

Evaluating the Change in Regional Economic Contributions  
of Forest-Based Industries in the South<sup>1</sup>

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## **Abstract**

Forestry is the dominant land-use in the South and forest-based industries have a major impact on the region's economy. This impact, however, has been changing over time both in terms of relative magnitude and location within the region. These changes have policy implications for the industry and its constituents. The economic impact of the forest-based industry was assessed for the region and individually for the 13 states comprising the region. This impact was modeled using the computer software Impact Analysis for Planning (IMPLAN) and data for 2001. Results were compared to a similar assessment from the early 1990's by Aruna et al. (1997) to determine changes in the relative importance of the industry to the region's economy over time. The number of individuals employed in forest-based industries over this time period increased by 84,800 full- or part-time jobs to 718,000, but as a percentage of total employment in the South, decreased from 1.5% to 1.3%. The forest-based industries value of shipments increased by \$54 billion to \$124 billion and increased as a percentage of the total manufacturing value of shipments from 7.8% to 9.6%. Manufacturing value-added also increased by \$24 billion to \$56 billion and the percentage of total manufacturing value-added increased from 8.0% to 9.1%. This indicated that, while the industry expanded in both absolute terms and as a percentage of the regional economy, it became relatively less labor intensive.

## **Introduction**

Forest-based industries in the South provide a major contribution to the state economies (Leatherman and Marcouiller 1999). The forest-based industry in the southeastern U.S. has become a leading supplier of the country's forest products, supplying 60 % of the Nation's forest products (Prestemon and Abt 2002). As demand from forest-based industries increases, their contribution to the economy will also become more prominent. The predominant land cover type of most southern states is timber land (Wear 2002). This resource base allows forest-based industries to obtain their raw materials almost exclusively from local supplier inputs, thereby increasing their economic contribution. A resource base of over 199 million acres of timber land in the South provides an opportunity for increased importance of the southern forest-based industry (Abt et al. 2002). Most southern states are generally rural areas in which forest-based industries are a major employer. Without the operation of these industries many states would lose an important component of their economic activity (Munday and Roberts 2001).

Aruna et al. (1997) performed a study using Impact Analysis for Planning (IMPLAN) to determine the economic contributions of each southern state's forest-based industry. Their study, based on the 1992 IMPLAN database, provided employment and multipliers for output, value added, income, and employment resulting from forest-based industries. Southern forest-based earnings were obtained from the American Forest and Paper Association's Facts and Figures report for 1990. The U.S. Department of Commerce 1991 Annual Survey of Manufacturers report was used for value of shipments, manufacturing value-added, and Gross State Product (GSP). The forest-based industry's economic contribution of each state was compared with that of the other states to determine its relative importance to the economy. The purpose of this project is to evaluate the change in the economic contributions of forest-based industries in the South since 1992. By evaluating changes in the forest-based industries' contribution to the southern economy, important trends in the industry can be identified (e.g. relative and absolute importance and geographic changes within the region.)

## **Objectives**

1. Determine the economic contribution of forest-based industries for each of 13 southern states and the region by calculating employment, earnings, value of shipments, and value-added using comparable data.
2. Determine the relative importance of forest-based industries to the state economies.
3. Compare and contrast our results to those found by Aruna et al. (1997) and discuss similarities/differences and changes over time.

## **Methods**

Data comparable to that used by Aruna et al. (1997) was used to evaluate changes since 1992 and the current state of the forest-based industries in the South. The 2001 IMPLAN database used in our study reflected the reconfiguration in the sector classification used by IMPLAN from 528 sectors to 509 sectors. The Minnesota IMPLAN Group (MIG, Inc.) provided information on

how the new sectors related to the old. This was used to aggregate the 2001 data comparable so it was to the 1992 data Aruna et al. (1997) used.

The 2001 IMPLAN sectors were aggregated into three sectors, lumber and wood products, paper and allied products, and wood furniture which follow. The lumber and wood products sector consisted of logging; sawmills; wood preservation; reconstituted wood product manufacturing; veneer and plywood manufacturing; engineered wood member and truss manufacturing; cut stock, resawn lumber, and planing; other millwork, including flooring; wood container and pallet manufacturing; prefabricated wood building manufacturing; and miscellaneous wood product manufacturing sectors. The paper and allied products sector contained pulp mills; paper and paperboard mills; paperboard container manufacturing; surface-coated paperboard manufacturing; coated and laminated paper and packaging materials; coated and uncoated paper bag manufacturing; die-cut paper office supply manufacturing; envelope manufacturing; sanitary paper product manufacturing; and all other converted paper product manufacturing sectors. The wood furniture sector consisted of wood windows and door manufacturing; wood kitchen cabinet and countertop manufacturing; upholstered household furniture manufacturing; nonupholstered wood household furniture manufacturing; institutional furniture manufacturing; other household and institutional furniture; wood office furniture manufacturing; custom architectural woodwork and millwork; and showcases, partitions, shelving, and lockers sectors. These aggregated sectors were used to obtain forest-based employment data and economic multipliers for employment, total and personal income, total output, and value-added.

Forest-based earnings were obtained from the American Forest and Paper Association's Forest Facts and Figures 2001 report, which reported 1998 data. Manufacturing value-added, manufacturing value of shipments, and gross state product values were obtained from the U.S. Department of Commerce, 2001 Annual Survey of Manufacturers. These data were collected for the region as a whole and each of the 13 individual states comprised Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

To determine the relative importance of the forest-based industries to each state's economy, an average ranking of employment, earnings, value of shipments, and value-added was computed for the Aruna (1997) and the current data. Individual rankings were constructed using the percentage of the economy each factor accounted for in each state. The state with the highest percentage was ranked first, the second highest percentage second, and for each state. The four ranks were summed and divided by four to determine the average state rank. This provides a rough measure of the relative importance to the forest-based industries to the state economy because it measures the importance in relation to the rest of the economy.

## **Results**

In 2001, southern forest-based industries employed 718,176, up from 633,367 jobs in 1992 (Table 1). Although the region and each state experienced an increase in total employment over this time period, there was a resulting decrease in the relative employment from 1.5% in 1992 to 1.3% in 2001. Forest-based employment in the South decreased as a percentage of total U.S. forest-based employment from 39.9% to 39.0%. Alabama and Virginia were the only two states

to have a decline in total forest-based employment over this time period, losing 2,142 and 1,580 jobs, respectively, accounting for 3.6% and 2.6% of their 1992 forest-based employment. Mississippi and Kentucky were the only two states in which forest-based industries increased in relative terms, accounting for an additional 0.6% and 0.1%, respectively, of total state employment. Employment in the lumber and wood products sector increased only in Louisiana and Oklahoma, while the South increased from 34.8% in 1992 to 41.5% in 2001 relative to the total U.S. lumber and wood products sector employment. Employment in the wood furniture sector increased in every state and the region, but decreased as a percentage of total U.S. wood furniture sector employment, from 57.2% to 39.7%. Arkansas, Kentucky, South Carolina, and Texas were the only states that had increases in paper and allied products sector employment, but employment in the South still increased from 28.1% of U.S. paper and allied products sector employment in 1992 to 35.2% in 2001.

Forest-based industries earnings increased \$3.3 billion in nominal dollars for the region from 1990 to 1998, but as a percentage of total earnings in the South, decreased from 1.4% to 1.3% (Table 2). Florida, North Carolina, Tennessee, and Virginia also experienced a decrease. Earnings from each of the southern forest-based industries sectors increased as a percentage of total U.S. earnings in the paper and allied products sector from 31.5% to 34.0% and in the lumber and wood products sector from 34.8% to 39.4%. Even though southern forest-based employment decreased as a percentage of total U.S. employment, southern forest-based earnings increased as a percentage of total U.S. forest-based earnings from 33.1% in 1990 to 36.5% in 1998.

Value of shipments from southern forest-based industries increased in nominal dollars for the region and each state and accounted for 39.5% of the total U.S. forest-based value of shipments in 2001 (Table 3). Louisiana's forest-based value of shipments, as a percentage of total manufacturing value of shipments more than doubled, increasing from 3.0% to 7.3% between 1991 and 2001. Mississippi experienced the largest increase in forest-based value of shipments as a percentage of the state's total manufacturing value of shipments of 6.8%, from 15.5% to 22.3%. Value of shipments as a percentage of the state total decreased in South Carolina, Oklahoma, and Georgia, but the South overall saw an increase from 7.8% to 9.6%.

Manufacturing value-added attributed to southern forest-based industry increased as a percentage of total manufacturing value-added from 8.0% in 1991 to 9.1% in 2001 (Table 3). Arkansas, South Carolina, and Oklahoma's forest-based value-added decreased as a percentage of total manufacturing value-added, while the other states increased. Mississippi had the largest increase in percentage of total manufacturing value-added from 15.5% to 23.5%. Although Louisiana had the largest increase in manufacturing value of shipments, this increase does not appear to have been captured with a similar increase in manufacturing value-added, with only an increase of 1.5% (10.0% to 11.5%). Value-added as a percentage of Gross Domestic Product (GDP) for the South, which according to the U.S. Census Bureau measures the market value of the goods and services produced by labor and property located in the area, remained unchanged at 1.9% (Table 3). Kentucky, Mississippi, Texas, and Virginia's value-added increased as a percentage of Gross State Product (GSP), indicating that the economic contribution from the forest-based industries in these states increased more than other industries.

There have been substantial shifts within the region over this time period. The paper and allied products sector employment accounted for 33.2% of the total southern forest-based employment in 1992 compared to 27.4% in 2001. Employment in the lumber and wood products sector accounted for 46.8% in 1992, but decreased to 35.5% in 2001. Wood furniture sector employment increased from 18.5% to 36.2% over the same time period.

Mississippi ranked first in every category but forest-based earnings, and had an overall rank of 1.3 (Table 4). Arkansas and Alabama were ranked 2<sup>nd</sup> and 3<sup>rd</sup> with scores of 2.3 and 2.8 respectively, and were in the top three with Mississippi in every category except forest-based earnings where Alabama ranked 4<sup>th</sup>. The next closest ranking was Georgia with a score of 5.3, nearly twice the 3<sup>rd</sup> ranked state. In 1992, Arkansas ranked first in all four categories, with Mississippi and Alabama at 2<sup>nd</sup> and 3<sup>rd</sup> scoring 2.0 and 2.25, respectively. Georgia was ranked 4<sup>th</sup> with a score of 2.25, more than twice the 3<sup>rd</sup> place score. Overall, there was relatively little change in the rankings. North Carolina had the largest absolute change in relative score from 7.5 in 1992 to 6.0 in 2001 and went from 8<sup>th</sup> place to being tied with South Carolina for 6<sup>th</sup> place.

## Conclusions

Forest-based industries in the South were less labor intensive in 2001 than in 1992 and account for a smaller percentage of total U.S. forest-based employment. However, the industry accounted for the same percentage of total southern earnings and a larger percentage of total U.S. forest-based earnings. Forest-based industries have become more important in terms of manufacturing, comprising a larger percentage of manufacturing value of shipments and manufacturing value-added than in 1992. Despite this increase, forest-based industry manufacturing value-added accounted for the same percentage of the South's GDP, indicating that other, non-manufacturing sectors have increased in importance in the economy to offset the increase in terms of manufacturing. In relative terms, forest-based industries are more important in Mississippi, Arkansas, and Alabama than in other states because they were the top three states in forest-based earnings, value of shipments, and value-added in terms of state total and in the top four in employment, thus decreases in forest-based industries would have a larger impact.

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Table 1a. 1992 Southern forest-based employment from 1992 IMPLAN database (Aruna et al. 1997).

	Total State		Paper and Allied	Wood	Lumber and	Total	Total
State	Employment	Forestry	Products	Furniture	Wood Products	Forest-Based	Forest-Based as % of Total State
	number of employees						%
Alabama	2,129,834	849	21,148	5,867	30,969	58,833	2.8
Arkansas	1,274,478	316	14,172	5,370	22,509	42,367	3.3
Florida	7,111,231	1,570	13,464	5,667	19,210	39,911	0.6
Georgia	3,768,056	1,405	31,228	4,714	28,960	66,307	1.8
Kentucky	2,016,886	245	8,904	2,404	16,454	28,007	1.4
Louisiana	2,060,312	402	12,214	455	13,039	26,110	1.3
Mississippi	1,249,574	305	8,970	4,154	28,101	41,530	3.3
North Carolina	4,055,213	591	22,714	46,023	38,893	108,221	2.7
Oklahoma	1,696,144	122	3,911	1,271	3,699	9,003	0.5
South Carolina	1,953,687	992	11,848	3,375	15,296	31,511	1.6
Tennessee	2,873,863	423	21,247	11,762	21,438	54,870	1.9
Texas	9,354,518	974	23,638	7,795	32,558	64,965	0.7
Virginia	3,776,416	1,310	16,647	18,598	25,177	61,732	1.6
South Total	43,320,212	9,504	210,105	117,455	296,303	633,367	1.5
U.S. Total	139,676,090	33,764	701,800	205,190	852,200	1,587,764	1.1
South % of U.S.	31.0	28.1	29.9	57.2	34.8	39.9	

Table 1b. 2001 Southern forest-based employment from 2001 IMPLAN database.

	Total State		Paper and Allied	Wood	Lumber and	Total	Total
State	Employment	Forestry	Products	Furniture	Wood Products	Forest-Based	Forest-Based as % of Total State
	number of employees						%
Alabama	2,421,223	338	16,356	14,530	25,467	56,691	2.3
Arkansas	1,517,570	546	13,479	9,926	20,362	44,313	2.9
Florida	9,172,732	838	11,614	19,008	17,077	48,537	0.5
Georgia	4,964,658	1,018	27,910	16,144	26,761	71,833	1.4
Kentucky	2,327,652	57	10,616	8,415	16,047	35,135	1.5
Louisiana	2,502,534	548	10,542	1,732	13,544	26,366	1.1
Mississippi	1,481,891	459	7,762	27,121	21,748	57,090	3.9
North Carolina	4,924,710	517	21,148	71,997	29,921	123,583	2.5
Oklahoma	2,064,469	113	2,930	3,753	4,265	11,061	0.5
South Carolina	2,280,026	381	14,736	6,129	13,121	34,367	1.5
Tennessee	3,472,042	209	20,573	23,762	17,172	61,716	1.8
Texas	12,638,113	835	26,004	32,058	28,435	87,332	0.7
Virginia	4,523,325	175	13,367	25,914	20,696	60,152	1.3
South Total	54,290,945	6,034	197,037	260,489	254,616	718,176	1.3
U.S. Total	168,743,115	11,875	559,692	655,420	613,772	1,840,759	1.1
South % of U.S.	32.2	50.8	35.2	39.7	41.5	39.0	

Table 2a. 1990 Southern forest-based earnings by state and forest-based sector (Aruna et al. 1997).

State	Total State Earnings	Forestry	Paper and Allied Products	Lumber and Wood Products	Total Forest-Based	Total Forest-Based as % of Total State
	millions \$					%
Alabama	43,672	22	963	687	1,672	3.8
Arkansas	23,617	17	484	481	982	4.2
Florida	150,022	18	513	545	1,076	0.7
Georgia	85,021	32	1,245	782	2,059	2.4
Kentucky	39,235	0	309	286	595	1.5
Louisiana	43,561	9	527	308	844	1.9
Mississippi	22,622	11	331	618	960	4.2
North Carolina	82,612	8	827	883	1,718	2.1
Oklahoma	33,764	1	129	79	209	0.6
South Carolina	39,208	37	659	365	1,061	2.7
Tennessee	58,349	3	743	490	1,236	2.1
Texas	214,975	14	868	761	1,643	0.8
Virginia	86,737	2	612	646	1,260	1.5
South total	923,395	174	8,210	6,931	15,315	1.7
U.S. total	3,378,897	350	26,024	19,938	46,312	1.4
South % of U.S.	27.3	49.7	31.5	34.8	33.1	

Table 2b. 1998 Southern forest-based earnings by state and forest-based sector.

State	Total State Earnings	Forestry	Paper and Allied Products	Lumber and Wood Products	Total Forest-Based	Total Forest-Based as % of Total State
	millions \$					%
Alabama	50,502	38	1,046	961	2,045	4.0
Arkansas	26,612	19	571	543	1,134	4.3
Florida	181,733	39	582	555	1,176	0.6
Georgia	110,011	56	1,464	1,211	2,731	2.5
Kentucky	45,559	0	427	297	724	1.6
Louisiana	49,382	25	543	379	946	1.9
Mississippi	26,648	31	397	682	1,110	4.2
North Carolina	103,644	26	962	1,100	2,089	2.0
Oklahoma	35,419	3	165	92	260	0.7
South Carolina	45,544	44	830	392	1,266	2.8
Tennessee	72,123	6	863	532	1,401	1.9
Texas	266,423	25	1,123	1,154	2,302	0.9
Virginia	103,582	12	798	668	1,478	1.4
South Total	1,117,181	324	9,771	8,567	18,662	1.7
U.S. Total	3,885,668	621	28,736	21,741	51,098	1.3
South % of U.S.	28.8	52.1	34.0	39.4	36.5	

Source: American Forest and Paper Association Facts and Figures 2001 Report

Table 3a. 1991 Southern forest-based industries (FBI) manufacturing sector value of shipments, value-added, and gross state product (GSP).

	Value of Shipments			Manufacturing Value Added			GSP	VA%of GSP
	All	FBI	%	All	FBI	%		
Alabama	48,448	8,051	<b>16.6</b>	21,056	3,652	<b>17.3</b>	74,347	<b>4.9</b>
Arkansas	31,084	5,172	<b>16.6</b>	12,825	2,261	<b>17.6</b>	40,748	<b>5.5</b>
Florida	59,275	4,900	<b>8.3</b>	29,054	1,928	<b>6.6</b>	255,162	<b>0.8</b>
Georgia	82,764	10,529	<b>12.7</b>	36,576	4,414	<b>12.1</b>	143,741	<b>3.1</b>
Kentucky	53,500	2,606	<b>4.9</b>	23,713	954	<b>4.0</b>	70,115	<b>1.4</b>
Louisiana	63,381	1,916	<b>3.0</b>	22,125	2,220	<b>10.0</b>	95,606	<b>2.3</b>
Mississippi	31,196	4,833	<b>15.5</b>	12,880	1,993	<b>15.5</b>	41,704	<b>4.8</b>
North Carolina	118,206	7,497	<b>6.3</b>	59,914	3,164	<b>5.3</b>	147,847	<b>2.1</b>
Oklahoma	28,418	1,631	<b>5.7</b>	11,958	761	<b>6.4</b>	57,983	<b>1.3</b>
South Carolina	47,515	5,431	<b>11.4</b>	22,490	2,597	<b>11.5</b>	66,658	<b>3.9</b>
Tennessee	69,549	4,960	<b>7.1</b>	32,499	2,219	<b>6.8</b>	101,335	<b>2.2</b>
Texas	204,001	7,345	<b>3.6</b>	77,569	3,081	<b>4.0</b>	396,327	<b>0.8</b>
Virginia	61,642	5,284	<b>8.6</b>	33,245	2,346	<b>7.1</b>	174,444	<b>1.3</b>
South Total	898,979	70,155	<b>7.8</b>	395,904	31,590	<b>8.0</b>	1,666,017	<b>1.9</b>

Source: U.S. Department of Commerce, 1991 Annual Survey of Manufacturers

Table 3b. 2001 Southern forest-based industries (FBI) manufacturing sector value of shipments, value-added, and gross state product (GSP).

	Value of Shipments			Manufacturing Value Added			GSP	VA%of GSP
	All	FBI	%	All	FBI	%		
Alabama	67,172	11,769	<b>17.5</b>	27,844	5,197	<b>18.7</b>	120,291	<b>4.3</b>
Arkansas	46,530	7,935	<b>17.1</b>	19,868	3,135	<b>15.8</b>	69,063	<b>4.5</b>
Florida	75,541	7,803	<b>10.3</b>	39,974	3,619	<b>9.1</b>	493,218	<b>0.7</b>
Georgia	127,624	16,118	<b>12.6</b>	57,578	7,545	<b>13.1</b>	296,786	<b>2.5</b>
Kentucky	84,180	6,037	<b>7.2</b>	31,722	2,683	<b>8.5</b>	117,151	<b>2.3</b>
Louisiana	85,488	6,269	<b>7.3</b>	22,545	2,593	<b>11.5</b>	132,899	<b>2.0</b>
Mississippi	38,560	8,597	<b>22.3</b>	15,573	3,657	<b>23.5</b>	66,233	<b>5.5</b>
North Carolina	167,124	17,875	<b>10.7</b>	91,184	8,126	<b>8.9</b>	284,769	<b>2.9</b>
Oklahoma	40,063	2,171	<b>5.4</b>	18,059	1,117	<b>6.2</b>	92,406	<b>1.2</b>
South Carolina	78,738	7,508	<b>9.5</b>	35,017	3,618	<b>10.3</b>	117,757	<b>3.1</b>
Tennessee	104,109	9,296	<b>8.9</b>	46,349	4,215	<b>9.1</b>	180,792	<b>2.3</b>
Texas	321,361	12,876	<b>4.0</b>	120,086	6,049	<b>5.0</b>	744,842	<b>0.8</b>
Virginia	92,874	10,179	<b>11.0</b>	53,043	4,745	<b>8.9</b>	275,725	<b>1.7</b>
South Total	1,329,364	124,432	<b>9.6</b>	578,842	56,300	<b>9.1</b>	2,991,932	<b>1.9</b>

Source: U.S. Department of Commerce, 2001 Annual Survey of Manufacturers

Table 4a. Relative rank of each state in terms of 1992 Southern forest-based employment, earnings, value of shipments, and value-added and average state rank.

State	Rank				Average Rank
	Employment	Earnings	Value of Shipments	Value-Added	
Alabama	3	3	1	2	2.3
Arkansas	1	1	1	1	1.0
Florida	12	12	7	9	10.0
Georgia	6	5	4	4	4.8
Kentucky	9	9	11	12	10.3
Louisiana	10	8	13	6	9.3
Mississippi	1	1	3	3	2.0
North Carolina	4	6	9	11	7.5
Oklahoma	13	13	10	10	11.5
South Carolina	7	4	5	5	5.3
Tennessee	5	6	8	8	6.8
Texas	11	11	12	12	11.5
Virginia	7	9	6	7	7.3

Table 4b. Relative rank of each state in terms of 2001 Southern forest-based employment, earnings, value of shipments, and value-added and average state rank.

State	Rank				Average Rank
	Employment	Earnings	Value of Shipments	Value-Added	
Alabama	4	3	2	2	2.8
Arkansas	2	1	3	3	2.3
Florida	12	13	7	7	9.8
Georgia	8	5	4	4	5.3
Kentucky	6	9	11	11	9.3
Louisiana	10	7	10	5	8.0
Mississippi	1	2	1	1	1.3
North Carolina	3	6	6	9	6.0
Oklahoma	12	12	12	12	12.0
South Carolina	6	4	8	6	6.0
Tennessee	5	7	9	7	7.0
Texas	11	11	13	13	12.0
Virginia	9	10	5	9	8.3