Forest Policy and Economics 39 (2014) 54–66

Contents lists available at ScienceDirect

Forest Policy and Economics

journal homepage: www.elsevier.com/locate/forpol

Global impacts of Russian log export restrictions and the Canada–U.S. lumber dispute: Modeling trade in logs and lumber

G. Cornelis van Kooten, Craig Johnston *

Department of Economics, University of Victoria, Victoria, British Columbia, Canada

ARTICLE INFO

Article history:
Received 10 July 2013
Received in revised form 12 November 2013
Accepted 13 November 2013
Available online 4 December 2013

JEL classification:
Q23
Q27
Q28
F17
Q21

Keywords:
Forest trade
Spatial price equilibrium model
Calibration
Mathematical programming

ABSTRACT

Forest product trade analysis is complicated by the inter-relationships among forest products. This paper deals with the development and application of an integrated log-lumber trade model that divides the globe into 20 regions. These regions play a significant role as producers and/or consumers of coniferous logs and softwood lumber. The model is calibrated using positive mathematical programming (PMP) so that the baseline scenario precisely duplicates observed 2010 bi-lateral trade flows of both logs and lumber. The calibrated model is then used to examine (1) liberalization of Russian log export taxes and (2) removal of the export restrictions on Canadian lumber exports to the United States. By permitting expanded log exports, Russian welfare increases by $2.3 billion, with losses to lumber consumers and producers more than covered by the gain in rents to timber land. However, the impacts on other regions in the model are surprisingly small. Likewise, removal of the export tax on Canadian lumber to the U.S. also leads to very small changes in welfare; Canada gains $91.8 million, but the U.S. loses only $16 million as it shifts lumber sales from domestic to export markets. Russia loses $485 million because it produces less logs and lumber, while the impact on other regions is imperceptible. Clearly, by modeling logs and lumber together, the overall impacts of forest policies in one region are mitigated at the global scale.

1. Introduction

In 2011, global exports of forest products were valued at $245.9 billion, with trade in industrial coniferous roundwood (softwood logs) and coniferous sawnwood (softwood lumber) valued at $79.0 billion and $23.2 billion, respectively.[1] The processing of roundwood into wood products leads to a complex relationship when it comes to the modeling of log and lumber trade flows (Perez-Garcia et al., 1997; Berck, 2005). Indeed, the flows of softwood timber products among countries are intertwined in such a way that forest policies in any one country potentially affect all countries.

Although trade flows have increased in recent years, a number of significant distortions remain in markets for softwood logs and lumber: one example is the Canada–U.S. Softwood Lumber Agreement (SLA) that penalizes lumber exports from Canada but allows logs to enter tariff free; another is Russian restrictions on log exports (Simeone and Eastin, 2012). Forest management policies adopted by countries can also influence domestic supply, such as Vietnam's curtailment of production from native forests that influences domestic supply and hence external demand (Vietnam has the world's 4th largest furniture industry) and Japan's subsides to promote domestic supplies for its sawmilling industry.

One cannot examine trade in logs without also considering trade in lumber, and vice versa. Indeed, it may also be necessary to include plywood and other wood products as well, although it is very likely that harvest residues, chips and sawmill waste are insignificant components of trade since they are used locally for pulp production and heat and power. Therefore, even though economists had previously used separate log and lumber models (e.g., Uhler, 1991; Margolick and Uhler, 1992; Mogus et al., 2006), it is important to any investigation of log markets to include both logs and lumber in the same model (e.g., see Berck, 2005).

Despite their usefulness for evaluating policy, analytic models have deficiencies that can only be addressed with an appropriate numerical model. In the case of forestry, the sheer number of forest products and their inter-relationships makes it difficult to construct a trade model that captures these relationships. One model that does examine multiple products is the Global Forest Products Model (GFPM), which eschews bi-lateral trade flows for more general trade relations — each country trades with the Rest of the World, but bi-lateral trade among individual countries is not usually modeled (Buongiorno et al., 2003; Sun et al., 2010), although it can be (Turner et al., 2007). Another model is the University of Washington's CINTRAFOR Global Trade Model (CGTM), which has 15 regions (three Canadian regions with the BC Interior and BC Coast constituting two of these) (see Perez-Garcia et al., 1997). It describes all aspects of forest product production including forest growth, processing and final demand, but it is a

* Corresponding author.
E-mail address: Craig@uvic.ca (C. Johnston).

[1] Information available from http://faostat.fao.org (viewed April 18, 2013).

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http://dx.doi.org/10.1016/j.forpol.2013.11.003

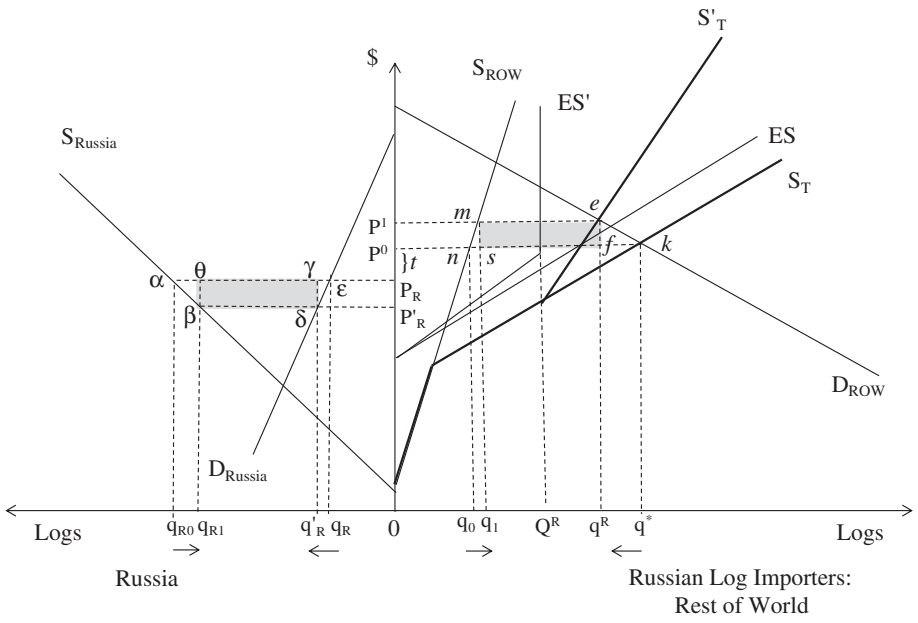

Fig. 1. Economics of Russian export TRQ: nonbinding quota.

proprietary model. Further, no explanation of the link between log and lumber markets, and how welfare is measured, is available in the detail provided here.

In this paper, we develop a trade model that has two products, coniferous logs and lumber, with the former an input into production of the latter. Our purpose is threefold: first, we provide a theoretical foundation for modeling trade in logs and lumber, using applied welfare analysis to identify and measure the economic costs and benefits of public policies and the income changes that such policies bring about (see Just et al., 2004; Schmitz et al., 2010). Second, we demonstrate how positive mathematical programming can be used to calibrate a partial equilibrium trade model (Paris et al., 2011; Paris, 2011), although we also point out some potential pitfalls with this approach. Finally, we develop a log-lumber trade model and use it to provide insights into the liberalization of Russian log exports and Canada–U.S. lumber trade. The forest model is referred to as the *R*EPA-*P*FC *F*orest *T*rade *M*odel, or RPFTM.

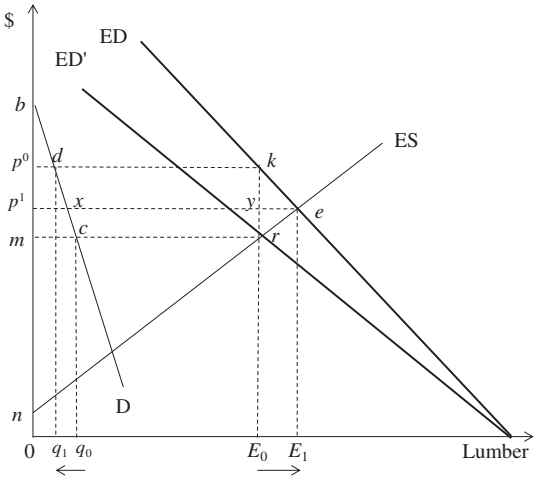

Fig. 2. Analysis of the Canada–U.S. softwood lumber dispute.

The RPFTM constitutes a spatial price equilibrium (SPE) model where transaction/transportation costs and government policies are the only impediment to equalization of prices across regions. The model employs a mathematical programming framework with an objective function and inequality and/or equality constraints. It consists of two products (logs and lumber) and twenty regions. In the model, Canada is divided into five regions — Atlantic Canada, Central Canada, Alberta, BC Interior and BC Coast. The United States is divided into three regions (South, North, West), and Asia is separated into China, Japan and Rest of Asia (including Korea as an important player in log-lumber trade). Chile, Australia and New Zealand are also separate regions, while the remaining six regions comprise Russia, Finland, Sweden, Rest of Europe, Rest of Latin America, and the Rest of the World (ROW). The model runs in a GAMS–Excel environment so no executable code is available.[2] Background information regarding the model is available from van Kooten (2002), Mogus et al. (2006), and Abbott et al. (2009).

We begin in the next section by using diagrammatical analysis of bilateral trade in a single output to investigate the potential economic impacts of Russian liberalization of log trade and resolution of the Canada–United States softwood lumber dispute. Then, in Section 3, we provide a detailed description of a log-lumber trade model consisting of twenty regions, including five Canadian and three U.S. regions. The underlying theory, data and model calibration using positive mathematical programming are discussed. In Section 4, the trade model is used to examine the impact of removing the Russian trade restrictions on log exports and removal of the export taxes applied to lumber from various Canadian regions destined to the United States as prescribed under the Canada–U.S. Softwood Lumber Agreement. Some conclusions follow in Section 5.

2. Spatial price equilibrium models of forest trade

A diagrammatic explanation of spatial price equilibrium trade models, and excess supply and demand functions, can be found in Just

[2] The GAMS and Excel files required to run the model are available from the lead author upon request.