

THE ECONOMIC IMPACT OF TENNESSEE FOREST PRODUCT EXPORTS IN 2023

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INTRODUCTION

The United States leads the world in wood production (FAO, 2024), with the U.S. South contributing more than half of the total output (Howard and Liang, 2019). This production volume mainly comes from states like Mississippi, Alabama, and Georgia, known for their large pine forest plantations. In contrast, Tennessee's landscape is dominated by naturally occurring hardwood forests, offering different uses compared to pine and potentially higher value. The hardwood forestry industry in Tennessee tends to operate on a smaller scale and in rural areas, leading to an underappreciation of its economic and social importance. Research indicates that Tennessee's forestry and wood products sector supports more than 85,000 jobs and has an annual economic impact exceeding \$21 billion (Menard, English, and Jensen, 2021). This places Tennessee among the top ten states in various measures of forestry's importance to the state economy (direct and total contribution to GDP, fraction of state GDP), alongside Maine, Wisconsin, and Oregon (Pelkki and Sherman, 2020).

The hardwood industry is currently encountering challenges, which are also affecting the forest sector in Tennessee. Overall production rates are at historically low levels, and key lumber species like red oak are experiencing record low prices (HMR, 2024). The traditional focus on high-quality lumber faces hurdles due to weak U.S. and global demand for solid wood products such as flooring, furniture, and cabinets. Consequently, there's a shift towards industrial products like railroad ties and pallet cants. There also has been an increasing reliance on exports, making Tennessee's forest economy vulnerable to global market fluctuations (Luppold et al., 2018).

This report examines the economic impact of Tennessee's forest product exports and analyzes export changes in 2023 compared to 2022, while considering destination countries (e.g., China, European Union) and product categories (e.g., oak lumber, hardwood logs, barrels). Additionally, it evaluates the overall economic impact of export sales on income and employment at the state level.

Forest product exports are not just important to Tennessee but to the entire country. U.S. sales of forest products to foreign countries were \$9.5 billion in 2023. In the context of *agriculture and related products* (as defined by the U.S. Department of Agriculture), forest products are an important share of total U.S. exports, with global sales comparable to America's top agricultural exports: corn (\$13.1 billion), beef (\$10.0 billion), tree nuts (\$8.8 billion), pork (\$8.2 billion), and dairy products (\$8.0 billion). In Tennessee, forest product exports (\$149 million in 2023) ranked fourth behind distilled spirits, cotton, and processed baked goods (e.g., breads, cereals, pastas) (USDA, 2024).

Exports of forest products were negatively impacted by the U.S. trade war with China in 2018 and 2019 and the COVID-19 pandemic in 2020. This was the case for both the U.S. and Tennessee. The pandemic had a significant impact on global sales due to supply and demand disruptions in the global market for finished wood products (e.g., furniture) and the interrelated market for raw materials and inputs (e.g., logs and lumber) (Muhammad and Taylor, 2020). These effects were in addition to the negative impacts of China's retaliatory tariffs on U.S. timber, which are still in place (Muhammad et al., 2022).

Exports of forest products from 2020 to 2023, nationally, regionally, and for Tennessee are reported in Table 1. From 2021 to 2022, U.S. exports increased by \$756 million to \$10.5 billion. In 2023, however, U.S. exports fell to \$9.5 billion, which was a decrease of \$986 million or 9.4% when compared to 2022. This decrease was mostly in Western states, followed by Southern states. In 2023, Tennessee exports decreased even more than the national average. This decline was so significant that exports sales in 2023 were comparable to sales during the height of the pandemic in 2020.

¹In this report, forest products are defined according to the U.S. Department of Agriculture, Foreign Agricultural Service, where exports are limited to the Harmonized System (HS) Chapter 44 *wood and articles of wood; wood charcoal and fuel*. Products such as wood pulp and paper products are not included.

Table 1. U.S. Forest Product Exports: 2018–2023

Country/ Region/State	2020	2021	2022	2023	\$ Change 2023-2022	% Change 2023-2022
\$ million						
United States	7,662	9,736	10,492	9,506	-986	-9.4%
South	3,059	3,878	4,363	4,094	-270	-6.2%
West	1,922	2,582	2,758	2,334	-424	-15.4%
Midwest	1,243	1,577	1,660	1,535	-124	-7.5%
Northeast	1,154	1,386	1,427	1,266	-161	-11.3%
Tennessee	139	186	194	149	-45	-23.1%

Source: U.S Department of Agriculture, Foreign Agriculture Service (2024)

OVERVIEW OF TENNESSEE FOREST PRODUCT EXPORTS

Figure 1 shows Tennessee forest product exports since 2011. In 2023, export sales were \$149 million, which was a decrease of \$45 million when compared to the previous year. From 2017 to 2020, export sales fell from \$290 million dollars to \$139 million. As previously noted, declines in 2018 and 2019 were caused by the U.S. trade war with China, which was compounded by the COVID-19 pandemic in 2020. In 2020, exports reached their lowest level in more than a decade. Exports to China were \$143 million in 2017, the highest in a decade, accounting for almost half of all of Tennessee’s forestry exports that year. Because of the trade war and pandemic, exports to China fell to a then-record low of \$32 million 2020. In 2023, however, exports to China fell to a new record low of \$26 million. Overall, total exports sales, as well as sales to China, have not recovered from the trade war and pandemic.



Figure 1. Tennessee Forest Product Exports: 2011-2023. Source: USDA, Foreign Agricultural Service (2024).

²See the following link for all USDA product categories:
<https://apps.fas.usda.gov/gats/ProductGroup.aspx?GROUP=BICO-HS10>

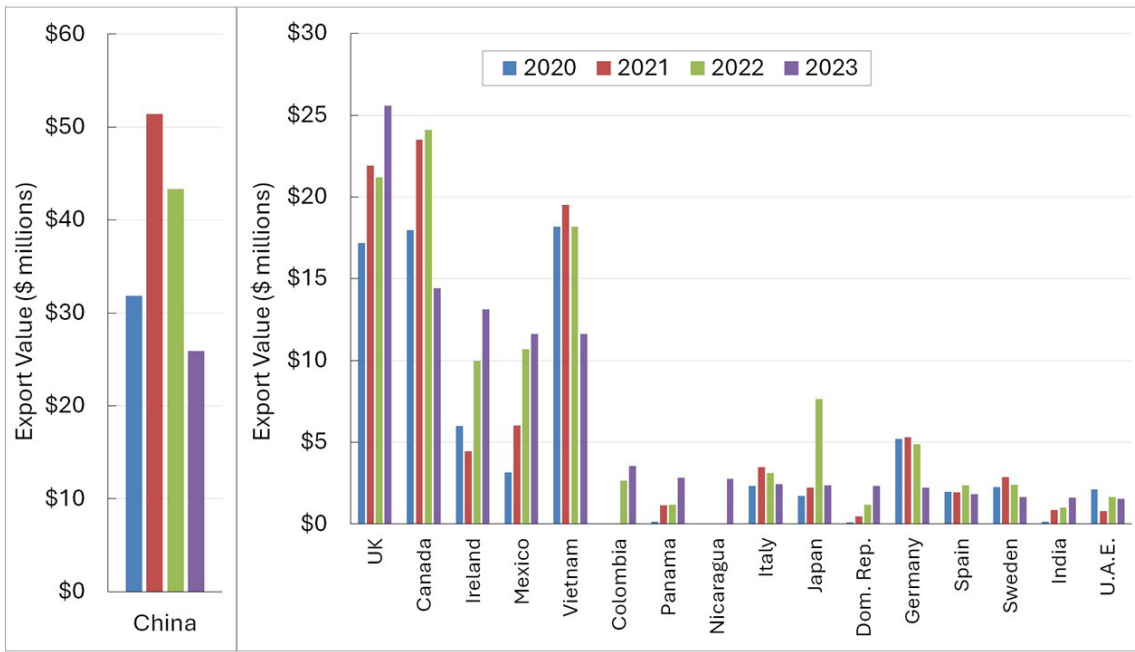


Figure 2. Tennessee Forest Product Exports by Top Destination Countries: 2020–2023. Note: Countries are ordered based on 2023 export sales. Source: USDA, Foreign Agricultural Service (2024).

Figure 2 shows Tennessee’s forest product exports to the top destination countries (2020-2023). The importance of China to Tennessee export sales cannot be overstated. In 2020, Tennessee was still feeling the effects of the retaliatory tariffs that China imposed on U.S. lumber, logs, and other timber products where exports to China declined significantly to about \$32 million. In 2021, exports to China rebounded to more than \$50 million. Unfortunately, exports to China fell in 2022 to \$43 million and reached a record low in 2023. Tennessee’s forest product exports in 2023 were sustained by countries other than China, most notably, the UK (\$26 million), Ireland (\$13 million), and Mexico (\$12 million), and new markets in Central and South America such as Colombia (\$4 million), Panama (\$3 million), and Nicaragua (\$3 million).

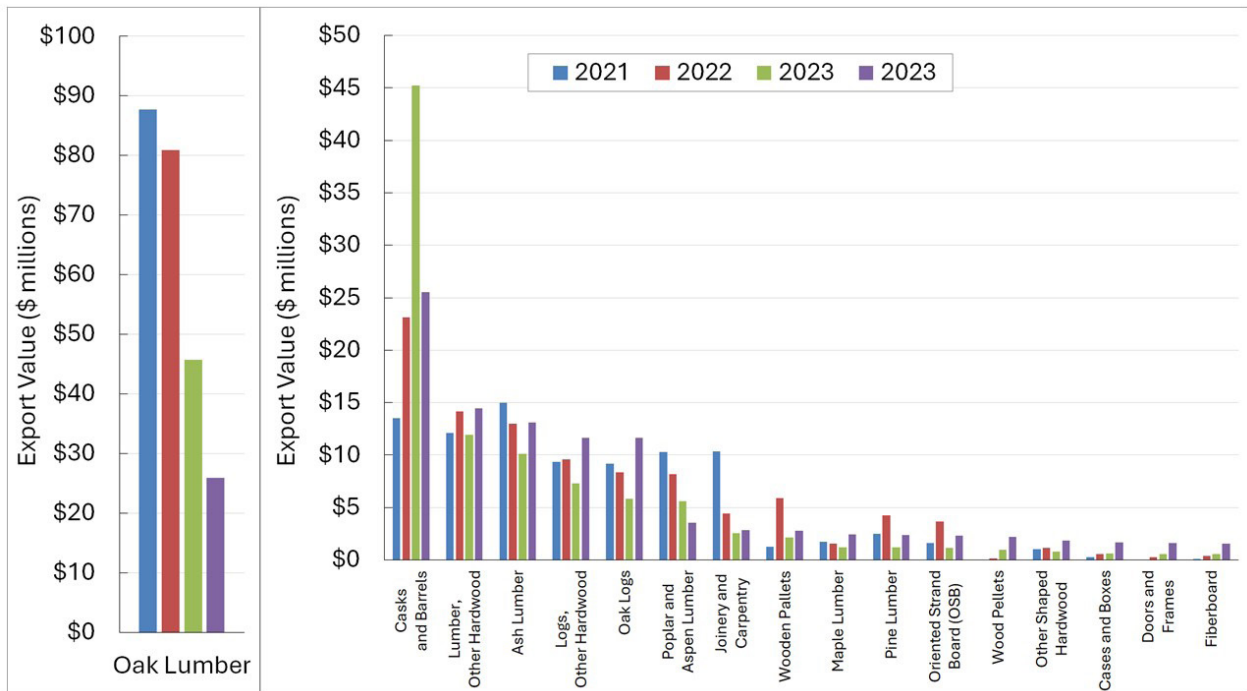


Figure 3. Tennessee Forest Product Exports by Top Products: 2020–2023. Note: Products are ordered based on 2023 export sales. Source: USDA, Foreign Agricultural Service (2024).

Figure 3 shows Tennessee’s forest product exports by top categories based on value (2020-2023). Oak lumber has been Tennessee’s largest forest product export, significantly exceeding all other wood products in past years. In 2019, oak lumber exports were \$84 million but decreased to \$65 million in 2020. In 2021, oak lumber exports increased to \$88 million but then slightly declined to \$81 million in 2022. In 2023, however, oak lumber exports significantly declined to \$46 million, which was comparable to cask and barrel exports that year (\$45 million). Other than casks and barrels (\$45 million), wood pellets (\$946 thousand), and cases and boxes (\$646 thousand), all other product categories were down in 2023. Wood pellets are a new emerging category, negligible in the recent past, but increasing by more than 600 percent in 2023.

Next, we consider Tennessee’s forest product exports by major product category and top destination (see Table 2). Oak lumber was the leading export category in 2023 with China being the top destination (around \$8.4 million), followed by the EU (\$6.5 million) and Vietnam (\$6.3 million). All were down by 63 percent, 53 percent, and 40 percent, respectively. Casks and barrels are the second largest category. However, these sales are mostly to the EU and UK. Note that casks and barrel exports to the EU and UK increased by 51 percent and 100 percent in 2023 when compared to the previous year. As shown in Figure 2, wood pellets are a relatively new category for Tennessee. Wood pellet exports from Tennessee are mostly going to the EU.

Table 2. Tennessee Forest Product Exports by Major Destination Country and Product Category: 2023 and Percent Change from 2022

Product Category	Total	China	EU	UK	Canada	Mexico	Vietnam
Export Value in 2023 (\$ millions)							
Oak Lumber	45.8	8.4	6.5	6.0	4.1	3.3	6.3
Casks (Barrels)	45.2	0.5	12.7	17.4	0.2		
Other HW Lumber*	11.9	3.6	0.5	0.3	0.4	5.1	1.2
Ash Lumber	10.1	4.0	1.8	1.5	0.4	0.2	0.5
Other HW Logs*	7.3	4.1	2.5	0.0	0.0		0.2
Oak Logs	5.8	2.5	0.01			0.1	-9.1
Poplar/Aspen Lumber	5.6	0.7	0.8	0.3	1.1	0.9	1.6
Joinery and Carpentry	2.6				2.5	0.02	
Wooden Pallets	2.2	0.7	1.1	0.1	0.1	0.1	
Maple Lumber	1.2	0.2			0.0	0.9	
Pine Lumber	1.2				0.5	0.4	
Oriented Strand Board	1.2		0.04		1.1	0.03	
Wood Pellets	0.9		0.9		0.01		
Other Shaped HW*	0.8				0.8		
Cases and Boxes	0.6		0.3		0.0		
Doors and Frames	0.6				0.6		
Fiberboard	0.6				0.6		
Cherry Lumber	0.5	0.5			0.0		
% Change in 2023 (from previous year)							
Oak Lumber	-43.4%	-62.8%	-53.0%	-37.5%	44.3%	49.5%	-39.6
Casks (Barrels)	95.8%	504.4%	51.1%	99.8%	-2.4%	-100.0%	
Other HW Lumber*	-16.0%	-19.7%	-69.9%	192.3%	-43.7%	71.7%	-29.9
Ash Lumber	-22.1%	-4.3%	-52.3%	3.5	46.8%	-59.8%	-46.3%
Other HW Logs*	-24.0%	-39.1%	80.1%	-58.7	-60.7%		-34.6%
Oak Logs	-29.9%	-21.4%	-91.3%	-100.0		-26.5%	1.9%
Poplar/Aspen Lumber	-31.9%	27.0%	-13.7%	-65.6	-32.6%	-0.1%	-40.9%

*Note: HW is hardwood. ∞% represented growth from zero (or near zero) to a new positive value.
Source: USDA, Foreign Agricultural Service (2023).

Table 2. Tennessee Forest Product Exports by Major Destination Country and Product Category: 2023 and Percent Change from 2022 (CONTINUED)

Product Category	Total	China	EU	UK	Canada	Mexico	Vietnam
% Change in 2023 (from previous year)							
Joinery and Carpentry	-42.1%				-1.7%	∞%	
Wooden Pallets	-63.2%	∞%	-52.0%	3.2	-59.1%	152.6%	
Maple Lumber	-22.0%	1.1%	-100.0%	-100.0	-78.2%	-8.0%	-100.0%
Pine Lumber	-71.5%	-100.0%	-100.0%		-80.3%	-67.6%	-100.0%
Oriented Strand Board	-68.3%		∞%		-71.1%	140.1%	
Wood Pellets	603.8%		1,068.1%		78.7%		
Other Shaped HW*	-27.8%				-21.9%	-100.0	
Cases and Boxes	13.7%		64.6%		-88.7%		
Doors and Frames	102.2%				119.5%		
Fiberboard	57.0%				57.0%		
Cherry Lumber	-45.3	-31.9%	-100.0%		-60.5%		-100.0%

*Note: HW is hardwood. ∞% represented growth from zero (or near zero) to a new positive value.
Source: USDA, Foreign Agricultural Service (2023).

ECONOMICS IMPACTS OF FOREST PRODUCT EXPORTS ON TENNESSEE

Model Overview and Data

In this section, we estimate the economic impact of Tennessee’s forestry exports for 2023. IMPLAN’s® (Cloud platform Version 7.0 basic data for 2022) was used in estimating the economic impact at the state level. Using state-level export data from the Foreign Agricultural Service’s Global Agricultural Trade System (GATS), the level and changes in export sales in 2023, by product category based on the Harmonized System (HS) of classifying traded products, were linked to corresponding North American Industry Classification System (NAICS) sectors using the Commodity Translation Wizard (DataWeb, 2023). In a few instances, where more than one NAICS code matched the same HS code, we used the NAICS sector that most closely aligned with the HS classification. The NAICS codes were then matched to corresponding IMPLAN codes using the IMPLAN conversion spreadsheet (IMPLAN, 2023). Export sales by IMPLAN codes based on state exports are reported in Table 3.

The state IMPLAN model provides estimates of multiplier-based impacts. The multipliers, in this instance, measure the response of the entire state economy to changes in forestry sector sales. There are three different components of the multiplier effects in the model for every industry. First is the initial impact or direct impact due to direct sales. Second is the indirect multiplier effects, which indicates to what extent output in the primary industry will impact other industries in the region due to the input needs (goods as well as services). The last impact (induced multiplier effects) indicates to what extent the output of the regional economy increases (decreases) because of changing consumer income due to industry payments to workers and owner operators and the rippling effect of local purchases.

³This version of IMPLAN has the capability to model 546 industries based on their assigned NAICS sectors. IMPLAN measures the economic transactions (buying/selling relationships) among industries and households in the economy. Output from the model provides quantitative measures of the economy including total industry output (the value of all sales), employment, labor income, value-added, plus taxes at the federal and state-county level.

The foreign trade data used in this report could influence the multipliers in the model as follows: multipliers are based on the amount of local purchasing as indicated by the regional purchase coefficient (the RPC) for each commodity. The RPC must be less than or equal to the supply demand pool coefficient (SDP), which is local supply, net of foreign exports, divided by gross demand. Because we include new estimates for foreign exports, it is possible that the resulting change in the SDP coefficient for the affected forestry sectors could influence the RPC coefficients in our analysis. However, in evaluating changes in the SDP coefficients for the 13 IMPLAN forestry sectors where we estimated trade impacts, the RPC coefficients were not affected (i.e., RPC remained less than or equal to the SDP coefficient for each of the 13 sectors).

Table 3. Direct Output and Changes in Direct Output for 2022 and 2023 by IMPLAN Sector Based on Export Sales

NAICS Code	IMPLAN Code and Sector		2022 (\$)	2023 (\$)	Direct Output Change (\$)	Direct Output Change (%)
113310	16	Commercial Logging	\$19,122,586	\$13,923,134	-\$5,199,722	-27.2%
321113	132	Sawmills	\$123,942,241	\$76,877,654	-\$47,064,587	-38.0%
321114	133	Wood preservation	\$547,351	\$15,933	-\$531,418	-97.1%
321211/321212	134	Veneer and plywood manufacturing	\$1,583,001	\$823,786	-\$759,215	-48.0%
321213	135	Engineered wood member and truss mfg.	\$10,502,823	\$2,659,898	-\$7,842,925	-74.7%
321219	136	Reconstituted wood product mfg.	\$4,415,045	\$2,030,585	-\$2,384,460	-54.0%
321911	137	Wood windows and door mfg.	\$298,521	\$671,441	\$372,920	124.9%
321918	139	Other millwork, including flooring	\$151,256	\$280,624	\$129,368	85.5%
321920	140	Wood container and pallet mfg.	\$29,559,328	\$48,049,498	\$18,490,170	62.6%
321999	143	All other miscellaneous wood product mfg.	\$3,225,646	\$3,297,259	\$71,613	2.2%
325194	163	Other basic organic chemical mfg.	\$213,839	\$439,885	\$226,046	105.7%
339995	390	Burial casket manufacturing	\$36,599	\$0	-\$36,599	-100.0%
339999	391	All other miscellaneous mfg.	\$135,908	\$2,679	-\$133,229	-98.0%
Total Direct Output from Exports			\$193,734,414	\$149,072,376	-\$44,662,038	-23.1%

Note: The direct output changes are used to shock the Tennessee IMPLAN model to derive total output and employment changes. "mfg." is manufacturing. Values are not adjusted for inflation. Source: Calculations using trade data from the USDA, Foreign Agricultural Service trade data and the Commodity Translation Wizard (DataWeb, 2023) to map the trade data to NAICS sectors and IMPLAN codes.

Economic Impact of Export Sales in 2023

The total impact of export sales in 2023 is reported in Table 4. Tennessee's forestry exports in 2023 were \$149.1 million, a 23.1 percent reduction from the previous year, which is associated with an estimated total impact of \$387.8 million. Estimates indicate that forestry exports support a total of 1,192 full- and part-time jobs statewide. Given the composition of Tennessee's export sales, the milling sector (sawmills) (\$159.9 million and 583 jobs), wood container and pallet manufacturing (\$84.7 million and 338 jobs), and the commercial logging sectors (\$25.8 million and 214 jobs) are the most affected sectors.

Table 5 depicts the decrease in exports in 2023 (relative to 2022). The -\$44.7 million decrease in forestry exports in 2023 resulted in an estimated total impact reduction of -\$93.5 million. Estimates indicate that this decrease led to a decline of 362 full- and part-time jobs statewide. The largest decreases were in the milling sector (sawmills) (-\$97.9 million and 357 lost jobs) and the engineered wood member and truss manufacturing (-\$13.9 million and 44 lost jobs) sectors. The largest gain, however, was for wood containers and pallet manufacturing (\$32.6 million and 130 jobs). Note that the decline for certain industries, particularly sawmills, is primarily due to declines in log and lumber exports overall.

Table 4. Total Impacts of Exports in 2023 with Inclusion of Indirect and Induced Multiplier Effects and State-Wide Total Impacts (in 2023 dollars).

Rank	Industry		Total Impact	
			Output ^a (million \$)	Employment ^b (jobs)
1	132	Sawmills	\$159.9	583.2
2	140	Wood container and pallet mfg.	\$84.7	337.5
3	16	Commercial logging	\$25.8	214.4
4	143	All other miscellaneous wood product mfg.	\$6.0	23.6
5	135	Engineered wood member and truss mfg.	\$4.7	15.0
6	136	Reconstituted wood product mfg.	\$3.0	6.1
7	134	Veneer and plywood manufacturing	\$1.4	5.0
8	137	Wood windows and door mfg.	\$1.2	4.4
9	163	Other basic organic chemical mfg. (wood charcoal)	\$0.7	1.2
10	139	Other millwork, including flooring	\$0.5	1.9
11	133	Wood preservation	\$0.029	0.1
12	391	All other miscellaneous mfg.	\$0.005	0.0
State Total Impact			\$387.80	1,192.40

^a Annual value of production by industry. "mfg." is manufacturing. ^b Industry-specific mix of full-time, part-time, and seasonal employment. Source: IMPLAN Group, LLC, 2022 Model Data

Table 5. Total Impacts of the Change in Exports in 2023 with Inclusion of Indirect and Induced Multiplier Effects and State-Wide Total Impacts (in 2023 dollars).

Rank	Industry		Total Impact	
			Output ^a (million \$)	Employment ^b (jobs)
1	140	Wood container and pallet mfg.	\$32.6	129.9
2	137	Wood windows and door mfg.	\$0.7	2.5
3	163	Other basic organic chemical mfg . (wood charcoal)	\$0.3	0.6
4	139	Other millwork, including flooring	\$0.2	0.9
5	143	All other miscellaneous wood product mfg.	\$0.1	0.5
6	390	Burial casket manufacturing	-\$0.1	-0.3
7	391	All other miscellaneous mfg.	-\$0.2	-0.8
8	133	Wood preservation	-\$1.0	-2.6
9	134	Veneer and plywood manufacturing	-\$1.3	-4.6
10	136	Reconstituted wood product mfg.	-\$3.5	-7.2
11	16	Commercial logging	-\$9.6	-80.1
12	135	Engineered wood member and truss mfg.	-\$13.9	-44.1
13	132	Sawmills	-\$97.9	-357.0
		Total Impact	-\$93.5	-362.3

^a Annual value of production by industry. “mfg.” is manufacturing. ^b Industry-specific mix of full-time, part-time, and seasonal employment.
Source: IMPLAN Group, LLC, 2022 Model Data

CONCLUSION

The forestry sector is important to the Tennessee economy, and, while exports are a small share of the total economic activity when considering all related activities such as furniture, flooring and paper production, global sales have a significant economic impact, primarily on the sawmill and logging sectors. Consequently, public efforts should continue to support increasing export sales and developing new markets. The results of this report also suggest the need to decrease reliance on the Chinese market. Overall, the results of this report show that the decrease in 2023 export sales relative to the previous year (-\$45 million) resulted in a total negative economic impact of -\$93.5 million and a loss of 362 jobs. Note that the results of this study do not include activities that facilitate export sales, such as transportation from sawmills to the port. Overall, 2023 was a down year for Tennessee forest product exports. However, the development of new international markets and the emergence of new products (e.g., wood pellets), shows that the Tennessee forestry industry is resilient and able to change to meet new global demand.

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