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Southeast Alaska economics
A resource-abundant region competing in a global marketplace

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Abstract

Questions related to economics figured prominently in the priority information needs identified in the 1997 Tongass Land Management Plan. Follow-on studies in economics were designed to improve understanding of aspects of the competitiveness of the Alaska forest sector, links between Alaska timber markets and other markets as evident in prices, and the relationship between resource allocation decisions and economic conditions in communities and the region. Analysis of the role of recreation and tourism in the regional economy was added to the topics addressed, based on early results of work to describe economic dynamics.

Comparisons are undertaken to evaluate the economic changes taking place in southeast Alaska, to analyze the sources of these changes, and to determine if and why they differ from the changes taking place at larger scales and those occurring in a similar rural and resource-abundant region. Divergent views regarding the current role of the Tongass in the regional economy are summarized and assessed by using contemporary evidence.

A variety of factors contribute to comparative and competitive disadvantages for the forest products sector in southeast Alaska. Alaska product and log markets are effectively integrated with other markets supplied by producers in British Columbia and the Pacific Northwest.

Empirical evidence suggests the need to re-examine assumptions regarding the relation between changes in "basic" sector activities and employment (such as timber harvesting and wood products manufacturing) and "nonbasic" (or support sector) employment in the rural communities of southeast Alaska. Many of the changes occurring in the economy of rural southeast Alaska are driven by changes in the international markets in which Alaskan products compete, and are largely independent of Tongass forest management.

Unearned income and tourism have replaced resource-extractive industries as the principal sources of income growth in the region. The contribution of the Tongass National Forest to the regional economy has become more complex and difficult to quantify. Forest management policies that enhance the comparative advantages the region enjoys in providing both tourism opportunities and quality of life attributes will aid communities in maintaining and expanding their economic opportunities.

Keywords: Competitiveness of the Alaska forest sector; Economic changes in rural southeast Alaska; Forest sector models; Timber prices; Market arbitrage; Timber production; Timber supply

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1. Context and introduction

Natural resource management and policy issues, especially debates over management of national forests, are complex and contentious. Disputes arise over both the objectives of management and the facts on which management decisions are based. During the latest plan revision for the Tongass National Forest, public comments and political debates revealed disagreements over goals of forest management in Alaska, effective and efficient methods to achieve consensus on goals, and the definition of equitable distribution of gains or losses resulting from allocation decisions. In southeast Alaska, as elsewhere, progress in addressing enduring and contentious disputes affecting forest management depends on timely and reliable information. The factual basis for planning, and the contribution of science to planning, includes knowledge of all systems affected by management: biophysical, social, and economic. Economic science provides some of the technical information needed to inform and evaluate management decisions. Economic research and synthesis can also provide critically important context for managers to use in understanding the public choice decisions associated with all national forest planning.

The economies and communities of southeast Alaska are affected by forest management in ways that are complex and not completely understood. The region has experienced significant economic change that has fundamentally altered the importance of Tongass resource production, and social change that has altered preferences for the mix of outputs. Changes in the mix of management objectives for the Tongass clearly are among the factors contributing to these changes. However, many of the factors leading to social and economic change are outside agency influence, resulting in uncertainty and disagreement over how to use social and economic information to evaluate management decisions. The challenge is to provide a science-based description of consequences of management decisions in the broader context of social and economic dynamics. This situation is not unique to Alaska, although data and analyses that take Alaska's circumstances into account are limited. The subsistence use of resources is an important but confounding consideration when analyzing indicators of social and economic well-being at the community scale in Alaska.[1]

Southeast Alaska presents a complicated combination of scope, diversity, and scale for resource-based social science. Unlike most biophysical sciences, social science theories and methods generally apply at large spatial scales. Significant diversity among communities and mixed signals from community-scale indicators of social and economic conditions—both within and across communities—complicate efforts to describe the region-wide effects of land management decisions. Information on regional trends, although easier to obtain, often masks differences in conditions and trends at the scale of communities. In other words, information is scale-specific and is often unavailable at the desired scale.

Owing largely to the abundance of natural resources and the dominance of primary product outputs, economic activity in southeast Alaska has always been highly dependent on conditions in the national and global economy.[2] In recent years, increased globalization along with changes in key Alaskan product markets has increased this dependence. The changes occurring at larger scales have trickled down to affect communities in the region, but the effects have not been uniformly distributed across or within communities.

Questions related to economics figured prominently in the priority information needs identified in the 1997 Tongass Land Management Plan (TLMP). Two of these needs focused on economic aspects of the forest sector: (1) Determine prices and costs in Alaska timber production and product supply. (2) Determine Alaska timber prices and market arbitrage in the Pacific Northwest. Two studies were conducted in response to these information needs and to verify assumptions used by Brooks and Haynes (1997) in their market projections for Alaska timber and products by examining both the competitiveness of the Alaska forest sector and

[1] Studies focusing on subsistence use are discussed in the social synthesis portion of this journal issue (Kruger).

[2] Tsournos, P., Haynes, R.W., in preparation. An assessment of growth and development paths for resource abundant regions. Gen. Tech. Rep. PNW-GTR. USDA Forest Service, Pacific Northwest Research Station, Portland, OR, provide a review of the economic literature on development paths in resource-abundant regions, including theories and evidence suggesting that some resource-abundant regions may never develop diverse economies.

the links between Alaska timber markets and other markets. A third priority information need focused on the effects of forest management on rural communities: (3) Determine the relationship between socioeconomic conditions in rural communities and resource allocations on the Tongass National Forest. Three additional studies were designed to improve understanding of the relationship between resource allocation decisions and economic conditions in communities and to examine growth and structural changes in the regional economy.

The purpose of this synthesis is to present our findings and their management and policy implications for the Tongass National Forest. I begin with a review of the forest sector economics studies (Robertson and Brooks, 2001; Stevens and Brooks, 2003) including objectives, methods, findings, and implications. An overview of current conditions in the Alaska forest sector and the markets in which Alaskan timber competes is presented both to analyze the validity of study findings and provide an outlook for the future. In Section 2, I discuss the objectives, methods, findings, and implications of a study analyzing employment multiplier impacts at the community scale in southeast Alaska (Robertson, 2003). As discussed above, economic, social, and biophysical systems are dynamic at all scales. Thus, any attempt to explain economic changes occurring at the regional or community scale must also consider influences from changes occurring at higher scales. In Section 3, I review the objectives, methods, findings, and implications of two studies (Robertson, in press; Crone, in press) that examined changes in the southeast Alaska economy within this larger context. In recent years, there have been increasingly divergent views on the importance of Tongass timber harvests to the regional economy. In Section 5, I introduce these alternative views and use historical and contemporary evidence to assess the past, present, and future roles of the Tongass National Forest in the regional economy.

2. Forest sector studies

Forest sector models have been used to prepare perspectives on future developments in the forest sector as a framework for policy formation and decision-making in the United States, Europe, and elsewhere. One modeling approach known as scenario planning differs from traditional modeling (and particularly forecasting) approaches by incorporating uncertainty directly in the analysis. In this approach, the modeler does not attempt to predict the future, but instead postulates a set of plausible futures (scenarios), each dependent on the assumptions underlying that future. Most forestry applications of this method employ a classical sensitivity analysis approach in which a limited number of key exogenous and endogenous elements are varied and key projection results are examined for differences. The exogenous elements are also commonly referred to as assumptions.[3]

In 1997, Pacific Northwest Research Station economists used this modeling approach to produce revised and updated projections of derived demand for Alaska national forest timber. Earlier projections (also based on the scenario modeling approach) had been done in 1990 and in 1994. New projections were necessary because significant changes in the structure of the Alaska forest sector, in markets for Alaska products, and in conditions faced by Alaska's competitors (the Pacific Northwest and British Columbia), resulted in violations of implicit assumptions used in the earlier analyses.[4] The closure of the two pulp mills in southeast Alaska altered both the structure and scale of its forest products industry by eliminating the primary market for low-grade and utility logs as well as local markets for residues from lumber production. Traditionally, Japan has been the primary market for Alaska logs and lumber. The Asian recession beginning in 1989 resulted in both decreased demand and increased price sensitivity in the Japanese market. Other changes in the Japanese market included increased acceptance of engineered wood products and increased preference for kiln-dried products. Additionally, new suppliers from Europe entered the market in response to the initial high prices resulting from public harvest restrictions in the Pacific Northwest. In the 1994 projections, it was assumed that Alaska might enjoy a competitive advantage over the Pacific Northwest because of these harvest restrictions. However, increased production from Canada, the

[3] This brief description of forest sector models and the scenario approach was drawn from Haynes (1993).

[4] Some of the assumptions (such as the number of operating pulp mills) were implicit in Brooks and Haynes (1994) but were examined through scenario analysis.

Table 1
Projections of the average annual-derived demand for Alaska national forest timber

Period	Alternative scenario projections	Previous projections	
		1990	1994
$1000\,m^3$			
1993–1997	820–910	1830	1359
1998–2002	435–565	1825	1427
2003–2007	589–824	1798	1504
2008–2010	598–1010	1816	1517

Source: Brooks and Haynes (1990, 1994, 1997).

entrance of new competitors, and Alaska's high costs eliminated this advantage.

Owing to the high degree of uncertainty surrounding important components of the demand projections, Brooks and Haynes developed high, medium, and low scenario projections by varying the levels of components. The scenario components were Alaska's share of North American shipments to Japan, North America's share of Japanese softwood lumber imports, the share of Alaska's shipments going to export markets, and the efficiency of Alaska lumber production. Table 1 shows the range of the projections based on the three scenarios as well as the previous base projections (Brooks and Haynes, 1990, 1994, 1997). Because of the changes discussed above, demand was estimated to be substantially lower under all three scenarios than in the previous projections. The authors also conducted a sensitivity analysis of the model to changes in the individual scenario components. This analysis revealed the model results to be most sensitive to changes in Alaska's share of North American shipments of softwood lumber to Japan. This finding and the desire to verify implicit assumptions used in developing the model provided the impetus for the two forest sector TLMP follow-on studies to which I now turn.

The objective of the first study by Robertson and Brooks, Assessment of the Competitive Position of the Forest Products Sector in Southeast Alaska, 1985–1994, was to provide quantitative measures of production costs and product revenues for softwood lumber produced in southeast Alaska and to compare them with those for the Pacific Northwest and coastal British Columbia. The goals of this study were to provide information relevant to the debate over Tongass timber harvest levels and to assess the economic efficiency implications of efforts to increase value-added processing in the region.

The theory of comparative advantage holds that a region will specialize in products that use more of the inputs that are abundant (and thus cheaper) in their region, and minimize the use of inputs that are relatively scarce (and thus more expensive). Competitive advantage can be defined as the ability to supply a good at a lower cost than other producers can. Two methods can be used to measure the competitiveness of southeast Alaska producers. The first is to look at unit input costs, defined as the cost of factors used to produce one unit of output. The second method is to examine stumpage prices, defined as the price buyers pay for timber. The following areas were analyzed to determine competitiveness:

(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);
(3) end markets where purchasers compare the price and physical characteristics of southeast Alaska products to those from other regions (Robertson and Brooks, 2001, p. 5).

An examination of 1995 harvests in southeast Alaska revealed that 24% of the harvest was Sitka spruce (*Picea sitchensis*) and 54% of the harvest was western hemlock (*Tsuga heterophylla*). Most of the Sitka spruce harvested was saw log quality or better (70%), whereas much of the hemlock harvest was classified as low-grade saw logs or utility logs (51.6%). Southeast Alaska is the major supplier of Sitka spruce (70% of North American production in 1995), but only a minor supplier of hemlock (17% of total western hemlock production for export to Pacific Rim markets).

Over the 1987–1994 period, it took an average of 35% more labor inputs (logging hours) to produce a $1000\,m^3$ in southeast Alaska compared to the Pacific Northwest. The authors attribute this difference primarily to the remoteness and rugged terrain of southeast Alaska. This combined with higher wages (23% higher on average) in southeast Alaska resulted in 65% higher unit labor costs in southeast Alaska. The authors posit that other unit factor costs (capital, energy,

and materials) will also be higher in Alaska for similar reasons.

In the sawmill sector, owing to both higher per unit labor inputs and higher hourly wages, unit labor costs were 49% higher in southeast Alaska. Reasons suggested for this difference are that southeast Alaska mills are less mechanized, use older and low-quality equipment, and were operating at less than full capacity throughout the study period. Again, the authors believe that the other unit factor costs will be higher as well. Southeast Alaska was also less efficient in converting logs to lumber. This may be caused by the substitution of relatively less expensive inputs (logs, especially low-grade hemlock) for relatively more expensive inputs (labor and capital). Additionally, the demand for mill residues by pulp mills reduced the incentive to maximize conversion rates.

Using prices to examine southeast Alaska's relative market position in the Japanese log and lumber markets (Alaska's primary export end-product markets) revealed that Alaska producers enjoy a competitive advantage and market power as the major supplier of Sitka spruce. This derives from the scarcity value and uniqueness to Alaska of this species. It is a different story for hemlock, for which Alaska is a minority producer and price taker. External factors such as the substitution of radiata pine from the southern hemisphere and whitewood from northern Europe (where suppliers also have more backhaul opportunities than Alaska; Wiita, 2001), the shift from green lumber to kiln-dried lumber and engineered wood products, reductions in Japanese housing starts, and changes in Japanese building codes will play a larger role in determining Alaska's competitiveness in this market than the characteristics of the log inputs. Because of the high cost of value-added inputs (labor and capital), Alaska is at a competitive disadvantage in this market and will suffer first from price decreases.

Analyzing total lumber production costs (stumpage, harvest, and manufacturing costs) across all species in 1994, the authors found southeast Alaska to be the highest cost producer followed by British Columbia and the Pacific Northwest. Southeast Alaska had both the highest manufacturing costs and the lowest stumpage prices. They argued that the low stumpage prices are indicative of the competitive disadvantage Alaska has in harvesting and manufacturing compared to the Pacific Northwest. Southeast Alaska processors are essentially charging some of their higher production costs against the scarcity value of timber, so that the national forest bears some of the cost of regional inefficiencies.

Analysis of stumpage values for individual species in southeast Alaska revealed high values for Alaska yellow-cedar (*Chamaecyparis nootkatensis*), lower values for Sitka spruce, and the lowest values for hemlock. Because hemlock accounts for the largest proportion of volume, this implies that the profitability of southeast Alaska processors will be very sensitive to changes in the price of hemlock.

Major findings from the study are:

1. Southeast Alaska is at a comparative disadvantage in the forest products sector because of both higher factor costs and lower productivity of factor inputs.
2. Southeast Alaska is able to profitably produce certain types of wood products because of the scarcity value of some of the better species and log grades in the region.
3. Southeast Alaska's advantage lies in its ability to supply these scarce raw materials (logs), not in providing value-added inputs (labor and capital) with them.[5]

Implications of these findings are that value-added processing in the region could be successful for the higher-valued species and grades of Alaska yellow-cedar and Sitka spruce, especially niche industries using primarily Sitka spruce to produce commodities that are not in direct competition with major producers in other regions. For the lower-valued species and grades that make up the majority of southeast Alaska's timber inventory, the authors believe policies that promote cost minimization and economies of scale in processing are preferred. Alternatively, reducing or eliminating processing of this material, by allowing partial harvesting or relaxing processing requirements for certain lower grades, might improve southeast Alaska's competitive position.

Although the findings from the study overwhelmingly indicate that southeast Alaska is a high-cost pro-

[5] Irland Group and Market Decisions (1990) found that, in general, high-wage areas are not suited to value-added wood processing. Galston and Baehler (1995) wrote, "In the case of forestry and wood products, a general rule of thumb states that the more value added to the lumber, the more likely the enterprises are to concentrate near urban areas." (p. 101).

ducer, some analysts (McDowell Group, 2000b) have argued that Alaska's timber resources are unique, and therefore insulated from competition, potential substitutes, and market declines. If this argument is true, Alaska's higher costs will not matter. This view contrasts with that of Brooks and Haynes (1997)[6] who expected future Alaskan timber production to be very sensitive to market cycles and competition from other regions. These opposing views provided the catalyst for the second timber economics study.

The objective of "Alaska Softwood Market Price Arbitrage" (Stevens and Brooks, 2003) was to determine whether or not Alaskan lumber and logs are integrated with those of similar products from the Pacific Northwest and British Columbia in the Japanese market. Using co-integration statistical testing methods suggested by Johansen (1995, 1997), the authors sought to determine whether the law of one price applies for these products. This principle holds that in long-run equilibrium, and in the absence of artificial (i.e., tariffs) and natural (i.e., transportation costs) barriers to trade, identical goods should sell for the same price in international markets. Ideally, the prices of similar products from all three regions could be included in a simultaneous multivariate co-integration test. The lack of a single data source for comparable products precluded this approach. Instead three independent data sets were used in pair-wise co-integration tests of long-run movements of prices in Alaska and the Pacific Northwest, and Alaska and British Columbia.

Annual data from the Japan Lumber Journal were used to compare Alaska Sitka spruce with British Columbia Sitka spruce log prices from 1979 to 1998. Quarterly data from this source were used in a comparison of Sitka spruce lumber prices from Alaska and British Columbia from 1974 to 1998. U.S. Department of Commerce quarterly data were used to compare Alaska and Pacific Northwest hemlock log prices (1989–1997) and hemlock lumber prices (1990–1997). Finally, monthly data from Japan Lumber Reports were used to compare Alaska and British Columbia hemlock prices from 1986 to 1997.

Results from their analysis supported the conclusion that Alaskan western hemlock and Sitka spruce logs share an integrated market (Japan) with logs from British Columbia and the Pacific Northwest. The test for the Sitka spruce lumber market also supported integration. Original results for Alaskan and Pacific Northwest hemlock lumber were less robust. However, when a pre- and post-1994 dummy variable was included to account for the closure of Alaska's pulp mills and structural changes in the Japanese lumber markets, the results supported an integrated market.

These results strongly indicate that in Japan most of Alaska's forest product exports do compete with products from the other regions. This implies that Alaskan production and exports will be sensitive to international market conditions and that the cost structure of the Alaskan forest products industry compared to competing regions is very important. An overview of the current situation in the Japanese market and Alaska's forest sector provides a litmus test for this and the previous study's conclusions.

Between 1995 and 2001, Japanese softwood lumber imports decreased by 24% from 10.73 to 8.13 million m^3. The North American share of these imports decreased from 72 to 53%. Alaska's share of North American softwood lumber exports to Japan decreased from 1.4 to 0.2% over this period. As discussed above, factors contributing to these declines were the emergence of low-cost suppliers of kiln-dried material (Europeans), the decrease in Japanese housing starts associated with the 1997 recession, and both regulatory and structural changes in the Japanese housing sector. The fact that Alaska's share of North American exports to Japan decreased supports Stevens and Brooks (2003) findings of an integrated market. Between 1995 and 2000, as competition in the shrinking Japanese market increased, the estimated share of Alaska sawnwood shipments going to export markets decreased from 82 to 28%. Much of the sawnwood shipped to the lower 48 states consists of shop hemlock going to the Puget Sound region where it is remanufactured into millwork, such as door and window casings and shipped to other locations. (Southeast Alaska Regional Timber Industry Task Force, 1997; Wescott, 2002; Fay, 2003). Some southeast Alaska mill owners report that they have found excellent markets and are receiving good prices for these products.[7] Spruce sawnwood sold in the domestic market has primarily

[6] See also Irland Group (1991, 1992), which concur with the Brooks and Haynes outlook.

[7] Personal e-mail communication. Brink, S., 2002. sbrink@fs.fed.us (22 December).

Table 2
National forest timber program in Alaska, 1997–2001

Year	Offered	Sold	Harvested
1000 m^3			
1997	915	960	525
1998	847	109	548
1999	525	281	661
2000	390	775	666
2001	308	226	217
5-year average	598	471	525

Source: USDA Forest Service (2002a).

been dimension lumber. Some locally produced dry surfaced lumber, paneling, and other construction products are being used in Alaska (Southeast Alaska Regional Timber Industry Task Force, 1997).

Table 2 shows the volume of timber offered, sold, and harvested from Alaska national forests from 1997 to 2001. The 5-year average annual harvest level of 525 000 m^3 falls near the Brooks and Haynes (1997) medium scenario-derived demand projection for the 1998–2002 period of 512 000 m^3. Based on their sensitivity analysis, this result implies that the decreases in demand predicted by decreases in both the North American share of Japanese softwood lumber imports and in Alaska's share of North American shipments to Japan have been at least partially offset by increases in the share of Alaska's shipments going to domestic markets. Table 3 provides further measures of trends in important aspects of the Alaska forest products sector and clearly reveals a substantially reduced forest products industry in southeast Alaska.

Stevens and Brooks (2003) provided evidence that most of Alaska's forest products must compete with products from other regions in the Japanese market, and Robertson and Brooks (2001) provided evidence that southeast Alaska is a high-cost producer in this market. As predicted by Brooks and Haynes (1997) and borne out by the statistics presented in Tables 2 and 3, these factors have combined to make Alaska timber production very sensitive to market cycles and competition from other regions and have contributed to the decline in this sector from 1995 to 2000. In Section 4, I will provide further analysis of the underlying causes of this decline within a historical and global context. Irrespective of the causes, at the time of the TLMP revision the effects of reduced harvests on the communities and economies of southeast Alaska were the subject of much debate (MacMullan and Niemi, 1994; McDowell Group, 1995). There was little disagreement that jobs in the wood products sector would decrease with reduced harvests; rather the indirect or secondary impacts were at issue. This debate spurred the third TLMP economics follow-on study.

3. Testing the export base model in southeast Alaska

Community-level impacts have long been a concern for U.S. Forest Service policymakers. Originally, much of the concern focused on the direct impacts of timber flows on logging and sawmilling activity, but more recently the focus has shifted to the overall impact of reductions in timber activity on the local economy at large (Robertson, 1999). The most common models used to estimate economic impacts to areas from changes in forest activities are export base or input–output (I–O) models. These models assume a linear relationship between export-oriented economic activity, from basic sectors such as logging and wood products manufacturing, and local-support economic activity, from non-basic sectors such as grocery stores and banks. The idea here is that the basic sectors bring new money into

Table 3
Alaska forest product statistics, 1996–2000

Variable	1995	2000	Change (%)
Volume of softwood lumber exports (1000 m^3)	119	8.5	−93
Percentage of wood product exports going to Japan (% value basis)	78	59	−19
Average value of softwood log exports (dollars per m^3)	156	94	−40
Average value of softwood lumber exports (dollars per m^3)	329	382	16
Average value of chip exports (dollars per metric ton)	92	45	−51
Southeast Alaska wood products employment	1911	994	−48

Source: USDA Forest Service (2002b).

the local economy, and the circulation of this money creates economic activity in the nonbasic sectors. An economic multiplier is an estimate of the amount of additional (or reduced) economic activity that will be generated from an increase (or decrease) in basic sector activity. Income or employment is generally used as an indirect measure of economic activity because detailed surveys of exactly what gets exported are difficult and costly. The existence of a strong linear relationship between basic activity, such as timber harvesting and processing, and nonbasic activity is widely upheld in both public and professional debates (Robertson, 1999).

Owing to a lack of data at smaller scales, a common approach to estimating local impacts has been to adjust broader-scale models for local conditions, and rarely have these estimates been compared to actual economic performance over time. In recent years, economic data at smaller spatial scales is becoming more common, allowing for empirical tests of multiplier effects at the community scale.

In the TLMP revision, an employment multiplier of 1.72 was used to estimate the secondary impacts of changes in the timber employment in the region. This implies, for example, if 10 jobs were lost in the timber sector, an additional 7.2 jobs would be lost in nonbasic sectors. The objective of the third economics TLMP follow-on study, "A test of the economic base hypothesis in the small forest communities of Southeast Alaska" (Robertson, 2003) was to determine whether this multiplier effect existed at the smaller scale of communities.

Past studies that have attempted to measure impact multipliers by using time series data include Sasaki (1963), Weiss and Gooding (1968), Moody and Puffer (1970), Moriarty (1976), and Henry and Nyankori (1981). All these studies suffered from small sample size problems. Fortunately, Robertson was able to obtain quarterly employment data from the Alaska Department of Labor covering the period from 1981 to 1996 for 15 forest communities in southeast Alaska, thus eliminating the small sample size problems and allowing for a more robust and detailed estimation of linear impact multipliers.

Robertson followed the general approach of the earlier studies by specifying a linear regression model with nonbasic employment as the dependent variable and basic employment as the independent variable. Basic employment included the majority of manufacturing employment and state and federal government employment, and nonbasic employment included all other employment. Although tourism represents basic activity, it is not reported as a separate category in employment statistics and thus cannot be separated from retail trade and services for local consumption. This problem was handled by the inclusion of a trend variable in the regression model, which served as a proxy for tourism employment and unearned income.[8] To smooth out seasonal variations in the data, the author used quarterly differencing in which data from the same quarter of the previous year is subtracted from the current quarter.

Because impacts in the nonbasic sector caused by changes in the basic sector are not instantaneous, the independent variable (basic sector employment) was lagged. Because of the high degree of multicollinearity between lagged periods, Robertson used an Almon lag structure specification. An intercept term, a fourth-order moving average error correction term, and a first-order autoregressive correction term, were also included in the model specification.

Results from this analysis are shown in Table 4. The multipliers shown are partial multipliers and reflect the estimated change in nonbasic sector employment associated with one additional job in basic sectors. To obtain a total multiplier, add 1 to the partial multipliers listed in the table. Negative estimates imply that when jobs increase in a basic sector, jobs in the nonbasic sectors are estimated to decrease. Examining the table reveals that in 4 of the 15 communities there was a statistically significant (at 90% level or higher) positive linear relationship between basic and nonbasic employment. However, in four of the communities there was a negative statistically significant linear relationship, and in seven of the communities there was no statistically significant linear relationship. The average partial multiplier across all communities was essentially zero. Based on this evidence, the author could not reject the null hypothesis of no positive linear relationship between basic and nonbasic employment in southeast Alaska communities. In none of the communities did the total multiplier reach the 1.72 multiplier used in the TLMP revision to estimate impacts.

[8] Both unearned income, which will be defined and discussed in detail in Section 4, and tourism have shown a steady increase over much of the study period (1981–1996).

Table 4
Estimated employment multipliers

Community	Estimated multiplier	*t*-Statistic
Angoon	0.29	3.55**
Gutavus	−.79	−1.79**
Haines	0.04	0.42
Hollis	−0.50	−3.12**
Hoonah	−0.22	−1.61*
Hydaburg	0.07	1.57*
Juneau	−0.08	−0.07
Kake	−0.56	−2.87**
Ketchikan	0.1	0.39
Metlakatla	0.28	0.32
Petersburg	−0.35	−0.85
Sitka	0.20	0.68
Thorne Bay	−0.09	−0.37
Wrangell	0.20	1.80**
Yakutat	0.48	6.42**
Average	−0.06	1.72[a]

Source: Robertson (2003).
[a] Average for the absolute value of community multiplier *t*-statistics.
* 90% significance level.
** 95% significance level.

The author offers several suggestions for low, zero, and in some cases negative multipliers at the community level. First, there may be low "local endogenity" in many of these small communities. What this means is that most purchases by locals are made elsewhere, either because of lower prices or low or nonexistent availability in their community. This implies that most of the secondary effects from changes in basic sector employment will occur outside the local community. The high percentage of nonresident workers in the wood products sector, 31.5% in 2000 (Hadland and Landry, 2002), also contributes to low local endogeneity. Second, factor supplies, especially labor, may be constrained in semi-isolated regions and communities. In other words, if a mill expands, workers may leave lower paying jobs in a nonbasic sector and go to work at the mill. Conversely, if a mill shuts down, workers may have to work two jobs in the nonbasic sector to make the same amount of money. Third, unemployment benefits, income maintenance programs, and spending out of savings by unemployed basic-sector employees may mitigate effects on nonbasic economic activity. Finally, the combination of regional economic growth and tight labor supplies over the analysis period indicates that workers released from basic-sector employment could likely find employment in other sectors, again decreasing the multiplier effect.

Robertson (2003) stresses that regional growth is a critical element in this argument and notes, "In a shrinking economy, excess labor supply as well as excess capacity in the nonbasic sectors is likely, and the linear impact multipliers hypothesized by economic base and I–O models may be more applicable than they (linear impact multipliers) are in a growing economy." (p. 77).

Based on the results in Table 4, two conclusions were drawn. First, the study findings indicate that on average there was no significant relationship between basic and nonbasic activity in the forest communities of southeast Alaska. Second, there was significant variation in the nonbasic sector response to changes in basic sector employment across communities. These results strongly suggest that the use of a single positive economic multiplier to estimate community impacts from changes in forest activity levels may be unwise. Policy implications concern both economic impact analysis and the distribution of relief funds. The author states (Robertson, 2003, p. 79):[9]

> If it cannot be demonstrated that a mill closure or similar economic shock will have significant economic ramifications in other sectors of the local economy, then ... it is meaningless to speak of "community impacts" as something other than simply the local portion of direct impacts of the closure, and the focus on community may serve to divert resources from those individuals who need help most. As a result, relief funding should be targeted to help directly impacted individuals in the sector receiving the exogenous shock rather than broader development projects aimed to bolster the economic prospects of the community at large.

The results from this study indicate that the assumption and application of a positive sector-specific impact multiplier is not a viable approach to impact estimation in small communities. Yet, in many of the economic impact assessments included in the environmental impact statements that must now accompany major for-

[9] The author offers the caveat to this implication that in the absence of reliable estimates of expected secondary impacts, the best policy may be to focus on the directly impacted sector but include monitoring programs in areas where secondary impacts are believed likely.

est planning decisions, a standard procedure is to use just such I–O-derived multipliers in conjunction with projections of basic employment or income to estimate total economic impacts. Often the impact multiplier exists as an unquestioned assumption buried in the analysis. Based on his results, Robertson suggests that more scrutiny should be given to these multipliers and their resulting impact assessments. The variation in the estimated multipliers across communities in his study further suggests that within the general debate regarding natural resource policy decisions, the presence of significant secondary impacts resulting from changes in resource-based economic activity cannot be taken as a matter of fact. Rather the effects of resource-based policy changes must be considered within the broader local, regional, and national contexts in which economic impacts occur. This is the subject of the last two TLMP economics follow-on studies.

4. Growth and change in southeast Alaska

The objectives of the follow-on studies by Robertson (in press) and Crone (in press) were to evaluate the economic changes taking place in rural southeast Alaska, to determine the sources of these changes, and to determine if and why they differ from the changes taking place at larger scales. In both studies, southeast Alaska is broken into two subregions: the borough of Juneau and rural southeast Alaska, defined as everywhere besides Juneau. This is done not only because of Juneau's relative size (42% of the population in southeast Alaska in 2000), but also because of the importance of state government operations in its economy. Because of its size, Juneau tends to dominate aggregate statistics for southeast Alaska, and its economic activity is often more reflective of trends within Alaska as a whole than is the economic activity in the less populated areas of southeast Alaska.

In his paper, "An Analysis of Changing Income Sources", Robertson (in press) provided a descriptive analysis of changes in the southeast Alaska economy in terms of primary income sources. The author used Bureau of Economic Analysis (BEA) data (U.S. Bureau of Economic Analysis, 1998) to compare total personal income in Juneau versus rural southeast Alaska from 1969 to 1996. This analysis revealed different patterns of growth, especially since 1990 when Juneau income grew while rural southeast Alaska income stagnated and declined. Based on this finding, the author separated his analysis into two periods, 1969–1989 and 1990–1996.

In his analysis of changes in total personal income, the author pointed out the important distinction between "earned income" (wages or profits to self-proprietors), which is tied to current employment in the area, and "unearned income" (dividends, interest, and rent; and transfer payments[10]), which is not. He notes that until recently the role of unearned income in stimulating economic growth has been largely overlooked. In rural southeast Alaska, he found that between 1969 and 1996, unearned income increased four-fold and increased its share of total personal income from 16% in 1969 to 33% in 1996. Within the unearned income component, the rate of growth in transfer payments has been somewhat higher than that of dividends, interest, and rent, especially since 1990, but both have been increasing in absolute levels and in their share of total personal income.

Both unearned and earned incomes in rural southeast Alaska had positive average annual rates of growth (6 and 2%, respectively) between 1969 and 1989. While unearned income continued to grow (2% per annum) between 1990 and 1996, earned income posted a 2% annual rate of decline over this period. An examination of individual industrial sectors revealed that the manufacturing sector accounted for the vast majority of the decline in earnings, declining at a rate of 7% per annum between 1990 and 1996. Manufacturing's share of earned income fell from 34% in 1969 to 17% in 1996, while service sector earnings have shown steady growth and increased in share from 8% in 1969 to 16% in 1996.

Robertson also examined changes in wages in rural southeast Alaska and concluded that decreases in wages within sectors have been far more important than shifts in employment between sectors in decreasing average wages in the region over the long term. However, he also found that over the short-term period from 1990

[10] Transfer payments include retirement and disability payments (social security, workers compensation, federal, state, and local government retirement), medical payments (Medicare), income maintenance (aid to families with dependent children, food stamps, and supplemental security income), unemployment insurance, and other benefits (veterans benefits, federal education and training, Bureau of Indian affairs, and Alaska permanent fund dividends).

to 1996, declines in timber harvesting and manufacturing were the primary cause of the decrease in average earnings in the region.

Robertson used Alaska Department of Labor employment data for rural southeast Alaska to identify employment sectors declining and advancing between 1981 and 1996. He found that employment gains were broadly distributed across a range of sectors, including local government, health services, retail, and construction. In contrast, employment declines in rural southeast Alaska were concentrated in the wood product industry and occurred primarily over the 1990–1996 period.

For context, Robertson compared changes in income in rural southeast Alaska to changes occurring in the United States at large and to changes in nonmetropolitan counties in the Pacific Northwest (PNW) region.[11] These areas also exhibited an increase in unearned income as a share of total personal income and a shift from manufacturing to services. However, when comparing industry structure in 1996, he found that rural southeast Alaska relied more on government activity while trade and services were under-represented in the region relative to the nonmetropolitan PNW counties and the nation at large.

Robertson also compared relative rates of employment growth in specific industries in rural southeast Alaska with rates of growth in nonmetropolitan Oregon counties between 1981 and 1995. He found that eating and drinking places, health services, and food stores were high-growth industries in both areas. On the other hand, business services and electronics manufacturing were high-growth sectors in nonmetropolitan Oregon counties, but displayed little or no growth in rural southeast Alaska.

Based on his analysis, Robertson concluded that the major sources of income growth in the rural southeast Alaska region were no longer in the traditional resource industries of timber, fishing, or mining. Rather, much of the growth came from increases in government, services, and retail activity. He also stated, "While increase in tourism is no doubt responsible for a substantial portion of this growth, the steady growth in unearned income, especially retirement and medical benefits, is likely a more important (though less noticed) factor." He also concluded that the increasing importance of unearned income and the shift from manufacturing to services in rural southeast Alaska and in nonmetro PNW were reflective of broad-scale changes in the nation at large. Growth in services, especially business services, has been slower in rural southeast Alaska than in the nation or in the nonmetro PNW.

In addressing the implications of his findings for forest policy, Robertson concluded that in the absence of significant increases in national forest timber sales (and the market to support them), the ability of forest policy to impact the regional economy via the timber sector will be small. Thus, the focus should shift to ways in which forest policy can affect the new drivers of economic activity in the region—tourism and unearned income. Forest policies that attract both visitors and new residents and keep existing residents from leaving will contribute to economic growth in the region. However, different user groups may prefer the provision of different amenities from the forest. The desires of residents and those of visitors are not always compatible, and the factors that make a place attractive to live are more complex and not always the same as those that make it attractive to visit. Because of these conflicts and those between tourism and recreational users of the forest and resource-extractive users, Robertson concluded that understanding and predicting the influence of forest management practices on local employment and income has become less direct and more complex.

In her paper, "Rural Manufacturing and the Wood Products Industry: Trends and Influences on Rural Areas" Crone (in press) expanded on the findings from Robertson. She began by using BEA data (U.S. Bureau of Economic Analysis, 2002) from 1969 to 2000 to examine trends in population, income, and earnings at the national (U.S.), state (Alaska), and regional (Juneau and rural southeast Alaska) levels. Because many of the concerns expressed about the economic effects of forest policy and management focus on impacts on small rural areas, Crone also compared trends in rural southeast Alaska with those in another rural and resource-abundant region. The other rural area chosen for comparison included four counties in Idaho and two counties in Montana. These counties were selected according to the following rule set: (1) county population less than 16 000 in 2000, (2) county not adjacent to a metro area (as defined by Cook and Miser,

[11] These counties were in Oregon and Washington and their populations ranged from 1642 to 135 833 in 1996.

1994), (3) at least 8% of county employment was in the wood products sector in 1995; (4) the county was not farming-dependent (as defined by Cook and Miser, 1994), and (5) National Forest System lands make up at least 50% of the county's land area. These criteria were used because they are representative of conditions in rural southeast Alaska.[12] This group of counties will be referred to as rural IdMt.

Crone found that, in general, the Alaska and Juneau economies have not followed the business cycles of the United States, and during most cycles appear to operate in a counter-cyclical manner. On the other hand, until recently, the rural areas did appear to be heavily influenced by national business cycles. Much of the susceptibility of the rural economies to national business cycles can be traced to their manufacturing sectors (Galston and Baehler, 1995). The manufacturing sector in rural southeast Alaska experienced negative average annual growth rates during all the U.S. recessions.

The apparent influence of the manufacturing sector on changes in earnings in rural southeast Alaska and rural IdMt led the author to take a closer look at the history of this sector. To better understand the influence of this sector on the rural areas under investigation here, she focused on rural manufacturing in general and the wood products sector in particular.

Crone found that the establishment of the pulp mills beginning in 1951 coincided with a general dispersal of manufacturing in the United States to rural areas during the 1950s and 1960s. Reasons cited for this national trend were the availability of low-cost labor,[13] cheap land, relatively relaxed regulations, weak or nonexistent unions, lower taxes, and often government incentives and subsidies. Although cheap labor did not draw the pulp companies to Alaska, the 50-year contracts they were granted effectively gave them a subsidy in the form of cheap timber.[14] In addition, the companies were granted exemptions from state and local taxes.

From 1970 to the mid-1980s, oscillations in both rural southeast Alaska and rural IdMt manufacturing sectors were clearly reflective of both trends in rural manufacturing in general and of cycles in the U.S. wood products sector in particular. The recession years of the early 1980s hit rural manufacturing and the U.S. wood products sector particularly hard. This was because U.S. policymakers increased both interest rates and the value of the dollar in an attempt to control inflation. The higher interest rates radiated to other countries such as Japan, and the combination of high interest rates and high value of the U.S. dollar decreased the demand for U.S. exports. This affected rural areas more because they had relatively more employment in the goods-producing industries and were more export-dependent than urban areas (Hamrick, 1997). Lumber and wood products employment in the United States reached its lowest level of the past 50 years in 1982.

In rural IdMt manufacturing employment decreased 27% between 1978 and 1982 while earnings in its wood products sector fell 56% over this same period. Manufacturing employment in rural southeast Alaska decreased by 33% between 1980 and 1984. Employment in Alaska's logging and pulp industries decreased by 27 and 42%, respectively, between 1980 and 1984, while employment in its lumber industry decreased by 73% between 1980 and 1986.

Manufacturing employment in rural IdMt never fully recovered from the recession of the early 1980s as many wood products plants either closed outright or invested in cost-cutting and efficiency measures for their plants. The end result in Idaho and Montana (as well in the Pacific Northwest) was a more mechanized wood products industry that employed fewer people. For example, in Montana, wood products output was higher in 1986 than in 1979, but 2400 fewer people were employed (Corporation for Enterprise Development, 1989). In 1990, manufacturing employment was only 86% of its 1978 peak, and by 2000 it was only 75% of that peak. In 1990, earnings in the wood products sector were only 54% of their 1978 peak level, and by 2000 they were only 36% of that peak.

In general, the wood products mills in rural southeast Alaska did not undertake the same efficiency-enhancing mechanization updates that were occurring elsewhere. Yet, rural southeast Alaska manufacturing employment and the wood products sector did recover (temporarily) from the early 1980s downturn.

[12] None of the nonmetropolitan counties in Oregon or Washington met all these criteria.

[13] Increases in agricultural productivity in the 1950s and 1960s created a large pool of surplus labor in rural areas.

[14] In order to attract the necessary large-scale investment to this remote and high-cost region, the Tongass Timber Act of 1947 authorized the construction of pulp mills on the forest and the use of 50-year timber sale contracts to supply their multiproduct wood-processing operations (Haycox, 1997).

The Irland Group (1991) attributed the rebound in the late 1980s to four factors: the declining dollar–yen exchange rate, the strong world pulp market, a stabilization of the dissolving pulp market, and the strong peak in log exports (primarily from Alaska Native Lands) that boosted logging jobs.

Historically, the integrated pulp mill operators in southeast Alaska were able to offset losses during low points in the pulp markets with the higher revenues they received when markets improved, but in the 1990s this ability disappeared for several reasons. First, the Tongass Timber Reform Act (TTRA) of 1990 removed many of the direct and indirect subsidies the pulp companies had been granted in their 50-year contracts and in the Alaska National Interest Lands Conservation Act (ANILCA) of 1981. Because the most accessible timber had already been harvested, the pulp companies' costs were already increasing and the cumulative effect of the TTRA was to push them higher.

The second factor affecting the profit margin of the pulp companies was the declining world demand for their primary product, dissolving pulp. Because the Alaska pulp mills were high-cost producers, they suffered first when the price of dissolving pulp decreased. The Alaska Pulp Company mill in Sitka shut down in 1993 and Ketchikan Pulp Company mill closed in 1997. Since the mid-1990s, more than 90 U.S. pulp, paper, and paperboard mills have shut down, and about 1 in every 12 industry-wide jobs have disappeared.

When the pulp mills closed, the marginal position of Alaska wood products manufacturers in the cyclical and global wood products industry became more evident and acute. With the pulp mills gone as ready markets for their mill residues and chips, Alaska firms must now compete with more efficient and lower cost suppliers from other regions in the global marketplace. The primary processing requirement for Forest Service land[15] and the long-term contracts with the pulp companies undoubtedly led to increased population and contributed to a more diversified economy in the region. However, this particular development strategy may have retarded the development of a competitive lumber and value-added industry. On the other hand, some would argue that because of Alaska's numerous cost disadvantages, it is doubtful that such an industry would have developed under any scenario (Irland Group, 1992). Today, many of the obstacles the industry faced in the 1950s remain and others have emerged (Southeast Alaska Regional Timber Industry Task Force, 1997; Morse, 2000).

The wood products firms that operate in southeast Alaska today have survived by finding niche markets. Crone discussed efforts underway to improve the competitiveness of Alaska wood products and expand into other niche markets. A lumber-grading project sponsored by the Alaska Manufacturer's Association and the Alaska Science and Technology Foundation has included testing to quantify the superior mechanical properties of Alaska species (Alaska Manufacturer's Association, 2002; Ketchikan Daily News, 2002). Additionally, the U.S. Forest Service Alaska Wood Utilization Research and Development Center in Sitka has undertaken projects to find technological and economic solutions for a durable forest products industry in Alaska. An update on their research findings states (Rapp, 2003, p.1):

They have found that wood recovery could be improved at nearly every sawmill in Alaska. Strong potential exists for sawmills to add dry kilns to dry lumber, which could sell at higher prices. Special grades based on the qualities of Alaska woods would increase lumber values further. Wood residues such as chips and sawdust should be viewed as resources instead of wastes. Value-added products could supply the domestic market in Alaska. Specialty products such as birch craft and cabinetry may bring higher prices if they are sold as made-in-Alaska products.

Because most observers believe it is unlikely that production and employment in the wood products industry will return to their previous levels, Crone examined other economic opportunities in the region. She found that the current situation in the other major natural resource industries, salmon fishing and mining, were similar to the wood products situation. The entrance of farmed salmon on world markets has dramatically decreased both Alaska salmon exports to Japan and sales in the U.S. market (McDowell et al., 2001). In the mineral industry, historic low metal prices and ris-

[15] In 1926, Congress prohibited the export of round logs from the Tongass. U.S. Congress Act of 12 April 1926, Exportation of Timber, P.L. 69-100, Ch. 117; 44 Stat. 242, as amended; 16 U.S. C. 616, 617. Harvests from Alaska Native lands are not subject to this log export ban.

ing costs, especially fuel, have decreased expenditures for exploration and development projects and revenue from mineral production (Swainbank et al., 2002).

Rural southeast Alaska is not unique with respect to changes in its resource extractive industries. Globalization of the markets for coal, timber, and agricultural products have decreased prices and reduced employment in local economies reliant on extractive industries (McLaughlin, 2002). Johnson (2000) writes that rural areas still tied to traditional rural industries face big challenges, as commodity producers face stiff competition and thin profit margins in the global economy, leaving many rural communities unsure of their best strategies. In many rural areas, the traditional sources of rural comparative advantage—abundant and cheap land (natural resources) and labor—have been replaced by a new comparative advantage—quality of life. For example, in rural IdMt despite the decreases in manufacturing employment and earnings in the wood products industry in the 1990s, population and total personal income increased throughout the decade.

Schroeder and others[16] document the dramatic rise in tourism (especially cruise tourism) in southeast Alaska. Using the same methodology previously employed by McDowell Group (1991, 1999), Crone estimated the number of tourism-related jobs in rural southeast Alaska at 1752 in 1999. In addition to attracting tourists, rural southeast Alaska enjoys a comparative advantage in attracting migrants seeking quality of life improvements. The area features outstanding recreation opportunities and what Isserman (2000) referred to as AMENities—freedom from congestion, crime, commuting, pollution, and other conflicts of urban life. Much has been written in recent years regarding the ability of these types of amenities to stimulate rural population growth and economic development by attracting both individuals and firms.[17]

Crone used data from the 2000 U.S. census (U.S. Department of Commerce Bureau of the Census, 2002) to examine indicators of socioeconomic well-being for the small (less than 2500 people) rural southeast Alaska communities. Using the amount of per capita funds each community received between 1996 and 2002 from the Southeast Economic Disaster Fund[18] as a proxy for forest products dependence, she classified the communities as timber-dependent if they received more than $1000 per capita from this fund. Using this classification system, she found there was no significant difference in mean median household income, mean per capita income, mean unemployment rate, or mean percentage of families in poverty between this group of 14 communities and the other 13 small rural southeast Alaska communities as a group. Based on this analysis, she could not conclude that the small communities that had a higher dependence on timber harvests were worse off than the other small communities in the region.

The growth of each community will depend on their individual resiliency. Resiliency, in this sense, is defined as adaptability to change and is influenced by more than just the economic structure of a community. It also depends on community leadership, activities like planning for the future, the presence and management of amenities that might attract and keep people in the area, and physical infrastructure (roads, sewers, water) (Crone and Haynes, 2001). Whether the smaller, more isolated and less economically diverse communities in rural southeast Alaska will be able to leverage their many natural amenities to overcome these development obstacles is likely to depend on each community's unique characteristics.

The implications for forest policy of these findings are similar to those from Robertson (in press). Forest management activities that maintain or enhance the comparative advantage of rural southeast Alaska communities in attracting tourists and new residents while maintaining or enhancing quality of life attributes for existing residents are likely to contribute to socioeconomic well-being in these communities. Efforts to improve the competitiveness of Alaska wood products can contribute to economic diversity in some communities,

[16] Schroeder, R., Cerveny, L., Robertson, G. Tourism growth in southeast Alaska: trends, projections and issues. Unpublished manuscript. On file with: L. Kruger, USDA Forest Service, Forestry Sciences Laboratory, 2770 Sherwood Lane, Juneau, AK 99801, USA.

[17] For examples and additional references, see Rudzitis (1999), Johnson and Rasker (1993), Beyers and Lindahl (1996), Crone and Haynes (1999), Nelson (1999), Vias (1999), McGranahan (2000), Southwick Associates (2000), and Pezzini and Wojan (2001).

[18] This fund, established by Congress in 1996, directed the Secretary of Agriculture to "allocate funds to local communities suffering economic hardship because of mill closures and economic dislocation in the timber industry to employ unemployed timber workers and for related community redevelopment projects" (Public Law 104-134, section 101, Title II (a-c4), Public Law 106-113, Title II and Public Law 106-391, Title II).

but it is unlikely that wood products production and employment will ever return to their previous levels in southeast Alaska.

5. Role of the Tongass in the regional economy: past, present, and future

Given the fact that the Tongass National Forest accounts for over 80% of the land base in southeast Alaska, since its creation, the management of this forest has affected the economy of southeast Alaska in many ways. With the establishment of the pulp companies and long-term contracts in the late 1950s, the primary influence on the economy was the provision of timber to the wood products industry. Indeed, as Crone (in press) notes, the early pulp mill proponents envisioned that these multiproduct wood-processing operations would be the principal component of a rural development strategy for the region. Haycox (1997) wrote, "For forty years and more, pulp was king of the Tongass . . .. Production from the mills proved marketable in a period of remarkable national growth, and the population of southeast Alaska increased significantly."

Beginning in the 1960s and throughout the 1970s, however, as the environmental movement gained momentum, many Americans began to embrace the notion of natural resource preservation. In southeast Alaska, local and national environmental groups began to question forest management practices and began filing suits to halt timber sales in the area (Sisk, 1989). In the 1980s when the timber market plummeted, these groups continued to scrutinize and attack Tongass management policies on both environmental and economic efficiency grounds. Haycox (1997) argued that the increased use of the waters in the forest by fishermen and the dramatic increase in tourism served to elevate the debate over management of the Tongass to the national spotlight. The end result of this debate was the TTRA (1990), which did not end the pulp companies' 50-year contracts but modified them to prevent below-cost sales and removed what many considered subsidies to the pulp companies.[19] This act removed the Tongass timber supply target of 20.4 million m^3 per decade (ANILCA, 1981)(established as part of ANILCA in 1981) and reduced the annual appropriation to support timber sale offerings from $40 million to $4 million. Additionally, the act directed the Forest Service to set the harvest level each year to meet "market demand" and sell timber at a profitable price.

In recent years, there have been increasingly divergent views on the importance of timber harvests from the Tongass to the regional economy. The McDowell Group (1995, 2000a) holds the view that the primary cause of economic decline in southeast Alaska is the reduction in timber supply from the Tongass. Others such as MacMullan and Niemi (1994), Whitelaw et al. (1998), Erickson and Associates (1999) and Erickson (2000) disagree, arguing that there are many other factors occurring both within and outside the forest sector that are greater influences on the economy. The discussion and analysis in previous sections of this paper provide support for the latter view for several reasons.

First, although reductions in timber harvests from the Tongass obviously imply a reduction in logging employment on the Tongass, the reduction in harvests from Native Corporation lands since 1990 have been just as large. Between 1996 and 2001, Alaska timber harvests from private lands decreased by 70% from 1 478 773 to 450 707 m^3 (see Table 19 in Warren, 2004). Koncor, once the second largest timber producer among Alaska Native corporations, ceased logging operations in 2001 (Gilbertsen, 2002). This company's president cited permanent changes in the market for Alaska logs (primarily in the Japanese market) as the main factor in their decision to exit the industry (Wheeler, 2001).

Second, from 1980 to 1987 the Forest Service prepared and offered an annual average volume of 2 100 000 m^3 of timber, but the volume sold and harvested averaged only 1 300 000 m^3. During the market peak from 1988 to 1990, the offered volumes were greater than the sold volumes but less than harvest volumes. For the 1991–2001 period, average volume of-

[19] The long-term sales were revised to make timber sales authorized under these contracts more consistent with independent timber sales in terms of planning, management requirements, and environmental assessment procedures. The revisions also included stipulations to eliminate the practice of over-harvesting old growth, to re-offer timber rejected by the pulp companies as independent sales and subtract this volume from the long-term contract volume, to adjust the price of timber offered under the long-term contracts to levels comparable to independent sale prices, to count utility logs against the contract volume, to assure purchaser road credits are treated the same as in independent sales, and to assure the timber offered meets the same economic criteria used for independent sales.

fered exceeded both the average volume sold and the average volume harvested. The fact that more timber has been offered than sold is likely attributable to the marginal position of Alaska wood products firms in the cyclical, integrated, and increasingly competitive markets for their products (Brooks and Haynes, 1997; Robertson and Brooks, 2001; Stevens and Brooks, 2003).

Third, the decreasing availability of cheap timber was not the only reason the pulp companies pulled out of Alaska. The price volatility and general decline in the demand for dissolving pulp as well as the increasing costs associated with operating older, polluting mills were likely equal, if not greater, factors in their decision to shut down (Crone, in press).

Fourth, the larger forces of globalization and adoption of more efficient production technologies (Crone, in press) and more aggressive marketing strategies in competing regions (Eastin, 2002) have further increased the comparative and competitive disadvantages (as identified in Robertson and Brooks, 2001) of the forest products sector in southeast Alaska. Owing in large part to the unique characteristics of the Alaska forest products sector, including the pulp companies and their long-term contracts, the primary processing requirement, and the increase in logging activity associated with Alaska Native harvests, this sector was able to withstand the severe market downturn in the 1980s without investing in the technological improvements that mills in other regions undertook in order to survive and compete in the global economy. The Southeast Alaska Regional Timber Industry Task Force (1997, p. 31) described the competitive environment in which the older and less efficient Alaska mills must now operate:

Computer assisted cutting, trimming, sorting, grading and shipping have increased both resource recovery and production speed and shipment in regions which already enjoyed cost advantages over Alaska. Advanced mills are not single-product operations but integrated manufacturing plants generating their own energy from wood chips and turning out an array of structurally superior engineered building products. While the cost and quality of timber supply continues to be an issue for the industry, perhaps even more critical is the strategic development of technology to more productively extract the full value from a costly resource.

Fifth, at least some of the recent economic decline must be attributed to the poor market situation for Alaska salmon (McDowell et al., 2001). Alaska's contribution to the global salmon market declined from 40 to 50% in the early 1980s to less than 20% by 2000, primarily because of competition from farmed salmon. Peak salmon prices in 2002 were 54–92% lower than they were in 1988, while total ex-vessel values in the Alaska salmon fishing-industry fell from $600 million to $150 million, and average selling prices for southeastern Alaska purse seine permits fell from $110 000 to $23 000 between 1992 and 2002 (Naylor et al., 2003).

Finally, because the Alaskan economy was growing slower with wages decreasing toward the national average (Robertson, in press), it is likely that some of the late 1990s decline in rural southeast Alaska employment was due to workers seeking better opportunities in faster growing areas in the lower 48 states (Erickson, 2000; Robinson, 2001). Crone (in press) wrote, "Rural southeast Alaska like many other rural areas did not share in the 'new economy' earnings growth of the late 1990s. One reason for this is that rural areas had less employment in and less growth of the producer services sector. This sector ... contributed most to increased urban earnings." Urban areas also tend to specialize in high-tech manufacturing industries, which provided most of the growth in manufacturing earnings, whereas rural areas tend to specialize in slower growing value-added and routine technology manufacturing (Gale and McGranahan, 2001). The wood products-manufacturing and seafood-processing industries in rural southeast Alaska fall into the latter category.

In his test of the economic base model in southeast Alaska communities, Robertson (2003) found that the presence of significant secondary impacts resulting from changes in resource-based economic activity cannot be taken as a matter of fact. In her examination of community indicators of socioeconomic well-being, Crone (in press) did not find a significant difference between small timber-dependent communities and other small communities in rural southeast Alaska. Robertson (in press) and Crone (in press) found that in the increasingly diverse and service-oriented economy that exists in southeast Alaska today, the contribution of the Tongass to the regional economy is much more complex and difficult to quantify.

Although timber from the Tongass continues to play a role and efforts to assist the wood products industry restructure should continue, timber is not likely to be the most important contributor to future socioeconomic well-being in the area. Based on regional, national, and international economic and demographic trends, the roles the Tongass plays as a provider of tourism and recreation opportunities and as the custodian of many of the unique natural amenities and ecosystem values that both attract tourists and enhance the quality of life for existing and potential residents, is likely to be of more importance to the economic vitality of the region. An important aspect of this role for Tongass National Forest managers will be a continuation of their ongoing efforts to help communities identify and implement strategies to enhance their comparative advantage and capture more of the economic benefits from recreation and tourism in ways that least detract from local quality of life.

Metric equivalents

When you know	Multiply by	To find
Cubic meters (log)	220	Board feet, log scale
Cubic meters (lumber)	420	Board feet, lumber scale
Dollars per m^3 (log scale)	4.53	Dollars per thousand board feet (log scale)
Dollars per m^3 (full sawn lumber)	2.358	Dollars per thousand board feet (full sawn lumber)
Dollars per metric ton	0.91	Dollars per standard ton

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