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Evaluating the impacts of an international phytosanitary standard for wood packaging material: Global and United States trade implications

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ABSTRACT

Wood packaging material (WPM) is a significant pathway by which bark- and wood-boring insects move between countries. Recognising this threat, an international standard for the treatment of WPM (ISPM 15) is being implemented by many countries. In addition, the United States has considered application of similar requirements to WPM used in domestic and bilateral trade with Canada. We use a domestic margin-inclusive version of the Global Trade Analysis model to estimate the economic and trade impacts of ISPM 15, along with alternatives of varying stringency. We also estimate the economic impacts of one of the benefits of ISPM 15; averted United States forest owner timber losses. ISPM 15 is likely to have a small, negative effect on exports and economic welfare for most countries. However, there is significant regional and sectoral variation, depending on the product mix traded. If ISPM 15 requirements are extended to United States domestic trade, the impacts on the United States are stronger. Inclusion of averted United States timber losses partly, but not completely, offset welfare and trade impacts of the ISPM 15 treatment. These results must be tempered with the additional benefits of ISPM 15 in terms of potential averted household and environmental damages.

1. Introduction

Wood packaging material (WPM; e.g. pallets, crates, and dunnage) is a vital part of global trade and the forest products industry. An estimated 50–80% of the US$12 trillion in world merchandise trade is moved using some form of WPM (USDA APHIS, 2003). This requires vast amounts of sawn timber. WPM is the third largest end use for sawn timber in the United States after single family home construction and residential repair and remodelling, accounting for 10–15% of consumption each year for over four decades (McKeever, 2009). Unfortunately, sawn timber can be infested with pests, and WPM is now recognised as one of the primary pathways by which bark- and wood-boring pests move among countries (Haack, 2001, 2006; Brockerhoff et al., 2006; McCullough et al., 2006; Zahid et al., 2008; Haack and Petrice, 2009; FAO, 2011). In the United States and elsewhere establishments of Asian longhorned beetle (*Anoplophora glabripennis*) (Haack et al., 2010), pine shoot beetle (*Tomicus piniperda*) (Haack and Poland, 2001), the emerald ash borer (EAB; *Agrilus planipennis*) (Haack et al., 2002) and other wood pests have been linked to the importation of WPM. For EAB alone, predicted treatment, removal, and replacement costs discounted over the period 2009 to 2019 are estimated at over US$10 billion (Kovacs et al., 2010).

In response to this threat, the Commission on Phytosanitary Measures of the International Plant Protection Convention (IPPC) adopted ISPM 15 in 2002, an international standard for the treatment of WPM designed to "reduce the risk of introduction and spread of quarantine pests associated with the movement in international trade of wood packaging material made from raw wood" (FAO, 2009). As currently implemented in 2012, ISPM 15 guidelines suggest that countries require all import-associated WPM manufactured from raw wood be heat treated or fumigated with methyl bromide in order to kill pests in the wood at the time of treatment (FAO, 2009). Wood that has received an approved ISPM 15 treatment is stamped as such to signify the risk of harbouring live pests is negligible and thus additional treatment should not be needed (FAO, 2009, 2011). In 2009, ISPM 15 was revised to include the elimination of bark patches greater than 3 cm wide and 50 cm^2 in surface area (FAO, 2009). This was to reduce the likelihood of insect infestation after treatment as many borers require large bark patches for successful reproduction and larval development (Evans, 2007; Haack and Petrice, 2009).

Article 3 of the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures encourages countries

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"to harmonise sanitary and phytosanitary (SPS) measures on as wide a basis as possible, members shall base their sanitary or phytosanitary measures on international standards, guidelines or recommendations" (WTO, 1995). ISPM 15 is perhaps the best example of a harmonised SPS measure based on an international standard. Since 2002, it has been implemented by over 70 of the 177 signatory countries to the IPPC. In contrast, the majority of the more than 30 International Standards for Phytosanitary Measures (ISPMs) that have been adopted under the auspices of the IPPC do not deal specifically with commodity treatments. Instead they are guidelines or recommendations that apply to phytosanitary activities such as pest risk assessment, inspection and surveillance, sampling, reporting, and determination of pest free zones (FAO, 2011). ISPM 15 was the first SPS measure applied to a pest transmission pathway. Because WPM is associated with the majority of global merchandise trade (FAO, 2011), ISPM 15 continues to affect more trade by volume than any other SPS measure.

In 1999 treatments similar to those specified in ISPM 15 were imposed on WPM from China to the United States, largely in response to the discovery of the Asian longhorned beetle in New York in 1996 and Illinois in 1998 (Haack et al., 2010). The United States, Mexico and Canada began implementing ISPM 15 in September 2005, with full implementation occurring on 5 July 2006. United States–Canada trade was exempted because these countries share a long common border and have many common forest pests. Recently it was proposed to expand ISPM 15 to United States–Canada cross border trade and also to interstate commerce within the United States (USDA APHIS, 2009, 2010).

The goal of this study is to estimate the effects of ISPM 15 and related SPS measures on bilateral commodity trade flows and country welfare, using a multi-commodity global trade model. We use the Global Trade Analysis Project (GTAP) model and version 7 database (Hertel, 1997; Narayanan and Walmsley, 2008),[2] which has been extended to include domestic margins (GTAP-M, Peterson, 2006). There has been very little research on the economics of ISPM 15, which is surprising given the significance of WPM to global trade and the forest products sector and the distinction of ISPM 15 as one of the best examples of a harmonised SPS measure. A study by Jabara et al. (2008) uses the GTAP model to assess some implications of ISPM 15 for United States trade. As a starting point for analysis, we adopt the share of pallet value in international transport costs calculated by Jabara et al. (2008) as a proxy for WPM value. We adjust these margins for reductions that have occurred in the cost of treatment and we include domestic transport margins, along with greater regional disaggregation.

Our analysis significantly extends and generalises the analysis of Jabara et al. (2008) in three important respects. First, we estimate the effects of WPM SPS measures on global trade using an updated database. Effects on the United States are highlighted as one component of the analysis and we extend previous work to include United States domestic transportation in the analysis. Second, we consider four phytosanitary policy scenarios, as summarised in Table 1: (1) ISPM 15 as initially approved in 2002, though revisions to ISPM 15 in 2006 and 2009 probably added little to the cost of WPM[3] ("Current"), (2) ISPM 15 with a more stringent heat treatment requirement ("HT+"), (3) an international ban on the use of WPM accompanied by a substitution of plastic for wood ("Plastic"), and (4) expansion of ISPM 15 to encompass United States domestic and Canada–United States cross-border trade ("US domestic"). The first scenario was applied to all international bilateral trade flows except bilateral US–Canada and US–China, while the second and third scenarios were applied to all international trade flows except bilateral US–Canada.

Each of these scenarios has received attention among the international standard setting community. The rationale for more stringent heat treatment is based on laboratory studies showing that some EAB larvae are able to survive the current ISPM 15 heat-treatment schedule (McCullough et al., 2007; Nzokou et al., 2008; Myers et al., 2009; USDA APHIS, 2011). An outright ban on the use of wood packaging material was one alternative discussed in the final rule making process when ISPM 15 was adopted by the United States (USDA APHIS, 2004) and continues to be raised in policy discussions of possible alternatives to ISPM 15. In some instances this has been motivated by reported finds of live quarantine pests on ISPM 15 stamped WPM (Zahid et al., 2008; Haack and Petrice, 2009). The expansion of ISPM 15 to United States domestic and United States–Canada trade was recently considered by APHIS in two proposed rules (USDA APHIS, 2009, 2010, 2011).

Table 1
ISPM 15 policy scenarios.

Scenario	Treatment cost ($/pallet)	Excluded bilateral trade flows	Domestic trade flows included	Timber losses
Current	1.50	US–China, US–Canada	None	None
HT+	2.00	US–Canada	None	None
Plastic	14.00	US–Canada	None	None
US domestic	1.50	US–China	US	None
Current + timber	1.50	US–China, US–Canada	None	US $130 m

The third contribution of our analysis is to model the trade and welfare impacts of averted forest landowner timber losses due to ISPM 15 eliminating bark- and wood-borer insect establishments in the United States, using recent estimates (Aukema et al., 2011) ("Current + timber"). Aukema et al. (2011) undertook a series of economic analyses to estimate the annual short-run damages in the United States associated with three forest pest feeding-guilds – wood borers, sap feeders, and foliage feeders – and five cost categories — federal government expenditures, local government expenditures, household expenditures, residential property value loss and forest landowner timber loss. The damages were estimated within a partial equilibrium framework and reflected changes from a baseline scenario of economic impacts from the forest pests being absent.

The analysis of this paper contributes to the more general literature that estimates the trade impacts of phytosanitary regulations and standards using gravity models, partial equilibrium models and computable general equilibrium models (see Beghin and Bureau, 2001 and Maskus et al., 2001 for reviews). Gravity models (Bergstrand, 1985, 1989) are best suited to ex post analysis of the trade impacts of phytosanitary standards. They have been used by Disdier et al. (2008) and Otsuki et al. (2001) to assess the trade implications of phytosanitary regulations and standards. These studies basically include a dummy variable in the estimated gravity model if a bilateral trade flow has a regulation in effect.

Partial equilibrium models have been used to assess the trade implications of phytosanitary standards for wood products by Prestemon et al. (2006) for the United States ban on log imports from Russia, and Turner et al. (2007) for a ban and debarking requirement on New Zealand log exports to China, Japan and Korea. Both of these studies used the Global Forest Products Model (Buongiorno et al., 2003).

Computable general equilibrium (CGE) models enable analysis of cross-sector impacts of phytosanitary regulations. This is an obvious characteristic of WPM, which is used among a wide range of commodities across a large number of sectors. The GTAP CGE model we use in this study incorporates a database of detailed bilateral trade, transport and tariff data that characterise regional linkages, along with input–output data that describe inter-sector linkages within regions.

The following section of the paper provides more detail about ISPM 15, the economic model, and the implementation of the

[2] See www.gtap.org for full details and updates of the model and database.
[3] Based on email responses from various international wood packaging industry and association representatives carried out by Robert A. Haack in April 2009.