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Competition of wood products with different fiber transformation and import sources

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ABSTRACT

Japan and China have been two leading importers of wood products in the global market, and the trade pattern for China since 1993 has largely repeated that for Japan in the 1960s. In this study, the import demand of wood products in Japan and China between 1995 and 2013 by product type and source is assessed using the translog cost function and cointegration analysis. Wood products are classified into three main types by the degree of processing and transformation on wood fiber: roundwood, sawnwood, and wood-based panels. The own-price elasticities are overall inelastic, but they can become very elastic for some source-differentiated products (e.g., sawnwood import by Japan and roundwood import by China from the United States). Clear substitutability across product types and supplying sources is identified. Wood products with a different degree of processing or from different sources can be substituted with each other when they are used by wood-utilizing industries in the importing countries. The substitute relation will continue to present both opportunities for economic development and challenges for global environment protection.

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1. Introduction

International trade of wood products has been gradually rising worldwide over the past several decades. Japan and China are two leading importers of wood products in the global market. The import quantity of roundwood by Japan reached 49% of the world total trade in 1973, while its imports of sawnwood and wood-based panels have been rising until the 1990s (Food and Agriculture Organization 2013). China has become a main participant in the global market since the early 1990s. Its imports of roundwood and sawnwood were 34% and 18% of world total imports in 2011, respectively (China State Forestry Bureau 2012).[1] At the same time, China has become a large exporter of wood-based panel products. A closer look at the trade patterns of Japan and China since 1961 reveals some similar patterns (Fig. 1), and in particular, the trend for China since 1993 largely repeated that for Japan in the 1960s.

Rising global trade of wood products, especially unprocessed timber, has caused wide concerns from both environmental and economic perspectives. Environmental functions of forests are associated with many of the basic public goods that a society needs. Exporting timber directly is widely perceived as reducing the availability of raw materials for domestic forest products industry, and consequently, reducing opportunities for job and income growth in many forest-dependent communities (Zhang and Gan 2007). Thus, a number of countries have adopted restrictive trade policies (e.g., a ban or tax on timber trade) to encourage a shift in exports from unprocessed timber to value-added wood products. For example, Russia has been aggressive during recent years in imposing an export tax to protect its domestic industry (Simeone 2012). Since 2008, Russia has imposed a tax with various schedules on its timber export. In the literature, a number of studies have been conducted to analyze the impact or economic efficiency related to timber export restrictions, e.g., Zhang (1996) for Canada, Kishor et al. (2004) for Costa Rica, Resosudarmo and Yusuf (2006) for Indonesia, and Amoah et al. (2009) for Ghana.

Besides these direct evaluations on trade policies, several studies have also assessed the substitution possibilities between various wood products as production inputs. The rationale of these studies is that if a strong substitution relation can be found between wood products with varying degrees of processing (e.g., roundwood versus wood-based panels) or from different sources, then the impact of a national conservation or trade policy may be transferred via international trade to other countries. Japan has been one of the leading importers of wood products, so its wood product market has attracted a large amount of attention in the earlier literature. For example, Vincent et al. (1991) revealed that sawlogs from temperate and tropical regions were substitutes in Japan's import market between 1970 and 1987. Uusivuori and Kuuluvainen (2002) found the elasticity of substitution between imported roundwood and domestic wood raw materials was very low in Japan, and that between domestic wood and imported wood chips was close to one between 1970 and 1997. Similarly for

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[1] In forestry statistics from by the Food and Agriculture Organization (2013), data for the mainland China, Taiwan, Hong Kong, and Macao are combined. In this study, China refers to the mainland China. The data from China State Forestry Bureau (2012), available since 1993, are used for descriptive analyses.

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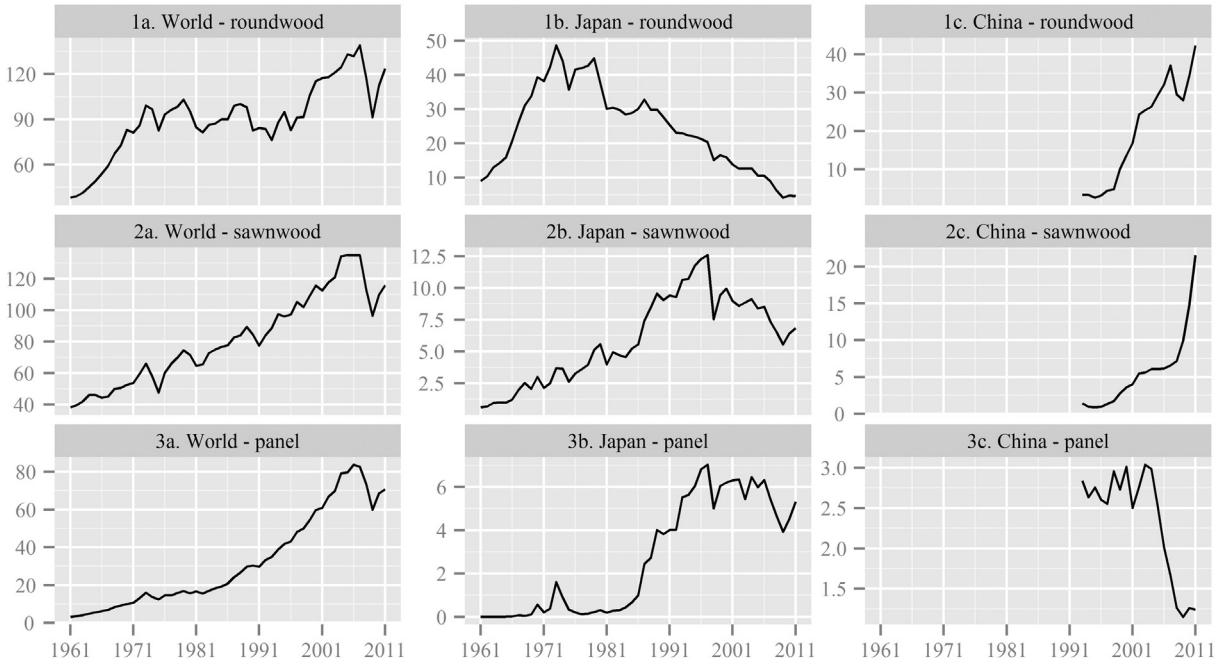

Fig. 1. The annual import quantities of wood products by world, Japan, and China between 1961 and 2011 (million m^3). (*Source*: China State Forestry Bureau 2012; Food and Agriculture Organization 2013).

other countries, Gan (2006) reported that the degree of substitutability between domestic and imported forest products in the United States were low in general and varied across product levels. Arabatzis and Klonaris (2009) found a substitute relation between imports of unprocessed (e.g., timber) and processed wood products (e.g., veneer) in Greece. At a global level, Uusivuori and Kuuluvainen (2001) evaluated the substitution relation in 36 wood-importing countries between 1990 and 1997. The substitution was found to be fairly low between different categories of imported wood, but higher between imported and domestic wood. Niquidet and Tang (2013) estimated the demand for source-differentiated log and lumber products in China and Japan separately, and both substitute and complementary relations were found. Overall, the substitution issue has been analyzed for a number of wood product markets and various degrees of substitution have been confirmed among wood products by type and source. At present, China has become the largest importer of wood products in the world during the past few years. Therefore, there has been a need to examine whether these conclusions are applicable to China's import market, and furthermore, whether China is different from other major importers in the market (e.g., Japan).

The objective of this study is to assess and compare the import demand of wood products in Japan and China as two leading importers in the global market. More specifically, this study seeks to analyze the impacts of economic factors (i.e., prices) and non-economic factors (i.e., trade interventions) on the demand of source-differentiated wood products. The translog cost function with a dynamic specification and cointegration analysis is employed. Source-differentiated models are estimated for both Japan and China in the long term. Properties of time series and cointegration analysis are utilized to examine the dynamics in the short term. Price elasticities are calculated to evaluate the relation of substitutability and complementarity among wood products by type and source. The data used are monthly imports by type and source from January 1995 to June 2013. Wood products are classified into three main types: roundwood, sawnwood, and wood-based panels. The top three supplying countries are considered for each product type in Japan and China. The main findings are that price elasticity estimates of wood product imports in both Japan and China can vary to some degree by product and source. There is clear substitutability across product type in general but cross-price elasticities are generally small. Overall, this study presents a detailed comparison of the import wood product markets in Japan and China. These findings are helpful to government agencies, environmental groups, and industrial firms in understanding the global wood products trade and addressing various concerns and challenges with the increasing trade volume.

2. An overview of wood products trade

Wood products can be classified by various criteria. One way is based on the degree of transformation on wood fiber. Major wood product types include roundwood (also referred to as unprocessed timber, sawlog, or log), sawnwood (or lumber), and wood-based panels (i.e., veneer, plywood, particleboard, and fiberboard) (Food and Agriculture Organization 2013). The transformation on fiber is the least for roundwood and the most intensive for panels. Another way is by species. Roundwood and sawnwood usually has a clear label of the single tree species. However, some wood-based panels (e.g., fiberboard) often contain both hardwood and softwood materials. Other criteria used in classifying wood products include the location of tree production (i.e., sources) and dimension of products. In this study, the focus is on the competition and substitution between wood products with different fiber transformation and sources in the global market.

International trade of wood products worldwide since 1961 has been evolving with different patterns by product category. Between 1961 and 2011, global trade quantity has increased from 38 to 124 million m^3 for roundwood, from 39 to 116 million m^3 for sawnwood, and from 3 to 71 million m^3 for wood-based panels (Food and Agriculture Organization 2013). Apparently, the growth is much higher for wood-based panels (Fig. 1). The aggregate quantity data neglect the difference in product dimension and quality. Thus, the aggregate value data can provide additional insights. In Fig. 2, the values and shares of wood products worldwide are plotted over the more recent years of 1993–2011. In comparison, the value shares of roundwood and sawnwood in all wood products traded have been declining, and the value share of panels has been rising rapidly. Thus, wood-based panels have been traded more actively than roundwood and sawnwood over time.

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