

## **Economic Contribution of Mississippi's Forest Products Industry over Time**

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### **Abstract**

Monitoring the economic contribution of the forest products industry is very important as it provides baseline information for planners and policy makers. Time series analysis and documentation of economic data are helpful in addressing critical economic issues and in understanding important industry trends. With the advent of Impact Analysis for Planning (IMPLAN), an input-output modeling system, it has been much easier to model the economic impact of forest industries and observe changes in these sectors over time. This study uses IMPLAN to estimate the economic impact of the forest industry in Mississippi. Forests covering approximately 65% of total land area of Mississippi are one of the major contributors to the state economy. Over the past decade, Mississippi's forest industries have experienced significant contractions. Examining the economic impact of the forest industry over this time period provides insights into how those changes have impacted the Mississippi economy and how the forest products industry's contribution has changed over time. The proposed analysis will update baseline economic information on the contribution of the forest products industry to the Mississippi economy, and the results of this analysis will be useful to planners and policy makers concerned with strengthening the economic health of these sectors.

**Keywords:** input-output modeling, IMPLAN, economic impact

## **Introduction**

Total economic value of global forest-based industry was US \$468 billion employing 13.7 million people in 2006 (Forest product industry technological road map 2010). The southern United States is one of the largest producers of timber products in the world (Prestemon and Abt 2002). Among the southern U.S. states, the percentage of state employment engaged in the forest products industry is greatest in Mississippi (Tilley and Munn 2007). Thus, forest resources are a major economic asset for Mississippi.

Forestland covering 19.7 million acres (65%) of total land area of Mississippi (Oswalt and Bentley 2011) is one of the major contributors to the state economy. The forest products industry affects the state's economy in three major ways, direct (initial impact), indirect (secondary impact), and induced (impact generated by direct and indirect impact) effects. These impacts are measured by several factors such as employment, salaries and wages, value-added, and total industry output. As input-output modeling, developed by Wassily Leontief, includes all of these impacts (direct, indirect, and induced) on the economy, it is one of the best models to estimate the economic impacts of the forest products industry. With the development of Impact Analysis of Planning (IMPLAN) by the Minnesota IMPLAN Group (MIG), an input-output modeling system that is updated annually, it has been much easier to model the economic impact of industries and to estimate the changes over time.

In 1998, the forest products industry contributed \$14.8 billion in total industry output and 151,632 jobs (direct, indirect and induced effects) to Mississippi's economy (Munn and Henderson 2002). In 2006 the industry contributed \$17.4 billion in total industry output and 123,659 jobs (Henderson et al. 2008). The economic contribution of the forest products industry clearly changes over time. Changes in the forest products sectors have larger impacts on state, regional, and national economies. Over the past decade, Mississippi's forest industries went through significant contraction. Thus, monitoring economic contribution over time is necessary to update baseline economic information.

The purpose of this study is to estimate 2010 economic impacts of the forest products industry in Mississippi and to compare and contrast the study results with Munn and Henderson (2002) and Henderson et al. (2008). Results from this study will provide a detailed picture of how economic changes have impacted the Mississippi economy and how the forest products industry's contribution has changed over time. In addition, this study will also document important trends in the industry. Economic information pertaining to the forest products industry is essential for policy makers to address critical economic issues and to strengthen the economic health of these sectors.

## **Material and methods**

### **Data specification**

Primary data for the analysis of the forest products industry's economic impacts were obtained from MIG. MIG provides IMPLAN databases that are updated annually and software to analyze those data. IMPLAN is used widely in different economic-related fields because it is powerful, user friendly and is based on Leontief's input-output model. IMPLAN was originally developed by the USDA Forest Service in collaboration with the Federal Emergency Management Agency and the USDI Bureau of Land Management (MIG 2004). To estimate current 2010 economic

impacts of the forest products industry in Mississippi, an input-output model of the Mississippi economy was constructed using IMPLAN and 2010 data. Results from the 2010 model were compared to 1998 (Munn and Henderson 2002) and 2006 (Henderson et al.2008).

## Data analysis

This study aggregated 440 IMPLAN sectors into 31 sectors that consist of four major forest products sectors, one miscellaneous forest products sector, and 26 non-forestry related sectors. This procedure follows Barnett and Reinschmeidt (1996). But the major focus was given to the four major forest product sectors and the impacts were estimated as the direct impact made by those sectors and the indirect and induced impacts made by each of the forest product sector to the other 27 sectors. Impacts were measured in terms of employment, wages and salaries, total industry output, and value-added.

The four major forest product sectors were logging, solid wood products, wood furniture, and pulp and paper sectors. Estimation of economic impacts were first made for the individual forest products sectors and then for the forest products industry as a whole. Except for the logging sector, direct, indirect, and induced impacts were estimated using IMPLAN data (2010). For the logging sector, total industry output was obtained from 2010 Harvest of Forest Products (Henderson 2011). Data were analyzed using IMPLAN V3.0 software based on North American Industrial Classification System (NAICS). IMPLAN models were constructed for Mississippi to generate direct, indirect and induced impacts for four major forest products sector using 2010 IMPLAN data and all impacts were measured in 2010 dollars.

## Results

### A. 2010 Economic impacts of the forest products industry in Mississippi

In 2010, the forest products industry comprised 4.32% of Mississippi's total economy and generated about 2.4% of the state's total employment. Average annual wages in the industry were \$5,897 greater than the state average. Total forest products industry output and value-added were \$7.66 and \$2.44 billion (Table 1). The wood furniture sector was the largest sector in the forest products industry.

**Table 1. Direct effects of the forest products industry for the aggregated economic sector (2010).**

Model Sectors	Employment	Wages and Salaries (\$MM)	Total Industry Output (\$MM)	Value-added (\$MM)
Miscellaneous Forest Products	449	32.91	195.79	102.56
Logging	5,734	244.35	1,042.39	239.28
Solid Wood Products	8,443	391.06	1,710.46	541.64
Wood Furniture	17,882	654.90	2,654.62	937.44
Pulp and Paper	3,623	309.24	2,063.57	616.42
Non-forestry related sector	1,455,935	56,984.58	169,945.61	81,546.14
Total Sectors	1,492,066	58,617.05	177,612.44	83,983.49

## Total economic impacts generated by each of the forest products industry sector

### Logging

The logging sector includes commercial logging. In 2010, the value of Mississippi's timber harvest at the point of first processing was \$1.04 billion (Henderson 2011). This total industry output value was used to construct an IMPAN model for the logging sector to generate indirect and induced impacts. 5,734 people were directly employed by the logging sector with \$244.35 million wages and salaries, and value-added was \$239.28 million (Table 1). The average annual wage was \$42,614. Table 2 shows indirect and induced impacts generated by the logging sector in rest of the economy. Logging sector generated 10,474 additional jobs with \$419.05 million wages. Additional total industry output was \$1.53 billion and value-added was \$512.74 million.

**Table 2. Total impacts of the logging sector for the aggregated economic sector (2010).**

Model Sectors	Employment	Wages and Salaries (\$MM)	Total Industry Output (\$MM)	Value-added (\$MM)
Miscellaneous Forest Products	262	19.21	114.29	59.87
Logging <sup>a</sup>	5,734	244.35	1,042.39	239.28
Solid Wood Products	19	0.87	4.07	1.00
Wood Furniture	3	0.09	0.37	0.13
Pulp and Paper	1	0.05	0.28	0.08
Non-forestry related sector	4,740	174.70	491.91	273.46
Total Sectors	10,474	419.05	1,534.30	512.74

<sup>a</sup> Direct impacts of logging sector.

### Solid Wood Products

The solid wood products sector includes sawmills and wood preservation; veneer and plywood manufacturing; engineered wood members and truss manufacturing; reconstituted wood products manufacturing; wood container and pallet manufacturing; prefabricated wood building manufacturing; all other miscellaneous wood product manufacturing; and custom architectural woodwork and millwork manufacturing.

The solid wood products sector directly provided 8,443 jobs with \$391.06 million wages. Total industry output from the solid wood products sector was \$1.71 billion and value-added was \$541.64 million (Table 1). The average annual wage was \$46,317.

Including indirect and induced effects, the solid wood products sector generated 17,321 jobs, \$727.79 million in wages and salaries, \$2.73 billion in total industry output, and \$1.04 billion in value-added (Table 3).

**Table 3. Total impacts of the solid wood products sector for the aggregated economic sector (2010).**

Model Sectors	Employment	Wages and Salaries (\$MM)	Total Industry Output (\$MM)	Value-added (\$MM)
Miscellaneous Forest Products	174	12.77	75.94	39.78
Logging	1,266	53.94	230.10	52.82
Solid Wood Products <sup>a</sup>	8,443	391.06	1,710.46	541.64
Wood Furniture	22	0.79	3.17	0.94
Pulp and Paper	4	0.24	1.46	0.35
Non-forestry related sector	7,413	268.99	712.51	403.68
Total Sectors	17,321	727.79	2,733.64	1,039.22

<sup>a</sup> Direct impacts of solid wood products sector.

### Wood Furniture

The wood furniture sector includes wood windows and door and millwork manufacturing; wood kitchen cabinet and countertop manufacturing, upholstered household furniture manufacturing; non-upholstered wood household furniture manufacturing; and office furniture.

Direct impacts of the wood furniture sector are shown in Table 1. The wood furniture sector generated 17,882 jobs and paid \$654.90 million in wages. The average annual wage generated by this sector was \$36,623. Total industry output was \$2.65 billion and value-added was \$937.44 million.

Impacts of the wood furniture sector on Mississippi's economy are illustrated in Table 4. The wood furniture sector generated 28,867 total jobs and \$1.05 billion wages. Total industry output was \$3.84 billion and value-added was 1.55 billion.

**Table 4. Total impacts of the wood furniture sector for the aggregated economic sector (2010).**

Model Sectors	Employment	Wages and Salaries (\$MM)	Total Industry Output (\$MM)	Value-added (\$MM)
Miscellaneous Forest Products	16	1.16	6.93	3.63
Logging	111	4.73	20.17	4.63
Solid Wood Products	516	24.45	110.06	30.68
Wood Furniture <sup>a</sup>	17,882	654.90	2,654.62	937.44
Pulp and Paper	30	1.83	11.01	2.51
Non-forestry related sector	10,313	371.49	1,044.22	566.90
Total Sectors	28,867	1,058.56	3,847.01	1,545.79

<sup>a</sup> Direct impacts of wood furniture sector.

## Pulp and Paper

The pulp and paper sector includes pulp mills; paper mills; paperboard mills; paperboard container manufacturing; coated and laminated paper, packaging paper and plastics film manufacturing; all other paper bag and coated and treated paper manufacturing; sanitary paper product manufacturing; and all other converted paper product manufacturing.

Table 1 depicts the direct impact of the pulp and paper sector which generated 3,623 jobs and paid \$309.24 million in wages. The average annual wage was \$85,361. Total industry output was \$2.06 billion and the value-added was \$616.42 million.

Employment generated by this sector through direct, indirect and induced effects was 10,875 with wages of \$ 592.82 million, total industry output of \$2.90 billion, and value-added of \$1.06 billion (Table 5).

**Table 5. Total impacts of the pulp and paper sector for the aggregated economic sector (2010).**

Model Sectors	Employment	Wages and Salaries (\$MM)	Total Industry Output (\$MM)	Value-added (\$MM)
Miscellaneous Forest Products	16	1.16	6.92	3.62
Logging	273	11.64	49.68	11.40
Solid Wood Products	210	9.14	39.55	10.86
Wood Furniture	8	0.27	1.09	0.34
Pulp and Paper <sup>a</sup>	3,623	309.24	2,063.57	616.42
Non-forestry related sector	6,746	261.36	738.39	413.36
<b>Total Sectors</b>	<b>10,875</b>	<b>592.82</b>	<b>2,899.20</b>	<b>1,056.00</b>

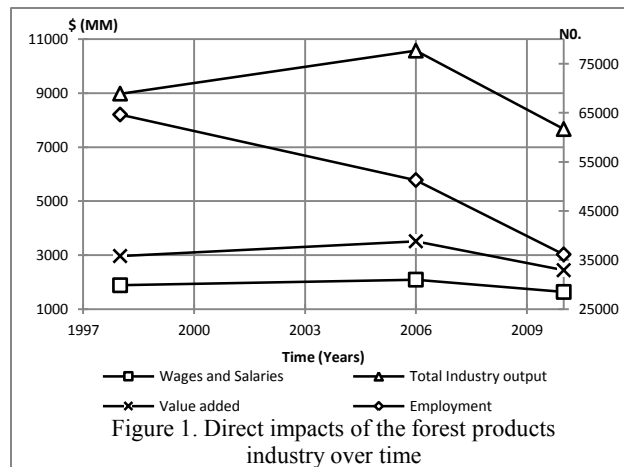
<sup>a</sup> Direct impacts of pulp and paper sector.

## Total forest product industry impact

Including direct, indirect and induced effects, the forest product industry sector generated 63,365 jobs and paid \$2.63 billion of wages. Total industry output was \$10.38 billion and value-added was \$3.95 billion.

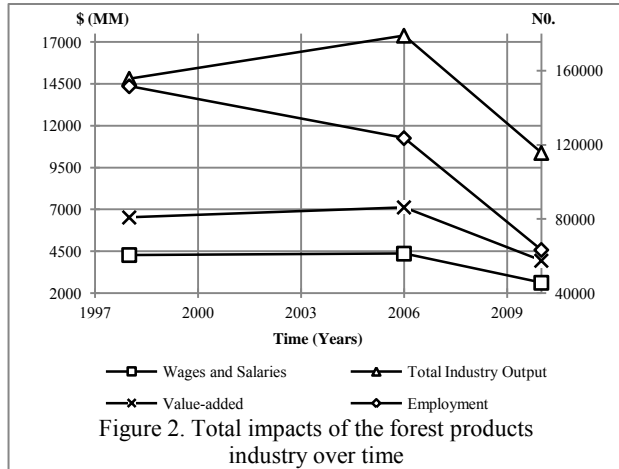
### B. Impacts of the forest products industry over time

From 1998 to 2006, the forest products industry direct impacts were increasing. Except for direct employment which decreased by 20.66%, all other measures increased. Wages and salaries, total industry output, and value-added increased by 11.13%, 17.74% and 18.47%, respectively (Figure 1). Total impacts followed the same pattern as the direct impacts. Total employment decreased by 18.45% whereas



wages and salaries, total industry output, and value-added increased by 1.98%, 17.36% and 9.19%, respectively (Figure 2).

From 2006 to 2010, the forest products industry impacts severely declined. Direct impacts decreased by 21.81%, 27.50%, 30.57% and 29.55% in wages and salaries, total industry output, value-added, and employment, respectively (Figure 1). Decreases in total impacts were even more severe. Employment, wages and salaries, total industry output, and value-added decreased respectively by 48.46%, 39.83%, 40.27% and 44.63% (Figure 2).



As a percentage of the state's total economy, the contribution of the forest products industry decreased from 1998 to 2006 which further decreased severely by 2010. The forest products industry represented 10.24%, 12.44%, 13.23% and 11.22% to state's employment, wages and salaries, total industry output, and value-added in 1998. These measures decreased to 8.27%, 9.16%, 10.05% and 9.37%, respectively, by 2006 and further decreased to 4.25%, 4.48%, 5.84% and 4.70%, respectively, by 2010.

## Discussion

The objective of this study is to estimate direct, indirect and induced impacts of the forest products industry to Mississippi's economy in 2010 and to compare the changes in economic contribution since 1998. The results depict two major findings 1) the forest products industry remains an important component of Mississippi's economy even though it accounts for a smaller percentage of the total state economy, and 2) the trend of the forest products industry's impact is decreasing severely after 2006.

Based on total industry output, the forest products industry in 2010 represents 4.32% of the total economy of Mississippi which was 8.02% in 1998 (Munn and Henderson 2002). Although the forest products industry represents 6.12% to total economy in 2006, which seemed to be decreased from 1998, economic contribution of the forest products industry increased by 17.74% from 1998 to 2006. However, it decreased by 27.50% by 2010. Therefore, we can say that the forest products industry has been severely affected after 2006. From 1998 to 2010, the wood furniture sector remained the highest direct employment generator among the entire forest products sector.

Comparing economic contribution of the forest products industry from 1998 (Munn and Henderson 2002) to 2006 (Henderson et al. 2008), the forest product industry is doing fairly well. However, after 2006, the trend of the forest products industry severely decreased. Sharp decline in housing and construction activities and the recent economic recession are the major factors that adversely affected the forest products industry. Solid wood products and wood furniture sectors are closely related with housing and construction. Thus, decrease in housing and



construction made a severe impact on the forest products industry. In addition, the recession related decrease in advertising and packaging also negatively impacted the pulp and paper sector.

## **Conclusion**

The findings of this study reveal that the forest products industry is one of the major contributors to Mississippi's economy; however, the size of that contribution over time is in a decreasing trend. This study provides an update to baseline economic information on the forest products industry, which is very helpful to policy makers to promote economic health of the forest products industry, address critical economic issues pertaining to these sectors and to return the forest products industry's economic contribution over time to a positive trend.

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