

# Determinants of trade for forest fuels and products

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## Overview

Between 1997 and 2005, the intra European trade in forest products and fuels increased more than five-fold (FAO, 2008). The relative scarcity of forest resources in some countries together with an increasing utilisation has increased the import needs for these countries and, at the same time, increased the export from relatively forest endowed countries. In addition, the trend towards a higher environmental awareness and an increasing support for renewable energy has perpetuated. Efforts to address environmental concerns often involve changes in environmental policies towards increasing the share of and changing consumer preferences towards renewable energy, of which forest resources have come to play a vital part. Efforts to address environmental concerns often involve changes in environmental policies. These trends are arguably connected. Consequently, an analysis of the European trade in forest products and fuels is an important input for understanding how parts of the European economies will be affected by EU policies aimed at promoting the use of renewable energy sources. The factors influencing the long term level of trade include income growth, improvements in forestry practice, harvesting and manufacturing technologies and costs, transportation costs, uniform classification of traded commodities and domestic use in relation to availability. The purpose of this study is to determine to what extent differences in net trade between EU member countries could be explained by differences in forest endowments, energy policies and other country specific characteristics such as domestic demand.

## Methods

The empirical work on revealed comparative advantages (RCA) in international trade has since e.g., Liesner (1958) developed significantly, both in terms of theoretical justifications and model development. The intuition behind RCA is that if an economy devotes more of a specific resource in production of a commodity than needed to meet domestic demand, it is revealing that it has a comparative advantage over others in the production of the commodity. Several measures of RCA have been proposed with different properties and specifications (e.g., Peterson, 1998). How good an index of RCA measures comparative advantage depends on the analysed commodities, market efficiencies, geographical characteristics and policies (e.g., Balassa, 1986; Bojnec, 2001). These indices are useful when it comes to ranking countries according to their relative comparative advantage. However, in order to link the revealed comparative advantage index to forest resource endowments, the model has been expanded. In general, the magnitude and direction of forest product trade flows are determined by geography, size of economies, character of forest endowments and government policies. Classical trade theory prescribes that trade occurs because there are differences amongst trading partners in their relative costs of production. The link between net trade, prices and resource endowment is provided by the Heckscher-Ohlin model, which has had mixed success in empirical analyses (e.g., Kohler, 1991; Noussair, 1995; Estevadeordal and Taylor, 2002). The Heckscher-Ohlin model predicts that a country's net exports of a given good are a positive function of its resource endowment and a negative function of its income. There are some assumptions that need to be made using the Heckscher-Ohlin model (Prestemon and Buongiorno, 1997): (i) There exists factors that are immobile between countries; (ii) Markets are competitive, with no barriers to trade; (iii) The same technology is universally available and; (iv) Consumption is homothetic with respect to income. According to the theory, the endowment variable should have a positive linear affect on the net trade and the income measure a negative linear affect. Moreover, the coefficients for the per capita income are expected to be positive, reflecting the positive relationship between net trade and factor endowments.

## Results

The empirical specification of the model was implemented on three different but interrelated forest commodities: roundwood; chips & particles and wood fuel. Observations for 19 European countries and for the period 1994-2006 were obtained. The estimated coefficients for roundwood exhibit the right sign for all the coefficients except for forest endowment. For chips & particles all the estimated coefficients have the expected sign except the factor endowment coefficient. Only the estimated coefficient for forest endowment has the right sign for wood fuel. The coefficients for the policy variable show a positive relationship between net trade of chips & particles and wood fuel and the increasing production of renewable energy. On the other hand, it shows a negative relationship between net trade of roundwood and the increasing production of renewable energy. In order to test the Heckscher-Ohlin model on different country specifics, the countries were firstly divided into two groups where the first group consisted of countries that have a relatively large traditional forest industry. Secondly, the countries were divided

according to their date of membership in the EU. We used this group division to study the cross-sectional impact of forest endowment and income on relative revealed trade advantage indices (*RTA*) of forest products more closely. It allowed an analysis of whether there are differences in the effects of forest endowment and economic activity between these groups. The results indicated that countries with a relatively large production of forest products have the highest level of statistical significance (except for wood fuel). However, the sign for income on roundwood and for forest endowment on chips & particles are not in line with the expectations. This inconsistency can be noticed in all of the group results and suggests either an empirical misspecification or a theoretical flaw. The result suggests that an increasing share of renewable power would, in general, decrease a country's comparative advantage in trading roundwood. However, it would increase its comparative advantage in trading both chips & particles and wood fuel. This is an interesting result. It can be argued that an increasing domestic production of renewable power can at least partly be met by an increasing utilisation of solid biofuels. Thus, since the most likely source of solid biofuels comes from the commodities chips & particles and wood fuel, an increased domestic production of these commodities is likely, changing the cost structure (e.g., via economies of scale) and consequently also the comparative advantage of the commodities.

## Conclusions

The results suggest that forest endowment is ambiguously affecting a country's comparative advantage in forest products. There might be other determinants affecting the trade pattern in forest products not included in the model (e.g., restructuring of the forest industries, technological development and movement towards more value-added products). These factors are difficult to assess using a static model, suggesting it might be more suitable to use a dynamic model. Moreover, it is possible that an increased utilisation of recycled material by the forest industries might affect the trade pattern of other fibrous raw materials. It should be stressed that the results are only valid for the dataset used. Accordingly, it is difficult to say anything about the comparative advantage of other countries that are not included in the dataset but nevertheless have a significant trade with Europe. Furthermore, since the time-period covers only the years 1994-2006, it is impossible to say to what extent the included countries have used their forest endowments to build comparative advantages in trade prior to this time period. However, the results partly support Vanek's (1963) specialized resource theory that states that a country's comparative advantage in forest products can largely be explained by the size of its economy and its endowment of forest resources. Despite the somewhat ambiguous results, it should be noted, however, that the analysis still partially confirms the Heckscher-Ohlin model prediction that countries with larger forest endowments has a comparative advantage in their exports as compared to countries with lesser forest endowments. These results are contrasting with much of the previous research on the topic (e.g., Bowen, et al., 1987; Kohler, 1991).

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