Economic Impacts of the Forestry and Forest Products Industries on the Tennessee Economy

by

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Abstract

An impact analysis was conducted to examine the relative importance of the forestry related sectors to the overall Tennessee economy, utilizing the IMPLAN database and model. The 1994 data used for this study were the most recent available. The Tennessee input-output economic model results indicated that in 1994, the Tennessee forest products industry directly employed 66,947 people and paid about $2.28 billion in wages. Also, value-added generated directly by the forest products industry totaled over $3.9 billion. When the forestry sector of the Tennessee economy produces products or services to meet demand, the overall State economy is affected in three ways: directly, indirectly and with induced effects. The total effect on the state economy is the sum of these three separate effects. Therefore, in 1994, relative to other Tennessee industries, the total effect of the forest products industries was 158,833 jobs, over $3.5 billion in wages and salaries, $15.5 billion of industrial output, and over $7.5 billion of value-added.

INTRODUCTION

Like many states in the South, the forests of Tennessee provide direct economic returns to landowners, loggers, and primary and secondary wood users. The 1989 forest survey indicated that almost 50 percent of total land area in Tennessee is forested, encompassing approximately 13.2 million acres. Forest resources are a major component of Tennessee’s economic base. Therefore, the forest products industry in Tennessee makes a major contribution to the Tennessee economy. This study employed a model to evaluate the relative importance of the forest products industry to the overall Tennessee economy.

Few studies have been done in Tennessee with the purpose to understand the role and measure the contribution of the forest-based industry to the state economy. Abt (1979) explored the possibility to incorporate into a larger model (econometric aggregated model, TEN II) an equation for the lumber and wood products sector (SIC 24) to predict sector output, employment, and wages. Maki et al. (1987) identified the forest products industry as one of Tennessee’s basic industries by using the excess of employment and earnings.

Other state forestry studies (Pedersen et al. 1989; Trenchi and Flick, 1992; and Aruna et al. 1997) have relied on construction of Input-Output state models that drew data from local surveys or secondary data. Other forestry studies have focused their attention in the regional dimension (Kaiser, 1972; and Teeter, et al. 1987) responding to the fact that population, resources and economic activities distribution take place in a geographical setting and impacts between regions are significant.

In the last decades, state policy makers have focused their attention to rural regions, particularly those with abundant forest resources, to explore the opportunities that could bring value-added forest

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2 TEN II is a state level econometric model developed and maintained by the Center for Business and Economic Research, College of Business Administration, The University of Tennessee.

3 Industries that exceeded the national distribution of employment and earnings are considered to be producing for exports outside the state, therefore is part of the economic state base.
resources-base programs as a tool to increase employment, attract new industries and serve as engines of growth (Vlosky and Glance, 1996). May (1991) suggested that agricultural and forestry sectors have developmental potential. The potential to develop agriculture and forestry is of importance for many persistent poverty counties in Tennessee, which have a relatively large agricultural sector and abundant forest resources.

Theory helps to explain why things are as they appear and to understand how things might be changed to a better way than currently exists. Richardson (1982) pointed out that the economic well-being of rural areas depends on numerous factors (e.g., factors that affect the costs of production and distribution, and the selection of a location that minimizes these costs). Thus, communities can provide incentives that offset the disadvantages of location. Rural regions that depend on natural resources have location advantages such as easy access to raw materials, and less costly labor pool. According to Shaffer (1989) the main goal of rural economic development is often adding sufficient value-added to raw commodities to offset transportation cost.

The forestry sector has played an integral role in regional economic growth and development throughout times (Marcouiller, 1983). As the need for land to grow crops balanced with regional population and regional export demand, land use patterns have evolved through time. The use of products derived from the forest has also undergone an evolution from the early uses for shelter, firewood and products for direct use in household to current and more sophisticated products such as paper, panels, chemicals, and other wood-related products.

Alward (1980) noted that the variety of forest uses is strongly tied to social and economic structure of rural regions. The forest, as in the past, continues to be the source for economic growth and development for rural regions. Davis and Johnson (1987) suggested the specific criteria for a successful use of forest resources consisted of: (1) economic efficiency; (2) favorable impacts on regional and local communities; (3) equity in the distribution of cost and benefits among the members of the society; (4) economic and social stability, and finally;

(5) security of the environment. The same authors adapt a useful grouping of regional goals and social impacts criteria for evaluating changes in forest use. These include goals such as: (1) economic activity comprised of employment, value-added, and sales; (2) individual welfare; (3) area equilibrium issues such as economic diversity, social strife and future development and; (4) local cost and benefits to local governments.

When the forestry sector of the Tennessee economy produces products or services to meet demand, the overall State economy is affected in three ways: (1) there is the direct effect on total employment, total wages and salaries, and total value-added of firms within the sector producing products to meet demand; (2) there is an indirect effect as firms within the sector purchase production inputs from other firms within the state and; (3) there is an induced effect when firms within the sector pay wages and salaries to their employees. Employees in the Tennessee forest products industry spend part of their income on goods and services produced in the state, generating an induced demand for the production of still more products and hence more total employment, total wages and salaries, and total value-added.

METHODS

This study employed a model to evaluate the relative importance of the forest products industry to the overall Tennessee economy. The model used was the IMpact Analysis for Plan ning (IMPLAN) model, developed originally by the USDA Forest Service in cooperation with the Federal Emergency Management Agency (FIMA) and the University of Minnesota.

The IMPLAN model is an input-output model used to generate aggregate statistics for various sectors of the Tennessee economy. IMPLAN creates regional Input/Output (I/O) social accounts using the national input-output tables as a base. The national I/O tables are regionalized into county or state area by using estimated regional purchase coefficients (RPC). The regional RPCs for a particular industry show the share of the regional demand that is supplied by the regional producers. The 1994 IMPLAN database for Tennessee was used to construct the Tennessee State model. The Minnesota IMPLAN Group, Inc. (IMPLAN 1998) provided the database used in this study.

To create the Tennessee state model, current data for almost all agricultural sectors, logging camps and logging contractors sectors were adjusted from the Tennessee Agricultural Statistics and Tennessee Department of Agriculture Division of Forestry (U.S. Dept. of Commerce Census of Manufacturers, 1994; Lindall 1997; Munn 1998). Each sector was impacted separately. When aggregating the

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4 To obtain a complete table of results from the overall IMPLAN model showing the Aggregation
furniture sector, in order to avoid double counting, the regional purchase coefficients (RPC) for logging and solid wood products aggregated sectors were set to zero value (Tanjuakio et al. 1996).

One of the assumptions of I/O analysis is that each sector produces a single output with a simple input structure and that there is no substitution between the output of different sectors. It is important to note that: (a) all products of a single sector should be either perfect substitutes for one another or they should be used in strictly fixed proportion and; (b) each sector should have a single input structure.

RESULTS
Tables 1, 2, 3 and 4 show the direct effects on Tennessee’s economy through the industry aggregation used. For each industry aggregation, employment, wages and salaries, output, and value-added are reported. The forest products industry is divided into logging, solid wood products, wood furniture, and pulp and paper sectors. In 1994, the forest products industry employed 66,947 people and paid about $2.28 billion in wages. The industry also generated an industry output of about $9.0 billion, and value-added that totaled over $3.9 billion. These industries (logging, solid wood products, furniture and paper and pulp) made substantial direct contributions to Tennessee’s economy relative to the other industries in Tennessee.

The direct and total effect results from logging, solid wood products, wood furniture and pulp and paper derived from the IMPLAN model for Tennessee are summarized below.

Logging sector
The logging sector includes all establishments engaged in cutting timber and producing rough, round, hewn, or riven primary forestry and wood raw materials (e.g. chips). The logging sector is important to the Tennessee economy in that logging provides wood-based raw materials for the Tennessee forest products industry, but also creates direct and indirect employment and income to Tennessee.

In 1994, the direct and total effects of the logging sector to the State economy were significant (Table 1). This sector employed directly more than 3,911 people in timber harvesting and transportation and paid $59.5 million in wages and salaries (Census of Manufacturer’s data). The industry generated an estimated $181.4 million of industry output and about $79 million of value-added to the Tennessee economy.

<p>| Table 1. Summary of the direct and indirect effects of the logging sector. |
|---------------------------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>Direct effects</th>
<th>Total effects</th>
</tr>
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<tbody>
<tr>
<td>Industrial Output</td>
<td>$181.4 million</td>
</tr>
<tr>
<td>Employment</td>
<td>3,911</td>
</tr>
<tr>
<td>Wages &amp; salaries</td>
<td>$59.5 million</td>
</tr>
<tr>
<td>Value-added</td>
<td>$79 million</td>
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</tbody>
</table>

The total impact of the logging sector in 1994 resulted in the creation of more than 6,620 jobs that paid over $114.3 million in wages and salaries. Timber harvesting generated an additional $292.5 million of total industry output, and $185.2 million of value-added to the overall Tennessee economy. Harvesting and transportation of raw materials (i.e., sawtimber and pulpwood) are essential for firms manufacturing solid wood products, pulp and paper and wood furniture.

Solid wood products sector
A key component of the Tennessee forest products industry is the solid wood products sector. This sector is made up of subgroups including sawmills, veneer mills, reconstituted wood products mills, and firms manufacturing articles made primarily of wood. In 1994, the total impact of the solid wood products sector on the Tennessee economy was substantial. Firms manufacturing solid wood products employed directly and indirectly 19,000 people, and paid $538 million in wages. The total industry output for the solid wood products industry was $2.09 billion and the value-added by manufacturing and its supporting industries exceeded $867 million.

The impact of solid wood products sector in 1994 resulted in the creation of more than 40,600 jobs that paid wages and salaries over $1 billion. The solid wood products sector generated an additional $3.5 billion of total industry output to the State, and added about $1.7 billion of value-added to the Tennessee economy.
Table 2. Summary of the direct and indirect effects of the solid wood products sector.

<table>
<thead>
<tr>
<th></th>
<th>Direct effects</th>
<th>Total effects</th>
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<tbody>
<tr>
<td>Industrial Output</td>
<td>$2.09 billion</td>
<td>$3.5 billion</td>
</tr>
<tr>
<td>Employment</td>
<td>19,000</td>
<td>40,602</td>
</tr>
<tr>
<td>Wages &amp; salaries</td>
<td>$537.5 million</td>
<td>$1.00 billion</td>
</tr>
<tr>
<td>Value- added</td>
<td>$867.6 million</td>
<td>$1.7 billion</td>
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</tbody>
</table>

In 1994, the solid wood products industry had substantial direct, indirect and induced effects to other major economic activities in the State, i.e., construction, transportation and communications, wholesale and retail trade, and financial and real estate sectors.

**Furniture sector**

This sector includes firms that manufacture wood household furniture, wood frames, wood office furniture, and wood partitions and fixtures. In 1994, firms manufacturing wood household furniture had a strong and substantial positive impact on the Tennessee economy. Directly, the furniture sector employed 26,600 workers and paid a total of $779 million in wages and salaries (Table 3). The wood furniture and related products sector directly generated industry output of about $2.66 billion and an associated $1.18 billion of value-added. The impact of the furniture sector in 1994 resulted in the creation of more than 60,700 jobs that paid wages and salaries over $1.5 billion. The wood and paper sector generated an additional $292.5 million of total industry output, and about $98.6 million of value-added. The indirect and induced effects of the pulp and paper sector had a major impact on the wholesale and retail trade, service, petroleum and chemicals, transportation and communications, construction, and utility sectors.

Table 3. Summary of the direct and indirect effects of the furniture sector.

<table>
<thead>
<tr>
<th></th>
<th>Direct effects</th>
<th>Total effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Output</td>
<td>$2.66 billion</td>
<td>$5 billion</td>
</tr>
<tr>
<td>Employment</td>
<td>26,600</td>
<td>60,776</td>
</tr>
<tr>
<td>Wages &amp; salaries</td>
<td>$779 million</td>
<td>$1.5 billion</td>
</tr>
<tr>
<td>Value- added</td>
<td>$1.18 billion</td>
<td>$2.5 billion</td>
</tr>
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The percentage share of the major forest products sectors, as related to the total effects of total industry output, employment, wages and value-added for the aggregated forest sectors, are shown in Figures 1, 2, 3 and 4.

The impact of the pulp and paper sector in 1994 resulted in the creation of more than 54,800 jobs that paid wages and salaries over $1.7 billion. The pulp and paper sector generated an additional $292.5 million of total industry output, and about $98.6 million of value-added. The indirect and induced effects of the pulp and paper sector had a major impact on the wholesale and retail trade, service, petroleum and chemicals, transportation and communications, construction, and utility sectors.

The percentage share of the major forest products sectors, as related to the total effects of employment shown in

6 To obtain a complete table of results from the IMPLAN model showing the total effects of the Tennessee forest products industry contact the Tennessee Forest Products Center, University of Tennessee, Knoxville, Tennessee.
Figure 2 indicate that the furniture sector contributed about 38%, pulp and paper 35% and solid wood products 20%, respectively.

For value-added, the percentage of the aggregated forest sectors related to total effects in 1994 show that the pulp and paper and furniture industries contributed about 42% and 34 %, respectively (Figure 3).

In 1994, the Tennessee pulp and paper industry showed the highest percentage of total effect in wages, about 49% (Figure 4). Combined, the furniture and solid wood products industries contributed about 50 percent of the total effects in wages.

CONCLUSION
The 1994 data used for this study were the most recent available. The Tennessee input-output economic model results indicated that in 1994, the Tennessee forest products industry directly employed 66,947 people and paid about $2.28 billion in wages. Also, value-added generated directly by the forest products industry totaled over $3.9 billion. When the forestry sector of the Tennessee economy produces products or services to meet demand, the overall State economy is affected in three ways: directly, indirectly and with induced effects. The total effect on the state economy is the sum of these three separate effects. Therefore, in 1994, relative to other Tennessee industries, the total effect of the forest products industries was 158,833 jobs, over $3.5 billion in wages and salaries, $15.5 billion of industrial output, and over $7.5 billion of value-added.

It is important to know that the forest products industry is essential to the Tennessee’s economy because expansion in the Tennessee forest products industry will foster economic growth. Expansion in the forest products industry would be useful to the legislators and other public officials who influence and create policies and programs affecting economic development. Also, it can be important to businessmen in the forest products industry who make investment and disinvestment decisions.

LITERATURE CITED


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Figure 4. Percent share of the aggregated forest sectors related to the total effects in wages and salaries, 1994.