# GEORGIA FOREST RESEARCH PAPER

27

APRIL 1982




# THE ECONOMIC IMPORTANCE OF GEORGIA'S FOREST INDUSTRY

BY

ALBERT A. MONTGOMERY AND ROBERT L. CHAFFIN

RESEARCH DIVISION

GEORGIA FORESTRY COMMISSION

# AUTHORS

ALBERT A. MONTGOMERY is Senior Research Associate and Professor, Contract Research Division, College of Business Administration, Georgia State University.

ROBERT L. CHAFFIN is Research Associate and Professor, Contract Research Division, College of Business Administration, Georgia State University.

# THE ECONOMIC IMPORTANCE OF GEORGIA'S FOREST INDUSTRY

BY

ALBERT A. MONTGOMERY AND ROBERT L. CHAFFIN

## HIGHLIGHTS

Forestry and its related economic activities comprise a $6.6 billion Georgia industry that employs an estimated 74 thousand Georgians.

The timber harvest of 879 million cubic feet is valued at $292 million standing on the stump. For every dollar of these timber sales, Georgia's forest product manufacturers created final wood products worth more than ten dollars, three-fourths of which are exported to national and world markets.

For every dollar of income received by Georgia's timberland owners for their stumpage, nearly six times as much income is earned by other Georgians in the subsequent transport, processing, and marketing of the timber harvest.

Much of this income is earned in Georgia's large cities, where wood product manufacturing is significantly concentrated and is becoming more so. In the 1970's, 72 percent of the new firms in the state's paper and allied product industry and 50 percent of its employment growth occurred in the Atlanta metropolitan area.

Georgia's timberland owners and forest product manufacturers pay an estimated $144 million in state and local taxes, more than 5½ times the combined federal and state budget for forestry in Georgia.

Forest product manufacturers recently spent $257 million for new plant and equipment, the largest capital investment

*Georgia is the nation's leader in the manufacture of pulp, paper and paperboard. This pulpwood at one of the state's big mills is the type of quality wood that is produced in abundance in many counties in the state.*

of any Georgia manufacturing industry and 22 percent of the new annual capital expenditures by all Georgia manufacturers.

Georgia has long been the nation's leading manufacturer of pulp, paper, and paperboard and would rank as the world's sixth largest producing nation exclusive of the United States. The typical Georgia pulp mill is one of the world's largest and more of these world class mills are concentrated in Georgia than in any comparable area in the world.

Although the pulp and paper industry is the largest of Georgia's forest product industries and is still growing, the state's output of lumber, plywood, veneer, and other sawtimber products has grown much faster in recent years, as has the secondary processing or converting of paper and paperboard into consumer products. Thus, the Georgia forest industry is not merely growing, it is becoming an increasingly integrated and mutually supporting complex of forest products and activities, ranging from the forest through manufacturing and distribution.

Reflecting these developments, the market economy is calling for substantial investments in reforestation and other productivity improving forest management practices so as to increase the future timber supply in Georgia. However, currently there is a shortfall of management on Georgia's nonindustrial timberland that is raising doubt about the future timber supply and, thus, about the continued growth of the forest products industry in Georgia.

# GEORGIA'S FOREST ECONOMY

According to the most recently available Census of Manufactures, forest and related products and services was a $5.4 billion Georgia industry in 1977 ($6.6 billion in 1980 dollars), Chart 1. In producing this gross flow of goods and services the industry created income (value added) in the amount of $2.1 billion ($2.6 billion in 1980 dollars). This income flow was the source of a $839.0 million ($1.0 billion) payroll for an estimated 74 thousand employees in forestry, forest product manufacturing, and Georgia industries directly supporting forestry. Forest product manufacturers spent $256.9 million for new plant and equipment, 22 percent of the annual new capital expenditures by all Georgia manufacturers. Georgia's timberland owners and forest product manufacturing establishments also paid an estimated $144 million in state and local taxes.

## Forest

The $307.9 million output of the forest itself consisted mainly of the $292.4 million stumpage value of the timber harvest. Gum naval stores and commercial firewood sales accounted for the remaining output. The value of the timber harvest does not include the economic contribution of timber logging and hauling, which is included in forest product manufacturing. Accordingly, only the forest activities of gum naval stores and firewood producers, forestry consultants, and forest management practice vendors are represented by the payroll and employment indicated for the forest. Neither does the forest's economic activity include Georgia's kaolin mining industry even though this clay is primarily destined for use in papermaking. However, that part of this industry's $256.9 million shipments, $157.8 million value added, $54.2 million payroll, and 3.6 thousand employment that is associated with Georgia's manufacture of pulp and paper is included in the contribution of supporting Georgia industries.

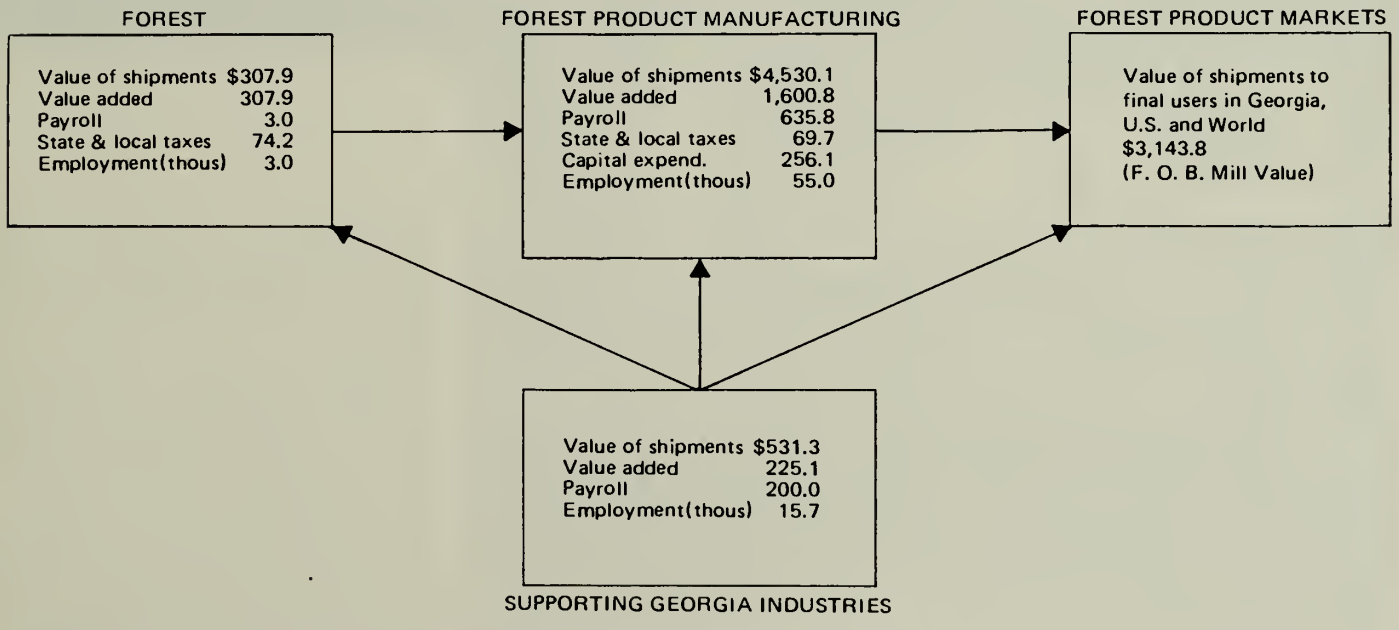
## Forest Product Manufacturing

The $4.5 billion of shipments of manufactured forest products consists mainly of the primary and secondary products of the wood flow, the nature of which will be elaborated below. A byproduct of the wood flow, gum and wood chemicals, accounts for an estimated $122.5 million shipments, $53.6 million value added, $16.0 million payroll, and 1.4 thousand employment.

## Supporting Georgia Industries

While the forest product flow consists mainly of wood, it is estimated that $531.3 million of materials and services from other Georgia industries was required as direct inputs in the processing and distribution of that product flow. These supporting Georgia industries include the chemical and other manufacturing industries located in Georgia, mining (kaolin), transportation services (other than timber hauling included in forest product manufacturing), wholesale trade, communication and utilities, finance, insurance, and real estate, miscellaneous business services, and the forestry programs of the federal and state governments. It is estimated that $225.1 million value added, $200.0 million payroll, and 15.7 thousand employees resulted from the direct participation of these industries in forestry, forest product manufacturing, and distribution. This economic contribution does not include industries indirectly related to forestry, such as the economic

**Chart I Georgia's forest industry (Millions of dollars), 1977**




*Source:* 1977 Census of Manufacturers, 1978 Wood-using Industries in Georgia, Interindustry Study of Forestry Sectors for Georgia, Timber Mart-south.

*Many products from the forests of Georgia are exported to world markets from this busy port - the port of Savannah.*

activity associated with forest industry employee expenditure of their incomes.

## Final Forest Product Markets

At the point where the flow of Georgia's manufactured forest products was ready for shipment to final markets in Georgia, the rest of the United States, and world, it had a value of $3.1 billion ($3.8 billion in 1980 dollars) or 10.2 times the stumpage value of the incorporated wood. An estimated three-fourths of this final output was exported from Georgia to national and world markets. Accordingly, the forest industry is basic to the Georgia economy, earning income for the state from the national and world economy.

## Economic Causation

In conventional industry analysis, the direction of economic cause and effect is seen to run in the direction from final markets through secondary manufacturing, primary manufacturing, to the primary economic resources employed in the industry, in this instance the forest. That is, the ultimate economic cause or determinant of the level of the industry's economic activity is assumed to be the aggregate demand of the business and households consuming the industry's final products. On a year to year basis, the level of output, income, and employment in Georgia's forest industry, including specifically the volume of the annual timber harvest, will vary with national and world economic conditions as they are reflected through final market demand. But over a period of years, the growth of the forest industry in Georgia will not be limited by the market, as such, so long as it can maintain its product cost and quality advantages over its competition for the market. Rather, the economic limits on the industry's future growth exist within Georgia itself, the most restrictive of which is the annual timber harvest that can be sustained by the Georgia forest resource.

If there is foresightful action today, this timber supply limit on the continued growth of Georgia's forest industry can be pushed back. Specifically, if the pine forest is benefited today with economically feasible reforestation and other productivity improving forest management practices, the future timber harvest and thus the permissable growth of forest product manufacturing in Georgia can be increased significantly. In this event, it can be said that the direction of economic cause and effect will run forward from the forest through manufacturing to the final markets, rather than the other way round. Investments in forestry today will determine or cause the continued growth of Georgia's forest industry.

## Economic Multipliers

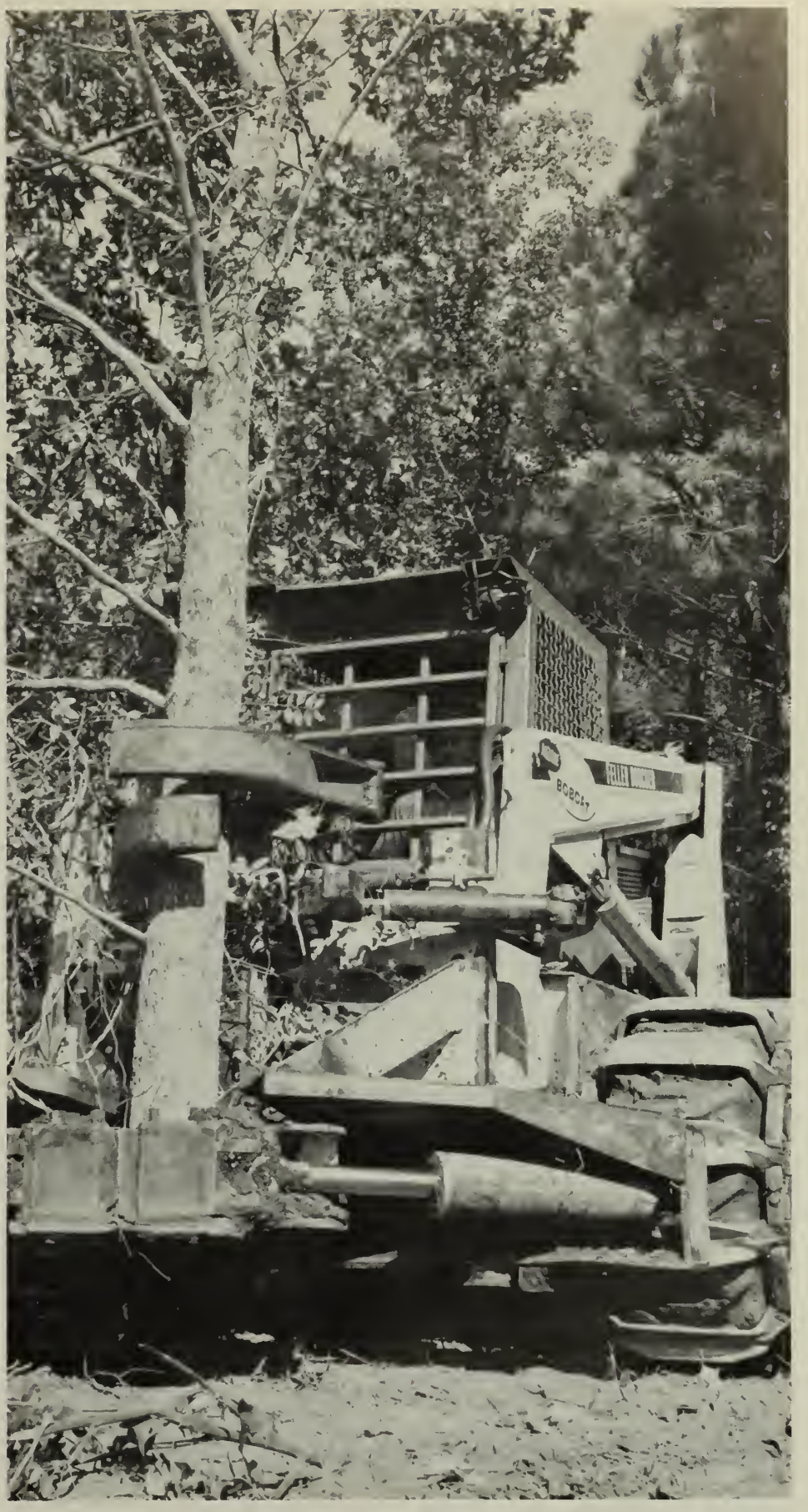
By however much the future timber supply (annual harvest) is increased by today's investments in forestry, there will be several dollars of economic benefit to Georgia for every dollar of additional timber value that results. Based upon the recent industrial structure, for every additional dollar of timber available for sale on the stump, Georgia's forest industry will create an additional $10.22 of final product value for sale to industrial and household consumers. Similarly, for every dollar of additional timber sales made possible by forest management, the forest industry will create $6.93 of income in Georgia, of which $1 would accrue to landowners while nearly six times as much would accrue to other Georgians.

## Benefit-Cost Ratios

If the Georgia forest industry is to continue its growth, it is essential that each and every participant in the process, landowner, logger, trucker, mill worker, mill manager, company stockholder, and customer, be given the prospect of a personal economic benefit greater than his or her personal economic cost. By the same token, if public expenditure is required there must be a prospect as well of a more than compensatory economic benefit for the taxpayer. Which is to say the growth of Georgia's forest industry must be economically feasible both privately and publicly.

In this regard, the ratio of personal and public economic benefit to the economic cost of forestry in Georgia is much greater than implied by the above economic multipliers. This is because it does not cost a dollar's worth of scarce economic resources to add a dollar's worth of economic value to the future timber supply, far from it. Man may considerably abet the growth of the forest with his timber management practices, but the actual process of growing timber is a work of nature and time.

From the public point of view, the annual timber harvest is virtually a gift of nature in that most stands harvested have not recieved any forest management. Privately, landowners could reckon that their timber revenues were not all profit in that they had been paying ad valorem taxes and sacrificing the interest income on those taxes over the years their natural stands were maturing. But the real economic cost of the recent harvest consisted mainly of the public protection afforded the stands against fire, insects, and disease plus interest on the accumulated public



*Modern timber harvesting equipment and techniques are now used to move raw materials swiftly from the forests to the processing plants, thus saving time and labor costs.*

*Operators who serve in the familiar fire lookout towers throughout the state help keep wildfire losses to a minimum.*

expenditure over the years man waited for nature to do its work.

Recently, the public cost of protecting the entire 24.8 million acre commercial forest in Georgia was only $11.5 million or scarcely more than a half penny per dollar of income created in Georgia by the forest industry's processing of timber harvested from several hundred thousand acres. For that matter, the total federal and state budget for forestry in Georgia was only $25.5 million, including federal services for the forest in other southern states. Georgia's timberland owners and forest product manufacturers paid more than five times as much in state and local taxes. Thus, not counting the state and local taxes paid by its employees and supporting industries, the forest and forest product manufacturers have been contributing far more to the support of Georgia's state and local governments than has been spent by the public for forestry.

In the coming years, the annual timber harvest will include timber from stands benefited from reforestation and other forest management practices, the real economic cost of which is much more substantial than that of forest protection. Under recently prevailing economic conditions, the annual reforestation of some 300,000 acres of Georgia's pine timberland is economically justified for the timberland owners. This reforestation would require a $30 million annual investment at recently prevailing forest management costs.

If this annual investment is made, it is estimated that the future timber harvest would eventually increase 342 million cubic feet from the 879 million cubic feet recently harvested. At the equivalent of recent stumpage prices, the economic return to landowners would increase by $114 million annually. Even considering the real economic cost of waiting a generation for this investment payoff, a substantial economic profit is implied for landowners by this nearly 4 to 1 private benefit-cost ratio.

So too would the public benefit from the economic growth made possible by the increased timber supply. In constant dollars the $30 million annual investment in reforestation would eventually enable industry to expand its annual shipments to final markets by $1.2 billion of quality but low cost consumer products. Similarly, $676 million in additional income would be created annually in Georgia's forest product manufacturing and its supporting industries, of which $311 million would be available either to increase the real wages of employees or to provide as many as 27 thousand new jobs. Georgia's state and local taxpayers would also benefit by an additional $56 million in tax collections from landowners and forest product manufacturers, not to mention the individual taxes collected on the additional forest industry payroll.

## Forest Management Shortfall

Considering the potential private and public economic benefits flowing from a small annual investment in reforestation, it is important to recognize that Georgia's timberland owners have not been investing as much in the forest as is being privately called for by the market economy. In recent years, no more than half of the 300,000 acres of economically feasible pine reforestation has been accomplished annually and most of that has been on land owned or leased by forest product manufacturing firms. Of the 6.6 million acres of Georgia's private, nonindustrial pine land that should eventually be managed under an improved forest management regime, less than a third of the acreage will achieve its full economic productivity at the current rate of annual reforestation by these landowners.

This shortfall of forest management is not explained by a lack of private economic incentive. For most pine timberland in Georgia, productivity improving forest management is one of the most profitable investments available in the economy. The future timber payoff will more than compensate the landowner for his cost, including Georgia's exceptionally high annual ad valorem tax on timber as

well as a compound interest cost equivalent to the best of competing investments in the economy. The problem is, an investment in forestry is both long term and non-income earning. While the necessity of waiting a long period without income may not discourage a corporation, pension fund, investment bank, or an extremely wealthy individual, it does render the forest investment impractical for many of Georgia's small timberland owners.

Typically, the small landowner cannot afford to carry out of pocket the costs of forest management and ad valorem property taxes for as long as it is necessary to get a timber payoff, the earliest of which would be 15 years into the future. In recognition of the small timberland owner's investment problem, the federal and state governments and the forest product manufacturing industry as well support various landowner assistance programs. But the scale of this support is very small in comparison to the federal soil bank program of the late 1950's and early 1960's, under which more than a million acres were planted.

At the current rate of forest management, including that which will soon accomplish a plantation economy on all pine land managed by industry, it is doubtful that the future pine timber supply will be adequate for the continued expansion of Georgia's forest products manufacturing capacity. If Georgia is to realize the private and public economic benefits of continued growth in the forest industry, ways and means must be found to make up the forest management shortfall on its nonindustrial land.

## THE PRIMARY MANUFACTURE OF THE WOOD FLOW

The 879 million cubic foot volume of Georgia's timber harvest was valued at $292.4 million, standing on the stump, Chart II. This economic return to Georgia's timberland owners was comparable in size to the farm marketings of Georgia's largest agricultural crop, peanuts. By the time its enormous mass had been logged and hauled to mill unloading docks, averaging 30 miles away, the value of the wood flow had doubled to $586.4 million. After processing by the nearby mills into lumber, plywood, veneer, pulp, paper, paperboard, and other primary wood products, the weight and bulk of the wood flow had been reduced by more than half and its value increased to $1.9 billion or by 6½ times. At this point in its economic transformation, the value of the wood product flow was comparable in size to the value of all Georgia farm marketings, including livestock, dairy, and poultry as well as cash crops other than peanuts.

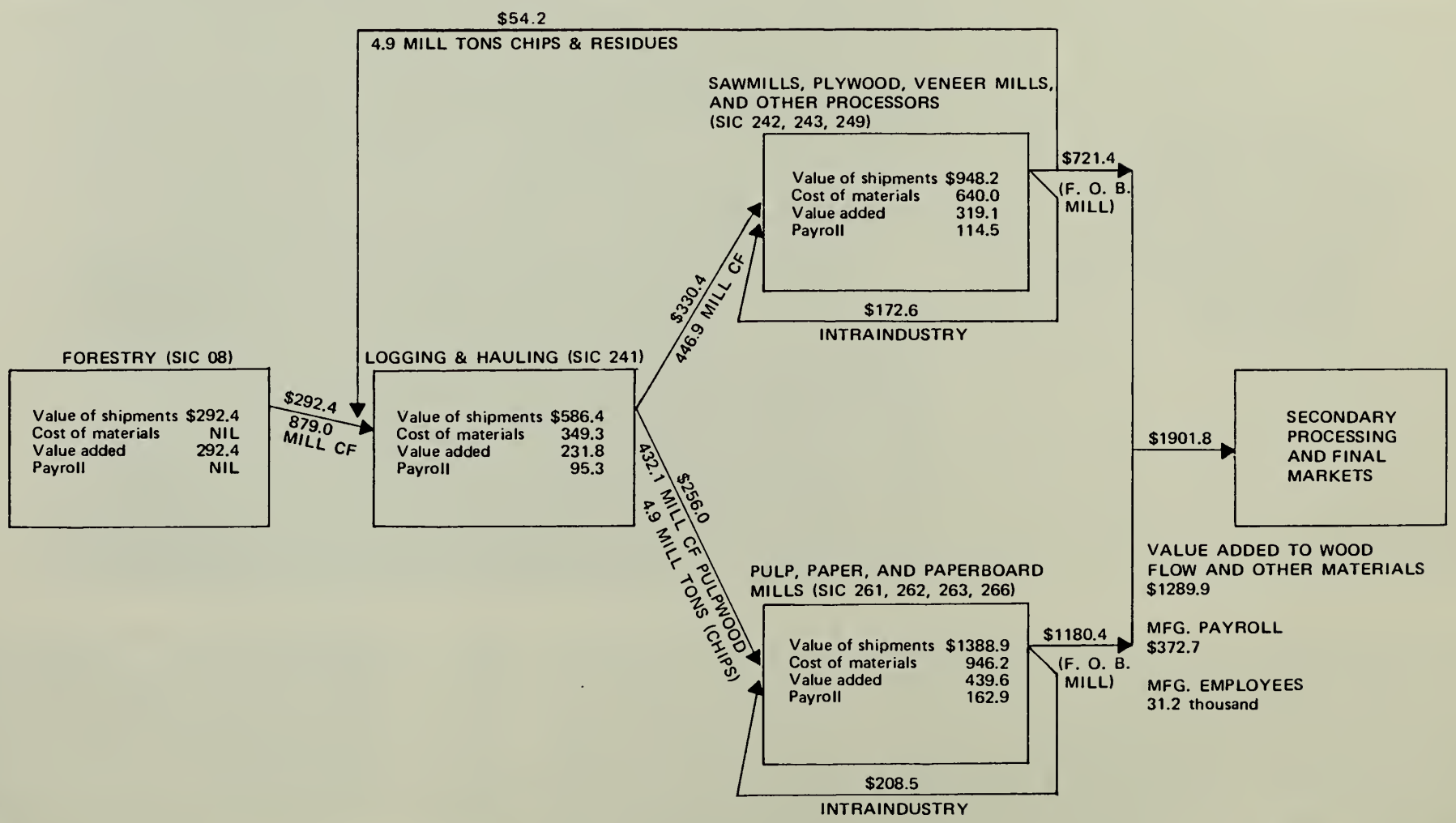
Economics dictate that the manufacturing processes which accomplish this remarkable transformation must be located as closely as possible to the source of the wood flow. Economics also favor, if not dictate, that the primary wood processing be accomplished by large scale, capital intensive establishments. Georgia's saw mills and pulp mills meet both requirements.

Of the 241 Georgia sawmills producing 1.8 billion board feet of lumber, the 56 mills producing 10 million board feet or more each accounted for 77 percent of the state's lumber output. Similarly, 77 percent of the 353 million board feet of sawtimber processed into plywood and veneer was accounted for by 5 large mills. Of the 15 pulp mills producing 5.3 million tons of pulp, which ranked Georgia as the leading state and as the world's sixth largest producer among nations outside of the United States, only 5 mills produced less than 200,000 tons. Indeed, the typical Georgia pulp mill is one of the world's largest and is usually integrated with an equally large paper or paperboard mill.

But the unique advantage of Georgia's forest product industry is that these large, economically efficient mills have been able to remain close to the source of their wood supply indefinitely, notwithstanding their monumental annual consumption of timber. The industry thus has an indefinitely long period to recover the huge investment cost of its mills and can modernize and expand capacity at less cost than is necessary for the industry located in regions where mill sites eventually must be shifted due to the cutting over

*This stand of timber is typical of the fine forests that blanket Georgia.*

**Chart II: Primary processing of Georgia's wood product flow (Millions of dollars) 1977**




*Source:* See Chart I.

*The logging and hauling of timber in Georgia is a staggering undertaking. Within a year, more than 30 million tons of logs are hauled 200 million miles over the state's roads and highways to mills, rail sidings and docks. Trucks range from short body vehicles which haul conventional length logs to huge tractor and trailer rigs such as the one shown above, which transports tree length logs.*

of the forest. The permanence of its mill sites in Georgia also enables the supporting growth of business and community infrastructure and gives the industry time as well to develop the technology with which to improve and diversify the end product uses of the southern pine species. The industry is also able to capitalize upon the opportunity for profitable integration of manufacturing processes, both vertically as between pulp, paper, and converted paper products and horizontally as between pulp and saw mills.

Insomuch as the cost and quality advantage of Georgia's wood products are due to these factors, the underlying reason is the rapid growth of the southern pine forest. Especially if the forest is benefited by productivity improving forest management, the rotation period is one third or less than that of softwood forests elsewhere in the northern hemisphere. This means a very large annual harvest can be sustained from a very small area, thus enabling short hauling distances for the bulky and heavy timber. Moreover, in Georgia the short-haul advantage is complemented by other advantages. Georgia's climate and terrain favor year-round, highly mechanized logging operations. The forest is interspersed with an agricultural economy that does not threaten its use of the land but which advantages it with a supporting infrastructure of communities, roads, highways, and railroads. Because of these advantages, Georgia enjoys the paradox of stumpage prices high enough to warrant forest investments and mill delivered timber prices lower than in competing regions.

## Logging and Hauling

If Georgia's large mills are economically "close" to the source of their wood supply, the advantage is only relative. Even in Georgia the logging and hauling of the timber harvest is a staggering undertaking. In recent years, 8,900 logging trucks have taken to Georgia's roads and highways at the rate of 200 million miles in hauling the more than 30 million tons of that year's harvest to rail sidings or mill unloading docks. It is estimated that timber logging, hauling, and handling added $231.8 million in value to the wood flow, of which $95.3 million was payroll. Thus, almost as much income was created by the economic middlemen between landowner and mill as accrued to landowners for their stumpage. By the same token, it is estimated that 23 percent of the value added reported for the state's

*Sawtimber is the most profitable market objective in forest management in Georgia. The log yard in the above scene is at one of the largest and most modern sawmills in the state.*

primary wood product manufacturers was attributable to logging and hauling.

Sawmills, Plywood, and Veneer Mills

An estimated 446.9 million cubic feet of sawtimber with a mill delivered value of $330.4 million was processed into lumber, plywood, veneer, and other roundwood products. Thus, slightly more than half of the roundwood volume of the harvest and 62 percent of its mill delivered value was accounted for by this industry's demand for saw-timber. By the same token, it is estimated that 71 percent of this industry's cost of materials consisted of sawtimber inputs, after netting out intra-industry purchases and sales of semi-processed wood by nonintegrated establishments. Reflecting this economic affinity, sawtimber is the most profitable market objective for forest management in Georgia. By the same token, it explains the dispersion of sawmills throughout the forest. However, almost a third of the roundwood volume received by this industry became chips and residues, which are included in the estimated $54.2 million of shipments to the pulp and paper industry. Shipments to secondary wood product manufacturers located in Georgia or to final markets totaled $721.4 million.

Pulp, Paper, and Paperboard Mills

Georgia's pulp and paper industry processed 432.1 million cubic feet of pulpwood and 4.9 million tons of chips with a delivered value of $256.0 million. After netting out intra-industry shipments, wood constituted 35 percent of this industry's cost of materials. Thus, there would appear to be less economic affinity between the pulp and paper industry and the forest than for the manufacture of lumber and plywood. However, directly and indirectly about two-thirds of the roundwood volume of the timber harvest is processed into pulp and paper products. That wood costs appear less important to this industry is due in part to the fact that some nonintegrated paper and board mills in Georgia depend upon pulp imported from mills in nearby states. Moreover, pulp and paper manufacture requires more nonwood inputs, chemicals, fuel, electricity, and the like. But its relatively low wood costs importantly reflects the advantage of its close proximity to cheap pulpwood and the increased availability of low cost chips and residues from the growing lumber and plywood industry.

While the lumber and plywood industry is the more important for the economics of forest management, the pulp and paper industry is the more important for the Georgia economy. Once the flow of pulpwood and chips has been processed into pulp, paper, paperboard, and tall oil, the value of shipments to final markets and secondary manufacture in Georgia was $1,180.4 million or 62 percent of the total final shipments from the two primary processing industries. By the same token, the income and payroll created in pulp and paper manufacturing, estimated here at $439.6 million and $162.9 million, constituted 57.9 percent and 58.7 percent respectively of that of the two industries combined. Moreover, as will be seen in a moment, the converted paper and paperboard product industries add considerably to the relative economic importance to Georgia of this part of the wood flow.

## SECONDARY WOOD PRODUCTS AND FINAL MARKETS

A large share of Georgia's lumber, plywood, pulp, paper, and other primary wood products does not receive further manufacture in the state. Either it is shipped to final users for their own unique product adaptations or it is shipped to out-of-state destinations for further processing. In general, economics favor the location of secondary wood processing closer to the final consumer than to primary processors and the forest. Partly this is because there is less need to locate the secondary manufacturing process close to the primary manufacturer. The cost of transporting the output of the latter is much less relative to its value than is the case for its bulky and heavy timber input. By the same token, if the secondary process adds considerably to the bulk and weight of the primary wood product relative to the value added at that manufacturing stage, any economic advantage of being located close to the primary manufacturer may be outweighed by the added transport cost of reaching the final consumer in a distant market.

Furthermore, if much labor is required in second stage wood processing, the addition of this labor demand to that of the primary mills may exceed the available labor supply in the rural locations where many of the primary mills must be located so as to be close to their wood supply. Finally, the secondary wood processor must have a much closer marketing relationship to the final consumer. Since so many potential wood products can be created to meet so many potential consumer uses, the marketing problem of matching up the special product with the special consumer need may require first hand or local knowledge of the consumer.

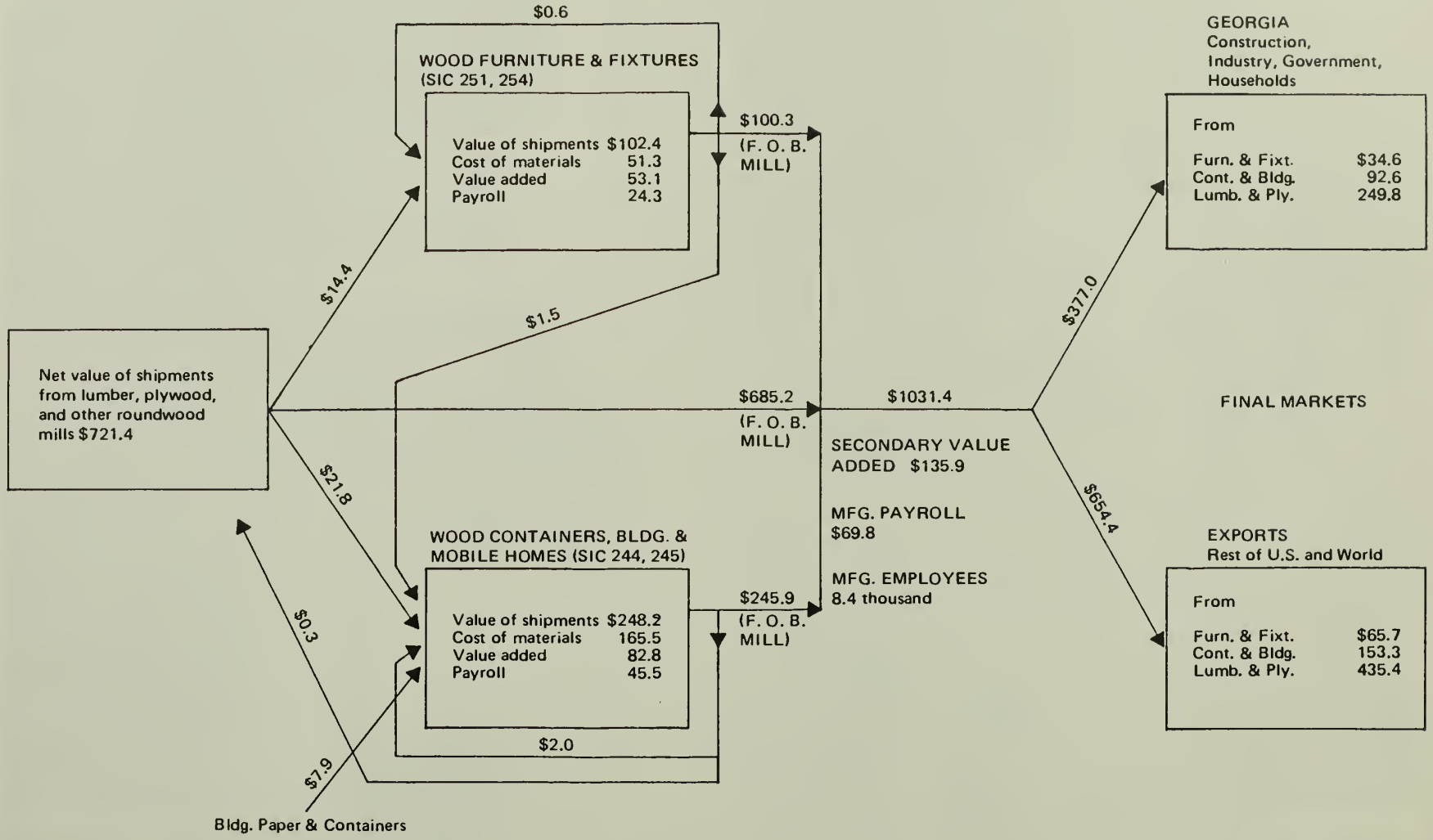
Nevertheless, secondary wood processing in Georgia is important and, in the instance of converted paper and paperboard products, it is becoming more important. There are several reasons for this seeming contradiction of location principles. One is that there can be production economies from the integration of primary and secondary processing. Another is that secondary processing may add very little in product bulk and weight even as it adds a great deal of product value. Thirdly, Georgia is strategically located relative to a large market of final consumers. The South is a region of growth with all that entails for the construction, business, and household demands for wood products. Moreover, Georgia's developing transportation, distribution, marketing, and communication systems are giving its forest product manufacturers increasing access to national and world markets.

### Wood Furniture, Mobile Homes, and Other

Ninety-five percent of Georgia's lumber and plywood output is shipped to final markets without further manufacture in Georgia, Chart III. It is estimated that only $36.2 million of lumber and plywood shipments became inputs into two secondary processing industries, wood furniture and fixtures and wood containers, and buildings and mobile

*Although much of the lumber and plywood manufactured in the state is shipped to other destinations, some of it finds its way into Georgia's furniture plants. This large furniture factory is located in Middle Georgia.*

Chart III: Secondary processing and final markets for Georgia's lumber and plywood industry (Millions of dollars), 1977




*Source:* See Chart I.

homes. These two industries had a combined value of final shipments of $350.6 million, value added of $135.9 million, and payroll of $69.8 million for 8.4 thousand employees.

As seen elsewhere, these two converting industries have not grown as much as other segments of the forest product industry. One reason is that the bulkiness of their products inhibits their access to national markets. Another is that the furniture and fixtures industry is inhibited by the fact that Georgia's forest economy is predominantly pine rather than hardwood. Moreover, the wood container, building, and mobile homes industry finds itself in competition with the end product uses of the flow of lumber, plywood, and paperboard containers. Thus, while it is proper to include these two industries in the general group of Georgia's forest products industries, it is problematical whether they should be included in the multiplying economic impact of an increased future timber harvest.

### Converted Paper and Paperboard Containers

Of the $1,180.4 million in shipments of pulp, paper,and paperboard, 77 percent or $909.0 million was destined for final markets without further processing in Georgia, Chart IV. The largest part of these final shipments, $803.9 million, was exported to national and world markets. Final consumers in Georgia, such as the printing and publishing and construction industries, received an estimated $105.1 million of shipments from the pulp and paper industry.

Of the $271.4 million of pulp and paper shipments receiving further processing in Georgia, all but $14.1 million became inputs for the state's paperboard container and miscellaneous converted paper products industries. In turn, the combined value of final shipments from these two converting industries was $1,080.3 million, which exceeded even that of the pulp and paper industry itself. The export share of converted products was virtually as large as that of pulp and paper and thus the dollar total of exports was slightly higher. These converting industries rivaled the pulp and paper industry as well in income creation. Their combined value added was $418.1 million, of which $177.3 million was payroll for 14.0 thousand employees, most of whom were located in the state's metropolitan areas.

This remarkably large product and income flow is due in part to the fact that these two converting industries importantly depend upon paper and paperboard imports from mills in neighboring states. Georgia's miscellaneous converted paper industry imported an estimated 41 percent of its paper input while the paperboard container industry imported 49 percent of its paperboard. But it is also due to the fact that these industries add a large amount of product value to their material inputs. Jointly, they add $0.58 of value per dollar of material cost as compared with $0.46 per dollar by the pulp, paper, and paperboard industry.

As seen elsewhere, Georgia's converted product industries have been growing faster than the other forest products industries, exceeding even the growth of pulp and paper manufacturing. Indeed, this growth has given an immediate impetus to the expansion of pulp and paper manufacturing capacity in the state. One reason for this growth is that there are economies flowing from the integration of converted product manufacturing with that of the primary processes. It is estimated that 81 percent of the paperboard container industry's cost of materials consisted of paperboard while 66 percent of converted paper product material consisted of paper inputs. Moreover, very little product bulk or weight is added in the process of adding $0.82 in value per dollar of paper or paperboard input.

Insomuch as the paperboard container and converted paper products industries continue their rapid growth, processing relatively more of Georgia's primary output of pulp and paper, there is a large potential for creating additional income and employment in the state from the available wood flow. For example, had all pulp, paper, and paperboard that was exported been processed into converted products in Georgia, an additional $659.2 million in income would have been created in the state and the economic multiplier would have increased from $6.93 to $9.07 of income per dollar of timber sales. Of course, this is an unrealistic assumption in that some pulp and paper products, such as newsprint and building paper, are exported in finished or final product form. Nevertheless, if these converted products retain their apparent advantage in national and world markets, there is a prospect that an expanded future wood harvest would lead to a more than proportional increase in economic benefits for the state, especially in the state's metropolitan areas where converted industries are concentrated.

## RECENT TRENDS IN GEORGIA'S WOOD PRODUCT MANUFACTURERS

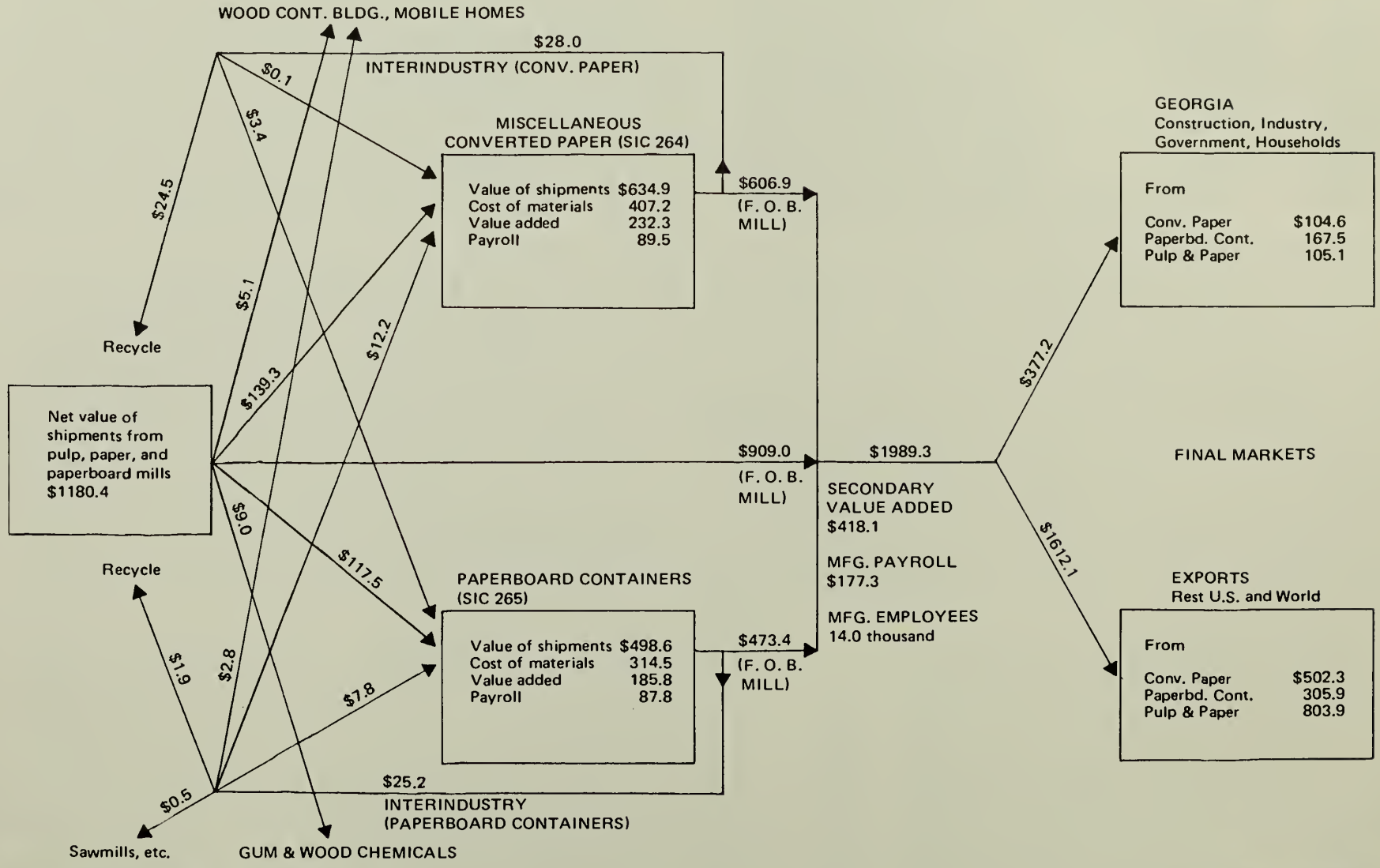
There was both substantial growth in Georgia's wood product manufacturing as well as substantial changes in its industrial structure over the past decade. At the beginning of the decade the pulp, paper, and paperboard industry dominated wood products manufacturing in the state. At its end, an integrated, multiproduct forest product manufacturing economy had emerged. These trends will be examined using the 1977 Census of Manufactures measures of value of shipments, valued added in manufacturing, payroll, and employment, the most recent data available. In order to facilitate the analysis of these trends, the dollar values reported by the Census in 1967 have been adjusted for the general price inflation that occurred over the ten year period, i.e. expressed in constant dollars in 1977 purchasing power. It should also be noted that the Census measures used here vary somewhat from the measures of the above interindustry analysis.

### Value of Shipments

Even after eliminating the growth in dollar value due to general price inflation, the value of shipments from Georgia's forest product manufacturers grew by 57.9 percent over this period, Table 1. The value of shipments from the primary processing industries increased more rapidly than those of the second stage processors, 65.6 percent versus 46.2 percent. The slower growth of the latter was due primarily to the wood container, buildings, and mobile homes industry and the wood furniture and fixtures industry, the constant dollar shipments of which declined by 3.2 percent and increased but by 5.7 percent, respectively. The relative decline of these two industry groups contrasts with the exceptional 124.0 percent growth of the miscellaneous converted paper products industry, which enabled this industry to become the state's leading secondary wood processor.

The more rapid growth in shipments at the primary processing level was attributable to the lumber and plywood industry, the output of which increased 145.6 percent in constant dollars. Most of the growth in the value of this and the logging industry was due to the growing physical volume of sawtimber being processed into lumber and plywood. How-

**Chart IV: Secondary processing and final markets for Georgia's pulp and paper industry (Millions of dollars), 1977**




*Source:* See Chart I.

*This retail sales lumber yard stocks dimension lumber products manufactured by the sawmills in the state. The growing volume of sawtimber being processed into lumber and plywood is motivated by a state, national and world market.*

ever, during this ten year period the prices of sawtimber, lumber, and plywood increased faster than prices generally in the economy, and thus the constant dollar increase in the value of shipments from these industries reflects an increase in real economic value of the products as well as an increase in physical volume of shipments. In turn, this means that the growing physical volume of sawtimber being processed into lumber and plywood was being motivated by the increasing prices of a strong national market.

In contrast, the 35.2 percent constant dollar growth in shipments from Georgia's pulp, paper, and paperboard industry reflects little, if any, increase in the real economic value of its products. With the exception of market pulp, this industry's product prices increased no more rapidly, if as much, than the general level of prices. This means that the growth in this industry's value of shipments almost entirely reflected an increasing physical volume of output. The same can be said of the two secondary processing industries allied with pulp, paper, and paperboard manufacture. That is, the 31.9 percent growth in paperboard container shipments and the exceptional 124.0 percent growth in miscellaneous converted paper product shipments were being marketed at prices that were no higher at the

Table 1

Value of Shipments by Wood Products Manufacturers in Georgia, 1967 and 1977
(millions of 1977 dollars)

| | 1967 | 1977 | Percent Change 1967-77 |
|---|---|---|---|
| TOTAL PRIMARY MANUFACTURERS | $1,531.5 | $2,536.6 | 65.6 |
| Logging | 118.3 | 199.5 | 68.6 |
| Lumber and Plywood | 386.1 | 948.2 | 145.6 |
| Pulp, Paper and Paperboard | 1,027.1 | 1,388.9 | 35.2 |
| TOTAL SECONDARY MANUFACTURERS | $1,014.8 | $1,484.1 | 46.2 |
| Wood Containers, Buildings and Mobile Homes | 256.3 | 248.2 | - 3.2 |
| Wood Furniture and Fixtures | 96.9 | 102.4 | 5.7 |
| Miscellaneous Converted Paper Products | 283.5 | 634.9 | 124.0 |
| Paperboard Containers and Boxes | 378.1 | 498.6 | 31.9 |
| TOTAL WOOD PRODUCTS MANUFACTURERS | $2,546.3 | $4,020.7 | 57.9 |

Source: Census of Manufactures, 1967 and 1977.

end of the period than ten years earlier, after adjustment for general price inflation. Thus, if the growth of Georgia's lumber and plywood industry was given the incentive of higher product prices in the national market, the same can't be said of Georgia's pulp and paper industry.

Value Added in Manufacturing

Value added in manufacturing is approximately the dollar difference between the dollar value of an industry's shipments and the dollar value of its purchased material inputs. As such, it measures the revenues available to the industry after its material purchases for its payroll, capital recovery or depreciation, interest or cost of capital, rents or royalities, taxes, miscellaneous business services, the financing of its inventory accumulation, and, not least, its profits. Loosely speaking, value added in manufacturing is the income created in the industry with which it pays those individuals who supply it with the primary factors of production, i.e. natural resources of the land, labor, management, and capital. The aggregation of value added in production throughout the economy is Gross National Product. The value added measure is more economically significant than the value of shipments for this reason, and

Table 2

Value Added By Wood Products Manufacturers in Georgia, 1967 and 1977
(millions of 1977 dollars)

| | 1967 | 1977 | Percent Change 1967-77 |
|---|---|---|---|
| TOTAL PRIMARY MANUFACTURERS | $ 751.5 | $ 990.5 | 31.8 |
| Logging | 57.0 | 88.6 | 55.4 |
| Lumber and Plywood | 162.3 | 369.6 | 127.7 |
| Pulp, Paper and Paperboard | 532.2 | 532.3 | — |
| TOTAL SECONDARY MANUFACTURERS | $ 394.1 | $ 554.0 | 40.6 |
| Wood Containers, Buildings and Mobile Homes | 83.1 | 82.8 | - .4 |
| Wood Furniture and Fixtures | 50.5 | 53.1 | 5.1 |
| Miscellaneous Converted Paper Products | 113.8 | 232.3 | 104.1 |
| Paperboard Containers and Boxes | 146.7 | 185.8 | 26.7 |
| TOTAL WOOD PRODUCTS MANUFACTURERS | $1,145.6 | $1,544.5 | 34.8 |

Source: Census of Manufactures, 1967 and 1977.

Table 3

Payrolls by Wood Products Manufacturers in Georgia, 1967 and 1977
(millions of 1977 dollars)

| | 1967 | 1977 | Percent Change 1967-77 |
|---|---|---|---|
| TOTAL PRIMARY MANUFACTURERS | $267.2 | $372.7 | 39.5 |
| Logging | 28.1 | 36.1 | 28.5 |
| Lumber and Plywood | 84.8 | 135.4 | 59.7 |
| Pulp, Paper and Paperboard | 154.3 | 201.2 | 30.4 |
| TOTAL SECONDARY MANUFACTURERS | $207.8 | $247.1 | 18.9 |
| Wood Containers, Buildings and Mobile Homes | 46.8 | 45.5 | - 2.8 |
| Wood Furniture and Fixtures | 29.6 | 24.3 | -17.9 |
| Miscellaneous Converted Paper Products | 57.5 | 89.5 | 55.7 |
| Paperboard Containers and Boxes | 73.9 | 87.8 | 18.8 |
| TOTAL WOOD PRODUCTS MANUFACTURERS | $475.0 | $619.8 | 30.5 |

Source: Census of Manufactures, 1967 and 1977.

Table 4

Employment by Wood Products Manufacturers in Georgia, 1967 and 1977
(thousands of employees)

| | 1967 | 1977 | Percent Change 1967-77 |
|---|---|---|---|
| TOTAL PRIMARY MANUFACTURERS | 27.6 | 31.2 | 13.0 |
| Logging | 4.4 | 3.8 | - 13.6 |
| Lumber and Plywood | 12.5 | 15.2 | 21.6 |
| Pulp, Paper and Paperboard | 10.7 | 12.2 | 14.0 |
| TOTAL SECONDARY MANUFACTURERS | 21.6 | 22.4 | 3.7 |
| Wood Containers, Buildings and Mobile Homes | 5.4 | 5.3 | - 1.9 |
| Wood Furniture and Fixtures | 4.1 | 3.1 | - 24.4 |
| Miscellaneous Converted Paper Products | 5.5 | 7.2 | 30.9 |
| Paperboard Containers and Boxes | 6.6 | 6.8 | 3.0 |
| TOTAL WOOD PRODUCTS MANUFACTURERS | 49.2 | 53.6 | 8.9 |

Source: Census of Manufacturers, 1967 and 1977.

Table 5

Average Payroll per Employee in Georgia's Wood Products Manufactures, 1967 and 1977
(1977 dollars)

| | 1967 | 1977 | Percent Change 1967-77 |
|---|---|---|---|
| TOTAL PRIMARY MANUFACTURERS | $ 9,681 | $11,946 | 23.4 |
| Logging | 6,386 | 9,500 | 48.8 |
| Lumber and Plywood | 6,784 | 8,908 | 31.3 |
| Pulp, Paper and Paperboard | 14,421 | 16,492 | 14.4 |
| TOTAL SECONDARY MANUFACTURERS | $ 9,620 | $11,031 | 14.7 |
| Wood Containers, Buildings and Mobile Homes | 8,667 | 8,585 | - .9 |
| Wood Furniture and Fixtures | 7,220 | 7,839 | 8.6 |
| Miscellaneous Converted Paper Products | 10,455 | 12,431 | 18.9 |
| Paperboard Containers and Boxes | 11,197 | 12,912 | 15.3 |
| TOTAL WOOD PRODUCTS MANUFACTURERS | $ 9,654 | $11,563 | 19.8 |

Source: Census of Manufactures, 1967 and 1977.

because it does not incorporate the duplication of product value due to intra and interindustry purchases and sales of materials flowing through the several stages of manufactures.

By this measure, Georgia's forest product manufacturing grew by 34.8 percent in constant dollars over the ten year period, Table 2. With the exception of the pulp, paper, and paperboard industry, the value added in manufacturing by these industries grew almost as much as their value of shipments. This means that the cost of material inputs per dollar of product output was only slightly higher at the end of the period than ten years earlier. Alternatively, the ratio of value added to value of shipments, i.e. the margin of income available to the industry for paying its primary factors and profit, was only slightly smaller than ten years earlier. In other words, these industries were able to virtually compensate for the increasing cost of their materials by increasing the prices of their products or by improving their operating efficiency or both.

For example, over this period the lumber and plywood industry was increasing the price it paid for sawtimber, its principal materials input, at a faster rate than the general inflation of prices in the economy. But due to the fact that it was able to sell lumber and plywood at prices rising faster than inflation, if not because of improved operating efficiency as well, the industry was able to maintain its margin of value added on an increasing physical volume of output.

In contrast, it is startling to note that there was virtually no constant dollar growth in the value added in manufacturing by the pulp, paper, and paperboard industry, even as its value of shipments grew by 35.2 percent. This unusual result is due to the fact that the absolute increase in the industry's cost of materials almost exactly balanced the absolute increase in its value of shipments. Thus, relatively speaking, the industry's cost of materials increased much faster than its value of shipments. Indeed, the cost of fuel, electricity, chemicals, wood, and other material inputs per dollar of pulp, paper, and paperboard shipments increased from 48.1 cents to 61.5 cents over the ten year period. Alternatively, the margin of value added per dollar of shipments declined from 51.9 cents to 38.5 cents.

## Payrolls and Employment

A major component of an industry's value added in manufacturing is its payroll. After adjustment for inflation, the payroll of Georgia's wood product manufacturers grew by 30.5 percent over the ten year period, Table 3. This growth in real or constant dollar payroll reflected growth in employment and faster than inflation growth in wage rates. Employment grew by 8.9 percent over this ten year period, Table 4. The exceptions to this growth were the wood containers, buildings, and mobile homes industry, with an employment decline of 1.9 percent, and the furniture and fixtures industry, the employment of which declined by 24.4 percent. For the industry as a whole, the growing real payroll also reflected an increase of 19.8 percent in the average payroll per employee, after inflation, Table 5. Thus, the industry was both employing more workers and paying them higher real wages than ten years earlier.

However, a comparison of the growth rates in payroll with those of value added in manufacturing implies that in general payroll costs comprised a smaller share of value added at the end of the period than ten years earlier. For example, in the lumber and plywood industry the average payroll per employee grew by 59.7 percent in constant dollars. This reflected a 21.6 percent increase in employment and a 31.3 percent increase in the average employee's real wage. But the industry's value added in manufacturing grew by 127.7 percent or more than twice as fast as its total payroll. Accordingly, the lumber and plywood industry's payroll constituted but 36.6 percent of its value added in manufacturing, down from 52.2 percent ten years earlier. Thus, while this industry was hiring more workers during this period and increasing its wage rates faster than the cost of living to the extent that real wages were virtually one-third higher at the end of the period, the added payroll cost was more than offset by the industry's growing productivity. The industry's value added per employee was 87.2 percent higher in constant dollars than ten years earlier. Thus, the lumber and plywood industry's growing output was given the economic incentive both of rising real product prices and of declining real wage costs.

In striking contrast, the payroll of the pulp, paper, and paperboard industry grew by 30.4 percent in constant dollars, even as there was no growth in its real value added in manufacturing. This payroll growth reflected a 14.0 percent growth in the industry's employment and a 14.4 percent growth in the constant dollar or real payroll per employee. Although the growth in wage per employee was slower than that of the lumber and plywood industry, at $16,492 the average per employee wage in the pulp and paper industry was still the highest of all Georgia wood manufacturers at the end of the period and, for that matter, as high as received by pulp and paper employees elsewhere in the nation. This high level of wages was sustained, notwithstanding the fact that as the pulp and paper industry increased its employment, the value added per worker in constant dollars declined from $49.7 thousand to $43.6 thousand over the ten year period. In consequence, the payroll of this industry commanded 38 percent of its value added in manufacturing, up from 29 percent ten years earlier.

## Overview of Industry Trends

Economically, it is easy to explain the rapid growth of Georgia's lumber and plywood industry and by derivation the growth in the volume of sawtimber harvested. All of the above economic measures indicate that the lumber and plywood industry was enjoying substantial growth in its profits. What may seem perplexing is the substantial growth in the physical output of the pulp, paper, and paperboard industry in the face of so many negative trends in the measures bearing on its profitability. The prices of its products were barely keeping up with inflation, if that much, thus giving the industry no real price incentive to market its increasing output. The cost of its materials was increasing much faster than the value of its shipments, therefore, squeezing the margin of its value added in manufacturing. Moreover, the payroll share of value added in pulp, paper, and paperboard manufacture was increasing, therefore impinging upon the industry's revenues available for capital recovery, interest, taxes, rents, and profits. And this says nothing of this industry's new capital expenditures for largely unproductive investments complying with environmental protection regulations and the attendantly higher interest costs which further eroded the margin of its value added available for profit.

One explanation for this unusual industry behavior is that these negative trends were universal to the industry in the nation and around the world. Thus, it should not be inferred that Georgia's pulp and paper industry lost its competitive advantage in national and world markets. On the contrary, the fact that the physical output of Georgia's pulp, paper, and paperboard has been growing implies that Georgia's industry has been taking over a share of the national and world

*This big pulp and paper mill is one of the latest to locate in Georgia. This and similar plants have aided in boosting forest products to the number two place in Georgia's billion dollar industries.*

Table 6

Value Added by Georgia's Billion Dollar Industries, 1967 and 1977
(millions of 1977 dollars)

| Industry | 1967 | 1977 | Percent Change 1967-77 |
|---|---|---|---|
| All Manufacturing | $8,800.7 | $12,548.8 | 47.6 |
| Textile Mill Products | 1,797.9 | 2,433.8 | 35.4 |
| FOREST PRODUCTS | 1,204.4 | 1,608.2 | 33.5 |
| Transportation Equipment | 1,292.6 | 1,578.0 | 22.1 |
| Food and Kindred Products | 1,011.7 | 1,362.2 | 34.6 |
| Chemical and Allied Products | 500.2 | 1,087.0 | 117.3 |

Source: Census of Manufactures, 1967 and 1977.

markets lost by those of its competitors who have been forced by these negative developments to shut down unprofitable mills. Granted, until these negative trends are reversed, there will not be much profit to be earned in the manufacture of pulp, paper, and paperboard. But if there is any profit to be earned at all, it will be earned in Georgia.

A second reason for this industry's continued growth in Georgia is that it reflects the growing integration of forest product manufacturing in the state. Earlier, the manufacture of pulp, paper, and paperboard was accomplished by firms typically specializing in one or more of these products. Recently, the manufacture of pulp, paper, and paperboard has been increasingly undertaken by firms engaged in a conglomerate of mutually supporting forest product processes and activities, ranging from the forest through the manufacturing and marketing of products for final household or industrial use. At the primary stages of manufacture, not only has Georgia's pulp and paper manufacturing been benefited from the increasing availability of chips and residues from lumber and plywood manufacture, increasingly firms are engaged in both industries. Similarly, some firms producing pulp and paper have been able to augment their profits from the wood chemical byproduct of the pulping process. Integration also is occuring between the primary and secondary processing stages, enabling the firm to achieve a high return in value added for every dollar of paper or paperboard diverted to its converting establishments.

Thus, no longer is it the case that the economic fortunes of any one product class or particular stage of product processing can be equated with the economic fortunes of the individual firms engaged

Table 7

Payrolls by Georgia's Billion Dollar Industries, 1967 and 1977
(millions of 1977 dollars)

| Industry | 1967 | 1977 | Percent Change 1967-77 |
|---|---|---|---|
| All Manufacturing | $4,049.6 | $5,124.5 | 26.5 |
| Textile Mill Products | 905.3 | 1,068.1 | 18.0 |
| FOREST PRODUCTS | 487.7 | 635.8 | 30.4 |
| Transportation Equipment | 643.1 | 561.7 | - 12.7 |
| Food and Kindred Products | 402.2 | 480.9 | 19.6 |
| Chemical and Allied Products | 128.3 | 183.3 | 42.9 |

Source: Census of Manufactures, 1967 and 1977.

Table 8

Employment in Georgia's Billion Dollar Industries, 1967 and 1977
(thousands of employees)

| Industry | 1967 | 1977 | Percent Change 1967-77 |
|---|---|---|---|
| All Manufacturing | 423.1 | 484.7 | 14.6 |
| Textile Mill Products | 109.2 | 116.6 | 6.8 |
| FOREST PRODUCTS | 50.2 | 55.0 | 9.6 |
| Food and Kindred Products | 45.7 | 47.1 | 3.1 |
| Transportation Equipment | 41.2 | 30.8 | -25.2 |
| Chemical and Allied Products | 10.7 | 13.5 | 26.2 |

Source: Census of Manufactures, 1967 and 1977.

Table 9

Capital Expenditures by Georgia's Billion Dollar Industries, 1972 and 1977
(millions of current dollars)

| Industry | 1972 | 1977 |
|---|---|---|
| All Manufacturing | $688.3 | $1,143.4 |
| FOREST PRODUCTS | 263.3 | 256.9 |
| Textile Mill Products | 27.6 | 214.1 |
| Transportation Equipment | 125.2 | 173.0 |
| Food and Kindred Products | 55.9 | 120.9 |
| Chemical and Allied Products | 16.4 | 73.4 |

Source: Census of Manufactures, 1967 and 1977.

*The state's forest products industries are concentrated in the metropolitan areas. Many are located in this city - the capital City of Georgia. Six other metro centers benefit from these enterprises.*

in its manufacture. This increasing integration of forest products and processes augurs well both for the future stability and growth of the industry in Georgia, as attested to by these historical trends. If the adverse trends in the profitability of the state's pulp and paper industry had been predictable, it would have been unimaginable that the Georgia forest product industry, as a whole, would overcome such adversity and experience growth in output, wages, and employment. Further, it would have been inconceivable that the Georgia pulp and paper industry, itself, would continue to increase its output, wages, and employment.

## FOREST PRODUCTS COMPARED WITH OTHER LEADING GEORGIA MANUFACTURERS

Georgia's manufacturing economy has five industries with value added in manufacturing in excess of one billion dollars, Table 6 and Chart V. These five leading manufacturing industries are textile mill products, forest products, transportation equipment, food and kindred products, and chemical and allied products. Jointly, these five industries account for almost two-thirds of the income originating in the state's manufacturing economy and more than half of its payroll and employment, Tables 7 and 8.

Forest products is Georgia's second largest manufacturing industry, as measured by value added, payroll, or employment. In recent years, forest products manufacturing has led all manufacturing industries in the magnitude of its new capital expenditures, recently accounting for 22 percent of all investments in Georgia's manufacturing economy, Table 9. Excepting the much smaller chemical industry, payroll and employment in the forest products industry have grown faster than in these other leading Georgia industries. Between 1977 and 1980 it is estimated that forest product manufacturing employment in Georgia grew 9 percent to 60 thousand employees.

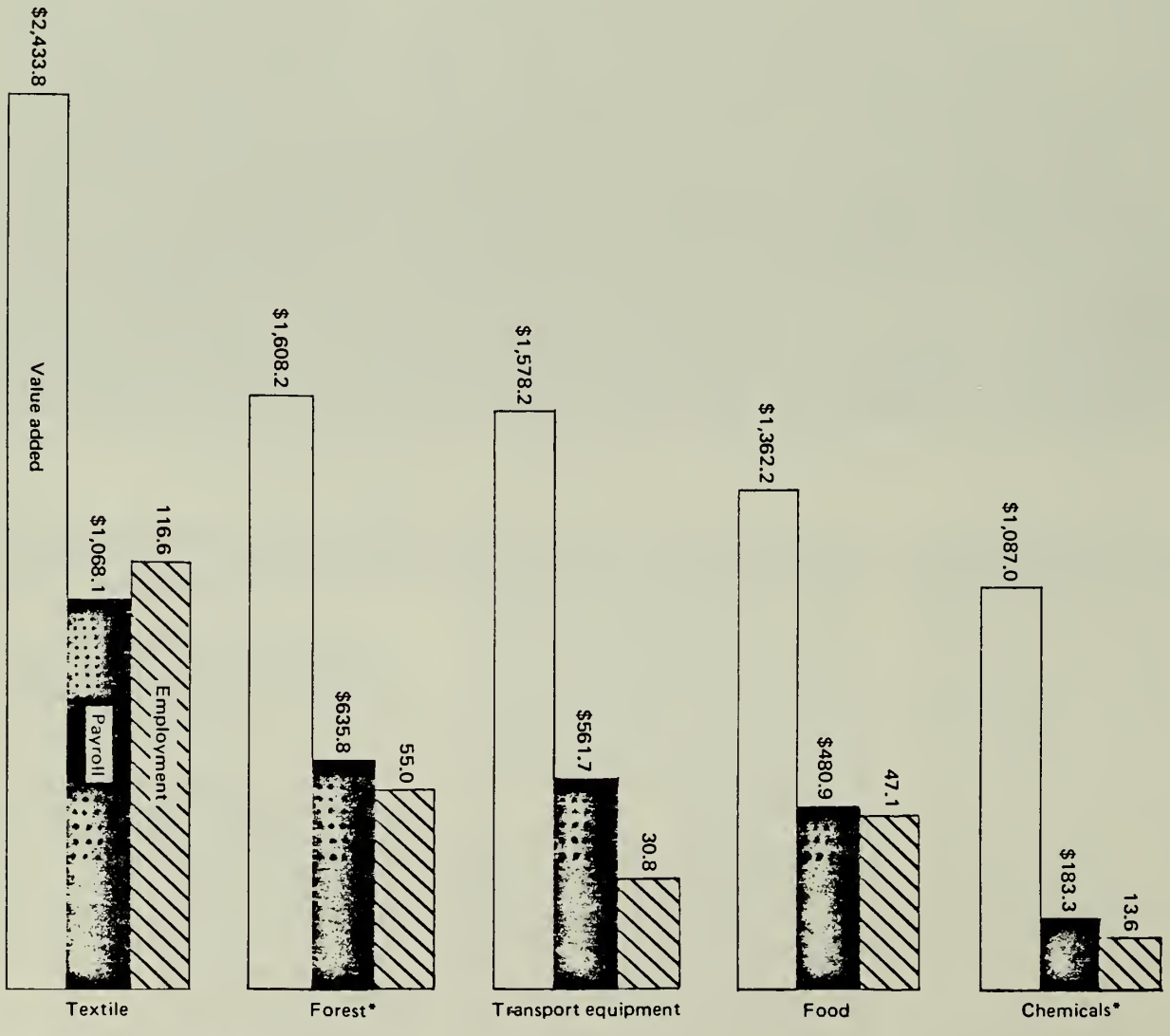
## IMPACTS OF FOREST PRODUCTS INDUSTRIES ON GEORGIA'S METROPOLITAN AREAS

The forest products industries are significantly concentrated in Georgia's seven metropolitan areas, Table 10. In 1980, 33.1 percent of lumber and wood products, 56.8 percent of wood furniture and fixtures, and 71.1 percent of paper and allied products manufacturers were located in the state's standard metropolitan statistical areas. The significance of forest products industries to the economic base of the Atlanta metropolitan area is indicated by the fact that 217 of the state's 770 forest products plants and mills are located in the 15-county SMSA.

Although the concentration ratio is less than that for the number of firms, employment in the forest products industries is importantly concentrated in metropolitan areas, Table 11. In 1980, Georgia's seven SMSA's claimed 47.2 percent of total employment in the forest products industry, ranging upward from 28.5 percent in lumber and wood products, to 40.0 percent in wood furniture and fixtures, to 64.2 percent in paper and allied products. The concentration of forest products industrial jobs is particularly significant in the Atlanta, Savannah, and Macon SMSA's. Measured as a percent of SMSA manufacturing employment, forest products industries account for a high 39.4 percent of manufacturing jobs in the Savannah SMSA, declining to 22.8 percent in Macon and 14.3 percent in Augusta.

The importance of forest products industries to the state's metropolitan areas is further illustrated by a comparison of growth trends in Georgia and the Atlanta SMSA for lumber and wood products and paper and allied products industries, Table 12. Based on the latest available data from the Census of Manufactures, the percentage increases between 1972 and 1977 were greater in the Atlanta SMSA than for all of Georgia in the number of firms, employment, payrolls, value added, and value of shipments. This accelerated metropolitan growth pattern was especially evident in paper and allied products. In this industry, the Atlanta SMSA accounted for the following proportions of state gains between 1972 and 1977: 72.1 percent of the number of firms, 50.0 percent of employment, 29.1 percent of payroll, 28.0 percent of value added, and 23.4 percent of the five-year increase in value of shipments.

**Chart V: Forest products ranking among five largest Georgia manufacturing industries by value added, payroll, and employment (Millions of dollars, thousands of employees), 1977**




*Gum and wood chemicals in forest

*Source:* 1977 Census of Manufacturers.

Table 10

Forest Products Firms Located in Georgia's Metropolitan Areas, 1980

| State and SMSA | Industry: Lumber and Wood Products | Industry: Wood Furniture and Fixtures | Industry: Paper and Allied Products | Total |
|---|---|---|---|---|
| GEORGIA | 523 | 74 | 173 | 770 |
| SMSA: | | | | |
| ALL | | | | |
| Number of Firms | 173 | 42 | 123 | 338 |
| Percent of State | 33.1 | 56.8 | 71.1 | 43.9 |
| ALBANY | | | | |
| Number | 6 | -- | 2 | 8 |
| Percent | 1.1 | -- | 1.2 | 1.0 |
| ATLANTA | | | | |
| Number | 96 | 35 | 86 | 217 |
| Percent | 18.4 | 47.2 | 49.7 | 28.2 |
| AUGUSTA[1] | | | | |
| Number | 16 | 2 | 9 | 27 |
| Percent | 3.1 | 2.7 | 5.2 | 3.5 |
| CHATTANOOGA[1] | | | | |
| Number | 5 | -- | 3 | 8 |
| Percent | 1.0 | -- | 1.7 | 1.0 |
| COLUMBUS[1] | | | | |
| Number | 8 | -- | 3 | 11 |
| Percent | 1.5 | -- | 1.7 | 1.4 |
| MACON | | | | |
| Number | 18 | 2 | 14 | 34 |
| Percent | 3.4 | 2.7 | 8.1 | 4.4 |
| SAVANNAH | | | | |
| Number | 24 | 3 | 6 | 33 |
| Percent | 4.6 | 4.1 | 3.5 | 4.3 |

[1]Includes only those SMSA counties located in Georgia.
Source: Georgia Department of Industry and Trade, Georgia Manufacturing Directory 1980-81, 1980.

Table 11

Forest Products Industries Employment in Georgia's Metropolitan Areas, 1980

| State and SMSA | Employment by Forest Products Industry: Lumber and Wood Products | Wood Furniture and Fixtures | Paper and Allied Products | Total | SMSA Manufacturing Emp.: Total | Forest Indus. As % of Total |
|---|---|---|---|---|---|---|
| GEORGIA | 24,380 | 5,124 | 29,021 | 58,525 | | |
| SMSA's: | | | | | | |
| ALL | | | | | | |
| Employees | 6,956 | 2,049 | 18,638 | 27,643 | 228,383 | 12.1 |
| Percent of State | 28.5 | 40.0 | 64.2 | 47.2 | | |
| ALBANY | | | | | | |
| Employees | 100 | --- | 219 | 319 | 10,828 | 2.9 |
| Percent | .4 | --- | .8 | .5 | | |
| ATLANTA | | | | | | |
| Employees | 3,489 | 1,591 | 8,943 | 14,023 | 141,219 | 9.9 |
| Percent | 14.3 | 31.0 | 30.8 | 24.0 | | |
| AUGUSTA[1] | | | | | | |
| Employees | 654 | 6 | 1,688 | 2,348 | 16,391 | 14.3 |
| Percent | 2.7 | .1 | 5.8 | 4.0 | | |
| CHATTANOOGA[1] | | | | | | |
| Employees | 110 | --- | 116 | 226 | 8,617 | 2.6 |
| Percent | .5 | --- | .4 | .4 | | |
| COLUMBUS[1] | | | | | | |
| Employees | 147 | --- | 67 | 214 | 17,985 | 1.2 |
| Percent | .6 | --- | .2 | .4 | | |
| MACON | | | | | | |
| Employees | 877 | 441 | 2,281 | 3,599 | 15,814 | 22.8 |
| Percent | 3.6 | 8.6 | 7.9 | 6.1 | | |
| SAVANNAH | | | | | | |
| Employees | 1,579 | 11 | 5,324 | 6,914 | 17,529 | 39.4 |
| Percent | 6.5 | .2 | 18.3 | 11.8 | | |

[1]Includes only those SMSA counties located in Georgia.

Source: Georgia Department of Industry and Trade, Georgia Manufacturing Directory 1980-81, 1980.

Table 12

Growth in Lumber and Wood Products and Paper Allied Products Manufacturers, Georgia and the Atlanta SMSA, 1972-77

| Economic Measure | Georgia | | | Atlanta SMSA | | |
|---|---|---|---|---|---|---|
| | Lumber and Wood Products | Paper and Allied Products | Total | Lumber and Wood Products | Paper and Allied Products | Total |
| Number of Firms | | | | | | |
| 1972 | 2,132 | 134 | 2,266 | 180 | 62 | 242 |
| 1977 | 2,189 | 177 | 2,366 | 191 | 93 | 284 |
| Percent Change, 1972-77 | +2.7 | +32.1 | +4.4 | +6.1 | +50.0 | +17.4 |
| Atlanta SMSA as Percent of State Change, 1972-77 | | | | 19.3 | 72.1 | 42.0 |
| Employees (000) | | | | | | |
| 1972 | 28.1 | 24.2 | 52.3 | 2.3 | 6.8 | 9.1 |
| 1977 | 24.3 | 26.2 | 50.5 | 2.2 | 7.8 | 10.0 |
| % Change | -13.5 | +8.3 | -3.4 | -4.3 | +14.7 | +9.9 |
| % of State Change | | | | (2.6) | 50.0 | - - - - |
| Payroll ($000,000) | | | | | | |
| 1972 | 168.5 | 232.9 | 401.4 | 14.7 | 58.0 | 72.7 |
| 1977 | 217.0 | 378.5 | 595.5 | 19.3 | 100.3 | 119.6 |
| % Change | +28.8 | +62.5 | +48.4 | +31.3 | +72.9 | +64.5 |
| % of State Change | | | | 9.5 | 29.1 | 24.2 |
| Value Added ($000,000) | | | | | | |
| 1972 | 367.1 | 600.9 | 968.0 | 29.4 | 126.0 | 155.4 |
| 1977 | 541.1 | 950.4 | 1,491.5 | 45.3 | 223.9 | 269.2 |
| % Change | +47.4 | +58.2 | +54.1 | +54.1 | +77.7 | +73.2 |
| % of State Change | | | | 9.1 | 28.0 | 21.7 |
| Value of Shipments ($000,000) | | | | | | |
| 1972 | 917.8 | 1,293.4 | 2,211.2 | 64.4 | 265.2 | 329.6 |
| 1977 | 1,395.9 | 2,522.4 | 3,918.3 | 113.8 | 553.2 | 667.0 |
| % Change | +52.1 | +95.0 | +77.2 | +76.7 | +108.6 | +102.4 |
| % of State Change | | | | 10.3 | 23.4 | 19.8 |

Source: Census of Manufacturers, 1972 and 1977.

## Literature Cited

U. S. Bureau of the Census, Census of Manufactures, Area Series, Georgia, 1977, 1972, and 1967.
U. S. Bureau of the Census, Census of Transportation, Truck Inventory and Use Survey, Georgia, 1977.
U. S. Bureau of the Census, Census of Wholesale Trade, Geographic Area Series, Georgia, 1977.
U. S. Department of Commerce, 1981 U. S. Industrial Outlook, 1981.
Georgia Department of Industry and Trade, Georgia Manufacturing Directory, 1980-81, 1980.
Georgia Forestry Commission, Wood-Using Industries in Georgia, 1978.
Chaffin, Robert L., Jere Atchison and Adele Kushner, Impacts of Forest Industries on the Economy of Georgia. Georgia Forest Research Council Report No. 26, 1971.
Elrod, Robert H., Kemal M. El Sheshai, and William A. Schaffer, Interindustry Study of Forestry Sectors for the Georgia Economy. Georgia Forest Research Council Report No. 31, 1972.
Montgomery, Albert A., Vernon L. Robinson, and James D. Strange, An Economic Model of Georgia's Long Run Timber Market. Georgia Forest Research Council Report No. 34, 1975.
Montgomery, Albert A., Vernon L. Robinson, and James D. Strange, Southeast Forest Resource: An Economic Outlook. Coastal Plains Regional Commission, 1979.
Timber Mart-South, Inc., Timber Mart-South, Various Issues.


A. Ray Shirley, Director
John W. Mixon, Chief of Forest Research