REGIONAL ECONOMIC IMPACTS OF FORESTRY: WHO'S IN FIRST?

P.B. Aruna, Frederick Cubbage, Karen J. Lee, and Clair Redmond[1]

Abstract: Forestry and forest-based industries make substantial direct contributions to the economy of the South, as well as contributing to pleasant living conditions and environmental protection. As of 1992, about 643,000 persons were employed in forest-related industries, comprising 1.5 percent of all southern employment. Total wage earnings received amounted to $15 billion in 1990, or 1.7 percent of all wages paid. Forest-based manufacturing value added, which is the best measure of total *net* contributions for all economic sectors, amounted to $32 billion in 1991. This comprised 1.9 percent of the 1666 billion in gross state product for the southern states. The value of shipments from forest industries, which includes the value added contributed by other sectors as well as forestry, amounted to $70 billion. Multipliers were calculated using IMPLAN for industrial output, employment, value added, regional income, and personal income. They indicate that forest-based industries have substantial indirect and induced effects in the southern economy—up to two or three times the direct impact, depending on the state, sector, and economic measure.

Introduction

Assessing the economic diversity and dependency of the forestry sector in each of the southern states is the first step towards formulating strategies, goals and policies to improve the regional economic growth and development. Each state is unique, but current regional economic information can facilitate economic development effort. Planners and policy makers will be able to use this regional economic information to make better development decisions. Periodic estimates of the economic contributions of southern forests have been made in various states. The most recent integrated South-wide estimates were published in 1996 based mostly on 1984 and 1990 data (Cubbage and Aruna 1996). This paper updates these statistics and discusses their implications.

Methods

Impacts of forestry on the state-level economy were estimated through various sources. Manufacturing based sector employment figures were obtained from the IMPLAN 1992 data base. Total state employment, employment in the forestry sector, and southern forest based manufacturing sector earnings were obtained from an American Forest and Paper Association (AF&PA) report that reported the U.S. Department of Commerce (USDC), Census of Manufactures statistics for 1990. Southern forest based manufacturing sector value of shipments and manufacturing value added were obtained from the 1991 survey of manufacturers (USDC 1991). Value of production of agricultural crops for the southern states were obtained from Statistical Abstract of the United States 1995 and the value of production of timber products were obtained from USDA Forest Service 1988, South's Fourth Forest report.

---

[1]Respectively, Ph.D. Candidate, and Professor and Head, Department of Forestry, North Carolina State University, Raleigh, NC 27695; Research Economist, USDA Forest Service, Southern Research Station, Research Triangle Park, Raleigh, NC 27511; and Economist, USDA Forest Service, Region 8, Atlanta, GA 30367. Paper presented at the 1996 Southern Forest Economics Workshop, Gatlinburg, Tennessee, March 27-29.

Regional economic multipliers were estimated using Micro IMPLAN. IMPLAN is an economic impact analysis system developed by the USDA Forest Service (Alward and Palmer 1983, Alward *et al.* 1985, Taylor *et al.* 1993). This system is based on an input-output model (I/O). Details on input-output theory are provided in Richardson (1972). I/O provides a framework in which to collect, categorize, and analyze data on the interindustry structure and interdependencies of the community's economy. The structure of a regional economy, the relationships between various actors (i.e., industries, institutions such as households and federal, state and local governments) performing different activities is described in the regional economic accounts. Within this structure one actor's expenditures corresponds to other actor's receipts. It is this "backward linked" structure that allows I/O to be used for impact analysis and to develop regional economic multipliers.

The main assumptions behind IMPLAN are: 1) the industry production function is linear, homogeneous, and has constant returns to size; 2) production technology is known and fixed; and 3) changes in relative factor prices will not affect the proportion of a factor used. The only way a given factor or intermediate product will be used is through a change in final demand. Supply is never an issue because IMPLAN assumes infinite supplies available at current prices. This however, limits the magnitude of impact analysis to small changes in a local economy.

Employment

Southern forest-based manufacturing industries make substantial contributions to the economies of each state. Table 1 summarizes the contributions of forest-related employment for the manufacturing sectors of forestry, pulp and paper, wood furniture and lumber. All forest-based sectors in the South employ about 643,000 persons, accounting for 1.5 percent of total employment in the region. The lumber sector employed the most people in forestry manufacturing, with 296,000 employees. The South's Fourth Forest (USDA Forest Service 1988) reported employment figures for 1982 (556,000 jobs), which increased to 643,000 jobs in 1992 (IMPLAN). This is an increase of 1.57 percent per year for these ten years.

Among the southern states, North Carolina ranks the first in terms of total employment in the forest-based manufacturing sector, with 109,000 employees. This is 20.8 percent of employees in this sector in the South and 2.8 percent of the state's total employment. North Carolina is followed by Texas and Georgia. More than 39 percent of all southern wood furniture employees (46,000) work in North Carolina. Virginia and Tennessee followed North Carolina in employment in the wood furniture sector. North Carolina also employed the most people in the lumber sector, with 38,000 employees (13.1% of all southern lumber employment). Georgia employed the most people in the paper sector, with 31,000 employees, followed by Texas and North Carolina. Arkansas had a higher percentage of employees in forestry (3.7%) than did other states, followed by Mississippi (3.6%) and Alabama (3.0%) in 1992. Total forestry employment in the South as a percentage of total U.S. forestry employment was 39.9 percent.

Earnings

Table 2 summarizes the forest related earnings for different manufacturing sectors of forestry. Forest-based earnings (wages) accounted for about $15 billion, or 1.7 percent of all earnings in the South. The pulp and paper sector paid the most in total wages, at $8.2 billion. Thus, this sector had higher wage rates than did the lumber sector, which had more employees and lower total earnings.

Among the southern states, Georgia had higher total forestry related earnings with $2 billion, with 60.5 percent of those earnings from the pulp and paper sector. North Carolina and Alabama ranked second and third. North Carolina ranked first in earnings from the lumber sector ($883 million)

Table 1. Southern forest-based manufacturing sector employment.

State	Total State Employment	Forest-Related Employment					
		Forestry	Paper	Wood Furniture	Lumber	Total Forestry	Forestry Percent of Total
		-- number of employees --					
Alabama	2,037,441	2,358	21,148	5,867	30,969	60,342	3.0
Arkansas	1,204,329	2,331	14,172	5,370	22,509	44,382	3.7
Florida	6,894,294	1,704	13,464	5,667	19,210	40,045	0.6
Georgia	3,686,563	2,330	31,228	4,714	28,960	67,232	1.8
Kentucky	1,923,933	636	8,904	2,404	16,454	28,398	1.5
Louisiana	1,979,125	962	12,214	455	13,039	26,670	1.3
Mississippi	1,196,953	1,449	8,970	4,154	28,101	42,674	3.6
North Carolina	3,861,115	1,675	22,714	46,023	38,893	109,305	2.8
Oklahoma	1,611,353	352	3,911	1,271	3,699	9,233	0.6
South Carolina	1,925,045	1,869	11,848	3,375	15,296	32,388	1.7
Tennessee	2,741,808	944	21,247	11,762	21,438	55,391	2.0
Texas	8,874,650	1,620	23,638	7,795	32,558	65,611	0.7
Virginia	3,686,238	1,187	16,647	18,598	25,177	61,609	1.7
South Total	41,622,847	19,417	210,105	117,455	296,303	643,280	1.5
U.S. Total	137,153,200	59,100	701,800	205,190	852,200	1,613,100	1.2
South Percent of U.S.	30.3	32.9	29.9	57.2	34.8	39.9	

Sources: IMPLAN Database (1992), American Forest and Paper Association (1995)

followed by Georgia and Texas. Paper sector earnings were the highest in Georgia ($1 billion) followed by Alabama and Texas. Non-manufacturing forestry earnings in the South were dominated by South Carolina at $37 million, followed by Georgia and Alabama. Mississippi and Arkansas had the highest earnings from forestry as a percentage of total state earnings at 4.2 percent, followed by Alabama and South Carolina. The South's Fourth Forest reported earnings for 1982, which are comparable to the 1990 American Forest and Paper Association data. Forest industries total wages and salaries in 1982 were $8.5 billion. Thus, nominal earnings have almost doubled, increasing from $8.5 billion in 1982 to $15.3 billion in 1990, excluding the effects of inflation.

Table 2. Southern forest-based manufacturing sector earnings, 1990.

State	Total State Earnings	Forest-Related Earnings				
		Forestry	Paper	Lumber	Total Forestry	Forestry Percent of Total
			-- million dollars --			
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 Percent of U.S.	27.3	49.7	31.5	34.8	33.1	

Source: American Forest and Paper Association 1995

Value of Production, Shipments, Value Added and Gross State Product

The 1995 Statistical Abstract of the United States summarized data on the value of production of agricultural crops for 1994. The value of production of timber products at the point of delivery in 1984 is summarized in South's Fourth Forest (USDA Forest Service 1988).

In total, timber delivered to the mill in the South in 1984 was valued at $6.1 billion. The value of all other agricultural products delivered to processors in 1994 was $24 billion. This is an increase of $5.1 billion or 27 percent compared to $18.9 billion in 1984 (USDA Forest Service 1988). Assuming the same rate of increase in value (27%) for timber products as occured for agricultural products, the value of production of

Table 3. Southern forest-based value of production.

State	Value of Production		Forestry as a Percent of Agriculture
	Agricultural Crops	Timber Products	
		– million dollars –	
Alabama	669	738	110
Arkansas	2,115	413	20
Florida	3,390	390	12
Georgia	1,939	1,003	52
Kentucky	1,954	[a]	[a]
Louisiana	1,350	528	39
Mississippi	2,033	593	29
North Carolina	2,266	573	25
Oklahoma	1,108	64	6
South Carolina	698	468	67
Tennessee	1,232	265	22
Texas	4,419	569	13
Virginia	865	515	60
South Total	24,038	6,119	25

[a] Kentucky data not available for timber products value of production.

Sources: Statistical Abstract of the United States (1995), USDA Forest Service (1988)

timber products in 1994 would be $7.8 billion (Table 3). For the 1984 data, the value of delivered timber in Georgia, South Carolina, and Virginia was equal to more than 50 percent of the total value of agricultural products in each state. In 1984, Georgia ranked the first in the value of production of timber products, followed by Alabama and North Carolina. Alabama ranked the first in the value of production of forestry as a percent of agriculture (110%), followed by South Carolina and Virginia.

Table 4 has summarized the value of shipments, value added for southern forest industries and gross state product for the southern states (USDC 1991). Value of shipments covers the received or receivable net selling values, f.o.b. plant (exclusive of freight and taxes) of products shipped, both primary and secondary, as well as all miscellaneous receipts. The measure of value added by a manufacturer is derived by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments (products manufactured plus receipts for services rendered). The result of this calculation is adjusted by the addition of value added by merchandising operations (the difference between the sales value and the cost of merchandise sold without further manufacture, processing or assembly). Value added avoids the duplication in the figure for some establishments as materials by others. Value added is considered to be the best measure available for comparing the relative economic importance of manufacturing among industries and geographic areas (USDC 1991). It is the statistic used as the basis for measuring the total gross state product (GSP) for a state or gross national product (GNP) for the U.S. Gross state product is the market value of the goods and services produced by the labor and property located in a state and is measured as the sum of gross state product in all industries in a state (USDC 1991).

Table 4. Southern forest-based manufacturing sector value of shipments, value added and gross state product.

State	Value of Shipments			Manufacturing Value Added			Gross State Product	
	All Manufacturing	Forest Industries	Forestry Percent of Total	All Manufacturing	Forest Industries	Forestry Percent of Total	State GSP	Forest Industries Value Added as a Percent of GSP
	-- million dollars (1991) --							
Alabama	48,448	8,051	16.6	21,056	3,652	17.3	74,347	4.91
Arkansas	31,084	5,172	16.6	12,825	2,261	17.6	40,748	5.55
Florida	59,275	4,900	8.3	29,054	1,928	6.6	255,162	0.76
Georgia	82,764	10,529	12.7	36,576	4,414	12.1	143,741	3.07
Kentucky	53,500	2,606	4.9	23,713	954	4.0	70,115	1.36
Louisiana	63,381	1,916	3.0	22,125	2,220	10.0	95,606	2.32
Mississippi	31,196	4,833	15.5	12,880	1,993	15.5	41,704	4.78
North Carolina	118,206	7,497	6.3	59,914	3,164	5.3	147,847	2.14
Oklahoma	28,418	1,631	5.7	11,958	761	6.4	57,983	1.31
South Carolina	47,515	5,431	11.4	22,490	2,597	11.5	66,658	3.90
Tennessee	69,549	4,960	7.1	32,499	2,219	6.8	101,335	2.19
Texas	204,001	7,345	3.6	77,569	3,081	4.0	396,327	0.78
Virginia	61,642	5,284	8.6	33,245	2,346	7.1	174,444	1.34
South Total	898,979	70,155	7.8	395,904	31,590	8.0	1,666,017	1.90

Sources: USDC (1991), USDC Bureau of Economic Analysis (1991)

Forest industries shipped about $70.1 billion worth of products in 1991 (a nominal increase of 42.8% from 1984), or 7.8 percent of all manufacturing output in the South. Value of shipments of forest industries were the largest in Georgia ($10 billion) followed by Alabama ($8. billion) and North Carolina ($7 billion). The value of shipments of forestry as a percentage of all manufacturing were the highest in Alabama and Arkansas (16.6%) followed by Mississippi (15.5%) and Georgia (12.7%).

The value added by forest industries in 1991 was $31.5 billion (a nominal increase of 59.8% from 1984) or 8% of all manufacturing output. Value added by the forest industries was the highest in Georgia ($4 billion) followed by Alabama ($3.6 billion) and North Carolina ($3.1 billion). Arkansas ranked the first in forest industries value added as a percent of total (17.6%) followed by Alabama (17.3%) and Mississippi (15.5%). The total Gross State Product in 1991 was $1666 billion, so southern forestry value added comprised 1.9 percent of all state economic activity. The value of shipments and manufacturing value added for the forestry sector as a percentage of total manufacturing have

declined since 1984. This indicates that while forest industries did increased rapidly in the South during the 1980s, other sectors increased still faster. Forest industries contributed more than 10 percent of the entire manufacturing value of shipments and/or value added in the states of Alabama, Arkansas, Georgia, Mississippi and South Carolina.

Note that the forest industries sector share of total manufacturing activity (8%) is larger than the forest-related employment and earnings (about 1.5%) as a share of all state activity, as reported by the American Forest and Paper Association (AF&PA 1995). Of course, forestry comprises a larger share of the manufacturing sector than it is of the whole economy. The manufacturing, or basic, sector of the economy is particularly important because it usually provides large multiplier effects that are felt throughout a region.

Other Impacts

Commerce Department data are not readily available for non-timber economic contributions of other forestry sectors, such as hunting, recreation, and tourism. The contribution of forests to these recreational activities is difficult to ascertain, but surely substantial. Because forests cover more than half the southern landscape, we will assume here that the relative non-timber economic contribution is similar. The Department of Interior, Fish and Wildlife Division, reports that southern wildlife-associated recreational expenditures were $19 billion in 1991. Fishing and hunting alone accounted for approximately 80 percent of the total (Southern Forest Based Economic Development Council 1995). Thus, forests must contribute $9.5 billion in expenditure. Other outdoor recreation and tourism expenditures have not been estimated, but could be a big number.

The South's forests make many other contributions. Timber sales generate income to landowners who own and manage forest lands. Log, chip, lumber, pulp, and paper exports help our foreign trade balance significantly. The South's forests are extremely diverse, ranging from the flatwoods southern pines and bottomland hardwoods to the Appalachian mixed hardwoods. The diversity of species, stands, and management types provides for a wealth of forest wildlife and for recreation as well as for commodity outputs which have value. For example, nearly 34 million people participated in wildlife-associated recreation in the 13 southern states each year, and 23 million persons obtained hunting and fishing licenses (Southern Forest Based Economic Development Council 1995).

Economic Multipliers

To estimate the regional economic impacts of the forestry sector, multipliers were calculated using a micro IMPLAN (IMpact analysis for PLANning) model for each state in the South for 1992. The South's Fourth Forest (USDA Forest Service 1988) reported Type II multipliers for the southern states based on 1982 data. In this paper Type I and Type III multipliers were calculated for the thirteen southern states instead of Type II. Type III multipliers are typically five to fifteen percent smaller than Type II multipliers. Type III multipliers minimize the overestimation that occurs with a linear consumption function (Taylor *et al.* 1993).

The micro IMPLAN model is based on input-output theory. Sectors were aggregated into lumber & sawmill, wood furniture, and pulp & paper based on the underlying assumption that each sector represents a homogeneous production function. Aggregation results in a production function that is a weighted average for all the industries included in that sector. The Standard Industrial Classification Codes (SIC) were used when creating aggregation schemes. SIC code 24, 25, and 26 were used for aggregating lumber & sawtimber, furniture, and pulp & paper sectors respectively. IMPLAN sectors 133-147 (excluding mobile homes) were used for lumber and sawmill sector. IMPLAN sectors 148-

157 (excluding non-wood furniture) and IMPLAN sectors 161-173 (excluding newspaper and other newsprint) were used for wood furniture and pulp and paper sector, respectively.

Impacts are measured in terms of direct, indirect and induced effects. Type I and Type III multipliers are generated for output, employment, total income, personal income and value added impact measures for three aggregated forestry sectors, namely lumber & sawmill, furniture, and pulp and paper. Direct effects are the immediate effects associated with the change in demand for a particular good or service. For example an increase in demand for furniture, lumber, or paper would cause the manufacturer to produce more furniture, lumber or paper. Indirect effects are the secondary effects that are caused when input needs change due to the impact of directly affected industries. For example, the indirect effects would include additional purchases of wood to manufacture furniture, cutting more trees to generate additional lumber, purchasing more pulpwood to manufacture paper, etc. Thus all industries that supply production inputs would increase production. Induced effects are the changes in regional household spending patterns caused by changes in regional employment. For example, an increase in the sale of furniture, paper or lumber would cause income and employment to increase thereby, stimulating spending in the economy in general.

The direct, indirect, and induced effects are combined to develop regional economic multipliers. Type I multipliers are the direct effect (produced by a change in final demand) plus the indirect effect, divided by the direct effect:

$$\textit{Type I} = (\textit{Direct} + \textit{Indirect}) / \textit{Direct}$$

It is assumed that increased demand leads to increased employment and population, with the average income level remaining constant.

Type III multipliers compares direct, indirect, and induced effects to the direct effects generated by a change in final demand:

$$\textit{Type III} = (\textit{Direct} + \textit{Indirect} + \textit{Induced}) / \textit{Direct}$$

The difference between the Type I, Type III, direct, indirect, induced and total multipliers is a matter of economic scope. The difference between the multipliers is analogous for output, personal income, total income, value added and employment multipliers. Direct effects are often the largest, induced the next largest, and indirect the smallest effect. The smaller magnitude of the indirect effects is because of the lack of interindustry purchases, i.e., the need to import a large percentage of the supporting goods and services. While input-output models are useful for assessing how economic effects get distributed among a region's industries, one should be cautious while using the multipliers generated from these models because of the various assumptions that the model is based on.

Output (Table 5)

The Type I and Type III output multipliers represent the value of production required from all sectors by a particular sector to deliver one million dollar's worth of output to final demand. Final demand is the ultimate consumption of commodities, including both goods and services. The size of the multiplier does not represent the importance of a given industry for the economy. It provides an estimate of the impact created if that industry's sales to final demand changed. Hence, it is an indicator that can be used to gauge the interdependence of sectors. The larger the output multiplier, the greater the dependence of the sector on the rest of the regional economy and the more a dollar turns over in an economy before it leaks out. Output multipliers are useful only as an indicator of the

Table 5. Output multipliers (aggregated) for the southern United States ($Million 1992).

State	Sector	Direct	Indirect	Induced	Total	Type I	Type III	PCPCE[a]
Alabama	Lumber and Sawmill	1	0.5868	0.5300	2.1168	1.5868	2.1168	6
	Furniture	1	0.4886	0.6780	2.1666	1.4886	2.1666	32
	Pulp and Paper	1	0.4320	0.2766	1.7086	1.4320	1.7086	1
Arkansas	Lumber and Sawmill	1	0.6192	0.5984	2.2176	1.6192	2.2176	8
	Furniture	1	0.3675	0.5969	1.9644	1.3675	1.9644	32
	Pulp and Paper	1	0.3344	0.2981	1.6324	1.3344	1.6324	4
Florida	Lumber and Sawmill	1	0.4071	0.7329	2.1399	1.4071	2.1399	3
	Furniture	1	0.3417	0.8941	2.2357	1.3417	2.2357	14
	Pulp and Paper	1	0.3206	0.3426	1.6632	1.3206	1.6632	1
Georgia	Lumber and Sawmill	1	0.6125	0.5534	2.1659	1.6125	2.1659	4
	Furniture	1	0.5500	0.7971	2.3471	1.5500	2.3471	22
	Pulp and Paper	1	0.3979	0.2911	1.6889	1.3979	1.6889	3
Kentucky	Lumber and Sawmill	1	0.5301	0.7154	2.2455	1.5301	2.2455	5
	Furniture	1	0.3696	0.7510	2.1207	1.3696	2.1207	13
	Pulp and Paper	1	0.2886	0.3220	1.6107	1.2886	1.6107	3
Louisiana	Lumber and Sawmill	1	0.6224	0.5188	2.1413	1.6224	2.1413	2
	Furniture	1	0.4855	0.7287	2.2141	1.4855	2.2141	4
	Pulp and Paper	1	0.4373	0.3227	1.7601	1.4373	1.7601	1
Mississippi	Lumber and Sawmill	1	0.6709	0.5229	2.1938	1.6709	2.1938	7
	Furniture	1	0.4685	0.6379	2.1063	1.4685	2.1063	25
	Pulp and Paper	1	0.3598	0.2786	1.6384	1.3598	1.6384	1
North Carolina	Lumber and Sawmill	1	0.5844	0.5705	2.1550	1.5844	2.1550	8
	Furniture	1	0.5015	0.6607	2.1622	1.5015	2.1622	37
	Pulp and Paper	1	0.3582	0.2742	1.6324	1.3582	1.6324	1
Oklahoma	Lumber and Sawmill	1	0.5043	0.7130	2.2173	1.5043	2.2173	5
	Furniture	1	0.3087	0.7594	2.0682	1.3087	2.0682	2
	Pulp and Paper	1	0.2586	0.2462	1.5048	1.2586	1.5048	3
South Carolina	Lumber and Sawmill	1	0.5439	0.4150	1.9589	1.5439	1.9589	5
	Furniture	1	0.4792	0.6039	2.0831	1.4792	2.0831	30
	Pulp and Paper	1	0.3484	0.2360	1.5844	1.3484	1.5844	2
Tennessee	Lumber and Sawmill	1	0.4783	0.7779	2.2562	1.4783	2.2562	7
	Furniture	1	0.3790	0.6795	2.0585	1.3790	2.0585	33
	Pulp and Paper	1	0.3463	0.3243	1.6706	1.3463	1.6706	3
Texas	Lumber and Sawmill	1	0.5454	0.6802	2.2256	1.5454	2.2256	6
	Furniture	1	0.3981	0.6722	2.0703	1.3981	2.0703	5
	Pulp and Paper	1	0.3769	0.3226	1.6995	1.3769	1.6995	1
Virginia	Lumber and Sawmill	1	0.5241	0.5339	2.0580	1.5241	2.0580	5
	Furniture	1	0.5282	0.7232	2.2514	1.5282	2.2514	39
	Pulp and Paper	1	0.3397	0.2773	1.6171	1.3397	1.6171	1

[a] PCPCE = Per capita personal consumption expenditure.

Note: Sectors have been aggregated based on the SIC codes. IMPLAN 1992 database was used to generate the multipliers.

degree of structural interdependence between each industry and the rest of the economy. Income and employment multipliers, on the other hand, are of more interest in most studies.

Type I output multipliers for the lumber and sawmill sector are greater than the other two sectors for all the southern states. They range from 1.40 (Florida) to 1.67 (Mississippi). However in relative terms, the Type I output multipliers for the three sectors are rather close. A Type I output multiplier of 1.40 for Florida would mean, for each million dollar of output produced by the lumber and sawmill sector, .40 million dollars worth of indirect output is generated in other local industries. In other words, a multiplier of 1.4 means that each dollar ripples through the economy 1.4 times in creating direct and indirect output.

Type III output multipliers for these southern states were substantially higher in the lumber & sawmill and furniture sector than pulp and paper sector. Type III output multipliers for the pulp and paper sector ranged from 1.50 (Oklahoma) to 1.76 (Louisiana), for lumber and sawmill sector they ranged from 1.95 (South Carolina) to 2.25 (Tennessee) and for the furniture sector they ranged from 1.96 (Arkansas) to 2.34 (Georgia). A Type III output multiplier of 2.34 for the furniture sector in Georgia would mean that for each million dollar's of output produced by the furniture industry, .5500 million dollars worth of indirect output is generated in other local industries and 0.7971 million dollars worth of induced effect is felt in the regional household spending patterns due to changes in regional employment.

The per capita personal consumption expenditure (PCPCE) represents per person expenditures toward the purchase of goods and services. PCPCE patterns show the spending of labor income via personal consumption. This is important because labor payments are a significant component of an industry's total outlay. Therefore the feedback effects of PCPCE can be significant. PCPCE is the highest for the furniture sector compared to the other two sectors in all the states. Virginia has the highest PCPCE for the furniture sector ($39), followed by North Carolina ($37). The PCPCE reflects how much consumers buy from that industry in that state. Since most consumers do not make purchases directly from the pulp and paper sector and lumber sector, the PCPCE for these two sectors are rather low compared to the furniture sector. Texas ($5), Louisiana ($4) and Oklahoma ($2) have low PCPCE for the furniture sector. This indicates that consumers buy less from the (smaller) furniture sector in these states.

Employment (Table 6)

The employment multipliers estimate the effects on employment (measured in terms of the number of jobs) from the production of one million dollars of output for final demand. The Type I and Type III employment multipliers for the pulp and paper sector were larger than the lumber & sawmill and furniture sectors. This means that pulp and paper sector would have a greater impact in terms of employment if that sector's final demand changes.

The Type I employment multipliers for the pulp and paper sector ranged from 1.52 (Kentucky) to 1.95 (Alabama) and Type III ranged from 2.55 (Mississippi) to 3.31 (Florida). The Type I employment multipliers for the lumber and sawmill sector in the southern region ranged from 1.44 (Tennessee) to 1.73 (Mississippi) and Type III ranged from 2.37 (Tennessee) to 2.86 (LS). The Type I employment multipliers for the furniture sector in this region ranged from 1.30 (Oklahoma) to 1.44 (Texas) and Type III ranged from 2.09 (South Carolina) to 2.36 (Florida).

Table 6. Employment multipliers (aggregated) for the southern United States ($Million 1992).

State	Sector	Direct	Indirect	Induced	Total	Type I	Type III
Alabama	Lumber and Sawmill	9.5666	6.2800	9.5485	25.3951	1.6564	2.6546
	Furniture	14.5480	5.7240	12.2151	32.4871	1.3935	2.2331
	Pulp and Paper	4.3835	4.1862	4.9832	13.5530	1.9550	3.0918
Arkansas	Lumber and Sawmill	10.3393	7.1290	11.3055	28.7737	1.6895	2.7830
	Furniture	12.2452	5.1776	11.2760	28.6988	1.4228	2.3437
	Pulp and Paper	5.1359	3.5653	5.6314	14.3326	1.6942	2.7907
Florida	Lumber and Sawmill	10.7893	4.9990	12.4588	28.2471	1.4633	2.6181
	Furniture	14.5546	4.7066	15.1994	34.4607	1.3234	2.3677
	Pulp and Paper	4.0398	3.5093	5.8248	13.3740	1.8687	3.3106
Georgia	Lumber and Sawmill	8.8250	6.2444	9.0145	24.0839	1.7076	2.7291
	Furniture	15.5125	6.1958	12.9858	34.6941	1.3994	2.2365
	Pulp and Paper	4.2116	3.9990	4.7418	12.9524	1.9495	3.0754
Kentucky	Lumber and Sawmill	12.2153	6.6292	13.1488	31.9933	1.5427	2.6191
	Furniture	14.7780	5.0053	13.8040	33.5873	1.3387	2.2728
	Pulp and Paper	5.6642	2.9692	5.9191	14.5524	1.5242	2.5692
Louisiana	Lumber and Sawmill	8.0281	5.9150	9.0499	22.9929	1.7368	2.8641
	Furniture	13.9003	5.3786	12.7100	31.9889	1.3869	2.3013
	Pulp and Paper	4.9179	3.7557	5.6296	14.3032	1.7637	2.9084
Mississippi	Lumber and Sawmill	9.5847	7.0797	9.4718	26.1361	1.7386	2.7269
	Furniture	14.6311	5.6958	11.5535	31.8804	1.3893	2.1790
	Pulp and Paper	5.5649	3.6035	5.0455	14.2139	1.6475	2.5542
North Carolina	Lumber and Sawmill	10.7794	6.7184	9.8852	27.3830	1.6233	2.5403
	Furniture	14.0902	6.1744	11.4483	31.7129	1.4382	2.2507
	Pulp and Paper	4.9052	3.7789	4.7517	13.4358	1.7704	2.7391
Oklahoma	Lumber and Sawmill	12.0109	6.4964	12.9576	31.4650	1.5409	2.6197
	Furniture	15.1635	4.5494	13.8018	33.5147	1.3000	2.2102
	Pulp and Paper	3.7088	3.0896	4.4751	11.2735	1.8330	3.0396
South Carolina	Lumber and Sawmill	8.6104	5.4639	7.7383	21.8126	1.6346	2.5333
	Furniture	15.1586	5.3223	11.6080	31.7417	1.3511	2.0940
	Pulp and Paper	4.8988	3.3541	4.4012	12.6541	1.6847	2.5831
Tennessee	Lumber and Sawmill	13.9830	6.1873	13.0143	33.1846	1.4425	2.3732
	Furniture	12.5687	5.0511	11.3687	28.9884	1.4019	2.3064
	Pulp and Paper	5.1292	3.6211	5.4257	14.1759	1.7060	2.7638
Texas	Lumber and Sawmill	10.7521	5.8773	10.5082	27.1376	1.5466	2.5239
	Furniture	11.3793	5.0541	10.3844	26.8179	1.4441	2.3567
	Pulp and Paper	4.6891	3.5059	4.9831	13.1782	1.7477	2.8104
Virginia	Lumber and Sawmill	9.8326	5.7518	9.2443	24.8286	1.5850	2.5251
	Furniture	14.8262	6.2843	12.5223	33.6328	1.4239	2.2685
	Pulp and Paper	4.9220	3.4597	4.8023	13.1841	1.7029	2.6786

Note: Sectors have been aggregated based on the SIC codes. IMPLAN 1992 database was used to generate the multipliers. The induced and total components are based upon the type III multipliers.

Value Added (Table 7)

Value added multipliers estimate the effects on value added generated from the production of one million dollar of output for final demand. Value added represents the costs added to the intermediate costs of producing goods and services to form the producer price. There are four components of value added: 1) employee compensation, e.g., wages and salaries, 2) proprietary income, including self-employment income, 3) other property type income, e.g., interest and corporate profits, and 4) indirect business taxes, e.g., sales and excise tax.

The Type I value added multipliers for the lumber and sawmill sector in the southern region ranged from 1.54 (Florida) to 1.84 (Mississippi) and Type III ranged from 2.45 (South Carolina) to 2.90 (Oklahoma). Both these multipliers are relatively larger for the lumber and sawmill sector compared to pulp & paper and furniture. The Type I value added multipliers for the furniture sector in this region ranged from 1.33 (Oklahoma) to 1.64 (Georgia) and Type III ranged from 2.28 (Oklahoma) to 2.86 (Florida). The Type I value added multipliers for the pulp and paper sector ranged from 1.34 (Oklahoma) to 1.54 (Georgia) and Type III ranged from 1.73 (Oklahoma) to 2.06 (Texas).

Total Income (Table 8)

Total income multipliers estimate the effects on total income (a sum of employee compensation, proprietary income, and other property income) generated from one million dollar's worth of production for final demand.

The Type I total income multipliers for the lumber and sawmill sector in the southern region ranged from 1.51 (Florida) to 1.82 (Mississippi) and Type III ranged from 2.41 (South Carolina) to 2.84 (Kentucky). The Type I total income multipliers for the furniture sector in this region ranged from 1.30 (Oklahoma) to 1.60 (Virginia) and Type III ranged from 2.15 (Oklahoma) to 2.68 (Florida). The Type I total income multipliers for the pulp and paper sector ranged from 1.31 (Oklahoma) to 1.52 (Georgia) and Type III ranged from 1.66 (Oklahoma) to 2.00 (Texas). The Type I multipliers for all three sectors were close in magnitude, but the Type III multipliers varied more.

Personal Income (Table 9)

The personal income multipliers estimate the effects on employee compensation generated by one million dollar of output for final demand. The Type I personal income multipliers for the lumber and sawmill sector in the southern region ranged from 1.53 (Florida) to 1.83 (Mississippi) and Type III ranged from 2.39 (South Carolina) to 3.01 (Kentucky). The Type I personal income multipliers for the furniture sector in this region ranged from 1.24 (Oklahoma) to 1.55 (Georgia) and Type III ranged from 1.87 (Oklahoma) to 2.58 (Florida). The Type I personal income multipliers for the pulp and paper sector ranged from 1.34 (Mississippi) to 1.62 (Georgia) and Type III ranged from 1.69 (Mississippi) to 2.21 (Florida).

Conclusions

North Carolina, Georgia, and Texas, respectively, ranked highest in terms of total forest sector employment, and Georgia, North Carolina, and Alabama, were highest in terms of total forestry earnings. Oklahoma had the least forestry employment (9,000 employees) and also the least earnings ($209 million). Kentucky and Louisiana also had lower employment and earnings from the forestry sector. In Texas, the contribution of forestry as a percent of total state employment (0.7%) and total state earnings (0.8%) is small. However, forestry employment and earnings are significant in relation to other states.

Table 7. Value added multipliers (aggregated) for the southern United States ($Million 1992).

State	Sector	Direct	Indirect	Induced	Total	Type I	Type III
Alabama	Lumber and Sawmill	0.3229	0.2414	0.3255	0.8898	1.7477	2.7556
	Furniture	0.4104	0.2222	0.4164	1.0489	1.5415	2.5561
	Pulp and Paper	0.3878	0.2001	0.1699	0.7578	1.5159	1.9539
Arkansas	Lumber and Sawmill	0.3588	0.2661	0.3670	0.9920	1.7417	2.7644
	Furniture	0.3935	0.1778	0.3660	0.9373	1.4518	2.3820
	Pulp and Paper	0.3678	0.1603	0.1828	0.7110	1.4359	1.9329
Florida	Lumber and Sawmill	0.3596	0.1946	0.4676	1.0218	1.5412	2.8416
	Furniture	0.4071	0.1892	0.5704	1.1668	1.4649	2.8663
	Pulp and Paper	0.3706	0.1637	0.2186	0.7529	1.4417	2.0316
Georgia	Lumber and Sawmill	0.3555	0.2794	0.3447	0.9796	1.7857	2.7554
	Furniture	0.4254	0.2753	0.4966	1.1974	1.6471	2.8144
	Pulp and Paper	0.3714	0.2012	0.1813	0.7540	1.5418	2.0301
Kentucky	Lumber and Sawmill	0.3580	0.2336	0.4317	1.0233	1.6526	2.8587
	Furniture	0.4571	0.1782	0.4532	1.0886	1.3899	2.3814
	Pulp and Paper	0.3636	0.1361	0.1943	0.6941	1.3742	1.9087
Louisiana	Lumber and Sawmill	0.3365	0.2594	0.3228	0.9187	1.7710	2.7303
	Furniture	0.4240	0.2281	0.4533	1.1054	1.5379	2.6072
	Pulp and Paper	0.3837	0.2046	0.2008	0.7891	1.5332	2.0565
Mississippi	Lumber and Sawmill	0.3190	0.2696	0.3122	0.9008	1.8452	2.8240
	Furniture	0.4045	0.2084	0.3808	0.9937	1.5152	2.4567
	Pulp and Paper	0.3800	0.1638	0.1663	0.7101	1.4312	1.8689
North Carolina	Lumber and Sawmill	0.3571	0.2605	0.3533	0.9709	1.7295	2.7187
	Furniture	0.4438	0.2388	0.4091	1.0917	1.5381	2.4601
	Pulp and Paper	0.3467	0.1762	0.1698	0.6927	1.5081	1.9979
Oklahoma	Lumber and Sawmill	0.3499	0.2350	0.4323	1.0173	1.6717	2.9073
	Furniture	0.4827	0.1603	0.4605	1.1034	1.3321	2.2861
	Pulp and Paper	0.3809	0.1308	0.1493	0.6610	1.3434	1.7353
South Carolina	Lumber and Sawmill	0.3331	0.2275	0.2556	0.8162	1.6831	2.4504
	Furniture	0.4192	0.2153	0.3719	1.0064	1.5137	2.4009
	Pulp and Paper	0.3686	0.1647	0.1454	0.6787	1.4469	1.8412
Tennessee	Lumber and Sawmill	0.3979	0.2322	0.4741	1.1041	1.5836	2.7751
	Furniture	0.4186	0.1982	0.4141	1.0309	1.4734	2.4627
	Pulp and Paper	0.3892	0.1717	0.1976	0.7586	1.4412	1.9490
Texas	Lumber and Sawmill	0.4118	0.2731	0.4212	1.1060	1.6632	2.6861
	Furniture	0.4054	0.2205	0.4162	1.0421	1.5440	2.5706
	Pulp and Paper	0.3721	0.1963	0.1997	0.7681	1.5274	2.0641
Virginia	Lumber and Sawmill	0.3821	0.2469	0.3345	0.9634	1.6461	2.5216
	Furniture	0.4145	0.2636	0.4531	1.1313	1.6360	2.7291
	Pulp and Paper	0.3605	0.1725	0.1738	0.7067	1.4784	1.9604

Note: Sectors have been aggregated based on the SIC codes. IMPLAN 1992 database was used to generate the multipliers. The induced and total components are based upon the type III multipliers.

Table 8. Total income multipliers (aggregated) for the southern United States ($Million 1992).

State	Sector	Direct	Indirect	Induced	Total	Type I	Type III
Alabama	Lumber and Sawmill	0.3057	0.2256	0.2895	0.8208	1.7380	2.6849
	Furniture	0.4013	0.2075	0.3703	0.9791	1.5170	2.4397
	Pulp and Paper	0.3731	0.1866	0.1511	0.7108	1.5000	1.9048
Arkansas	Lumber and Sawmill	0.3423	0.2489	0.3252	0.9164	1.7270	2.6771
	Furniture	0.3882	0.1659	0.3244	0.8785	1.4273	2.2630
	Pulp and Paper	0.3585	0.1484	0.1620	0.6689	1.4140	1.8659
Florida	Lumber and Sawmill	0.3422	0.1774	0.4100	0.9296	1.5184	2.7164
	Furniture	0.4000	0.1729	0.5001	1.0730	1.4322	2.6827
	Pulp and Paper	0.3536	0.1479	0.1917	0.6931	1.4181	1.9601
Georgia	Lumber and Sawmill	0.3246	0.2560	0.3061	0.8867	1.7888	2.7321
	Furniture	0.4190	0.2543	0.4410	1.1143	1.6070	2.6595
	Pulp and Paper	0.3549	0.1847	0.1610	0.7006	1.5203	1.9740
Kentucky	Lumber and Sawmill	0.3206	0.2119	0.3796	0.9122	1.6609	2.8449
	Furniture	0.4533	0.1642	0.3985	1.0161	1.3623	2.2415
	Pulp and Paper	0.3557	0.1246	0.1709	0.6512	1.3503	1.8307
Louisiana	Lumber and Sawmill	0.3202	0.2399	0.2800	0.8401	1.7492	2.6238
	Furniture	0.4198	0.2110	0.3933	1.0241	1.5027	2.4395
	Pulp and Paper	0.3702	0.1871	0.1742	0.7315	1.5055	1.9761
Mississippi	Lumber and Sawmill	0.2985	0.2467	0.2696	0.8149	1.8265	2.7297
	Furniture	0.3982	0.1907	0.3289	0.9178	1.4789	2.3048
	Pulp and Paper	0.3556	0.1482	0.1436	0.6474	1.4166	1.8205
North Carolina	Lumber and Sawmill	0.3437	0.2439	0.3116	0.8991	1.7098	2.6165
	Furniture	0.4365	0.2236	0.3609	1.0209	1.5123	2.3391
	Pulp and Paper	0.3334	0.1635	0.1498	0.6467	1.4905	1.9397
Oklahoma	Lumber and Sawmill	0.3418	0.2178	0.3789	0.9385	1.6371	2.7455
	Furniture	0.4795	0.1484	0.4036	1.0316	1.3096	2.1513
	Pulp and Paper	0.3750	0.1189	0.1305	0.6248	1.3170	1.6660
South Carolina	Lumber and Sawmill	0.3073	0.2091	0.2244	0.7408	1.6806	2.4109
	Furniture	0.4029	0.1981	0.3265	0.9275	1.4917	2.3021
	Pulp and Paper	0.3473	0.1510	0.1276	0.6260	1.4349	1.8024
Tennessee	Lumber and Sawmill	0.3874	0.2169	0.4181	1.0224	1.5598	2.6388
	Furniture	0.4141	0.1848	0.3652	0.9640	1.4463	2.3283
	Pulp and Paper	0.3753	0.1591	0.1743	0.7087	1.4240	1.8884
Texas	Lumber and Sawmill	0.3796	0.2497	0.3696	0.9989	1.6579	2.6315
	Furniture	0.3958	0.2040	0.3652	0.9650	1.5153	2.4381
	Pulp and Paper	0.3518	0.1788	0.1753	0.7059	1.5082	2.0064
Virginia	Lumber and Sawmill	0.3672	0.2313	0.2956	0.8940	1.6298	2.4348
	Furniture	0.4068	0.2479	0.4004	1.0551	1.6095	2.5937
	Pulp and Paper	0.3467	0.1598	0.1535	0.6600	1.4609	1.9038

Note: Sectors have been aggregated based on the SIC codes. IMPLAN 1992 database was used to generate the multipliers. The induced and total components are based upon the type III multipliers.

Table 9. Personal income multipliers (aggregated) for the southern United States ($Million 1992).

State	Sector	Direct	Indirect	Induced	Total	Type I	Type III
Alabama	Lumber and Sawmill	0.1865	0.1393	0.1710	0.4967	1.7468	2.6636
	Furniture	0.2871	0.1311	0.2187	0.6370	1.4566	2.2184
	Pulp and Paper	0.2252	0.1077	0.0892	0.4222	1.4784	1.8746
Arkansas	Lumber and Sawmill	0.2207	0.1552	0.1860	0.5619	1.7029	2.5453
	Furniture	0.2759	0.1047	0.1855	0.5661	1.3795	2.0518
	Pulp and Paper	0.2064	0.0850	0.0926	0.3840	1.4119	1.8608
Florida	Lumber and Sawmill	0.2231	0.1200	0.2577	0.6008	1.5379	2.6930
	Furniture	0.2712	0.1144	0.3144	0.7000	1.4219	2.5812
	Pulp and Paper	0.1772	0.0952	0.1205	0.3929	1.5373	2.2174
Georgia	Lumber and Sawmill	0.2014	0.1653	0.1856	0.5523	1.8211	2.7427
	Furniture	0.3027	0.1670	0.2674	0.7370	1.5518	2.4352
	Pulp and Paper	0.1891	0.1187	0.0976	0.4054	1.6275	2.1438
Kentucky	Lumber and Sawmill	0.1744	0.1284	0.2226	0.5254	1.7360	3.0122
	Furniture	0.3212	0.1013	0.2337	0.6562	1.3154	2.0427
	Pulp and Paper	0.2136	0.0757	0.1002	0.3895	1.3546	1.8237
Louisiana	Lumber and Sawmill	0.2025	0.1493	0.1637	0.5155	1.7373	2.5456
	Furniture	0.2802	0.1324	0.2299	0.6425	1.4726	2.2930
	Pulp and Paper	0.2338	0.1080	0.1018	0.4436	1.4621	1.8976
Mississippi	Lumber and Sawmill	0.1716	0.1421	0.1509	0.4646	1.8279	2.7073
	Furniture	0.2863	0.1154	0.1841	0.5858	1.4030	2.0460
	Pulp and Paper	0.2333	0.0810	0.0804	0.3947	1.3472	1.6919
North Carolina	Lumber and Sawmill	0.2089	0.1528	0.1824	0.5441	1.7315	2.6046
	Furniture	0.3240	0.1428	0.2112	0.6780	1.4407	2.0927
	Pulp and Paper	0.2020	0.0990	0.0877	0.3887	1.4902	1.9243
Oklahoma	Lumber and Sawmill	0.2192	0.1354	0.2170	0.5716	1.6176	2.6073
	Furniture	0.3664	0.0896	0.2311	0.6871	1.2445	1.8753
	Pulp and Paper	0.1393	0.0707	0.0749	0.2849	1.5072	2.0449
South Carolina	Lumber and Sawmill	0.1845	0.1265	0.1304	0.4413	1.6854	2.3922
	Furniture	0.2983	0.1244	0.1897	0.6124	1.4170	2.0531
	Pulp and Paper	0.2238	0.0891	0.0742	0.3871	1.3983	1.7296
Tennessee	Lumber and Sawmill	0.2303	0.1381	0.2458	0.6142	1.5994	2.6665
	Furniture	0.2969	0.1202	0.2147	0.6319	1.4049	2.1280
	Pulp and Paper	0.2149	0.0979	0.1025	0.4153	1.4558	1.9327
Texas	Lumber and Sawmill	0.2480	0.1589	0.2173	0.6242	1.6407	2.5173
	Furniture	0.2678	0.1344	0.2148	0.6170	1.5017	2.3037
	Pulp and Paper	0.1916	0.1062	0.1031	0.4009	1.5539	2.0918
Virginia	Lumber and Sawmill	0.2227	0.1471	0.1792	0.5491	1.6606	2.4650
	Furniture	0.3015	0.1595	0.2427	0.7037	1.5292	2.3343
	Pulp and Paper	0.2177	0.0989	0.0931	0.4097	1.4545	1.8821

Note: Sectors have been aggregated based on the SIC codes. IMPLAN 1992 database was used to generate the multipliers. The induced and total components are based upon the type III multipliers.

Georgia, North Carolina, Texas and Alabama's employment multipliers were very close to one another. Louisiana had the largest employment multiplier (Type I and Type III) for the lumber and sawmill sector (1.73 and 2.86) implying that if the final demand decreased or increased, this sector would have the greatest impact on the economy.

A larger Type III multiplier and a relatively small Type I multiplier for the same industry can be observed in the tables. This results because the backward linked sectors had small output to employment ratios (i.e, required a large number of employees to supply the output). A low multiplier does not always indicate a poor performance of an industry in a state. For example, there are other factors like exports from the state that could result in a lower multiplier. Size of regional economy also has an effect on multiplier size. A small area means more is purchased outside and quicker the dollars leak out resulting in a smaller multiplier. Multipliers can assist interested states in determining the relative effectiveness of sectors to promote area growth and provide information for identifying economic development opportunities for different states. However, they should be evaluated in conjunction with other relevant information such as the comparative advantage of each state, overall goals, and environmental considerations.

In brief, southern forests make a large contribution to the resource-based production and amenity consumption in the region, to economic development, and to quality of life. USDA Forest Service projections indicate that the South's contributions to timber supply and thus economic development will increase substantially in the next two decades (Haynes *et al.* 1995). There are, however, many competing uses that will challenge our ability to achieve these projections (Cubbage *et al.* 1995).

Overall, the economic measures we calculated or collected here provide an interesting summary of the state of the southern economy. Depending on the economic measure examined, forest-based industries comprise about 1.5 percent to 1.7 percent of the total southern employment and earnings, respectively, but exceed 3 percent to 4 percent in some states (Alabama, Arkansas, and Mississippi). Forest-based industries comprise 8.0 percent of the total *manufacturing* value added in the South, and more than 15 percent in Alabama, Arkansas, and Mississippi. In states with strong, diversified economies, such as Georgia, Texas, and North Carolina, forest-based industries may contribute less to the total economy, but still comprise very large and important sectors. Georgia actually has the largest amount of value added and earnings in a state—based on the largest pulp and paper sector—and North Carolina has the largest employment—based on its large furniture sector. Multipliers for industrial output, employment, value added, regional income, and personal income indicate that forest-based industries have substantial indirect effects in the southern economy—up to two or three times the direct impact, depending on the state, sector, and economic measure.

Note that while the economic measures calculated here are substantial, they are still somewhat less than the occasionally spectacular numbers cited by advocates of the forestry sector. Several states advertise their forest-based industries as exceeding $10 billion, but only the economic measure of value of shipments approaches that in even Georgia and Alabama, which have the greatest values. The large economic contributions publicized by states actually consist of multiple contributions of all sectors added together. These type of data are interesting (and large) but not meaningful for comparisons with other sectors, which could make equally inflated claims. Value added, which is the basis of GNP or GDP, is the best measure of a sector's total contributions relative to other sectors in a state. Forest industries value added comprised 1.9 percent of total southern GSP, with a high of 5.55 percent in Arkansas, 4.91 percent in Alabama and a low of 0.76 percent in Florida. Truth in advertising might suggest these comparisons be used rather than the double-counted higher numbers, or at least in addition to the more spectacular numbers.

Competition requires wiser and more efficient use of the forest resources we have. Increasing timber harvests and enhancing southern economic contributions will require more intensive timber production practices on nonindustrial private forest landowner holdings as well as industrial holdings. Increasing recreational and urban uses of forest lands will require development of new methods to protect forests and enhance nontimber values. Forest health and amenity values also will require development and implementation of improved forest management to ensure sustainable forestry. The southern forestry sector, including its five million private forest landowners and its 199 million acres of timberland, will continue to be a key to economic development in the region.

Literature Cited

Alward, G. S., and C. J. Palmer. 1983. An input-output analysis system for Forest Service Planning. In Forest Sector Models: Proceeding of the First North American Conference. AB Academic publishers.

Alward, G. S. 1985. Extending the IMPLAN I/O system: the social accounting matrix. Paper presented at the Midwest Forest Economist's Association Meeting, Ames, Iowa, May 30-31.

American Forest & Paper Association. 1995. Facts and figures: U.S. forests. American Forest & Paper Association, Washington, D.C.

Cubbage, F. W., T. G. Harris, Jr., D. N. Wear, R. C. Abt, and G. Pacheco. 1995. Timber supply in the South: where is all the wood? Journal of Forestry. 93(7):16-20.

Cubbage, F. W., and P. B. Aruna. 1996. Southern forests and economic contributions. Forest Landowner. 55(2, March/April):

Haynes, R. W., D. M. Adams, and J. R. Mills. 1995. The 1993 RPA Timber Assessment Update. General Technical Report RM-259. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Office of Management and Budget. 1987. Standard Industrial Classification Manual. Executive Office of the President, Office of Management and Budget.

Powell, D. S., J. L. Faulkner, D. R. Darr, Z. Zhu, and D. W. MacCleery. 1993. Forest Resources of the United States, 1992. General Technical Report RM-234. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Richardson, H. W. 1972. Input-Output and Regional Economics. John Wiley and Sons, New Yorl, New York.

Southern Forest Based Economic Development Council. 1995. Forests of the South.

Taylor, C., S. Winter, G. Alward, and E. Siverts. 1993. Micro IMPLAN User's Guide. USDA Forest Service, Land Management Planning Systems Group, Fort Collins, Colorado.

U.S. Department of Commerce. 1990. Census of Manufacturers. U.S. Department of Commerce, Bureau of the Census, Economics and Statistics Administration.

U.S. Department of Commerce. 1991. Annual Survey of Manufacturers: Statistics for Industry Groups and Industries. U.S. Department of Commerce, Bureau of the Census, Economics and Statistics Administration.

U.S. Department of Commerce. 1993. Annual Survey of Manufacturers: Statistics for Industry Groups and Industries. U.S. Department of Commerce, Bureau of the Census, Economics and Statistics Administration.

U.S. Department of Commerce. 1995. Statistical Abstract of the United States. U.S. Department of Commerce, Bureau of the Census, Economics and Statistics Administration.

USDA Forest Service. 1988. The South's Fourth Forest. Forest Resource Report No. 24. USDA Forest Service, Washington, D.C.