

## Using Impact Analysis to Document a Forest Products Sector's Contributions to Ohio's Economy

### Abstract

Economic impacts are often determined by input-output analysis using IMPLAN software. IMPLAN can provide valuable information to producer groups and community leaders, and Extension is well positioned to offer this service through applied research programs. Sawmilling and wood preservation (SWP) is a key sector in Ohio's forest economy, and its impacts were modeled for 2009. The SWP directly employed 1,700 citizens and produced \$364 million in industrial output. Total impacts amounted to 4,500 workers being employed because of SWP activities, with industrial output totaling \$724 million. This information has raised awareness of SWP's importance in communities and assisted with policymaking decisions.

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## Introduction

Ohio is a forest-rich state with 7.9 million acres of forested land. Non-industrial private landowners control 6.8 million acres, with 13% of the forestland in public ownership (Lytle, 2011; Widmann & Balsler, 2011). Ohio's timber volume is comprised 96.4% of hardwood species, such as oaks and maples, while 3.6% of the total volume consists of softwood species, such as pine (Widmann & Balsler, 2011). Ohio's forest products industry is likewise a significant contributor to Ohio's economy, with a total economic impact of over \$15 billion in 2005 (Letson, Sabula, & Romig, 2006). Seeing the importance of the forest economy to Ohio, The Ohio State University Extension launched the Forest Products Extension (FPE) program in 2011.

The economic landscape has changed considerably in the United States since 2005. This has led to many off-the-cuff observations with respect to the forest products industry's role in Ohio's economy.

Tangible data, however, have been lacking. This scarcity led the FPE advisory group to request an updated scientific accounting of Ohio's forest economy. This would provide "on the ground" information to industry representatives, state and local government natural resources agencies, as well as Extension educators for raising awareness of the industry's many functions in both rural and urban communities.

Production forestry has long been recognized for its direct impacts on the local economy through employment, wages and benefits, products produced, and value-added monies, such as tax revenues. Other effects, though, go largely unnoticed. Its impacts on allied industries, resulting from the purchasing of goods and services necessary to maintain production, reach far beyond the forest landowner's fence or the producing mill's gate and into allied industries, neighboring communities, and counties. Additionally, the effects of purchasing goods and services by employees of production forestry and its allied industries can ripple throughout not only the local community but around a state and region.

Harvested timber is normally taken to sawmills to be processed into lumber as a first step in its utilization. Some lumber then travels to a treating facility, where it is pressure-treated with wood preservatives. This sector is critical to the now \$22.4 billion forest products industry as it is an intermediate supplier of raw materials to many secondary manufacturers in Ohio's forest economy (McConnell, 2012). These industries include wood furniture manufacturing and container and pallet manufacturing, where Ohio ranks in the top five in employment nationally (United States Census Bureau, 2007).

The goal of the study reported here was to determine the effects of the sawmilling and wood preservation (SWP) sector on Ohio's economy. Input-output analysis was used to evaluate SWP impacts across the state's economy. Four measures were evaluated to determine these effects. *Employment* was measured by the number of full and part-time jobs. *Labor income* was the sum of employee compensation (wages and benefits) plus proprietor income. Value-added was payments made by industry to workers (i.e., labor income), interest, profits, and indirect business taxes. *Total output* was the total value of production measured as the sum of value-added plus the cost of buying goods and services to produce the product (Minnesota IMPLAN Group [MIG], 2004).

## Methodology

Input-output analysis follows commodity flows through each stage of production from producer to consumer. This type of analysis tracks how the products produced by one company are used as inputs in another company or industrial sector. A network of interdependent suppliers and consumers can then be illustrated and quantified in a locality or region through economic modeling. Thus, an industry's impacts within and between sectors in an area can be determined. These impacts are reported as direct, indirect, and induced, and they can be determined using the software package Impact Analysis for Planning (IMPLAN), administered by MIG. Detailed descriptions of input-output modeling can be found in Blaine, Bowen-Ellzy, and Davis, (2011) and Shields and Deller, (2003).

Input-output analyses have been successful in quantifying the impacts of the forest products industry in Mississippi (Henderson, Munn, Perez-Verdin, & Grebner, 2008), Minnesota (Deckard, & Skurla, 2011), and Wisconsin (Marcouiller, & Mace, 2005). They have also been used to estimate the

potential impacts of new forest industries (Grebner, Perez-Verdin, Henderson, & Londo, 2009) and even Forestry Extension programming (Marcouiller, Ray, Schreiner, & Lewis, 1992).

An impact analysis was run using Ohio state level data purchased from MIG for 2009, which was the most recent available at the time. IMPLAN combines SWP into one sector, thus the two are reported and discussed collectively. The state's economy was modeled, and the direct effects of SWP were obtained from the study area data file. The results reported are in 2009 dollars.

An activity for the SWP sector was then created to determine the total economic impacts—direct, indirect, and induced. The event year, which is automatically generated for the current time, was changed to 2009 to reflect the year of the data. Local purchase percentage was set at 100%, the IMPLAN default. An event was designed removing total employment, 1,718 workers, from SWP to measure the impact of losing all SWP industrial activity on the state's economy (Henderson, Munn, Perez-Verdin, & Grebner, 2008; MIG, 2004). IMPLAN Version 3 software calculated this change, and the results were exported to an Excel data file. Employment, value-added, and total output values from each of the 440 IMPLAN sectors were then ranked and summed to determine SWP's influence on other industries.

## Results

### Effects

The direct impacts of the SWP sector are presented in Table 1. The industry employed over 1,700 people and contributed \$364.5 million dollars in economic activity to Ohio's economy. New wealth created via value addition amounted to over \$79 million with value-added broken into its individual components, employee compensation, proprietor income, other property type income, and indirect business taxes. Additionally, \$30.2 million in federal non-defense taxes and \$23.3 million in state and local taxes were generated.

**Table 1.**  
Direct Impacts of Ohio's Sawmilling and Wood Preservation Sector

<b>Category</b>	<b><i>Employment</i></b>	<b><i>Output</i></b>	<b><i>Employee Compensation</i></b>
Value	1,718	\$364,586,914	\$57,639,194
<b>Category</b>	<b><i>Proprietor Income</i></b>	<b><i>Other Property Type Income</i></b>	<b><i>Indirect Business Taxes</i></b>
Value	\$4,025,008	\$15,833,018	\$1,577,403

The total effect of SWP on Ohio's economy was much greater when the direct, indirect, and induced impacts of the sector on other industries were taken into account (Table 2). Over 4,500 people, 3.9% of the forest products industry, were employed in 137 sectors and paid \$173.7 million in labor

income as a result of SWP activities. Of the total labor income, \$72.4 million was indirect, and \$39.6 million was induced by industry and supply chain employee purchasing. Industrial output totaled \$724.7 million, including \$259.0 million in value-added. This was 3.2% of the forest products industry as a whole.

**Table 2.**

The Total Effect of Sawmilling and Wood Preservation on Ohio's Economy

<i><b>Impact Type</b></i>	<i><b>Employment</b></i>	<i><b>Labor Income</b></i>	<i><b>Value-Added</b></i>	<i><b>Output</b></i>
<b>Direct Effect</b>	1,718	\$61,688,008	\$79,079,503	\$364,609,408
<b>Indirect Effect</b>	1,727	\$72,423,594	\$108,593,868	\$240,228,465
<b>Induced Effect</b>	1,062	\$39,620,028	\$71,382,914	\$119,911,512
<b>Total Effect</b>	4,507	\$173,711,630	\$259,056,286	\$724,749,384

## Employment

The indirect effect of the SWP supply chain accounted for an additional 1,727 jobs to supply inputs to the sector. The top five industries impacted were commercial logging, wholesale trade businesses, transport by truck, support activities for agriculture and forestry, and forestry, forest products, and timber tract production (Table 3). The induced impacts of purchasing goods and services by employees of the sector and its supply chain generated 1,062 more jobs throughout the state. The top five industries impacted were food services and drinking places; offices of dentists, physicians, and other health practitioners; real estate establishments; private hospitals; and nursing and residential care facilities (Table 4).

**Table 3.**

The Employment of the Top Five Sectors Indirectly Impacted by Ohio SWP

<b>Industrial Sector</b>	<b>Number of Jobs</b>
Commercial Logging	564
Wholesale Trade Businesses	137
Transport by Truck	114
Support Activities for Agriculture and Forestry	111
Forestry, Forest Products, and Timber Tract Production	79

**Table 4.**

The Employment of the Top Five Sectors Induced by Ohio SWP Activities

<b>Industrial Sector</b>	<b>Number of Jobs</b>

Food Services and Drinking Places	123
Offices of Dentists, Physicians, and Other Health Practitioners	56
Real Estate establishments	55
Private Hospitals	53
Nursing and Residential Care Facilities	40

## Value Addition

The SWP sector created \$259.0 million in new wealth for Ohio's economy. The supply chain accounted for \$108.6 million. The top five industries impacted were commercial logging; wholesale trade businesses; forestry, forest products, and timber tract production; transport by truck; and electric power generation, transmission, and distribution (Table 5). Spending by those employees and SWP employees induced another \$71.4 million into the state economy. The top five industries impacted were imputed rental activity for owner-occupied dwellings, which according to the Bureau of Economic Analysis and is considered the cost of homeownership; real estate establishments; offices of dentists, physicians, and other health practitioners; wholesale trade businesses; and insurance carriers (Table 6).

**Table 5.**

The Value Addition of the Top Five Sectors Indirectly Impacted by Ohio SWP

<b>Industrial Sector</b>	<b>Value Addition, \$MM</b>
Commercial Logging	\$22.6
Wholesale Trade Businesses	\$16.3
Forestry, Forest Products, and Timber Tract Production	\$9.2
Transport by Truck	\$7.2
Electric Power Generation, Transmission, and Distribution	\$4.5

**Table 6.**

The Value Addition of the Top Five Sectors Induced by Ohio SWP

<b>Industrial Sector</b>	<b>Value Addition, \$MM</b>
Imputed Rental Activity for Owner Occupied Dwellings	\$10.4
Real Estate Establishments	\$4.4

Offices of Dentists, Physicians, and Other Health Practitioners	\$4.4
Wholesale Trade Businesses	\$3.7
Insurance Carriers	\$3.5

## Industrial Output

The SWP activities produced \$724.7 million in total industrial output, with approximately half coming directly from within the sector. The indirect impact of industrial outputs was \$240.2 million, coming primarily from commercial logging; wholesale trade businesses; forestry, forest products, and timber tract production; transport by truck; and all other crop farming, which does not include oilseeds, grains, vegetables and melons, fruits, tree nuts, tobacco, cotton, and sugarcane and sugar beets (Table 7). The induced impact of industrial outputs was \$119.9 million. Imputed rental activity for owner-occupied dwellings; offices of dentists, physicians, and other health practitioners; private hospitals; food services and drinking places; and real estate establishments were the top five impacted sectors (Table 8).

**Table 7.**

The Industrial Output of the Top Five Sectors Indirectly Impacted by Ohio SWP

<b>Industrial Sector</b>	<b>Industrial Output, \$MM</b>
Commercial Logging	\$66.0
Wholesale Trade Businesses	\$24.9
Forestry, Forest Products, and Timber Tract Production	\$24.4
Transport by Truck	\$16.0
All Other Crop Farming	\$9.6

**Table 8.**

The Industrial Output of the Top Five Sectors Induced by Ohio SWP

<b>Industrial Sector</b>	<b>Industrial Output, \$MM</b>
Imputed Rental Activity for Owner Occupied Dwellings	\$15.4
Offices of Dentists, Physicians, and Other Health Practitioners	\$7.0
Private Hospitals	\$6.8

Food Services and Drinking Places	\$6.4
Real Estate Establishments	\$5.9

## Discussion

Ohio's forest products industry contributed \$22.4 billion to Ohio's economy and played a role in employing 114,500 people in 2009. This amounted to 4.8% and 1.8% of Ohio's gross state product and employment, respectively (McConnell, 2012). Those employees earned an annual average wage of \$48,791, \$2,695 higher than the state's average of \$46,096. The value of the industry's output increased \$7.3 billion since 2005 (Letson, Sabula, & Romig, 2006). As such, SWP is also a very important sector in Ohio's economy. Each new job created in SWP would have generated 1.6 additional jobs in 2009 and total impacts of \$101,000 in labor income, \$151,000 in value-added, and \$421,000 in industrial output.

Softwood lumber prices are highly dependent on housing market demand; however, hardwood lumber demand has been found to be tied to residential construction more so than previously considered (Lutz, 2009; Barrett, 2012). This and the financial crisis of 2008 have significantly impacted the forest products industry across the country, and Ohio's SWP sector is unfortunately no different. Hardwood lumber production overall has fallen in the eastern U.S. since 2006 (Espinoza, Buehlmann, Bumgardner, & Smith, 2011). This impact is felt strongest in southern Ohio, a largely rural area where SWP activities are concentrated. Direct employment has fallen 11.3% since 2005, and the sector's average annual wage of \$38,542, while higher than 2005, lags behind the state average (Letson, Sabula, & Romig, 2006; McConnell, 2012). Value-added and output have fared better, both increasing 12.9% and 13.9% respectively.

Commercial logging was the most dependent industry on SWP, affecting one quarter of its directly employed workforce. Transport by truck was also significantly impacted as many contract haulers deliver roundwood. Thus, SWP activities can indirectly affect forestry and the forest products industry as a whole because of logging's integral role in timber harvesting and delivery along with forestry's role in managing timberland for production. Further, spending by SWP-associated employees induced economic activity in sectors associated with home ownership, health care, and the food services. All are economic drivers at the local, state, and federal levels and benefit from consumer discretionary spending.

The information presented herein has been timely for SWP as it was used in meetings with the state's Public Utilities Commission to temporarily rescind an electricity rate increase that had significantly impacted not only SWP, but other small businesses as well. It has also been presented to state legislators to seek designating the first week of October as "Ohio Forest Products Awareness Week." This will coincide with the Paul Bunyan Show, a forest products industry trade show held annually by the Ohio Forestry Association since 1957. The goal is to increase public awareness through education as to the important economic, environmental, and social contributions of the state's forests and forest products industry. The FPE is currently collaborating with Extension educators to document county-level forest economies, beginning in southern Ohio. The program is also providing industry assistance through wood products price analyses and classes on trends and

outlooks for industry sectors.

## Conclusion

Leveraging limited resources where producer groups may enjoy a competitive advantage can be facilitated through applied research by Extension. IMPLAN is a valuable tool for educators and specialists to describe inter-industry interactions in their areas of expertise. Ohio's lumber is in high demand around the world, and the support of policymakers and the communities in which SWP operates is integral to ensuring this sector's longevity given these current economic conditions. The SWP industry produced a total of 4,500 jobs in 137 industrial sectors, \$259 million in value-added, and \$725 million in industrial output. Taking this holistic approach to SWP illustrates the importance of this industry to the citizens and communities of Ohio.

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