



# Incidence of Russian log export tax: A vertical log-lumber model



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## ABSTRACT

In 2007, Russia imposed an ad valorem tax on its log exports that lasted until 2012. In this paper, we use a Muth-type equilibrium displacement model to investigate the market and welfare impacts of this tax, utilizing a vertical linkage between log and lumber markets and considering factor substitution. Our theoretical analysis indicates that, without considering the vertical linkage, the negative effects of log export tax on equilibrium price for log producers is underestimated when logs and processing services are gross substitutes, and the direction of bias is uncertain when they are gross complements. Empirical simulations show that the burden of Russian log export tax is shared almost equally between foreign log buyers and domestic log producers and that the tax increases domestic lumber production. Further, the marginal effect of the log export tax on domestic lumber production decreases as Russian domestic demand share of logs increases. Overall, the welfare gains for Russian lumber consumers, lumber producers in the form of quasi-rents to processing services, and tax revenue exceed the loss in its logging sector.

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## Introduction

Russia is one of the world's largest exporters of coniferous logs. In 2006, its log exports reached 36.4 million m<sup>3</sup>, which was more than six times in 1992 and contributed to 44.5% of the world's total softwood log exports (Food and Agriculture Organization of the United Nations or FAO, 2017). However, the vast forest resources in Russia have not contributed significantly to the country's economic growth because of lack of investments and low level of resource utilization in its forest sector (Torniainen et al., 2006). To stimulate domestic lumber production, Russia imposed an ad valorem export tax of 6.5% on January 1, 2007, rising to 20% on July 1, 2007 and 25% on April 1, 2008 (van Kooten and Johnston, 2014). Russia originally intended to introduce another round of tax increase from 2009, but postponed the move following protests from neighboring countries and sharply dropped international demands on wood products after the 2008 financial crisis. When Russia joined the World Trade Organization (WTO) on August 22, 2012, it was forced to reduce the export tax on softwood logs to between 13 to 15% within a quota while the rate remains at 25% beyond the quota

(WTO, 2017). As the quota volume was set below previous trade levels, log export volumes in 2013 was 4% lower as compared to 2012. As a result of all these restrictions and falling international demands, Russian softwood log exports declined drastically to 12.7 million m<sup>3</sup>, or 15.5% of total global trade, in 2016 (FAO, 2017).

The purpose of this study is to estimate the incidence of the Russian log export tax between 2007 and July 2012 and to assess its effectiveness. Even though Russia has changed its log export restrictions to a tariff-rate quota system since August 22, 2012, this analysis is relevant and has policy implications because it provides a basis for comparing different systems in Russia. Furthermore, it can inform public policy if a similar tax is implemented in other jurisdictions. From an academic and analytical perspective, it fills the void in literature on this particular tax in Russia, which presents a unique opportunity to assess the extent to which a vertical market linkage might affect tax incidence. Conventional theory indicates that export taxes on raw materials (e.g., logs) can reduce domestic log price which in turn boosts domestic production and exports of finished goods (e.g., lumber). However, ignoring the interdependence between log and lumber markets in a global supply chain and possible factor substitution may produce biased estimations on the price, production, and welfare effects of the log export tax.

Simeone (2012) uses descriptive statistical analysis to look into Russian market share change in international log markets before and after the implementation of log export tax. The other two

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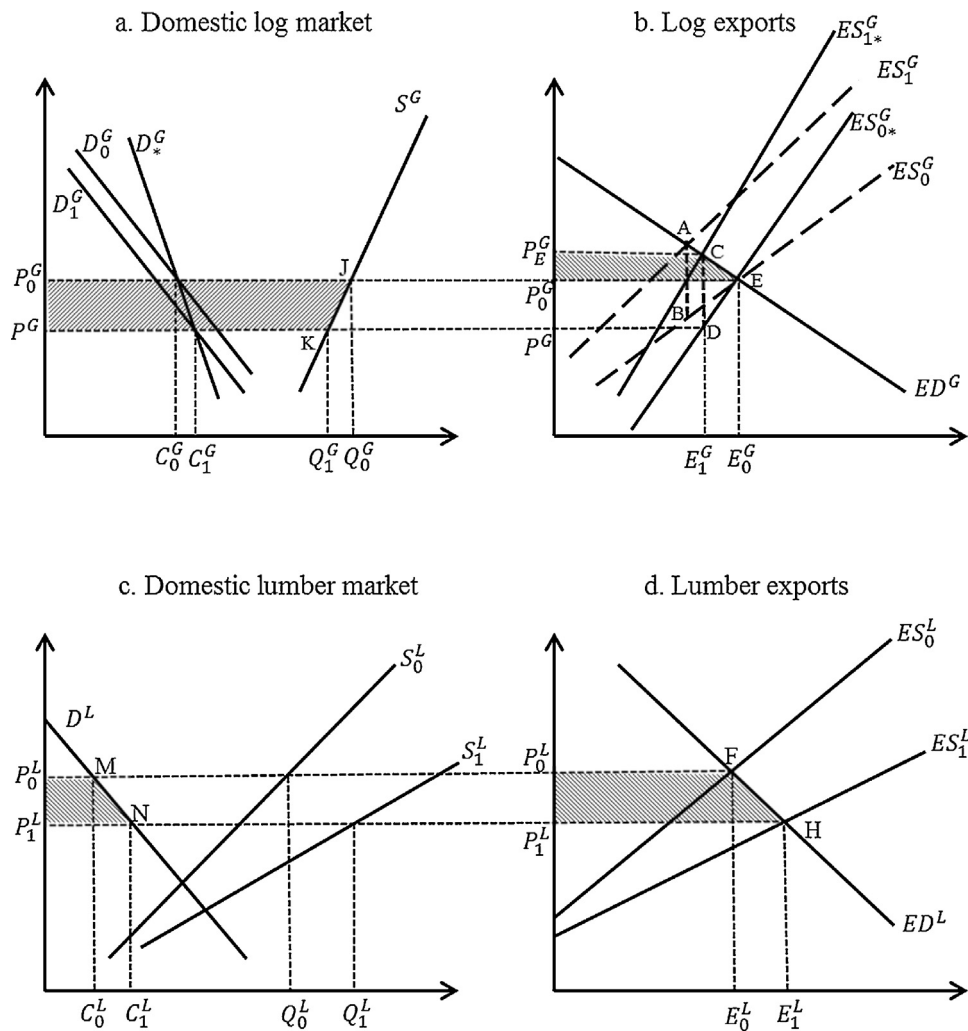


Fig. 1. The effects of Russian log export tax: Vertical log-lumber markets.

Source: Authors' analyses.

studies, Solberg et al. (2010) and van Kooten and Johnston (2014) include multiple wood products in their analyses. Using a global forest sector model (EFI-GTM), Solberg et al. (2010) predict the price and production of Russian and global forest products towards 2020 under alternative tax levels. However, the incidence of log export tax is still not transparent. van Kooten and Johnston (2014) estimate the market effects of Russian log export tax by developing an integrated log-lumber trade model from a global perspective and using simulations. Their main conclusion is that lifting the log export tax increases Russian welfare, which means that the tax has caused welfare loss to Russia. This conclusion, however, is contrary to the theory of optimal tax for a country with sufficient monopoly power in the world market (e.g., Sedjo and Lyon, 1992). Studies on log export restrictions in other jurisdictions include Zhang (1995), Johnson et al. (1995), and van Kooten (2014).

In this study, we use a Muth-type equilibrium displacement model (EDM) to measure the incidence of Russian log export tax based on a vertical log-lumber market linkage. The Muth-type EDM uses a less restrictive assumption that allows the possibility of substitution between factors of production (Alston, 1991). Moreover, it makes transparent the economic forces that determine tax incidence. Specifically, we estimate the impacts on price and quantity changes and the resulted benefits or costs to (1) Russian log producers, (2) Russian lumber producers (the consumers of Russian logs), (3) Russian treasury, (4) foreign log buyers, and (5) foreign lumber

buyers. The sum of (1) to (3) is the net benefits or costs to Russia, and that of (4) to (5) is the net benefits or costs to the rest-of-the-world (ROW). The sum of Russian and ROW benefits and costs gives the total world benefits or deadweight loss.

This study differs from other investigations of this question insofar as it is based on a Muth-type EDM, considering factor substitution in lumber production and feedback effects on log demand. Furthermore, we illustrate the log-lumber market interaction in a graphical analysis. Finally, the primary parameters used in this study—the elasticities of supply and demand for Russian lumber and log—are directly estimated using recent data. Our main conclusion is that the export tax was beneficial to Russia and the average tax rate between 2007 and 2012 was suboptimal from Russia's perspective. The next section presents a graphical analysis of the impacts of Russian log export tax on domestic and overseas log and lumber markets, followed by a theoretical analysis. Sections parameter estimation and model calibration and simulation provide our elasticity estimates of Russian domestic and export markets for logs and lumber and estimates of the prices, quantities, and welfare effects associated with the tax. The final section concludes.

### Graphical analysis

Lumber production uses two factors: logs and processing services. One stage analysis focuses on log markets only, without

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