TRADE ANALYSIS OF WOOD FOREST PRODUCTS BETWEEN CHINA AND UNITED STATES of AMERICA

by

Yuchun Zhang

FACULTY OF NATURAL RESOURCES MANAGEMENT
LAKEHEAD UNIVERSITY
THUNDER BAY, ONTARIO

April. 20 2021

TRADE ANALYSIS OF TIMBER FOREST PRODUCTS BETWEEN CHINA AND
THE UNITED STATES

by

Yuchun Zhang

An Undergraduate Thesis Submitted in Partial Fulfillment of the Requirements for the
Degree of Honours Bachelor of Science in Forestry

Faculty of Natural Resources Management

Lakehead University

Oct. 30 2020

---------------------------------------   ----------------------------------
Dr. Mathew Leitch   Dr. Kevin Crowe
Major Advisor   Second Reader

LIBRARY RIGHTS STATEMENT

In presenting this thesis in partial fulfillment of the requirements for the HBScF degree at Lakehead University in Thunder Bay, I agree that the University will make it freely available for inspection.

This thesis is made available by my authority solely for the purpose of private study and may not be copied or reproduces in whole or in part (except as permitted by the Copyright Laws) without my written authority.

Signature:

Date: _____April 24, 2021_

A CAUTION TO THE READER

This HBScF thesis has been through a semi-formal process of review and comment by at least two faculty members. It is made available for loan by the Faculty of Natural Resources Management for the purpose of advancing the practice of professional and scientific forestry.

The reader should be aware that opinions and conclusions expressed in this document are those of the student and do not necessarily reflect the opinions of the thesis supervisor, the faculty, or of Lakehead University.

ABSTRACT

Forest products have become a significant part of internationally traded products. United States forestry has achieved sustainable development, with the improvement of forest management and logging systems more and more forest resources are able to be harvested. In addition to meeting their own domestic demands, the wood production of The United States also has a large surplus for export. This paper discusses the factors that influence the trade of timber forest products in China with the United States from two aspects of trade development pattern and trade friction. To look into this information sources such as forest products import and export trade between China and the United States in recent years, data for quantitative analysis, import and export commodity structure, the international market distribution, woody forest products of China import and export trade, and trade development and prospects were acquired. The results show that: The trade scale of China's wood forest products shows a dynamic growth trend, the import and export commodity structure is relatively concentrated, and the international market is mainly distributed in the United States, Japan and other developed economies. With the increasing diversification of timber forest product export markets, forestry enterprises should strengthen international production capacity and co-operation to deal with trade barriers, accelerate the transformation of the forestry industry, and implement fiscal and taxation policies to promote the sustainable development of the forest products trade.

Key Words: Wood forest products; Imports. Exports; Influencing factors; Trade prospects

ACKNOWLEDGEMENTS

Table of Contents

1.0 INTRODUCTION

Forest products refer to the related products derived from or relying on forest resources, including wood, wood-based board, paper, wood products, etc. Wood forest products are the main body of China's forest products trade, its total trade volume has exceeded 70% (Zhang et al. 2019). According to the FAO (Food and Agriculture Organization, 2019) data analysis results, China's trade volume of major wood forest products surpassed the United States of America (USA) in 2010, and China became the world's largest wood forest product import country, which has remained at the forefront in recent years (Peck 2020). These import products are mainly paper, paper pulp, log and saw timber (Peck 2002). In addition to a large number of imports, the total export of China's wood forest products was also increasing, especially in 2006, the export exceeded the import, then reaching the trade surplus for the first time (Nunery et al. 2010). Unlike the USA, who have sustainable development and complete forest management and logging systems, China's lack of forest and timber resources does not satisfy the large demand of wood forest products (Tian et al. 2017). Based on the data of the United Nations trade database, this paper analyzes the basic situation, overall characteristics, main problems, countermeasures and development trends of China's forest products trade in recent years. The objective is to provide an overview of the current state of trade in forest products between China and the USA, discuss national policies affecting trade, examine tariff and non-tariff barriers, free trade agreements and environmental issues, and their potential impact on trade flow.

At present, the definition and statistical standards of forest product categories in the world are not uniform. The Food and Agriculture Organization of the United Nations (FAO) defines the World Food Programme category as seven categories of industrial logs, sawn timber, wood pulp, wooden

panels, wood fuel, paper products, recycled paper, but no statistics on wood products and wooden furniture are compiled(Peck 2020). However, the China Forestry Statistical Yearbook divides the world's forest resources into 14 categories, including logs, sawn timber, veneer, extrusions, particleboard, fibreboard, plywood, wood products, wooden furniture, wood chips, wood pulp, wastepaper, charcoal, paper and their products (Peck 2020). In addition, the product code for the United Nations Comtrade database does not correspond to either of these categories. For the convenience of data collection and analysis, this study defines wood forest products as: logs, sawn timber, wood products, wood furniture, wood pulp (including wastepaper), paper and its products and other raw materials (including wood chips). Commodity number and description are shown in Table 1.

Table 1. The commodity codes and specific descriptions of the classified wood forest products.

Product Category	Commodity Code	Commodity Descriptions
Log	HS4403	Logs, whether or not peeled, sapwood or rough sawn
Sawn timber	HS4407	Longitudinal saws, slits, sliced or peeled wood
Wood pulp	HS47	Mechanical wood pulp, chemical wood pulp, sulfite wood pulp, semi-chemical wood pulp, other fibrous cellulose pulp, waste paper, and cardboard products
Paper and its products	HS48,HS49	Rolled or sheeted newsprint, books, pamphlets, loose-leaf prints, and similar prints, whether leaflets, etc.
Wooden product	HS4414-HA4421,960910	Wooden picture frames, wooden cable reels, wooden pallets, box trays, wooden vats, barrels, pots, wooden figurines and other decorations, pencils, etc.

Wooden furniture	HS940161,HS940169,HS94034 0,HS940350,HS940360	Wooden furniture including kitchen and bedroom wooden furniture
Other raw materials	HS4401,HS4404,HS4405	Firewood, chips or pellets, sawdust, wood waste and debris, hoops, rafts, stakes, sticks, chips and similar products, wood wool, wood flour

Source from FAO (2020)

2.0 Literature Review

According to the statement of the current situation of world trade in forest products, trade in forest products is highly dependent on macroeconomic factors that affect the demand of import regions (Peck 2020). Wood products are one of the most important commodity categories in international trade and have a significant impact on the trade balance of many countries (Peck 2002). World trade in forest products is characterized by bilateral and multilateral trade within regional trade zones and inter-regional trade zones of North America, Europe, Japan and its Pacific Rim suppliers (Peck 2020). International trade in forest products is also affected by trade agreements, green consumerism, global deforestation and other issues (Puttock et al. 1994). According to the North American Free Trade Agreement (NAFTA), there is little impact on the forest products of the USA, but in a world trade war, the protection of the United States by this policy will cause serious losses to other countries. According to Buongiorno and Johnston (2018) data analysis, the main reason for the change of primary forest products between China and the USA is the difference in import and export products. The competitiveness of forest products in the USA has always been stable, while China's forest products have only gained market competitiveness in recent years (Wu et al. 2016). Wooden forest products play a very important role in world trade, and their economic

status is very high for big import and export trade countries. However, the advantages of wood forest products are reflected in the original ecology and renewability. The classification of wood forest products through the trade database of the United Nations Statistical Office can better explain the analysis (Cao et al. 2018). Regarding the phenomenon of the predicted trade pattern of forest products in the future, the USA, Japan and Europe will remain the major importers of forest products, while the rapid economic growth of China will make it the largest market of original timber, intermediate and final forest products in the world (Turner et al. 2005).

3.0 BACKGROUND

To study the forest products trade situation one must first understand the situation of the forest resources of the whole earth. According to the statistics of the United Nations, the global forest coverage rate is about 4 billion hectares, accounting for about 31% of the world's land area, and the world's forest resource accumulation is estimated to be about 430 billion m3 (Zhang et al. 2020). Although the rate of forest degradation and loss has slowed, nearly 200 square kilometers of forest are still lost every day (Puttock et al. 1994). Besides, the distribution of the world's forest area is extremely uneven, Russia's forest area is the largest, accounting for about 1/5 of the global forest area, followed by Brazil, Canada, the USA and China, the total forest area of these five countries accounted for more than half of the global forest area (Zhang et al. 2020). The main results of the 2010 Global Forest Resources Assessment (GFRA) conducted by the Food and Agriculture Organization of the United Nations (FAO 2019) shows that the world's forest area has reached 4 billion hectares, accounting for about 31% of the land area (excluding the area of inland waters), and the forest area per capita is 0.6 hectares. Planted forests cover 264 million hectares worldwide, accounting for about 7% of the world's forest area (Buongiorno and Johnston 2018). In terms of forest function, global commercial forests cover nearly 1.2 billion hectares, biodiversity

protected forests cover more than 460 million hectares, and shelter forests cover 330 million hectares, accounting for 30 percent, 12 percent and 8 percent of the world's forests, respectively (Zhang et al. 2020). From the point of view of forest ownership, public forest area accounts for 80% of the world's forest area (Zhang et al. 2020). The world's forests also hold 289 billion tonnes of carbon (Nunery et al. 2010).

Forest products are one of the components of social commodities. This includes wood products based on forest resources, mainly including logs, sawn timber, wood-based panels, various wood finished products and semi-finished products, wood pulp, all kinds of paper and paper products with wood as raw materials, forest chemical products and so on (Turner et al. 2005).

To quantitatively analyze the data of Chinese wooden forest products trade in recent years, the use of forest products import and export trade data, import and export commodity structure data, and international market distribution system analysis data is used to summarize the development of China's wooden forest products trade characteristics, factors affecting the development of China's wooden forest products trade and development prospect into the future. China is an important timber and wood products production country with significant trade partners around the world. In recent years, driven by the domestic consumption market and exports, China's trade in wood and forest products has entered a golden period of development. The import and export volume has increased from US $68.2 billion in 2008 to the US $120.1 billion in 2018, with an average annual growth rate of 5% (Nunery et al. 2010). In the past few years, trade-in wood forest products between China and the United States have also witnessed rapid development (Martin and Darr 1997). However, since 2019, due to economic downward pressure and trade friction between China and the United States, the trade volume of wood forest products in China has dropped to US

$109.9 billion, with a year-on-year decline of 8.5%, among which the import volume has dropped by 14.9% and the export volume has dropped by 2.3% (Zhang et al. 2019).

4.0 IMPORT AND EXPORT OF TIMBER AND WOOD PRODUCTS

From 2008 to 2018, China's export volume of wood and forest products has been growing steadily. From 2008 to 2009, under the influence of the USA financial crisis, the export volume declined somewhat and then recovered rapidly. The year 2019 was an extremely difficult year for the world's foreign trade in timber and products. It is also a year of opportunities and challenges. The import of wood and wood-based panels has been affected by the decrease in the production of wood furniture and the decrease in the use of raw materials such as wood, fiberboard, and particle board due to the decrease in export volume and the impact of domestic real estate(Peck 2020). Again due to the international forest products market atrophy, forest products market competition is intense. (Peck 2020) China's production of high-density fiberboard, solid floorboards, wooden furniture, and other wood processing products for export is also required for an accelerated urbanization , large population out of poverty and new job-seekers with employment, which is increasing demand for lumber, wood furniture, and wood products. Combined this with China's goal to stop natural forest logging, it provides a market for the import of wood and related wood processing products. Table 2 presents the trade volume of raw forest products from the USA between 2013 to 2019 as well as from China between 2013 and 2019.

Table 2. Trade volume of Raw Forest Products from the USA and from China between 2013 to 2019.

Trade volume of Raw Forest Products from the US between 2013 to 2019 (US $100 million)										
	Logs		Sawn timber		Paper products		Paperboard		Pulp	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
2013	-	3.117	5.036	3.133	-	1.84	2.551	6.23	-	8.697
2014	-	3.39	5.731	3.609	-	1.864	2.776	6.85	-	8.702
2015	-	3.104	5.446	3.216	-	1.904	2.743	6.6	-	8.483
2016	-	3.043	6.609	3.403	-	1.868	2.73	6.4	-	8.299
2017	-	3.398	7.12	3.89	-	1.905	2.981	7.08	-	8.775
2018	-	3.7	7.19	3.59	-	1.94	3.06	7.86	-	9.28
2019	-	4.38	7.23	4.63	-	1.97	3.23	8.02		8.73

Trade volume of Raw Forest Products from China between 2013 to 2019 (US $100 million)										
	Logs		Sawn timber		Paper products		Paperboard		Pulp	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
2013	9.31	-	10.77	-	12.2	14.23	-	6.88	11.31	-
2014	11.78	-	14.51	-	11.56	15.85	-	7.85	12	-
2015	8.06	-	13.56	-	11	17.03	-	7.31	12.7	-
2016	8.08	-	14.52	-	10.57	16.4	-	6.9	12.19	-
2017	9.92	-	15.12	-	12.57	16.7	-	6.72	15.26	-
2018	10.98	-	10.13	-	6.2	19.14	-	5.55	19.7	-
2019	6.49	-	16.24	-	9.7	22	-	7.73	17.1	-

Source from FAO 2013-2019

As can be seen from Table 2, log exports increased by 11.7% in 2018 after declining by 10.2% in the previous two years. In terms of value, logs accounted for 19.88% of the total growth of forest product exports in 2018 (Wu et al. 2016). Of those exports, the lion's share (41.1 percent) went to China, which accounted for almost all of the growth. Cardboard remains America's largest export of paper products. China is one of the largest recipients of industrial paper and paperboard from the United States, with Mexico and Canada consuming 55.1 percent of the total (Lyke 1998). China has been a major destination for US wastepaper exports but has declined from 60.9 percent in 2017

to 53.8 percent in 2018 (Zhang et al. 2019). In mid-2017, the Chinese government announced a major adjustment in the import of the commodity, banning the export of certain types of waste paper. Over the past few years, China's share of USA log exports has increased in volume and value. In 2019, China's trade in timber and wood products totaled US $56.172 billion, down 12.11% from the previous yea r(Zhang et al. 2019). The import value was the US $22.983 billion, down 12.06% year on year while the export value was US $33.189 billion, down 12.14 percent year on year (Zhang et al. 2019).

As can be seen from Table 3, China imports three main types of wood forest products: wood pulp, paper products, and industrial logs. In 2019, the import trade volume of the above three categories of goods was US $17.13 billion, US $7.724 billion and US $6.491 billion respectively, and the trade volume of the top three bulk commodities accounted for 72.1% of the import trade of timber forest products in China (Buongiorno et al. 2018). Zhange et al. (2019) conducted an in-depth analysis of the largest category of commodities in China's total imports and exports of timber forest products from 2013 to 2019. The market distribution of China's wood forest products trade in 2019 was analyzed. Exports were dominated by wooden furniture, paper products and paperboard, while imports were dominated by wood pulp, paper products and logs. According to the statistics of the quantity and proportion of China's import and export of wood and forest products, it was found that the United States is still the largest trade market of China's wood and forest products, and the main trade markets of China's wood and forest products are concentrated in the USA, Japan, Hong Kong, the United Kingdom and other countries (Buongiorno et al. 2018). Wooden furniture, paper products, and wood-based panel exports mainly rely on the USA market (Zhang et al. 2019).

5.0 RESULTS

The main problems found in the analysis of the trade of forest products between China and the USA include the following three points. The first point (1) is that the import ratio of raw material type products is significant, and the import varieties are relatively small. The second point (2) is that the export of processed products is too high, leading to a serious trade imbalance. Third (3), the traceability system of timber is not perfect, which impeded the normal trade process (Wu et al. 2016). The USA is a developed country in forestry, and the structure of forest products in international trade is reasonable (Tian et al.2017). This first point is that China is a big developing country. At present, it mainly imports raw material for processing and production of forest products, and exports processed products to developed regions such as Europe, America and Japan (Zhang et al. 2020). From the perspective of China's import and export of wood and forest products to the USA, China's imports of raw materials from the USA accounts for about one-fifth of the total, with a small number of imported varieties (Zhang et al. 2020). Among raw material products, the import value of pulp, sawn timber and log products accounted for as much as 50 per cent of the trade volume, while the import value of other wood products accounted for a smaller proportion of the trade volume (Zhang et al. 2020). As a result, China's imports of raw material products from the USA are not only less in variety but also in a single type, leading to an excessive market concentration of raw material bulk products in China and high trade risks, which is not conducive to the sustainable and normal development of international trade in forest products between China and the USA (Wu et al. 2016). The second point deals with the industrial chain of international trade of forest products in the world where China has undertaken a large number of manufacturing, processing, and export trade of low-end forest products with relatively low labor cost and environmental cost and has earned a small trade surplus. From the perspective of China's import

and export trade of wood and forest products to the USA, China exports too many processed products to the United States and the trade imbalances are significant (Wu et al. 2016). Processed products, wood furniture, wood and other products for export trade in the proportion is relatively high. The products of the production, manufacturing and processing do have a high degree of dependence on labor, especially in the relatively low Chinese earth sciences and technologies, high energy consumption, waste, and pollution caused by these factors has led to environmental problems being more serious (Wu et al. 2016). For example, the imbalance of ecological environment. Although China imports some raw materials from the USA, it exports a large number of processed products, from which the USA has gained and enjoyed inexpensive forest products and processing services. The USA imports a large number of processed products from China and indirectly transfers the ecological footprint caused by forest product production to China, which not only causes China's ecological and environmental problems but also leads to the imbalance of Sino-US forest product trade, which is not conducive to the healthy and sustainable development of trade cooperation between China and the USA. The third point relates to the traceability of wood being monitored by the international community and watchdog organizations dealing with the trade of wood and wood products. From consumer countries of forest products to supplier countries, a global traceability system of forest products is taking shape (Zhang et al. 2020). The amendment to the USA in 2008 issued the Lacey Act, for in the American market of wood and wood products mandatory wood source of legitimacy and traceability requirements, traders must perform import declarations to the USA customs authorities and provide a source of imported timber used for forest products, plant scientific name and product quantity, the value of goods and the timber logging and transport information such as whether to comply with local regulations (Guan and Gong 2015). To ensure the accuracy of this information, forest products companies

have to trace back the forest products they trade and collect all transaction information and legal documentation along the supply chain (Guan and Gong 2015). Otherwise, they could be investigated for suspicious information and face civil or criminal penalties such as high fines, forfeiture of products and imprisonment of traders. Wood traceability has become a prerequisite for forest products to enter the USA. As a major importer and exporter of forest products, China has not yet established an effective wood traceability system (Guan and Gong 2015). At the same time, China is a processing country in the world, and all kinds of wood raw materials come from many countries or regions, so it is difficult for most forest product enterprises to meet the new requirements of wood traceability. This has caused serious obstacles to the export of Chinese forest products to the USA and hindered the normal development of the Sino-US forest product trade to a large extent (Guan and Gong 2015).

6.0   DISCUSSION

To ensure a sustainable supply of domestic wood and reduce the dependence on foreign countries, the sustainable management of forests must be carried out to realize the sustainable development of forestry. This can be accomplished simply by expanding the forestry land, make efforts to plant trees, increase forest resources, develop a forestry industry, and provide a forest raw materials base to these industries. Or more intensively by strengthening the management and protection of forest resources, scientifically cultivate forests, vigorously develop artificial forests, improve the supply capacity of domestic artificial forests, and improve the utilization rate of forest resources by industry. The other option is to actively explore a variety of supply channels in overseas countries or regions with wood resources, establish enterprises directly in overseas countries with rich forest

resources, or increase the ownership of forest resources through the purchase of property rights and other forms, to realize the diversification of the import and trade regions of wood resources (Turner et al. 2005). At the same time of trade between China and the USA, imports of forest products, raw materials such as wood and processed wood products, should be expanded in quantity, and exports of raw materials such as wastepaper and paper products and other processed products should be increased to increase the variety of forest products trade (Turner et al. 2005). Then optimize the structure of product imports and exports to promote trade balance. China's trade in wood and forest products with the USA has always been in the form of surplus. At the same time, imports of raw materials and exports of processed products account for too much, and the concentration of major trade products is too large. In order to optimize the structure of trade in and out of forest products and trade products between China and the USA, reduce trade surplus and promote trade balance, China should focus on strengthening the import of high-tech and high-value-added forest products, and appropriately reduce the import of low-end processed and manufactured products. At the same time, China should promote the transformation and upgrading of China's forest products processing trade, control the development scale of low-level processing trade, increase the technological content of processing trade and the added value of wood forest products, and realize the balanced and sustainable development of Sino-US forest products trade. The traceability of wood has been recognized and supported by governments, environmental organizations and forest product enterprises all over the world (Turner et al. 2005). Timber-producing countries have started to establish wood traceability systems one after another. Types, source of forest products business involving materials, production, processing, storage, transportation, marketing, etc. are linked. Forest products enterprises own ability is limited to do everything, this needs to be resolved by forest products throughout the supply chain, wood

producers, forest products processing and consumer of wood legitimacy policy, legal system, and worldwide the complex timber supply chain and many problems such as language differences of different countries is very difficult. As one of the world's forest products import and export power countries, China should build an authority system, and a stable and efficient wood traceability system. The realization of China's forest products trade traceability can improve the system of legitimacy that China timber and forest products market monitoring and early warning system, meet the USA, Europe and other markets for wood traceability requirements, and can also improve the international reputation of China's wood and wood products, and promote the sustained and healthy forest product trade both at home and abroad.

7.0 CONCLUSION

In 2020, under the impact of COVID-19 pandemic, the global import and export trade of wood forest products will encounter unprecedented challenges. As far as China is concerned, the forest products manufacturing and foreign trade industries with small, medium and micro enterprises as the main body will face the possibility of reshuffling. In the short term, the impact of the epidemic on trade is mainly reflected in the temporary stagnation of domestic production of forest products, which leads to the decrease in the import demand of raw materials such as wood, and the shortage of export products such as wood furniture and wood-based panels. In the medium and long term, as the epidemic continues to spread around the world, the impact on the global supply chain of forest products is gradually deepening, leading to reduced production in wood producing countries, decreased demand for forest products exports, and increased trade barriers related to the pandemic (Zhang et al. 2020).

Timber import outlook is being influenced by the delayed resumption of work and other factors, China's timber import demand slowed down significantly in the first quarter, and the timber supply was dominated by inventory consumption. With the spread of the pandemic, major timber producing countries entered the shutdown state one after another, and the cost and difficulty of timber import has risen (Zhang et al. 2020). On the supply side, timber producers such as Russia, New Zealand, Australia, Germany, France, Finland and Cameroon have taken measures to restrict the entry of foreign personnel, close border ports and suspend cargo flights, etc., making it inevitable that lumber production will decrease around the world (Zhang er al. 2020). From the demand side, with the improvement of the domestic pandemic prevention and control situation, timber upstream and downstream enterprises have returned to work in a comprehensive way, and the market demand has gradually picked up (Zhang et al. 2020). In order to stimulate economic growth, the government has introduced a number of tax and fee reduction policies, and increased investment of $36 trillion yuan of infrastructure projects (Zhang et al. 2020). Timber demand has sustained strong momentum. It is expected that in 2020, the price of imported timber in China will fall first and then rise. In the early stage, the lumber is mainly to clear the inventory and increase the return of capital. In the later stage, the pressure of wood supply and demand increases, and the probability of wood price rise is likely (Zhang et al. 2020).

Outlook for export of wood and forest products is also positive but at the same time unknown due to current issues globally. Under the dual pressure of the pandemic and trade frictions, the year 2020 is likely to be a "cold winter" for wood and forest product exporters. On the one hand, under the impact of the pandemic, the world economy is facing the risk of a deep recession. Japan, the European Union, the USA and other major forest product consumers have become the pancenter of the pandemic, and it is difficult for China's export of wood forest products to recover in the

short term (Zhang et al. 2020). Additionally, although the Sino-US trade talks have achieved high-quality results, the USA crackdown on Chinese wood and forest products continues. On February 21st, the US International Trade Commission (ITC) issued a preliminary ruling against imports of wood molds and woodworking products from China. On Feb 24th, the US Department of Commerce announced that it has taken measures against imports of wooden cabinets and bathroom cabinets from China. In general, the export situation of China's wood forest products is closely related to the development of the world pandemic. The pandemic is difficult to be effectively controlled in a relatively short time, and the export of forest products is difficult to embrace a recovery growth (Zhang et al. 2020). As the external market environment continues to deteriorate, forest product exporters should pay more attention to the improvement of product quality and the development of domestic markets and emerging markets, pay close attention to the overseas pandemic situation and the change of demand for forest products, make early preparations for response, and reduce the risks of the industrial supply chain. The market for wood is through the roof right now, industry cant produce enough hence the high prices of lumber. The economy is strong, the pandemic is holding it back from growing.

Literature Cited

FAO. FAOSTAT: Forestry Production and Trade [DB/OL]. [2017-10-
12].https://comtrade.un.org/data/

Buongiorno, J., and C. Johnston. 2018. Potential effects of US protectionism and trade wars on
the global forest sector. Forest Science 64(2): 121–128. doi: 10.1093/forsci/fxx001.

Cao, X., Yang, S., Huang, X., & Tong, J. (2018). Dynamic decomposition of factors influencing
the export growth of China's wood forest products. Sustainability, 10(8), 2780.
doi:http://dx.doi.org.ezproxy.lakeheadu.ca/10.3390/su10082780

Guan, Z., & Gong, P. (2015). The impacts of international efforts to reduce illegal logging on
China's forest products trade flow. China Agricultural Economic Review, 7(3), 467-483.
doi:http://dx.doi.org.ezproxy.lakeheadu.ca/10.1108/CAER-12-2014-0134

Lyke, J. (1998). The impact of the north american free trade agreement on U.S. forest products
trade with canada and mexico: An assessment. Forest Products Journal, 48(1), 23-28.
Retrieved from http://ezproxy.lakeheadu.ca/login?url=https://www-proquest-
com.ezproxy.lakeheadu.ca/docview/214628322?accountid=11956

Martin, R. M., & Darr, D. R. (1997). Market responses to the U.S. timber demand-supply
situation of the 1990s: Implications for sustainable forest management. Forest Products
Journal, 47(11), 27-32. Retrieved from http://ezproxy.lakeheadu.ca/login?url=https://www-
proquest-com.ezproxy.lakeheadu.ca/docview/214629950?accountid=11956

Nunery, J.S., and W.S. Keeton. 2010. Forest carbon storage in the northeastern United States:
Net effects of harvesting frequency, post-harvest retention, and wood products. Forest
ecology and management 259(8): 1363–1375. doi: 10.1016/j.foreco.2009.12.029.

Peck, T. (2002). The international timber trade. Forest Products Journal, 52(9), 10-19. Retrieved

from

http://ezproxy.lakeheadu.ca/login?url=https://www.proquest.com/docview/214648062?acco

untid=11956

Puttock, G. D., Sabourin, M., & Meilke, K. D. (1994). International trade in forest products: An

overview. Forest Products Journal, 44(3), 49. Retrieved from

http://ezproxy.lakeheadu.ca/login?url=https://www-proquest-

com.ezproxy.lakeheadu.ca/docview/214632989?accountid=11956Tian, Minghua, Lingchao

Li, Li Wan, Jinlong Liu, and Wil de Jong. "Forest Product Trade, Wood Consumption, and

Forest Conservation—the Case of 61 Countries." Journal of Sustainable Forestry 36, no. 7

(October 3, 2017): 717–28. doi:10.1080/10549811.2017.1356736.

Turner, J. A., Buongiorno, J., Zhu, S., & Prestemon, J. P. (2005). The U.S. forest sector in 2030:

Markets and competitors. Forest Products Journal, 55(5), 27--36. Retrieved from

http://ezproxy.lakeheadu.ca/login?url=https://www-proquest-

com.ezproxy.lakeheadu.ca/docview/214622767?accountid=11956

Wu, J., Wang, J., & Lin, W. (2016). Comparative analysis of primary forest products export in

the united states and china using a constant market share model. Forest Products

Journal, 66(7), 495-503. doi:http://dx.doi.org.ezproxy.lakeheadu.ca/10.13073/FPJ-D-14-

0007

Zhang, X., Sun, C., Gordon, J., & Munn, I. A. (2020). Determinants of temporary trade barriers

in global forest products industry. Sustainability, 12(9), 3839.

doi:http://dx.doi.org.ezproxy.lakeheadu.ca/10.3390/su12093839

Zhang, L., Sun, Y., Song, T., & Xu, J. (2019). Harvested wood products as a carbon sink in china, 1900–2016. International Journal of Environmental Research and Public Health, 16(3) doi:http://dx.doi.org.ezproxy.lakeheadu.ca/10.3390/ijerph16030445

Zambelli, P., Lora, C., Spinelli, R., Tattoni, C., Vitti, A., Zatelli, P., and Ciolli, M., 2012, *A GIS decision support system for regional forest management to assess biomass availability for renewable energy production*, Environmental Modelling & Software, 203-213.