FOREST PRODUCTS INDUSTRIES' ECONOMIC CONTRIBUTIONS TO MICHIGAN'S ECONOMY IN 2013

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1.0 INTRODUCTION

Forests and forest products industries are central for the transition to a greener and more sustainable economy. A green goods and services economy relies on the sustainable use of natural resources. Of course, Michigan's forest products industries are tightly bound to forests and the goods and ecosystem services that they provide (e.g., wildlife habitat, watershed protection, etc.).
The contributions of Michigan's forests can increase with expanded emphasis on the use of wood-based products, adoption of modern wood energy technology, and clear linkages to ecosystem services. On April 23, 2013, the Governor's Forest Products Summit (Summit) was convened to explore ideas and options for growing the state's forest products industries (http://www.mich.gov/dnr/0,4570,7-153-30301_30505_64883---,00.html). The Michigan Department of Natural Resources (MDNR) and the Governor-appointed Timber Advisory Council (TAC) developed five-year (2018) goals related to the industries; they are:

- Increasing the economic impact of the timber industry on state and regional economies from $14 billion to $20 billion;
- Increasing the export of value-added forest products by 50 percent;
- Increasing forest products-related careers by 10 percent;
- Supporting existing industry; and
- Encouraging regionally based industry development.

The purpose of this report is to provide circa 2013-14 data and information to update an earlier assessment (Leefers et. al. 2015) on progress toward meeting the first three goals above (i.e., increasing economic impact, exports and jobs). This report is organized into five sections. The Introduction is followed by the Methods section, which broadly describes the approach used in developing this report. Third, recent data reflecting the economic contributions of the forest products industries for 2013 are presented. Fourth, international and national trade flows are examined using the most recent data available (2014). And finally an assessment is made of the progress toward the five-year (2018) goals.

2.0 METHODS

This report is based on compiling data published by the federal government and from commercially available Impact Analysis for Planning (IMPLAN) data (IMPLAN Group LLC, www.implan.com). The report and related documents provide a documented approach that can be used to update this assessment as needed in future years.

The section on the economic contributions of Michigan's forest products industries relied on 2013 IMPLAN software and data (Release 3). IMPLAN is a widely used economic input-output model that focuses on the interdependence among various producing and consuming sectors in the economy. IMPLAN data are compiled and linked by the IMPLAN software (Version 3.1.1001.12); data come from various government agencies including the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, and the U.S. Bureau of Economic Analysis. Economic measures in IMPLAN include employment, labor income, value added, output or sales and others. The economic values were reported in nominal dollars, except when deflated to make them comparable to previously reported 2012 data (in Table 12).

IMPLAN was used to examine the current status of the forest products industry and to provide a basis for estimating progress in meeting several goals of the 2013 Governor's Forest Products Summit. For this report, thirty-one IMPLAN sectors were identified as forest products sectors. They were aggregated into seven larger industries for ease of communication and analysis. The industries are: Forestry, Logging, Primary Solid Wood Products and Wood-based Power, Secondary Solid Wood

Products, Wood Furniture, Primary Paper and Paperboard Products, and Secondary Paper and Paperboard Products.

The section on international and national trade flows was based on International Trade Administration data (tse.export.gov) and the U.S. Census Bureau's Commodity Flow Survey. The importance of domestic and international exports in economic growth warrants a separate report section, and it is directly linked to one of the goals of the Governor's Forest Products Summit.

The final section of the report focuses on progress toward three goals of the Governor's Forest Products Summit: Increasing economic impacts to $20 billion; Increasing value-added exports by 50%; and Increasing forest products-related employment by 10%. Previously reported IMPLAN data from 2012 were used as the base year for this section, and 2018 was used as the target year for achieving the Summit's goals. The first goal of $20 billion in economic contributions (in terms of output or sales) was monitored by estimating total contributions using IMPLAN multipliers applied to direct contributions of all forest industries. The second goal related to increasing value-added (international) exports by 50% was evaluated based on published export data from forestry and logging, wood product manufacturing and paper industries. The third goal of increasing employment by 10% was calculated using IMPLAN-based estimates of direct employment in all forest industries.

3.0 Economic Contributions of the Forest Products Industries to Michigan's Economy

There has been concern over the status and future of the forest products industries in Michigan and throughout the U.S. This concern has been driven, in part, by the significant economic downturn during the recession of 2007 to 2009 (Woodall et. al. 2012). Global competitiveness with related offshoring of production, an increase in use of electronic media and a decline in U.S. housing markets are seen as causes of the long-term decline in wood products and paper manufacturing industries.

In Michigan, there have been significant declines in employment in the forest products industries since 1990 (Table 1, Figure 1). The Forestry and Logging industry has fared best, with an increase of 6 percent since 2000. The Wood Products Manufacturing and Paper Manufacturing industries have declined 31 percent and 43 percent respectively over the same period. Although not presented in Table 1 due to the mix of wood and non-wood subsectors, the Furniture industry, with a sizable wood furniture component, has declined 28 percent.

Table 1. Total full-time and part-time employment in selected forest products industries, 1990-2013.

Industry	**Year**							
	1990	**1995**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**
Forestry and logging	3,953	4,416	4,256	4,469	3,521	3,759	4,469	4,530
Wood product manufacturing	13,374	15,613	15,730	13,458	9,562	9,907	10,145	10,905
Paper manufacturing	20,596	21,017	19,708	14,685	11,567	11,382	11,334	11,158
TOTAL	**37,923**	**41,046**	**39,694**	**32,612**	**24,650**	**25,048**	**25,948**	**26,593**

Source: Bureau of Economic Analysis, Regional Economic Accounts.

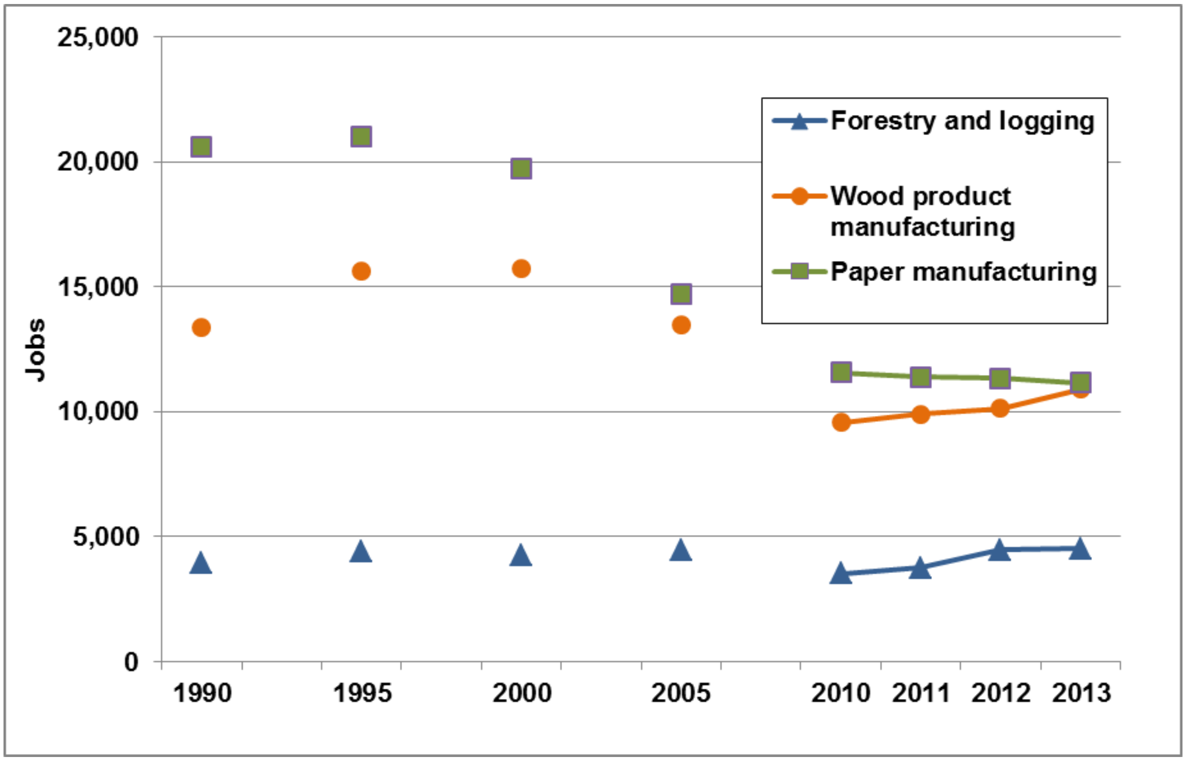

Figure 1. Total full-time and part-time employment in selected forest products industries, 1990-2013.

Two goals related to the forest products industries' economic contributions emerged from the 2013 Governor's Forest Products Summit: Increasing the economic impact of the timber industry on state and regional economies to $20 billion; and Increasing forest products-related careers by 10 percent. This report section provides a more detailed examination of the structure of the forest products industries in Michigan using recent IMPLAN and government data, mostly from 2013. Descriptive statistics regarding the economic contributions of the forest products industries to Michigan's economy are presented.

3.1 Economic Contributions Defined

The economic contributions of the forest products industries is a snapshot of direct economic activity associated with given industries and other economic activities linked to those industries. An introduction to some economic terminology is helpful in describing the concept of economic contributions.

Economic contributions are defined as "the changes in a region's existing economy that can be attributed to a given industry" (Watson et. al. 2007). Hence, economic contributions define the role of an industry within a state or region. Several terms are used to describe economic effects (Table 2).

Table 2. Terms used to describe economic contributions.

TERM	DESCRIPTION
Output	The dollar measure of production within an area; it is also viewed as sales.
Employment	The number of full-time and part-time jobs associated with an industry.
Labor income	The dollar total of employee compensation and proprietor income; the latter is associated with self-employed individuals.
Value added	The sum 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 state equals the Gross State Product.
Direct effects	The economic activities (e.g., output, employment, labor income, and value added) associated with an industry or sector in the study area. These can describe the current economic sectors or changes to those sectors.
Indirect effects	The impact of local industries purchasing goods and services from other industries leading to others' outputs, employment and labor income.
Induced effects	The impact of labor income (employee compensation and proprietor income) via goods and services purchased due to the direct and indirect spending by industries.
Total effects	Sum of direct, indirect and induced effects.
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, etc. These are available for output; employment, labor income, and value added and are used to assess effects of changes in industry activity (i.e., "ripple effects").

Source: www.implan.com/

Contributions can be in terms of value added, output, employment and/or labor income. Value added is commonly used to describe the economic contributions of an industry. It is a conservative measure of economic contributions. Value added is the difference between an industry's output or sales and the costs of intermediate inputs. When a sawmill sells a board, the value of the log and other inputs is not counted in value added because they were counted when produced by loggers and others. Thus, only new additions to value (e.g., labor income, etc.) are included. Labor income is the major component of value added and includes employee compensation and proprietor income. Value added, summed across all sectors, is equal to the gross state product. Another measure of economic contribution is industry output or sales. For example, if a log is sold to a sawmill and the sawmill sells boards, both sales are counted as part of the overall region's sales or output - they are important economic activities. Another measure, employment, includes both full-time and part-time jobs. As the number of sectors in an analysis increases, there can be overlap in the number of part-time jobs across sectors. The Governor's Forest Products Summit goals focused on output and employment, which are the main statistics reported in this section.

3.2 USING IMPLAN TO ESTIMATE ECONOMIC CONTRIBUTIONS

Impact Analysis for Planning (IMPLAN) was used to estimate economic contributions of the forest products industries (IMPLAN Group, LLC 2013). It is a widely used input-output model comprised of economic data and software. Input-output (IO) models characterize financial linkages among industries, households and institutions. Within IO models, various industries have production functions which show the value of inputs used in production of industry outputs. Michigan's economy was represented by 426 sectors or industries in 2012, the base year for analysis. The number of sectors increased to 536 in 2013 with a change in the North American Industrial Classification System (NAICS). Economic values for 2013 were used, except when deflated to 2012 dollars using deflators provided by the IMPLAN Group, LLC (see Table 12).

Counties provide the building blocks for a state, and Michigan's 83 counties were included in IMPLAN modeling for this report. Given IMPLAN's structure, sub-state analyses can be developed, too (e.g., for MDNR regions).

To more compactly describe the economic contribution of the forest products industries, 31 economic sectors were aggregated into seven broad industries (Table 3): Forestry, Logging, Primary Solid Wood Products and Wood-based Power, Secondary Solid Wood Products, Wood Furniture, Primary Paper and Paperboard Products, and Secondary Paper and Paperboard Products. Detailed descriptions of the sectors are presented in Appendix 1.

Several sectors included wood and non-wood products (e.g., institutional furniture manufacturing); output and other measures were reduced to better reflect the wood-only component (Appendix 1). Primary industries (e.g., sawmills, OSB [reconstituted wood product], and power plants) use wood directly from the forest, including roundwood, chips or similar forms. Secondary industries (e.g., trusses and furniture) use one or more primary forest products (e.g., lumber and paper) in their manufacturing processes.

Table 3. Aggregated forest products industries and IMPLAN component sectors.

IMPLAN Sector	SECTOR NAME
	FORESTRY
15	Forestry, forest products, and timber tract production
19	Support activities for forestry*
	LOGGING
16	Commercial logging
	PRIMARY SOLID WOOD PRODUCTS AND WOOD-BASED POWER
134 (95)	Sawmills
135 (95)	Wood preservation
136 (96)	Veneer and plywood manufacturing
138 (98)	Reconstituted wood product manufacturing
47 (NA)	Electric Power Generation - Biomass
	SECONDARY SOLID WOOD PRODUCTS
137 (97)	Engineered wood member and truss manufacturing
139 (99)	Wood windows and doors manufacturing
140 (99)	Cut Stock, resawing lumber, and planing
141 (99)	Wood windows and doors and millwork manufacturing
142 (100)	Other millwork, including flooring
143 (101)	Manufactured home (mobile home) manufacturing
144 (102)	Prefabricated wood building manufacturing
145 (103)	All other miscellaneous wood product manufacturing
	WOOD FURNITURE
368 (295)	Wood kitchen cabinet and countertop manufacturing
369 (296)	Upholstered household furniture manufacturing
370 (297)	Nonupholstered wood household furniture manufacturing
372 (299)	Institutional wood furniture manufacturing*
373 (300)	Wood office furniture manufacturing
374 (301)	Custom architectural woodwork and millwork manufacturing
376 (302)	Showcase, partition, shelving, and locker manufacturing*
	PRIMARY PAPER AND PAPERBOARD PRODUCTS
146 (104)	Pulp mills
147 (105)	Paper mills
148 (106)	Paperboard Mills
	SECONDARY PAPER AND PAPERBOARD PRODUCTS
149 (107)	Paperboard container manufacturing
150 (108 &109)	Paper bag and coated and treated paper manufacturing
151 (110)	Stationery product manufacturing
152 (111)	Sanitary paper product manufacturing
153 (112)	All other converted paper product manufacturing

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

3.3 ECONOMIC CONTRIBUTION RESULTS

A number of IMPLAN-based studies across the U.S. have examined the economic contributions of the forest products industries for states or regions, including studies in Illinois, Minnesota, Texas, Virginia, and the southern U.S. (Deckard and Skurla 2011, Henderson and Munn 2012, Rephann 2013, Joshi et. al. 2014, and Brandeis and Hodges 2015). Some similar work has been completed in Michigan (Chappelle et. al. 1986, Pedersen and Chappelle 1990, Potter-Witter et. al. 2000, Leefers 2007, and Leefers et. al. 2015). Results presented in this section expand and update these earlier efforts.

The direct contributions of Michigan's forest products industries in 2013 were $10.2 billion in output (2013 dollars), 34,951 jobs and $2.1 billion in labor income (Table 4). Total contributions, including direct, indirect and induced effects, were $17.9 billion in output, 87,381 jobs and $4.5 billion in labor income. All of these measures equaled or exceeded the 2012 estimates (see report section 5.0) and highlight positive growth in aggregate. Detailed contributions for the 31 economic sectors are presented in Appendix 2 (Direct) and Appendix 3 (Total).

Multipliers can be used to assess expected changes in total contributions associated with changes in direct effects. For example, if output (i.e., change in final demand) for the Secondary Paper and Paperboard Products industry increased by $1 million, the total contribution would be $1.59 million in output (i.e., the original $1 million multiplied times 1.59). On average, in the forest products industries, one new job creates 1.50 additional jobs (multiplier = 2.50). The Primary Paper and Paperboard Products industry had the highest employment and second highest labor income multipliers; the Forestry and Logging industries had the lowest employment multipliers.

The Secondary Paper and Paperboard Products had the highest direct output and second highest direct employment contributions (Figures 2 and 3). Two sectors within the industry provided the highest level of employment and output: (1) Paperboard Container Manufacturing, and (2) Paper Bag and Coated and Treated Paper Manufacturing (see Appendix 2). The Wood Furniture industry had the largest direct jobs contributions, but third largest contribution in direct output and labor income (Figure 4). The Wood Office Furniture sector is the largest component of this industry. The Forestry industry, which includes nurseries, consulting foresters, and other forestry support establishments, had the lowest level of output and jobs. At the aggregate level, there is little indication of heavy economic concentration across industries. However, at the individual sector level, the highest numbers of jobs were in the Paperboard Container Manufacturing, Commercial Logging, Wood Office Furniture Manufacturing, and Paper Mill sectors, respectively; combined, they had over 15,000 direct jobs in 2013 (Appendix 2). The top four sectors in terms of output or sales were the Paperboard Container Manufacturing, Paper Mills, Wood Office Furniture and Paperboard Mills sectors, respectively; combined, they had over $5.6 billion in direct output.

Table 4. Direct contributions, total contributions and SAM multipliers for seven aggregated forest products industries, 2013.

Forest Products Industries	Employment	Output	Labor Income
	(Jobs)	(Millions of 2013 Dollars)	
Direct Contributions			
Forestry	665	69.6	21.9
Logging	3,591	337.8	152.2
Primary Solid Wood Products and Wood-based Power	4,550	1,351.9	225.2
Secondary Solid Wood Products	6,177	957.0	269.8
Wood Furniture	8,845	1,680.5	549.0
Primary Paper and Paperboard Products	3,394	2,579.8	341.3
Secondary Paper and Paperboard Products	7,729	3,237.9	517.4
Grand Total	**34,951**	**10,214.4**	**2,076.8**
Total Contributions			
Forestry	1,179	119.5	41.2
Logging	6,536	613.4	244.0
Primary Solid Wood Products and Wood-based Power	13,931	2,631.3	655.1
Secondary Solid Wood Products	12,290	1,833.7	555.6
Wood Furniture	17,820	2,946.0	952.2
Primary Paper and Paperboard Products	15,565	4,493.0	954.8
Secondary Paper and Paperboard Products	20,059	5,152.6	1,132.0
Grand Total	**87,381**	**17,789.5**	**4,535.0**
SAM Multiplier	**Ratios (Total Contributions/Direct Contributions)**		
Forestry	1.77	1.72	1.88
Logging	1.82	1.82	1.60
Primary Solid Wood Products and Wood-based Power	3.06	1.95	2.91
Secondary Solid Wood Products	1.99	1.92	1.87
Wood Furniture	2.01	1.75	1.33
Primary Paper and Paperboard Products	4.59	1.74	2.80
Secondary Paper and Paperboard Products	2.60	1.59	2.19
Grand Total	**2.50**	**1.74**	**2.18**

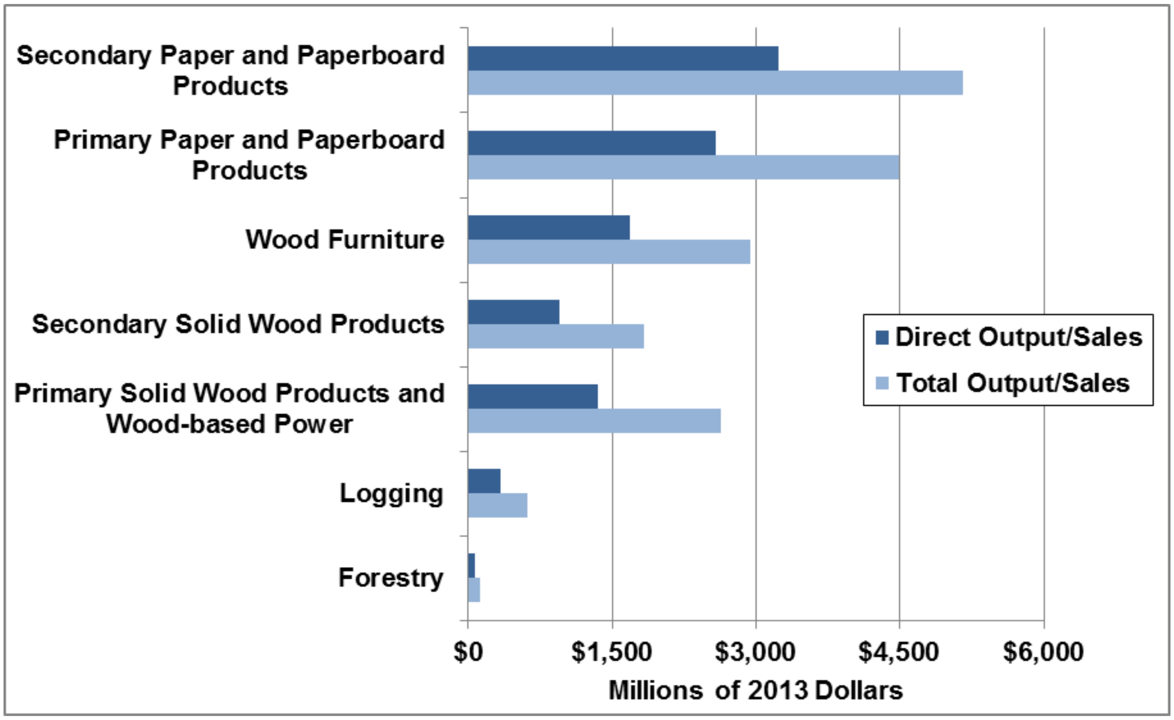

Figure 2. Michigan direct and total output (in millions of 2013 dollars) by forest products industry, 2013.

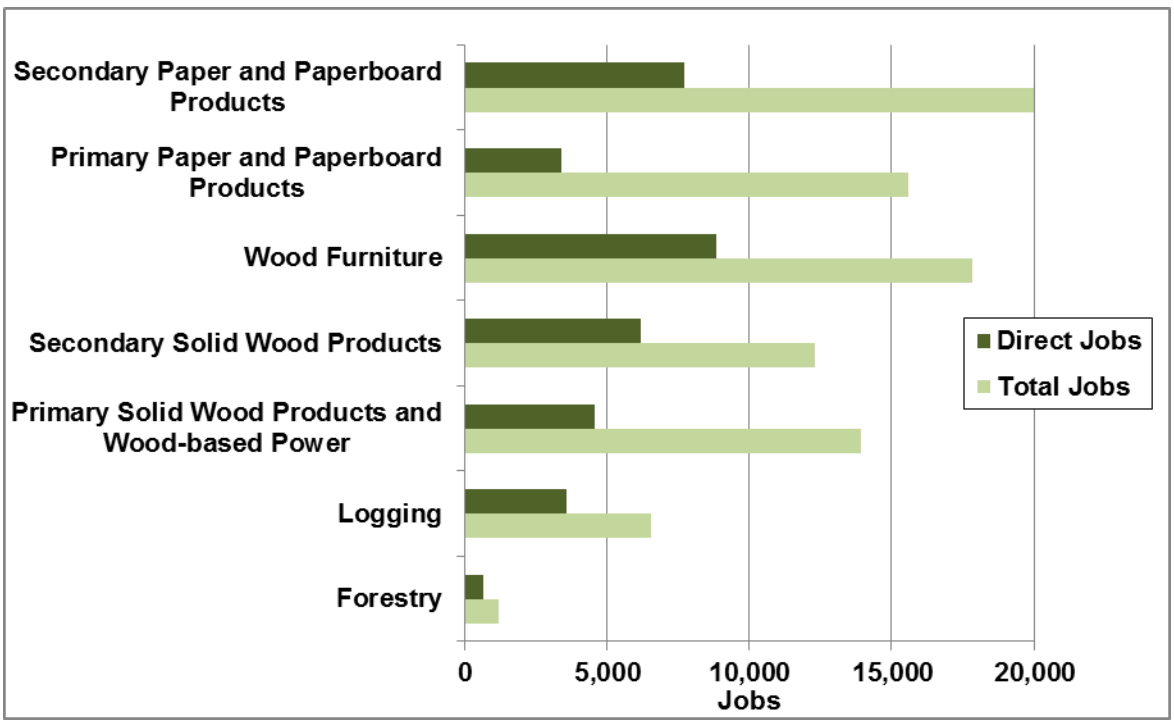

Figure 3. Michigan direct and total employment by forest products industry, 2013.

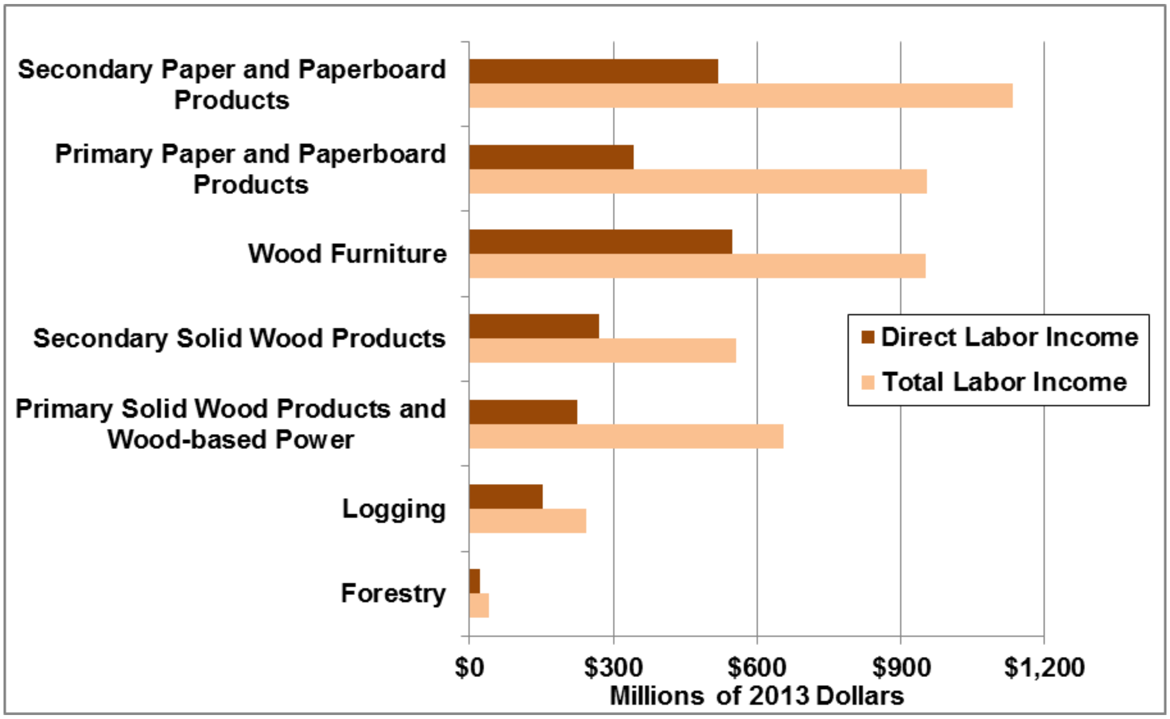

Figure 4. Michigan direct and total labor income (in millions of 2013 dollars) by forest products industry, 2013.

In addition to examining the relative importance of various forest industry sectors within Michigan, it is insightful to look at these sectors relative to other states (Table 5, Appendix 2). The Bureau of Labor Statistics tracks employment and annual wages for all sectors across the U.S. The highest ranked sectors in Michigan relative to other states are the Wood Office Furniture and Institutional Furniture Manufacturing sectors. Though these sectors are below their historic highs, they are still important sectors within Michigan and nationally.

It is also useful to compare the contribution of Michigan's forest products industries with other industries. Natural resources and agricultural industries make important contributions to the diversity of economic activities within Michigan's $439 billion Gross State Product (Figure 5). The forest products industries provide more direct employment than the: (1) commercial fishing, hunting and trapping, (2) mining and oil & gas production, and (3) agricultural production [plant crop and animal] industries (Figure 5). However, agricultural production industries had the highest value added; that is, they contributed the most to the Gross State Product (GSP). Michigan's forest products industries comprised 0.6% of the GSP in 2013. In a recent study of forest sector contributions in the southern U.S., the percent of value added relative to GSP ranged from less than 1% in Florida, Oklahoma and Texas to more than 4% for Alabama, Arkansas and Mississippi (Brandeis and Hodges 2015). In general, larger economies had lower percentages of GSP associated with forest products industries. Although not examined for this report, food processing and manufacturing industries and outdoor-based tourism industries add considerably to the economic contributions of natural resources and agriculture in Michigan.

Table 5. Forest industry sector rankings by employment (top 10 listed) and sales within Michigan and by employment and annual wages within the U.S., 2013

Sector Name	Within Michigan Ranking in:		U.S. Ranking in:	
	Employment	Output or Sales	Employment	Annual Wages
Paperboard Container Manufacturing	1	1	11	12
Commercial Logging	2	6	14	16
Wood Office Furniture Manufacturing	3	3	1	1
Paper Mills	4	2	10	10
Sawmills	5	4	17	17
Wood Container and Pallet Manufacturing	6	8	13	12
Institutional Furniture Manufacturing	7	7	3	3
Wood Kitchen Cabinet and Countertop Manufacturing	8	10	26	22
Other Millwork, including Flooring	9	9	16	17
Paper Bag and Coated and Treated Paper Manufacturing	10	5	18	18

Source: Appendix 2 and Bureau of Labor Statistics (www.bls.gov/blb/)

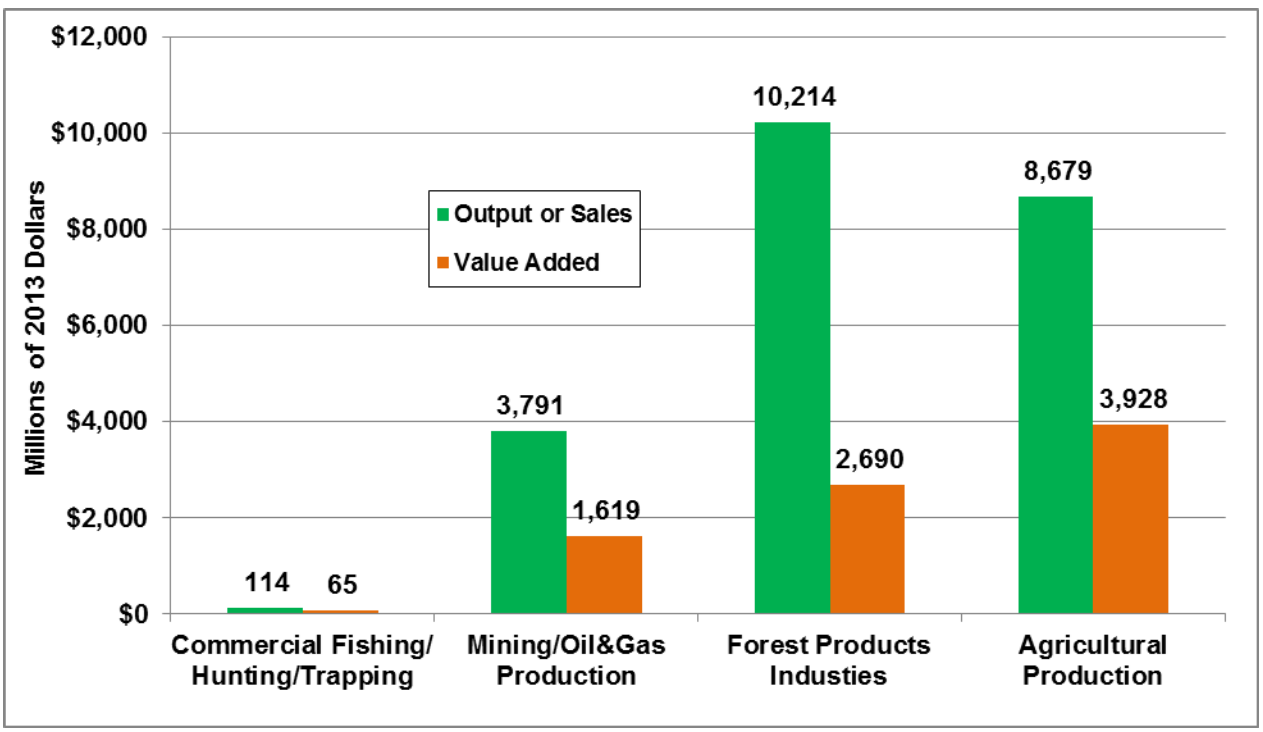

Figure 5. Michigan direct output and value added (in millions of 2013 dollars) for selected industries, 2013.

3.4 Summary

Employment in Michigan's forest products industries has declined in recent decades, but has rebounded since 2010. The U.S. and Michigan economic recovery will provide opportunities for continued growth in these industries. Moreover, policies aimed at encouraging extant firms to remain and grow in Michigan and new firms to locate in Michigan will provide additional growth in the forest products industries.

Total direct contributions for 2013 were $10.2 billion in output, almost 35,000 jobs, $2.1 billion in labor income, and $2.7 billion in value added. Using Social Accounting Matrix (SAM) multipliers, total contributions (includes "ripple effects") were estimated. Total contributions were $17.8 billion in output, over 87,000 jobs, $4.5 billion in labor income and $6.7 billion in value added.

Michigan's Wood Office Furniture sector had the highest employment and annual wages of any state in 2013. Similarly, the Institutional Furniture Manufacturing sector was estimated to be the third largest in the U.S. in terms of employment and annual wages. Most of Michigan's top-ten sectors rank between 10^{th} and 18^{th} nationally.

A detailed examination of forest products sectors highlights the relative economic contributions each sector provides. However, a broader analysis of the economic contributions of natural resources is beyond the scope of this report. Nonetheless, the forest products industries compare favorably to the commercial fishing, hunting and trapping industries and the mining, oil, and gas production industries.

4.0 International and National Trade Flows

One goal set by the MDNR and the Governor's Timber Advisory Council was to increase "the export of value-added forest products by 50 percent" by the end of 2018. This section provides a more detailed examination of trends in international and domestic trade in wood products (NAICS 321) and paper (NAICS 322).

The phrase "value added" has different interpretations. In regional economics (and IMPLAN), it is the sum of wages, rents, interest and profits. In more common discourse, it refers to higher stages in the production process (e.g., wooden tables are further along in the production process than lumber). For purposes of this goal, the focus is on products beyond the logging stage of production; value is added to the logs as they are processed. Lumber, pallets, medium density fiberboard, cardboard, paper and wood furniture are examples of value-added products. Notably, the furniture and fixtures industry (NAICS 337) is addressed initially in this section, but dropped from later discussions due to the difficulty of separating exports of wood-based furniture from other furniture component materials (e.g., metal and plastic) under the 3-digit NAICS classes (e.g., NAICS 337). Regardless, it remains an important part in Michigan's diverse forest products industries. So, the principal focus in this section is on solid wood products and paper.

For policy makers and others, the term "export" evokes the notion of international markets. However, economists consider any products shipped out of Michigan to be exports, whether they are going to international or domestic markets. In fact, domestic wood products and paper exports far exceed international exports. Exports sold outside of Michigan bring revenues to the companies within the state and support employment in them.

Much of Michigan's forest products industries' economic output is shipped out of state (Figure 6). The most recent (2012) commodity flow survey data from the U.S. Census Bureau and international trade data from the U.S. Department of Commerce provided an output estimate for wood products and paper of $7.8 billion in Michigan. The combined output in solid wood and paper products (excluding furniture, forestry and logging) based on 2012 IMPLAN estimates was $7.8 billion as well. The Department of Commerce data distribution was skewed more toward solid wood products, however.

Approximately 70 percent of this value was shipped out of Michigan to international and domestic markets in 2012.

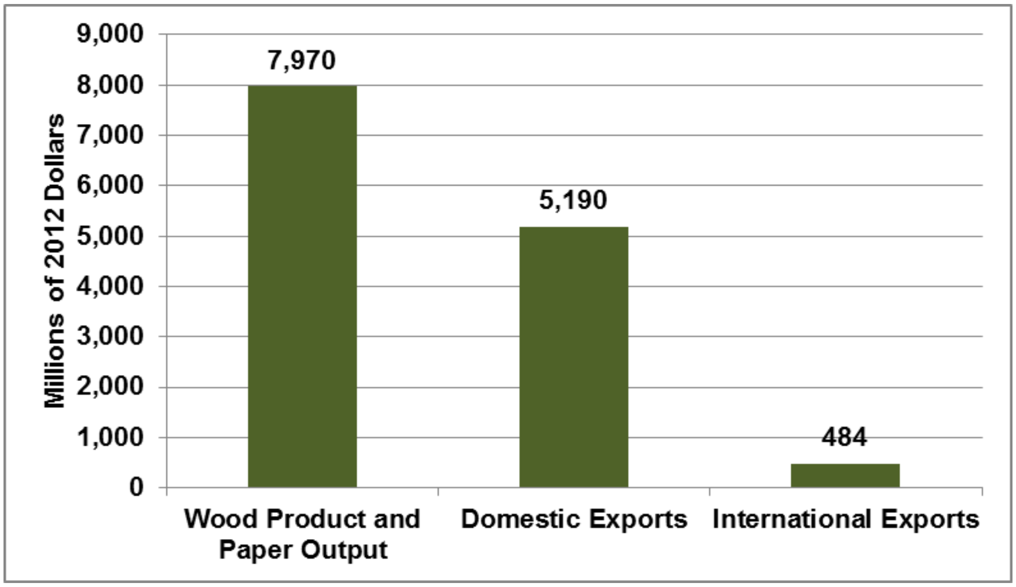

Figure 6. Michigan direct wood product and paper output, domestic Exports and international exports (in millions of 2012 dollars), 2012.

Source: 2012 IMPLAN data; US Department of Commerce, International Trade Administration; and US Census Bureau, Commodity Flow Survey.

4.1 International Exports

The U.S Department of Commerce estimated the value of Michigan's 2014 total international exports at $55.9 billion. Forest products exports were a small part of this total. Historic export data are published in nominal dollars (not adjusted to reflect inflation). Although producer price inflation for forest products industries was about 2 percent per year from 2008 through 2014, no adjustment is made for this report given the focus on 2014 exports, the most recent year available.

With an annual international export value of $636.2 million in 2014, Michigan ranked 2nd to the top state of California in furniture exports (Table 6, Figure 7). However, Michigan has not fared well in exporting other forest products—wood products and paper. In 2014, Michigan's exports of wood products were valued at $166.6 million (ranked 19th among the states), which came close to achieving the export level of 2008, considering inflation, before the economic recession. The recession hit the housing industry particularly hard, and this in turn depressed the wood products industry across the U.S. Michigan's export of paper products in 2014 was $346.9 million and ranked 21st in the country. All three industries have shown growth and decline over the past five years.

Table 6. Value of international exports from Michigan for NAICS 321, 322 and 337, in millions of nominal dollars, 2008-2014.

	NAICS 321 - Wood Products	NAICS 322 - Paper	NAICS 337 - Furniture & Fixtures
YEAR	MILLIONS OF DOLLARS (NOMINAL)		
2008	159.8	343.4	502.9
2009	113.0	279.3	399.4
2010	138.2	341.4	469.6
2011	129.6	367.7	536.9
2012	146.4	337.6	654.5
2013	154.4	363.9	650.5
2014	166.6	346.9	636.2

Source: U.S. Department of Commerce, International Trade Administration (tse.export.gov/). Downloaded 7/31/15.

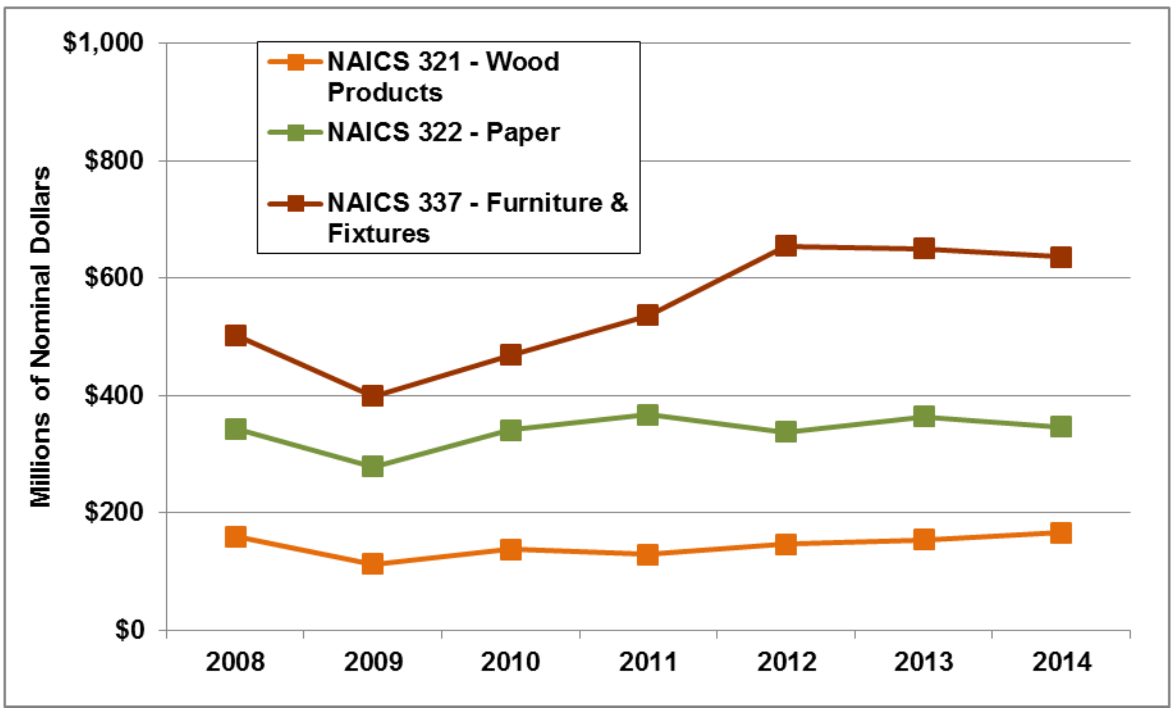

Figure 7. Value of international exports from Michigan for NAICS 321, 322 and 337, in millions of nominal dollars, 2008-2014.

While exports have fluctuated, imports have mostly been increasing. Specifically, imports of wood products, paper and furniture reached, respectively, $554.4 million, $503.5 million and $908.2 million in 2014 (Table 7, Figure 8). Notably, the state is a net importer of wood products, paper and furniture. Consequently, import substitution provides an opportunity for expanding Michigan's forest products industries. Goods produced in Michigan need to outcompete similar imported goods in terms of price, quality or cachet for import substitution to succeed.

Table 7. Value of international imports to Michigan for NAICS 321, 322 and 337, in millions of nominal dollars, 2008-2014.

	NAICS 321 - Wood Products	NAICS 322 - Paper	NAICS 337 - Furniture & Fixtures
YEAR	MILLIONS OF DOLLARS (NOMINAL)		
2008	385.4	633.4	536.8
2009	279.1	422.8	426.9
2010	339.4	519.5	540.8
2011	314.2	567.4	621.5
2012	391.9	538.0	799.5
2013	489.3	602.7	857.8
2014	554.6	503.5	908.2

Source: U.S. Department of Commerce, International Trade Administration (tse.export.gov/stateimports/). Downloaded 7/31/15.

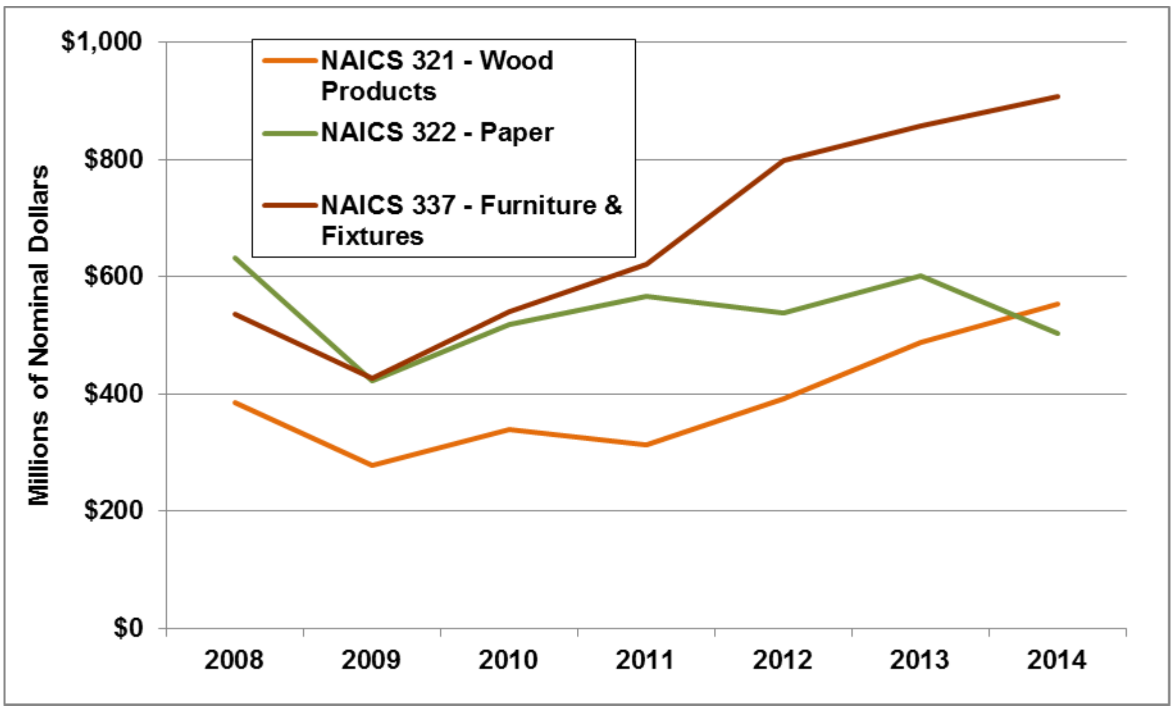

Figure 8. Value of international imports from Michigan for NAICS 321, 322 and 337, in millions of nominal dollars, 2008-2014.

In 2014, China was the largest exporting destination for wood products and paper combined after the U.S.'s two North American neighbors - Canada and Mexico (Tables 8 and 9, Figures 9 and 10). Exporting to China has shown the fastest growth in recent years. Similarly, imports from China are the largest other than Canada and Mexico; and importing from China has witnessed significant growth in recent years.

Table 8. Value of international exports from Michigan for NAICS 321-Wood Products in total and for the top five importing countries, in millions of nominal dollars, 2014.

COUNTRY	NAICS 321 - WOOD PRODUCTS	
	MILLIONS OF DOLLARS	% OF TOTAL
World	166.6	100
Canada	90.3	54
China	17.7	11
Germany	11.4	7
Japan	10.8	6
Spain	5.1	3

Source: U.S. Department of Commerce, International Trade Administration (tse.export.gov/stateimports/). Downloaded 7/31/15.

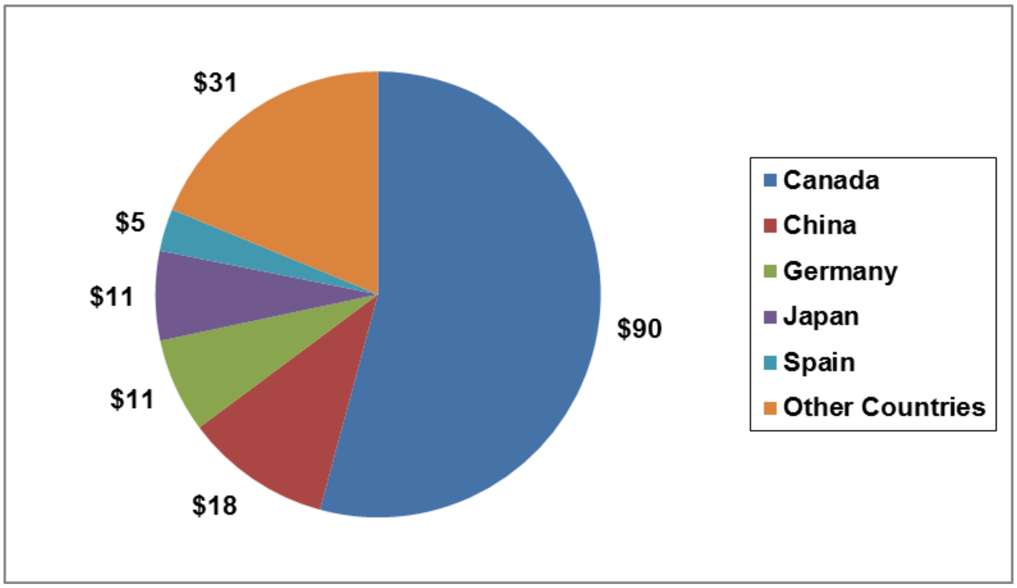

Figure 9. Value of international exports from Michigan for NAICS 321-Wood Products for the top five importing countries, in millions of nominal dollars, 2014.

Table 9. Value of international exports from Michigan for NAICS 322-Paper in total and for the top five importing countries, in millions of nominal dollars, 2014.

Country	NAICS 322 - Paper	
	Millions of Dollars	% of Total
World	346.8	100
Canada	208.0	60
Mexico	57.1	16
China	20.0	6
Germany	9.2	3
U.K.	6.1	2

Source: U.S. Department of Commerce, International Trade Administration (tse.export.gov/). Downloaded 7/31/15.

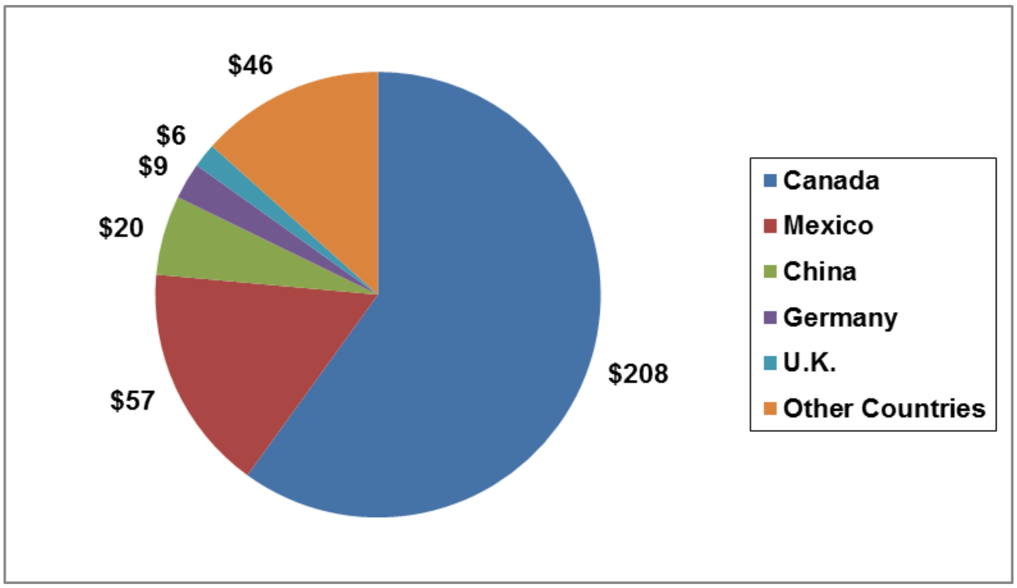

Figure 10. Value of international exports from Michigan for NAICS 322-Paper for the top five importing countries, in millions of nominal dollars, 2014.

4.2 Domestic Exports

Domestic trade data are collected by the U.S. Census Bureau every five years; 2007 and 2012 are the most recent survey years. Based on the value of shipment data provided from the U.S. Census Bureau's 2012 Commodity Flow Survey, $1.4 billion in wood products and $3.7 billion in paper was sent to other states in 2012 (Tables 10 and 11, Figures 11 and 12). The top six states accounted for approximately 60 percent of domestic exports.

Table 10. Value of domestic exports from Michigan for NAICS 321-Wood Products in total and for the top six importing states, in millions of nominal dollars, 2007 and 2012.

State	NAICS 321 - Wood Products (2007)		NAICS 321 - Wood Products (2012)	
	Million $	% of Total	Million $	% of Total
USA (excl. MI)	1,455	100	1,445	100
Indiana	182	13	282	20
Wisconsin	200	14	206	14
Illinois	160	11	178	12
Ohio	104	7	91	6
New York	38	3	66	5
Pennsylvania	54	4	38	3

Source: U.S Census Bureau, Commodity Flow Survey (www.census.gov/econ/cfs/).

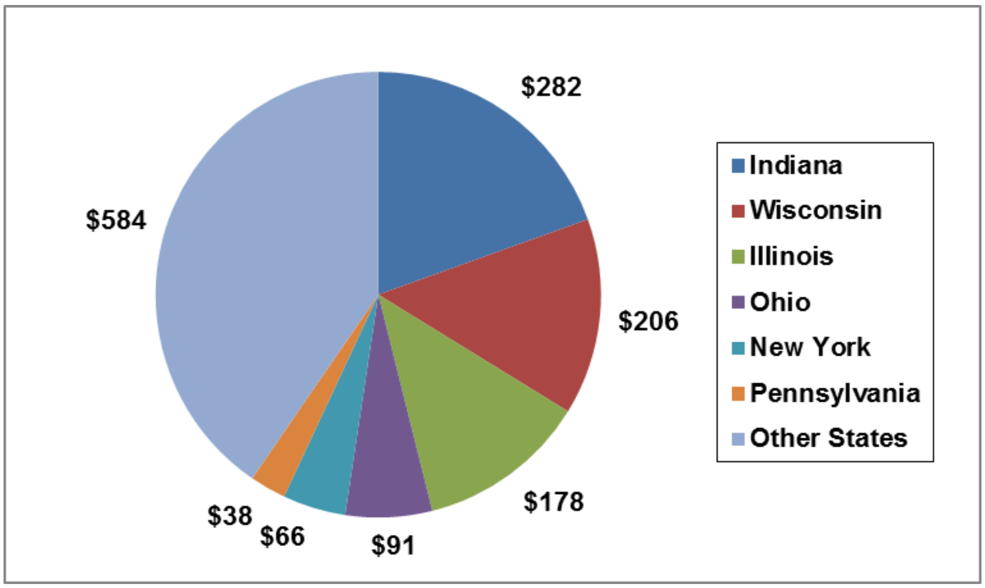

Figure 11. Value of domestic exports from Michigan for NAICS 321-Wood Products for the top six importing states, in millions of nominal dollars, 2012.

The top six importing (or export-destination) states were mostly nearby states (i.e., Wisconsin, Illinois, Indiana and Ohio). Like Canada internationally, these are important markets. In 2012, the top importing state for each industry exceeded the total international exports for the industries. The economic impact in Michigan associated with $100 million in domestic exports or the same amount in international exports likely yields similar employment and sales impacts within Michigan, though the transportation industry impacts may be distributed differently. This reinforces the need to consider expanding domestic exports along with international exports.

Table 11. Value of domestic exports from Michigan for NAICS 322-Paper in total and for the top six importing states, in millions of nominal dollars, 2007 and 2012.

State	NAICS 322 - Paper (2007)		NAICS 322 - Paper (2012)	
	Million $	% of Total	Million $	% of Total
USA (excl. MI)	3,432	100	3,745	100
Wisconsin	401	12	556	15
Ohio	383	11	462	12
Indiana	320	9	409	11
Illinois	342	10	331	9
Pennsylvania	111	3	195	5
Texas	187	5	179	5

Source: U.S Census Bureau, Commodity Flow Survey (http://www.census.gov/econ/cfs/).

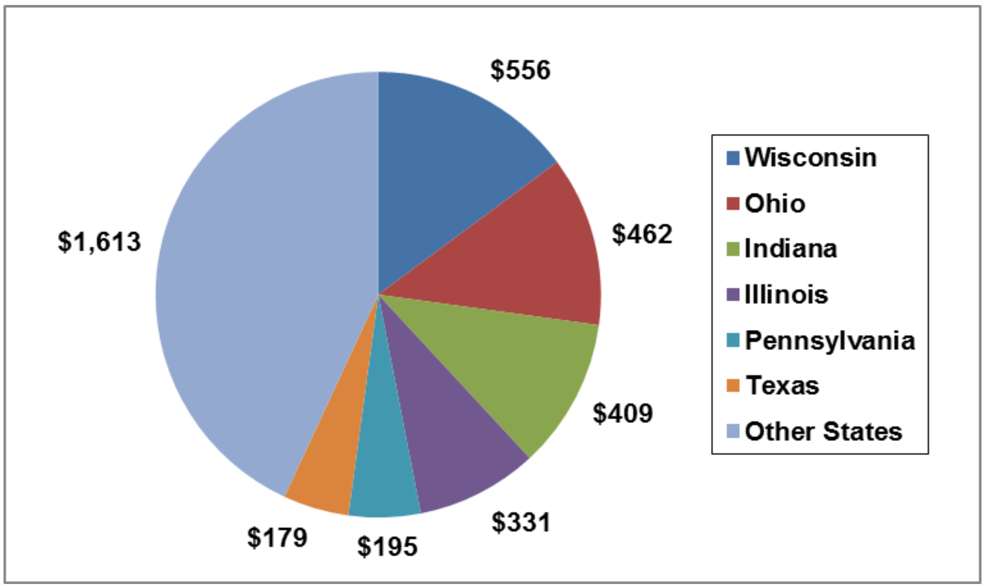

Figure 12. Value of domestic exports from Michigan for NAICS 322-Paper for the top six importing states, in millions of nominal dollars, 2012.

4.3 Summary

Overall, forest products were a fairly small component of Michigan's 2014 total international exports valued at $55.9 billion. Nonetheless, forest products exports have increased since 2009, when the recession ended. Prospects for more exports will improve as the economies of the U.S. and its trading partners continue to expand and as policies are implemented to encourage exports.

Canada is clearly the largest international market for wood products and paper, accounting for about 58 percent of exports. The top five importing countries for each industry account for approximately 85 percent of the industries' exports. So, there are clearly established international markets for Michigan's forest products. Although not included in this analysis, the furniture and fixtures industry provides additional opportunities for value-added exports.

Discussion surrounding increasing exports traditionally implies international exports, but in fact, domestic exports exceed international exports significantly and may provide excellent opportunities for expansion as well. Michigan's forest products industries will thrive, if domestic and international exports can be expanded. Given the high level of forest products imports, import substitution is another area that may yield markets for Michigan's forest products.

5.0 Five-year (2018) Goals Revisited

The focus of this final section is on monitoring economic progress toward three goals set at the Governor's Forest Products Summit in 2013. Specifically, the goals are:

- Increasing the economic impact of the timber industry on state and regional economies from $14 billion to $20 billion;
- Increasing the export of value-added forest products by 50 percent; and
- Increasing forest products-related careers by 10 percent.

The other goals, supporting existing industry and encouraging regionally based industry development can be assessed over time by examining the public and private policies, programs and investments aimed at supporting the forest products industries.

5.1 Goal 1: Increasing Total Economic Impacts to $20 Billion

Prior to the Governor's Forest Products Summit, an initial estimate of the economic contributions by the forest products industries to Michigan's economy was $14.0 billion, based on 2011 IMPLAN data; the Wood Furniture industry was not included in the initial estimate. The estimate was increased to $17.5 billion using 2012 IMPLAN data and expanded forest industry sectors (Appendix 4; Leefers et. al. 2015). The revised estimate provided the baseline for assessing progress toward the goal of $20 billion (in 2012 dollars) in total contributions to Michigan's economy.

After accounting for inflation, the 2013 level of contributions was essentially unchanged from the 2012 baseline (Table 12). These estimates reflect shifts between different industries. For example, paper and paperboard output declined from 2012 to 2013, whereas solid wood products output increased. Market opportunities and industrial policies will determine the mix of industry sectors that may ultimately achieve the $20 billion goal.

Table 12. Progress toward five-year goals (2018) set at the 2013 Governor's Forest Products Summit.

Goal	Unit	2012 Baseline	2013	2014	2018 Target
Increasing economic impacts to $20 billion	Billions of 2012 $	17.487	17.475		**20.000**
Increasing international value-added exports by 50%	Billions of 2012 $	0.484	0.515	0.517	**0.726**
Increasing forest products-related employment by 10%	Number of Jobs	34,204	34,951		**37,624**

5.2 Goal 2: Increasing International Export of Value-added Forest Products by 50 Percent

As with Goal 1, there are a number of options for monitoring progress towards the export goal. Exports from wood products (NAICS 321) and paper (NAICS 322) industries were used to calculate the 2012 baseline (Table 6). Across these two industries, there was a 6.8 percent increase in exports over the 2012-14 period. Aggregate industry figures are used because export data does not differentiate between primary and secondary products. The Furniture and Fixtures industry was not included due to the lack of export details on wood-based furniture at this time.

For solid wood products, the 2012-14 export values combined output from Sawmills; Wood Preservation; Veneer and Plywood Manufacturing; Engineered Wood Member and Truss Manufacturing; Reconstituted Wood Product Manufacturing; Wood Window and Door Manufacturing; Cut Stock, Resawing Lumber, and Planning; Other Millwork, including Flooring; Wood Container and Pallet Manufacturing; Manufactured Home (Mobile Home) Manufacturing; Prefabricated Wood Building Manufacturing; and all other Miscellaneous Wood Product Manufacturing. For paper products, export values combined output from Pulp Mills; Paper Mills; Paperboard Mills; Paperboard Container Manufacturing; Coated and Laminated Paper, Packaging Paper and Plastics Film Manufacturing; Stationery Product Manufacturing; Sanitary Paper Product Manufacturing; and all other Converted Paper Product Manufacturing.

5.3 Goal 3: Increasing Forest Products-related Careers by 10 Percent

The third goal, increasing forest products-related employment, was derived by adding 3,420 jobs (10%) to the 2012 baseline level of 34,204 yielding a goal of 37,624 jobs. Employment estimates (Table 12) were derived from IMPLAN data in 2012 and 2013; employment increased 2.2% from 2012 to 2013.

5.4 Summary

The goals for expanding the forest products industries are interrelated. Changes in final demand or output drive economic activity yielding increased employment, labor income and total impacts on Michigan’s economy. Goal 1 requires additional total impacts of $2,525 million above the 2013 level. This translates into an increase of direct output (final demand) of approximately $1,451 million. Goal 2 exports are $209 million below the 2018 target. If the Goal 1 target is met, the Goal 2 target will likely be met as well. Although they are not perfectly correlated, increasing outputs for domestic and international markets will lead to increases in employment, the focus of Goal 3.

The purpose of quantifying goals provides a basis for future comparisons regarding accomplishments associated with goals of the Governor’s Forest Products Summit. Scenarios can be developed to describe more details about direct and total impacts of meeting these goals across various forest products industries in terms of output, employment and labor.

As summarized by Woodall and others (2012), “the high value forest resources of the northern region continue to mature and could provide more wood for an expanded wood products manufacturing industry. An opportunity exists to both improve the health and resiliency of these maturing forests while developing the local economies with improved competitiveness, capacity, and production of wood industries.” They noted the positive opportunities for more paperboard production and increased international trade, biofuels and wood energy. These opportunities exist in Michigan; supportive policies and investments can make them a reality.

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APPENDIX 1

Table A1. Description of economic sectors for forest industries, including IMPLAN industry sectors and 2007 North American Industry Classification System (NAICS) codes.

IMPLAN Sector	Description (NAICS Code): Detailed Description
15	Timber Tract Operations (113110): This industry comprises establishments primarily engaged in the operation of timber tracts for the purpose of selling standing timber. Forest Nurseries and Gathering of Forest Products (113210): This industry comprises establishments primarily engaged in (1) growing trees for reforestation and/or (2) gathering forest products, such as gums, barks, balsam needles, rhizomes, fibers, Spanish moss, ginseng, and truffles.
16	Logging (113310): This industry comprises establishments primarily engaged in one or more of the following: (1) cutting timber; (2) cutting and transporting timber; and (3) producing wood chips in the field.
19*	Support Activities for Forestry (115310): This industry comprises establishments primarily engaged in performing particular support activities related to timber production, wood technology, forestry economics and marketing, and forest protection. These establishments may provide support activities for forestry, such as estimating timber, forest firefighting, forest pest control, and consulting on wood attributes and reforestation. IMPLAN Sector 19 (NAICS 115) initial values were reduced to 4.1% of initial employment and 6.1% of dollar values based on the employment and annual wages ratios between (1) Forestry Support Activities and (2) Agriculture and Forestry Support Activities for the MI in 2013 (Bureau of Labor Statistics).
47* (NA)	Biomass Electric Power Generation (221117): This U.S. industry comprises establishments primarily engaged in operating biomass electric power generation facilities. These facilities use biomass (e.g., wood, waste, alcohol fuels) to produce electric energy. The electric energy produced in these establishments is provided to electric power transmission systems or to electric power distribution systems. This was a new sector in 2013 IMPLAN datasets. This Michigan industry was comprised of six main power plants that sold electricity in Michigan in 2007: Cadillac Renewable Energy, Genesee Power Station, Grayling Generating Station, Hillman Power Co., Viking Energy-Lincoln and Viking energy-McBain. A 2009 survey (Leefers, Michigan State University) was used to adjust employment for this sector (i.e., 133 direct jobs and 686 total jobs).
134 (95)	Sawmills (321113): This U.S. industry comprises establishments primarily engaged in sawing dimension lumber, boards, beams, timbers, poles, ties, shingles, shakes, siding, and wood chips from logs or bolts. Sawmills may plane the rough lumber that they make with a planing machine to achieve smoothness and uniformity of size.
135 (95)	Wood preservation (321114): This U.S. industry comprises establishments primarily engaged in (1) treating wood sawed, planed, or shaped in other establishments with creosote or other preservatives, such as alkaline copper quat, copper azole, and sodium borates, to prevent decay and to protect against fire and insects and/or (2) sawing round wood poles, pilings, and posts and treating them with preservatives.

IMPLAN Sector	Description (NAICS Code): Detailed Description
136 (96)	Hardwood Veneer and Plywood Manufacturing (321211): This U.S. industry comprises establishments primarily engaged in manufacturing hardwood veneer and/or hardwood plywood. Softwood Veneer and Plywood Manufacturing (321212): This U.S. industry comprises establishments primarily engaged in manufacturing softwood veneer and/or softwood plywood.
137 (97)	Engineered Wood Member (except Truss) Manufacturing (321213): This U.S. industry comprises establishments primarily engaged in manufacturing fabricated or laminated wood arches and/or other fabricated or laminated wood structural members. Truss Manufacturing (321214): This U.S. industry comprises establishments primarily engaged in manufacturing laminated or fabricated wood roof and floor trusses.
138 (98)	Reconstituted Wood Product Manufacturing (321219): This U.S. industry comprises establishments primarily engaged in manufacturing reconstituted wood sheets and boards.
139 (99)	Wood Window and Door Manufacturing (321911): This U.S. industry comprises establishments primarily engaged in manufacturing window and door units, sash, window and door frames, and doors from wood or wood clad with metal or plastics
140 (99)	Cut Stock, Resawing Lumber, and Planing (321912): This U.S. industry comprises establishments primarily engaged in one or more of the following: (1) manufacturing dimension lumber from purchased lumber; (2) manufacturing dimension stock (i.e., shapes) or cut stock; (3) resawing the output of sawmills; and (4) planing purchased lumber. These establishments generally use woodworking machinery, such as jointers, planers, lathes, and routers to shape wood.
141 (99)	Other Millwork, including Flooring (321918): This U.S. industry comprises establishments primarily engaged in manufacturing millwork (except wood windows, wood doors, and cut stock).
142 (100)	Wood Container and Pallet Manufacturing (321920): This industry comprises establishments primarily engaged in manufacturing wood pallets, wood box shook, wood boxes, other wood containers, and wood parts for pallets and containers.
143 (101)	Manufactured home (mobile home) manufacturing (321991): This U.S. industry comprises establishments primarily engaged in making manufactured homes (i.e., mobile homes) and nonresidential mobile buildings. Manufactured homes are designed to accept permanent water, sewer, and utility connections and although equipped with wheels, they are not intended for regular highway movement.
144 (102)	Prefabricated Wood Building Manufacturing (321992): This U.S. industry comprises establishments primarily engaged in manufacturing prefabricated wood buildings and wood sections and panels for prefabricated wood buildings.
145 (103)	All Other Miscellaneous Wood Product Manufacturing (321999): This U.S. industry comprises establishments primarily engaged in manufacturing wood products (except establishments operating sawmills and preservation facilities; establishments manufacturing veneer, engineered wood products, millwork, wood containers, pallets, and wood container parts; and establishments making manufactured homes (i.e., mobile homes) and prefabricated buildings and components).

IMPLAN Sector	Description (NAICS Code): Detailed Description
146 (104)	Pulp Mills (322110): This industry comprises establishments primarily engaged in manufacturing pulp without manufacturing paper or paperboard. The pulp is made by separating the cellulose fibers from the other impurities in wood or other materials, such as used or recycled rags, linters, scrap paper, and straw.
147 (105)	Paper (except Newsprint) Mills (322121): This U.S. industry comprises establishments primarily engaged in manufacturing paper (except newsprint and uncoated groundwood paper) from pulp. These establishments may manufacture or purchase pulp. In addition, the establishments may also convert the paper they make. Newsprint Mills (322122): This U.S. industry comprises establishments primarily engaged in manufacturing newsprint and uncoated groundwood paper from pulp. These establishments may manufacture or purchase pulp. In addition, the establishments may also convert the paper they make.
148 (106)	Paperboard Mills (322130): This industry comprises establishments primarily engaged in manufacturing paperboard from pulp. These establishments may manufacture or purchase pulp. In addition, the establishments may also convert the paperboard they make.
149 (107)	Paperboard Container Manufacturing (32221): This industry comprises establishments primarily engaged in converting paperboard into containers without manufacturing paperboard. These establishments use corrugating, cutting, and shaping machinery to form paperboard into containers. Products made by these establishments include boxes, corrugated sheets, pads, pallets, paper dishes, and fiber drums, and reels. Six-digit NAICS industries are: Corrugated and Solid Fiber Box Manufacturing (322211), Folding Paperboard Box Manufacturing (322212), and Other Paperboard Container Manufacturing (322219).
150 (108, 109)	Paper Bag and Coated and Treated Paper Manufacturing (322220): This industry comprises establishments primarily engaged in one or more of the following: (1) cutting and coating paper and paperboard; (2) cutting and laminating paper, paperboard, and other flexible materials (except plastics film to plastics film); (3) manufacturing bags, multiwall bags, sacks of paper, metal foil, coated paper, laminates, or coated combinations of paper and foil with plastics film; (4) manufacturing laminated aluminum and other converted metal foils from purchased foils; and (5) surface coating paper or paperboard.
151 (110)	Stationery Product Manufacturing (322230): This industry comprises establishments primarily engaged in converting paper or paperboard into products used for writing, filing, art work, and similar applications.
152 (111)	Sanitary Paper Product Manufacturing (322291): This U.S. industry comprises establishments primarily engaged in converting purchased sanitary paper stock or wadding into sanitary paper products, such as facial tissues, handkerchiefs, table napkins, toilet paper, towels, disposable diapers, sanitary napkins, and tampons.
153 (112)	All Other Converted Paper Product Manufacturing (322299): This U.S. industry comprises establishments primarily engaged in converting paper or paperboard into products (except containers, bags, coated and treated paper, stationery products, and sanitary paper products) or converting pulp into pulp products, such as egg cartons, food trays, and other food containers from molded pulp.

IMPLAN Sector	Description (NAICS Code): Detailed Description
368 (295)	Wood Kitchen Cabinet and Countertop Manufacturing (337110): This industry comprises establishments primarily engaged in manufacturing wood or plastics laminated on wood kitchen cabinets, bathroom vanities, and countertops (except freestanding). The cabinets and counters may be made on a stock or custom basis.
369 (296)	Upholstered Household Furniture Manufacturing (337121): This U.S. industry comprises establishments primarily engaged in manufacturing upholstered household-type furniture. The furniture may be made on a stock or custom basis.
370 (297)	Nonupholstered Wood Household Furniture Manufacturing (337122): This U.S. industry comprises establishments primarily engaged in manufacturing nonupholstered wood household type furniture and freestanding cabinets (except television, radio, and sewing machine cabinets). The furniture may be made on a stock or custom basis and may be assembled or unassembled (i.e., knockdown).
372* (299)	Institutional Furniture Manufacturing (337127): This U.S. industry comprises establishments primarily engaged in manufacturing institutional-type furniture (e.g., library, school, theater, and church furniture). Included in this industry are establishments primarily engaged in manufacturing general purpose hospital, laboratory, and dental furniture (e.g., tables, stools, and benches). The furniture may be made on a stock or custom basis and may be assembled or unassembled (i.e., knockdown). Bureau of Labor Statistics does not break this industry into wood and non-wood components. To estimate the amount of this industry is wood-based, the ratio of wood-based subsectors (337121 and 337122) and total household furniture subsectors (337121, 337122, 337124 and 337125) for the MI in 2013 (Bureau of Labor Statistics) was calculated for employment (74.4%) and wages (68.1%) and used to adjust IMPLAN Sector 372 values.
373 (300)	Wood Office Furniture Manufacturing (337211): This U.S. industry comprises establishments primarily engaged in manufacturing wood office-type furniture. The furniture may be made on a stock or custom basis and may be assembled or unassembled (i.e., knockdown). This was a new sector in 2013 IMPLAN datasets. Previously, IMPLAN Sector 300 included Non-Wood Office Furniture Manufacturing (337214).
374 (301)	Custom Architectural Woodwork and Millwork Manufacturing (337212): This U.S. industry comprises establishments primarily engaged in manufacturing custom designed interiors consisting of architectural woodwork and fixtures utilizing wood, wood products, and plastics laminates. All of the industry output is made to individual order on a job shop basis and requires skilled craftsmen as a labor input. A job might include custom manufacturing of display fixtures, gondolas, wall shelving units, entrance and window architectural detail, sales and reception counters, wall paneling, and matching furniture.

IMPLAN Sector	Description (NAICS Code): Detailed Description
376* (302)	Showcase, Partition, Shelving, and Locker Manufacturing (337215): This U.S. industry comprises establishments primarily engaged in manufacturing wood and nonwood office and store fixtures, shelving, lockers, frames, partitions, and related fabricated products of wood and nonwood materials, including plastics laminated fixture tops. The products are made on a stock or custom basis and may be assembled or unassembled (i.e., knockdown). Establishments exclusively making furniture parts (e.g., frames) are included in this industry. Like Institutional Furniture Manufacturing, this sector includes both wood and nonwood components. To estimate the amount of this industry is wood-based, the ratio of wood-based custom and office furniture subsectors (337211 and 337212) and total office furniture subsectors (337211, 337212, and 337214) for the MI in 2013 (Bureau of Labor Statistics) was calculated for employment (35.2%) and wages (33.8%) and used to adjust IMPLAN Sector 376 values.

Note: Sector numbers from 2012 IMPLAN sectorization scheme noted in parentheses, and sectors modified for this analysis denoted with "".*

Appendix 2

Table A2. Detailed forest industry sector direct contributions, 2013.

IMPLAN Sector	Forest Industry Sector	Direct Contributions, 2013		
		Employment (Jobs)	Output (2013 Dollars)	Labor Income (2013 Dollars)
15	Forestry, forest products, and timber tract production	246	45,894,897	5,929,907
16	Commercial logging	3,591	337,777,679	152,221,542
19	Support activities for forestry*	419	23,704,926	15,920,858
47	Electric power generation - Biomass*	133	125,359,940	7,213,542
134	Sawmills	2,299	542,077,942	95,293,452
135	Wood preservation	120	45,602,333	4,938,741
136	Veneer and plywood manufacturing	1,051	240,873,535	48,853,123
137	Engineered wood member and truss manufacturing	736	121,735,603	35,863,734
138	Reconstituted wood product manufacturing	946	398,034,302	68,929,281
139	Wood windows and door manufacturing	667	115,480,667	30,412,304
140	Cut stock, resawing lumber, and planing	408	75,993,301	17,284,941
141	Other millwork, including flooring	1,251	203,501,678	54,125,999
142	Wood container and pallet manufacturing	2,056	263,643,341	84,273,513
143	Manufactured home (mobile home) manufacturing	97	18,159,136	7,408,174
144	Prefabricated wood building manufacturing	389	62,643,723	16,874,919
145	All other miscellaneous wood product manufacturing	573	95,807,022	23,519,081
146	Pulp mills	193	158,317,566	21,191,196
147	Paper mills	2,434	1,836,446,899	252,474,144
148	Paperboard mills	767	584,992,310	67,639,704
149	Paperboard container manufacturing	5,771	2,349,360,596	379,780,002
150	Paper bag and coated and treated paper manufacturing	1,080	471,418,091	82,279,256
151	Stationery product manufacturing	222	73,103,622	11,039,304
152	Sanitary paper product manufacturing	324	242,135,162	25,269,097

IMPLAN Sector	Forest Industry Sector	Direct Contributions, 2013		
		Employment (Jobs)	Output (2013 Dollars)	Labor Income (2013 Dollars)
153	All other converted paper product manufacturing	332	101,872,437	19,062,000
368	Wood kitchen cabinet and countertop manufacturing	1,264	187,685,608	74,103,927
369	Upholstered household furniture manufacturing	212	40,052,784	8,802,273
370	Nonupholstered wood household furniture manufacturing	667	91,647,720	26,758,445
372	Institutional wood furniture manufacturing*	1,628	259,616,453	85,177,294
373	Wood office furniture manufacturing	3,486	805,268,860	259,419,903
374	Custom architectural woodwork and millwork	550	95,139,511	38,494,054
376	Showcase, partition, shelving, and locker manufacturing*	1,037	201,058,900	56,264,629
	TOTAL	**34,951**	**10,214,406,545**	**2,076,818,338**

Note: sectors modified for this analysis denoted with "".*

APPENDIX 3

Table A3. Detailed forest industry sector total contributions, 2013.

IMPLAN Sector	Forest Industry Sector	Total Contributions, 2013		
		Employment (Jobs)	Output (2013 Dollars)	Labor Income (2013 Dollars)
15	Forestry, forest products, and timber tract production	667	77,444,190	19,417,117
16	Commercial logging	6,536	613,371,857	244,032,934
19	Support activities for forestry*	512	42,069,927	21,766,533
47	Electric power generation - Biomass*	686	201,571,594	34,542,310
134	Sawmills	7,449	1,193,121,885	322,951,791
135	Wood preservation	396	87,669,709	18,356,290
136	Veneer and plywood manufacturing	2,812	480,998,868	130,165,794
137	Engineered wood member and truss manufacturing	1,570	244,836,585	75,600,928
138	Reconstituted wood product manufacturing	2,588	667,964,663	149,126,555
139	Wood windows and door manufacturing	1,348	214,152,025	62,858,378
140	Cut stock, resawing lumber, and planing	916	145,375,732	40,180,681
141	Other millwork, including flooring	2,659	400,647,581	118,849,473
142	Wood container and pallet manufacturing	3,619	492,057,562	158,118,200
143	Manufactured home (mobile home) manufacturing	194	31,630,768	11,671,104
144	Prefabricated wood building manufacturing	769	116,907,311	34,673,824
145	All other miscellaneous wood product manufacturing	1,215	188,118,627	53,627,955
146	Pulp mills	1,066	287,987,100	63,028,194
147	Paper mills	10,571	3,123,839,541	665,647,892
148	Paperboard mills	3,928	1,081,171,742	226,164,579
149	Paperboard container manufacturing	15,073	3,773,243,310	840,658,527
150	Paper bag and coated and treated paper manufacturing	2,679	729,869,282	162,658,882
151	Stationery product manufacturing	498	117,658,416	25,237,795

IMPLAN Sector	Forest Industry Sector	Total Contributions, 2013		
		Employment (Jobs)	Output (2013 Dollars)	Labor Income (2013 Dollars)
152	Sanitary paper product manufacturing	1,053	364,067,601	63,087,603
153	All other converted paper product manufacturing	756	167,711,486	40,357,557
368	Wood kitchen cabinet and countertop manufacturing	2,392	344,311,080	124,010,966
369	Upholstered household furniture manufacturing	381	66,543,168	17,069,127
370	Nonupholstered wood household furniture manufacturing	1,143	161,184,870	48,864,480
372	Institutional wood furniture manufacturing*	3,105	456,084,851	147,460,112
373	Wood office furniture manufacturing	7,712	1,408,909,636	453,119,371
374	Custom architectural woodwork and millwork	1,080	168,776,826	61,924,554
376	Showcase, partition, shelving, and locker manufacturing*	2,007	340,204,923	99,791,547
		87,381	**17,789,502,719**	**4,535,021,053**

Note: sectors modified for this analysis denoted with "".*

APPENDIX 4

Table A4. Direct contributions, total contributions and SAM multipliers for seven aggregated forest products industries, 2012.

Forest Products Industries	Employment	Output	Labor Income
	(Jobs)	(Millions of 2012 Dollars)	
Direct Contributions			
Forestry	873	107.5	35.9
Logging	3,170	261.8	131.4
Primary Solid Wood Products and Wood-based Power	4,350	1,027.7	204.4
Secondary Solid Wood Products	5,807	909.2	241.1
Wood Furniture	8,591	2,053.2	549.7
Primary Paper and Paperboard Products	3,470	2,806.1	340.5
Secondary Paper and Paperboard Products	7,943	3,227.1	531.0
Grand Total	**34,204**	**10,392.5**	**2,034.0**
Total Contributions			
Forestry	1,974	203.8	75.0
Logging	5,593	546.2	232.5
Primary Solid Wood Products and Wood-based Power	11,943	1,981.1	540.4
Secondary Solid Wood Products	11,509	1,714.1	507.7
Wood Furniture	18,425	3,380.2	989.6
Primary Paper and Paperboard Products	14,651	4,517.6	905.3
Secondary Paper and Paperboard Products	20,113	5,144.2	1,147.7
Grand Total	**84,208**	**17,487.2**	**4,398.1**
SAM Multiplier			
Forestry	2.26	1.90	2.09
Logging	1.76	2.09	1.77
Primary Solid Wood Products and Wood-based Power	2.75	1.93	2.64
Secondary Solid Wood Products	1.98	1.89	2.28
Wood Furniture	2.14	1.65	1.82
Primary Paper and Paperboard Products	4.22	1.61	2.66
Secondary Paper and Paperboard Products	2.53	1.59	2.16
Grand Total	**2.46**	**1.68**	**2.16**