



Forest Products Industries' Economic Contributions: Ohio, 2023

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Foreword

Forests sustain life and Ohio is fortunate to have nearly 8 million acres of forestland throughout the state. Whether it's timber harvesting, hiking, hunting, or simply appreciating the autumn beauty, Ohioans enjoy a wide variety of benefits from the state's forests.

The value of these life-sustaining benefits demands that we recognize the value of forest management throughout the state. Ohio's forests have long provided valuable timber products to move the country forward—from manufacturing railroad ties during westward expansion to fueling iron furnaces. Although times have changed, Ohio is still proud to be producing quality forest products and providing economic opportunities for its citizens.

As you will see in the following pages, Ohio's forest products industries are as diverse as the forests growing here. From loggers to maple syrup producers, more than 124,000 individuals contribute \$35 billion annually to Ohio's forest products economy. These industries create furniture, flooring, paper, and other wood products used locally and around the globe.

As the report details, the industry has faced significant volatility in the last 7 years. What hasn't changed is that Ohio's forest industry is a key part of both the agricultural and manufacturing sectors of our economy. Compared to other industries in these sectors, the forest products industry has fared better than most. Science-based forest management will help ensure that Ohio continues to build upon the successes of this industry.

Ohio's forests are a valuable renewable resource; through sustainable management they will continue providing environmental and economic benefits well into the future. Thank you for your interest in this report and Ohio's forest products industries.

Sincerely,

Daniel R. Balsler

Chief and State Forester

Division of Forestry

Ohio Department of Natural Resources

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Executive Summary

Based on 2023 FIA estimates, Ohio contains approximately 7.72 million acres of forest land, representing about 29.6 percent of its total land area. Of this forest base, 96.4 percent (7.44 million acres) is classified as timberland capable of producing commercial volumes of wood, while about 3.6 percent consists of reserved or low-productivity forestland. Private ownership accounts for the majority of forest land at 84.2 percent (6.50 million acres), followed by state and local governments (11.7 percent; 0.90 million acres) and federal ownership (4.2 percent; 0.32 million acres). This report summarizes the economic contribution of forest products industries in Ohio using IMPLAN 2023 data. This report also captures the pre-and post-COVID snapshots of forest products industries in Ohio and shows the changes in last five years.

Forest Product Industries

This report analyzes the economic contribution of Ohio's forest products sector, comprised of 31 individual economic sectors aggregated into seven industry groups: Forestry, Logging, Primary solid wood products, Secondary solid wood products, Wood furniture, Pulp, paper, and paperboard mills, and Secondary paperboard and other paper products. In 2023, these industries directly supported 55,318 jobs and generated \$21.41 billion in output, \$6.17 billion in value added, and \$4.60 billion in labor income. When indirect supply-chain linkages and induced household-spending effects are included, the sector's total economic footprint reached 124,127 jobs, \$35.61 billion in output, \$14.25 billion in value added, and \$9.07 billion in labor income. The sector exerts a powerful multiplier effect on the broader economy; for every 100 direct jobs in the forest industry, roughly 124 additional jobs are supported elsewhere in the state.

Leading Forest Products Industry Groups (direct contribution)

Among the seven aggregated groups, Secondary Paperboard and Other Paper Products was the dominant direct employer in 2023 (19,212 jobs), driven by the state's robust packaging industry. It was followed by Wood Furniture (14,009 jobs) and Secondary Solid Wood Products (13,953 jobs), highlighting the heavy concentration of employment in downstream manufacturing. In terms of output, Secondary Paperboard also produced the highest direct output at \$10.44 billion, serving as the sector's undisputed financial engine. Secondary Solid Wood Products generated \$4.23 billion, while Wood Furniture contributed \$2.93 billion. Capital-intensive Pulp, Paper, and Paperboard Mills generated nearly \$1.96 billion in output with a relatively smaller workforce (2,368 jobs). In contrast, the upstream sectors were the smallest financial contributors; Forestry generated \$42.0 million in direct output, while Logging generated \$445.4 million.

Leading Individual Forest Products Sectors (direct contribution)

At the disaggregated level (31 sectors), Paperboard Container Manufacturing was the top individual performer across all metrics. It ranked first in employment (10,961 jobs), Labor Income (\$875.0 million), Value Added (\$1.31 billion), and Output (\$6.24 billion). This single sector represents a massive portion of the state's forest economy. Wood Container and Pallet Manufacturing ranked second in employment (4,958 jobs), reflecting the critical role of wood products in industrial logistics. Paper Bag and Coated and Treated Paper Manufacturing was another financial heavyweight, ranking second in Output (\$2.45 billion) and third in employment (4,872 jobs). Other notable drivers included Wood Kitchen Cabinet Manufacturing, which employed 4,709 workers and generated over \$890 million in output.

Ohio's Forest Products Industries Compared to Other Ohio Industries

The Forest Products sector remains the leader of Ohio's natural resource economy. In 2023, it ranked first in both Output and Labor Income when compared to Agriculture, Mining, and Commercial Fishing. The forest sector's direct output (\$21.41 billion) exceeded both Mining (\$18.90 billion) and Agricultural Production (\$14.08 billion). In terms of employment, the 55,318 jobs supported by the forest industry accounted for roughly 32 percent of the total natural resources workforce, trailing only Agriculture (94,017 jobs). Furthermore, within the statewide manufacturing landscape, Forest Products operates as a top-tier industry. It ranked as the fifth-largest manufacturing employer (52,288 manufacturing jobs), surpassing major sectors like Chemical, Plastics, and Primary Metal Manufacturing, and ranked eighth in total output (\$20.92 billion).

Seven-years Trends in Ohio's Forest Products Industries Economic Contribution

From 2017 to 2023, the sector demonstrated remarkable stability and resilience, contrasting with broader industrial trends. Direct employment increased by 1.6 percent, while direct output increased by 6.0 percent in real terms. This growth trajectory stands out against the wider Ohio manufacturing base, which saw a net decline in employment over the same period. The data suggests a simultaneous gain in productivity and capacity; direct real Value Added expanded by 8.5 percent, outpacing both employment and labor income growth (2.0 percent), implying that the sector is becoming increasingly efficient and valuable to the state economy.

Glossary

Forestry Terms

Average annual harvest removals: The estimated volume of trees that were live at the time of the previous inventory and were either cut and removed by direct human activity related to harvesting or died as a result of silvicultural or land-clearing activity by the time of the current inventory.

Average annual mortality: The volume of trees that were live at the time of the previous inventory and are dead in the current inventory.

Average annual net growth: The change in merchantable bole volume of growing-stock trees (at least five inches diameter at breast height [DBH]) after deducting mortality volume, in cubic feet, on forest land.

Forest land: Land that is at least 10 percent stocked by trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated. Forest land includes transition zones, such as areas between heavily forested and non-forested lands that are at least 10 percent stocked with trees and forest areas adjacent to urban and built-up lands, including pinyon-juniper and chaparral areas in the western U.S., and afforested areas. The minimum area for classification of forest land is one acre and 120 feet wide, measured stem-to-stem from the outermost edge. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest land if less than 120 feet wide.

Growing stock: Live trees of commercial species that meet minimum merchantability standards (at least five inches DBH). In general, these trees have at least one solid eight-foot section, are reasonably free of form defect on the merchantable bole, and at least 34 percent or more of the volume is merchantable. Excludes rough or rotten cull trees.

Timberland: A subset of forest land that produces or can produce crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. (Note: Areas qualifying as timberland can produce at least 20 cubic feet per acre per year of industrial wood in natural stands. Currently inaccessible and inoperable areas are included.)

Economic Contribution Terms

Direct effects/contributions: The direct contribution represents the economic activities (output, employment, labor income, and value-added) that occur within an industry or sector as a result of its existing production to satisfy current (exogenous) final demand. In contribution analysis, the direct effect corresponds to the sector's own production activities that maintain the structure of the regional economy. For example, the direct contribution of the forest products industry reflects its ongoing production and employment required to meet current local and export demand for forest-based goods.

Employment: The number of full- and part-time jobs associated with an industry.

Indirect effects/contributions: The indirect contribution captures the inter-industry linkages created when the industry purchases goods and services from other local industries. These transactions stimulate additional production, employment, and income along the supply chain. For instance, demand for wood products generates additional output in sectors such as transportation, wholesale trade, and equipment manufacturing that supply inputs to the forest industry. The magnitude of indirect contribution reflects the degree of interdependence and strength of local supply-chain relationships.

Induce effects/contributions: The induced contribution measures the additional economic activity generated by household spending of labor income earned through direct and indirect effects. When workers employed in the forest products and related supply-chain sectors spend their income on goods and services, such as housing, healthcare, or retail, it further stimulates regional economic activity. This household feedback effect represents the cyclical flow of income and expenditures within the economy.

Labor income: The dollar total of employee compensation and proprietor income; the latter is associated with self-employed individuals.

Output: The dollar measure of production within an area; it is also viewed as sales.

Social Accounting Matrix (SAM) multipliers: These multipliers are derived by dividing the sum of direct, indirect, and induced effects by the direct effects. The social accounts include payments made between households, households and government, and more. These are available for output, employment, labor income, and value-added and are used to assess the effects of changes in industry activity (i.e., "ripple effects").

Total effects/contributions: The sum of direct, indirect, and induced effects.

Value-added (also known as gross state product, or GSP): The sum of labor income, other property income (e.g., rents and profits), and indirect business taxes (e.g., excise and sales

taxes). It is the difference between an industry's total output and the cost of its intermediate inputs. The sum of value-added for all economic sectors within the region equals the total GSP.

Introduction

Forest products industries are an integral component of Ohio's economy. They provide jobs, raw materials, and finished goods that generate additional economic activity throughout the state, region, and nation. Forests in Ohio have always supported local and state economies and generated employment and income (Leefers 2014, 2015; Poudel, 2022). These forests form the foundation for a wide array of industries, supporting logging, sawmills, pulp and paper, wood products manufacturing, and furniture production. Collectively, the Forest Products Industry (FPI) contributes directly to the economic development of the region, while also supporting rural livelihoods, providing raw materials for construction and packaging, and generating substantial downstream linkages to other industries (Poudel and Dahal 2025; Lamsal et al. 2025a). The scale and diversity of activities across the FPI underscore its role as a major part of the broader manufacturing economy, contributing to value added and sustaining consumer demand (Lamsal et al. 2025b).

A state report on FPI contributions on Ohio was previously published by Leefers et al. (2020) using 2017 IMPLAN data. The present update extends that effort using 2023 data, allowing for a comparison across time. This analysis measures how the performance of forest sector industries in Ohio has shifted between 2017 and 2023 in terms of employment, output, labor income, and the Gross State Product (GSP), also known as value added¹. Tracking these changes is essential, as it provides a clear picture of both long-term trends and the more recent disruptions caused by the COVID-19 pandemic. The pandemic had economy-wide effects on supply chains, consumer demand, and labor markets (Poudel and Dahal 2025; Lamsal et al. 2025b), and this report therefore captures the pre- and post-COVID conditions of the FPI within the region.

This trend analysis can be used in multiple ways by related stakeholders. For policymakers, it offers a benchmark for monitoring the health of one of the region's key resource-based industries and helps inform workforce development, investment, and rural economic policies. For industry stakeholders, it provides insight into productivity, competitiveness, and sectoral resilience, supporting strategic planning. For researchers and forest managers, it offers a consistent regional framework that connects forest resources with industrial performance and economic outcomes.

The data used in this report were derived from the U.S. Forest Service Forest Inventory and Analysis (FIA) database and from Impact Analysis for Planning (IMPLAN). These data and related

¹ The 2017 results in this report are based on data from the IMPLAN Pro desktop version, whereas the 2018–2023 results are based on the IMPLAN web platform. Because there are minor differences between the Pro and web versions, the 2017 estimates shown here may not exactly match 2017 results reproduced from the web version. To maintain consistency with the original 2017 report and ensure a valid basis for comparison and trend analysis, we use the original 2017 IMPLAN Pro data, and IMPLAN web data for all years from 2018 through 2023.

information are presented in four major sections: (i) Forest Resources of Ohio, (ii) Economic Contributions of the Ohio FPIs, (iii) Comparing FPIs with other industries and neighbor states, and (iv) Summary. We acknowledge that, due to rounding, some values in the tables and figures may not sum to the exact total indicated.

Forest Resources of Ohio state

According to 2023 estimates from the USDA Forest Inventory and Analysis (FIA) program, Ohio's total land area totals 26.09 million acres. Of this, 7.72 million acres (29.6 percent) meet the FIA definition of forest land, while the remaining 18.37 million acres (70.4 percent) are classified as non-forest land. FIA defines forest land as land at least 10 percent stocked by trees of any size, including areas that formerly supported such tree cover and that will be naturally or artificially regenerated. Within Ohio's forest land base, timberland accounts for 7.44 million acres, or 96.4 percent (Figure 1), and represents unreserved forest capable of producing at least 20 cubic feet of wood per acre per year. Reserved forestland comprises 276,442 acres (3.6 percent) and is withdrawn from timber utilization by legal or administrative designation. Other forestland totals 1,948 acres (less than 0.1 percent) and consists of unreserved forests of low productivity, generally yielding less than 20 cubic feet per acre per year. In practical terms, approximately 7.44 million acres are available and biophysically suitable for commercial timber management, while about 278,390 acres are either reserved or too low in productivity to contribute materially to timber supply.

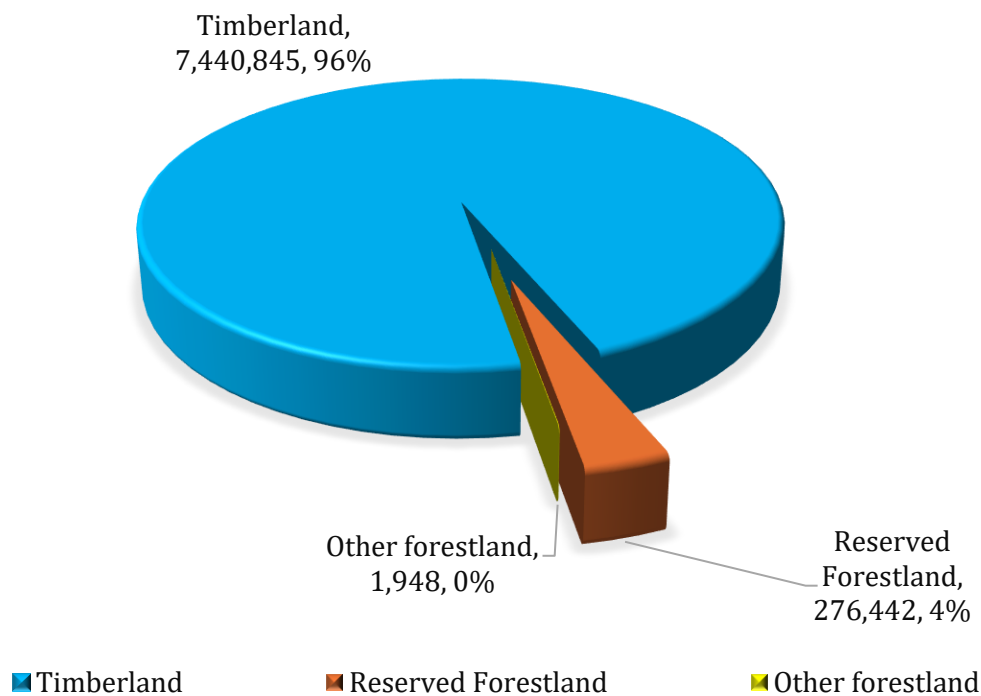


Figure 1: Ohio Forest Land area in acres by Land use type, 2023 (US Forest Service).

Ownership of Ohio’s 7.72 million acres of forest land is distributed among federal, state and local, and private entities, with private owners holding the majority share (Figure 2). Private landowners manage 6.50 million acres (84.2 percent) of the state’s forest land. State and local governments are responsible for 899,791 acres (11.7 percent), while federal ownership totals 322,473 acres (4.2 percent). Within the federal category, National Forests account for 257,657 acres (3.3 percent), and other federal agencies manage 64,816 acres (0.8 percent).

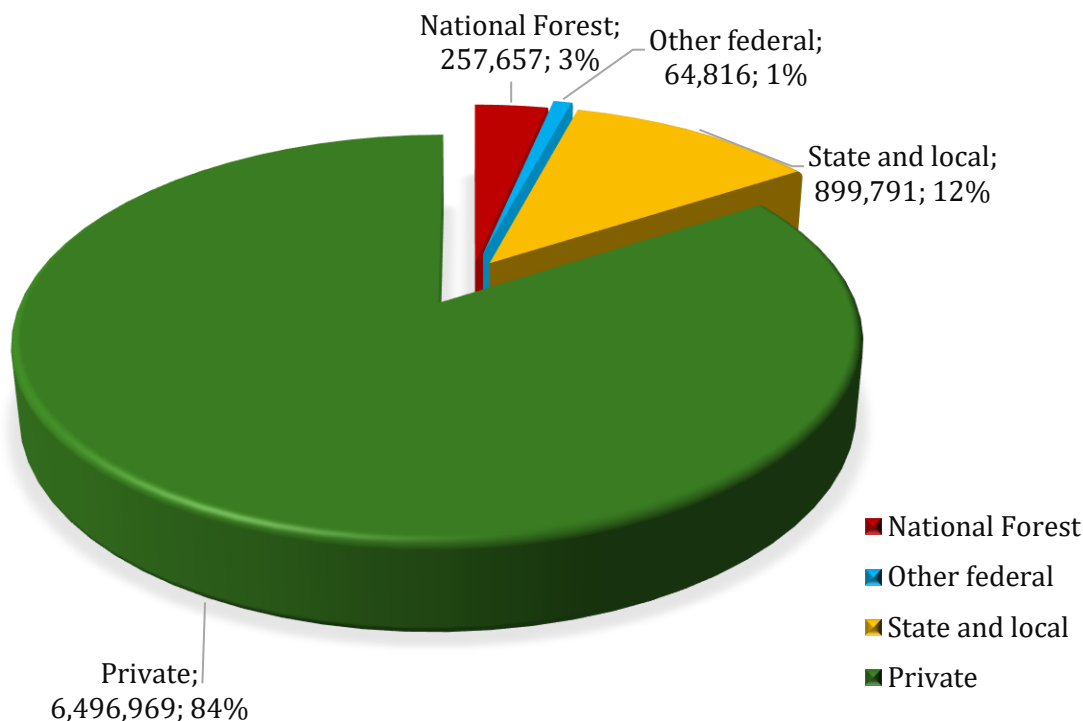


Figure 2: Ohio Forest Land area in acres by Ownership group, 2023 (US Forest Service).

Hardwoods dominate Ohio’s 7.72 million acres of forest land. The oak/hickory forest-type group is the most extensive, occupying 4.93 million acres (64 percent) of the total forest area (Figure 3). The maple/beech/birch group is the second-largest at 1.58 million acres (20 percent), followed by elm/ash/cottonwood with 697,204 acres (9 percent). Forest types with a stronger conifer component represent a comparatively small share of the land base: oak/pine totals 135,915 acres (2 percent) and white/red/jack pine accounts for 69,886 acres (1 percent). The remaining 309,022 acres (4 percent) are distributed among other forest-type groups. Overall, the major hardwood-associated groups (oak/hickory, maple/beech/birch, and elm/ash/cottonwood) comprise approximately 93 percent of Ohio’s forest land.

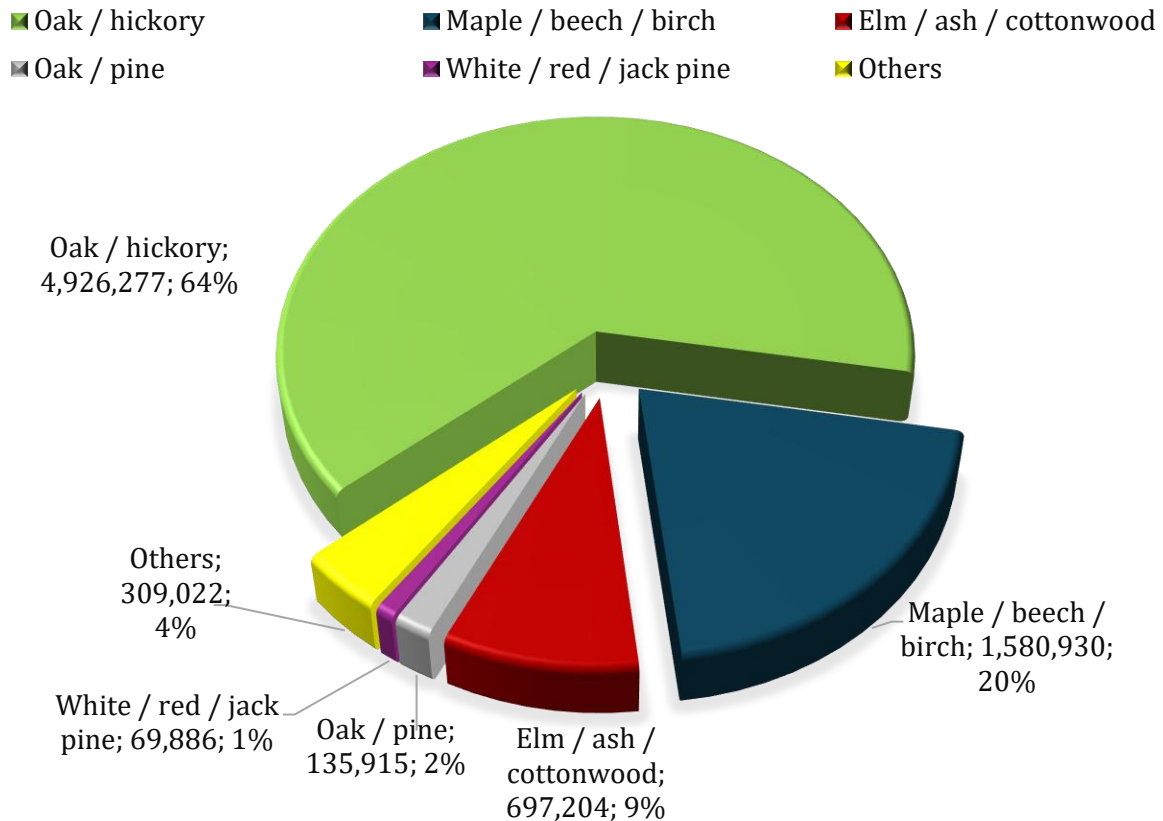


Figure 3: Ohio Forest Land area in acres by Forest type group, 2023 (US Forest Service).

Ohio's timber resources are dominated by hardwood growing stock, supporting forest-based industries that include commercial logging, sawtimber, veneer, furniture, millwork, pallet production, and secondary wood products manufacturing. The estimated volume of standing timber suitable for forest products, defined here as the marketable volume of growing stock, is approximately 18.34 billion cubic feet, or about 231 million standard cords (Table 1). Of this total, hardwoods account for 17.47 billion cubic feet, or 95.3 percent, while softwoods account for 0.87 billion cubic feet, or 4.7 percent. By ownership class, about 81.4 percent of growing-stock volume is on private lands, 13.8 percent is on state and local lands, 3.9 percent is on National Forest lands, and 0.9 percent is on other federal holdings.

Average annual net growth totals 305.7 million cubic feet per year, while average annual harvest removals total 106.3 million cubic feet and average annual mortality totals 172.5 million cubic feet per year. Net growth exceeds harvest removals by a ratio of about 2.9 to 1, indicating that removals remain well below net biological growth statewide. Because net growth is already net of mortality, the implied annual net change in growing-stock volume is net growth minus harvest removals, or approximately 199.4 million cubic feet per year. This positive balance indicates continued expansion of growing stock volume at the statewide level. Average annual

harvest removals equal roughly 0.6 percent of standing volume, or about 1.3 million standard cords, while mortality represents about 0.9 percent of standing volume. Hardwoods account for nearly all annual inventory flows, comprising 93.6 percent of net growth, 93.6 percent of harvest removals, and 95.0 percent of mortality. Harvest removals are concentrated on private lands, which account for about 86.9 percent of total removals, followed by state and local ownerships at about 13.1 percent. Overall, these statewide indicators suggest that Ohio's growing stock inventory remains in a condition of positive net growth.

Table 1: Characteristics of Growing Stock in Ohio, 2023. †

Description	Species group	National Forest	Other federal	State and local	Private	Not available	Total
Net volume	Hardwood	657,693	165,208	2,357,231	14,293,637	0	17,473,768
	Softwood	56,218	806	178,156	630,524	0	865,704
	Total	713,911	166,013	2,535,386	14,924,161	0	18,339,472
Average annual net growth	Hardwood	10,031	1,638	29,862	241,613	2,929	286,073
	Softwood	1,371	18	2,855	15,285	86	19,613
	Total	11,401	1,656	32,716	256,898	3,015	305,686
Average annual harvest removals	Hardwood	0	0	13,937	85,527	0	99,465
	Softwood	0	0	0	6,811	0	6,811
	Total	0	0	13,937	92,339	0	106,276
Average annual mortality	Hardwood	3,975	1,749	22,282	135,778	0	163,784
	Softwood	548	0	1,422	6,733	0	8,704
	Total	4,524	1,749	23,704	142,511	0	172,488

† All amounts are in thousands of cubic feet.

Note: **Growing stock** is all live trees of commercial species that meet minimum merchantability standards. **Net volume** is net volume in cubic feet of growing stock for timber species, for trees greater than or equal to five inches in diameter, from a one-foot stump to a minimum four-inch top diameter, or to where the central stem breaks into limbs, all of which are less than four inches in diameter. **Net growth** is the average annual net growth of growing stock, in cubic feet, on forest land. **Annual mortality** is the average annual cubic foot mortality of live growing-stock trees (at least four inches DBH), in cubic feet, on forest land. **Harvest removals** are the average annual harvest removals, in cubic feet, of growing stock trees on forest land.

Economic contribution of the Forest Product Industries, 2023

The FPIs in this study are defined as 32 IMPLAN industries that were aggregated into seven analytic groups for consistent reporting across the state. This report follows the same industry grouping framework used in the 2017 report, which was originally developed through consultation with state forestry agencies and other stakeholders and represent a working consensus on what constitutes the regional FPI (Leefers et al., 2020; Poudel and Dahal, 2025). The complete list of industries and groupings are presented in [Appendix A](#).

The FPI encompasses a wide range of activities that begin with forest management and timber harvesting and extend through the conversion of raw materials into high-value finished goods. These activities include timber tract operations, nurseries, logging, sawmills, wood preservation, pulp and paper manufacturing, furniture production, and related downstream sectors (Poudel and Dahal 2025). The FPI is a cornerstone of the Ohio economy, not only providing direct employment in logging, milling, and manufacturing but also supporting a much larger network of indirect and induced jobs in transportation, warehousing, wholesale trade, and retail (Leefers et al., 2020). Its health has far-reaching consequences for rural communities, where it is often one of the few sources of year-round employment, and for regional supply chains that depend on steady flows of wood, fiber, and paper products (Lamsal et al., 2025a).

Measuring these contributions requires more than simply counting jobs, mills, or other establishments. Contribution analysis is essentially a descriptive, ex-post accounting framework that traces how industries interact within a regional economy and support the economy (Lamsal et al., 2025b, Watson et al., 2015). It not only measures the direct transactions tied to a sector, but also the indirect effects in supplier industries and the induced effects from household spending that ripple outward. Economic contribution analysis depends on standardized frameworks that can translate government statistics into regional input–output models. The Bureau of Economic Analysis (BEA) provides the foundation through its Benchmark Input-Output Accounts, which map the flow of goods and services across industries and establish the structure of GDP by industry (BEA 2023). The Bureau of Labor Statistics (BLS) complements this with the Quarterly Census of Employment and Wages (QCEW) and occupational data, which provide details on employment and payroll. Further, the U.S. Census Bureau adds extra detail with the Economic Census and County Business Patterns, which track establishments, receipts, and industry-level production. Impact Analysis for Planning (IMPLAN) harmonizes these data sources into a consistent input-output modeling framework for estimating regional economic contributions (IMPLAN 2023). IMPLAN is widely used in forest-sector economic research to estimate employment, output, labor income, and value-added effects associated with forest-

products industries. Several forest-sector studies have also paired IMPLAN with FIA data to link forest resource conditions with regional economic outcomes, including timber-product output in Ohio (Coronado et al. 2014), domestic hardwood substitution for imported trailer decking in New York (Pokharel et al. 2023), and potential mass timber processing facility development in Michigan (Khanal et al. 2024). IMPLAN also provides a bridge table that is important for defining the forest-products sectors included in this report. The bridge table is useful in both directions: it aggregates NAICS industries into IMPLAN sectors for modeling and identifies the NAICS components represented within each IMPLAN sector. Although this does not by itself constitute a formal sector disaggregation within IMPLAN, it provides the basis for constructing partial-sector estimates when external data are available.

This distinction is particularly important for forest sector analysis because several IMPLAN sectors contain both forestry and non-forestry components (Poudel and Dahal 2025). In this study, the IMPLAN bridge table was used to identify the relevant NAICS-defined activities embedded within broader IMPLAN sectors, and external data were then used to approximate the forest-related share of selected mixed sectors. For example, IMPLAN Sector 10 (All Other Crop Farming) includes a wide variety of agricultural activities such as alfalfa, peanut, and hemp farming, also in addition to maple syrup production. Using USDA maple syrup production data, only the maple syrup portion of Sector 10 was included in the FPI.. Similarly, IMPLAN Sector 19 (Support Activities for Agriculture and Forestry) encompasses a broad spectrum of NAICS industries, including soil preparation, crop harvesting, farm labor contracting, and specialized support services for forestry. To avoid overstating the sector, only Support Activities for Forestry were retained in the FPI totals, using BLS employment and establishment data. Thus, the partial-sector estimates reported here reflect analyst-defined allocations based on the IMPLAN bridge table and supplementary data, rather than an automatic sector split performed within IMPLAN. In the 2017 report, several additional sectors were treated as partial sectors, IMPLAN 40 (Electric Power Generation, Biomass), IMPLAN 352 (Institutional Furniture Manufacturing), and IMPLAN 356 (Showcase, Partition, Shelving, and Locker Manufacturing), but in 2023, following stakeholder consensus and due to limited data to isolate wood-based components, these are treated as full sectors; consequently, the 2023 economic contribution estimates for these specific sectors appear higher and are not directly comparable to the 2017 figures. Any comparison between years should therefore be interpreted with caution.

Further, the 2023 analysis implemented the mixed endogenous-exogenous closure using the Output- and Employment -based multipliers formulation approach (Miller and Blair 2022; Lamsal et al. 2025a), whereas the 2017 report used the equivalent matrix-inversion approach. Since these approaches are alternative computational expressions of the same input-output framework and, under the same closure assumptions, these formulations are theoretically equivalent and yield the same multipliers and results.

Note on Data Consistency (2017 vs. 2018–2023): Readers should interpret the sharp variance between 2017 and 2018 data with caution. The 2017 figures presented in this report are retained from previous studies that used the desktop-based IMPLAN Pro software. Data for 2018 through 2023 were generated using the modernized IMPLAN Cloud (Web) platform, which utilizes updated accounting frameworks and regional purchase coefficients. Although both sets of estimates are based on the same underlying input–output/SAM framework, they are not fully comparable in construction. IMPLAN revised its industry classification structure over time, moving from the 536-industry scheme used for 2013–2017 data years to the 546-industry scheme used for 2018–2022, and later to the 528-industry scheme beginning in 2023. IMPLAN also documents differences in trade-flow and regional purchase coefficient estimation between legacy Pro-era workflows and the current cloud environment. In addition, this report applies updated aggregation and sector-inclusion rules for selected forest-related industries. Accordingly, differences between 2017 and later years may reflect methodological discontinuity in addition to underlying economic change. Comparisons spanning 2017 to 2018 should therefore be interpreted with caution.

Economic Performance Trends of Forest Product Industry (2017-2023)

Figures 4 and 5 illustrate the resilience and gradual expansion of the Ohio Forest Sector over the seven-year study period. As shown in Figure 4, the sector’s direct employment experienced a modest net increase of 1.6%, rising from 54,445 jobs in 2017 to 55,318 in 2023, with a notable recovery following the pandemic-induced dip in 2020. Real Industry Output grew at a faster pace than employment, increasing by approximately 6.0% to \$21.41 billion in 2023. This divergence between output and employment growth drove a measurable increase in labor productivity; the average output per worker increased by 4.3%, rising from approximately \$370,900 in 2017 to \$387,000 in 2023.

Figure 5 details the trends in Value Added and Labor Income, revealing a shift in the sector's financial composition. Real Value Added grew by 8.5% to \$6.17 billion, outpacing both output and employment growth. However, total Real Labor Income remained nearly flat, increasing by only 2.0% to \$4.60 billion. Consequently, the average labor income per worker remained virtually unchanged, moving from \$82,873 in 2017 to \$83,190 in 2023 (+0.4%). This stagnation in per-worker income contrasts with the rise in value-added, causing the ratio of Labor Income to Value Added to decrease from 79.4% in 2017 to 74.6% in 2023. This shows that recent efficiency gains have primarily improved the sector's value-added margin rather than increasing average workforce compensation.

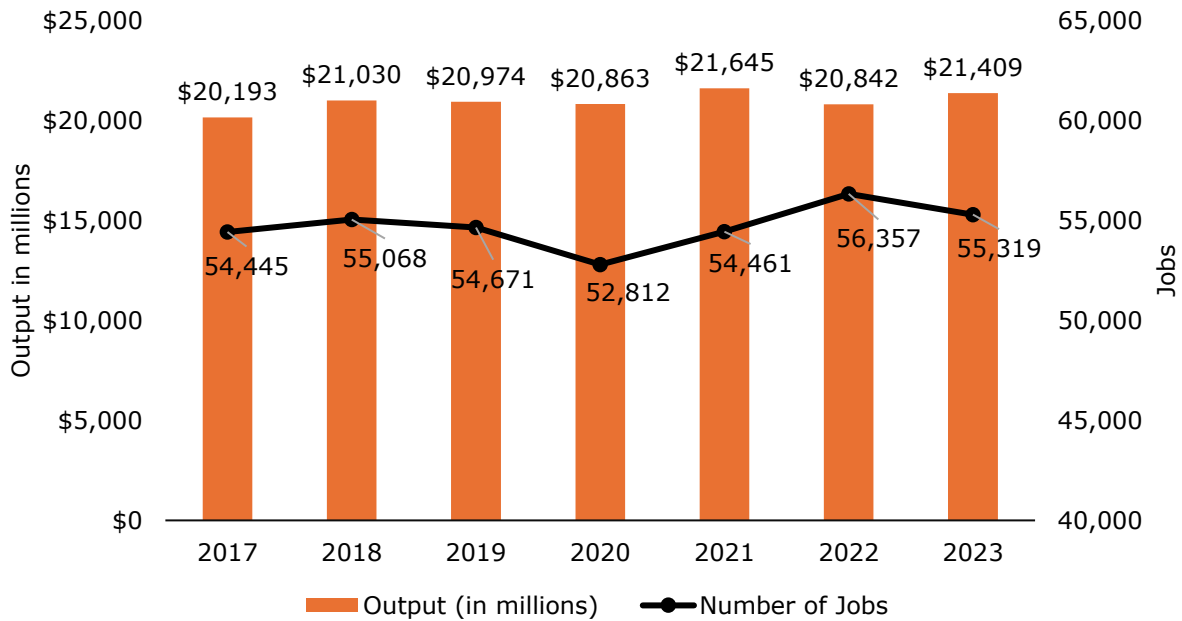


Figure 4: Direct output and employment, 2017–2023, Ohio state forest products industries.

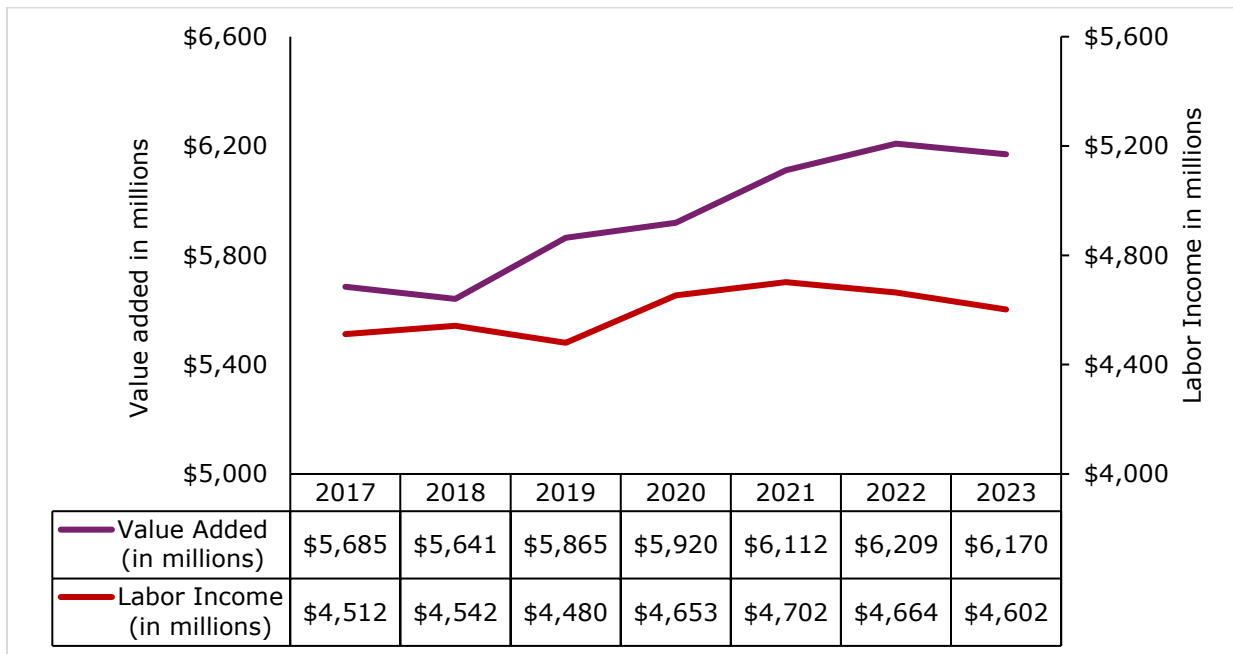


Figure 5: Direct value-added and labor income, 2017–2023, Ohio state, forest products industries.

Direct and Total Contributions by Forest Product Industry Groups

In 2023, Ohio’s forest products industries directly employed 55,318 individuals, generated approximately \$21.4 billion in gross output, and contributed nearly \$6.17 billion in value-added to the state economy. However, the sector’s aggregate influence extends significantly beyond these direct operations. When accounting for indirect supply-chain transactions and induced household spending, the sector’s total economic contribution reached 124,127 jobs and over \$35.6 billion in total output.

Table 2: Statewide Economic Contribution of Forest Products Industries, 2023. [†]

	Employment	Labor Income	Value-added	Output
Direct in 2023	55,318	\$4,602,364	\$6,169,823	\$21,408,554
Compared to 2017	1.6%	2.0%	8.5%	6.0%
Total in 2023	124,127	\$9,074,213	\$14,248,201	\$35,606,246
Compared to 2017	-0.5%	-1.3%	5.3%	3.8%
Multipliers in 2023	2.24	1.97	2.31	1.66

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

Comparing these results with 2017 values shows a notable divergence between the core industry's performance and its broader economic footprint. While the direct forest sector demonstrated resilience and growth, with direct employment increasing by 1.6% and value-added expanding by 8.5%, the total economic impact did not scale at the same rate. Total employment actually declined slightly by 0.5%, and total output grew at a more modest pace (3.8%) compared to direct output (6.0%). The calculated multipliers, however, underscore the sector’s continued role as a high-impact economic driver. The Value-Added multiplier of 2.31 is exceptionally strong, indicating that for every dollar of wealth created directly by forest industries, an additional \$1.31 is generated elsewhere in the Ohio economy. Similarly, the employment multiplier of 2.24 implies that every 100 direct jobs in the forest industry support roughly 124 additional jobs in other sectors. This high ratio highlights the industry’s deep integration into the regional economy, where it sustains a vast network of logistics, utility, and professional service jobs despite the shifting trends in total employment figures.

Table 3 reports the direct economic contributions of the seven industry groups, while Table 4 presents their total contributions including multiplier effects. In contrast to states with heavy reliance on extraction, Ohio’s forest economy is overwhelmingly driven by downstream manufacturing. In 2023, the Secondary Paperboard and other Paper Products sector was the dominant economic engine, accounting for the highest direct employment (19,212 jobs) and

nearly 49% of the sector’s total direct output (\$10.4 billion). This indicates a highly developed industrial base where the majority of value is created through advanced processing rather than raw material extraction.

The financial data highlights distinct variations in capital intensity and labor productivity across the groups. While Wood Furniture and Secondary Solid Wood Products are significant employers, combined accounting for over 50% of the direct workforce (approx. 28,000 jobs), their output-per-worker ratios are lower than the paper manufacturing sectors. Conversely, Pulp, Paper, and Paperboard Mills displayed exceptional capital intensity. With a relatively small workforce of 2,368, this sector generated nearly \$1.96 billion in output, signaling highly mechanized, high-value operations. Meanwhile, the upstream sectors of Forestry and Logging, while foundational to the supply chain, represented a smaller fraction of direct contributions, generating a combined \$487 million in output.

Table 3: Direct Economic Contributions in Ohio state, Industry Groups, 2023. [†]

Industries	Employment	Labor Income	Value-Added	Output
1.Forestry	480	\$38,852	\$39,669	\$41,970
2.Logging	2,545	\$441,716	\$435,028	\$445,442
3.Primary Solid Wood Products	2,750	\$191,037	\$302,283	\$1,369,023
4.Secondary Solid Wood Products	13,953	\$1,040,317	\$1,347,340	\$4,226,590
5.Wood Furniture	14,009	\$1,020,384	\$1,041,988	\$2,932,868
6.Pulp, Paper, and Paperboard mills	2,368	\$236,662	\$474,216	\$1,957,514
7.Secondary Paperboard and other Paper Products	19,212	\$1,633,396	\$2,529,298	\$10,435,146

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

When supply-chain and induced effects are included (Table 4), the rankings reinforce the depth of inter-industry linkages, particularly within the paper and wood processing value chains. Secondary Paperboard and other Paper Products remains the unrivaled leader, supporting 52,201 total jobs and over \$17.5 billion in total economic output. However, the highest relative multipliers are observed in the primary processing sectors. For instance, Pulp, Paper, and Paperboard Mills shows a huge employment multiplier effect, expanding from 2,368 direct jobs to 9,279 total jobs. This nearly four-fold increase suggests that these mills maintain deep backward linkages, driving significant demand in logging, energy, logistics, and wholesale trade.

Taken together, the combined Paper and Paperboard sectors (Groups 6 and 7) account for approximately 59% of the Ohio forest sector's total output impact, highlighting the state's role as a hub for paper-based packaging and manufacturing.

Note: In Table 4, readers may observe that the sum of the economic contributions for the individual industries exceeds the reported total contribution for the Forest Sector as a whole as presented in Table 2. This difference is intentional and results from the "mixed-model" approach used to ensure accuracy.

In Input-Output (I-O) analysis, simply adding the total contributions of individual sectors results in double-counting. This occurs because the output of one forest industry often serves as an input for another. For example, logs harvested by the Logging sector are inputs for the Furniture sector. If modeled individually and summed, the model counts both the direct value of the logs and the associated supply-chain ripples (indirect effects) twice: once as a production requirement for the Furniture, and again as a direct output of the Logging sector. To provide the most accurate estimate, the aggregated total is calculated by treating the forest industries as a single economic unit. This method mathematically nets out all inter-industry transactions within the sector, ensuring that the final results reflect only the new economic value generated for the state economy.

Table 4: Total Economic Contributions in Ohio state, Industry Groups, 2023. [†]

Industries	Employment	Labor Income	Value- Added	Output
1.Forestry	672	\$49,678	\$60,268	\$75,714
2.Logging	4,784	\$566,905	\$670,637	\$829,377
3.Primary Solid Wood Products	8,268	\$625,879	\$996,501	\$2,520,002
4.Secondary Solid Wood Products	30,019	\$2,116,488	\$3,209,617	\$7,608,076
5.Wood Furniture	25,908	\$1,778,518	\$2,413,269	\$5,432,602
6.Pulp, Paper, and Paperboard mills	9,279	\$730,155	\$1,347,676	\$3,545,293
7.Secondary Paperboard and other Paper Products	52,201	\$3,817,830	\$6,552,924	\$17,517,213

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars.

Forestry

Economic Contribution of Forestry

Table 5 presents the economic contribution of the Forestry sector. For the 2023 Ohio analysis, this group primarily includes two industries: (1) forestry, forest products, and timber tract production, which involves managing lands for standing timber; and (2) support activities for forestry. The latter encompasses essential services such as timber cruising, wildland firefighting, and silvicultural consulting that maintain the commercial viability of the timber base. It is important to note that data for "all other crop farming" (maple syrup production), which is typically included in this group, was not disclosed or present for Ohio in 2023 dataset.

In 2023, the sector directly supported 480 jobs and generated nearly \$42.0 million in direct output. While Forestry acts as the upstream foundation for the entire wood products value chain, its financial structure is distinct from downstream manufacturing. The data shows an exceptionally labor-intensive industry where the vast majority of gross output is retained as workforce compensation. Specifically, approximately 92.6% of the sector's direct output is allocated to Labor Income, \$38.9 million out of \$42.0 million. This high ratio suggests that value creation in this sector is driven almost exclusively by human capital and proprietary management rather than intermediate material inputs.

This structural characteristic drives the sector's specific multiplier effects. The employment multiplier is 1.40, indicating that for every 100 direct jobs in Forestry, 40 additional jobs are supported elsewhere in the state. Decomposing this multiplier highlights that the economic ripple effects are fueled primarily by household spending rather than business-to-business transactions.

- **Indirect Effect:** The sector generated minimal indirect impacts, supporting only 3 jobs and less than \$1 million in output. This reflects the land-intensive nature of timber growing. Unlike manufacturing facilities that require constant inflows of energy and materials, forestry operations have negligible supply chain purchasing requirements.
- **Induced Effect:** In contrast, the induced effect was substantial, supporting 189 jobs and roughly \$33.0 million in output. Because such a high percentage of the sector's revenue flows directly to employees and proprietors, the primary economic contribution extends into the local economy through household consumption.

When these effects are combined, the Forestry industry contributed a total of 672 jobs, \$75.7 million in output, and \$60.3 million in value-added to the Ohio economy in 2023. The total output multiplier of 1.80 implies that every \$100 of output generated by forest management activities stimulates an additional \$80 of economic activity throughout the state, largely driven by the spending power of the forestry workforce.

Table 5: Direct, Indirect, and Induced Economic Contributions of the Forestry Industry in Ohio, 2023. [†]

	Employment	Labor Income	Value-Added	Output
Direct	480	\$38,852	\$39,669	\$41,970
Indirect	3	\$198	\$412	\$773
Induced	189	\$10,629	\$20,187	\$32,970
Total	672	\$49,678	\$60,268	\$75,714

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars.

Trend Analysis: Forestry (2017–2023)

As illustrated in Figure 6, the Forestry industry in Ohio has demonstrated significant volatility over the seven-year period, a pattern consistent with a sector sensitive to biological cycles, timber market prices, and seasonal operational constraints. The data reveals a distinct "U-shaped" recovery trajectory. Following a sharp contraction between 2017 and 2019, where output plummeted from \$47.6 million to a low of \$28.5 million, the sector has staged a robust rebound in the post-pandemic years.

From 2020 through 2023, the industry entered a phase of steady expansion. Direct output grew by roughly 31% over this four-year span, stabilizing at \$42.0 million in 2023, nearly reaching its 2017 peak. Employment followed a similar upward trend, recovering from a nadir of 359 jobs in 2020 to 481 jobs in 2023. This resurgence shows a renewed demand for timber management and support services, driven by the recovery in downstream wood manufacturing sectors.

A key insight emerges when analyzing labor productivity (output per worker). During the peak recovery year of 2022, productivity surged to approximately \$94,200 per worker. However, in 2023, while output remained effectively flat (\$42.0 million), the sector continued to hire more employees, adding nearly 40 workers. This caused a slight moderation in apparent labor productivity to roughly \$87,300 per worker. This dynamic, hiring growth outpacing output growth, signals business confidence, where firms are staffing up to build capacity for anticipated future demand rather than merely maximizing short-term efficiency.

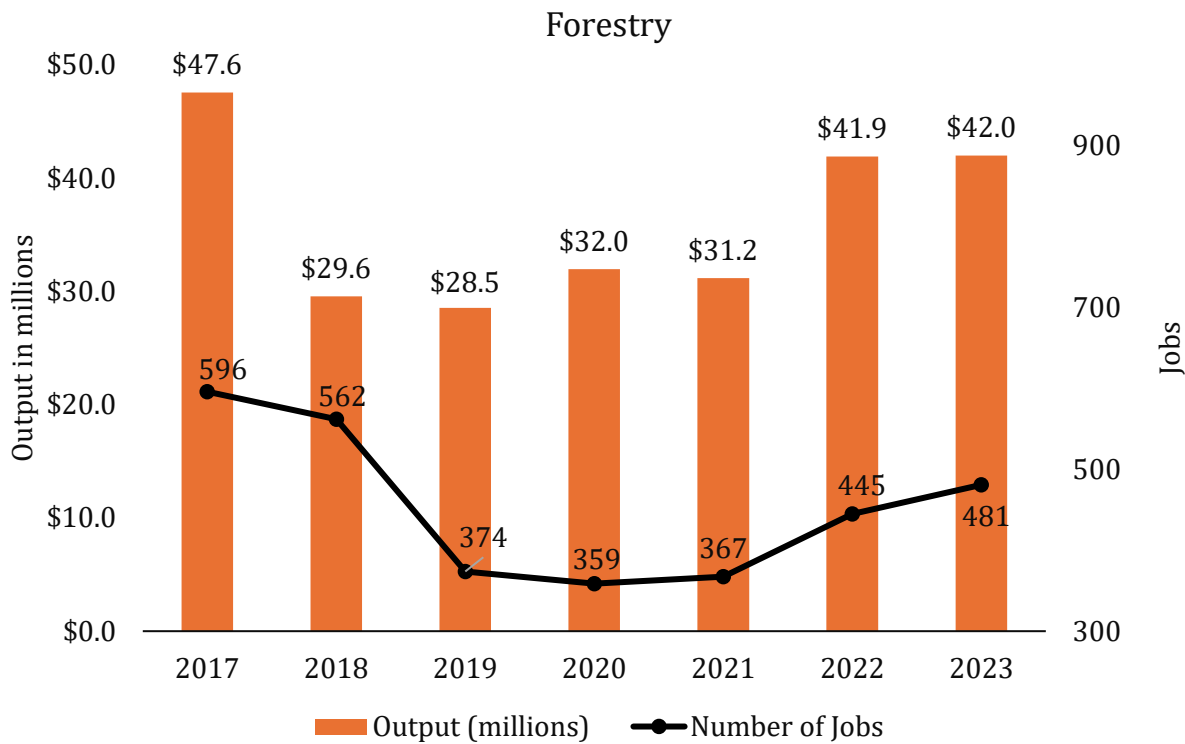


Figure 6: Trend in direct employment and output for the Forestry industry in Ohio, 2017–2023.

Logging

Economic Contribution of Logging

The commercial logging sector is critical to the Ohio forest products supply chain, consisting of establishments primarily engaged in the cutting, transportation, and field processing of timber. Table 6 outlines the sector's distinct economic contributions. In 2023, Logging was a significant source of upstream employment, directly supporting 2,545 jobs. The sector generated over \$445.4 million in direct industry output and \$435.0 million in Value Added.

Like the Forestry sector, Logging shows a structural characteristic of high labor intensity. A substantial portion of the direct output flows directly into workforce compensation, which drives its unique multiplier profile. Specifically, Labor Income constitutes nearly 99.2% of the sector's direct output (\$441.7 million out of \$445.4 million). This extremely high ratio indicates that the economic value created by logging operations is nearly entirely retained as income for local employees and proprietors, rather than being spent on high-volume intermediate goods.

This concentration of value in labor income creates a powerful link between industry activity and local household spending, as evidenced by the multiplier decomposition:

- **Indirect Effect:** The sector generated minimal indirect impacts, supporting only 73 jobs and \$5.5 million in output. This reflects the operational nature of logging, where major inputs are generally limited to fuel, heavy equipment maintenance, and stumpage fees, resulting in a relatively small supply chain footprint.
- **Induced Effect:** In contrast, the induced effect was exceptionally strong, supporting 2,166 jobs and \$378.4 million in output. This effect, which is nearly 68 times larger than the indirect output, is the primary source of economic ripple. It is generated by the re-spending of the large aggregate payroll by the logging workforce within their local communities.

When combining these effects, the Logging industry contributed a total of 4,784 jobs, \$829.4 million in output, and \$670.6 million in value added to the Ohio economy. The total output multiplier is 1.86, meaning that every \$1.00 of timber harvesting output generates an additional \$0.86 of economic activity throughout the state, driven by the sector’s highly localized income stream.

Table 6: Direct, Indirect, and Induced Economic Contributions of the Logging Industry in Ohio, 2023. †

	Employment	Labor Income	Value-Added	Output
Direct	2,545	\$441,716	\$435,028	\$445,442
Indirect	73	\$3,134	\$3,950	\$5,533
Induced	2,166	\$122,056	\$231,659	\$378,402
Total	4,784	\$566,905	\$670,637	\$829,377

† All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars.

Trend Analysis: Logging (2017–2023)

As shown in Figure 7, the Logging industry in Ohio demonstrates a clear structural divergence between workforce size and production value. The most consistent trend over the seven-year period is the steady, uninterrupted contraction of the direct labor force. Employment declined every single year, falling from 3,069 jobs in 2017 to 2,545 in 2023. This cumulative 17.1% reduction suggests a long-term consolidation in the labor market.

In contrast to the linear decline in employment, industry output exhibited significant volatility. After a sharp contraction between 2017 and 2019, where output fell by over 36% to a low of \$386.6 million, the sector experienced a strong resurgence during the pandemic era. Between 2019 and 2022, output rallied impressively to \$519.8 million. Crucially, this growth occurred while employment continued to fall, signaling a substantial gain in labor productivity. By 2022, the average output per worker had rebounded to approximately \$202,000, surpassing 2017

levels. However, 2023 marked a correction following this rally. While employment stabilized with only a marginal decline, output dropped by 14.3% to \$445.4 million.

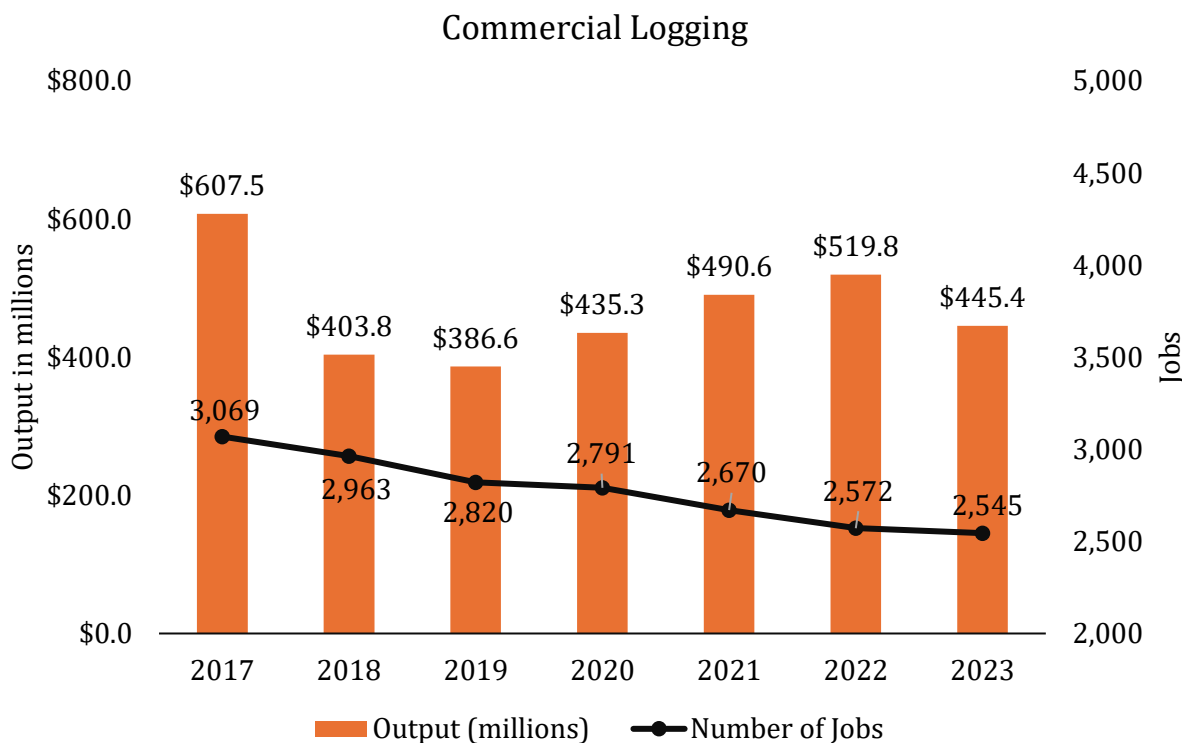


Figure 7: Trend in direct employment and output for the Logging industry in Ohio, 2017–2023.

Primary Solid Wood Products

Economic Contribution of Primary Solid Wood Products

Table 7 outlines the economic contributions of the Primary Solid Wood Products industry. In Ohio, this diverse manufacturing sector includes wood-based electric power generation (biomass), sawmills, wood preservation, veneer and plywood manufacturing, and reconstituted wood product industries. In 2023, this sector directly employed 2,750 workers and generated nearly \$1.37 billion in direct output. The sector’s financial profile is robust, contributing over \$302 million in direct Value-Added, which reflects the significant economic gains achieved by processing raw timber into finished lumber, structural materials, and energy products.

The Primary Solid Wood Products industry exhibits the strongest backward linkages within the Ohio forest economy, characterized by an exceptionally high employment multiplier. Unlike the upstream Forestry and Logging sectors, where induced effects (household spending) were the dominant driver, this sector is fueled by deep supply chain purchases. The data reveals a critical structural dynamic: the Indirect Employment effect supports 3,170 jobs, a figure that effectively exceeds the sector’s own direct workforce of 2,750. This implies that the industry requires a

massive network of supporting services, ranging from logging and transportation to equipment maintenance and utilities, to sustain its operations.

The implied Employment Multiplier is 3.01. This means that every 100 direct jobs in primary wood manufacturing support roughly 201 additional jobs elsewhere in the state economy. This underscores the sector's role as the "keystone" industry that anchors the wider forest supply chain; without the demand generated by these mills and processors, the extraction sectors would lack a substantial local market.

When aggregating direct, indirect, and induced effects, the Primary Solid Wood Products industry contributed a total of 8,268 jobs, \$2.52 billion in output, and nearly \$1.0 billion in value-added to the Ohio economy in 2023. By supporting over 8,200 jobs statewide, this industry serves as a critical manufacturing engine, transforming raw natural resources into high-value products that drive economic activity across Ohio's rural and industrial counties.

Table 7: Direct, Indirect, and Induced Economic Contributions of the Primary Solid Wood Products Industry in Ohio, 2023. †

	Employment	Labor Income	Value-Added	Output
Direct	2,750	\$191,037	\$302,283	\$1,369,023
Indirect	3,170	\$302,385	\$442,393	\$739,848
Induced	2,348	\$132,457	\$251,824	\$411,131
Total	8,268	\$625,879	\$996,501	\$2,520,002

† All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars.

Trend Analysis: Primary Solid Wood Products (2017–2023)

Figure 8 illustrates a classic case of industrial consolidation and capital deepening within Ohio's Primary Solid Wood Products sector. Over the seven-year study period, the industry displayed a sharp divergence between physical capacity (employment) and economic performance (output). Direct employment followed a persistent downward trajectory, contracting by approximately 13.5% from a high of 3,178 jobs in 2017 to 2,750 in 2023.

Conversely, the sector's financial output demonstrated remarkable resilience. Despite the shrinking labor force, Real Industry Output increased by 10.6% over the period, reaching a peak of \$1.37 billion in 2023. This decoupling of labor input from financial yield signals a significant surge in apparent labor productivity. In 2017, the average output per worker was approximately \$389,000; by 2023, this figure had risen to nearly \$498,000, a gain of nearly 28%. This divergence is characteristic of capital deepening or structural consolidation, where the industry sustains higher production values per unit of labor through increased operational efficiency rather than workforce expansion.

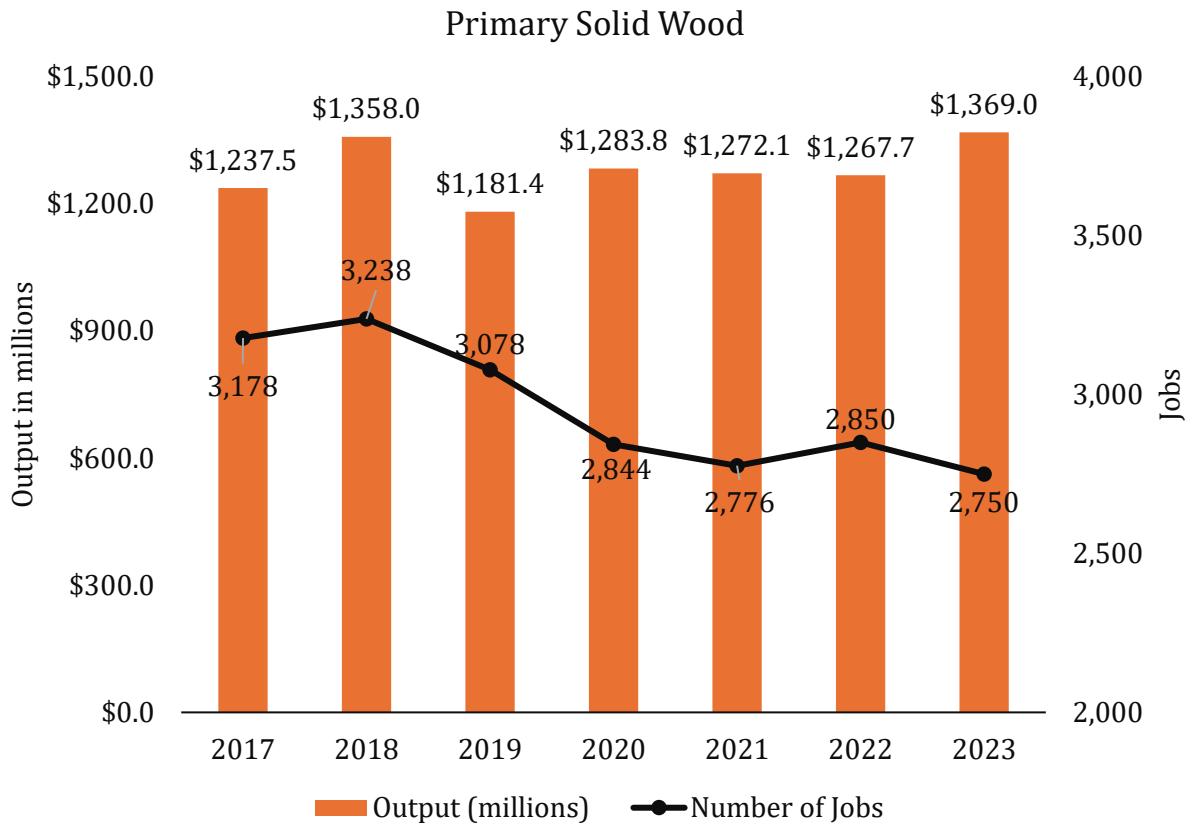


Figure 8: Trend in direct employment and output for the Primary Solid Wood Products industry in Ohio, 2017–2023.

Secondary Solid Wood Products

Economic Contribution of Secondary Solid Wood Products

Table 8 details the economic contribution of the Secondary Solid Wood Products industry, a diverse manufacturing group that includes engineered wood members, wood windows and doors, millwork, flooring, pallets, and prefabricated wood buildings. As a downstream sector, it represents the stage where raw lumber is transformed into final consumer and construction goods. In 2023, this sector was a massive volume driver for the state's forest economy, directly employing 13,953 workers and generating over \$4.2 billion in direct output. The sector also contributed roughly \$1.35 billion in direct Value-Added, showing that a significant portion of its revenue is derived from the complex manufacturing processes that add utility and value to raw wood materials.

The multiplier effects for Secondary Solid Wood Products demonstrate a balanced but deep integration into the state economy. Unlike the primary processing sectors, where indirect (supply chain) effects often exceed induced effects, this sector shows a more symmetrical distribution of downstream impacts. The Indirect effect supported 8,164 jobs and nearly \$2.0

billion in output, reflecting strong demand for intermediate goods such as lumber, hardware, finishes, and transportation services. Simultaneously, the Induced effect supported 7,902 jobs, driven by the household spending of the sector’s large direct workforce.

When aggregated, the total economic footprint of this industry reached 30,019 jobs, \$7.61 billion in output, and \$3.21 billion in value-added. The implied Employment Multiplier is 2.15, meaning that for every 100 jobs created in secondary wood manufacturing, approximately 115 additional jobs are supported in other sectors of the Ohio economy. This multiplier highlights the sector's dual role: it acts as a critical buyer for the primary wood industry while simultaneously serving as a major employer that sustains local service economies through workforce consumption.

Table 8: Direct, Indirect, and Induced Economic Contributions of the Secondary Solid Wood Products Industry in Ohio, 2023. †

	Employment	Labor Income	Value-Added	Output
Direct	13,953	\$1,040,317	\$1,347,340	\$4,226,590
Indirect	8,164	\$630,339	\$1,014,173	\$1,997,390
Induced	7,902	\$445,832	\$848,103	\$1,384,096
Total	30,019	\$2,116,488	\$3,209,617	\$7,608,076

† All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars.

Trend Analysis: Secondary Solid Wood Products (2017–2023)

As shown in Figure 9, the Secondary Solid Wood Products industry stands out as a primary engine of growth for the Ohio forest sector, exhibiting a robust upward trajectory in both physical capacity and financial performance. Unlike the upstream extraction sectors that faced workforce contractions, this value-added manufacturing group expanded its employment base by 11.5% over the seven-year period, rising from 12,516 jobs in 2017 to 13,953 in 2023. This steady job creation highlights the sector's expanding role in the state economy, driven by strong demand for millwork, pallets, and prefabricated wood components.

The most striking trend, however, is the explosive growth in economic output. Real Industry Output surged by nearly 42%, climbing from roughly \$2.98 billion in 2017 to over \$4.23 billion in 2023. Notably, the sector displayed exceptional resilience during the economic disruptions of 2020, maintaining output levels effectively flat while other industries faltered.

The final year of the study shows a significant leap in efficiency. Between 2022 and 2023, while direct employment dipped slightly (a decrease of roughly 100 jobs), output jumped by nearly \$550 million, a 14.9% year-over-year increase. This sharp divergence implies a rapid gain in labor productivity or a shift toward higher-value product lines. By 2023, the average output per

worker reached approximately \$303,000, significantly higher than the \$238,000 observed at the start of the study, implying that Ohio’s secondary manufacturers are successfully leveraging technology and higher-margin goods to drive growth.

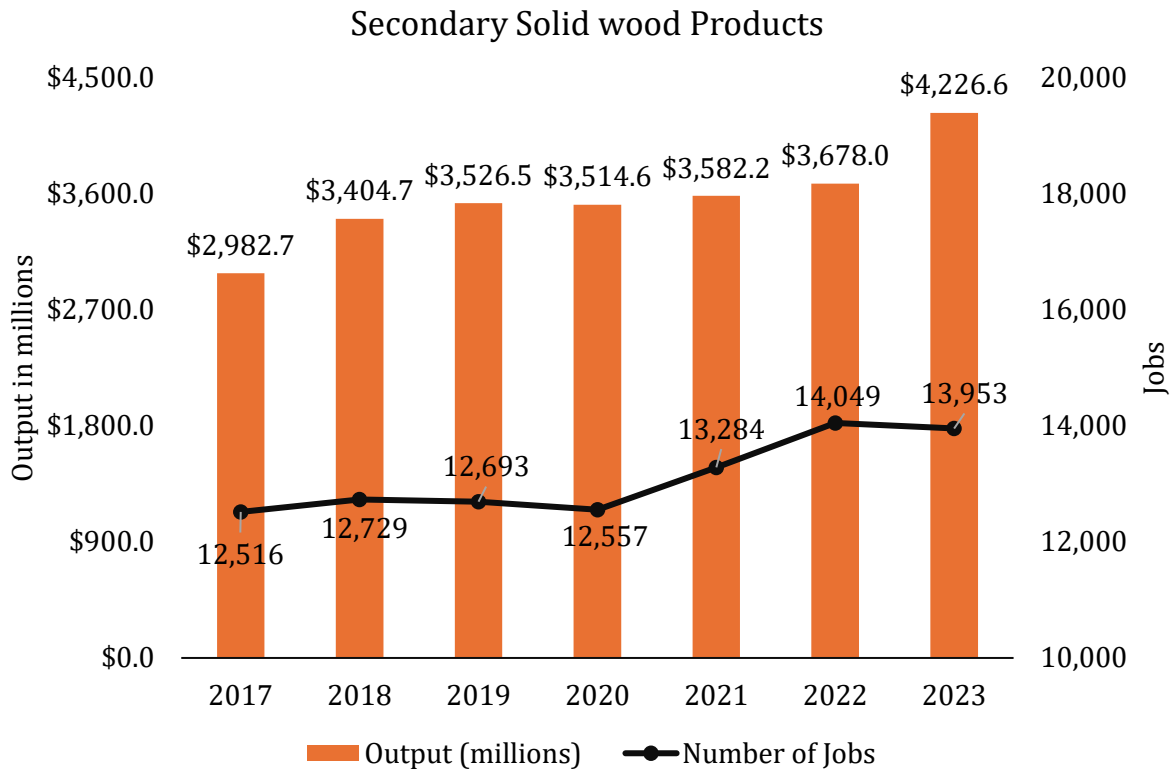


Figure 9: Trend in direct employment and output for the Secondary Solid Wood Products industry in Ohio, 2017–2023.

Wood Furniture

Economic Contribution of Wood Furniture

Table 9 presents the economic contributions of the Wood Furniture industry, a key downstream manufacturing sector that includes kitchen cabinets, countertops, upholstered and non-upholstered household furniture, office furniture, and institutional furniture. In 2023, this sector was one of the major employers within the Ohio forest economy, directly supporting 14,009 jobs, making it second largest single employment groups. The sector generated nearly \$2.93 billion in direct output and contributed over \$1.04 billion in direct Value-Added. The fact that the direct Value-Added figure is approximately one-third of the direct output figure suggests an efficient conversion of raw materials into high-margin finished consumer goods.

The multiplier effects for the Wood Furniture industry reflect a significant overall economic footprint, driven almost equally by supply chain linkages and labor consumption. The total economic contribution reached 25,908 jobs and \$5.43 billion in total output. The Indirect effect

supported 5,277 jobs and \$1.34 billion in output, indicating strong reliance on business-to-business purchasing. These purchases include raw lumber, engineered wood panels, textiles, hardware, and specialized manufacturing services. Similarly, the Induced effect was highly comparable, supporting 6,622 jobs and \$1.16 billion in output. This effect underscores the economic importance of the sector's large workforce; the re-spending of \$1.02 billion in direct Labor Income provides a substantial and localized economic boost to service industries across the state.

The implied Employment Multiplier for the Wood Furniture sector is 1.85. This means that for every 100 direct jobs in wood furniture manufacturing, the sector supports an additional 85 jobs elsewhere in the Ohio economy.

Table 9: Direct, Indirect, and Induced Economic Contributions of the Wood Furniture Industry in Ohio, 2023. [†]

	Employment	Labor Income	Value-Added	Output
Direct	14,009	\$1,020,384	\$1,041,988	\$2,932,868
Indirect	5,277	\$384,417	\$660,227	\$1,339,076
Induced	6,622	\$373,717	\$711,054	\$1,160,657
Total	25,908	\$1,778,518	\$2,413,269	\$5,432,602

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars.

Trend Analysis: Wood Furniture Industry (2017–2023)

As illustrated in Figure 10, the Wood Furniture industry in Ohio has faced significant structural headwinds over the seven-year period, characterized by a gradual contraction in both workforce size and economic output. The sector experienced its peak performance early in the study, reaching highs of 15,561 jobs and nearly \$3.45 billion in output in 2018. However, since that crest, the industry has struggled to regain momentum and is trending downward.

The most concerning signal in the data is the performance in the final year of the study. In 2023, the sector recorded its lowest levels for both metrics across the entire timeline. Direct employment fell to 14,009, a net decline of 6.0% from the start of the study. Similarly, Real Industry Output dropped to \$2.93 billion, marking the first time in the seven-year period that output dipped below the \$3.0 billion threshold.

Unlike the Primary Solid Wood sector, where job losses were offset by efficiency gains (rising output), the Wood Furniture industry is experiencing a symmetrical decline. Labor productivity has remained relatively stagnant, hovering around \$209,000 per worker in 2023 compared to roughly \$205,000 in 2017. This lack of significant productivity growth, coupled with shrinking

volume, suggests the sector is grappling with demand-side challenges rather than undergoing a technological transformation.

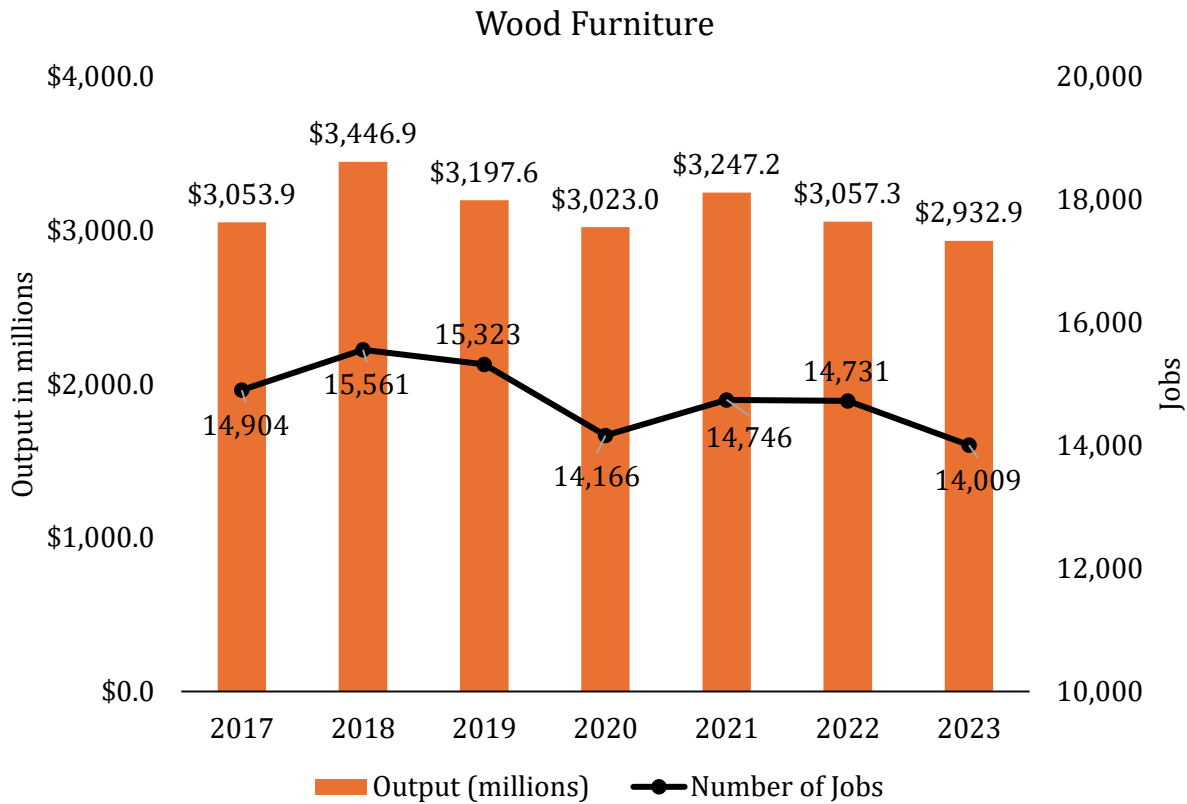


Figure 10: Trend in direct employment and output for the Wood Furniture industry in Ohio, 2017–2023.

Pulp, Paper, and Paperboard Mills

Economic Contribution of Pulp, Paper, and Paperboard Mills

Table 10 presents the economic contributions of the Pulp, Paper, and Paperboard Mills industry group, which includes establishments engaged in the core production of pulp, paper, and paperboard stock. In 2023, this sector directly supported 2,368 individuals and generated nearly \$1.96 billion in direct output. This places the sector among the most economically powerful on an output-per-worker basis, generating approximately \$826,562 in output for every job. This metric shows that the mills represent the most capital-intensive segment of Ohio’s forest economy, requiring enormous investment in machinery, energy, and raw materials.

The structural profile of this industry is unique, as evidenced by its financial ratios. Direct Labor Income accounts for only 12.1% of direct output, a sharp contrast to the high-labor-intensive upstream sectors like Forestry and Logging. This indicates that the vast majority of revenue is

allocated to intermediate supply chain purchases and capital maintenance rather than workforce compensation, signaling a highly automated production environment.

Crucially, the sector generates an exceptionally large multiplier effect, underscoring its deep integration into the wider economy. The total economic footprint reached 9,279 jobs and approximately \$3.55 billion in total output. The implied Employment Multiplier of 3.92 is the strongest in the entire forest products value chain, meaning that every 100 direct mill jobs support an additional 292 jobs elsewhere in Ohio. This ripple effect is overwhelmingly driven by backward linkages into the supply chain.

The Indirect effect supported 4,184 jobs, a figure that is nearly twice the sector’s own direct employment. Similarly, indirect output (\$1.11 billion) significantly outweighs the induced output (\$478 million). This decomposition clearly establishes the mills as a massive industrial purchaser, requiring extensive inputs of wood fiber, chemicals, energy, and transportation, which generates substantial economic activity in supporting industries across the state.

Table 10: Direct, Indirect, and Induced Economic Contributions of the Pulp, Paper, and Paperboard Mills Industry in Ohio, 2023. †

	Employment	Labor Income	Value-Added	Output
Direct	2,368	\$236,662	\$474,216	\$1,957,514
Indirect	4,184	\$339,576	\$580,564	\$1,109,782
Induced	2,727	\$153,917	\$292,896	\$477,998
Total	9,279	\$730,155	\$1,347,676	\$3,545,293

† All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars.

Trend Analysis: Pulp, Paper, and Paperboard Mills (2017–2023)

As detailed in Figure 11, the Pulp, Paper, and Paperboard Mills industry in Ohio presents a unique economic narrative characterized by diverging trends in workforce expansion and financial output. The most positive signal in the data is the sustained growth in direct employment. After fluctuating near the 2,200 level for most of the study period and dipping during the 2020 downturn, the sector aggressively expanded its workforce in the final years. By 2023, employment reached a seven-year peak of 2,368 jobs, marking a 7.1% increase from 2017 levels.

However, the output trajectory has not perfectly mirrored this job growth. Real Industry Output peaked early in the study at \$2.15 billion in 2017 and experienced a general downward drift through 2022, where it hit a low of \$1.82 billion. While 2023 marked a significant recovery, rebounding by 7.7% to nearly \$1.96 billion, the sector’s financial generation remains approximately 9.1% below its 2017 starting point. This divergence results in a notable shift in

labor productivity metrics. In 2017, the sector generated approximately \$973,000 in output per worker. By 2023, despite the recovery in total output, the surge in hiring brought this ratio down to roughly \$827,000 per worker.

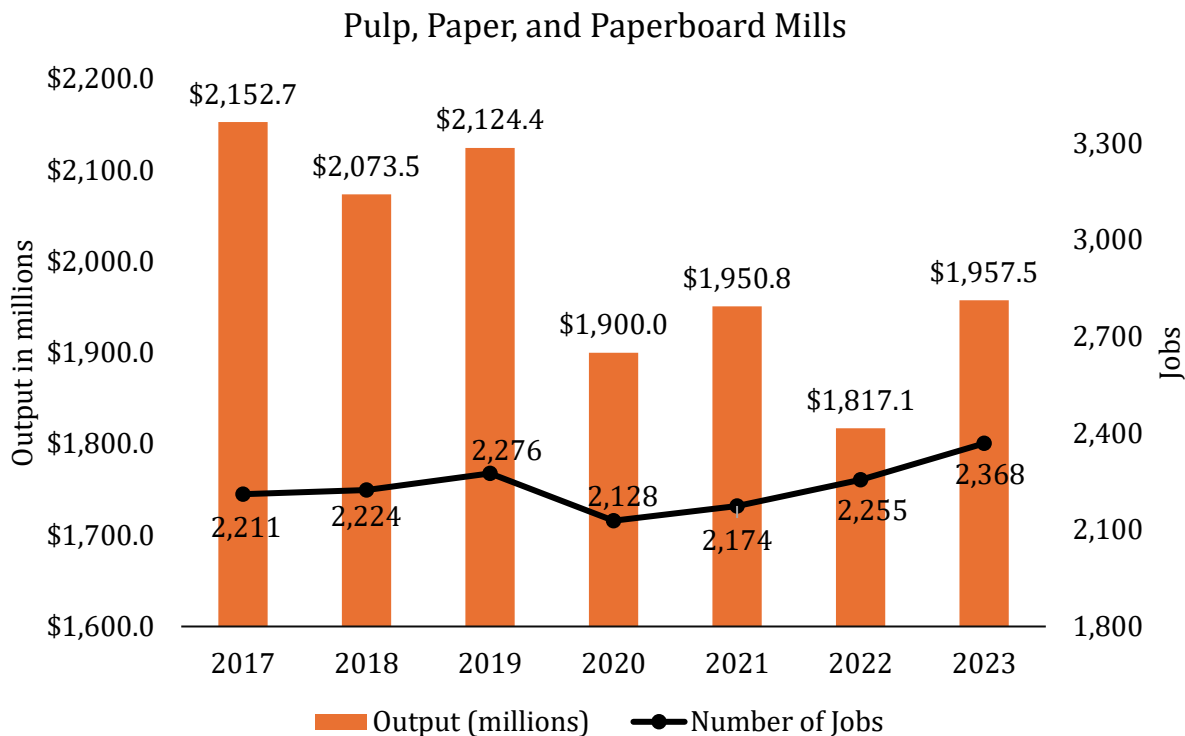


Figure 11: Trend in direct employment and output for the Pulp, Paper, and Paperboard Mills industry in Ohio, 2017–2023.

Secondary Paperboard and Other Paper Products

Economic Contribution of Secondary Paperboard and Other Paper Products

Table 11 presents the economic contributions of the Secondary Paperboard and Other Paper Products industry. This sector represents the final and most valuable stage of the fiber value chain, where bulk paper and paperboard are converted into consumer-ready goods. The group encompasses a wide range of manufacturing activities, including paperboard containers, coated and treated paper bags, stationery, and sanitary paper products. In 2023, this group stood as the undisputed economic heavyweight of the Ohio forest sector, directly employing 19,212 workers and generating a massive \$10.44 billion in direct output.

The scale of this sector's direct output, more than double that of the next largest group, indicates that Ohio serves as a major regional hub for packaging and paper converting. The financial data further underscores the high value-added nature of this manufacturing. The sector contributed nearly \$2.53 billion in direct Value-Added, reflecting the substantial

economic utility created when transforming intermediate paper stock into finished packaging and sanitary goods essential for the broader retail and logistics economy.

The multiplier analysis indicates that the sector is strongly integrated within the state’s industrial structure. The total economic contribution reached a staggering 52,201 jobs and over \$17.5 billion in total output. The implied Employment Multiplier is 2.72, meaning that for every 100 jobs within these converting plants, roughly 172 additional jobs are supported elsewhere in Ohio.

Most notably, the composition of these ripple effects highlights the sector's immense demand for supply chain support. The Indirect effect alone supported 18,821 jobs, a figure nearly identical to the sector's own direct workforce. This 1:1 ratio between direct and indirect employment is a rare and powerful indicator of industrial depth. It suggests that the production of paperboard and packaging materials triggers an almost equal volume of employment demand in upstream sectors, driving significant activity in transportation, warehousing, wholesale trade, and the primary paper mills that provide the raw material inputs.

Table 11: Direct, Indirect, and Induced Economic Contributions of the Secondary Paperboard and Other Paper Products Industry in Ohio, 2023. [†]

	Employment	Labor Income	Value-Added	Output
Direct	19,212	\$1,633,396	\$2,529,298	\$10,435,146
Indirect	18,821	\$1,384,842	\$2,395,948	\$4,599,622
Induced	14,167	\$799,593	\$1,627,678	\$2,482,445
Total	52,201	\$3,817,830	\$6,552,924	\$17,517,213

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars.

Trend Analysis: Secondary Paperboard and Other Paper Products (2017–2023)

Figure 12 details the performance of the Secondary Paperboard and Other Paper Products industry, showing its status as the most stable and financially dominant sector within the Ohio forest economy. Over the seven-year period, the sector demonstrated consistent growth in its physical footprint, with direct employment increasing by 7.0%, rising from 17,971 jobs in 2017 to 19,212 in 2023. This continuous workforce expansion highlights the ongoing demand for converted paper products, driven primarily by the e-commerce and logistics sectors.

Real Industry Output, which is the largest component of the entire forest sector, also showed robust long-term growth. Output increased by 3.2% over the full period, rising from \$10.11 billion to \$10.44 billion, after peaking at over \$11.0 billion in 2021. The ability of the sector to maintain its multi-billion dollar output level even during periods of economic contraction (e.g.,

2020) underscores its classification as an essential industry providing crucial packaging and sanitary supplies.

Secondary Paperboard and Other Paper Products

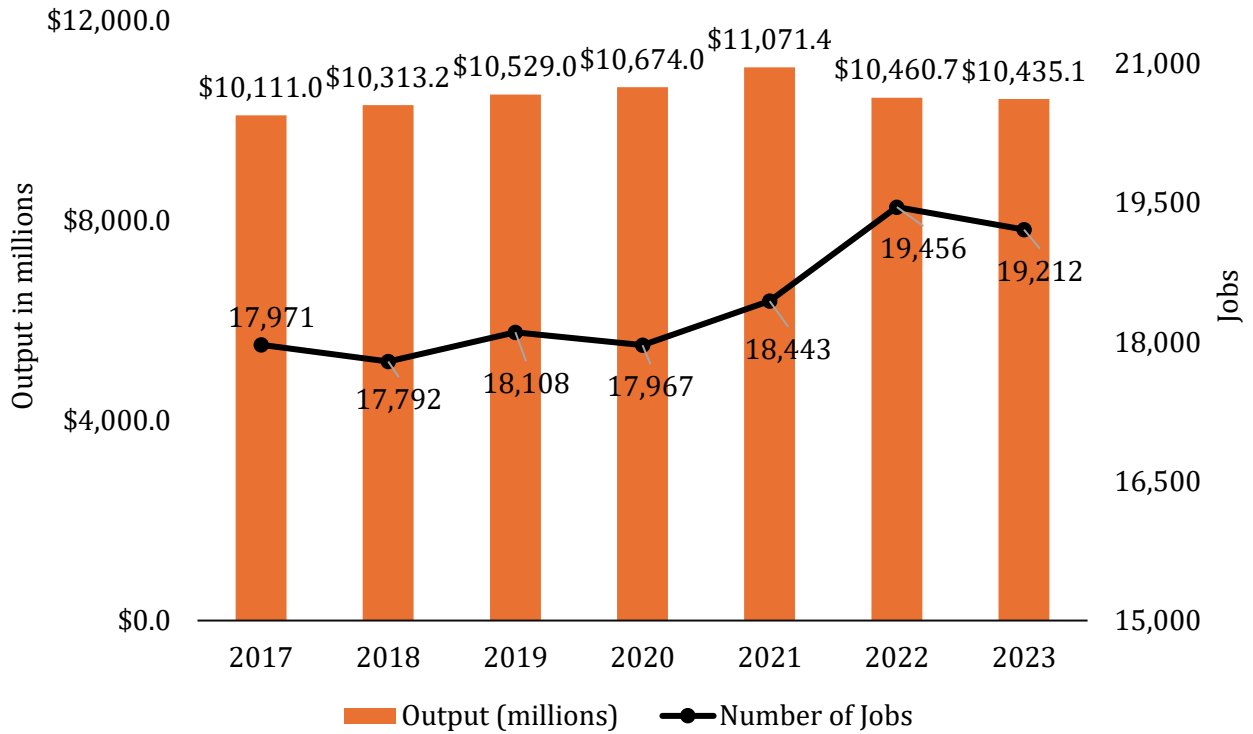


Figure 12: Trend in direct employment and output for the Secondary Paperboard and Other Paper Products industry in Ohio, 2017–2023.

Top Forest Product Sectors

Ohio's forest products sector is represented by 31 IMPLAN industries, as the "All other crop farming" (Maple Syrup Production) sector is not present or its data is undisclosed in the state's 2023 industry mix. Table 12 presents the top five individual industries contributing to the state economy, revealing a sector heavily weighted toward downstream manufacturing and industrial packaging rather than raw extraction. Paperboard Container Manufacturing serves as the undisputed economic engine of the Ohio forest sector, ranking first across all four metrics. It employed 10,961 individuals, generated nearly \$875 million in labor income, and produced a massive \$6.24 billion in direct output.

In terms of employment, the profile is concentrated in secondary wood and paper processing. Wood Container and Pallet Manufacturing ranked second with 4,958 jobs, followed closely by Paper Bag and Coated and Treated Paper Manufacturing (4,872 jobs) and Wood Kitchen Cabinet Manufacturing (4,709 jobs). This distribution stands in contrast to states with heavy reliance on upstream timber harvesting; in Ohio, the top five employers are all value-added manufacturing industries.

However, the financial rankings highlight the distinct capital and labor dynamics within specific sub-sectors. While Commercial Logging did not rank among the top five employers, it emerged as the third-largest generator of Labor Income (\$441.7 million) and Value-Added (\$435.0 million). This underscores the sector's high labor intensity and the fact that a significant proportion of logging revenue is retained as workforce compensation and as a proprietor income. Conversely, Paper Mills appears in the top five for Output (\$1.26 billion) despite not ranking in the top five for employment. This disparity shows the high capital intensity of the milling sector, where automated operations generate substantial economic value with a relatively smaller, highly specialized workforce compared to the more labor-reliant furniture and cabinetry sectors.

Table 12: Top five industries in terms of direct Economic Contributions in Ohio state, 2023. †

Rank	Employment	Labor Income	Value added	Output
1	Paperboard container manufacturing (10,961)	Paperboard container manufacturing (\$874,962)	Paperboard container manufacturing (\$1,313,365)	Paperboard container manufacturing (\$6,238,465)
2	Wood container and pallet manufacturing (4,958)	Paper bag and coated and treated paper manufacturing (\$500,594)	Paper bag and coated and treated paper manufacturing (\$776,495)	Paper bag and coated and treated paper manufacturing (\$2,450,721)
3	Paper bag and coated and treated paper manufacturing (4,872)	Commercial logging (\$441,716)	Commercial logging (\$435,028)	Wood container and pallet manufacturing (\$1,275,782)
4	Wood kitchen cabinet and countertop manufacturing (4,709)	Wood container and pallet manufacturing (\$345,913)	Wood container and pallet manufacturing (\$418,266)	Paper mills (\$1,259,899)
5	Non-upholstered wood household furniture manufacturing (3,790)	Wood kitchen cabinet and countertop manufacturing (\$319,392)	Wood kitchen cabinet and countertop manufacturing (\$342,171)	Wood kitchen cabinet and countertop manufacturing (\$890,937)

† All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

Top Non-Forest Industries supported by the Forest Sector in 2023

Excluding the forest-products industries themselves, the Ohio economy included 480 IMPLAN sectors in 2023. The forest sector’s economic reach is extensive, supporting at least one job in 302 industries and at least ten jobs in 181 of those industries. Beyond the 55,318 direct jobs, the sector supported about 68,809 additional indirect and induced jobs across the state’s economy. These ripple effects are concentrated heavily in logistics, real estate, and service sectors. Table 13 highlights the top ten non-forest industries most heavily impacted by this economic activity in 2023. Together, these ten sectors account for 25,577 jobs, representing a significant concentration of the forest economy's downstream impact.

Table 13: Top Ten Industries Impacted by Ohio state’s Forest Products Industries in terms of number of jobs in 2023.

Industries	Number of Jobs
Warehousing and storage	4,862
Truck transportation	2,955
Other real estate	2,796
Couriers and messengers	2,405
Hospitals	2,325
Wholesale - Other durable goods merchant wholesalers	2,320
Employment services	2,193
Full-service restaurants	2,057
Limited-service restaurants	1,832
Management of companies and enterprises	1,832
Total	25,577

The composition of these top sectors reveals the specific mechanisms through which the forest sector stimulates the wider Ohio economy.

- Logistics and Supply Chain Integration:** The most profound linkages are found in the movement and storage of physical goods. Warehousing and Storage ranks as the single largest sector supported by forest industries, accounting for 4,862 jobs. This exceptionally high number suggests that the sheer volume of wood products, paperboard, and packaging materials produced in the state requires massive storage infrastructure. When combined with Truck Transportation (2,955 jobs) and Couriers and Messengers (2,405 jobs), it becomes clear that the forest sector acts as one of the primary drivers of the state's transportation network. The industry requires a robust

fleet to move raw timber to mills and, more significantly, to distribute finished paper packaging and furniture to national markets.

- **Induced Household Spending:** The prominence of Other Real Estate (2,796 jobs), Hospitals (2,325 jobs), and dining establishments illustrates the "induced" power of the forest workforce. Full-service Restaurants and Limited-service Restaurants combined to support nearly 3,900 jobs. These positions are sustained not by mill supply chains, but by the wages spent by forest-sector employees in their local communities. The high ranking of real estate and healthcare services suggests that the salaries paid to loggers, millwrights, and manufacturing staff are a critical source of revenue for local housing markets and essential community services.
- **Business and Corporate Support:** Notably, Employment Services (2,193 jobs) and Management of Companies and Enterprises (1,832 jobs) also appear in the top ten. This indicates that Ohio's forest product firms are significant consumers of corporate support services, relying on external agencies for staffing solutions, administrative oversight, and strategic management. This linkage demonstrates that the sector's influence extends beyond the industrial zones into the professional services economy.

In terms of economic output, the forest sector's influence shifts toward high-volume wholesale trade, capital-intensive infrastructure, and household service sectors. As detailed in Table 14, the top ten non-forest industries supported by forest-sector activity generated a combined \$5.27 billion in output in 2023.

The dominant financial linkage involves the movement and wholesale distribution of goods, reflecting the forest industry's reliance on a massive logistics network. The leading sector is Wholesale - Other Durable Goods Merchant Wholesalers, which generated \$772.2 million in output. When combined with Wholesale - Other Nondurable Goods Merchant Wholesalers (\$581.5 million), the total wholesale trade supported by the forest sector exceeds \$1.35 billion. This output is driven by the distribution of finished wood products, paper packaging, and the resale of raw materials. This is further reinforced by high rankings for transportation infrastructure: Truck Transportation generated \$651.3 million, and Warehousing and Storage contributed \$458.0 million, underscoring the critical role of freight and storage in managing the high volumes of forest products.

The analysis of induced (household spending) effects reveals the sector's substantial impact on consumer wealth and financial services. The presence of Owner-Occupied Housing as the third-largest supported sector, generating nearly \$610 million, is a strong indicator. In economic modeling, this represents the imputed value of homeownership, confirming that the wages, salaries, and benefits paid, and income as a proprietor in Ohio's Forest Product manufacturing mills sustain high levels of homeownership and household wealth. This effect is further supported by Other Real Estate (\$488.9 million) and Hospitals (\$467.8 million). Additionally, the

ranking of Monetary Authorities and Depository Credit Intermediation (\$409.6 million) highlights the financial weight of the sector, which drives demand for banking and credit services.

Finally, the sector’s large energy and corporate footprint is evident. Electric Power Transmission and Distribution generated \$351.7 million in output, driven by the substantial electricity consumption of the state’s energy-intensive mills (Pulp, Paper, and Paperboard). Meanwhile, Management of Companies and Enterprises (\$483.0 million) indicates that forest product firms are significant consumers of high-value, centralized corporate and administrative services.

Table 14: Top Ten Industries impacted by Ohio State’s Forest Products Industries in terms of output production in 2023. [†]

Industries	Output
Wholesale - Other durable goods merchant wholesalers	\$772,163
Truck transportation	\$651,294
Owner-occupied housing	\$609,737
Wholesale - Other nondurable goods merchant wholesalers	\$581,540
Other real estate	\$488,895
Management of companies and enterprises	\$483,033
Hospitals	\$467,767
Warehousing and storage	\$457,990
Monetary authorities and depository credit intermediation	\$409,610
Electric power transmission and distribution	\$351,653
Total	\$5,273,681

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

Importance of the Forest Products Industries in Context

Natural Resources and Agricultural Industries

To contextualize the economic importance of the forest economy, Table 15 compares the direct contributions of Ohio’s four primary natural resource and agricultural sectors: Forest Products, Commercial Fishing/Hunting, Mining (including oil & gas), and Agricultural Production. The data reveals a distinct hierarchy where Agricultural Production dominates in physical workforce size, but the Forest Products industry leads in total economic output and labor income.

In terms of employment, Agricultural production is the largest sector within this group, supporting 94,017 jobs, which accounts for nearly 54% of the total natural resources workforce.

Forest Products follows as the second-largest employer with 55,318 jobs. However, a stark divergence appears when analyzing labor compensation. Despite employing significantly fewer workers than Agriculture, the Forest Products sector generated the highest total Labor Income at \$4.60 billion. This figure exceeds Agriculture (\$3.42 billion) and Mining (\$2.39 billion), indicating that the forest product industries, heavily weighted toward manufacturing, offer significantly higher average labor income and labor quality compared to the seasonal or lower-wage roles often found in crop and animal production.

In terms of gross industrial activity, the Forest Products sector emerged as the leading output generator, producing \$21.41 billion in Output. This surpasses both Mining (\$18.90 billion) and Agriculture (\$14.08 billion), highlighting the sector's extensive value-added supply chain that transforms raw resources into high-value consumer goods. However, the Value-Added (GSP) metrics reflect the extreme capital intensity of the extractive industries. Mining, and Oil & Gas Production ranked first in contribution to GSP with \$9.82 billion, despite having the smallest major workforce (24,446 jobs). This underscores the mining sector's reliance on heavy capitalization and resource rents rather than labor inputs to generate wealth.

The comparative trend analysis from 2017 to 2023 highlights the Forest Products sector as a pillar of stability amidst significant volatility in other natural resource fields. Forest Products demonstrated consistent, comprehensive growth, with employment rising by 1.6 percent and Value-Added increasing by 8.5 percent. This steady performance contrasts sharply with the other sectors.

Mining experienced a massive structural consolidation; while Output surged by 21.8 percent (likely driven by energy prices or automation), employment plummeted by 27.5 percent, and Value-Added actually contracted by 17.6 percent. Agricultural Production displayed a remarkable recovery in profitability. Although employment declined by 5.5 percent, Labor Income (+101.3 percent) and Value-Added (+82.1 percent) virtually doubled. This suggests a dramatic shift in farm economics, likely driven by commodity price recoveries or efficiency gains that boosted net returns despite a shrinking workforce.

Table 15: Natural Resources and Agricultural Production Industries in Ohio state, 2023. †

Industry	Employment	Δ2017^{††}	Labor Income	Δ2017^{††}	Value-Added	Δ2017^{††}	Output	Δ2017^{††}
1. Forest Products	55,318	1.6%	\$4,602,364	2.0%	\$6,169,823	8.5%	\$21,408,554	6.0%
2. Commercial fishing, hunting & trapping	917	8.0%	\$6,109	-31.1%	\$41,498	22.8%	\$43,825	-5.1%
3. Mining, and oil & gas production	24,446	-27.5%	\$2,388,011	-5.3%	\$9,817,559	-17.6%	\$18,897,708	21.8%
4. Agriculture production (plant crops and animals)	94,017	-5.5%	\$3,418,058	101.3%	\$7,458,597	82.1%	\$14,082,843	15.3%
Total	174,698	-7.3%	\$10,414,542	19.2%	\$23,487,477	8.1%	\$54,432,930	13.5%

† All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

†† All percentage differences are calculated in real terms using 2023 constant dollars.

Manufacturing Industries

To assess the relative standing of the forest sector within Ohio's industrial base, Table 16 compares "Forest Products Manufacturing" against the state's other major manufacturing groups. Note that in this context, "Forest Products" refers specifically to the manufacturing sub-sectors (Groups 3 through 7), excluding the extraction activities of forestry and logging and other non-manufacturing sectors (IMPLAN codes 10, 15, 16, 19, and 40 see Appendix A). The data shows that while Ohio is dominated by heavy industrial and chemical giants, the Forest Products sector operates as a critical top-tier employer and a stabilizing force within the manufacturing economy.

In terms of physical scale, the Ohio manufacturing landscape is defined by a "Big Four" dynamic involving Transportation Equipment, Fabricated Metal, Machinery, and Food processing. Forest Products Manufacturing secures a strong position immediately following this tier, ranking fifth in total employment with 52,288 jobs. This places the sector ahead of major industrial categories such as Chemical Manufacturing (47,137 jobs), Plastics and Rubber (44,639 jobs), and Primary Metal (36,361 jobs). Accounting for approximately 7.6% of the state's total manufacturing workforce, the Forest Products Manufacturing Industry is a larger labor provider than the entire Chemical and Petroleum sectors combined, underscoring its vital role in sustaining employment across the state's industrial regions.

Financially, the sector's ranking shifts due to the extreme capital intensity of Ohio's heavy industries. While ranking fifth in jobs, Forest Products Manufacturing ranks eighth in direct output, generating nearly \$20.92 billion. It trails hyper-capitalized sectors like Chemical and Petroleum, which generate immense output values relative to their workforce size. However, the forest sector remains a fiscal heavyweight, outproducing well-known industries such as Plastics and Rubber (\$19.7 billion), Electrical Equipment (\$14.2 billion), and Computer and Electronic Products (\$8.6 billion).

A key insight emerges when analyzing labor productivity and resilience. The Forest Products sector generates approximately \$400,000 in output per worker, a figure that indicates strong operational efficiency. Notably, this outperforms the state's second-largest employer, Fabricated Metal, which generates roughly \$352,500 per worker. Furthermore, comparisons with the broader manufacturing trends highlight the forest sector's unique stability. While Ohio's total manufacturing base contracted between 2017 and 2023, shrinking by 2.9 percent in employment and 2.7 percent in output, the Forest Products sector (as noted in Table 2) defied this trend with positive employment growth of 1.6 percent.

Table 16: Manufacturing Industries in Ohio state, 2023. †

Manufacturing Industries	Employment	Labor Income	Value Added	Output
Transportation Equipment	112,613	\$11,242,797	\$16,655,166	\$77,478,936
Fabricated Metal	99,926	\$8,406,415	\$13,482,133	\$35,225,721
Machinery	78,774	\$7,755,829	\$10,945,649	\$32,832,754
Food	72,327	\$5,296,258	\$11,272,056	\$48,098,084
Forest Products	52,288	\$4,120,925	\$5,692,193	\$20,915,084
Chemical	47,137	\$6,444,026	\$21,963,240	\$59,832,057
Plastics and Rubber Products	44,639	\$3,352,250	\$5,334,625	\$19,684,295
Primary Metal	36,361	\$4,130,459	\$7,555,528	\$41,570,745
Nonmetallic Mineral Product	26,848	\$2,389,130	\$4,713,815	\$11,641,926
Electrical Equipment	26,650	\$2,627,130	\$5,389,647	\$14,188,123
Miscellaneous	26,434	\$2,548,644	\$2,964,663	\$7,811,154
Printing	21,623	\$1,286,802	\$1,959,009	\$4,184,261
Computer and Electronic Product	19,349	\$1,924,448	\$1,613,461	\$8,608,703
Beverage and Tobacco Product	12,777	\$866,297	\$2,598,977	\$7,159,238
Textiles and Apparel	8,424	\$468,325	\$712,612	\$2,071,069
Petroleum and Coal	5,332	\$1,043,591	\$14,133,361	\$33,622,620
Total	691,500	\$63,903,324	\$126,986,135	\$424,924,770
Compared to 2017	-2.9%	-5.7%	-0.6%	-2.7%

† All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

Summary

The 2023 economic contribution report shows that the Forest Products sector is a massive industrial powerhouse, characterized by extensive downstream manufacturing and structural resilience within Ohio's industrial base. Navigating a complex landscape of market volatility and technological shifts, the sector has demonstrated the capacity for expansion and stability.

In 2023, the Forest Products sector directly employed 55,318 individuals and generated \$21.41 billion in direct economic output. The sector's influence extends deeply into the broader economy; when accounting for indirect supply chain purchases and induced household spending, the total contribution reached over 124,127 jobs and about \$35.61 billion in total output. This indicates a robust employment multiplier of 2.24, meaning every 100 direct jobs in the forest sector supports an additional 124 jobs elsewhere in the Ohio economy.

The industry exhibits a strong concentration in its manufacturing arms, contrasting sharply with states reliant on extraction. Downstream manufacturers are the primary drivers of employment, with the top five largest employers all being value-added processing industries (e.g., Paperboard Container, Wood Container, and Cabinet manufacturing). Financially, Paperboard Container Manufacturing is the undisputed leader, generating a massive \$6.24 billion in direct output. While extraction sectors like Commercial Logging are highly labor-intensive, generating high labor income, capital-intensive Paper Mills drive wealth, producing \$1.26 billion in output despite a smaller workforce.

Within the state's natural resources base, Forest Products stands as the undisputed leader in terms of labor income and output production, generating the highest labor income (\$4.60 billion) and output (\$21.41 billion), surpassing both Agriculture and Mining. In the broader manufacturing landscape, it functions as a critical upper-tier industry. Ranking fifth in total manufacturing employment with 52,288 jobs, the sector is a larger employer than the entire Chemical and Primary Metal sectors. Furthermore, its productivity remains competitive, with its output per worker outperforming the state's second-largest employer, Fabricated Metal.

The study period (2017–2023) reveals a sector in a state of controlled growth and increasing efficiency. The total sector increased employment by 1.6% and Value-Added by 8.5%, defying the net contraction experienced by the broader Ohio manufacturing base. This stability was driven by the strong performance and employment growth in sectors like Secondary Solid Wood Products and Secondary Paperboard. Ultimately, by converting local renewable resources into high-value paper, packaging, and durable wood goods, the sector reinforces its role as an enduring engine of economic activity.

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Appendix A: Forest Products Industries Groupings and IMPLAN Sectors

A1: Forestry Industry Grouping and IMPLAN Sectors

Industry Code	Industry name
10	All other crop farming***
15	Forestry, forest products, and timber tract production
19	Support activities for agriculture and forestry-*

Note: Sectors with an “*” indicate that only a portion of the sector is included in the forest products industries.

Sectors denoted by “***” indicate that the corresponding FPI is not present in Ohio.

A2: Logging Industry Grouping and IMPLAN Sector

Industry Code	Industry name
16	Commercial logging

A3: Primary Solid Wood Products Industry Grouping and IMPLAN Sectors

Industry Code	Industry name
40	Electric power generation – Biomass**
124	Sawmills
125	Wood preservation
126	Veneer and plywood manufacturing
128	Reconstituted wood product manufacturing

Note: Sectors with “**” indicate that it is treated as **full sector** in 2023; however in 2017 it was treated as a **partial (wood component only)** so the numbers are not strictly comparable.

Industry Code	Industry name
127	Engineered wood member and truss manufacturing
129	Wood windows and door manufacturing
130	Cut stock, resawing lumber, and planning
131	Other millwork, including flooring
132	Wood container and pallet manufacturing

133	Manufactured home (mobile home) manufacturing
134	Prefabricated wood building manufacturing
135	All other miscellaneous wood product manufacturing

A4: Secondary Solid Wood Products Industry Grouping and IMPLAN Sectors.

A5: Wood Furniture Industry Grouping and IMPLAN Sectors.

Industry Code	Industry name
348	Wood kitchen cabinet and countertop manufacturing
349	Upholstered household furniture manufacturing
350	Non-upholstered wood household furniture manufacturing
352	Institutional furniture manufacturing**
353	Wood office furniture manufacturing
354	Custom architectural woodwork and millwork
356	Showcase, partition, shelving, and locker manufacturing**

Note: Sectors with “**” indicate that it is treated as **full sector** in 2023; however in 2017 it was treated as a **partial (wood component only)** so the numbers are not strictly comparable.

A6: Pulp, Paper, and Paperboard Mills Industry Grouping and IMPLAN Sectors.

Industry Code	Industry name
136	Pulp mills
137	Paper mills
138	Paperboard mills

A7: Secondary Paperboard and Other Paper Products Industry Grouping and IMPLAN Sectors.

Industry Code	Industry name
139	Paperboard container manufacturing
140	Paper bag and coated and treated paper manufacturing
141	Stationery product manufacturing
142	Sanitary paper product manufacturing
143	All other converted paper product manufacturing

Appendix B. Detailed Economic Contribution Results of 2023

B1: Direct Economic Contribution by IMPLAN Sector, 2023

B1.1: Direct Economic Contributions, Forestry Sector Details, 2023. [†]

Industries	Employment	Labor Income	Value-Added	Output
All other crop farming	0	\$0	\$0	\$0
Forestry, forest products, and timber tract production	165	\$27,627	\$28,256	\$29,873
Support activities for agriculture and forestry	316	\$11,225	\$11,413	\$12,097
Total	480	\$38,852	\$39,669	\$41,970

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B1.2: Direct Economic Contributions, Logging Sector Details (2023, in 2023 USD). [†]

Industries	Employment	Labor Income	Value-Added	Output
Commercial logging	2,545	\$441,716	\$435,028	\$445,442
Total	2,545	\$441,716	\$435,028	\$445,442

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B1.3: Direct Economic Contributions, Primary Solid Wood Products Sector Details (2023, in 2023 USD).[†]

Industries	Employment	Labor Income	Value- Added	Output
Electric power generation - Biomass	5	\$872	\$2,933	\$6,058
Sawmills	1,612	\$109,726	\$154,862	\$768,218
Wood preservation	135	\$10,635	\$22,232	\$110,605
Veneer and plywood manufacturing	736	\$47,506	\$72,799	\$259,830
Reconstituted wood product manufacturing	262	\$22,298	\$49,457	\$224,313
Total	2,750	\$191,037	\$302,283	\$1,369,023

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B1.4: Direct Economic Contributions, Secondary Solid Wood Products Sector Details (2023, in 2023 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Engineered wood member and truss manufacturing	1,242	\$102,457	\$133,266	\$501,102
Wood windows and door manufacturing	2,291	\$184,727	\$231,672	\$697,688
Cut stock, resawing lumber, and planing	602	\$41,519	\$64,398	\$228,356
Other millwork, including flooring	2,674	\$205,202	\$294,436	\$869,766
Wood container and pallet manufacturing	4,958	\$345,913	\$418,266	\$1,275,782
Manufactured home (mobile home) manufacturing	479	\$38,528	\$42,878	\$149,630
Prefabricated wood building manufacturing	356	\$29,047	\$42,431	\$132,066
All other miscellaneous wood product manufacturing	1,350	\$92,923	\$119,995	\$372,201
Total	13,953	\$1,040,317	\$1,347,340	\$4,226,590

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B1.5: Direct Economic Contributions, Wood Furniture Sector Details (2023, 2023 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Wood kitchen cabinet and countertop manufacturing	4,709	\$319,392	\$342,171	\$890,937
Upholstered household furniture manufacturing	540	\$30,935	\$33,281	\$113,058
Non-upholstered wood household furniture manufacturing	3,790	\$237,807	\$252,148	\$703,722
Institutional furniture manufacturing	2,161	\$201,546	\$214,736	\$545,018
Wood office furniture manufacturing	300	\$23,077	\$25,720	\$78,665
Custom architectural woodwork and millwork	1,048	\$83,240	\$36,367	\$201,048
Showcase, partition, shelving, and locker manufacturing	1,461	\$124,388	\$137,567	\$400,420
Total	14,009	\$1,020,384	\$1,041,988	\$2,932,868

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B1.6: Direct Economic Contributions, Pulp, Paper, and Paperboard Mills Sector Details (2023, in 2023 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Pulp mills	49	\$2,876	\$4,460	\$30,166
Paper mills	1,568	\$153,552	\$312,093	\$1,259,899
Paperboard mills	751	\$80,234	\$157,664	\$667,449
Total	2,368	\$236,662	\$474,216	\$1,957,514

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B1.7: Direct Economic Contributions, Secondary Paperboard and Other Paper Products Sector Details (2023, in 2023 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Paperboard container manufacturing	10,961	\$874,962	\$1,313,365	\$6,238,465
Paper bag and coated and treated paper manufacturing	4,872	\$500,594	\$776,495	\$2,450,721
Stationery product manufacturing	1,283	\$88,405	\$108,620	\$536,343
Sanitary paper product manufacturing	774	\$65,841	\$153,704	\$648,275
All other converted paper product manufacturing	1,321	\$103,595	\$177,113	\$561,342
Total	19,212	\$1,633,396	\$2,529,298	\$10,435,146

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B2: Direct Economic Contribution by IMPLAN Sector, 2017 (2017 USD)

B2.1: Direct Economic Contributions, Forestry Sector Details (2017, in Nominal 2017 USD).[†]

Industries	Employment	Labor Income	Value- Added	Output
All other crop farming	161	\$20,096	\$20,311	\$24,523
Forestry, forest products, and timber tract production	286	\$10,318	\$9,246	\$10,345
Support activities for agriculture and forestry	149	\$1,223	\$1,832	\$3,080
Total	596	\$31,638	\$31,389	\$37,948

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B2.2: Direct Economic Contributions, Logging Sector Details (2017, in Nominal 2017 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Commercial logging	3,069	\$361,555	\$417,276	\$484,704
Total	3,069	\$361,555	\$417,276	\$484,704

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2017 dollars value.

B2.3: Direct Economic Contributions, Primary Solid Wood Products Sector Details (2017, in Nominal 2017 USD).[†]

Industries	Employment	Labor Income	Value- Added	Output
Electric power generation - Biomass	0	\$0	\$0	\$0
Sawmills	2,123	\$112,272	\$119,564	\$587,231
Wood preservation	196	\$13,445	\$16,360	\$109,613
Veneer and plywood manufacturing	620	\$32,345	\$36,872	\$166,251
Reconstituted wood product manufacturing	240	\$17,436	\$23,522	\$124,281
Total	3,178	\$175,499	\$196,317	\$987,376

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2017 dollars value.

B2.4: Direct Economic Contributions, Secondary Solid Wood Products Sector Details (2017, in Nominal 2017 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Engineered wood member and truss manufacturing	1,208	\$65,550	\$71,149	\$265,342
Wood windows and door manufacturing	1,448	\$85,963	\$95,960	\$323,768
Cut stock, resawing lumber, and planing	549	\$33,182	\$39,198	\$127,933
Other millwork, including flooring	2,392	\$133,249	\$152,429	\$486,952
Wood container and pallet manufacturing	4,606	\$251,159	\$267,656	\$737,086
Manufactured home (mobile home) manufacturing	255	\$16,437	\$19,934	\$62,211
Prefabricated wood building manufacturing	444	\$30,092	\$31,474	\$81,985
All other miscellaneous wood product manufacturing	1,613	\$91,049	\$98,958	\$294,600
Total	12,516	\$706,681	\$776,757	\$2,379,878

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2017 dollars value.

B2.5: Direct Economic Contributions, Wood Furniture Sector Details (2017, in Nominal 2017 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Wood kitchen cabinet and countertop manufacturing	4,868	\$274,798	\$293,852	\$733,783
Upholstered household furniture manufacturing	470	\$20,874	\$22,759	\$88,447
Non-upholstered wood household furniture manufacturing	4,613	\$235,071	\$270,802	\$621,103
Institutional furniture manufacturing	1,547	\$123,603	\$137,397	\$333,438
Wood office furniture manufacturing	369	\$22,834	\$29,221	\$80,583
Custom architectural woodwork and millwork	1,168	\$77,319	\$85,150	\$196,174
Showcase, partition, shelving, and locker manufacturing	1,868	\$113,317	\$129,110	\$383,100
Total	14,904	\$867,817	\$968,291	\$2,436,627

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2017 dollars value.

B2.6: Direct Economic Contributions, Pulp, Paper, and Paperboard Mills Sector Details (2017, in Nominal 2017 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Pulp mills	52	\$5,491	\$7,144	\$33,712
Paper mills	1,389	\$146,474	\$261,375	\$1,073,378
Paperboard mills	770	\$69,598	\$120,808	\$610,518
Total	2,211	\$221,564	\$389,328	\$1,717,609

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2017 dollars value.

B2.7: Direct Economic Contributions, Secondary Paperboard and Other Paper Products Sector Details (2017, in Nominal 2017 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Paperboard container manufacturing	10,031	\$712,333	\$933,225	\$4,565,237
Paper bag and coated and treated paper manufacturing	4,683	\$417,606	\$610,877	\$2,159,784
Stationery product manufacturing	1,304	\$71,826	\$103,088	\$457,329
Sanitary paper product manufacturing	757	\$51,799	\$133,664	\$528,835
All other converted paper product manufacturing	1,196	\$71,871	\$89,253	\$356,212
Total	17,971	\$1,325,435	\$1,870,107	\$8,067,397

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2017 dollars value.

B3: Direct Economic Contribution by IMPLAN Sector, 2017 (2023 USD)

B3.1: Direct Economic Contributions, Forestry Sector Details (2017, in 2023 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
All other crop farming	161	\$24,572	\$24,835	\$30,736
Forestry, forest products, and timber tract production	286	\$12,616	\$11,306	\$12,965
Support activities for agriculture and forestry	149	\$1,496	\$2,240	\$3,860
Total	596	\$38,685	\$38,381	\$47,561

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B3.2: Direct Economic Contributions, Logging Sector Details (2017, in 2023 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Commercial logging	3,069	\$442,084	\$510,215	\$607,490
Total	3,069	\$442,084	\$510,215	\$607,490

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B3.3: Direct Economic Contributions, Primary Solid Wood Products Sector Details (2017, in 2023 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Electric power generation - Biomass	0	\$0	\$0	\$0
Sawmills	2,123	\$137,279	\$146,194	\$735,988
Wood preservation	196	\$16,440	\$20,004	\$137,380
Veneer and plywood manufacturing	620	\$39,549	\$45,084	\$208,366
Reconstituted wood product manufacturing	240	\$21,320	\$28,761	\$155,763
Total	3,178	\$214,587	\$240,043	\$1,237,498

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B3.4: Direct Economic Contributions, Secondary Solid Wood Products Sector Details (2017, in 2023 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Engineered wood member and truss manufacturing	1,208	\$80,151	\$86,996	\$332,559
Wood windows and door manufacturing	1,448	\$105,110	\$117,333	\$405,785
Cut stock, resawing lumber, and planing	549	\$40,573	\$47,929	\$160,341
Other millwork, including flooring	2,392	\$162,927	\$186,379	\$610,307
Wood container and pallet manufacturing	4,606	\$307,099	\$327,270	\$923,804
Manufactured home (mobile home) manufacturing	255	\$20,098	\$24,374	\$77,970
Prefabricated wood building manufacturing	444	\$36,794	\$38,484	\$102,753
All other miscellaneous wood product manufacturing	1,613	\$111,328	\$120,999	\$369,228
Total	12,516	\$864,080	\$949,764	\$2,982,748

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B3.5: Direct Economic Contributions, Wood Furniture Sector Details (2017, in 2023 USD).[†]

Industries	Employment	Labor Income	Value-Added	Output
Wood kitchen cabinet and countertop manufacturing	4,868	\$336,004	\$359,302	\$919,665
Upholstered household furniture manufacturing	470	\$25,524	\$27,828	\$110,852
Non-upholstered wood household furniture manufacturing	4,613	\$287,429	\$331,118	\$778,440
Institutional furniture manufacturing	1,547	\$151,134	\$167,999	\$417,904
Wood office furniture manufacturing	369	\$27,920	\$35,730	\$100,996
Custom architectural woodwork and millwork	1,168	\$94,540	\$104,116	\$245,869
Showcase, partition, shelving, and locker manufacturing	1,868	\$138,557	\$157,867	\$480,147
Total	14,904	\$1,061,106	\$1,183,959	\$3,053,873

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B3.6: Direct Economic Contributions, Pulp, Paper, and Paperboard Mills Sector Details (2017, in 2023 USD).[†]

Industries	Employment	Labor Income	Value- Added	Output
Pulp mills	52	\$6,714	\$8,736	\$42,252
Paper mills	1,389	\$179,099	\$319,591	\$1,345,286
Paperboard mills	770	\$85,100	\$147,716	\$765,175
Total	2,211	\$270,913	\$476,042	\$2,152,714

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.

B3.7: Direct Economic Contributions, Secondary Paperboard and Other Paper Products Sector
 Details (2017, in real 2023 Dollars).[†]

Industries	Employment	Labor Income	Value- Added	Output
Paperboard container manufacturing	10,031	\$870,991	\$1,141,082	\$5,721,703
Paper bag and coated and treated paper manufacturing	4,683	\$510,619	\$746,938	\$2,706,900
Stationery product manufacturing	1,304	\$87,824	\$126,049	\$573,180
Sanitary paper product manufacturing	757	\$63,337	\$163,435	\$662,800
All other converted paper product manufacturing	1,196	\$87,879	\$109,132	\$446,448
Total	17,971	\$1,620,649	\$2,286,635	\$10,111,031

[†] All monetary values (Labor Income, Value-Added, and Output) are in thousands of U.S. dollars, adjusted to 2023 dollars value.