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Secondary manufacturing of solid wood products in Alberta 2013/2014: Structure and economic contribution

Bryan E.C. Bogdanski and Alec McBeath

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Industry, Trade and Economics Research Group

Canadian Forest Service

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Contents

Acknowledgements	v
Abstract	vi
Key Points	viii
1. Introduction	1
2. Research Methods	2
3. Sector Background and Trends	4
3.1 Past Studies.....	4
3.2 Sector Trends Determined from External Data Sources.....	5
3.2.1 Panelboard Mills.....	8
3.2.2 Secondary Manufacturing Versus Other Forest Product Sectors.....	9
4. Survey Results	10
4.1 Current State of the Sector.....	10
4.2 Business Profile	11
4.2.1 Employment and Sales.....	13
4.2.2 Cost Structure.....	13
4.3 Wood Material Utilization and Species.....	14
4.4 Markets.....	14
4.5 Use of the Internet	16
4.6 Economic Outlook.....	18
4.6.1 Short-term Sales Trends.....	19
4.6.2 Capacity Utilization and Expansion Plans	19
4.7 Constraints to Expansion.....	20
5. Conclusion	21
6. References	23
Appendix 1: Taxonomy of secondary manufactured wood productsa	24
Appendix 2: 2013 Survey of Alberta Wood Product Secondary Manufacturing	25
Appendix 3: Listing of products within each business type	33
Appendix 4: Non-response bias tests	34
Appendix 5: Harmonized system for traded products code, description, and correspondence to business types used in this study	36
Appendix 6: Wood products by business type	37
Appendix 7: Responses to constraints to expansion	40

List of Figures

Figure 1.	Sales from manufacturing select industry aggregates, 1990–2012.....	5
Figure 2.	Total number of employees for select industry aggregates, 1990–2012.....	6
Figure 3.	Monthly sales for select industry aggregates, 2000–2015.....	6
Figure 4.	Aggregate exports and imports for NAICS 6-digit industries, excluding panelboards.....	7
Figure 5.	Alberta’s wood furniture imports and exports, 2000–2014.....	8
Figure 6.	Manufacturing sales revenue and total number of employees for Alberta panelboard industry, 1990–2014.....	8
Figure 7.	Value of exports and imports of waferboard, fibreboard, and plywood, 2000–2014.....	9
Figure 8.	Real sales from manufacturing, 1992–2014.....	9
Figure 9.	Location of Alberta’s secondary wood manufacturers in 2013, by business type.....	10
Figure 10.	Locations of Alberta’s secondary wood manufacturers in 2013, showing number of firms and business type.....	11
Figure 11.	Proportion of firms in each region by size.....	11
Figure 12.	Distribution of firms across secondary manufacturing business types by size.....	12
Figure 13.	Proportion of firms in each region by size.....	12
Figure 14.	Sales revenue per firm, by secondary manufacturing business type.....	13
Figure 15.	Sales per employee across business types.....	14
Figure 16.	Distribution of operating costs across business type.....	14
Figure 17.	Distribution of wood fibre by business type.....	15
Figure 18.	Percentage of wood fibre species used.....	15
Figure 19.	Wood species use by business type.....	16
Figure 20.	Percentage of wood volume by source.....	16
Figure 21.	Market shares of Alberta secondary manufacturing sales.....	17
Figure 22.	Distribution of sales to destination market by business type.....	17
Figure 23.	Trends in sales, 2012–2014.....	19
Figure 24.	Constraints to expansion, where 1 = least constraining and 5 = most constraining.....	20

List of Tables

Table 1.	Survey population, response, and working sample.....	2
Table 2.	Correspondence between business types used in this study and North American Industrial Classification System 6-digit groups.....	4
Table 3.	Percentage of firms using the internet for management, e-commerce, or marketing by business type.....	18
Table 4.	Capacity utilization by business type.....	19
Table 5.	Planned capacity expansion.....	20

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Abstract

This report presents survey results for Alberta's secondary wood manufacturing industries in 2013. The survey compiled operational, employment, production, marketing, and financial information on nine business types. Additional information was acquired from Statistics Canada and Innovation, Science and Economic Development Canada to provide supplemental trend data and information on panelboard industries. This is the first focused survey of the sector in many years and provides base information for continued tracking of the sector in subsequent years. The secondary wood manufacturing sector has grown tremendously over the past 20 years but certainly has struggled to grow over the last decade. Presently, the Alberta secondary wood product industries, clustered around Calgary and Edmonton, are significant users of Alberta's wood resources and suppliers

of wood-based products to Alberta and the rest of North America. Most of the fibre used by Alberta manufacturers is in the form of lumber sourced from the Alberta market. The majority of sales were within Alberta (57%), with the rest distributed across British Columbia (8%), the Prairies (10%), eastern Canada (8%), and the United States (14%). Many firms hope to expand operations, although opportunities to do so are threatened by several challenges. The cost of labour, along with insufficient skills and experience of the labour force, were identified as the most pressing challenges facing the industry.

Keywords: employment, forest industry, markets, policy, secondary manufacturing, value-added

Résumé

Ce rapport présente les résultats d'une enquête menée auprès des industries de transformation secondaire du bois de l'Alberta en 2013. Ce document expose les résultats de l'enquête portant sur les activités, l'emploi, la production, la commercialisation et les finances pour neuf types d'entreprises. D'autres renseignements ont été recueillis auprès de Statistique Canada et d'Innovation, Sciences et Développement économique Canada et ont permis d'obtenir des données supplémentaires sur les tendances relatives aux industries de panneaux. Il s'agit de la première enquête ciblée du secteur menée depuis de nombreuses années, qui fournit des données de référence pour faire le suivi continu du secteur au cours des années futures. Le secteur de la transformation secondaire du bois a pris énormément d'ampleur au cours des 20 dernières années, mais a certainement éprouvé des difficultés à se développer au cours de la dernière décennie. À l'heure actuelle, les industries de transformation secondaire du bois de l'Alberta,

qui sont regroupées autour de Calgary et d'Edmonton, sont des utilisatrices importantes des ressources ligneuses de l'Alberta et sont aussi des fournisseurs de produits dérivés du bois à l'Alberta et au reste de l'Amérique du Nord. La majorité de la fibre utilisée par les producteurs de l'Alberta est sous forme de bois d'œuvre qui provient du marché de l'Alberta. La majorité des ventes se sont faites en Alberta (57 %), et le reste des ventes ont été réparties entre l'ensemble de la Colombie-Britannique (8 %), les Prairies (10 %), l'Est du Canada (8 %) et les États-Unis (14 %). De nombreuses entreprises espèrent élargir leurs activités, bien qu'elles doivent relever plusieurs défis pour tirer parti de ces occasions. Le coût de la main-d'œuvre, ainsi que le manque de compétences et d'expérience de la main-d'œuvre ont été cernés comme les difficultés les plus urgentes qui se dressent devant l'industrie.

Mots-clés : emploi, industrie forestière, marchés, politique, transformation secondaire, valeur ajoutée

Key Points

- This report summarizes the results of a comprehensive survey of secondary manufacturing of solid wood products in Alberta for the year 2013. The final survey population included 205 firms, with 61 responding.
- To complement the survey results, auxiliary data from Statistics Canada was compiled to provide trend analysis for the sector and the panelboard industry.
- The secondary wood manufacturing sector has grown tremendously over the past 20 years but certainly has struggled over the past decade during a period of recession, high Canadian dollar, and increased overseas and United States competition in domestic markets. Despite the headwinds, the sector is comparable in size to Alberta's paper and sawmilling industries.
- For 2013, we estimate that 201 businesses (excluding panelboard businesses) employed 7449 people and had sales of \$1.355 billion.
- Most sales were to Alberta (57%), with the rest distributed across British Columbia (8%), the Prairies (10%), eastern Canada (8%), and the United States (14%). Sales are more diversified across markets than 30 years ago when the last detailed study of the sector was conducted. This is despite a large decrease in exports to the United States over the past decade.
- The most common business type is millwork (28%), followed by cabinets (18%), and engineered wood products (18%).
- The survey respondents used approximately 1.5 million m³ of wood fibre. Most commonly used wood fibre species were softwoods (spruce, pine, and fir) in the form of lumber and logs, with 83% of it is sourced from within Alberta.
- Internet use is prevalent, with 90% of companies reporting some form of internet use. Use of social media, such as Facebook and LinkedIn, was in its initial stages; early adopters tended to be companies producing finished products, such as furniture, buildings, and cabinets.
- Many firms expected to expand during 2014–2016, but labour, markets, and wood supply were potential constraints.
- Labour skills and experience stood out as a potential constraint to industry growth.

1. Introduction

In 2014, the Canadian Forest Service conducted a survey of secondary wood manufacturing businesses in Alberta to learn more about this subsector of Alberta's forest industry. Alberta's secondary wood manufacturing is not often studied in depth, with the last known research conducted in mid-1990 (Alberta Economic Development and Tourism 1995). The Canadian Forest Service (CFS) collaborated with Alberta Environment and Sustainable Resource Development and the Alberta Forest Products Association to create a current and comprehensive understanding of the sector.

Interest exists to promote value-added wood processing to maximize the level of economic activity from each unit of wood fibre harvested in Alberta. The challenges that face the primary wood and paper industries are related to increased competition and reliance on cyclical foreign markets, particularly the United States, and to an expanding threat of the mountain pine beetle across Alberta's forests, which could lead to a potential supply shock. Secondary manufacturing of lumber into intermediate and finished products, or adding value to sawmill waste streams, is one important industrial strategy to help diversify forestry-dependent economic regions and mitigate risks related to markets or natural disturbances. Ensuring effective policy responses requires credible and up-to-date information on the sector. Current and detailed data will help communities and industry associations better understand the existing sector and perhaps discover viable strategies to support growth and diversification of the subsector.

This study follows closely the definition of secondary manufacturing used in a similar 2012 survey of secondary wood manufacturers in British Columbia (Bogdanski and McBeath 2015) with slight modifications to better fit the Alberta industry. To provide important trend information and context for the survey results and supplementary information on the panelboard industry, we augmented the survey

data obtained with publicly available data from Statistics Canada and Innovation, Science and Economic Development Canada.

Secondary manufacturing is the further processing of primary wood or wood-based materials into semi-finished or finished products. Aggregated by business type, the major wood products groups in the secondary manufacturing industry include:

- millwork
- cabinets
- engineered wood products—building components
- engineered wood products—buildings
- pallets and containers
- furniture
- other wood products
- remanufactured products
- panelboards

Our definition of a "manufacturer" excludes several activities, the primary being "contractor/builders" or "custom one-off operations." The business types most affected are within engineered wood products (i.e., buildings and building components) and cabinet firms. For example, a firm that manufactures houses in a plant and then ships them out for final assembly falls within our definition of "engineered wood products—buildings," whereas a contractor or builder who constructs houses at a job site does not. Appendix 1 contains a comprehensive listing of wood products organized by level of processing.

2. Research Methods

An inventory of Alberta companies involved in secondary wood manufacturing was compiled from membership lists of producer associations, commercial directories, and a list of companies provided by Alberta Environment and Sustainable Resource Development and the Alberta Forest Products Association. This inventory formed the initial sampling frame for the survey, identifying a total of 335 firms. During the process of administering the survey, 123 of these firms were found to be either misclassified and outside the scope of the survey, or no-longer in business; an additional 7 firms were inactive during the 2013 manufacturing year. Therefore, 205 firms made up the identified population of secondary wood manufacturers in Alberta for the 2013 survey year.

A multi-part questionnaire covering nine themes was developed based on previous surveys administered by the Canadian Forest Service for studies of the British Columbia secondary manufacturing sector (Wilson et al. 2001; Stennes and Wilson 2008; Bogdanski and McBeath 2015). The first part sought basic information about the business followed by sections focused on wood use, operational costs, employment, capacity and expansion plans, constraints to expansion, use of electronic commerce and social media, markets, sales revenue, and products (see Appendix 2).

The questionnaire was mailed mid-August 2014 to all firms identified in the survey frame, with follow-up several weeks later in September. Firms that did not respond to the faxes, emails, or mail-outs were contacted again by phone during October 2014 to February 2015 and asked to complete and return the survey using the return envelope or by digital

copy via email or fax. By mid-February, 61 firms had returned the survey for a response rate of 30%. Some firms that elected not to complete the survey provided information by phone or email, confirming their business and in some cases providing information on their products, employee numbers, or sales. Although the response rate was lower than surveys conducted in British Columbia, those were two-part surveys, with firms electing either to complete a short section or complete the full survey. The response rate for the Alberta survey was lower than the response rate for British Columbia's short survey (41%) but higher than that for the long survey (20%).

Table 1 summarizes the survey population and respondents by business type. Each respondent firm was classified into a business type according to its reported sales of specified product types; non-respondent firms were classified based on communications with the company or indirectly through company webpages and industry directory information (see Appendix 3 for the specific activities within our defined business types). Most firms were classified as "millwork" firms (28%) or "cabinets" (18%). Although "building" firms are often included in the "engineered wood products" classification (e.g., Bogdanski and McBeath 2015), they were broken out into a separate subgroup for this study because of their significant size. The buildings subgroup is made up of firms that make log and timber-framed homes and commercial and residential prefabricated modular buildings.

The classification of businesses into types of manufacturers is not without some ambiguity. Traditionally, we include

Table 1. Survey population, response, and working sample

Business type	Number of firms		Response rate (%)
	Population	Respondents	
Panelboards	4	1	25
Remanufacturers	5	5	100
Other wood products	11	6	55
Buildings	24	7	29
Engineered wood products	35	5	14
Cabinets	36	14	39
Millwork	58	13	22
Furniture	13	3	23
Pallets and containers	19	7	37
Total	205	61	30

firms that make panelboards as secondary manufacturers, yet several of these firms could be categorized as primary mills, depending on the product, process, and integration of processes at the mill. Oriented strand board (OSB) operations typically mill logs to produce final products that are processed into wood strands and then pressed together into panels using heat and adhesives within the mill. These multi-process mills are arguably primary mills; however, if the operation purchased wood strands from another mill, then it fits the definition of a secondary manufacturing mill. A similar distinction between primary and secondary mills could be made with plywood and medium-density fibreboard (MDF) mills. Unlike OSB mills, two equally common types of plywood mills exist—those that are multi-process and those that purchase veneer sheets from other mills and in turn combine veneer using adhesives, heat, and pressure to produce plywood panels. Both types of plywood mill occur because of the multiple uses of veneer and readily available markets, whereas the wood strands used to make OSB are a specialty product and often tailored to a mill's particular panel process. Specialized wood fibre inputs limit external opportunities and favour an integrated mill. Medium-density fibreboard mills generally co-locate near primary sawmills that produce small wood particles as a by-product and aptly fit within the definition of secondary mills. Some Alberta sawmills produce secondary products, such as chips, fuel pellets, and animal bedding, using mill residues or further manufacturing their lumber outputs into specialty lumber products. In these instances, we either broke out the secondary process or dropped the firm from the analysis when the secondary business constituted less than 50% of sales.

Table 1 clearly shows that the number of respondents was low for some business types, raising the issue of confidentiality. For example, because only one panelboard firm responded, we dropped the "panelboard" business type from the study. Fortunately, very good supplementary data for this business type was available from Statistics Canada and the Government of Alberta (2013). In other cases, some business types answered few of the individual questions and so results were suppressed to maintain confidentiality.

Data from completed surveys was stored in a secure database and survey results were checked for errors and anomalies. Employment data and sales data were acquired directly from non-participating firms through follow-up communication and indirectly from websites, news articles, or company reports. Employment and sales data were obtained for 160 and 116 firms, respectively. In some cases, returned surveys had missing sales and employment data. For these records, the missing data was estimated using information from similar businesses. Employment and sales

data or estimates were obtained for 165 firms or 81% of the population.

Non-response to the survey by businesses raises concern of biased results. Firms that did not participate may be very different than firms that did respond, resulting in biased results and perhaps false conclusions. For example, perhaps only larger or more profitable firms responded. We conducted three statistical tests to check for response bias.

The first test compared the frequency distribution of the responding firms across business types against the population distribution. This test found no difference; therefore, the survey respondent group provides a good representation of the distribution of business types across the population.

The second test split the survey respondents into two groups: (1) those that responded to the survey relatively quickly (before October 1, 2014); and (2) those that took much longer to respond (on or after October 1, 2014). Responses to specific questions were compared between these two groups to test the idea that late responding firms were, nevertheless, like non-responding firms. If the two responding groups are statistically different, then perhaps the non-respondents are also different from the early responding group, and so another procedure compared early and late respondents' answers to questions concerning the importance of potential constraints to expansion, such as market, labour, and wood fibre availability. A similar procedure was applied to the question that asked firms if they intended to expand capacity in the coming years. For these three key questions on constraints to expansion, no differences were found between early and late respondent groups, suggesting that the entire respondent group is a good representation of the non-respondent firms. For the question on expansion plans, a difference was found between the early and late respondent groups, suggesting that extrapolation of the respondent group to the population regarding expansion plans should be done with caution.

A final test compared the size distribution between respondent and non-respondent firms to determine possible firm size bias. To undertake this test, we acquired supplementary employment data, covering 81% of the estimated population. This test found no difference between the two groups.

In sum, the survey respondents are generally representative of the entire population of firms; however, as with any census survey that fails to collect information from all firms, some uncertainty remains and therefore caution should be exercised in extrapolating results to the entire population. Appendix 4 shows detailed results for tests of non-response bias.

3. Sector Background and Trends

3.1 Past Studies

Few studies of the Alberta secondary wood manufacturing sector have been undertaken. One very comprehensive study, conducted in 1983 for the Canadian and Alberta forest services, found that the sector was composed of over 300 firms employing 5500 people and generating annual sales of \$400 million (Hallmark Engineering and Woodbridge, Reed and Associates 1983). The largest business sectors were furniture, millwork, prefabricated buildings, and cabinets, with most businesses servicing the Alberta market (76%). The study also found that most of the fibre used by the sector was imported from other provinces, the United States, and overseas.

A later Alberta government survey of the sector produced a directory of businesses (Alberta Economic Development and Tourism 1995). This survey found that 690 firms employed an estimated 14 225 people. Though different methods were used, the two studies indicate that the sector grew significantly between the mid-1980s and mid-1990s.

The Alberta government also periodically releases a report on the “Economic Impact of Alberta’s Forest Sector,” which was last produced for the 2012 reporting year (Government of Alberta 2005, 2010, 2013). Early versions of the report accounted for sales, employment, and tax revenue generated by the primary and secondary forest industries. The primary industries included pulp and paper, sawmilling, and panelboard manufacturing; the secondary manufacturing included cabinet making, engineered wood products, remanufactured lumber, prefabricated buildings, millwork, furniture, and other wood products. The 2012 edition of the report (Government of Alberta 2013) did not include secondary manufacturing figures, but the 2009 edition (Government of Alberta 2010) reported data for 2007, 2008, and 2009, years that coincided with the “Great Recession” in the North America. For 2009, employment, manufacturing sales, and tax revenue for the secondary wood product sector (not including panelboards) were reported to be 6300, \$1.443 billion, and \$49 million, respectively. These measures were markedly lower than pre-recession highs. The distribution of manufacturing sales across the four regions of

Table 2. Correspondence between business types used in this study and North American Industrial Classification System (NAICS) 6-digit groups

NAICS code	NAICS description	Corresponding business type in this study
321114	Wood preservation	Other wood products
321211	Hardwood veneer and plywood mills US	Panelboards
321212	Softwood veneer and plywood mills US	Panelboards
321215	Structural wood product manufacturing	Engineered wood products
321216	Particle board and fibreboard mills	Panelboards
321217	Waferboard mills	Panelboards
321911	Wood window and door manufacturing	Millwork
321919	Other millwork	Millwork/remanufacturing
321920	Wood container and pallet manufacturing	Pallet and containers
321991	Manufactured (mobile) home manufacturing	Buildings – engineered wood products
321992	Prefabricated wood building manufacturing	Buildings – engineered wood products
321999	All other miscellaneous wood product manufacturing	Other wood products/remanufacturing
337111	Wood kitchen cabinet and counter top manufacturing	Cabinets
337121	Upholstered household furniture manufacturing	Furniture
337123	Other wood household furniture manufacturing	Furniture
337213	Wood office furniture, including custom architectural woodwork, manufacturing	Furniture/millwork

“Edmonton & area,” “Grande Prairie–Grande Cache,” “Hinton–Edson,” and “Rocky Mountain House–Calgary–Southern Alberta” were 47%, 2%, 2%, and 49%, respectively.

3.2 Sector Trends Determined from External Data Sources

Secondary wood manufacturing industries, as defined in our study, largely fall within five industrial groups of the North American Industry Classification System (NAICS):

- 3212 – Veneer, Plywood and Engineered Wood Product Manufacturing;
- 3219 – Other Wood Product Manufacturing;
- 337111 – Wood Kitchen Cabinet and Counter Top Manufacturing;
- 337123 – Other Wood Household Furniture Manufacturing; and
- 337213 – Wood Office Furniture, including Custom Architectural Woodwork, Manufacturing.

The business type “remanufactures” falls under several NAICS groups:

- 3211 – Sawmills and Wood Preservers (Siding and Dressed Lumber);
- 321919 – Other Millwork (Planed Lumber);
- 321999 – All Other Miscellaneous Wood Product Manufacturing (Fencing).

Also, businesses producing products such as wood fuel pellets or horticultural products that are under our “other” business category, fall under NAICS 321999 (i.e., All Other Miscellaneous Wood Product Manufacturing). Table 2 lists the NAICS codes and names corresponding to the business groupings of secondary forest products used in this study.

Statistics Canada’s Annual Survey of Manufacturers and Logging provides information on Alberta’s forest sector industries and includes information on revenues, employee numbers, number of firms, and costs; the most recent release is for the 2012 manufacturing year (Statistics Canada 2012). Because of confidentiality laws, information is often suppressed, preventing a detailed disaggregation of the industry to separate out non-wood and wood material industries, such as with furniture manufacturing and related industries (NAICS 337), or data is not available for each year; however, the available data can still provide a good understanding of historical and recent trends.

For the aggregation of furniture (NAICS 337), other wood product manufacturing (NAICS 3219), structural wood product manufacturing (NAICS 321215), and wood preservation (NAICS 321114), sales from manufacturing and employment experienced significant growth between 1990 and 2007 before falling quickly during the Great Recession (Figures 1 and 2). Although the data includes non-wood furniture manufacturing, it is still a good indicator of industry changes from 1990 to 2012. “Furniture” manufacturing grew steadily from 1990 to around 2001 before leveling off for several years and then falling after 2007. Because this broad aggregate includes both wood and non-wood furniture, it is

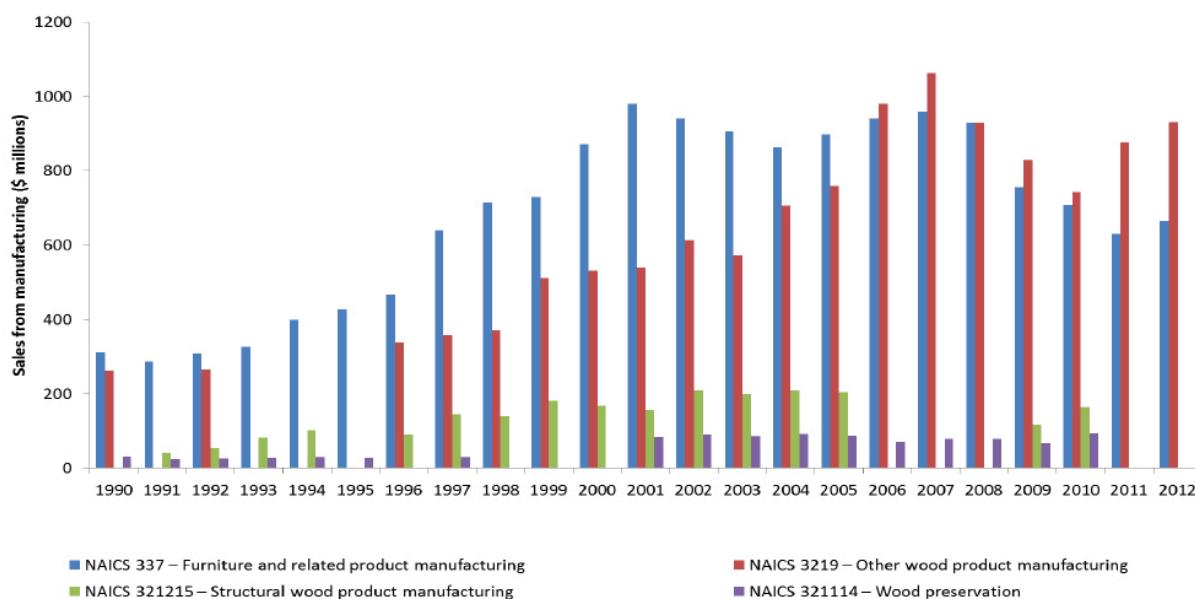


Figure 1. Sales from manufacturing select industry aggregates, 1990–2012 (source: Statistics Canada 2012).

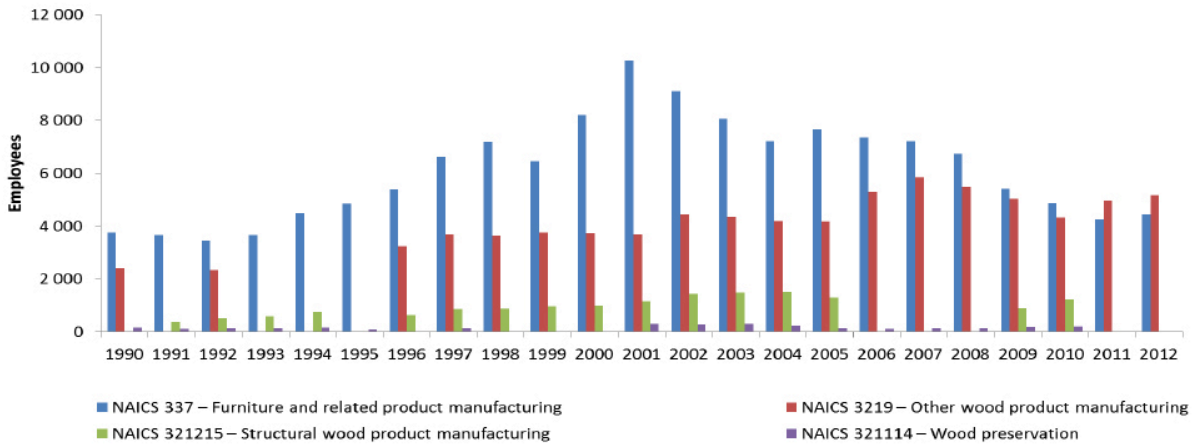


Figure 2. Total number of employees for select industry aggregates, 1990–2012 (source: Statistics Canada 2012).

not clear how wood furniture manufacturers fared over this period. A closer look at subindustries that fit the definition of wood furniture manufacturing (NAICS 337121, 337123, 337213) and cabinetry (NAICS 337110) shows that only cabinetry has seen growth since 2000. “Other wood products” grew steadily between 1990 and 2007 before dipping during the recession. This sector includes prefabricated wood building and manufactured (mobile) home manufacturing. The available data suggest about half of the sales in each year between 1990 and 2012 are associated with these activities.

More recent information on manufacturing sales is available from Statistics Canada’s monthly manufacturing sales and inventory survey (Statistics Canada 2015); however, for confidentiality reasons, complete information on the detailed manufacturing aggregates is not available.

Available monthly sales data for detailed industry aggregates show interesting divergent trends across the sector over

the past 15 years (Figure 3). By far the most volatile is the “all other wood product” (NAICS 32199) category, which includes mobile home and prefabricated wood buildings in addition to a disparate group of industries, such as wood turners, wood pellets, some remanufacturers, and fence makers. This collection of manufacturers has seen monthly sales vary from \$22 million during the depth of the global recession to a high of nearly \$100 million in mid-2013. Since mid-2013, monthly sales have been in a free fall to \$55 million by the end of 2014. Combining this information with the Annual Survey of Manufacturers points to the “buildings” group of firms (i.e., NAICS 321991 [mobile homes] and 321992 [prefabricated wood buildings]), which accounted for 78–85% of aggregate NAICS 32199 annual sales between 2005 and 2010, as the source of the variation. As many companies falling within this group make buildings for the oil and gas and mining sectors, the recent ups and downs may be related to the ebbs and flows of these sectors.

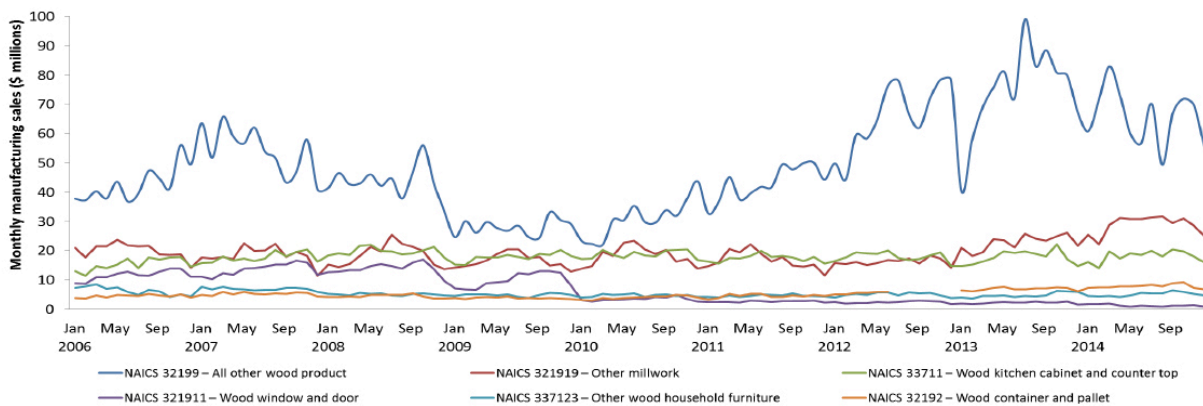


Figure 3. Monthly sales for select industry aggregates, 2000–2015 (June) (source: Statistic Canada 2015).

In contrast to NAICS 32199, businesses involved in “other millwork” (NAICS 321919), cabinetry (NAICS 33711), other wood household furniture (NAICS 337123), and wood container and pallet manufacturing (NAICS 32192), have had steady to marginally growing nominal sales over the past 10 years. Only “wood window and door” manufacturers have seen sales steadily drop to very low levels.

Foreign trade of secondary wood products to and from Alberta has dramatically changed over the past 20 years. Alberta has gone from a modest net exporter in 1995, to a large net exporter by 2000, to a large net importer by 2014 (Figure 4). The growth in exports between 1995 and 2000 is consistent with the overall growth in the sector (Figures 1 and 2); the furniture industry experienced overall sales and employment growth and export growth through this period (Figures 1, 2, and 4). Beginning in 2001, exports of furniture products began to fall from peak values of \$300 million in 2000 to just over \$10 million in 2014. Over this same period, Alberta’s imports of furniture products increased from around \$30 million to \$126 million. Decreased export demand and increased import competition were likely behind the reduced overall sales and employment of the furniture industry over this period. Although it is difficult to determine which factors contributed to these fluctuations, the overall export and import trends track the changing US–Canadian dollar exchange rate, suggesting loss of competitiveness related to the strengthening Canadian dollar in recent years (Figure 4).

A detailed look at Alberta’s furniture trade uncovers two key trends since 2000; that is:

1. a dramatic decrease in office and bedroom furniture exports (Figure 5); and
2. a dramatic increase in imports of bedroom furniture, seats (predominately upholstered), and other wooden furniture (e.g., home desks, vanities, cabinets, shelving, living room furniture).

The US–Canada dollar exchange rate certainly seems to be a strong factor behind the bedroom and office furniture export trends, as nearly all exports over this period were sent to the United States and as the Canadian dollar became stronger exports fell. Over this same period, bedroom and other wooden furniture imports came from mainly Asian countries, such as China and Vietnam, and to a lesser extent Mexico, the United States, and Europe, suggesting that globalization trends of moving manufacturing and assembly to lower-cost countries had more to do with the trend than exchange rates. For upholstered seats, the factors include both globalization and loss of competitiveness with United States manufacturers related to the stronger Canadian dollar, as imports surged from both China and the United States over the period and exports to the United States fell to virtually zero by 2009 (incidentally during the Great Recession).

Similar to wood furniture trade trends, the prefabricated buildings industry, which falls under product code HS 940600 that covers wood, steel, aluminum, and inflatable buildings and industry code NAICS 321992, went from being a large net export product group to a large net import product group (Figure 4) (see Appendix 5 for detailed correspondence between NAICS codes and the Harmonised

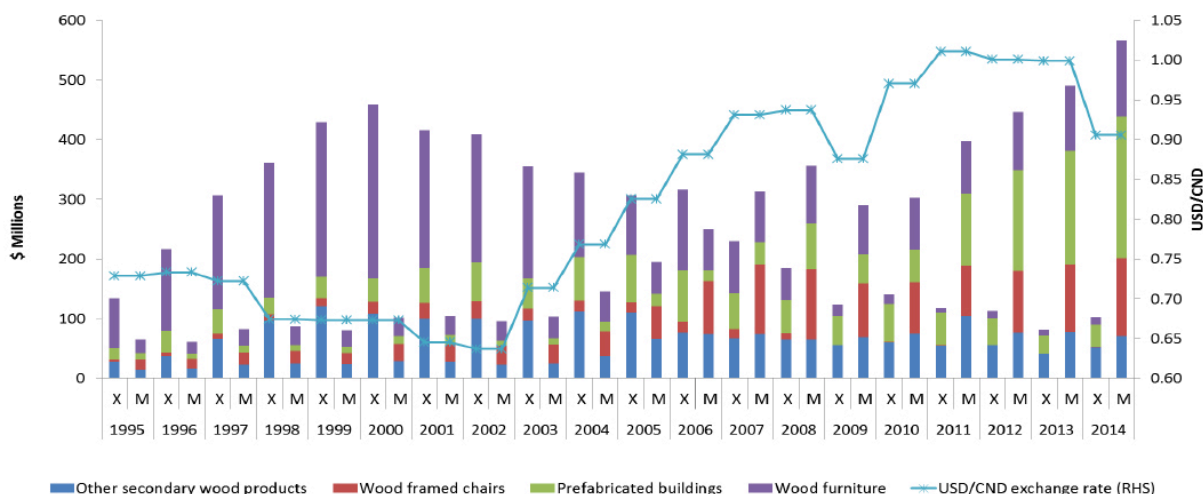


Figure 4. Aggregate exports (X) and imports (M) for NAICS 6-digit industries, excluding panelboards (NAICS 321211, 321212, 321217) (source: Trade Data Online website).¹

¹ See Innovation, Science and Economic Development Canada’s “Trade Data Online” (TDO) website at: <https://www.ic.gc.ca/eic/site/tdo-dcd.nsf/eng/home>.

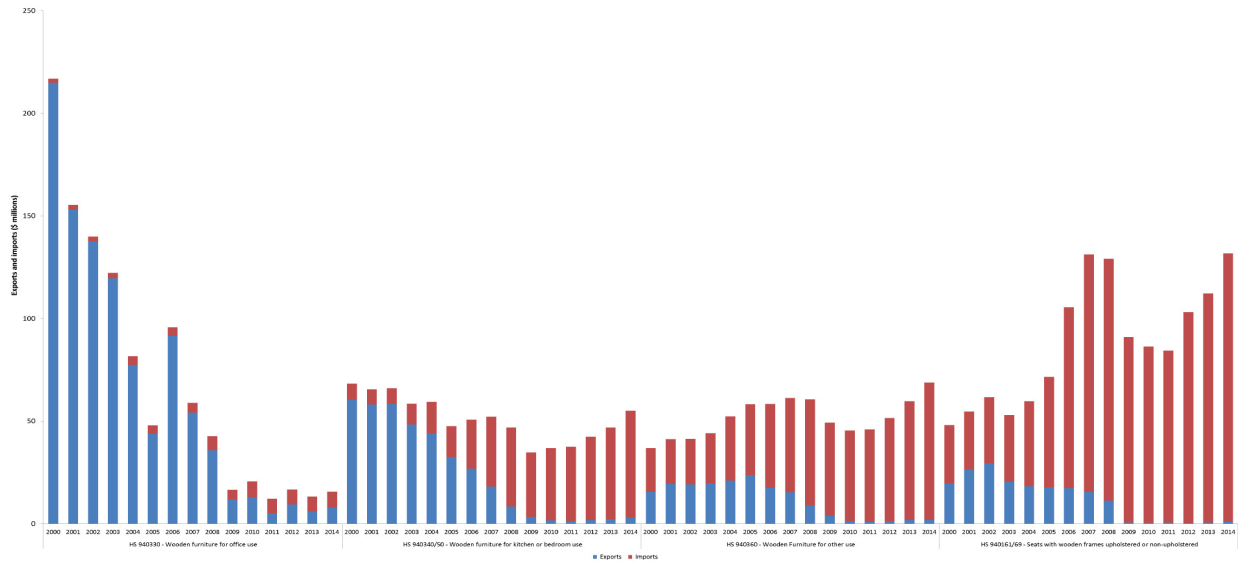


Figure 5. Alberta’s wood furniture imports and exports, 2000–2014 (source: Statistics Canada 2014b).

System [HS] of product codes). Industry Canada’s special trade data aggregation for NAICS 321992 shows that Alberta’s industry went from exporting over \$43 million of wood buildings in 2006 to just over \$18 million in 2014.² Over the same period, Alberta’s imports (almost entirely from the United States) went from just over \$1 million to nearly \$110 million. The big change in Alberta’s trade balance occurred between 2007 and 2008, at the start of the Great Recession

and the beginning of a period when the US–Canada dollar exchange rate exceeded \$0.90 US for \$1.00 Canadian.

3.2.1 Panelboard Mills

Although panelboard mills are technically classified as secondary manufacturing mills because of the large average size of mills and the scale of the industry, they are sometimes treated as a primary industry. In this study, we recognize

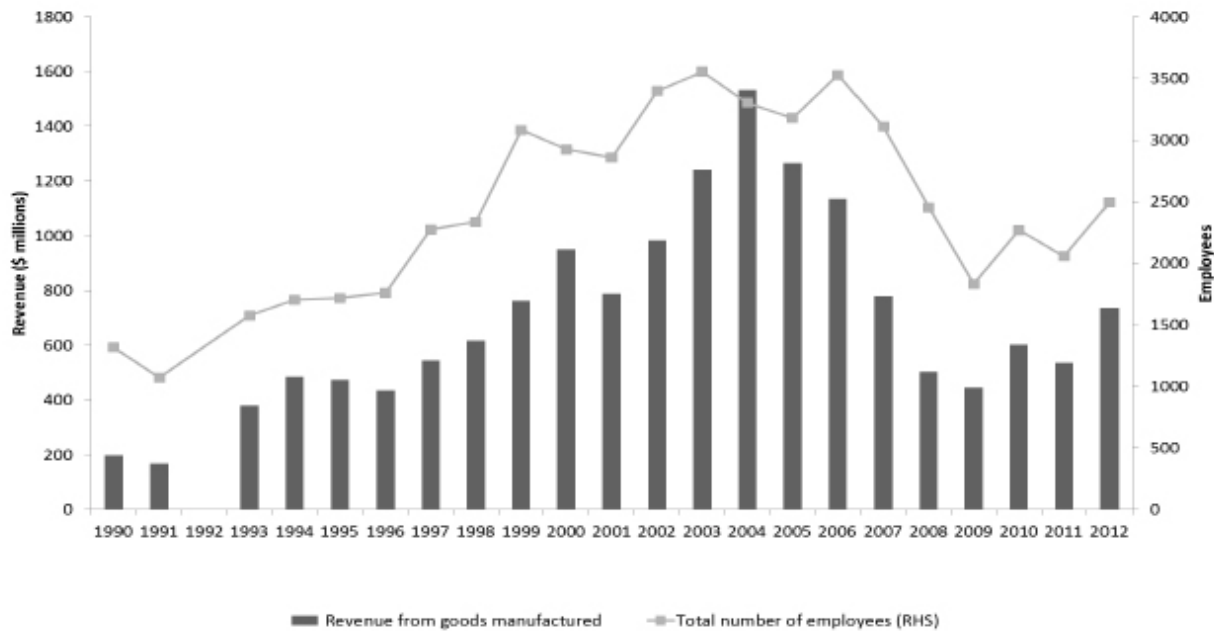


Figure 6. Manufacturing sales revenue and total number of employees for Alberta panelboard industry, 1990–2014 (source: Statistics Canada [2012]).

² Ibid.

panelboards as part of the secondary wood manufacturing sector but exclude them from the survey analysis owing to confidentiality issues and low survey response rate. Here we provide a cursory overview of the industry trends and current state using data available from Statistics Canada and Innovation, Science and Economic Development Canada.

In 2014, six mills made hardwood veneer or softwood plywood and veneer, four mills made either particle board or fibreboard, and four mills made waferboard (oriented strand board) (Figure 6; Statistics Canada 2014a). Between 1990 and 2012, the industry grew considerably with employment and revenues peaking in the mid-2000s. After a significant decline during the United States housing slump beginning in 2007 and the subsequent Great Recession of 2008–2009, the industry has been slowly growing over the past few years.

In 2014, Alberta's exports of panelboard products reached \$305 million after hitting a low of \$130 million in 2008 in the middle of the Great Recession (Figure 7). Nearly all of Alberta's particleboard, fibreboard, and plywood is shipped

to the United States, with the province's panel industry fueled by demand for waferboard (orientated strand board) in United States housing construction (Figure 7). After reaching a low point for exports in 2012, exports of particleboard to the United States reached \$250 million in 2014 as its housing market began to stabilize and grow. Alberta's exports of fibreboard have been less volatile than particleboard, but the \$38 million shipped to international markets in 2014 was less than the peak shipments achieved in 2001. Recently, imports of fibreboard and plywood have been growing with China as the dominant supplier, although some fibreboard is sourced from Europe. With growing imports and declining exports, Alberta's balance of trade was slightly positive for fibreboard in 2014 and slightly negative for plywood.

3.2.2 Secondary Manufacturing Versus Other Forest Product Sectors

Since 1992, the industries associated with secondary wood product manufacturing have grown considerably, although most of this growth occurred in the 1990s (Figure 8). Real

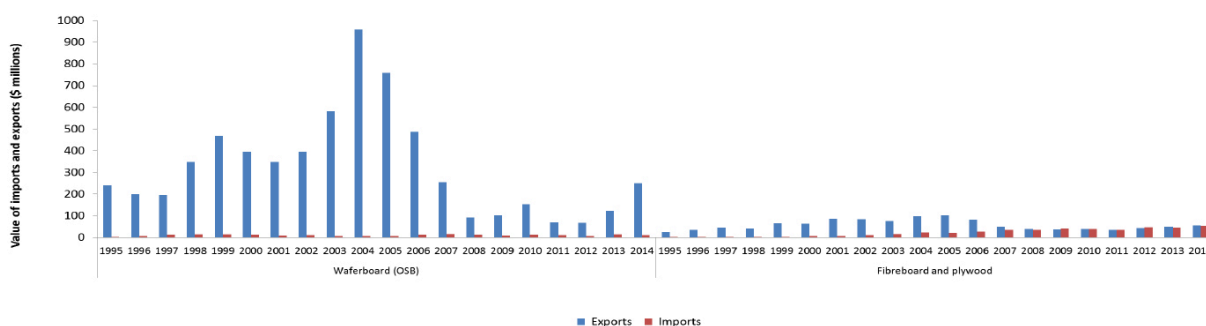


Figure 7. Value of exports and imports of waferboard (oriented strand board), fibreboard, and plywood, 2000–2014.³

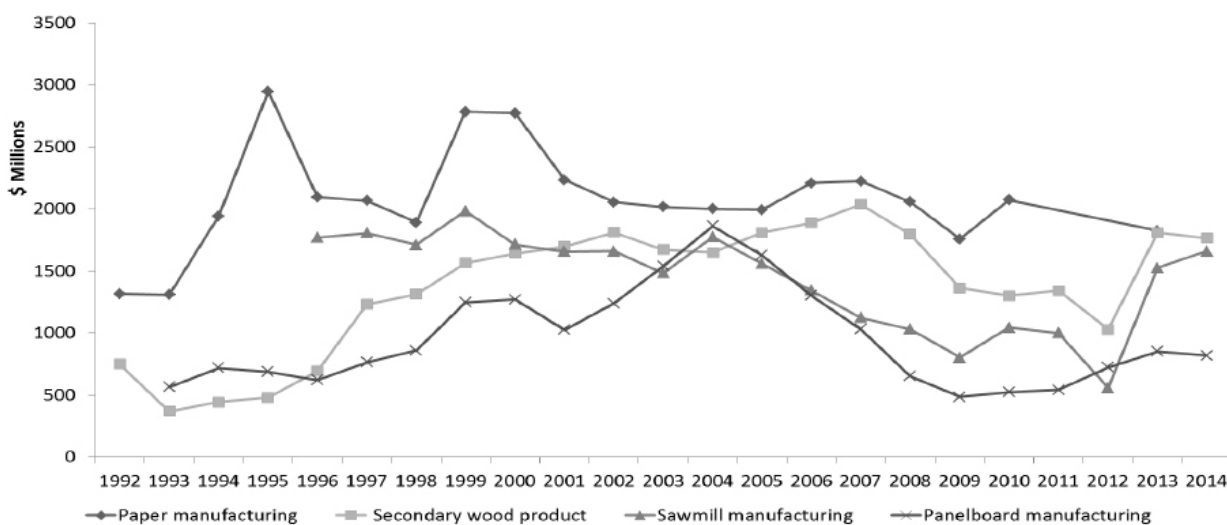


Figure 8. Real sales from manufacturing (2014 constant dollars), 1992–2014. Note: Data unavailable for some years. Engineering wood product components included in “panelboard manufacturing” and not all furniture included in “secondary wood manufacturing” is wood furniture (source: Statistics Canada 2015).

³ Ibid.

manufacturing sales measured in 2014 dollars for “secondary wood manufacturing” (NAICS 3219, 3371, 3372) grew 136% from \$750 million in 1992 to over \$1.7 billion in 2014, with peak sales occurring in 2007. In comparison, over similar periods, real manufacturing sales increased 38% for pulp and paper (1992–2013), 6% for sawmilling (1996–2014), and 45% for panelboards (1993–2014). In addition, compared to the

primary product sectors, only sawmilling has fared better than secondary manufacturing since the end of the recession, with sales near to pre-recession (2006) levels. At the end of 2014, secondary manufacturing was the second largest forest industry group in sales, although if panelboards are included, it would be the largest forest industry grouping in Alberta.

4. Survey Results

This section provides results and insights from the survey. First, we characterize the geographical distribution and scale of the sector using information from all identified businesses. Then, we profile the various businesses by products, employment, costs, and sales. This is followed by an in-depth look at the type and source of fibre used by the businesses. Next, we report on how respondents use the internet to support their businesses. Finally, we report on the opportunities and challenges facing the survey respondents to get a sense of the outlook for the future, and highlight possible areas where effort could be directed to support industry growth.

4.1 Current State of the Sector

The estimated number of secondary wood product manufacturing firms, as defined in the survey, was 205 in 2013 (see Table 1). For 2013, aggregate employment and sales (excluding panelboards) are estimated to be 7449 and

\$1.355 billion, respectively, based on survey responses and additional information collected from company reports and industry directories during the survey process. These statistics are not completely comparable to those produced by Statistics Canada, given the differing methodology and definitions used, and the incompleteness of available Statistic Canada data related to confidentiality rules; however, these magnitudes seem reasonable.

The millwork, pallets and containers, and buildings business types are located entirely in the south of the province where the population and demand for those products is concentrated (Figure 9). Millwork includes architectural millwork that will be used in commercial buildings and these business types are logically located around the commercial hubs of Edmonton and Calgary in the North Saskatchewan and the South Saskatchewan regions.⁴ The business types producing commodities (i.e., remanufacturing and other wood

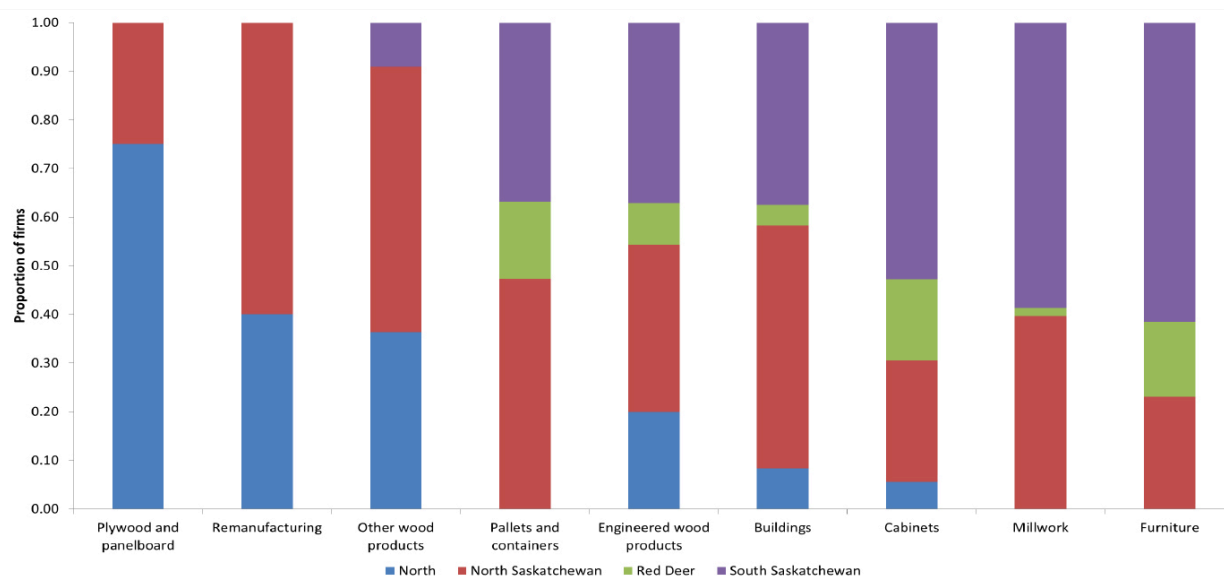


Figure 9. Location of Alberta’s secondary wood manufacturers in 2013, by business type.

⁴ These regions are the “land-use framework planning regions” used by Alberta Environment and Sustainable Resource Development (as of April 2011), Forestry Division, Forest Management Branch. In this section, the Upper and Lower Peace region and the Upper and Lower Athabasca region are grouped into one region called the “North.” These are the same regions depicted in Figure 10, where they are referred to simply as “Forest Regions.”

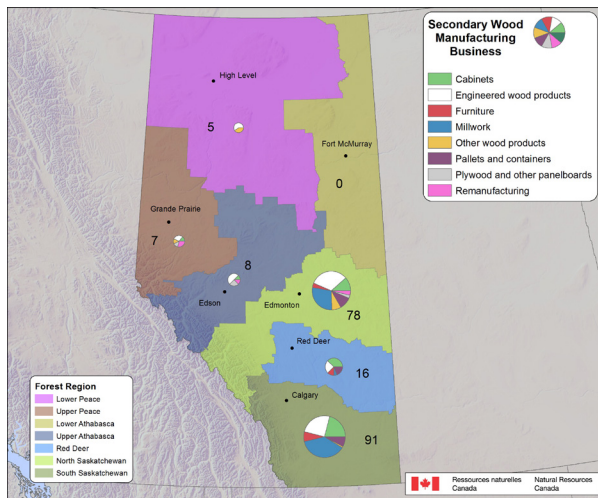


Figure 10. Locations of Alberta’s secondary wood manufacturers in 2013, showing number of firms and business type.

products) or using more wood inputs (i.e., plywood and panelboards) are in the north, closer to their wood fibre inputs sourced from the primary production mills. The few building businesses in the north tend to be those specializing in log and timber-framed buildings. Cabinets and engineered wood products (i.e., trusses and joists) are well distributed and close to major housing markets. Furniture businesses are clustered in the south, close to large population centres and within reach of United States regional markets via major transportation hubs. The pallets and containers operations are located throughout the south to serve the key manufacturers and

the transportation hubs of Calgary and Edmonton. Building businesses focused on prefabricated and mobile buildings are clustered around the manufacturing centres of Calgary and Edmonton.

Figure 10 shows that most firms are in the south, with 44% in the South Saskatchewan region and 38% in the North Saskatchewan region. Secondary manufactures are sparse in the North region (~10%), with 2% of those firms located in the Upper Peace, 3% in the Lower Peace, 4% in the Upper Athabasca, and none in the Lower Athabasca.

4.2 Business Profile

Across all business types, approximately 122 distinct products or product types are manufactured, with the engineered wood product and cabinet business types producing the greatest variety of products. Engineered wood product operations commonly manufacture flooring, I-joists, laminated veneer lumber, and oriented strand board or the newer innovations in wood products such as cross-laminated timber. Cabinet makers manufacture products used in kitchens or commercial cabinets, although some of these firms also make doors, which would typically be produced by millwork operations. Appendix 6 provides a detailed breakdown of the products manufactured by the various business types surveyed.

The fewest number of products is associated with the furniture business type, although our survey’s low response rate may mean that our results do not accurately reflect the

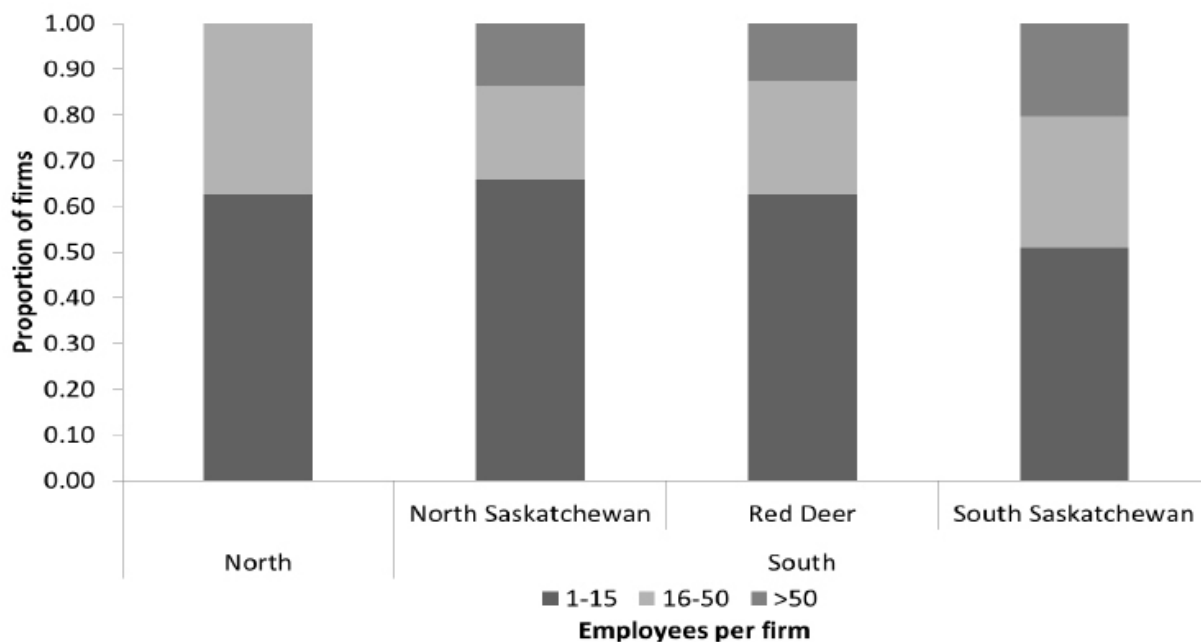


Figure 11. Proportion of firms (n = 161 firms) in each region by size (employees per firm).

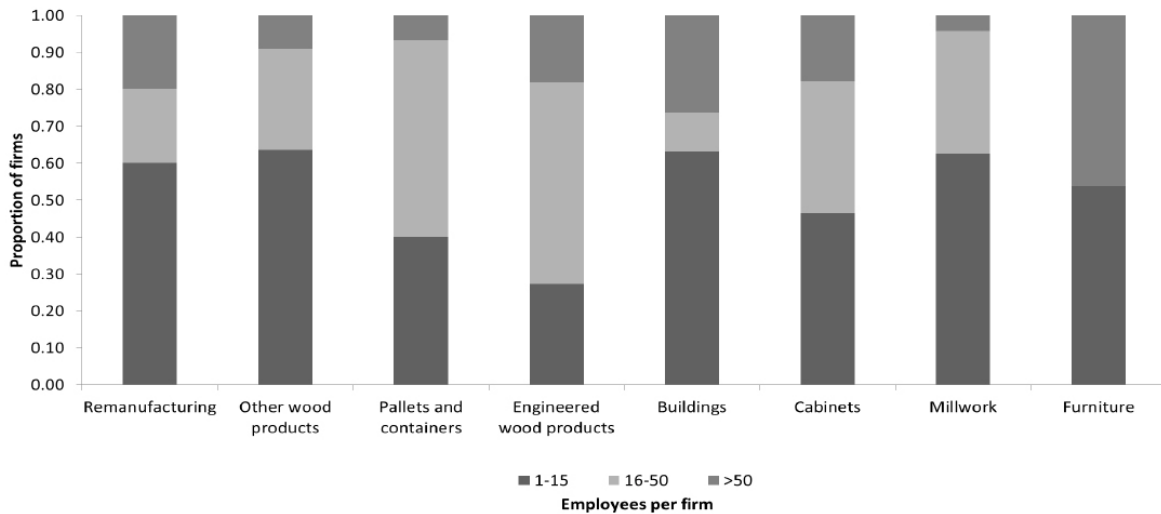


Figure 12. Distribution of firms across secondary manufacturing business types by size (employees per firm) (n = 161).

diversity of products manufactured. Products manufactured by furniture operations are broadly classified as office furniture or school furniture, as well as furniture in general, and thus do not truly provide insight into the scope of products manufactured by this business type. Millwork operations manufacture doors and windows and duplicate some products manufactured by cabinet firms. Operations related to the buildings business type manufacture both commercial buildings and residential buildings, such as log homes, modular homes, or trailers. The variety of products produced within

the secondary wood manufacturing sector is continuously evolving as firms find new markets with specific dimensional requirements, or as wood product innovation uncovers new ways to take advantage of wood's properties.

Nearly one-third of survey respondents indicated they provided some form of service. About one-quarter of respondents provided a manufacturing service, most commonly re-sawing, planning, or kiln drying. About one-fifth of the companies provided a non-manufacturing service, namely marketing (15%), logistics (12%), and distribution (8%). For

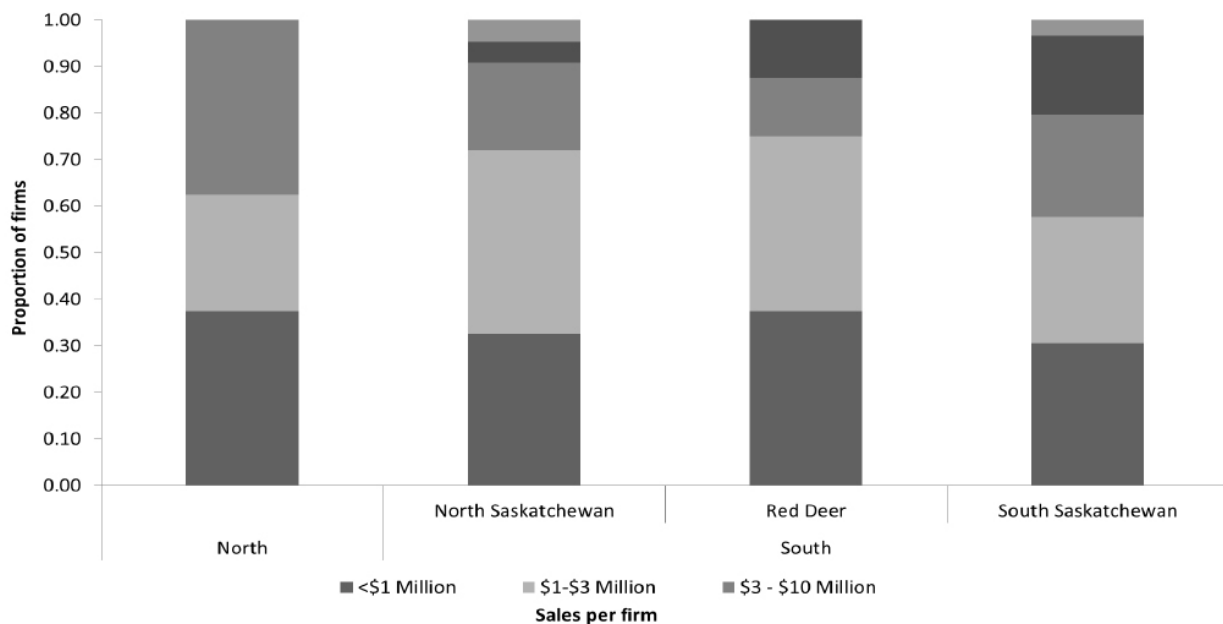


Figure 13. Proportion of firms (n = 161) in each region by size (sales per firm).

some companies, service provision represented up to 30% of their gross sales; however, for most companies, service provision produced around 5% of gross sales.

4.2.1 Employment and Sales

Sixty-nine of the 161 surveyed firms were small, having 1–15 employees. The average firm had 46 employees, while the median is 18. Figure 11 shows that the 19 large firms (> 50 employees per firm) are in the three southern forest regions, which contain most of the provincial population. The South Saskatchewan region has the greatest proportion of large firms. The larger firms fall within buildings, remanufacturing, and furniture business types. The pallets and containers and engineered wood products business types have the highest proportion of medium-sized firms (Figure 12). The 28 cabinet manufacturers are well distributed across small, medium, and large firms in terms of number of employees.

The size of firms as measured by gross sales is comparable to the size as measured by the number of employees; that is, most firms are small businesses, with approximately 60% having less than \$3 million in sales. Sales for 2013 averaged across all firms is \$8.4 million, with median sales of \$3.3 million. Figure 13 shows the distribution of firms across regions. No firms in the North region had sales above \$10 million, whereas all firms in the South did. The largest firms, with sales above \$50 million, are in the North Saskatchewan (Edmonton) and the South Saskatchewan (Calgary) regions.

For Figure 14, which presents firms' sales across business types, we used additional information gathered from non-respondent firms or secondary sources such as websites. The remanufacturing, buildings, and furniture business types stand out as the only firms with sales greater than \$50 million. Most

firms in the millwork business type had sales of less than \$10 million per year. The firms in the engineered wood products and pallets and containers business types are generally larger, with only 10% having sales of less than \$1 million.

Figure 15 combines sales and employment data to show average sales per employee across business types. Sales per employee is an indicator of the potential wage levels available to employees, as higher sales per employee may indicate the manufacture of higher value-added products. Nevertheless, businesses with a high volume of output, and therefore sales, may also have high material (e.g., raw lumber) and capital costs and thus may not generate much value-added product per employee, which is required to support higher wages.

The remanufacturing business type had the highest sales per employee; the other wood products and pallets and containers business types also had relatively high sales per employee ratios. Average sales per employee is very similar for the buildings, furniture, millwork, engineered wood products, and cabinets business types, but all markedly lower than the pallets and containers business type, which had the third highest ratio.

4.2.2 Cost Structure

Figure 16 highlights the amount of wood and proportions of costs in four categories used in each business. ⁵The big consumers of wood fall into the remanufacturing, pallets and containers, and engineered wood products business types. Labour is a substantial cost across all business types but is greatest for the buildings, millwork, and cabinet firms. Other costs make up the greatest share of total costs for the buildings and other wood product business types, mainly

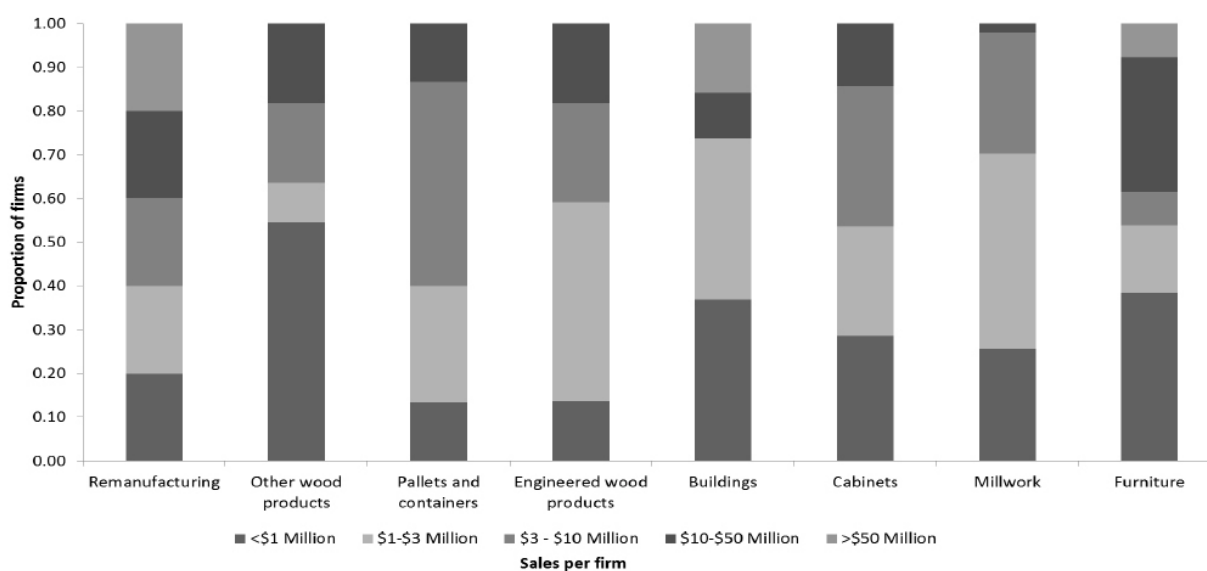


Figure 14. Sales revenue per firm (n = 160 firms), by secondary manufacturing business type

⁵ Note that the furniture business type was removed owing to a low response rate.

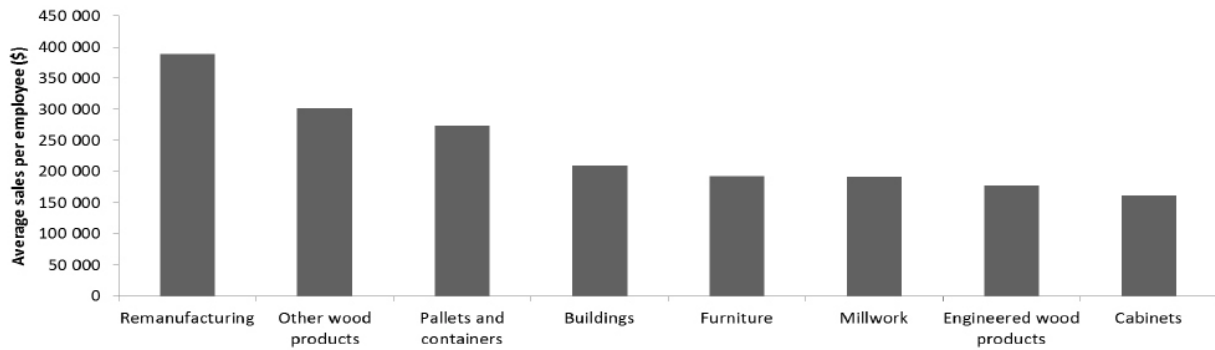


Figure 15. Sales per employee across business types.

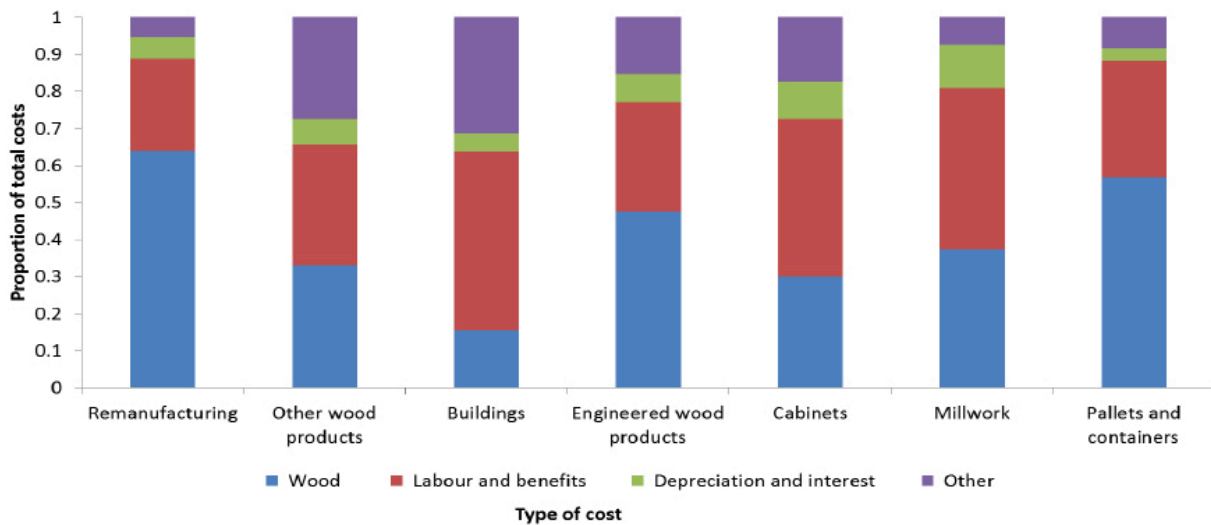


Figure 16. Distribution of operating costs across business type.

steel for use in mobile buildings and framing for oil rig mats (other wood products). Depreciation and interest are generally a small part of the cost structure but most significant for cabinet and millwork business types.

The buildings business type uses the smallest proportion of wood, at 15% of their total costs, even though log homes use a greater proportion of wood than other firms in this category. The low response rate from log home builders will have influenced this result. Much of the manufacturing from this business type includes commercial buildings manufactured for the oil and gas and mining sectors.

4.3 Wood Material Utilization and Species

The information gathered from survey respondents offers unique insights into the relative interdependence between Alberta's primary and secondary wood product sectors. To enable comparison, fibre use was converted into roundwood

equivalents.⁶

Sixty-seven percent of all fibre used by Alberta manufacturers is in the form of lumber, with logs as the second largest fibre input at 31% (Figure 17). About 2% of wood fibre used is in the form of plywood or oriented strand board. The plywood material is used by the pallets and containers, cabinets, and millwork business types, while all the oriented strand board is consumed by the buildings business type. The remaining fibre is made up of melamine and particleboard used by the cabinets and millwork business types. The pellet mills in our survey were integrated with lumber mills, and therefore their fibre supply is represented in the log data. This explains, in part, the high use of log fibre inputs by the other wood products business type. In addition, a laminated veneer lumber mill is fully integrated, making the veneer onsite from whole logs, which explains why the engineered wood products business type has such high log inputs.

Figure 18 shows the volume of wood fibre species used. The

⁶Conversion factors are based on Nielson et al. 1985.

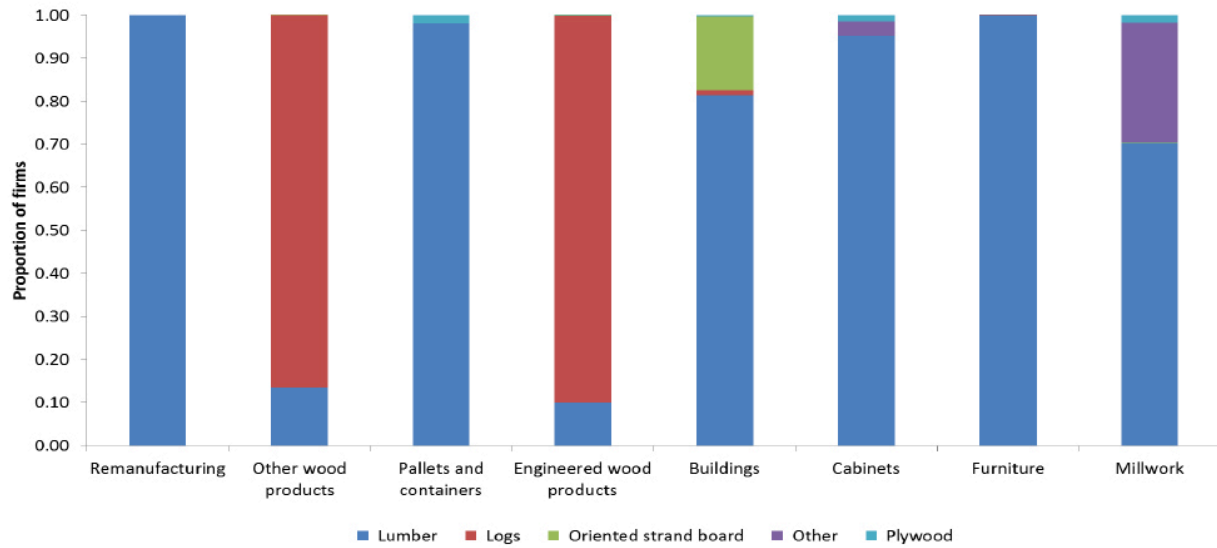


Figure 17. Distribution of wood fibre by business type.

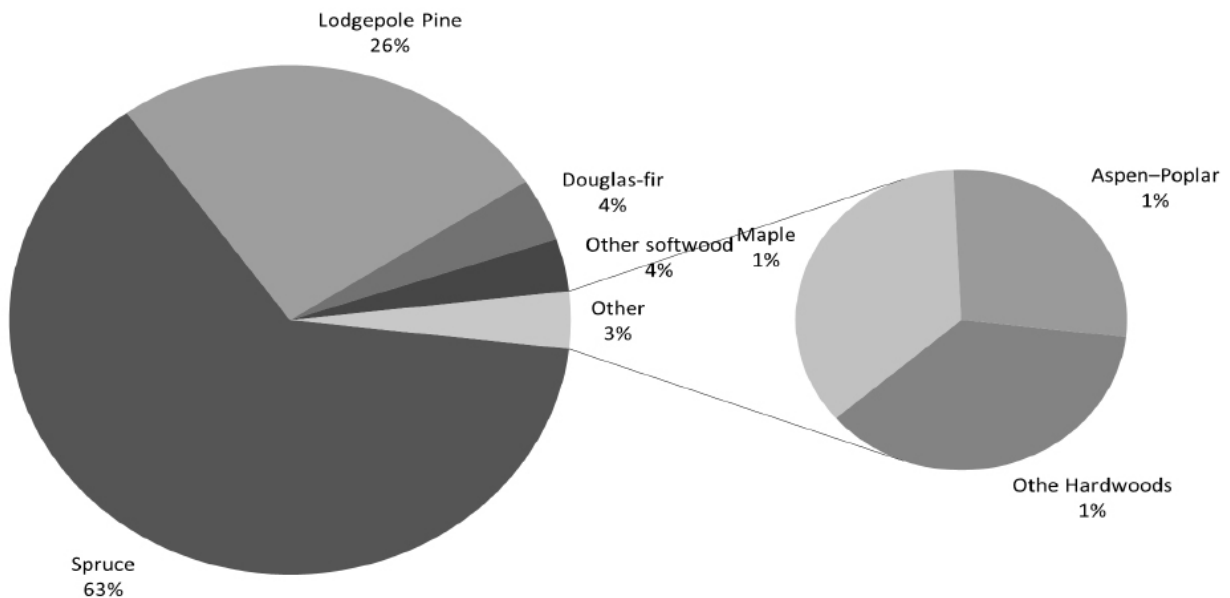


Figure 18. Percentage of wood fibre species used.

survey respondents (n = 57) used about 1.5 million m3 of roundwood equivalent. Softwood species made up most of the volume used and are the key input for several business types. Spruce (63%) and lodgepole pine (26%) are used extensively and are both commonly found in Alberta. Douglas-fir (4%) was also used, as well as various other softwood (4%) species such as larch, tamarack, and hemlock. The business

types in the North region use softwood species exclusively. Aspen and poplar (1%), common in Alberta, and maple (1%) were the most commonly used hardwood species. Other hardwoods, such as oak, birch, walnut, and cherry, made up 1% of the wood volume used.

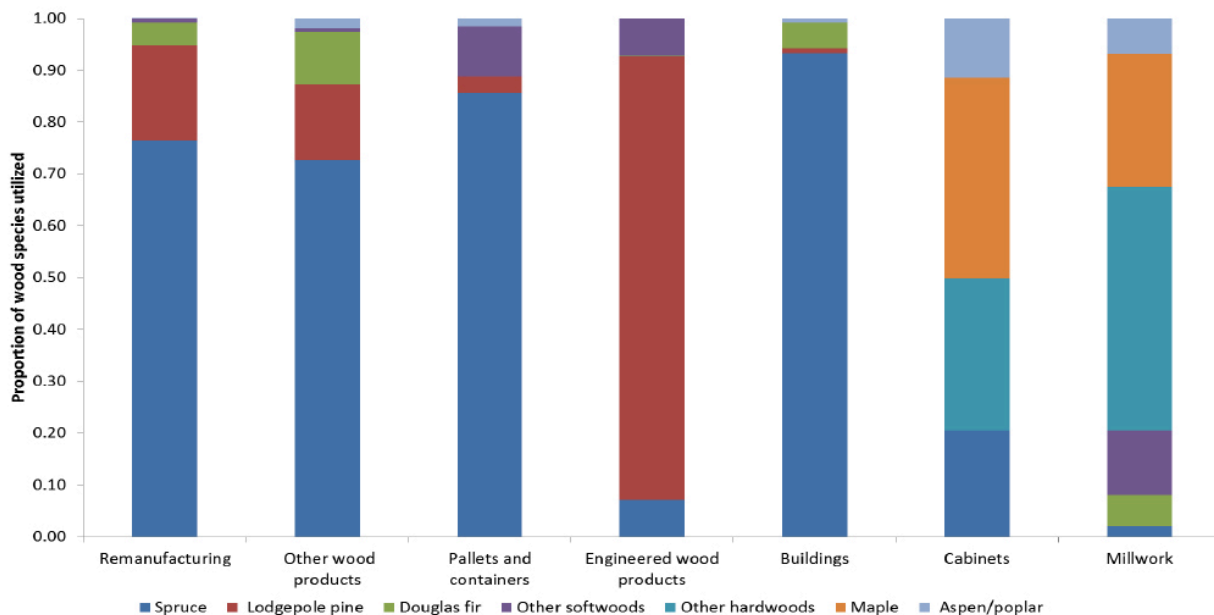


Figure 19. Wood species use by business type (excluding furniture).

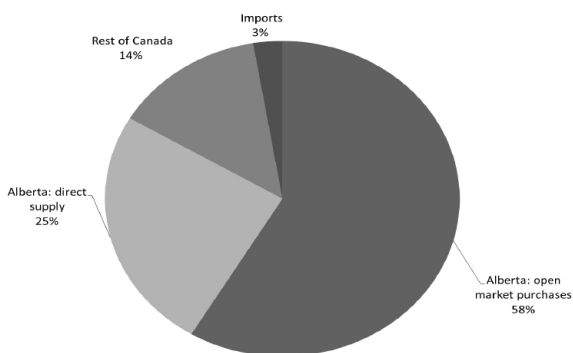


Figure 20. Percentage of wood volume by source.

Figure 19 shows species use by business type. Remanufacturers use the greatest volume of wood fibre (43%), followed by the other wood products (19%), engineered wood products (17%), and pallets and containers (16%) business types. These business types, along with buildings, used the greatest proportion of softwoods. The cabinets and millwork business types use the highest proportion of aspen and poplar and other hardwoods, as well as using the greatest variety of species. The few furniture firms (not shown in Figure 19) that did respond to the survey use local softwood, but this may not be indicative of the entire industry. In addition, the buildings business type's use of aspen may be underreported. Aspen is the main timber species used to produce oriented strand board in Alberta.

Although buildings operations reported oriented strand board as making up close to 20% of their wood inputs (Figure 17), this business type reported the use of only a small amount of aspen (Figure 19).

Figure 20 shows that most (83%) of the wood volume used by the responding firms was sourced from Alberta, either from the open market (58%) or directly from the forest through a harvest license (25%). The remaining volume is sourced from the rest of Canada (14%) or imported (3%). Over 60% of firms sourced some or most (> 50%) of their fibre domestically in Alberta. Twenty-five percent of firms sourced some or most (> 50%) of their fibre from the rest of Canada. Of the imports, hardwoods are sourced from the eastern United States and Douglas-fir is sourced from Washington and Oregon.

4.4 Markets

To understand market specialization and highlight possible opportunities for market diversification and growth, we asked respondents to list the markets in which they sold their products. Not surprisingly, the markets for Alberta's products are concentrated locally, with 57% of sales going to the domestic market (Figure 21). This is considerably lower than the 76% estimated in the 1980s (Halmark Engineering and Woodbridge, Reed and Associates 1983). The rest of Canada accounts for 26% of sales, which are distributed across the Other Prairies (10%), British Columbia (8%), and Eastern Canada (8%). Although we could not compare current and

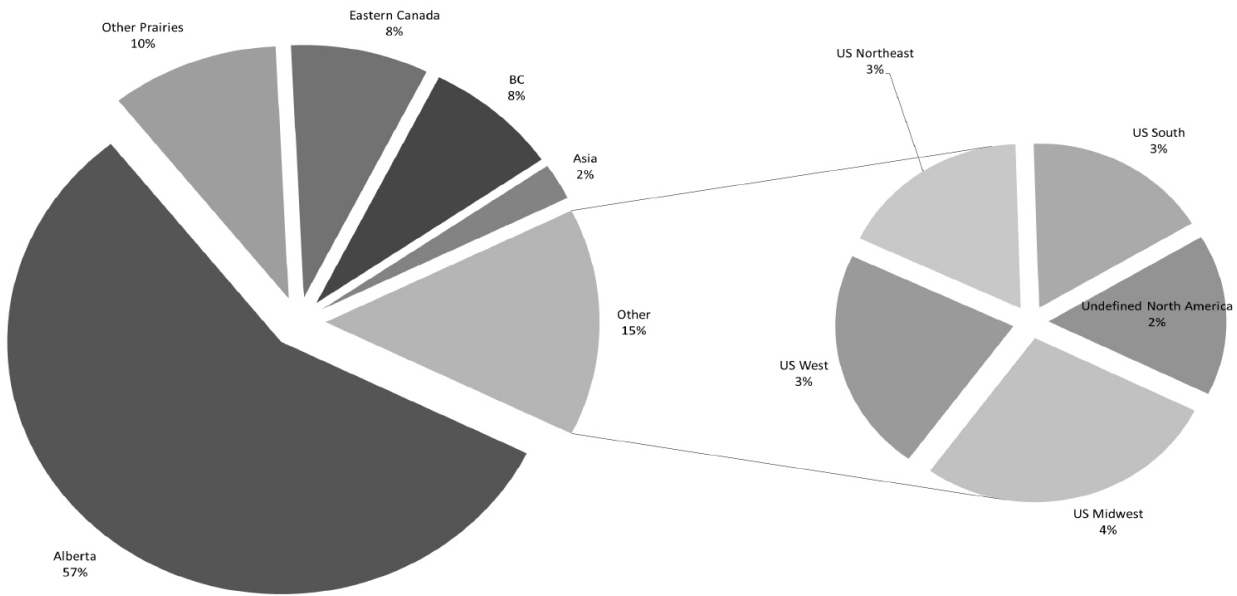


Figure 21. Market shares of Alberta secondary manufacturing sales.

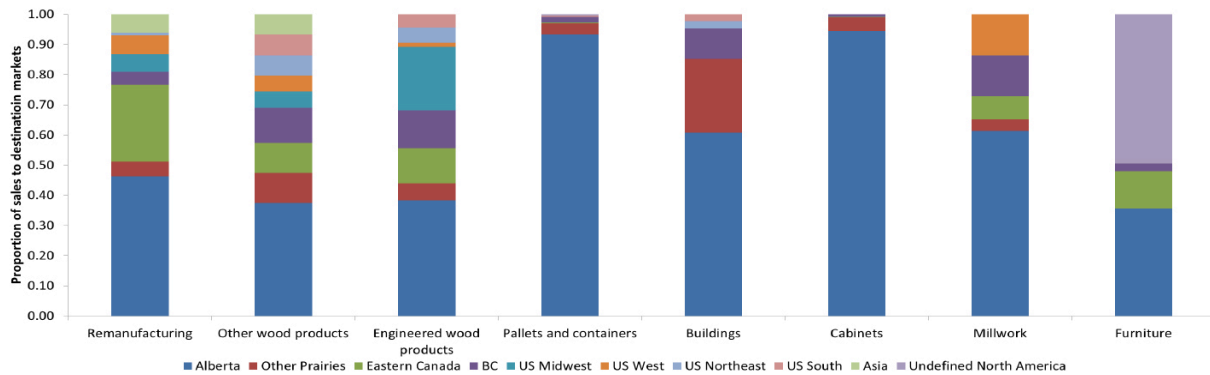


Figure 22. Distribution of sales to destination market by business type.

past sales distribution across markets (as we could in our British Columbia report, as the Canadian Forest Service has conducted repeated studies over 25 years; see Bogdanski and McBeath 2015), we speculate that the Alberta secondary wood manufacturing sector has been buoyed by domestic demand while the United States housing market continues to recover from the 2006–2010 housing crisis. As this market continues to improve, we expect that the proportion of sales to the United States (currently 14%) will increase. Sales to the United States are well distributed across the regions, with the Midwest leading the way at 4%. Currently, sales to overseas markets are very low (2%) and far less than British Columbia's 20% (see Bogdanski and McBeath 2015). Overseas sales are exclusively to China and Japan (1% each) and perhaps

offer the most reasonable overseas market expansion opportunities.

The most diversified business types are remanufacturing, engineered wood products, and other wood products, which ship to all key markets including overseas to Asia (Figure 22). The engineered wood products business type has made the greatest progress into the United States market and this growth should continue (see Section 4.6 Economic Outlook). The buildings business type serves mainly western Canada, with significant sales to the Other Prairies and British Columbia, but it has some sales to the United States. Millwork firms sell 60% of their goods in the Alberta market, but do have a presence in the rest of Canada and the United States

West. Respondents in the furniture business type indicated that sales are somewhat diversified across North America, with only one-third of sales to Alberta. The cabinets and pallets and containers business types are the least diversified, with a predominant focus on the Alberta market.

4.5 Use of the Internet

To gauge the use of emerging electronic business practices, survey respondents were asked if they use the internet in some way to support their business. The survey responses were arranged into three groups that represented the firms' use of the internet: (1) management, (2) e-commerce, and (3) marketing (Table 3).

When using the internet for management purposes, 75% of firms used it to acquire knowledge and information and 25% used it to access LinkedIn. LinkedIn, a social media tool suited to finding employment and employees, was used to some degree by all business types except engineered wood products. Overall, 65% of firms used the internet to purchase products, whereas only 18% used it to sell their products. The furniture and millwork business types were the most likely to sell their products via the internet. The engineered wood products and cabinet business types were the least likely to report electronic sales. Nearly 90% of the businesses reported having a website. This was by far the most common use of the internet for marketing purposes. When using the internet for more novel marketing tools, 33% of firms used Facebook, followed by 22% for YouTube, 13% for Twitter, and 8% for Pinterest (a web-based push-pin display board). The buildings, millwork, and furniture

business types, which tend to sell finished consumer products, were more likely to use these electronic marketing tools, perhaps seeing them as an effective marketing channel to final consumers. Although the furniture business type had a low response rate, the visual nature of these products is a good candidate for internet marketing.

One-third (n = 63) of survey respondents indicated that they planned to expand their use of the internet. Twenty-five percent of these firms did not use the internet or simply had a website, whereas 75% already used the internet beyond a simple web presence to support their businesses. Over one-half of these firms indicated that they will redesign their web pages, one-third that they will adopt social media, and one-third that they will expand into e-commerce. Forty percent of these were millwork firms, with an equal number of cabinets, engineered wood products, and pallet and containers firms also expecting an expansion into e-commerce. Ninety percent of the firms intending to expand were either of small or medium size (i.e., less than 50 employees).

Twenty-eight of the 63 survey respondents provided various reasons for not adopting or expanding their use of internet. The two most common reasons were: (1) they did not see how the internet would help their business; and (2) they had insufficient resources (i.e., time, cost, or knowledge).

4.6 Economic Outlook

When we look forward to the economic future of secondary manufacturing in Alberta, we need to consider the domestic

Table 3. Percentage of firms using the internet for management, e-commerce, or marketing by business type

Business types	Management		E-commerce		Marketing				
	Knowledge – Information	LinkedIn	Purchase	Sell	Website	Facebook	YouTube	Twitter	Pinterest
Remanufacturing	60	40	60	20	60	60	20	0	0
Other wood products	67	17	50	17	83	17	0	0	0
Buildings	86	29	71	14	86	29	29	29	14
Engineered wood products	60	0	40	0	100	0	0	0	0
Cabinets	71	29	79	7	93	36	14	14	0
Millwork	100	31	85	31	100	46	38	15	23
Furniture	67	33	67	67	100	67	67	67	33
Pallets and containers	57	14	29	14	86	14	14	0	0
All firms	75	25	65	18	90	33	22	13	8

economy and the export outlook, most importantly for the United States economy. The current economic environment is characterized by a weak Canadian dollar, low oil and gas prices, low interest rates, and modest economic growth in the United States and Canada. The adverse impact on the Alberta economy from the current slowdown in oil and gas sector development will certainly affect regional demand for secondary wood products over the medium term. Nevertheless, modest economic growth in the United States and a steady improvement in its housing market should provide offsetting medium-term opportunities. In the next section, we examine how firms saw their economic future, looking at short-term sales trends, the 2013 level of operating capacity, expansion plans, and factors constraining expansion.

4.6.1 Short-term Sales Trends

Figure 23 shows short-term (3-year) sales trends. These trends were determined from reported sales for 2013, the change from the previous year, and the estimated change from 2013 to 2014. Over this period, the Alberta economy had 3 years of strong growth (greater than 4% annual growth in real gross domestic product), although the second half of 2014 coincided with collapsing world crude oil prices. It is unlikely that firms could have accurately anticipated the oil price collapse and its consequent impact on oil and gas development and the rest of the Alberta economy, including the secondary wood products sector. Only the buildings business type forecasted a fall in sales for 2014. This was a continuation of its downward sales trend, which started between 2012 and 2013. This negative outlook was likely a reflection of slower spending in the oil and gas sector in western Canada. For the rest of the sector, sales trends were slightly positive or flat.

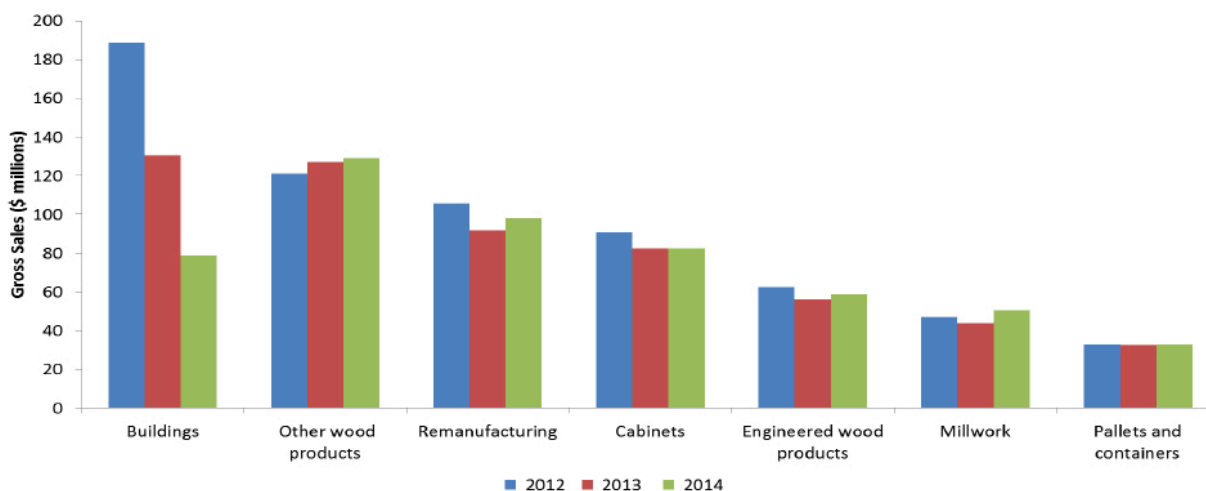


Figure 23. Trends in sales, 2012–2014.

4.6.2 Capacity Utilization and Expansion Plans

Table 4 shows that all business types were operating below 100% capacity and had room for expansion. Capacity utilization was lowest for the buildings and pallets and containers business types. Just over 40% of firms expected to expand over the next few years (Table 5). Of these firms, average expansion plans were modest at 33%. Over one-half of the firms planning to expand also had intentions of expanding into new markets, most of which were outside of Alberta.

Given the poor sales trend for the buildings business type (Figure 23), it is surprising that one-half of responding firms expected to expand over the next few years; however, the firms planning to expand were manufacturers of residential buildings and not commercial buildings, highlighting two divergent outlooks for this business type.

Table 4. Capacity utilization by business type

Business type	Capacity utilization (%)
Remanufacturing	74
Other wood products	68
Buildings	61
Engineered wood products	87
Cabinets	85
Millwork	79
Pallets and containers	65
All business types	76

The engineered wood products and pallets and containers business types were leaders in planned expansion. Sixty percent of pallets and containers firms had planned expansion and, given they had lower capacity utilization (see Table 4), physical capital should not be a constraint. Conversely, engineered wood products firms already reported a high level of capacity utilization, and so physical capital was a short-term constraint to proposed expansion. At the other end of confidence range, only 23% of cabinet makers expected to expand.

Interestingly, 13 of the 20 firms that planned to expand their use of the internet also expected to expand manufacturing capacity; thus, e-commerce and e-marketing were a key part of their business development strategy. Nevertheless, most of these firms tended to have more than 10 employees, suggesting that labour resources, expertise, or cost may limit smaller companies from pursuing the same strategy. Furthermore, 40% of firms expecting to expand their use of the internet were also hoping to break into new markets, all outside of Alberta, possibly seeing expanded internet use as the means to reach new clients. This seems likely as of the remaining two-thirds of the 18 firms that intended to expand their markets only two did not use the internet for e-commerce or social media, supporting the view that a strong web presence is necessary to support business expansion, especially outside of Alberta.

Clearly, as a growing United States economy with favourable interest rates and improved employment numbers will drive future housing needs, rising house prices will also influence consumer choices, making multifamily units more attractive. Like the United States, multifamily unit structures in Canada account for a greater share of new residential construction

compared to 10 years ago. APA – The Engineered Wood Association's outlook for 2015 expected multifamily units to account for around 40% of housing starts in Canada and 36% in the United States. This is positive for the secondary manufacturing sector overall, and represents a good outlook for engineered wood products and panelboard firms.

Table 5. Planned capacity expansion

Business type	Proportion of firms expecting to expand (%)	Average Expansion (%)
Engineered wood products	60	27
Pallets and containers	57	66
Buildings	50	43
Remanufacturing	40	25
Millwork	46	28
Other wood products	40	13
Cabinets	23	17
All business types	43	33

4.7 Constraints to Expansion

Our survey examined six factors that may constrain a firm's ability or expectations for expansion: (1) wood supply; (2) labour; (3) markets; (4) financing; (5) management capacity;

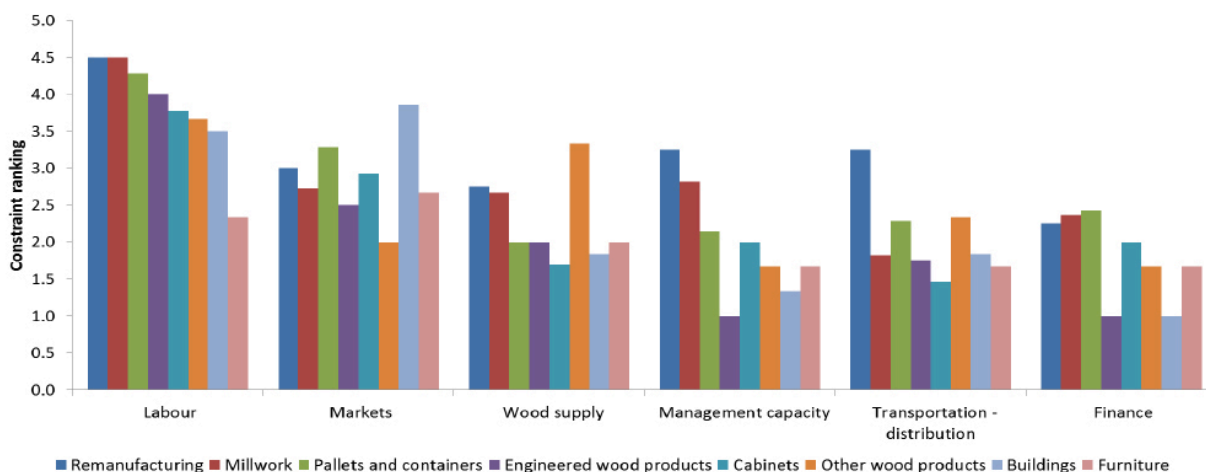


Figure 24. Constraints to expansion, where 1 = least constraining and 5 = most constraining.

and (6) transportation and distribution. Firms were asked to rank each of these factors on a scale of 1 to 5 (i.e., from least constraining to most constraining). Survey respondents also ranked subcategories of these six factors, providing some insights into the specific issues that may constrain expansion. The detailed responses are tabled in Appendix 7. Figure 24 clearly indicates that labour issues (3.9) were perceived as the most constraining to a firm's ability to expand in Alberta. This result was expected given that, at the time of this survey, Alberta's economy was dominated by the oil and gas and mining sectors, well known for their high levels of labour demand and high wages. All business types scored this factor as 3.5 out of 5.0, or higher, except for the furniture business type, which scored it below 2.5. In the detailed responses, we see that firms were concerned not only about the cost (3.8) of labour but also about the level of experience (3.9) and training and skills (3.6). Furthermore, responses to the closely related question on labour efficiency under "Management Constraints" also ranked high (3.5). Clearly, the survey respondents perceived multiple issues surrounding labour as constraints.

Firms across all business types ranked markets as the second greatest constraint to growth (2.9), with the buildings business type indicating that markets (3.9) was an area of special concern for its business. This is also not surprising given that the oil and gas and mining sectors are a major consumer of this business type's products. The pallets and containers business type ranked markets as constraining, with an average score of 3.3, but the remanufacturing and millwork business types also scored this factor greater than 2.5. Although markets is the second most constraining factor overall, its relative importance varies across business types and subcategories. For example, the detailed breakdown of the market constraints (see Appendix 7) shows that foreign regulations (3.0) are important for the remanufacturing and furniture business types. The 2006 Softwood Lumber Agreement and associated dispute and uncertainty may be behind the remanufacturers' score. Market diversification also stands out for these two business types as a possible expansion constraint. Except for "market and product

research," the market constraint for the buildings and furniture business types centres on firms' abilities to make sales. Firms have products and know which markets could benefit from their products, but the diversification challenge centres on how to break into new markets.

Wood supply was ranked as the third most constraining factor, with the other wood products business type scoring this constraint as 3.3. For the remanufacturing, pallets and containers, and millwork business types, "quality and grade" appear to be an issue, whereas volume of wood fibre is an issue for the other wood products business type. Management came in as the fourth most important constraint, with the remanufacturing and millwork business types scoring it above 2.5. The big issue identified under management was cost, with five of eight business types scoring this 3.4, or higher. Transportation came in as the fifth most important constraint, and was most constraining for the remanufacturing business type (3.3). Financing came in as the least constraining factor to expansion, with no business type scoring it greater than 2.5.

Labour, markets, and wood supply have been ranked as factors constraining growth and are areas where policy improvements are necessary. Labour may be a difficult factor to influence as high wages in the oil and gas and mining sectors draw labour from Alberta as well as the rest of Canada, creating a competition challenge for the secondary wood manufacturers; however, labour skills development and labour mobility are areas where effort could be directed. Policy should also focus on developing markets. We found some firms in British Columbia opened marketing wood businesses or co-operated with other firms (business clusters) to share the marketing costs and share knowledge of new markets (Bogdanski and McBeath 2015). These types of efforts could be encouraged and supported, especially with an eye to expanding overseas market opportunities. Policies that improve wood supply may help diversify the types of businesses in the sector. For example, policies that decrease access costs to mountain pine beetle or fire-killed timber might expand opportunities for bioenergy, especially pellet manufacturing.

5. Conclusion

The Alberta secondary wood product manufacturing sector is a significant industry that has outpaced the primary sectors over the past two decades. It is a very different industry now than it was 30 years ago when the last comprehensive study of the industry was conducted. Unlike in the 1980s, the current industry produces over 120 products for Alberta

and external markets using primarily Alberta wood resources. The sector is well balanced with no one business group dominant, although the size of the buildings business type is noteworthy. One aspect that has not changed is the relative concentration of the industry around the urban centres of Calgary and Edmonton, although a sizeable

industry exists within the buffer zone of Red Deer and a more commodities-focused industry grouping is co-located near primary industry and the wood supply in the northwest of the province. Increased market and product diversification and generating more value added from its domestic timber base is a clear success story for the industry. The United States' share of Alberta sales (14%) would be expected to grow as its housing market improves, and while overseas markets are a challenge owing to distances to ports, there continues to be opportunities for growth.

Although the industry contracted similarly to the other forest sectors during the recession of 2008–2009 and the rebound has been slow, many firms surveyed expected to grow over the near term (2014–2016). At the time of the survey, firms indicated that labour, markets, and wood supply were the key constraints to growth. Responses indicate that multiple aspects of labour, including lack of skills and experience in

addition to the more obvious high wage issues, are the most pressing challenges facing efforts to expand. The recent recession in the oil and gas and mining sectors may alleviate some aspects of the labour issue, such as availability and cost, but skills training may linger as an issue and may require focused effort.

The cyclical nature of commodity forest product markets and the potential timber supply risks from the ever-present mountain pine beetle outbreak means interest remains to promote sustainable growth of the Alberta value-added wood processing sector. Through accurate and timely information on the existing structure and challenges provided by this survey, a comprehensive assessment of various options is made possible, greatly benefitting future policy development focused on the secondary wood product sector.

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Appendix 1: Taxonomy of secondary manufactured wood products^a

Log products	Wood products		
	Primary ^b	Intermediate	Final
Chopsticks	Boards	Building/home	Boxes, bins, and crates
Firewood	Cants	Components	Cabinets
House logs	Chips	Cutstock	Coffins
Pilings	Flitches	Door stock	Countertops
Poles	Lumber/Industrial timber	Edge-glued components	Decking
Posts	Treated timber	Finger-jointed stock	Fencing
Log homes	Veneer	Furniture components	Finger-jointed lumber
Shakes		Joinery stock	Flooring
Shingles		Ladder stock	Flooring/engineered
Treated pilings		Laminated components	Furniture/commercial
Treated poles		Laminated stock	Furniture/household
Treated posts		Metric stock	Furniture/patio
Novelties		Moulding, panel blanks	Furniture/RTA
		Pallet, crating stock	Garden buildings/products
		Medium-density fibreboard	Laminated veneer lumber
		Particleboard	Millwork/architectural, custom
		Pattern stock	Medium-density fibreboard
		Sawmill specialty products	Mouldings
		Staircase components	MSR lumber
		Turning squares	Oriented strandboard
		Window stock	Pallets
			Paneling
			Plywood
			Prefab buildings and manufactured homes
			Oil and gas drill rig mats
			Siding
			Staircases
			Stakes, lathe, strips, and batten
			Structural laminated beams
			Treated lumber
			Trusses
			Turned wood products
			Windows
			Wood novelties
			Wood pellets

^a This taxonomy is based on Wilson and Ennis (1993).

^b This column does not include secondary products but is inserted to provide a more complete taxonomy.

Appendix 2: 2013 Survey of Alberta Wood Product Secondary Manufacturing

Purpose:

The information collected in this survey will provide an accurate and comprehensive measure of the economic contribution of secondary manufacturing in Alberta and contribute to an Alberta secondary forest manufacturing company product directory.

Confidentiality:

The information collected will remain strictly confidential and no individual firm's business operations information will be shared. The research will contribute to a report using only aggregated information on the sector.

Respondents will be given the opportunity to be listed in a separate manufacturer's directory that profiles businesses, their products, markets, tree species used and includes company name, address and contact information provided by those firms wanting to be included.

Business Information

Company Name: _____

Mailing Address: _____

1. Please give the location of where the mill/plant site is located.

Name of Contact Person:

Mr. Ms. _____

Phone () _____ Fax () _____

Email _____

2. Do you want to be included in the company/product directory?

Yes No

3. Do you want a copy of the company/product directory?

Yes No

4. Do you want a copy of the final report sent to you?

Yes No

5. Please check the Business Type that accounts for the majority (greater than 50%) of your 2013 sales revenue.

Remanufactured products (finger joint, lumber specialties, fencing, panels, rig mats)

- Engineered wood products (glulam, LVL, I-joists, laminated posts/beams, trusses, prefab buildings, log homes, treated wood)
 - Millwork (doors, windows, architectural and custom woodwork, turned wood products, mouldings)
 - Cabinets (kitchen/vanity cabinets, cabinet doors, countertops)
 - Furniture (household, ready-to-assemble, commercial, institutional and patio)
 - Pallets and containers (pallets, boxes, bins, crates)
 - Plywood & Panelboards (excluding/net of veneer production)
 - Other (please specify)
-

Wood Use

6a. Estimate volume of wood raw material used in 2013:

Type of Raw Material		Volume
Logs (m ³)		
Lumber (1000 board feet)		
Plywood (Sq.Ft. 3/8" basis)		
OSB (Sq.Ft. 3/8" basis)		
Other (please specify what & units)		
Material	Volume & Units	

6b. Sources of wood raw material supply in 2013 (approximate) percent:

Source of Wood Supply	%
Alberta market purchases	
Canadian purchases but outside Alberta	
Other tenures *	
Imports from outside Canada	
Total = 100%	

6c. If sourced from outside Alberta or Canada, where are your wood raw materials sourced from and which species?

7. Estimate species use by % of total volume:

Softwood	%	Hardwoods	%
Lodgepole pine		Aspen/poplar	
Spruce		Birch	
Larch/tamarack		Other (please specify)	
Other softwoods (please specify)			
Total = 100%			

Operations

8. What proportion of 2013 operating costs do each of the following represent (approximate)?

Main Operating Costs	%	Other (please specify top 2)	%
Wood Costs			
Labour and Benefits			
Interest			
Depreciation			
Total = 100%			

9. Estimate the average number of full-time equivalent employees in 2013. A full-time equivalent is 220 or more days worked in the year.

_____ Full Time Equivalent Employees

_____ Production Staff

_____ Non-Production Staff

Manufacturing Capacity and Expansion

10a. Approximately what percentage of manufacturing capacity was the plant operating at in 2013? _____%

10b. How many shifts were running? 1 2 Other

11a. Do you currently plan to expand manufacturing capacity over the three-year period 2014 - 2016?

Yes No

11b. If yes, by what total % do you currently plan to expand capacity in this three-year period? _____ %

Constraints to Expansion

12a. Please rank the following possible constraints to capacity expansion for your firm from 1 to 5 where 1 = least constraining and 5 = most constraining.

	Least			Most	
	1	2	3	4	5
Wood Supply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Labour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Markets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Finance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Management Capacity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transportation/Distribution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other(specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12b. Please rank each of the following aspects of the possible constraints to capacity expansion by your firm from 1 to 5 where 1 = least constraining and 5 = most constraining.

i. Wood Supply

	Least			Most	
	1	2	3	4	5
Volume	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Price	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality/Grade	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Price Volatility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other(specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ii. Labour

	Least			Most	
	1	2	3	4	5
Training/Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Experience	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other(specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

iii. Markets	Least					Most
	1	2	3	4	5	
Softwood Lumber Agreement(SWL)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Product Diversification	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Market Diversification	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Market/Product Research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Foreign Regulations(other than SWL)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Other(specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

iv. Financing	Least					Most
	1	2	3	4	5	
Availability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Flexibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Repayment Schedule Length	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Other(specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

v. Management Capacity	Least					Most
	1	2	3	4	5	
Improving Product Quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Reducing Manufacturing Costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Increasing Labour Efficiency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Improving Raw Material Recovery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Implementing Lean/Just-in Time Manufacturing Techniques	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

vi. Transportation & Distribution	Least					Most
	1	2	3	4	5	
Costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Access	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Logistics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Frequency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Other(specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

vii. Other constraints (specify):

Electronic Commerce and Social Media:

13a. Does your company currently engage in e-commerce and/or social media (e.g. website, sales, facebook)?

Yes No

If you responded "Yes" to 13a then please skip to 13c.

13b. If no, what are the key issues for not adopting e-commerce?

13c. Does your company maintain a website?

Yes No

13d. Does your company sell products or services through the web?

Yes No

13e. Does your company purchase or search the web for inputs?

Yes No

13f. Does your company search the web for manufacturing knowledge/information?

Yes No

13g. Which social media sites does your company use? Please check all that apply.

Facebook Twitter Linked-in YouTube Pinterest Other _____

13h. Is your company currently expanding/planning to expand e-commerce?

Yes No

13i. If no, what are the key issues for not expanding e-commerce?

13j. If yes, what type of expansion are you planning (e.g. Web design, sales, purchases, social media)?

Markets

14a. List your 2013 market areas (based on % of total sales revenue).

North America	%	Overseas	%
Alberta		Europe	
B.C.		Japan	
Other Prairie		China	
Eastern Canada		Korea	
US West		Other Asia	
US South		Latin America	
US Midwest		Africa	
US Northeast		Australia/New Zealand	
Other (please specify country)			
Total = 100%			

14b. Please indicate new market areas of interest.

Sales Revenue

15a. Approximate 2013 gross sales revenue (FOB mill - C\$).

- | | | | |
|----------------------------|--------------------------|-----------------------------------|--------------------------|
| Less than 250 thousand | <input type="checkbox"/> | 24.1 - 27 million | <input type="checkbox"/> |
| 250 – 500 thousand | <input type="checkbox"/> | 27.1 - 30 million | <input type="checkbox"/> |
| 500 thousand – 1.0 million | <input type="checkbox"/> | 30.1 - 33 million | <input type="checkbox"/> |
| 1.1 - 3 million | <input type="checkbox"/> | 33.1 - 36 million | <input type="checkbox"/> |
| 3.1 - 6 million | <input type="checkbox"/> | 36.1 - 39 million | <input type="checkbox"/> |
| 6.1 - 9 million | <input type="checkbox"/> | 39.1 - 42 million | <input type="checkbox"/> |
| 9.1 - 12 million | <input type="checkbox"/> | 42.1 - 45 million | <input type="checkbox"/> |
| 12.1- 15 million | <input type="checkbox"/> | 45.1 - 48 million | <input type="checkbox"/> |
| 15.1 - 18 million | <input type="checkbox"/> | 48.1 - 51 million | <input type="checkbox"/> |
| 18.1 - 21 million | <input type="checkbox"/> | Over 51 million (please specify): | |
| 21.1 - 24 million | <input type="checkbox"/> | | |

15b. Please estimate the percentage change in gross sales revenue for 2013 over 2012 and indicate whether this was an increase (+) or a decrease (-). Calculate using the formula: 2013 sales divided by 2012 sales, minus 1, and multiply by 100.

_____ %

15c. Looking forward to 2014, please estimate the expected percentage change in gross sales revenue for 2014 over 2013 and indicate whether this will be an increase (+) or a decrease (-). Calculate using the formula: expected 2014 sales divided by 2013 sales, minus 1, and multiply by 100.

_____ %

15d. List the top 4 products manufactured and indicate approximate percentage of 2013 total manufacturing sales revenue.

Products	%
Others	
Total = 100%	

15e. Which custom services do you provide? Please check all that apply.

Manufacturing Services		Non-manufacturing Services	
Planing	<input type="checkbox"/>	Marketing	<input type="checkbox"/>
Kiln Drying	<input type="checkbox"/>	Distribution	<input type="checkbox"/>
Resawing	<input type="checkbox"/>	Logistics	<input type="checkbox"/>
Other	<input type="checkbox"/>	Other	<input type="checkbox"/>
Total manufacturing service as percentage of total gross sales	____%	Total non-manufacturing services as percentage of total gross sales	____%

15f. Do you currently plan to expand into different services or industries? Please specify.

Thank you for your time.

Appendix 3: Listing of products within each business type

Remanufactured Products

- Lumber specialties
- Sawmill specialties
- Custom processing
- Fencing
- Cutstock
- Siding
- Decking

Engineered Wood Products

- Laminated beams
- Trusses
- Treated wood
- Laminated veneer lumber
- Cross Laminated Timber

Engineered Wood Products: Buildings

- Log homes
- Prefab buildings

Millwork

- Doors
- Architectural woodwork
- Windows
- Turned wood
- Moulding
- Stairs
- Flooring

Cabinets

- Kitchen cabinets
- Cabinet doors
- Vanity cabinets
- Countertops

Furniture

- Household
- Commercial and institutional
- Ready to assemble
- Patio

Pallets and Containers

- Pallets
- Boxes, bins, and crates
- Shipping materials

Panelboards

- Plywood
- Oriented strandboard
- Particleboard
- Medium-density fibreboard

Other Wood Products

- Poles and posts
- Wood novelties
- Veneer
- Woodcrafts
- Instruments
- Fuelwood pellets
- Oil and gas drill rig mats

Appendix 4: Non-response bias tests

1. Chi-squared test for goodness-of-fit between population and sample distributions

Business type	Population	Observed (o)	Expected (e)	$o - e$ (d)	(d) ²	(d) ² /e
Buildings	24	7	6.5	0.5	0.30	0.046
Cabinets	36	14	9.7	4.3	18.63	1.923
EWP	35	5	9.4	-4.4	19.49	2.070
Millwork	58	13	15.6	-2.6	6.77	0.434
Pallets & Containers	19	7	5.1	1.9	3.57	0.698
Grand Total	171	46	46.0	0.0		5.172

Chi-square value is 5.172, which is less than the Chi-square statistic for 4 degrees of freedom at 5% level of significance (9.488). Do not reject hypothesis that distributions are the same.

2. Chi-squared test for goodness-of-fit between early respondents and late respondents to Question 11b on plans to expand manufacturing capacity.

Plan to expand	Early response	Late response observed (e)	Late response expected $o - e$	(o) d ²	(d)	d ² /e
No	16	13	9	4.4	18.93	2.189
Yes	21	7	11	-4.4	18.93	1.668
Total	37	20	20			3.857

Chi-square value is 3.857, which is greater than the Chi-square statistic for 1 degree of freedom at 5% (3.841) level of significance. Reject hypothesis that two groups are the same.

3. Chi-squared test for goodness-of-fit between early respondents and late respondents to Question 12a on wood supply as a constraint to expansion (1 = least constraining to 5 = most constraining).

Response	Early response	Late response observed (e)	Late response expected $o - e$	(o) d ²	(d)	d ² /e
1-2	23	13	11.8	1.2	1.41	0.236
3-5	14	6	7.2	-1.2	1.41	0.197
Total	37	19	19			0.432

Chi-square value is 0.432, which is less than the Chi-square statistic for 1 degree of freedom at 5% (3.841) level of significance. Do not reject hypothesis that two groups are the same.

4. Chi-squared test for goodness-of-fit between early respondents and late respondents to Question 12a on markets as a constraint to expansion (1 = least constraining to 5 = most constraining).

Response	Early response	Late response observed (e)	Late response expected $o - e$	(o) d^2	(d)	d^2/e
1-2	13	7	7.2	-0.2	0.05	0.016
3	13	7	7.2	-0.2	0.05	0.007
4-5	10	6	5.6	0.4	0.20	0.036
Total	36	20	20			0.059

Chi-square value is 0.059, which is less than the Chi-square statistic for 2 degrees of freedom at 5% (5.991) level of significance. Do not reject hypothesis that two groups are the same.

5. Chi-squared test for goodness-of-fit between early respondents and late respondents to Question 12a on labour as a constraint to expansion (1 = least constraining to 5 = most constraining).

Response	Early response	Late response observed (e)	Late response expected $o - e$	(o) d^2	(d)	d^2/e
1-3	11	7	5.9	1.1	1.11	0.222
4	10	5	5.4	-0.4	0.16	0.030
5	16	8	8.6	-0.6	0.42	0.049
Total	37	20	20			0.301

Chi-square value is 0.301, which is less than the Chi-square statistic for 2 degrees of freedom at 5% (5.991) level of significance. Do not reject hypothesis that two groups are the same.

6. Chi-squared test for goodness-of-fit between firm size distribution for firms that responded and those that did not. Includes firms identified in survey frame with available employee information (n = 160).

Firm size	Responded to survey	Did not respond (e)	Expected $o - e$	(o) d^2	(d)	d^2/e
1-4	11	21	19.3	1.7	2.74	0.142
5-9	8	15	14.1	0.9	0.87	0.062
10-19	10	23	17.6	5.4	29.31	1.667
20-49	16	24	28.1	-4.1	17.12	0.609
50 or more	13	19	22.9	-3.9	14.92	0.652
Total	58	102	102			3.131

Chi-square value is 3.13, which is less than the Chi-square statistic for 4 degrees of freedom at 5% (9.488) level of significance. Do not reject hypothesis that two groups are the same.

Appendix 5: Harmonized system for traded products code, description, and correspondence to business types used in this study

Business type used in study	Harmonized system for traded products code	Product description
Other	HS 440131	Sawdust, wood waste and scrap w/ or not agglomerated in logs, briquettes, pellets: wood pellet
Other	HS 440310	Wooden telephone poles, fence posts, other wood in rough - painted, stained or treated
Other	HS 4404	Hoopwood, split poles, piles, pickets and stake
Other	HS 440690	Cross-ties (sleepers) railway/tramway – wood – impregnated
Panelboard	HS 4408	Veneer/plywood sheets (thickness < 6 mm)
Millwork	HS 4409	Wood (lumber) continuously shaped
Panelboard	HS 4410	Particle board of wood or other ligneous material
Panelboard	HS 4411	Fibreboard
Panelboard	HS 4412	Plywood (plies < 6 mm thick) and veneered or laminated panel
Other	HS 4413	Densified wood – in blocks, plates, strips or profile shape
Other	HS 4414	Wooden frames
Pallets and containers	HS 4415	Cases, boxes, crates, drums, pallets, load boards and similar packing articles of wood
Other	HS 4417	Tools (bodies and handles), broom/brush bodies, footwear parts of wood
Millwork	HS 4418	Windows, doors, shingles and shakes, panels and other builders, joiners and carpentry of wood
Other	HS 4419	Tableware and kitchenware of wood
Other	HS 4420	Wood statuettes, ornaments, caskets, cases; wood marquetry and inlaid wood
Other	HS 4421	Other articles of wood
Furniture	HS 940161	Seats with wooden frames – upholstered
Furniture	HS 940169	Seats with wooden frames – not upholstered
Furniture	HS 940330	Wooden furniture for office use
Furniture	HS 940340	Wooden furniture for kitchen use
Furniture	HS 940350	Wooden furniture for bedroom use
Furniture	HS 940360	Wooden furniture for other use
Buildings – engineered wood products	HS 940600	Prefabricated buildings (“industrialized buildings”)

Appendix 6: Wood products by business type

Business type and products	Number of firms manufacturing
Engineered wood products: Buildings	
Beds*	1
Cabins*	1
Commercial buildings	3
Log accents, specialties	1
Log cabins	1
Log furniture*	1
Log homes	7
Log railings*	2
Log stairs	1
Modular buildings	5
Modular homes	5
Multi-family homes	1
Picnic tables	1
Single family homes	1
Trailers	1
Number of Products	15
Cabinets	
Cabinets*	6
Case goods cabinets	1
Commercial cabinets	4
Counters*	4
Doors*	2
Furniture*	1
Kitchen cabinets*	4
Medium density fibreboard cabinetry	1
Millwork*	2
Mouldings*	1
Plywood and melamine cabinetry	1
Reception desks	1
Residential cabinets	1
Solid wood cabinetry	2
Specialty frames	1
Trim	1
Vanity cabinets	2
Wall units	1
Number of products	18
Millwork	
Architectural millwork	14
Cabinets*	8
Closets	1
Commercial millwork	1
Counters*	2
Curves	1
Custom cabinetry	1
Custom millwork	3
Desks	1
Doors*	12
Exterior wood doors	1
Furniture*	5
Handrail	1

Historical replication	1
Kitchen cabinets*	1
Laminations	1
MDF mouldings	1
Millwork*	13
Mouldings*	7
Panels	1
Railings*	2
S4S Lumber	1
Stairs*	3
Store fixtures	1
Turnings	1
Windows	3
Wood paneling	1
Number of products	27

Furniture

Beds*	1
Furniture*	6
Log furniture*	1
Log railings*	1
Office furniture	2
School furniture	1
Number of products	6

Engineered Wood Products

Cabins*	1
Chips*	1
Cores	1
Crates*	2
Floor joists	2
Floor material	2
Floor systems	1
Floor trusses	1
Floors	3
Gazebos	1
Glulam	1
I-joists	3
Laminated veneer lumber	1
Millwork*	1
Mouldings*	1
Open web floors	2
Oriented strand board	1
Pallets*	1
Plywood	1
Railings*	1
Roof trusses	3
Sheds	1
Stairs*	2
TEC posts	1
Timber buildings	1
Timber frames	1
Timber trusses	1
Trusses	16
Veneer	1
Wall panels	1
Wall systems	1
Westlam	1
Number of products	32

Other wood products

Bird Carvings	1
Chips*	2
Dimensional lumber	1
Dunnage	1
Lumber	2
Rig mats*	1
Tanks	1
Trucking	1
Wood pellets	4
Wood shavings	1
Number of products	10

Pallets and containers

Bed frames	1
Boxes	1
Containers	1
Crane pads	1
Crates*	7
Custom cut lumber	1
Hoods	1
HT pallets	1
Lathe*	1
Millwork*	1
Pallet components	1
Pallets*	10
Pipe bunk	1
Repaired pallets	2
Rig mats*	1
Skids*	3
Wedges and gussets	1
Number of products	17

Remanufacturing

Access mats	1
Decking	1
Dunnage	1
Fences	2
Furring strips	1
Kilnsticks	1
Lathe*	1
Pallets*	1
Planks	1
Rig mats*	1
Skids*	1
Specialty 1" boards	1
Strips (Furring)	1
Studs	1
Tongue and groove	1
Number of products	15
All products produced by industry	122

*Product manufactured by more than one business type.

Appendix 7: Responses to constraints to expansion

Labour Constraints

Business type	Experience	Cost	Training and skills	Flexibility
Remanufacturing	4.5	4.8	3.3	3.0
Other wood products	2.7	3.0	2.7	2.0
Buildings	4.3	3.8	3.5	3.2
Engineered wood products	3.4	3.0	3.4	3.6
Cabinets	3.8	3.8	3.4	2.9
Millwork	4.3	4.0	4.2	3.5
Furniture	2.5	3.5	3.0	3.0
Pallets and containers	3.9	4.0	3.6	3.4
Total	3.9	3.8	3.6	3.2

Wood Supply Constraints

Business type	Price	Quality and grade	Price volatility	Volume
Remanufacturing	3.0	3.3	3.0	2.5
Other wood products	2.8	2.8	2.0	3.8
Buildings	2.4	3.0	2.2	1.8
Engineered wood products	1.5	2.8	2.0	2.0
Cabinets	2.9	2.2	3.1	1.5
Millwork	3.5	3.3	2.8	2.7
Furniture	2.0	2.0	2.0	2.0
Pallets and containers	3.9	3.7	3.6	2.4
Total	3.0	2.9	2.8	2.2

Market Constraints

Business type	Market diversification	Market and product research	Product diversification	Foreign regulations
Remanufacturing	3.3	2.8	1.8	3.0
Other wood products	2.3	2.3	1.3	1.3
Buildings	2.8	2.8	3.0	1.3
Engineered wood products	2.0	1.5	1.8	1.0
Cabinets	2.2	2.3	2.1	2.1
Millwork	2.3	2.2	2.4	1.4
Furniture	3.5	3.0	3.0	3.0
Pallets and containers	2.0	1.6	2.0	2.3
Total	2.4	2.2	2.1	1.8

Financing Constraints

Business type	Cost	Flexibility	Repayment	Availability
Remanufacturing	2.5	2.3	2.5	2.0
Other wood products	2.7	1.0	1.5	1.7
Buildings	2.0	1.5	1.3	1.3
Engineered wood products	1.6	1.4	1.2	1.8
Cabinets	2.2	2.0	2.2	1.8
Millwork	3.5	2.8	2.6	2.5
Furniture	2.0	2.0	2.0	2.0
Pallets and containers	2.6	2.3	2.4	2.3
Total	2.5	2.1	2.1	2.0

Management Constraints

Business type	Labour efficiency	Cost	Material recovery	Manufacturing techniques	Product quality
Remanufacturing	3.8	3.8	3.0	3.0	1.8
Other wood products	3.0	3.8	2.8	2.0	2.5
Buildings	4.4	3.4	3.0	3.0	2.0
Engineered wood products	2.4	2.6	2.4	2.4	1.6
Cabinets	3.3	2.8	2.7	3.0	2.4
Millwork	3.8	3.8	3.1	3.0	2.9
Furniture	3.0	3.0	3.0	3.0	3.0
Pallets and containers	3.6	3.4	3.1	2.6	2.0
Total	3.5	3.3	2.9	2.8	2.3

Transportation and Distribution Constraints

Business type	Cost	Access	Logistics	Frequency
Remanufacturing	3.8	3.5	3.5	2.8
Other wood products	3.5	3.0	3.3	2.5
Buildings	4.2	3.2	2.4	1.8
Engineered wood products	2.2	2.2	1.6	1.4
Cabinets	2.3	2.1	1.9	1.9
Millwork	3.0	3.0	3.0	3.0
Furniture	3.8	2.8	2.8	3.1
Pallets and containers	3.3	2.9	2.4	2.0
Total	3.2	2.7	2.5	2.3

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