingly popular to spur economic growth and competitiveness within targeted regions through partnerships involving government, private sector firms, and research institutes.

Cluster initiatives (CIs) have become increasingly popular to spur economic growth and competitiveness within targeted regions through partnerships involving government, private sector firms, and research institutes. Solvell et al. (2003) identified more than 500 CIs worldwide and obtained survey data from over 230. They created the Cluster Initiative Performance Model (CIPM) to assess the implementation of CIs. Their CIPM uses three driving forces to evaluate the performance of a CI: the social, political, and economic setting of its geographic context (e.g., the business environment), its objectives (e.g., research and networking), and the process by which it develops (e.g., initiation and planning). Improvements in competitiveness and economic growth are fundamental factors in the CIPM's determination of successful CIs. Among the results from the 238 respondents to their global cluster initiative survey (GCIS) they found that government initiated 32 percent of the CIs and that a majority of the CIs (54 percent) primarily received government financing. The survey also suggested that the failure of CIs was strongly linked to a lack of consensus among the partners and "the absence of an explicitly formulated vision for the CI" (Solvell et al. 2003: 51).

The Tongass National Forest has the potential to establish national forest CIs across a wide range of economic sectors. Some of these could occur in traditional resource-dependent sectors (e.g., fishing and seafood processing), whereas others might occur in newly emerging sectors (e.g., biopharmaceuticals). These Tongass-based initiatives would represent partnerships among a public land management agency, local private sector firms, nongovernmental organizations, and local institutions of higher learning. For example, the Tongass National Forest could formulate a CI fusing its combined wildlife habitat restoration/second-growth[9] program (USDA FS 2005b: 44) with local wood products manufacturers. Essentially, as a byproduct of the wildlife restoration efforts, the Tongass National Forest would provide second-growth material to local wood products manufacturers for milling into value-added products (e.g., house logs and related accessories; fig. 6). This CI could

[8] On August 2, 2006, the Tongass National Forest leadership team invited me to give a presentation and lead a discussion entitled "National Forest-Based Economic Cluster Initiatives." My presentation included a proposal and action plan to establish a Tongass National Forest Wood Products Cluster Initiative. The Tongass leadership team and The Nature Conservancy participated in the discussion.

[9] Second-growth refers to timber that has regrown after a virgin stand was logged or burned.

Robert Deal, USDA Forest Service

Figure 6—Wildlife restoration of young-growth stands could offer a reliable source of material for local wood products manufacturers.

explicitly seek to partner the Tongass' restoration/second-growth program with local private sector firms, nongovernmental conservation interests, and university-affiliated researchers.

Conservation groups, such as the The Nature Conservancy, have indicated a strong interest in supporting such a CI. This support could generate "branding" opportunities for participating mills in the CI seeking niche markets catering to consumers desiring to purchase wood products endorsed by well-established conservation entities.

Local wood products manufacturers (fig. 7) in this CI could harness the discrete values of the Tongass wildlife restoration/second-growth program and the official endorsement of conservation groups to adopt innovative marketing programs for their wildlife restoration/second-growth sourced value-added products. Additionally, a Tongass National Forest wood products CI could attract the attention of environmentally oriented venture capital firms and other financial intermediaries seeking directly—through equity partnerships—or indirectly—by providing public and private offerings of bonds, stocks, and financial derivative instruments linked to the CI—to finance economic CIs based on sustainable environmental management.

David Nicholls, USDA Forest Service

Figure 7—Viking Lumber Company, Inc. in Craig, Alaska.

Many of the necessary ingredients for the formal creation of a Tongass National Forest wood products CI currently exist on Prince of Wales Island in southeast Alaska.

Many of the necessary ingredients for the formal creation of a Tongass National Forest wood products CI currently exist on Prince of Wales (POW) Island in southeast Alaska (fig. 8):

- Prince of Wales hosts a relatively large concentration of competitive sawmills of different capacities (Brackley et al. 2006: 3) that could operate in a complementary manner.
- Potential private sector leadership for the CI exists within the POW Chamber of Commerce Forest Products Task Force (fig. 9).
- A well-maintained road network (i.e., 105 miles of paved road, 155 miles of improved gravel roads, 2,000 miles of shot-rock logging roads) connects sawmills located on POW, and a new (2006) inter-island ferry service offers an additional transportation link to mills in the nearby towns of Petersburg and Wrangell.
- A technology center, the Ketchikan Wood Technology Center,[10] currently provides a laboratory in southeast Alaska for testing traditional and innovative wood products (fig. 10).

[10] The Ketchikan Wood Technology Center is a nonprofit research and development lab operating in partnership with the Forest Service and the University of Alaska.

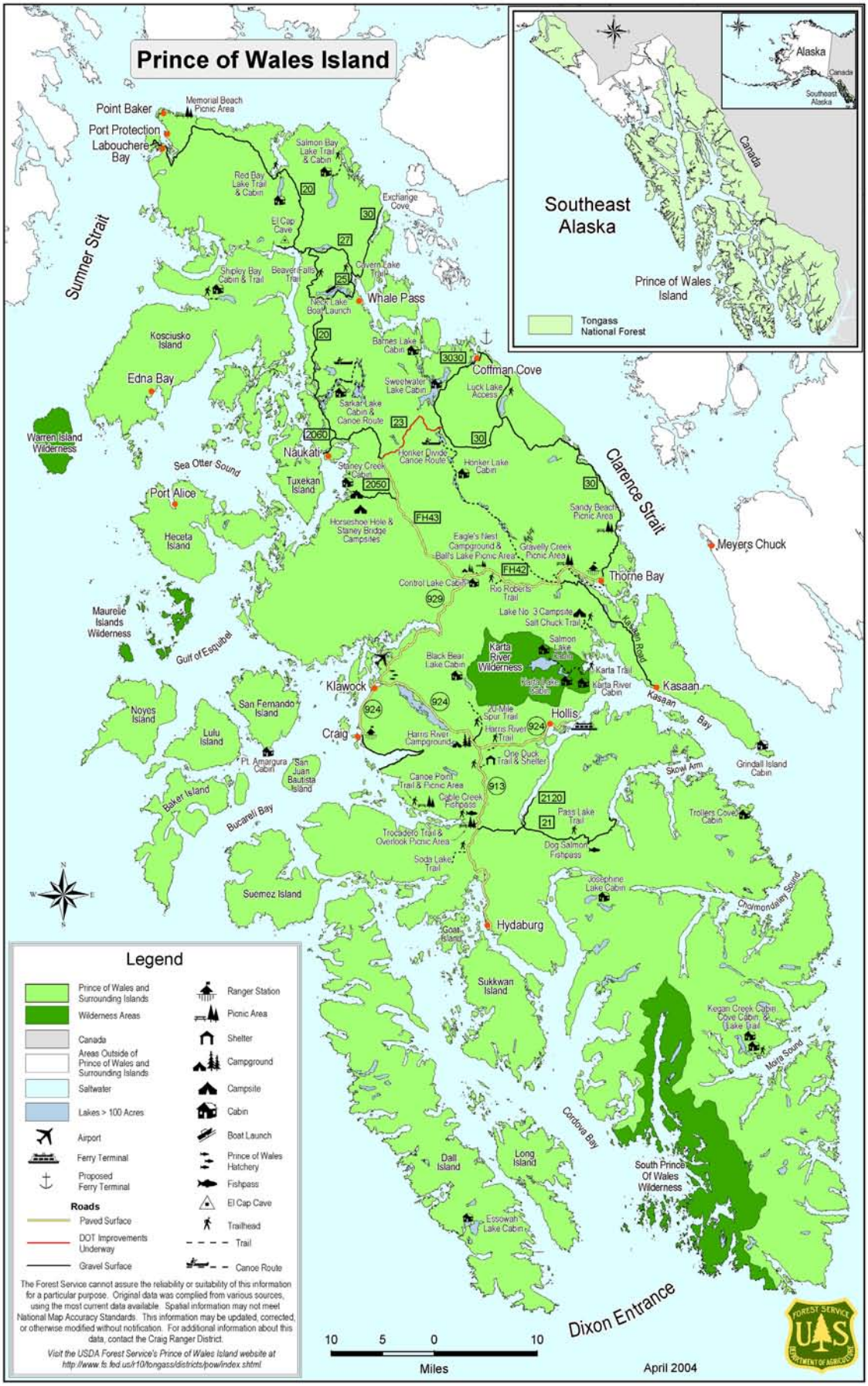
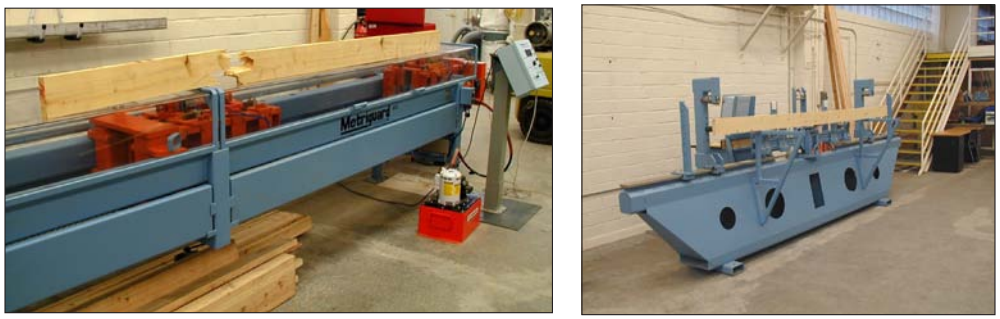


Figure 8—Prince of Wales Island in southeast Alaska.

Karen Peterson, University of Alaska-Fairbanks

Figure 9—Prince of Wales Chamber of Commerce Forest Products Task Force conducting a field trip to a local mill.



David Nicholls, USDA Forest Service

Figure 10—Bending and tension testers at the Ketchikan Wood Technology Center.

A Tongass National Forest wood products CI would offer the opportunity to create an explicit and official partnership among national forest management, conservation groups, university research centers (i.e., through the Ketchikan Wood Technology Center) and local private sector firms to enhance the microeconomic environment of Tongass National Forest-based communities. If successful, other national forests could replicate the Tongass CI in their respective jurisdictions.

Successful wood products CIs already exist and could provide guidance in formulating one within the National Forest System. For example, the Scottish Forest Industries Cluster was initially established in September 2000 as an official partnership between the Forest Industries Development Council (a Scottish private trade association) and Scottish Enterprise (a government economic development agency) (Scottish Forest Industries Cluster 2000). Its first action plan includes creating over 1,000 jobs within the timeframe of the plan, the stimulation of an extra 1 million pounds sterling of investment in processing capacity, and an increase in market penetration from 9 to 15 percent. Regular annual reports provided online narrate the process behind the successful evolution of the Scottish Forest Industries Cluster since its inception.

The Tongass National Forest management team could modify existing models of successful wood products CIs to fit its own goals and objectives. A Forest Service Economic Cluster research team could assist national forest managers in formulating the most viable structure for a successful wood products CI by carefully assessing the microeconomic determinants of competitive advantage of the initiative and the potential for cooperation among the participating partners.

The Tongass National Forest management team could modify existing models of successful wood products CIs to fit its own goals and objectives.

Conclusion

In this paper, I have discussed and proposed the use of cluster theory as a tool to analyze and upgrade the microeconomic environments of national-forest-based communities. Despite publicly stating its interest in promoting the economic vitality of national-forest-based communities, the Forest Service currently lacks an explicit framework to assess the determinants of competitive advantage affecting these microeconomic environments. A cluster-based economic development approach could strongly benefit national-forest-based urban and rural communities by explicitly influencing their determinants of microeconomic productivity and competitiveness and clearly identifying the role of the national forest in their microeconomic value chain and value system. Cluster-based economic development strategies could form part of individual national forest land management plans to assist the viability of urban and rural microeconomic communities embedded in and close to their jurisdictions. By creating national forest economic clusters, the Forest Service could help identify the most competitive firms within or near the national forests to form part of its CIs. A Forest Service Economic Clusters research team could assist the Forest Service in its efforts to analyze and improve the determinants of competitive advantage affecting national-forest-based urban and rural communities. This research could facilitate the implementation of economic CIs in national-forest-based communities to improve their overall social well-being

through increased investment and microeconomic diversity. Finally, I envision establishing a wood products CI on the Tongass National Forest that would partner national forest managers, conservation groups, university affiliated researchers, and local wood products manufacturers.

Still, this paper represents only a small first step to incorporating economic cluster research as an important component in the Forest Service's overall research program. Subsequent steps would involve identifying and analyzing other existing and potential national-forest-based economic clusters throughout the National Forest System. This research would include data collection on economic cluster sectors (i.e., size and impact, linkages within, resource assessment, available tools for marketing and financing) and SWOT (i.e., strengths, weaknesses, opportunities, threats) analysis of possible cluster initiatives. Additionally, comparative studies could be undertaken to examine and learn from the economic CIs undertaken by other U.S. government agencies, such as the Department of Commerce Economic Development Administration and the U.S. Agency for International Development, as well as foreign government agencies such as the European Union Thematic Network ACENET and Scottish Enterprise.

The microeconomic environments of the urban and rural communities embedded in and close to the 191 million acres of land occupied by the national forests need an explicit framework to facilitate innovation and spur competitiveness if they are to remain sustainably competitive. By adopting a cluster-based economic development strategy in the land management plans of individual national forests, the Forest Service could assist in enhancing the social well-being and prosperity of national-forest-based communities.

Metric Equivalents

When you know:	Multiply by:	To find:
Acres	0.405	Hectares
Miles	1.609	Kilometers

Literature Cited

Alaska Department of Labor and Workforce Development. 2006. Alaska Economic Trends. 26(5): 19. http://almis.labor.state.ak.us. (May 16).

Brackley, A.M.; Parrent, D.J.; Rojas, T.D. 2006. Estimating sawmill processing capacity for Tongass timber: 2003 and 2004 update. Res. Note PNW-RN-553. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 15 p.

Bresnahan, T.; Gambardella, A.; Saxenian, A. 2001. "Old economy" inputs for "new economy" outcomes: cluster formation in the new silicon valleys. Industrial and Corporate Change. 10(4): 835–860.

Council on Competitiveness. 2005. Measuring regional innovation: a guidebook for conducting regional innovation assessments. Washington, DC: Council on Competitiveness. 52 p. http://www.compete.org/pdf/126956_12–15.pdf. (June 12, 2006).

Donoghue, E.M.; Sutton, N.L. 2006. Socioeconomic conditions and trends for communities in the Northwest Forest Plan region, 1990-2000. In: Charnley, S., tech. coord. Northwest Forest Plan—the first 10 years (1994–2003): socioeconomic monitoring results. Volume III: rural communities and economies. Gen. Tech. Rep. PNW-GTR-649. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 7–35. Chapter 2.

European Union Thematic Network ACENET. 2003. Final report. Stockholm, Sweden: Inno Scandinavia AB. 97 p. http://www.innovating-regions.org/download/ACENET%20final%20report%2Epdf. (November 7, 2006).

Goldman Sachs Group, Inc. 2005. Global strategy research, portfolio strategy: United States. The growing interest in environmental issues is important to both socially responsible and fundamental investors. New York. 10 p.

Harris, C.; McLaughlin, W.; Brown, G.; Becker, D. 2000. Rural communities in the inland Northwest: an assessment of small communities in the interior and upper Columbia River basins. Gen. Tech. Rep. PNW-GTR-477. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 120 p.

Marshall, A. 1890. Principles of economics. 9th ed., variorum with annotations by Guillebaud, C.W. London, England; New York: Macmillan for the Royal Economic Society, 1961. 1743 p. 2 vol.

Mazza, R.; Kruger, L. 2005. Social conditions and trends in southeast Alaska. Gen. Tech. Rep. PNW-GTR-653. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 102 p.

Mitchell Group, Inc. 2003. Promoting competitiveness in practice: an assessment of cluster-based approaches. Washington, DC: The Mitchell Group. 112 p. http://www.bdsknowledge.org/dyn/bds/docs/254/USAID-Mitchell-Clusters.pdf. (June 12, 2006).

Morse, K. 1997. Southeast timber task force report. [Place of publication unknown]: The Southeast Regional Timber Industry Task Force. 58 p.

Munnich, L.W.; Schrock, G.; Cook, K. 2002. Rural knowledge clusters: the challenge of rural economic prosperity. Reviews of economic development literature and practice: No. 12. Minneapolis, MN: Hubert H. Humphrey Institute of Public Affairs, University of Minnesota. 38 p. http://www.eda.gov/ImageCache/EDAPublic/documents/pdfdocs/u_2eminn_2elit_2erev3_2epdf/v1/u.minn.lit.rev3.pdf. (July 31, 2006).

Porter, M. 1990. The competitive advantage of nations. New York: Free Press. 855 p.

Robertson, G.C. 2003. A test of the economic base hypothesis in the small forest communities of southeast Alaska. Gen. Tech. Rep. PNW-GTR-592. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 113 p.

Scottish Forest Industries Cluster. 2000. Roots for growth: a strategic framework for action for the Scottish Forest Industries, September 2000. Edinburgh, Scotland: Scottish Enterprise. 24 p. http://www.forestryscotland.com/pages/publications_detail.asp?id=8. (July 31, 2006).

Solvell, O.; Lindqvist, G.; Ketels, C. 2003. The cluster initiative greenbook. Stockholm, Sweden: Bromma tryck AB. 93 p. http://www.cluster-research.org/greenbook.htm. (July 31, 2006).

State of Alaska. 2005. Alaska community database community information summaries (CIS) [Database]. Alaska Department of Commerce, Community and Economic Development. http://www.commerce.state.ak.us/dca/commdb/CF_CIS.htm. (December 14).

Tsournos, P.; Haynes, R.W. 2004. An assessment of growth and development paths for southeast Alaska. Gen. Tech. Rep. PNW-GTR-620. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p.

U.S. Department of Agriculture, Forest Service [USDA FS]. 2005a. Chief's review of the Forest Service in the Alaska region, review report. Washington DC. 27 p.

U.S. Department of Agriculture, Forest Service [USDA FS]. 2005b. A strategy for management and priority setting: FY 2006 thru FY 2010. Ketchikan, AK: U.S. Department of Agriculture, Forest Service, Tongass National Forest. 110 p. http://fsweb.stikine.r10.fs.fed.us/tongass/fst/tongass_strategic_plan.pdf. (July 31, 2006).

U.S. Department of Agriculture, Forest Service [USDA FS]. 2005c. Tongass National Forest [1:760,320 map]. [Place of publication unknown]: Alaska Region.

U.S. Department of Agriculture, Forest Service [USDA FS]. 2005d. USDA Forest Service, Alaska Region, strategic business plan for fiscal years 2006–08. Version 2.0. [Place of publication unknown]: Alaska Region. 42 p.

Weber, A. 1929. Theory of the location of industries. Translation with an introduction and notes by Friedrich, C.J. Chicago, IL: University of Chicago Press, 1962. 256 p.

Pacific Northwest Research Station

Web site	http://www.fs.fed.us/pnw
Telephone	(503) 808-2592
Publication requests	(503) 808-2138
FAX	(503) 808-2130
E-mail	pnw_pnwpubs@fs.fed.us
Mailing address	Publications Distribution Pacific Northwest Research Station P.O. Box 3890 Portland, OR 97208-3890

U.S. Department of Agriculture
Pacific Northwest Research Station
333 SW First Avenue
P.O. Box 3890
Portland, OR 97208-3890