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# Factors affecting sawnwood consumption in Europe

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ABSTRACT

Recent significant changes in the sawnwood consumption per capita in some European countries raise the questions, whether similar changes could happen in other countries as well, and if so, driven by what? The objective of this study is to identify potential factors affecting the level and growth rate of sawnwood consumption in Europe. Econometric models with sawnwood consumption per capita as the dependent variable are estimated for 17 European countries for the period of 1980–2012. The per capita form normalizes the data in regard to the size of the markets, and therefore makes the data more comparable across countries and over time. The results indicate that the sawnwood consumption per capita is related to construction activity, income, and prices. However, the results point to large regional differences in the drivers of sawnwood consumption across Europe. Moreover, in densely forested and scarcely populated regions, there have been structural changes that may have been caused by changes in the market share of sawnwood in the construction markets, which the models measuring economic activity are unable to capture.

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## 1. Introduction

### 1.1. Background

The sawnwood sector has large significance for many regional economies in Europe. In the EU27, the sawnwood industry employed 250,000 people and produced a turnover of around 32 billion euros in 2010 (Eurostat, 2013: Nace R2 C161). Moreover, the developments of the sawnwood markets also affect the prices and supply flows for the other large scale forest-based industries, such as pulp, wood-based panels, and bioenergy markets (Lundmark, 2007). Given the importance of the sector, there has been surprisingly little empirical research on the European sawnwood market developments in the 21st century. The few examples include Simangunsong and Buongiorno (2001), Baudin (2003), Flinkman (2003), Kangas and Baudin (2003), Hetemäki et al. (2004), Mutanen and Toppinen (2005), Mutanen (2006), Sauquet et al. (2011), and Jonsson (2010, 2013).

The economic crisis caused the European sawnwood markets to plunge in 2008 and the markets have continued to stagnate for several years. Moreover, historical trends and major long-term demographic and economic indicators do not seem to support strong growth for sawnwood demand in Europe in the future either. On one hand, the number of households may increase, due to the declining number of people living in a household (Jonsson, 2011). However, on average, the European population is projected to be stagnating towards 2050 (UN, 2013). Moreover, the population in the Western world is forecast to continue to age and urbanize, thus reducing the demand for wood in construction (UN, 2012, 2013). Also, the economic growth is expected to be sluggish in Europe in the coming decades (OECD, 2012).

The European sawnwood markets could be characterized as path dependent in that the construction sector that accounts for the most of the sawnwood consumption has shown few changes away from traditional building practices (see also Mahapatra and Gustavsson, 2008). Similarly, the sawnwood consumption patterns do not seem to have been converging between regions (Buongiorno, 2009).

Given the above trends and the industry characteristics, major increase in the use of sawnwood would seem to require changes in the consumption patterns, i.e. in the level of consumption per capita (CPC). Indeed, while the aggregate level statistics for the European Union show little changes in the sawnwood CPC over the past decades, in some countries major changes have occurred. For example, in Finland the sawnwood CPC approximately doubled over the period of 1995 to 2000, yet it has plummeted back to the level of 1995 after the peak in 2007 (see Fig. 1). Hetemäki et al. (2011) argue that the increase may have been due to inter alia public promotion campaigns, government platforms (which seek to enhance wood building), technology platforms (e.g. open construction system), removing institutional obstacles of wood-frame construction (e.g. revising fire regulations and building standards), and successful examples (e.g. modern wood cities).

The difference between the aggregate and country level developments depicted in Fig. 1 raises the question, if the determinants of

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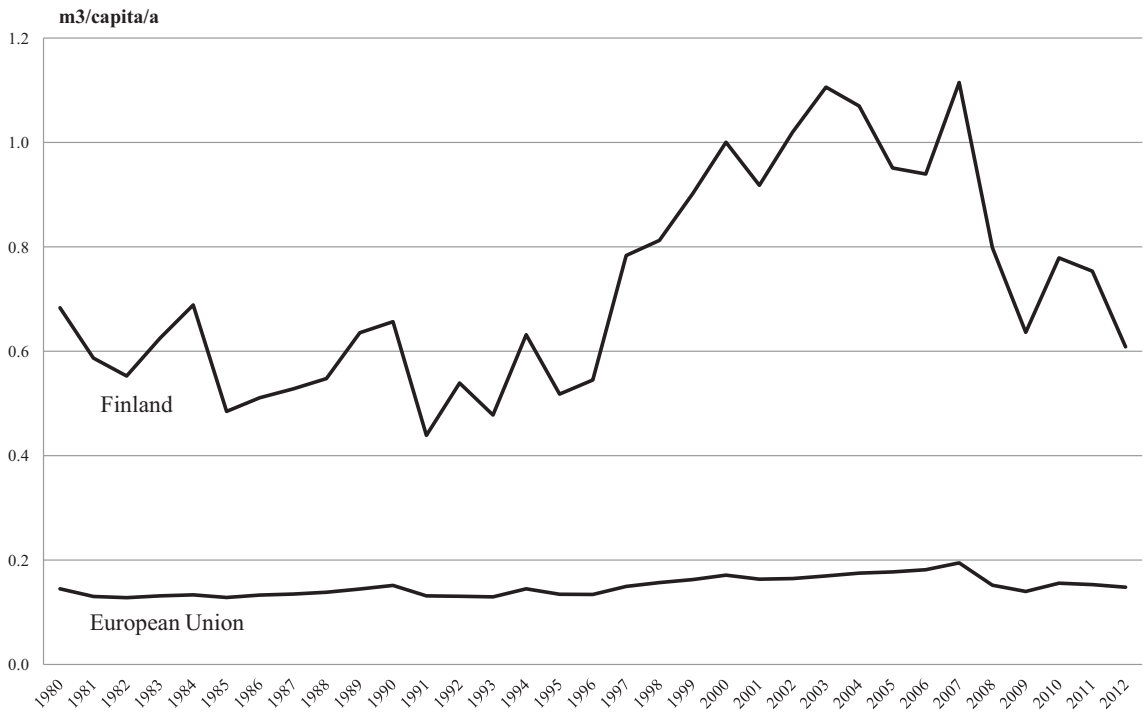


**Fig. 1.** Coniferous sawnwood consumption per capita in Finland and the European Union.

sawnwood consumption can be generalized to hold across Europe? Moreover, could similar changes as in Finland occur in other countries also?

Surprisingly, empirical studies analyzing CPC have been rare in forest economics literature (with the exception of Haripriya and Parikh, 1998), even though in other economic sectors per capita analyses appear rather common. For example, there are many studies on per capita economic growth, renewable energy consumption, alcohol and food consumption, and the intensity of material and energy use (see e.g. Mishra et al., 2009; Sadorsky, 2009; Gan and Smith, 2011; Marques and Fuinhas, 2011; Masini and Menichetti, 2012; Mohammadi and Ram, 2012; Newton and Meyer, 2012; Kepplinger et al., 2013; West and Schandl, 2013; Kula, 2014).

In trade journal literature and expert reports, discussion regarding the possible structural drivers of sawnwood consumption can be found (e.g. Eastin et al., 2001; Schuler and Adair, 2003; O'Connor et al., 2004; Kärkkäinen, 2005; Hänninen et al., 2007; Hetemäki and Hänninen, 2009, 2013; Hetemäki et al., 2011; Enroth and Valtonen, 2012). However, typically the previous studies have not attempted to quantify and validate the assumed linkages between the possible drivers and sawnwood consumption.

### 1.2. Objectives

The objective of this study is to explore what explains the differences in the level and growth rate of sawnwood consumption per capita across Europe. Econometric panel data modeling is used to test whether the conventional demand model and variables extensively used in literature (see Simangunsong and Buongiorno, 2001) are able to explain the observed large regional differences in sawnwood CPC. Moreover, we formulate a number of ad hoc models for the sawnwood CPC in an attempt to improve the understanding of the market structures and to validate expert analyses.

Many of the potential factors are difficult to measure or quantify, which constrains the possibilities to empirically test hypotheses on the factors affecting sawnwood consumption. Consequently, in addition to the empirical analysis, the potential factors that have been argued to affect sawnwood consumption patterns are synthesized in a qualitative framework.

The results provide empirical evidence on the sawnwood market structures and synthesize expert assessments on the factors affecting sawnwood consumption. In doing so, the findings seek to contribute both to the information needs of industry stakeholders and policy planning, as well as to the methodological discussion on sawnwood markets research.

## 2. Methods and data

### 2.1. The models

The estimation uses panel data, since panel data contain information of both the differences between individual countries, and the differences over time within individual countries. Also, using panel data improves the estimation efficiency and allows considering country-specific unobserved effects (Baltagi, 1995). Eq. (1) shows the general panel data model

$$y_{it} = \beta_0 + \beta X_{it} + a_i + c_t + \varepsilon_{it}, \quad (1)$$

where y is the dependent variable in country i (i = 1, 2, 3, …, N) over time period t (t = 1, 2, 3, …, T), $\beta_0$ is a constant, X is a vector of explanatory variables, $\beta$ is a vector of the corresponding coefficients, $a_i$ is a country-specific effect (a dummy for each cross-section), $c_t$ is a period-specific effect (a dummy for each year), and $\varepsilon$ is the error term.

The size of population is a major determinant of absolute forest product consumption. However, instead of using it as an independent variable, it is considered implicitly in the empirical analysis by converting all the appropriate absolute variables into per capita variables. The per capita scaling normalizes the data in regard to the size of the markets, and therefore makes the consumption patterns more comparable across countries and over time.

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