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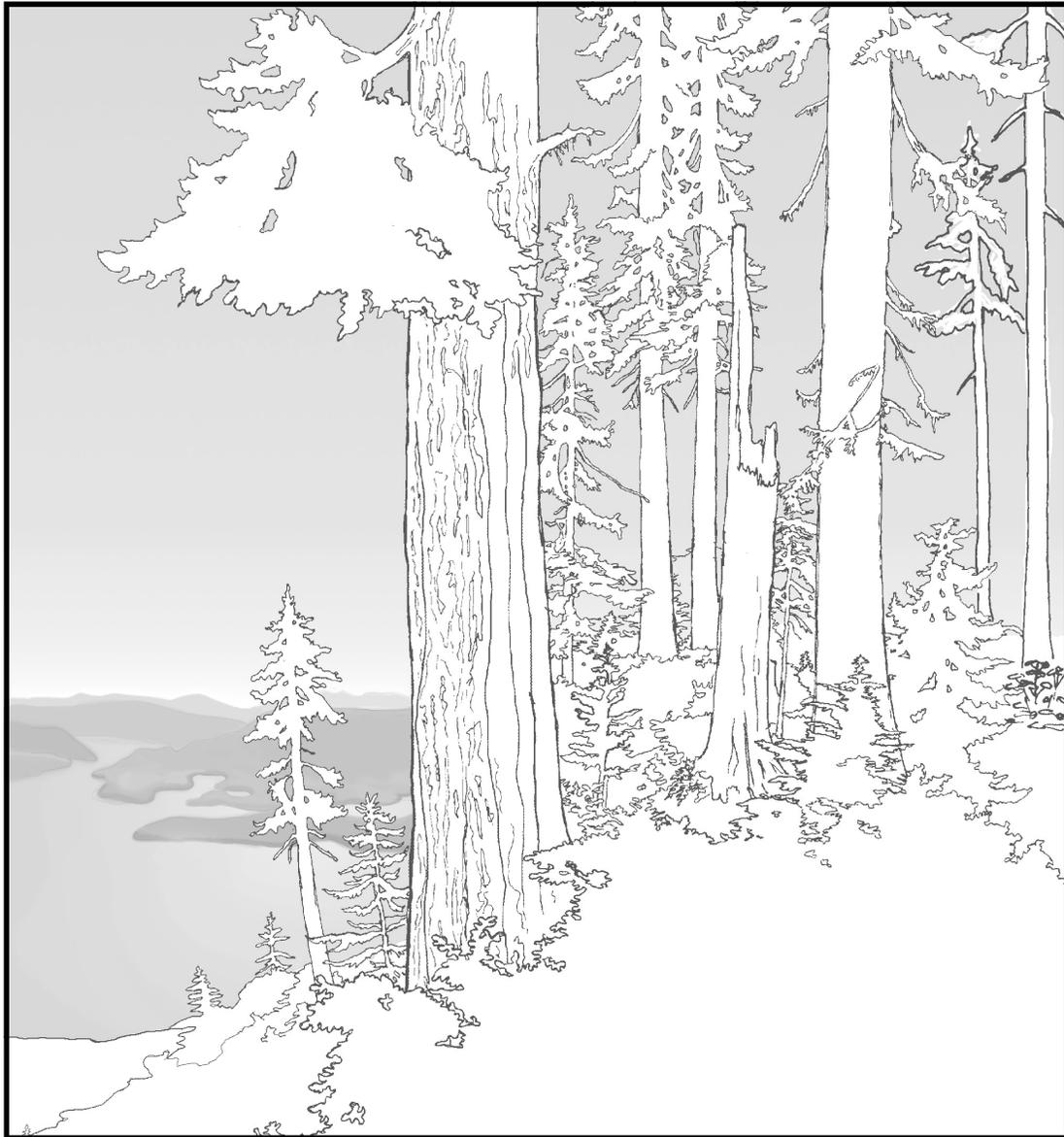
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Assessment of the Competitive Position of the Forest Products Sector in Southeast Alaska, 1985-94

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Abstract

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This paper provides an assessment of the competitive position of the forest products sector in southeast Alaska relative to that of its major competitors. An analytical framework relying on the economic concepts of comparative and competitive advantage is first developed, with emphasis on the relative cost and productivity of productive inputs such as labor, capital, and raw materials. The assessment is divided into three main components: (1) forest resource characteristics and production costs in the logging sector, (2) production costs in the sawmill sector, and (3) relative market position in end-product markets. Major competing regions are British Columbia in Canada and the states of Washington and Oregon in the United States. Japan's market for soft-wood saw logs and sawn wood is the focus of the end-market analysis. Data consistently indicate that southeast Alaska has been a high-cost producer of sawn-wood products operating at the margin of profitability over the assessment period. This is due to a combination of high labor costs on a per-unit-of-input basis and low productivity for labor inputs in both the logging and sawmill sectors, and for raw material inputs in the sawmill sector. Certain species and log grades, however, are capable of generating considerable profits, and the relation between average profitability for the sum total of harvests in southeast Alaska and the profitability of specific components of this harvest also is analyzed. Implications of these findings for current efforts to promote increased value-added timber processing in southeast Alaska are discussed in the conclusion.

Keywords: Comparative advantage, labor productivity, timber scarcity, value added, stumpage prices.

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Introduction

An assessment of the competitive position of the forest products sector in southeast Alaska has important implications for various forest policy questions including current efforts to increase value-added processing in the region as well as the more general debate over harvest levels for the Tongass National Forest. Primarily because of its remote location, southeast Alaska generally has been recognized as a high-cost producer of wood products. On the other hand, some species and log grades harvested in southeast Alaska are capable of sustaining high market prices in some market cycles, thereby offsetting higher production costs. The objective of this assessment is to provide quantitative measures of production costs and product revenues for softwood lumber produced in southeast Alaska and to compare these data with similar measures for southeast Alaska's principal North American competitors. Although most of the assessment concentrates on average costs for timber harvested and processed in southeast Alaska, production costs and market prices for specific species also are included.

The first section of this assessment establishes a framework that can be used to assess the position of the wood products sector relative to that of its competitors and end markets in southeast Alaska. The economic concepts of comparative and competitive advantage are used to focus the analysis on the cost and utilization of productive inputs such as labor, capital, and for the sawmill sector, log inputs. In subsequent sections, this framework is used to organize data specific to southeast Alaska and to compare these measures with similar measures used in the coastal region of British Columbia in Canada and the Pacific Northwest region of the United States.

The body of the assessment focuses on specific aspects of the chain of events starting from the forest resource to the sale of processed products in final markets. Following a general overview of the wood products sector in southeast Alaska, logging costs and the composition of the forest resource are considered. Next, we discuss processing costs and efficiency in the sawmill sector. This is followed by an analysis of total lumber production costs. The relative position of southeast Alaska products in the Japanese market for softwood sawn wood is considered next. We then address the impact of production costs and market prices on the imputed "residual value" of stumpage (market prices minus production costs) and the observed prices received for the sale of timber in southeast Alaska, British Columbia, and the Pacific Northwest. As cost factors and their implications for comparative and competitive advantage are not static over time, the next to last section of this report concentrates on how southeast Alaska's regional comparative advantage in lumber production may be changing over time. The conclusion addresses the policy implications of the assessment.

Analytical Framework

Two main bodies of economic theory specifically address the position of a regional wood products sector relative to that of its major competitors. The first is the Heckscher-Ohlin trade theory (and variants thereof), which is summarized in the concept of comparative advantage. The second is found more often in the business and management literature and relates to the competitiveness of a firm, industry, or sector. Although competitiveness is defined in various ways, all definitions involve the ability to supply comparable goods at lower cost than major competitors. Before addressing their application to the southeast Alaska wood products sector, we will discuss each of these theories separately.

Comparative and Competitive Advantage

First described by the British economist David Ricardo in the early 19th century, the concept of comparative advantage today relies heavily on the work of Heckscher (1949 for example), Vanek (1963), and Ohlin (1967). Their work primarily explains trade patterns as a function of country-specific endowments of productive inputs (or "factors"),

which usually are restricted to labor and capital. Briefly stated, the theory of comparative advantage holds that a country will specialize in producing products that more intensively use productive factors that country has in relative abundance. Hence, developing countries, such as China, with large labor resources relative to the supply of capital inputs, will specialize in labor-intensive goods. Countries with large stocks of fixed and human capital such as the United States, on the other hand, will specialize in capital or information-intensive goods. This specialization and resulting trade, it is argued, maximizes welfare by efficiently allocating the productive resources of all traders.

A corollary to the concept of comparative advantage is that of factor price equalization, which holds that, in equilibrium, wages (including payments for capital) paid to similar productive factors will be equal across all trading countries. To continue with the above example of developing and developed countries, factor price equalization can readily be seen in the tendency of imports of labor-intensive manufactures from low-wage countries to depress wages for unskilled labor in the developed nations. Note that the quality of factor inputs must be similar, and labor skills must be taken into account. Here, skilled labor can be viewed as the combination of unskilled labor and human capital inputs (namely, education and experience).

Empirical work addressing comparative advantage has tended to concentrate on only the broadest aggregate measures, yielding general conclusions about the comparative advantage of nations but little information about specific regions or products. A common approach is to view the net balance of trade of a country in capital or labor-intensive goods as indicative of its comparative advantage in either of these categories. The share of the net trade of a given good in the country's total trade volume can then be used as a measure of comparative advantage. This is often termed "revealed comparative advantage." Econometric methods can then be used to estimate the relation between revealed competitive advantage and variously constructed indexes of the endowment of labor and capital of a country, both fixed and human (see Balassa 1978 for an example of this approach). Not surprisingly, empirical studies have found a consistent relation between capital endowments and net exports of capital-intensive goods.

Bonnefoi and Buongiorno (1990) provide a rare example of the application of this sort of method to trade in wood products. By regressing net trade of various wood products on total income and on proxies for capital endowments and forest resource endowments (represented by per capita income and total harvest, respectively), they were able to explain a relatively high proportion of the net international trade in processed wood products. They were not as successful, however, in explaining roundwood exports. Additionally, the influence of their capital proxy was generally insignificant in all but the paper and paper board sector. Given that total harvest was used as a proxy for forest resource endowments, results of the study simply state that those countries with high levels of harvest relative to the size of their economies are more apt to export wood products either in raw or in processed form. An additional conclusion is that countries with high capital endowments are more apt to export paper products.

Bonnefoi and Buongiorno (1990) highlight the difficulty in incorporating forest resources as a productive factor in a comparative-advantage analysis. The problem involves measuring the relative abundance or scarcity of a natural resource in economic terms. A substantial amount of literature addresses this question for nonrenewable resources (for example, Smith 1980, Solow 1974). Berk (1979) provides an often-cited example of a forestry-related application, and Catimel (1996) provides a general discussion of the

relation of scarcity, comparative advantage, and trade in Canada's forest products sector. Although stumpage prices (the price of standing timber) and harvest costs have been proposed as two possible measures of scarcity, both entail certain problems, and there is no broad agreement on an accepted or unambiguous measure of timber scarcity in the literature on the topic.

Competitiveness

The second of economic theory applied in this assessment is that of competitiveness. Brinkman (1987) provides two definitions of competitiveness: (1) "market competitiveness," which refers to the ability of an industry to supply comparable goods at a lower cost than other producers; and (2) "true competitiveness," which is defined as the ability of an industry to provide goods to the international market in competition with other producers such that the activity augments the wealth of the nation. This second definition addresses the need to consider the total costs and benefits accruing from production activities. These include government subsidies, and economic externalities affecting both market and nonmarket values. For this assessment, we concentrate on the first definition, although issues such as direct subsidies and environmental externalities are recognized as being important to forest management.

The literature on competitiveness is both voluminous and diffuse, ranging from theoretical discussions of the tangible and intangible elements that affect the competitive position of firms, industries, and nations (for example, Coffin and others 1993, Porter 1990) to more practical analyses of industry cost structures and markets. Indeed, many of the articles found in the trade journals as well as many university and public sector working papers fall into this latter category. Similarly, this report relies extensively on the measurement and analysis of production costs and end-market price behavior as indicators of competitiveness.

Although closely related, competitiveness and comparative advantage are not the same. Comparative advantage is an equilibrium concept. At economic equilibrium, factor prices, and therefore production costs, will be equal for all trading partners. Advantage will be measured solely by the relative volumes of production and trade of different types of goods. Competitive advantage, on the other hand, relies on the existence of disequilibria. Here, different technologies and factor wages result in different production costs for similar goods. The country (or region) demonstrating the lower cost possesses a competitive advantage. To the extent that factor wages reflect the economic fundamentals of a country or region, and not market distortions, competitive advantage will reflect an underlying comparative advantage. In this case, the expected market equilibrium has not yet been reached. Economic theory would predict that this competitive advantage will result in increased production volumes and relative trade shares. At the same time, increased local demand for productive factors, and increased supply of the final product in export markets will result in the equalization of factor wages. Consequently, competitiveness can be used (with proper care) to predict future economic developments: countries with a competitive advantage in a given industry can expect increasing production and export market shares in that industry. Also, if the supply of productive factors used in that industry is constrained, the country can expect increasing wages to those factors. For competitive disadvantage, the exact opposite is the case.

Factor Inputs and Stumpage Prices

The application of this argument to the wood products sector is complicated by the fact that timber is a major component in the input mix. As demonstrated by Berk (1979), and further evidenced by positive stumpage prices, timber is a scarce resource, at least in the short run. This is especially true for the high-quality, old-growth timber that comprises a proportion of southeast Alaska harvests. High scarcity values for the timber

(referred to as “scarcity rents” by economists) will be reflected in high market prices for logs or lumber products. Stumpage prices will partially reflect these scarcity rents. The production of logs, however, will entail the use of other inputs, and the cost of these inputs also will be incorporated in the stumpage value of the resource. Here, the stumpage price can be seen as a residual value that measures the final market price of the logs minus the cost of their production. Using an example that also fore-shadows the conclusions of this paper, consider a region with high labor costs but also high scarcity rents associated with its timber. Although the region will be at a competitive disadvantage in logging per se, it still may have an advantage in log production if the scarcity value of the timber is high enough to compensate for the higher cost of labor.

This sort of competitive advantage based on scarcity value, however, cannot always be used as a predictor of future increases in production volumes. The scarce resource is, by definition, depletable. With old-growth timber, the limited volume of accessible timber may severely constrain increases in production. Even with second-growth or plantation timber, currently available supply will be dictated by investments made years ago, sometimes under different economic conditions. Before physical depletion of supply is reached, production costs can be expected to rise at an increasing rate as producers are forced to harvest more inaccessible stands. For certain stands, these costs will exhaust even relatively high timber scarcity rents, and the resulting negative residual values (or zero stumpage prices) will clearly signal a lack of profitability and competitive advantage in the sector. In addition to changing production costs, the sector also may face cyclic swings in the demand for its product. Such swings are well known in the wood products sector. The resulting price fluctuations will be reflected in changing stumpage values, and once again, negative profitability during some portions of the market cycle.

The previously mentioned arguments suggest two ways to measure competitiveness: production costs and profitability—essentially two sides of the same coin. Production costs can be estimated by examining the productivity and wages of specific factors. For example, hourly wages can be combined with labor hours per unit of output to derive a unit cost for labor. The latter can be estimated by examining stumpage prices or calculating residual values. In the following analysis, these measures for southeast Alaska are compared with those for the Pacific Northwest and British Columbia. Throughout, it is important to view specific products as a combination of factor inputs, and the production process as a whole as a process that seeks to efficiently allocate the use of these factors. Subject to the limitations of technology and often policy, firms will attempt to maximize the use of factors that are cheap relative to other producers and minimize the use of those that are expensive.

The Wood Products Sector in Southeast Alaska

Rigorous application of the theories described previously to the question of comparative and competitive advantage of southeast Alaska is complicated by the lack of adequate comparable data for the region and its competitors, the relative absence of competitive stumpage markets in the region, and the general complexity of the wood products sector. For southeast Alaska, these complexities include physical and policy-induced resource constraints and the potential to produce various products in different locations. Rather than presenting an abstract but complete picture of the competitive position of the region, the present analysis is more similar to putting together a puzzle where some of the pieces are missing. Consequently, the following sections present evidence of the relative position of the region in a somewhat piecemeal fashion by using available data and making comparisons where possible. Different stages in the production and marketing process are used as the principle means to organize these data and their comparisons.

Figure 1 provides a schematic diagram of the wood products sector, which identifies major production stages and key elements that combine to determine competitiveness. Three broad areas of analysis are indicated: (1) the forest resource in which timber stocks are combined with labor, machinery, and other inputs to produce raw logs; (2) the processing sector in which logs are combined with other factors to produce products such as lumber and chips (including mill residues); and (3) end markets where purchasers compare the price and physical characteristics of southeast Alaska products to those from other regions. These purchasers include both manufacturers and final consumers. Factor costs include wages, interest (the opportunity cost of invested capital), and costs for other materials and services. The physical characteristics of timber contribute to the determination of competitive status through their effect on the quantity and cost of other factor inputs needed to both manufacture and use products from southeast Alaska, and the range, quantity, and quality of products that may be supplied. Finally, end-market demand shifters such as construction activity and consumer preferences in conjunction with the availability of substitute products will help determine product prices.

Along the bottom portion of figure 1, the concept of stumpage price as a residual value also is displayed. Given the assumption of perfect information and competitive markets, the difference between final price and production costs will be “bid back to the stump” or, in other words, concentrated in the stumpage price. The validity of these two assumptions, however, particularly that of perfect information, is open to question. Stumpage prices are perhaps better viewed as emerging from a separate stumpage market in which purchasers bid based on expected profits and thus include their expectations of future price fluctuations and their attitude toward risk. In spite of the intervening influence of these and other factors in stumpage markets, the connection between stumpage prices and residual values nonetheless remains a strong one. Both measures will be examined in the following analysis.

Data for this report were drawn from various sources. The physical characteristics of the forest resource are analyzed by using historical data on southeast Alaska log production by species and grade. Pong log values, mill prices (or export prices as reported by the U.S. Department of Commerce [as reported in Warren 1998]), and end-market prices in Japan comprise our primary sources of price data at different stages of the production process. For estimates of harvest and processing costs, we have relied on USDA Forest Service sale appraisal data and industry survey data¹ available from outside sources. Our discussion of factor costs focuses on relative wage rates as reported by the U.S. Bureau of the Census, Annual Survey of Manufactures.

Cost estimates from the sale appraisal process are a major source of information used in this report. These estimates, however, are based on historical industry conditions (as reflected in Forest Service cost collection surveys), and these conditions have changed considerably in recent years as the sector has adjusted to the closure of the region’s remaining pulp mill in Ketchikan and a general reduction in sawmill capacity. Additionally, new production facilities are being considered. These developments could substantially alter the costs reported in the sale appraisal process as well as the general economics surrounding the Forest Service’s sale program. Census of Manufactures

¹U.S. Department of Agriculture, Forest Service. 1984-94. Sale appraisal data. Unpublished data. On file with: USDA Forest Service, Forest Management Division, Alaska Region, P.O. Box 21628, Juneau, AK 99802.

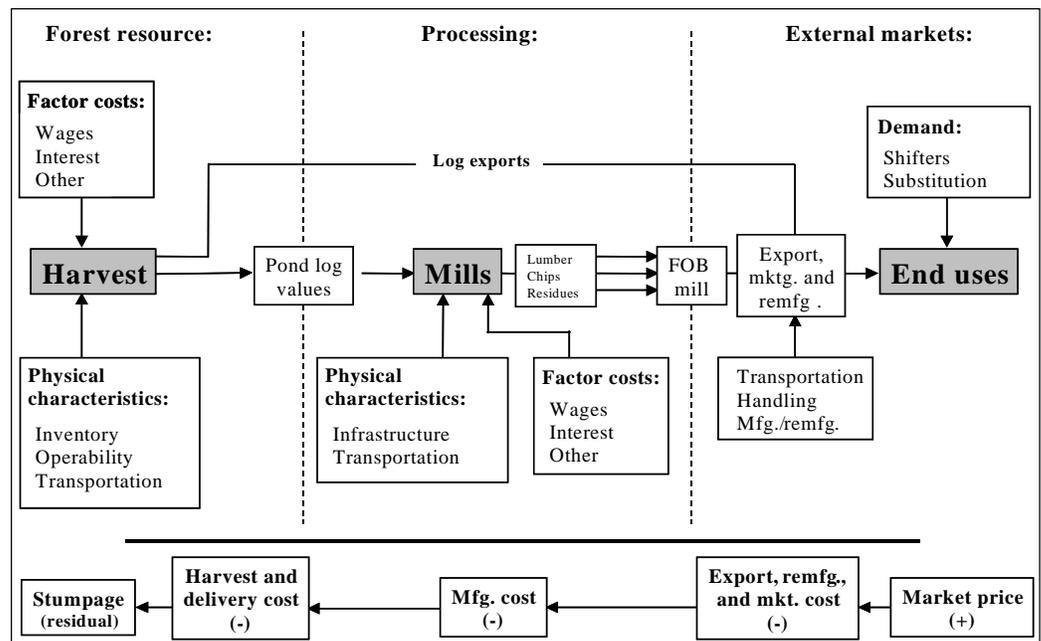


Figure 1—Sources of comparative and competitive advantage in the wood products sector.

wage and labor input data, on the other hand, provide a more independent (but significantly less detailed) assessment of costs faced by southeast Alaska producers. These data reflect more fundamental economic conditions in southeast Alaska, and they generally corroborate the conclusions found in the analysis of the sale appraisal data.

The Forest Resource Physical Characteristics

Although in certain years Alaska has imported pulpwood and mill residues, these imports are small and largely irrelevant to the assessment of southeast Alaska's competitive and comparative advantage. In the absence of imported raw timber, the quantity and the physical characteristics of the forest resource in southeast Alaska define the upper boundary of how much and what sorts of wood products the region may produce. For the Tongass National Forest, this boundary will be further constrained by several forest regulations, including designations of the suitable timber base and constraints on harvest designed to ensure sustainability and guard against high grading (that is, harvesting only the better trees or stands). Restrictions on exports of raw material from the Tongass National Forest currently limit log exports of federal timber to Alaska yellow cedar (*Chamaecyparis nootkatensis* (D. Don) Spach) and a proportion of the western redcedar harvest (*Thuja plicata* Donn ex D. Don). This ban applies to all sales outside the region. The Tongass National Forest timber base is the major focus of this part of the report, and the private forests of southeast Alaska will be discussed primarily in terms of their impact on Tongass National Forest harvests and subsequent processed goods. Additionally, we have concentrated on only the existing timber stock; future second-growth timber supplies and issues of forest productivity are not considered.

The distribution of harvest by species and log grades is largely determined by the forest resource, particularly if proportionality requirements restricting high grading at the stand or forest level are in place. In table 1, we present 1995 statistics for harvest by species and grade for southeast Alaska and British Columbia (similar data are not readily available for the Pacific Northwest). Estimates for southeast Alaska are based on Alaska Region log scaling tickets, whereas for British Columbia estimates are from

Table 1—Distribution of 1995 harvest by species and grade, coastal British Columbia and southeast Alaska

Species and location	Premium saw log	Saw log	Low-grade saw log	Utility	Species share (of total harvest)
<i>Percent</i>					
Sitka spruce:					
British Columbia	14.6	61.8	10.0	13.6	1.9
Southeast Alaska	17.4	52.7	11.3	18.6	23.8
Hemlock:					
British Columbia	3.7	46.9	17.0	32.4	15.6
Southeast Alaska	7.2	41.2	24.8	26.8	58.3

Note: Southeast Alaska log classes are translated as follows: premium saw log = no. 1 saw log, select and special mill; saw log = no. 2 saw log; low-grade saw log = no. 3 and no. 4 saw logs; utility = utility logs. Source: USDA Forest Service (1984-94), British Columbia Council of Forest Industries (see footnote 3).

the Vancouver log market.^{2,3} In general, log class distributions are similar across regions, with a high concentration of volume in the saw log class (number 2 saw logs in southeast Alaska), and a higher proportion of volume in the lower grades for western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) than for Sitka spruce (*Picea sitchensis* (Bong.) Carr.). Although there are higher percentages in the premium grade for southeast Alaska, this could possibly be an artifact of the different log classification systems used for each region.

A more striking difference is found in the comparison of the shares of Sitka spruce in total production. Because of the relatively small share of Sitka spruce in British Columbia total volume, spruce volumes supplied in 1995 are small in spite of the overall position of British Columbia as a major forest products producer. In that year, southeast Alaska accounted for about 70 percent of estimated total North American production of Sitka spruce (42 percent from private owners and 28 percent from the Tongass National Forest) with British Columbia accounting for the remainder. This highlights the special position southeast Alaska enjoys as the world's major producer of Sitka spruce. For hemlock, however, the situation is reversed. Southeast Alaska accounts for around 17 percent (private 11 percent and Tongass National Forest 6 percent) of total western hemlock production for export to Pacific Rim markets; British Columbia, at 59 percent, accounts for most of the western hemlock production, and the Pacific Northwest accounts for most of the remaining 23 percent. If Pacific Northwest production for U.S. domestic markets were included in this calculation, southeast Alaska's share of total hemlock production would be significantly smaller. The role of the region as a principal

² Although the southeast Alaska log ticket data purportedly comprise a census of total Tongass National Forest log production, analysis indicates that a small proportion of log production is not recorded. Nevertheless, it seems safe to assume that the sample is representative. The Vancouver log market, on the other hand, constitutes only a minority share of total British Columbia coastal log production. We have no reason, however, to believe that the sample differs systematically from the whole.

³ British Columbia log market prices and volumes. Unpublished data. On file with: British Columbia Council of Forest Industries, 1200-555 Burrard Street, Vancouver, BC V7X 1S7, Canada.

supplier of Sitka spruce and a relatively minor supplier of hemlock has important implications when analyzed in conjunction with the end markets for each of these species, and they will be discussed further in later sections of this report.

Harvest Costs

Harvest costs per thousand board feet log scale⁴ for southeast Alaska, the Pacific Northwest, and British Columbia are displayed in figure 2. Figures for southeast Alaska were estimated by using Forest Service sale appraisal data from independent sales, and they represent an appraised cost rather than actual transactions (Western Pine Association).⁵ Data for the Pacific Northwest and British Columbia were obtained from a private mill survey and represent actual costs as reported by respondents (Resource Information Systems, Inc. [RISI] 1996). The figure clearly indicates a similarity in both levels and trends between southeast Alaska and British Columbia and a large discrepancy between these series and that for the Pacific Northwest. As will be shown in subsequent sections, the similarity between southeast Alaska and British Columbia also is reflected in delivered wood costs (or pond log values). Though accessibility is a factor, the increasing trend in harvest costs in southeast Alaska most likely is due to decreases in both average piece size and volumes per acre. National forest sales in the Pacific Northwest likely have experienced similar increases in cost because of these same factors and from a related expansion in the use of helicopter logging systems. Regional Pacific Northwest averages, however, may have been held in check by an increasing proportion of private volumes in the total mix, and the greater accessibility and more uniform characteristics of the second-growth private resource. In any event, these data show a large and expanding cost differential between southeast Alaska and the Pacific Northwest.

British Columbia has the highest harvest costs of the three regions, which likely is due in part to similar resource characteristics as those encountered in southeast Alaska. Firms in British Columbia, however, operate in a substantially different macroeconomic environment, thereby making direct comparisons of costs with U.S. producers problematic. Trends, on the other hand, are more amenable to comparison. Most harvests in both regions are concentrated in old-growth timber and thus occur at the extensive margin of timber production. As old-growth stocks are liquidated, increasing costs over

⁴ Log scale (broad feet log scale) refers to a Scribner measurement in which round logs are converted into the number of board feet lumber tally (board feet lumber to tally a square foot of lumber 1 inch thick), which can be produced from these logs. Initially, board feet log scale and board feet lumber to tally were theoretically identical, but increasing lumber recovery and variations among different regions and different log sizes mean that the two measures are not the same. Converting broad feet log scale to board feet lumber to tally entails an estimate of the physical conversion of logs to lumber at the mill. This issue is further addressed in the subsequent section on log conversion efficiency and overrun.

⁵ Here we have used volume weighted yearly averages from the Forest Service form FS 2400-17 (line 29, logging costs net of specified road construction). These figures represent Forest Service estimates of expected costs and not actual costs incurred by harvest. The lack of an adequate sample size (particularly in 1986) is a problem, but the estimates generally conform to expectations and seem to be relatively stable (though slightly increasing) over time. Note that the extension of this series to the entire Tongass National Forest requires the assumption that the long-term contract sales exhibit the same cost parameters as the independent sales.

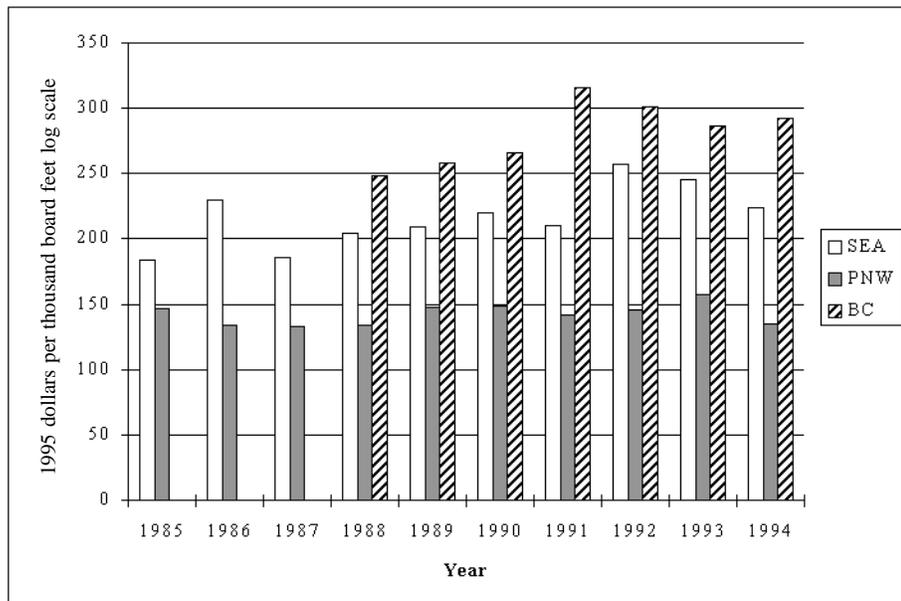


Figure 2—Harvest costs in southeast Alaska, the Pacific Northwest, and British Columbia. All estimates exclude permanent roading costs (from USDA Forest Service, Alaska Region, timber sale appraisal data [see footnote 1]; RISI 1996).

time can be expected. This is in contrast to the Pacific Northwest, where second-growth timber constitutes a substantial and increasing majority of total harvest, a trend which was accelerated by the recent declines in harvests from public lands in the region.

Table 2 displays a more detailed description of southeast Alaska-appraised logging costs as estimated from the sale appraisal data. The major cost categories include skidding and loading (44 percent of 1985-94 average total logging costs), transportation to mill (16 percent), and felling and bucking (12 percent). Specified roads are counted as separate for the application of purchaser road credits. They accounted for 15 percent of total appraised logging costs in the 1985-94 period. The total change over the sample period is reported in the last column of table 2. The \$26-increase in skidding and loading (an estimated 3.7-percent annual rate of increase) is the largest increase for any single category and accounts for over half of the total increase in logging costs. Costs in this category will be sensitive to several factors, operability and log size being chief among them. In contrast to the “logging cost” subtotal, “total logging costs” experienced slight gains over the sample period, but this is due to a zero reported specified road cost in the final year, an anomaly which disguises a generally upward trend in these costs as well (note that only one sale was available for the 1994 sample).

Factor Costs and Intensity in the Logging Sector

The physical characteristics of the forest will largely determine the quantity and mix of productive factors used to harvest a given quantity of timber. Although economic theory predicts the marginal substitution of factors (capital for labor, for example) because of changes in relative factor wages, production technologies in the real world are less flexible. Logging firms will combine various productive inputs based on a limited menu of possible logging techniques. Consequently, the ability to adjust the mix of inputs may be limited. When combined with wage rates, the use of these factors will determine total production costs. Table 3 displays labor cost statistics for Alaska and for the

Table 2—Southeast Alaska logging costs from sale appraisal sample (1995 dollars per thousand board feet log sacle^a)

Category and sample	Year										1985-94 change
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
<i>Dollars</i>											
Cost category:											
Felling and bucking	28	41	33	29	31	29	28	35	24	24	-4
Skid and load	84	117	95	101	106	121	114	147	133	110	26
Haul dump raft and tow	45	44	36	45	39	37	37	38	44	51	6
Road maintenance	3	3	3	5	4	2	4	5	4	8	5
Temporary roads	11	22	15	14	17	19	14	15	13	7	-4
Other	13	2	4	10	13	13	12	16	20	24	11
Logging cost (subtotal)	184	230	186	205	210	220	210	257	237	224	40
Specified road costs	32	0	45	55	43	65	41	48	65	0	-32
Total logging costs	216	230	231	260	253	285	251	305	302	224	8
Sample information:											
Sample size	3	1	8	8	5	7	7	7	10	1	
Total volume of sales (MMbf) ^b	121	5	88	118	38	55	34	36	115	2	

^aLS = log scale. See footnote 2 in the text for explanation of measurement units.

^bMMbf = million board feet.

Source: USDA Forest Service, Alaska Region, timber sale appraisal data, (see footnote 1).

Table 3—Labor inputs in the logging sector, Alaska, Oregon, and Washington (1987-94)

Labor inputs by region	Year									Yearly growth
	1987	1988	1989	1990	1991	1992	1993	1994	Average	
<i>Hours</i>										
Logging production hours per Mbf ls: ^a										
Alaska	3.59	2.79	3.32	3.47	3.61	3.23	3.57	5.56	3.64	5.20
Pacific Northwest	2.37	2.45	2.35	2.64	2.58	2.78	3.02	3.38	2.7	4.90
Difference (%)	52	14	41	31	40	16	18	65	35	—
<i>Dollars</i>										
Logging production wage (1995 \$ per hour):										
Alaska	17.33	15.91	17.43	16.63	17.53	17.96	16.96	15.24	16.87	-0.50
Pacific Northwest	14.14	13.52	14.22	13.68	14.13	13.73	13.37	13.41	13.77	-.60
Difference (%)	23	18	23	22	24	31	27	14	23	—
<i>Dollars</i>										
Unit labor cost (1995 \$ per Mbf ls): ^a										
Alaska	62.29	44.36	57.84	57.63	63.35	57.99	60.47	84.74	61.08	4.60
Pacific Northwest	33.47	33.06	33.38	36.15	36.51	38.15	40.41	45.27	37.05	4.30
Difference (%)	86	34	73	59	74	52	50	87	65	—
Difference	28.82	11.3	24.47	21.48	26.84	19.84	20.05	39.47	24.03	—

^a Mbf = thousand board feet log scale.

Source: U.S. Department of Commerce, Bureau of the Census, Annual Survey of Manufactures (1985-94).

Pacific Northwest as represented by an Oregon-Washington average (comparable data were not available for British Columbia). These data were obtained from the Bureau of Census' Survey of Manufactures and are reported for production workers; that is, workers directly engaged in production as opposed to those engaged in management and support.

As shown in the upper rows of table 3, Alaska used an average of 3.6 hours of production worker labor per thousand board feet log scale of lumber output over the 1987-94 period. The Pacific Northwest used 2.7 hours—a difference of 35 percent. Each of the years reported likewise shows a significantly higher labor intensity in logging production in Alaska, and though each region shows a generally increasing trend over time, there is no significant trend in the difference between them. As noted in the analysis of the sale appraisal data, the most likely explanation for higher labor intensity in Alaska relates to its remoteness and more difficult terrain, conditions which preclude certain mechanized harvesting operations and which necessitate higher labor inputs even under comparable harvest systems. Smaller average log sizes in Alaska also may play an important role in dictating lower labor productivity.

Relative wages are a function of both industry-specific conditions and of other factors affecting the regional labor market as a whole (which will be discussed in a latter section). As in the case of labor intensity, wages in the Alaska logging sector are consistently and significantly higher than those in the Pacific Northwest, and there is no discernible trend, either increasing or decreasing, in their relation.

By combining labor intensity and wages, we may obtain a measure of the unit cost of labor in the logging sector (in other words, the labor costs incurred in the production of one thousand board feet log scale; see the bottom rows of table 3). The combined effect of the higher labor intensity and higher wages in Alaska is evident in the estimated average unit labor cost differential (65 percent) between Alaska and the Pacific Northwest. This translates into an extra \$24 per thousand board feet log scale in labor costs, which Alaska must pay on average over and above costs paid in the Pacific Northwest. This differential applies only to those employment categories that are explicitly coded as logging; if the case is similar for other labor inputs (such as those engaged in road construction), then the total per thousand board feet labor cost differential will accordingly be higher. In terms of relative levels, the labor cost data presented here mirrors the total harvest cost estimates presented above, but the divergence of trends apparent in the total cost data is not evident here; costs in both regions are increasing at essentially the same rate (see table 3 last column). Given the short timespan considered and the high year-on-year variation in the labor cost data, however, these trend estimates are far less robust than the estimates of average levels for the entire period.

Other factor costs include capital costs (interest on loans and the opportunity cost of invested capital), energy costs, the cost of other materials (including stumpage costs), and various other costs such as road construction and transportation. Although labor statistics are covered by federal and state reporting agencies, information on other factor inputs is largely unavailable, and it was not possible in this report to derive unit cost measures for other inputs. Labor cost differentials may nonetheless be indicative of the relative cost of other inputs in southeast Alaska. Higher wages reflect a higher overall cost of living for the region (the cost of living allowance for federal employees in Alaska, for example, is 25 percent). This higher cost also generally will apply to production activities as well as consumption.

The Manufacturing Sector

Capital costs in the region, as measured by interest rates, may be assumed to be equivalent to that for investments of comparable risk in the Pacific Northwest as capital markets are well integrated at the national and, increasingly, international levels.⁶ Capital inputs per Mbf harvested in Alaska, however, may well be higher due to more difficult operating conditions and the absence of road transportation networks. Indeed, if we assume similar capital to labor ratios in both regions, then unit capital inputs will exceed those in the Pacific Northwest by the same amount as the unit labor input. For similar reasons, inputs of other materials and services generally will be higher in southeast Alaska than in the Pacific Northwest. Thus, even assuming wages for these inputs are similar to those in the Pacific Northwest, costs will be higher because of lower productivity. Wages for these inputs, however, are likely to be higher owing to the generally higher costs endemic to the local economy.

This section focuses on lumber production, again concentrating on unit labor costs arising from the combined influence of productivity and wages. More so than in the logging sector, the distribution of fixed capital investments in the region will help determine the productivity of other inputs (notably labor) and thereby overall production costs. Closure of the Ketchikan Pulp Company's mill in Ketchikan in 1997 brought pulp production in the region to an end; consequently, lumber, wood chips, and panel products remain as the most viable commodity options for the wood products sector in the foreseeable future.⁷ A laminated veneer lumber plant is planned for the region, but it is not yet installed. Changes of this sort may somewhat alter labor productivity statistics for the sector, but underlying fundamentals determining comparative and competitive advantage will remain the same. In addition to revenues from lumber sales, the sale or other use of mill residuals (sawdust and chips) often will play a key role in mill profitability. Because of a lack of data, however, this role could not be directly analyzed in this report. Nonetheless, the general wage and productivity information, which is part of the following analysis, will have implications for the production of all mill products, including residuals.

Total Manufacturing Costs in the Sawmilling Sector

Total sawmilling costs net of the cost of wood inputs for southeast Alaska, the Pacific Northwest, and British Columbia are shown in figure 3. The figures here are reported in terms of thousand board feet log scale, and the sources for the Pacific Northwest and British Columbia are the same as those cited for logging costs. Figures for southeast Alaska were obtained from the "midmarket analysis," a component of the Forest Service sale appraisal process (see footnote 1). They constitute an average manufacturing cost for all species milled in southeast Alaska, meaning western hemlock and Sitka spruce for all practical purposes. Once again, southeast Alaska costs are significantly higher than those for the Pacific Northwest, ranging from 19 percent higher in 1984 to about twice the Pacific Northwest figure throughout the 1991-94 period.

⁶ Because of current policy in southeast Alaska, private firms have identified uncertainty as a major impediment to obtaining financing for new production capacity, which in turn, signifies a higher interest rate within the sector owing to higher risk. This higher capital cost, however, is a reflection of the current state of the sector and does not constitute an exogenous input cost. Given identical risk and potential for profit, interest rates in southeast Alaska should match those in the Pacific Northwest and elsewhere.

⁷ In addition to these products, several specialty wood products are manufactured in southeast Alaska, with music-wood as the most visible example. The dynamics of this sector, however, are considerably different from those in main-stream commodity production, and specialty wood products are beyond the scope of the present analysis.

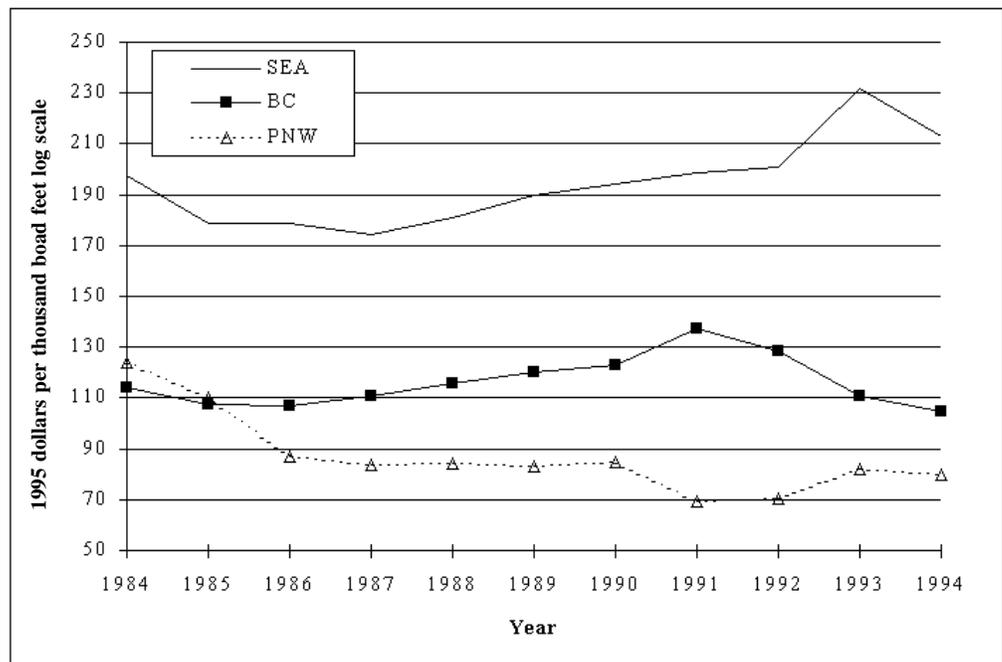


Figure 3—Lumber manufacturing costs in southeast Alaska, the Pacific Northwest, and British Columbia (from USDA Forest Service, Alaska Region, timber sale appraisal data [see footnote 1]; RISI 1996).

The trends in these series are also similar to trends for logging costs. Declining costs in the Pacific Northwest are commonly ascribed to closures of inefficient mills over the last few decades. This occurred in the early to mid 1980s because of a demand-driven recession in the wood products industries, and again in the early 1990s because of a supply contraction from expanded forest conservation. Costs for southeast Alaska, on the other hand, have been increasing at an average 3-percent real growth rate per year over the period shown. Data from previous years, however, indicate that the early 1980s saw a sharp decline in processing costs. (Because of a lack of comparability and other statistical problems, these earlier data are not displayed here). The 3-percent real growth figure, therefore, may be the partial result of the endpoints chosen for analysis and not of longer term trends. Declining log quality and piece size resulting in increased processing and handling costs also may be partly responsible for this trend. Although British Columbia logging costs are similar to those in southeast Alaska, manufacturing costs for British Columbia seem to be closely associated with those of the Pacific Northwest in both levels and trends. This is not surprising given British Columbia's position as a major and highly competitive producer of sawn wood for export markets both in the United States and throughout Asia. Although productivity in the British Columbia logging sector largely will be determined by the physical characteristics of the resource, costs in the sawmilling sector will reflect the efficiency gains needed to successfully compete in global commodity markets.

Factor Costs and Intensity in the Sawmilling Sector

Table 4 summarizes labor inputs in the sawmilling sector. The sources and derivations are similar to those for the logging sector shown in table 3. Again, unit labor costs in southeast Alaska are considerably higher (49 percent higher, on average) than those in the Pacific Northwest. This is due to the combination of higher per-unit labor inputs and higher hourly wages. Although higher factor use in the logging sector is easily explained by the more arduous physical conditions found in southeast Alaska, the

Table 4—Labor inputs in the sawmilling sector, Alaska, Oregon, and Washington (1987-94)

Labor inputs by region	Year								Average	Yearly growth
	1987	1988	1989	1990	1991	1992	1993	1994		
	----- Hours -----									<i>Percent</i>
Sawmill production (hours per Mbf It): ^a										
Alaska	3.97	8.81	4.21	5.48	6.89	5.96	7.75	5.25	6.04	3.10
Pacific Northwest	4.54	4.67	4.65	4.78	4.8	4.88	5.19	4.76	4.78	1.20
Difference (percent)	-13	89	-9	15	43	22	49	10	26	—
	<i>Dollars</i>									
Sawmill production wage (1995 \$ per hour):										
Alaska	13.35	14.75	13.76	14.28	14.61	17.21	16.02	17.74	15.21	3.80
Pacific Northwest	13.13	12.76	12.69	12.82	12.98	12.92	13.16	13.57	13.01	.50
Difference (percent)	2	16	8	11	13	33	22	31	17	—
	<i>Dollars</i>									
Unit labor cost (1995 \$ per Mbf It): ^a										
Alaska	52.97	130	57.96	78.19	100.59	102.58	124.15	93.07	92.44	7.00
Pacific Northwest	59.64	59.56	59.06	61.26	62.32	63.01	68.28	64.55	62.21	1.70
Difference (percent)	-11	118	-2	28	61	63	82	44	49	—
Difference	-6.66	70.45	-1.1	16.93	38.27	39.56	55.88	28.52	30.23	—

^a MBF It = thousand board feet lumber tally.

Source: U.S. Bureau of the Census, Annual Survey of Manufactures (1985-94).

same argument cannot be made for the sawmilling sector. The relatively low score on labor productivity in sawmilling for southeast Alaska is somewhat surprising given the lack of kiln drying and other finished lumber processing in the region, activities which would tend to raise the number of production hours per Mbf in lumber manufacture.

There are several possible explanations for the relatively higher costs of labor for sawmilling in Alaska than in the Pacific Northwest. First and foremost, Pacific Northwest mills are noted for their high degree of mechanization, and, with a large proportion of their activity devoted to the production of standardized dimension lumber, they are likely to benefit from efficiencies and economies of large scale not obtainable in southeast Alaska. Secondly, though adequate figures for fixed capital accumulation are difficult to come by, it is commonly recognized that the capital stock in southeast Alaska is relatively old and poor in quality. Mills in southeast Alaska commonly utilize less expensive and older equipment, which results in lower labor productivity. Thirdly, southeast Alaska mills have been operating well below full capacity throughout the period included in this analysis. This underutilization of installed capacity may have been mirrored by an underutilization of labor resources, with mills hiring more workers per Mbf than would be necessary at optimal capacity utilization.

Many of the arguments relevant to the cost of other factors in the logging sector also apply in the sawmilling sector. With the exception of capital costs, mills in Alaska will face higher prices for goods and services in line with the higher prices faced by all firms operating in the region. As with labor, the absence of large-scale economies will reduce

Log Conversion Efficiency and Overrun

the productivity of capital investments and other inputs. Also, although the link between physical resource characteristics and the quantity of inputs needed is not as direct as in the logging sector, the remote location mills in the region will necessitate certain inputs, particularly in the area of transportation, not needed in the Pacific Northwest. Consequently, both the unit cost of nonlabor inputs and the quantity needed will be higher in southeast Alaska.

In general, both the trends and levels shown in table 4 are consistent with the data shown in the previous section on total sawmilling costs (fig. 3): southeast Alaska levels are significantly higher than those in the Pacific Northwest, and the difference is increasing over time. In contrast to declines in the total cost data for the Pacific Northwest, per-unit labor cost estimates for the Pacific Northwest show an increasing trend. This constitutes somewhat of an anomaly in the data, but, as with labor costs in the logging sector, the trend estimates presented here are not robust. Moreover, the Pacific Northwest, especially the state of Washington, has experienced rapid increases in secondary manufacturing of wood products in the last decade (Robertson and Lippke 1996). This will be reflected in higher labor inputs per Mbf and thereby higher costs (note that increased production hours per Mbf account for most of the increase in costs in the Pacific Northwest shown in table 4). Because of survey procedures, the cost estimates shown in figure 3 are less apt to include secondary manufacturing activity and thereby register this shift in industry structure in the Pacific Northwest.

As with labor inputs, efficiency in the conversion of log inputs to lumber is an important indicator of competitive advantage in lumber manufacture. High conversion rates will minimize log inputs and the costs associated with them, and will thus denote an efficient use of both the forest resource (as embodied in stumpage rates) and the labor and other inputs needed to harvest and deliver logs to the mill. "Overrun" is a measure of the amount of lumber (denoted in lumber tally, or Mbf lt), that can be produced from a unit of log input (log scale, or Mbf ls). Brooks and Haynes (1997) cite an estimated overrun of 1.22 for southeast Alaska in 1994. In contrast, the 1994 Forest Service estimate for the Pacific Northwest is 1.7.⁸ Resource Information Systems Inc., a private consultant firm, has estimated the Pacific Northwest west-side overrun at 2.03, though they do not claim that this represents an unbiased sample (RISI 1996). The smaller Forest Service Pacific Northwest estimate of 1.7 is about 35 percent higher than that for southeast Alaska, thereby indicating that, even with equivalent delivered log costs, southeast Alaska mills would incur considerably higher costs for their log inputs. Overrun estimates for British Columbia are currently not available, but it is commonly assumed that British Columbia conversion efficiency is somewhere in between the Pacific Northwest and south Alaska, and most likely closer to the former than the latter.

Various factors will determine log conversion efficiency. Species, log diameters and grades, and the amount of log defect all are important determinants that are beyond the control of the local sawmilling sector. Other, less tangible, factors such as the local pool of labor skills and accepted local business practices also may affect conversion efficiency. Mill technology, however, is often a more important determinant and is directly dependent on the investment and production decisions of mill operators. Choice of end product is likewise largely dependent on producer decisions. Taking independent factors such as labor skills and forest characteristics as a given, there is still good reason why producers may decide not to maximize log-conversion efficiency. In regions like

⁸ Personal communication. 1996. Darius Adams, professor, Oregon State University, Corvallis, OR 97331.

southeast Alaska where manufacturing costs (as opposed to delivered log costs) constitute a much higher proportion of the total cost of lumber production incentives to minimize the cost of log inputs may be relatively weak, especially if such moves would entail substantial investments of new capital. Likewise, where relatively large profits are made on a small proportion of the log volume (high-grade spruce and cedar) but the bulk of material (lower grade hemlock) presents little profit potential even when delivered wood cost are excluded from the calculation, incentives to economize on inputs of this lower grade material will be minimal. Here, labor and capital are the high-cost factors, and their use will be minimized relative to that of log inputs.

The above arguments do not explicitly consider the role of wood chips in the sawmill product output mix. Pulp production, however, played a dominant role in the timber economy of the region over the period examined in this report. Consequently, sawmill overrun rates, as well as overall productivity, may have been substantially impacted by the need to maintain a steady supply of mill residue to augment wood fiber supply for the pulp mills. Vertical integration of lumber and pulp manufacturing facilities increases the possibility that this is the case. More generally, the ability to enhance profits through the sale or use of wood chips and other mill residue will alter sawmill behavior and the relation between factor inputs and product outputs. And finally, the ability to legally (and profitably) export certain species in raw log form may affect the behavior of a mill in situations where it has this option. Hence, the low conversions efficiencies of the southeast Alaska sawmilling sector is the likely result of various contributing factors, many of which may make good sense given the product mix and economic conditions prevailing in the region.

Pond Log Values and British Columbia Log Market Prices

Another approach to estimating relative lumber production costs can be made through the comparison of southeast Alaska pond log values and British Columbia log prices. Pond log values are derived by subtracting manufacturing costs from final product prices (FOB mill) as reported for Alaska in the sale appraisal process. Assuming perfect competition in the British Columbia log market, log prices should represent a similar measure, with mills bidding up prices until all profits (that is, revenues over and above production costs and a normal rate of return on investment) are dissipated. A comparison of southeast Alaska pond log values and British Columbia log market prices is shown in figure 4. In terms of both absolute levels and changes over time, prices in the two regions are remarkably similar. If we assume that end-product prices are about equivalent across regions, the implication is that processing costs are also about equivalent in Alaska and British Columbia, or that lumber production is considerably more profitable in British Columbia. When considering the similarity between estimated harvest costs in the two regions and the large discrepancy between sawmilling costs (see previous sections), it seems that the latter argument, that British Columbia mills are more profitable, is the more likely of the two. The lower production costs of British Columbia lumber producers are not reflected in higher log prices. This, in turn, implies a partial break in the link between residual value and prices of intermediate products, with log prices in British Columbia being largely determined by harvest cost and stumpage prices rather than final product price net of mill costs. Once again, however, the caveat concerning different macroeconomic environments in Canada and the United States applies.

Total Costs

By combining estimates of harvest costs with those for sawmilling, we can derive an estimate of the total cost of producing a unit of lumber net of stumpage costs. This estimate is shown in figure 5 for the three regions, and represents the sum of the estimates presented above. This measure, however, is an aggregate of various species and

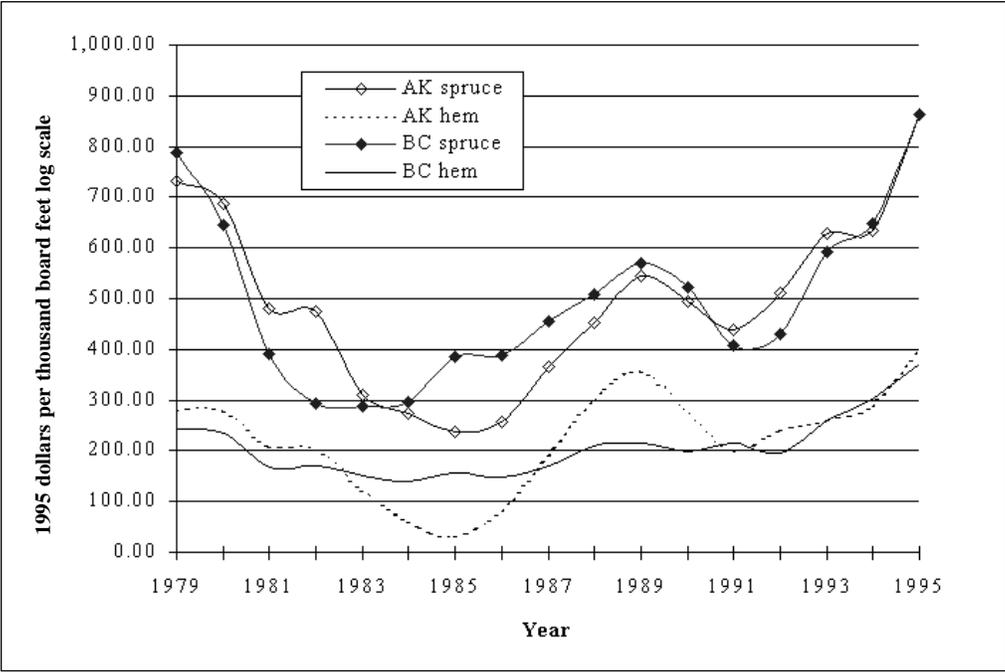


Figure 4—Log values in southeast Alaska and British Columbia (from USDA Forest Service, Alaska Region timber sale appraisal data [see footnote 1]; British Columbia Council of Forest Industries (see footnote 3).

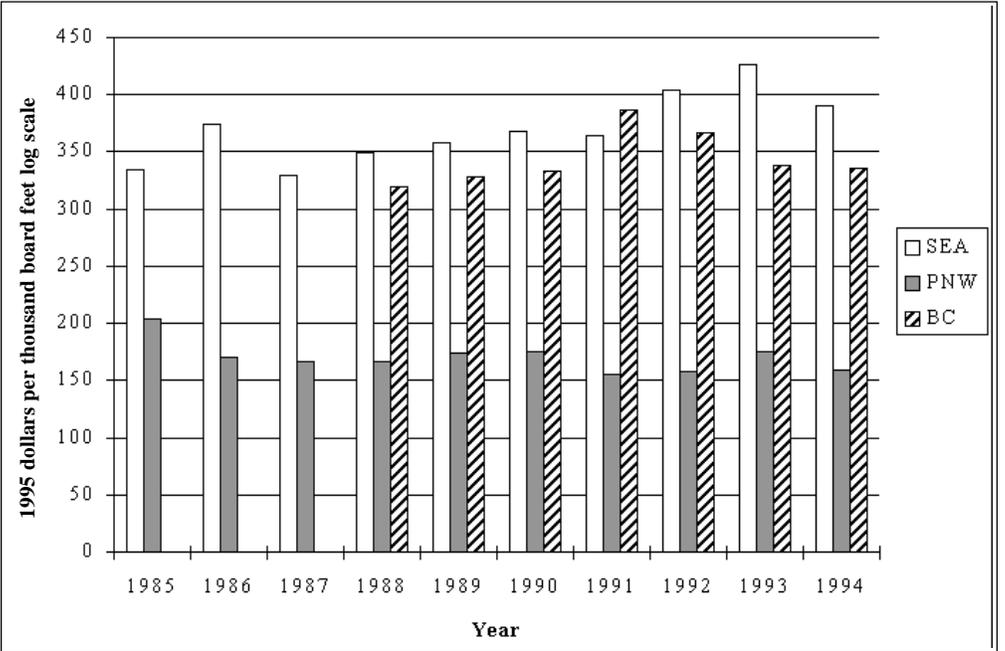


Figure 5—Total production costs (logging + lumber) (from USDA Forest Service, Alaska Region, timber sale appraisal data [see footnote 1]; RISI 1996).

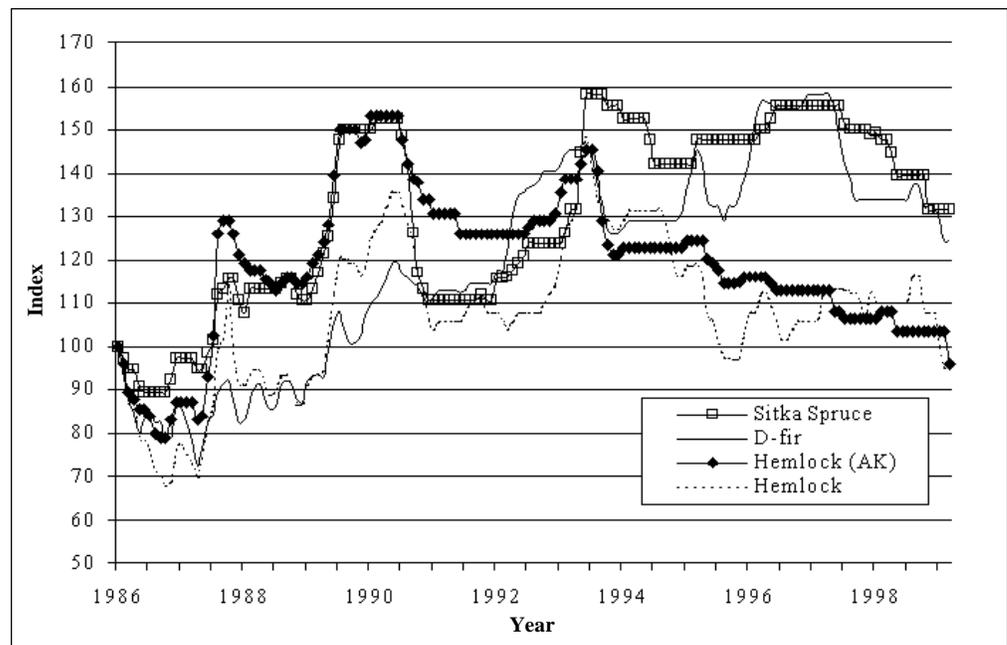


Figure 6—Japan wholesale log prices (yen price index, January 1986 = 100) (Japan Lumber Reports 1945-94).

products and the results cannot be directly extended to particular cases without careful consideration. Southeast Alaska is the highest cost producer in most of the years. Primarily because of its higher harvest costs, British Columbia is the high cost producer in 1991 and is close to southeast Alaska in other years until 1993, when trends for the two regions diverge. Throughout the period shown, costs for southeast Alaska generally are increasing, which is in contrast with stable to declining costs in the Pacific Northwest and a rising and then declining trend in British Columbia.

End Markets

End markets will ultimately determine the value of southeast Alaska products relative to that of its competitors. The following analysis concentrates on Japan's market for North American softwood logs and sawn wood. The strategy here is to analyze product prices to ascertain the relative position of southeast Alaska products in this market. Japan traditionally has been the principal market for southeast Alaska logs and lumber and the largest export market for Pacific Northwest and British Columbia products if cross border trade between Canada and the United States is excluded. As such, Japan's market is the most logical place to compare relative prices and products from the three producing regions. However, with the collapse of Japan's prices for higher grade logs and lumber in the last few years, southeast Alaska producers have devoted an increasing share of their production to supplying U.S. consumers in the lower 48 states.

Figure 6 displays yen-based price indexes for major North American log export species in Japan's market. The use of an index was chosen because the price data were not comparable among different species (different sizes and grades were used for each). Before 1993, western hemlock, Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) and Sitka spruce log prices fluctuate in a broadly similar fashion. During this period, it

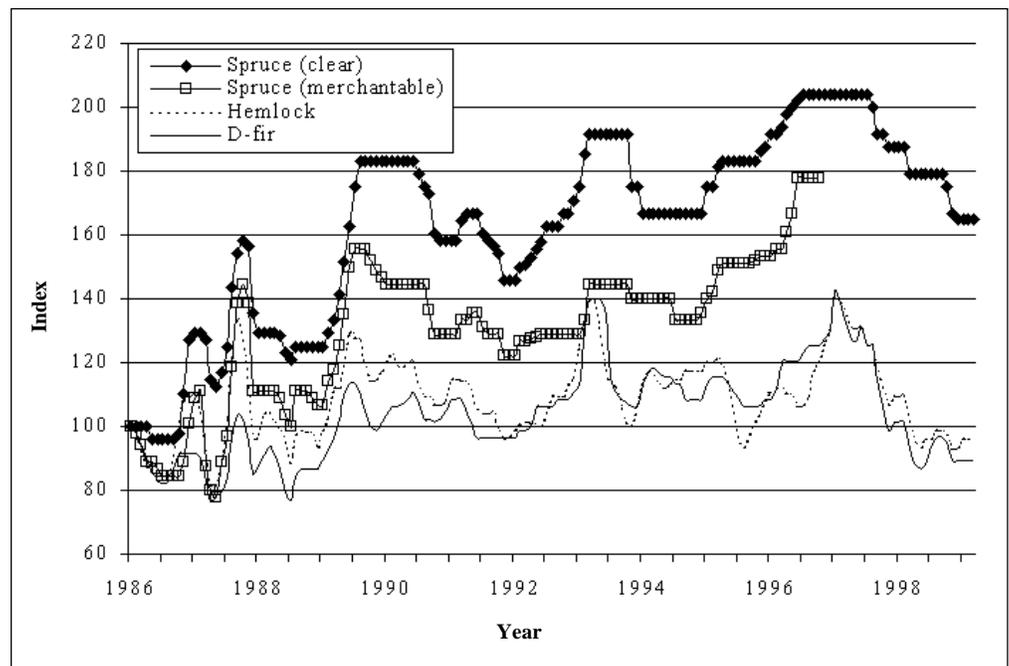


Figure 7—Japan wholesale lumber prices (yen price index, January 1986 = 100) (Japan Lumber Reports 1945-94).

seems that geographic origin rather than species is the primary factor in the correlation of price changes, with the two Alaska species moving much in tandem and (non-Alaska) hemlock and Douglas-fir likewise following each other closely.

After 1993, the indexes begin to diverge, with Sitka spruce prices stabilizing at a high level, Douglas-fir prices rising through rapid fluctuations, and prices for western hemlock logs (from Alaska and other sources) showing declines. This provides a partial indication of the market position of southeast Alaska products, where Sitka spruce occupies a high-quality niche position relative to hemlock. Western hemlock is imported by Japan in larger volumes from both the Pacific Northwest and British Columbia than from southeast Alaska, and it is more prone to substitution from other species, especially at the lower end of its grade distribution. This conclusion is further borne out in figure 8, which displays comparable indexes for Sitka spruce, Douglas-fir, and western hemlock lumber. Here Sitka spruce clearly emerges as a separate product subject to the same general fluctuations over time but displaying a much greater overall trend in price increase. This, in turn, indicates an important component of the potential competitive advantage of southeast Alaska: its ability to fill this lucrative and relatively unique market niche. Although in direct competition with spruce production in British Columbia, Sitka spruce production in southeast Alaska comprises most of the North American total, and the region likely enjoys a certain degree of market power, which may counterbalance local diseconomies in logging and sawmilling.

Southeast Alaska hemlock, on the other hand, supplies a broader commodity market and faces greater competition from other producers and species. Given the relatively low volumes supplied by Alaska, it will be a true price taker in this market. Consequently, future prospects for hemlock production in southeast Alaska will largely depend on developments external to the region, including substitution by softwood species from

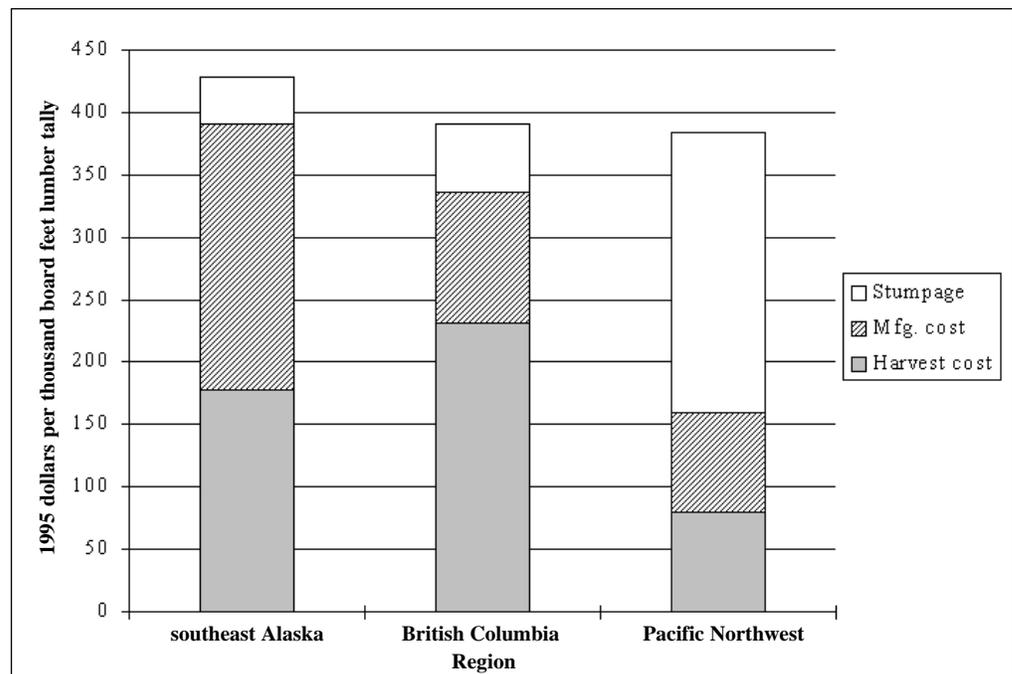


Figure 8—Total lumber production costs (with stumpage), 1994 (from USDA Forest Service, Alaska Region timber sale appraisal data [see footnote 1]; RISI 1996).

the Russian far east, Northern Europe, and the conifer plantations in the Southern Hemisphere; the expanding market share of engineered or fiber-based products; and a general trend toward the use of lower valued species in higher valued applications. Increasingly, the cost and quality of “value-added” inputs (capital and labor), and not the characteristics of raw log inputs, will determine the success of wood products manufacturers supplying these commodity markets. Consequently, hemlock resource in southeast Alaska may provide a necessary condition for wood products commodity manufacture and export, but the region will have to compete on the basis of other inputs.

Although we have given little attention in this report to log exports originating on private lands in southeast Alaska, these exports constitute an important source of competition for southeast Alaska processed wood products, especially for higher grade spruce (Flora and others 1992). Evidence for this can be found in the close correlation between the fluctuations in Sitka spruce log and lumber prices in Japan shown in figures 6 and 7. The likely conclusion here is that spruce lumber is supplying much the same end markets whether it is processed in southeast Alaska or in Japan. Given the supposed market power of the region in Sitka spruce production, anticipated declines in private log production and exports could result in higher prices for domestically produced lumber. For lower valued log grades and species (primarily hemlock), the same argument does not hold. This is not surprising given the small share of southeast Alaska products in these markets; declines in hemlock log exports from private lands will not be sufficiently large to significantly impact market prices for hemlock lumber.

Stumpage Prices and Residual Values

Under the assumption of perfect competition in stumpage markets, stumpage prices will be about equal to market prices net of all production and delivery costs.⁹ Ideally, competition among stumpage purchasers will result in cost minimization and zero “economic” profits (in other words, returns over and above a competitive return on invested capital) in the processing and delivery sectors. Consequently, economic rents will be maximized and concentrated in the stumpage price. To the extent that this holds, stumpage prices will be directly linked to residual value. Given a definition of competitiveness that relies on the cost of producing a good relative to its final market, the residual value, and thus the stumpage price, will constitute the single most indicative measure of regional competitive advantage in log production.

Depending on the proportion of local timber further processed in the region, stumpage prices also may provide an indication of competitiveness in the wood-processing sectors. This is especially true when, as is the case in each of the regions considered in this report, a significant proportion of harvest is barred from export in raw log form. Competition from log exporters is thus eliminated from stumpage markets for export constrained timber, and prices will reflect only the demand (and hence profitability) of local processors. Here, high stumpage prices will indicate local industries whose costs are well below the final value they generate, and conversely, low stumpage prices will indicate an industry operating at the margin of profitability. Note that if timber is not locally scarce, then the profitability of local processors will signal increased production either through additional investments by existing firms or the entry of new firms. Eventually, economic profits will be eliminated either through wage increases for relatively scarce inputs, or final market price decreases because of the increased product supply. This is the market mechanism mentioned previously, which relates competitive advantage to revealed comparative advantage via the market equilibrium process. For the regions and tree species considered in this report, however, timber is a scarce resource, and positive stumpage prices apply.

The relation between stumpage values and production costs is shown in figure 8. Harvest and manufacturing costs are the same as those cited previously in this report, except in this case, harvest costs are converted to a thousand board feet lumber tally basis. Stumpage prices are the prices received at the time of harvest (actually a “cut price”), also expressed in terms of thousand board feet lumber tally. For southeast Alaska, these prices are for federal timber, and in the Pacific Northwest, they are for federal timber in California, Oregon, and Washington west of the Cascade crest. British Columbia prices are for timber harvested on crown lands in coastal British Columbia (as reported by RISI 1996). Total production costs are relatively similar for all regions, but the distribution of these costs across the different categories is great. Following the arguments presented above, the assumption here is that high production costs in southeast Alaska and British Columbia lead to low stumpage values, and low production costs in the Pacific Northwest lead to high stumpage prices. The data presented in figure 4 represents a simplification, which aggregates across a wide range

⁹ Because stumpage sales often occur a year or more before the anticipated time of harvest, stumpage prices will incorporate future expectations and attitudes to risk on the part of buyers in addition to current market conditions and firm profitability. Also, policies regarding stumpage price adjustments in line with market price fluctuations along with other peculiarities of specific market arrangements also will influence bid and realized prices at stumpage auctions.

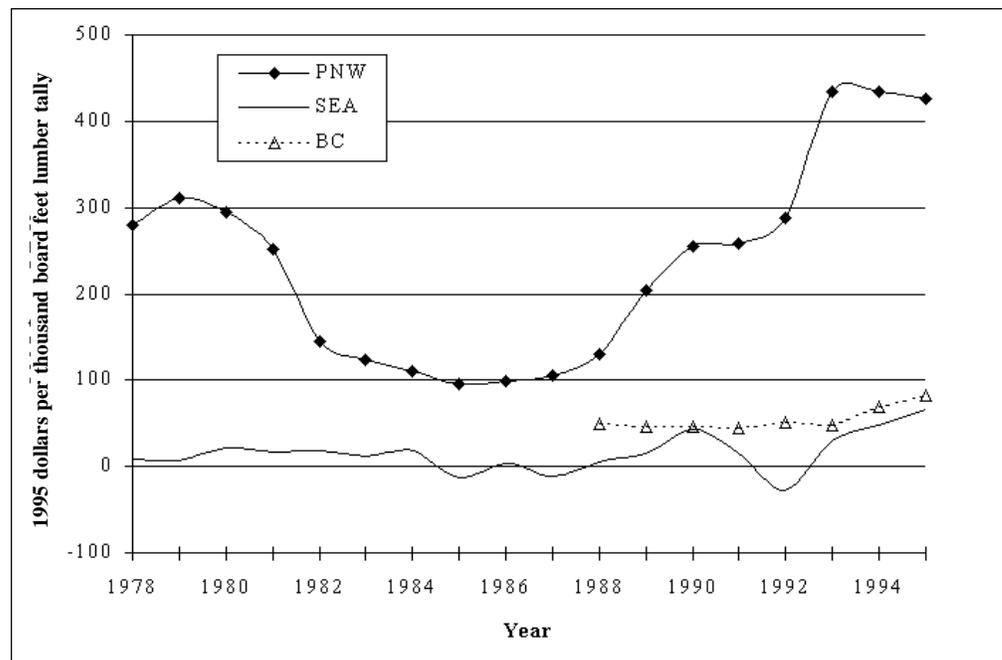


Figure 9—Cut prices for southeast Alaska, Pacific Northwest, and British Columbia national forests, all species (from USDA Forest Service and British Columbia Ministry of Forest as reported in Warren 1999)

of species and products. Likewise, especially in the case of the Pacific Northwest and British Columbia, the various figures reported in figure 4 do not come from the same source and may be only loosely comparable. Nonetheless, these numbers provide a clear depiction of the different aggregate costs in the competing regions, and the relation among these costs, final market values, and stumpage prices.

With the highest total production cost of the three regions and a substantially lower stumpage value, the marginal position of southeast Alaska as a high cost producer is evident. As stumpage price cannot fall below zero (in theory at least), the profitability of the sector will be highly susceptible to relatively small variations in end-product prices. British Columbia has somewhat lower production costs, but its stumpage values are only slightly higher than those in southeast Alaska. The explanation for this discrepancy may lie in differing end products (that is, if British Columbia generally produces lower valued lumber) or in differences in reporting procedures, firm profitability, and tax structures. The Pacific Northwest demonstrates both the lowest production costs and by far the highest realized stumpage value of the three regions. Here, efficiency in production allows for substantially increased returns to stumpage. To the extent that fluctuations in end-product prices are directly transmitted to stumpage, the Pacific Northwest can sustain large declines in end-product prices without a loss of profitability for the sector.

Historical values in cut prices for the Tongass National Forest, the Pacific Northwest, and British Columbia are shown in figure 9. Pacific Northwest prices are the harvest prices reported for national forests in the Pacific Northwest Region, and logs from these harvests are restricted from raw log export. Because log exports also are restricted for British Columbia and the Tongass National Forest, all the harvest prices reported here will be for export-restricted logs and will thus incorporate competitiveness factors in the

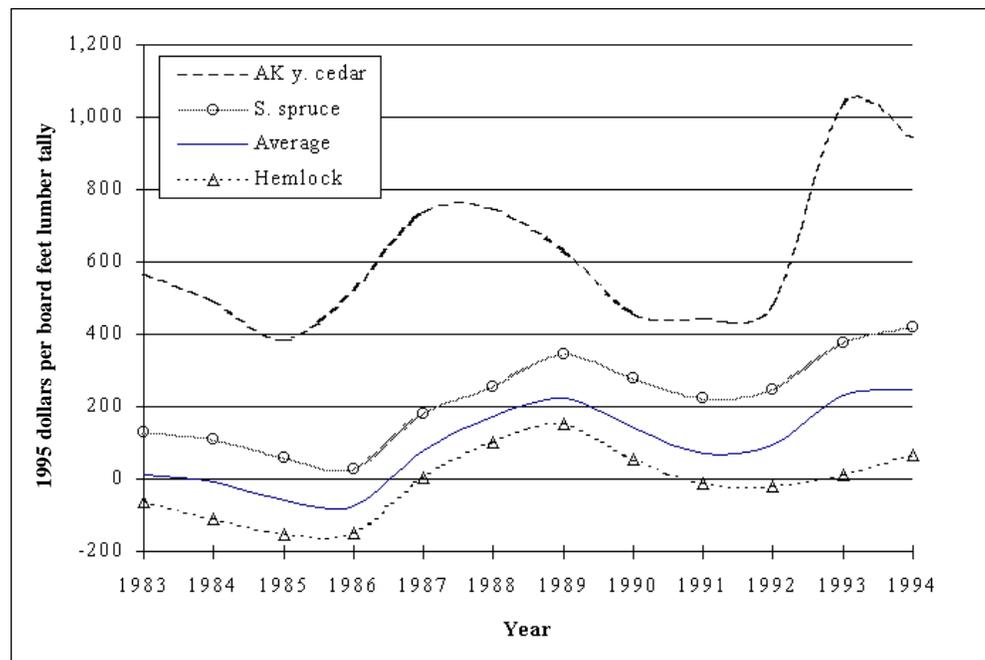


Figure 10—Southeast Alaska average residual value by species (sawtimber and pulpwood) (from USDA Forest Service, Alaska Region, timber sale appraisal data [see footnote 1]).

sawmilling as well as logging industries. As is true with the 1994 data shown in figure 4, figure 9 displays the marginal character of southeast Alaska operations relative to the Pacific Northwest and supports the conclusion that the Pacific Northwest generates a much greater residual value per thousand board feet harvested and processed. Perhaps surprisingly, British Columbia cut prices are only slightly higher than those for southeast Alaska, thus reflecting the comparable harvest costs prevailing in that region, but also perhaps different timber sale procedures and the failure of British Columbia processors to incorporate profits from their relatively efficient sawmilling operations into their stumpage bids. Cut prices reported for southeast Alaska are confounded by retroactive rate redeterminations and other factors peculiar to the region, thereby resulting in negative prices in some years.

Much of the preceding discussion has been based on regional aggregates across species and log grades. More detailed data generated in the sale appraisal process allows for an analysis of residual values on a species-by-species basis for the Tongass National Forest (fig. 10), but comparable analyses are presently not possible for the other regions. These values were calculated by subtracting species-specific manufacturing costs from selling values (as reported in the midmarket analysis in the Alaska Region sale appraisal process) and then further subtracting average harvest costs calculated from the independent sale appraisals (see above). These data display a strong differentiation in value by species. Hemlock and spruce generally move in tandem and demonstrate an overall upward trend but marked cyclic fluctuations. Hemlock is the lowest valued species with estimated residual values dipping below zero in the mid-1980s and early 1990s. These fluctuations roughly correspond to price movements in the international pulp market (note that utility logs and a proportion of low-grade saw logs are assumed to be used as pulp and are appraised accordingly). Sitka spruce demonstrates substantially higher residual values, obtaining levels between \$200 and

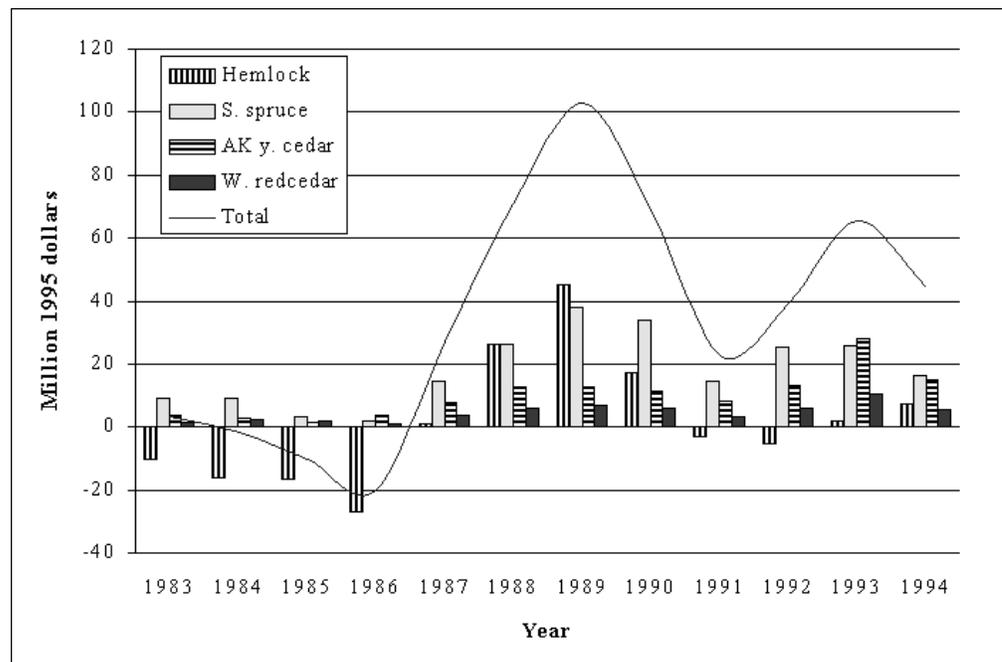


Figure 11—Southeast Alaska total estimated residual value by species (from USDA Forest Service, Alaska Region, timber sale appraisal data [see footnote 1]).

\$400 per thousand board feet throughout the 1990s and late 1980s. This estimate is for all log grades, and residual value estimates for better spruce grades would be considerably higher. Alaska yellow cedar generates extremely high residual values owing to its high selling value and low manufacturing price (essentially a port delivery cost as Alaska yellow cedar is exempt from log export restrictions and is exported almost exclusively in raw log form). Because of the predominance of hemlock and spruce in the volume mix, the volume weighted average closely follows the hemlock price but is higher because of the higher price of other species.

By multiplying the per thousand board feet residual shown in figure 10 by total harvest volume for each species, an estimate of total residual value generated in southeast Alaska by individual species can be calculated (fig. 11). Again, the high proportion of hemlock volumes means that total residual values will be sensitive to relatively small fluctuations in the price of hemlock. In half of the years, the contribution of hemlock to residual value is negative, and only in 1988 and 1999 does it provide a substantial positive contribution to total value. Also, given the extremely large residual values associated with Alaska yellow cedar and, to a lesser extent, western redcedar, the total residual value generated by these species accounts for well over half of the Tongass National Forest total in the last few years. This highlights the economic importance of Alaska yellow cedar and western redcedar, species that often garner considerably less attention owing to their relatively small volumes.

Overall positive trends for the residual values shown in figures 10 and 11 indicate increasing profitability for the sector as a whole. Much of this, however, is due to the fact that in the early 1980s, a major global slump occurred in demand for wood products followed by a recovery and then further upward pressure on North American softwood prices because of harvest restraints in the Pacific Northwest. A sharp decline in prices for most grades and species in southeast Alaska has occurred in the latter half of the 1990s.

Comparative and Competitive Advantage Revisited

Taken together, the residual value estimates for individual species indicates that the region is capable of generating significant value in certain species but that the profitability of the timber sector at large will be extremely vulnerable to market price fluctuations in hemlock. This result is based on species averages across all log grades. If log grades also were considered, price fluctuations for lower grades of both spruce and hemlock likely also would prove to be a major determinant in sector profitability. As shown in the earlier section on forest resource characteristics, most of the material harvested from the Tongass is in mid to lower grades of spruce and, especially, hemlock. Because of the heterogeneous nature of southeast Alaska forest stands and specific regulations designed to limit high-grading on federal lands, the ability of the sector to adjust the mix of grades and species to different market conditions is limited. Consequently, potential profits from the sale of higher valued species and grades, particularly cedar, often may be sacrificed to support the harvest and processing of lower quality material.

How do the data and arguments presented previously relate to the concepts of comparative and competitive advantage? The first conclusion that can be made is that southeast Alaska is at a competitive disadvantage in the provision of labor as an input in the production process. This argument is likely true for capital (and other nontimber inputs) as well. If this is the case, then the region has a competitive disadvantage in value-added processing as a whole, as labor and capital alone comprise the value-added component of any good. From the standpoint of comparative advantage, this means that labor and capital are scarce relative to the supply of other inputs, notably timber. Given recent layoffs and mill closures, it is hard to argue that labor shortages characterize the current situation in the southeast Alaska timber sector. Nonetheless, it must be remembered that comparative advantage is a long-term equilibrium concept, and short-term fluctuations in labor markets do not apply. In general, the high wages paid for labor (and other inputs) in southeast Alaska reflect the premium needed to attract and keep workers in the region. From an economic standpoint, this premium is synonymous with relative labor scarcity—there are relatively more jobs to do than qualified workers to do them, and producers will consequently bid up the price of labor.

In spite of this competitive (and comparative) disadvantage, southeast Alaska is able to profitably produce certain types of wood products. This is because of the scarcity rents generated by the better species and log grades of the region. Hence, the advantage of the region can be seen as lying in its ability to supply these scarce raw materials (logs) and not in providing value-added inputs in combination with them. This assertion should, in turn, be revealed in the behavior of local firms. Economic theory (as well as common sense) predicts that firms faced with a competitive disadvantage in processing will provide the minimum of processing necessary before export. In doing so, they will minimize the losses incurred in their noncompetitive processing sector and thus maximize profits. The fact that virtually all private harvests of suitable quality in the region are exported in raw log form bears this prediction out, as does the fact that local mills have been wholly unsuccessful at bidding private logs away from the export market. Although data on factor use in the sawmilling sector presented previously do not directly indicate that mills are likewise minimizing inputs, the lack of lumber finishing and secondary manufacturing facilities in the region further suggests a comparative disadvantage in processing.

Certain determinants of comparative and competitive advantage do not change over time. Location is one such factor. The remoteness, climate, and difficult topography of southeast Alaska are major factors that impact both the price and productivity of labor and, by extension, other nontimber inputs. Moreover, although the region is considerably closer to Japan and other export markets in northern Asia, this has not

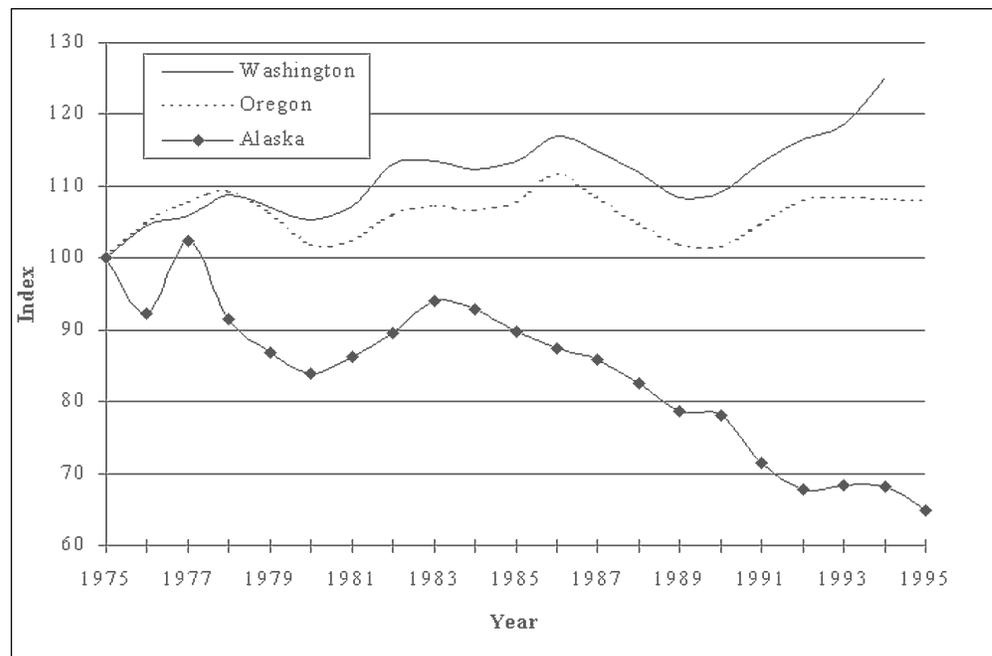


Figure 12—Real manufacturing wages for Alaska and the Pacific Northwest (index, 1975 = 100) (U.S. Bureau of the Census, Annual Survey of Manufactures [1985-94]).

translated into a cost advantage in trans-Pacific shipping owing to diseconomies associated with the smaller volume of trade, weather conditions, and the lack of backhaul opportunities (Wisdom 1990).

Comparative advantage, however, is not a static concept, and the relative advantage of nations and regions will be in constant flux. Alaska is no exception to this rule. Prices for most goods and services are considerably higher in Alaska because of several factors, with the absence of economies of scale and transportation costs being chief among them. As for wages, there is an added factor related to the need to provide wage premiums over and above cost of living adjustments to induce workers to move to the state in spite of a harsher climate, remoteness, and other perceived disamenities (Greenwood and others 1991). Recent years, however, have seen a steady reduction in many of these factors. Growing population has allowed for increasing economies of scale in transportation, retail and services, and other sectors, and the positive amenities of life in Alaska have increasingly come to be recognized by local residents and potential immigrants.

Although the data specific to the wood products sector presented in this report give little indication of relative trends in factor input prices, broader measures of the Alaska economy clearly indicate a steady reduction in prices relative to the rest of the United States. Figure 12 shows real wage indexes in the manufacturing sector for Alaska, Oregon, and Washington. Although the Pacific Northwest states demonstrate a similar increasing trend, Alaska's index shows a dramatic decline, particularly in the 1983-92 period during which the index fell by 28 percent. Current manufacturing wages in Alaska are about equivalent to those in the Pacific Northwest, and these developments likely will be mirrored in the wood products sector of southeast Alaska in the coming years. Ideally, a regional producer price index would be the best way to gauge changes in factor input prices in Alaska relative to those in other regions. Such indexes are not

available at the state level. Consumer price indexes (CPI), however, are available for certain urban areas, Anchorage Alaska, among them. In the last decade or so, the Anchorage CPI has fallen slightly more than 10 percent relative to the U.S. average index. This is equivalent to about a 10-percent decline in absolute prices for the Anchorage area. Prices in Alaska are still considerably higher than elsewhere, but they are falling in relative terms.

The data on falling relative prices in Alaska should be treated with some caution. Because it is a composite of wages in all manufacturing industries, the wage index may reflect changes in industry composition (increasing shares in hi-tech manufacturing in the Pacific Northwest and fish processing in Alaska, for example) as well as actual declines in real wages within a given industry. Likewise, the Anchorage CPI may not be indicative of changes happening in southeast Alaska, as Anchorage is relatively far from the region and is substantially larger and therefore enjoys greater economies of scale. Nevertheless, it is plausible that continued economic growth in southeast Alaska will result in declines in producer prices and that the region will see a gradual but steady increase in its relative advantage in wood products processing. Changes in statewide wages and consumer prices may partially reflect just such a process. Likewise, the desire of residents to continue to live and work in the region should not be discounted. Southeast Alaska is perhaps unique in the number (in per capita terms) of individual entrepreneurs who pain to attempt small-scale wood products manufacturing in the region. The willingness of these owner operators to work long hours for little pay, however, likely does not extend to a willingness to work for lower wages in a large mill or related facility.

Conclusion

The comparative and competitive advantage of southeast Alaska lies in its stocks of high-grade spruce and cedar timber. In terms of log production, it seems that southeast Alaska is competitive with British Columbia, the only other major source of Sitka spruce. Other species, even hemlock, can be profitably harvested given log grades of suitable quality. In all cases, it is the scarcity value of the resource that allows for profitable operations. In sawmilling, the evidence shows that costs in southeast Alaska are significantly higher than those in both the Pacific Northwest and British Columbia. In an open market, southeast Alaska lumber producers would be unable to compete in stumpage and log markets with more efficient mills in other regions. With the prohibition of log exports from federal lands, however, processors are able to charge a portion of their higher costs against the scarcity value of the timber resource, thereby resulting in reduced stumpage prices. This allows the national forest to bear the costs of regional diseconomies in processing. Although this is not efficient in an economic sense, the Tongass National Forest is managed to meet various local and national objectives; as part of the balance among objectives, returns to the Treasury are foregone in favor of opportunities for local employment.

The above arguments have important implications for current efforts to increase value-added manufacturing in the region. In general, efforts to cultivate manufacture of commodity products in direct competition with major producers in other regions will be a challenge. This is especially true for products where value-added inputs, rather than timber scarcity rents, comprise a relatively large proportion of the final product value. The development of niche industries relying primarily on Sitka spruce may be more successful (as evidenced by the music wood and other specialty producers currently operating on Prince of Wales Island). Anticipated declines in private harvests in southeast Alaska and Sitka spruce production in British Columbia may further bolster the chances of success in these ventures. Alaska yellow cedar has commanded extremely

high prices in Japan's market, and southeast Alaska has a near monopoly in its production. These prices could bear increased processing (with diseconomies once again being charged to the stump), but processors must compete with log exports. In the absence of strict export bans, it is doubtful that they can do so successfully in large numbers. In any case, Alaska yellow cedar volumes are not large enough to generate significant employment in manufacturing commodity products. Moreover, attempts to increase processing of this species must be balanced against probable reductions in residual values and thus stumpage prices.

Most of southeast Alaska timber inventory, however, is concentrated in lower valued species and log grades. Successful policies directed to this portion of the resource likely would involve efforts to promote cost minimization and economies of large scale in processing. An alternative would be to reduce or forego processing of this material altogether, thereby allowing the region to concentrate on those areas where it has a demonstrated advantage. This could be obtained either by relaxing those harvest restrictions that prohibit partial harvests (favoring better species and grades) or by relaxing processing requirements for certain lower grades. Such policy changes will have to be evaluated in relation to other forest policy goals in the region and the ecological consequences of alternative harvesting methods. Should declines in wages and the price of other inputs result in changes in the comparative advantage of the region in the long term, then it is likely that increased value-added processing of lower grade materials may evolve on its own accord. Ideally, such an industry would draw on both private and public timber supply in the region.

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