

An Input-Output Analysis of the Incremental Contributions of Timber Harvests to the Regional Economies of the South and Pacific Northwest¹

by

Brian M. Cox and Ian A. Munn²

Abstract

An input-output analysis using IMPLAN was employed to quantify the incremental contributions of timber harvests to the regional economies of the South and Pacific Northwest United States. The primary objective was to compare the economic impacts of a one-million board foot (MMBF) change in harvest on the respective regional economies. Output, value added, personal income, and employment multipliers were used to evaluate the economic impacts of an incremental change in harvest levels. Regional comparisons were based on incremental impacts per MMBF of timber delivered instead of the standard per dollar of output used in most input-output analyses. Because of dramatically different stumpage and delivery prices between the regions, examining the incremental contributions to the regional economies from changes in harvest levels on a per MMBF basis more accurately illustrates the effects of changes in national timber harvest policy. Incremental impacts per MMBF harvested are substantially greater in the Pacific Northwest than in the South: \$280,708 more output; \$149,762 more value added; \$86,328 more personal income; and 2.05 more jobs.

INTRODUCTION

Forestry and forest-based industries make substantial contributions to the United States economy. The total value of shipments by all sectors of the U.S. forest products industry was over \$210.9 billion in 1992 (USDC 1992). The portions of the forest products industry located in the South and Pacific Northwest are particularly important to the nation's economy. In 1992 for example, the value of shipments from the South and Pacific Northwest were \$64.7 and \$20.8 billion, respectively (USDC 1992). This represented 30.7% and 9.8% of value of shipments nationally for the forest products industry.

From a national perspective, the forest products industry is highly differentiated by region. This is due, in part, to differences in inputs such as stumpage, labor, and processing technology. For example, the industry in the Pacific Northwest relies primarily on the publicly owned old-growth timber of the National Forests, while in the South it relies on second and third generation timber that is privately owned. Additionally, the industry in the South utilizes the substantial hardwood component of the region's timber resource. Timberland ownership patterns differ markedly between the two regions. Over 53% of timberland in the Pacific Northwest is

contained within national or other publicly-owned forests. In contrast, forest industry, farmers, private individuals and companies own 90% of the timberland in the South (AF&PA 1995).

These regional differences, especially in raw material supply, necessitate differences in manufacturing technology, industrial output, and the linkages between producers and consumers. This ultimately results in dissimilar economic structural relationships and different interactions with other industries within the regional economies. Smith and Munn (1998), in a regional cost function analysis of the logging industry in the Pacific Northwest and Southeast, indicated that a regional shift in logging sector demand would result in an overall decrease in sector employment at the national level. Their analysis determined that input substitution between labor and capital in the logging sector is more limited in the Pacific Northwest than in the Southeast. Firms in the Southeast have more flexibility to adjust their capital/labor ratios as they expand production to meet increased demand. Compared to the Pacific Northwest, loggers in the Southeast are more labor intensive, but as they expand are likely to substitute increasingly more capital for labor. Therefore, increases in logging sector employment in the

¹ Approved for publication as Journal Article No. FO122 of the Forest and Wildlife Research Center, Mississippi State University.

² Graduate Research Assistant and Associate Professor of Forestry, respectively, Department of Forestry, Box 9681, Mississippi State, MS 39762. Contact I.A. Munn at (662) 325-4546 or imunn@cfr.msstate.edu

Southeast will not be proportional to the increase in output that results from the shift in the geographic location of the industry from the Pacific Northwest.

Old-growth timber depletion, revised forest management decision-making criteria, and environmental constraints have led to substantial reductions in timber harvests in the Pacific Northwest. From 1986 to 1991, the annual removal of softwoods from all ownership groups in this region decreased by 2.55 billion board feet (20.6%) while removals nationally increased by 1.40 billion board feet (2.2%). Over this same time period, annual removals from the South increased by 1.99 billion board feet (9.4%) (Powell et al. 1993). This harvest data illustrates the recent, dramatic geographic shift in production of the forest products industry from the Pacific Northwest to the South.

Traditionally, economic contributions of regional industries have been evaluated using input-output models in one of two ways. In one method, regional contributions are evaluated by computing the total impact of industry output on the regional economy (See, for example, Barnett and Reinschmidt 1996; Aruna et al. 1997; Munn 1998). In the other method, regional contributions are evaluated by computing the marginal impact of additional industry output – economic multipliers – on the regional economy (See, for example, Flick and Teeter 1988). Both methods have drawbacks. The first assumes that the input-output relationships are constant, regardless of output levels. Economic multipliers avoid this pitfall by focusing on the marginal impacts of additional output computed on a "per dollar" basis. While this method is fundamentally sound, it does not account for regional differences in the dollar value of the output. If output prices vary significantly between regions, comparing these standard economic multipliers may be misleading because a dollar shift in output will represent different output quantities for each region. An alternative is to compute economic multipliers based on a "per unit of output" basis.

This study investigates the regional differences in the incremental economic contributions of a million board foot (MMBF) change in harvest levels to the regional economies of the South and Pacific Northwest. Examining incremental contributions to both regional economies from per unit changes in the amount of timber delivered to forest-based industries by the logging sector will illustrate the potential impacts of changes in national timber harvest policy on the South and Pacific Northwest.

METHODS

Input-Output Models

Forest products industry economic impacts were examined using input-output models. Input-output models are accounting frameworks for analyzing the flow of goods and services between businesses and between businesses and final consumers. These models are useful for defining the relationships, and the degree of interdependency, between various industries or sectors of an economy (Miernyk 1965; Kaiser 1972; Hotvedt et al. 1988). Models constructed for the South and Pacific Northwest were used to evaluate the relative importance of the industry to the two regional economies

The regional input-output models used to analyze the incremental economic impacts of timber harvests in the South and Pacific Northwest were developed using the IMPLAN modeling system (MIG 1997). IMPLAN was originally developed by the USDA Forest Service in cooperation with the Federal Emergency Management Agency, USDI Bureau of Land Management, and the University of Minnesota (Alward and Palmer 1983). IMPLAN data for 1993 was used in this analysis.

Regional Study Areas

The IMPLAN models created for this project represent the economies of the South and Pacific Northwest United States. The states comprising these two study areas correspond to the regions and/or subregions used for U.S. Forest Service assessment updates required under the Forest and Rangeland Renewable Planning Act of 1974 (Powell et al. 1993). The South consists of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia. The Pacific Northwest is composed of Oregon and Washington.

Incremental Economic Contributions

This study examined the incremental contributions to the regional economies of the South and Pacific Northwest that result from per unit changes in the forest products industry's stumpage harvest in those regions. The impact analysis was performed by specifying output changes equivalent to the monetary value of one MMBF of timber harvested for each region and applying these values to the IMPLAN models' regional multipliers. Timber prices from 1993 were used to maintain

consistency with the IMPLAN database employed in the regional economic models.

Economic impacts resulting from per unit changes in the South's harvest were performed using the Timber Mart-South 1993 southeastern state annual average delivered (F.O.B. mill) price for pine sawtimber. The impact analysis for the South is thus based on a delivered price of \$254.50 per thousand board feet (MBF), Scribner scale. The 1993 average stumpage value of \$293.26 per MBF, Scribner of softwood timber harvested from national forests in Oregon and Washington was used to examine this same industry impact in the Pacific Northwest (Haynes 1998a). The 1993 average logging and hauling cost of \$156.23 per MBF, Scribner of timber harvested in Oregon and Washington was added to the average stumpage value to derive the delivered price for softwood sawtimber in the Pacific Northwest (Haynes 1998b). Therefore, the impact analysis for the Pacific Northwest is based on a delivered price of \$449.49 per MBF, Scribner scale.

Evaluation of the incremental contributions from per unit changes in the regional harvest levels was conducted using the impact reports generated by the IMPLAN models. The output, employment, personal income, and total value added reports were

used to compare the total effects (direct, indirect, and induced) per million board feet (MMBF) of timber harvested by the logging sector on the regional economies of the South and Pacific Northwest.

RESULTS

The combined effects (direct, indirect, and induced) on the economy of the South per million board feet of timber delivered by the logging sector to the point of first processing result in a total impact to regional industrial output of \$458,998. In the Pacific Northwest, the impact to the industrial output of all sectors per MMBF of timber delivered by the region's logging sector equals \$739,706. The value added created by all sectors of the regional economy per MMBF of timber delivered by the logging sector for further processing is \$180,432 and \$330,194 for the South and Pacific Northwest, respectively. In the South, 4.36 jobs are generated (direct, indirect, and induced) per MMBF of delivered timber compared to 6.41 jobs per MMBF in the Pacific Northwest. Personal income generated by all sectors of the economy per MMBF of delivered timber is \$108,295 in the South and \$194,623 in the Pacific Northwest (Table.1).

Table 1. Incremental Impact per MMBF of Timber Delivered by the Logging Sector on the Output, Employment, Personal Income, and Value Added of the South and Pacific Northwest United States, 1993.

Economic Impact	Incremental Impact per MMBF	
	South	Pacific NW
Output	\$458,998	\$739,706
Value Added	\$180,432	\$330,194
Personal Income	\$108,295	\$194,623
Employment (No. of Jobs)	4.36	6.41

DISCUSSION

The impacts on regional industrial output, value added, personal income, and employment from per MMBF change in the stumpage harvest by the forest products industry of the South and Pacific Northwest were analyzed to determine the incremental effects that such changes have on the two economies. The impacts on the Pacific Northwest economy are greater than the South's. For an additional MMBF of timber harvested, \$280,708 more output is generated in the Pacific Northwest than in South. There are \$149,762 more value added, and \$86,328 more personal income, created in the Pacific Northwest regional economy per MMBF of delivered timber than in the South. In the Pacific Northwest, 2.05 more jobs are generated per MMBF change in the regional harvest than in the South.

Determining incremental economic contributions using a per MMBF analysis is useful for examining the impacts on regional economies that result from such events as timber harvesting restrictions in the Pacific Northwest and corresponding increases in annual timber removals in the South. Incremental impact analysis on a per MMBF basis is straightforward because it accounts for regional variations in the value of production. The shift in timber harvests from the Pacific Northwest to the South has resulted in greater negative effects for its regional economy than it has in corresponding positive total for economy of the South. Harvest reductions in the Pacific Northwest result in greater losses to regional industrial output, value added, personal income, and employment per MMBF than are gained by equal increases in harvest

levels in the South. These results are consistent with Smith and Munn (1998).

The incremental economic impact analysis performed on the logging sectors of the two regions in this study suggests that a regional production shift from the Pacific Northwest to the South results in net losses to industrial output, value added, personal income, and employment. Per MMBF incremental impact analysis allows for the preservation of regional differences that exist in the forest products industry, especially that of regional variation in the cost of raw wood material inputs. This type of information provides insight for policy-makers so that appropriate adjustments can be made to national policy to better fit regional economic variations.

Shifts in the geographic location of the forest products industry as significant as have occurred in recent years create substantial direct, indirect and induced effects on the regional industrial, commercial and agricultural sectors. These effects differ substantially by region. Understanding regional differences in output, value added, personal income, and employment is a critical first step in addressing economic issues and formulating effective natural resource policy, both at the regional and national level.

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