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The future operating environment of the Finnish sawmill industry in an era of climate change mitigation policies

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ABSTRACT

Sawnwood and its further-processed products play an important role in the mitigation of climate change; sawnwood, as well as its by-products from production processes, such as raw material (bark, chips, dust) for energy products (e.g. pellets, heating power), can substitute for other raw materials with higher carbon footprints. In this study, we integrate various foresight methods in analysing the future of the sawmilling industry in Finland. According to the results, climate change mitigation policies impact firstly through increasing energy costs and secondly through emerging energy products. The greatest uncertainties are related to the price of energy and the competitive situation of wood as a potential source of energy, both regulated heavily by EU- and national-level policies. In addition, the future development of biorefineries was regarded as a potential driver of change: the increasing demand for pulpwood would increase competition for the raw materials. From a managerial perspective, the Finnish sawmilling industry should thus consider adoption of new business models for joint production of wood, chips, and energy for heat and power. For the policymakers our study illustrates how important it is to take into account the causal effects on profitability determinants when designing policy measures.

1. Introduction

Sawnwood and its further-processed products play an important role in the mitigation of climate change, as they are capable of long-term storage of carbon. In addition, sawnwood as well as its by-products from production processes, such as raw material (bark, chips, dust) for energy products (e.g. pellets, heating power), can substitute for other raw material with higher carbon footprints. The long carbon storage option has been presented as the most viable opportunity in the construction sector (see e.g. Gustavsson and Sathre, 2007; Nässlen et al., 2012), the main end-use sector for sawnwood. In the long run, the relative competitiveness of wood products may improve with respect to competing substitutes, such as mineral or oil-based products, or products requiring energy-intensive production processes (Upton et al., 2008). However, the strength of the substitution impact will largely depend on political decisions concerning the role of harvested wood products (HWP) and bioenergy. In the case of Finland, for example, the development of energy prices depends largely on the future of domestic (see e.g. Ministry of Trade and Industry in Finland, 2014) and EU bioenergy policies (European Commission, 2014), where the goal in Finland is to increase the share of renewable energy to 50% by 2030, in line with the obligations proposed by the European Commission.

In recent literature on the Nordic sawmilling industry, investments in new product development (Stendal et al., 2007), developing marketing processes (e.g. Hugosson and McCluskey, 2009) and increasing forward integration (Brege et al., 2010) have been emphasized as means for strategic renewal and increased profitability of the traditional sawmilling sector. Few scenario studies have emerged in Europe concerning the future of wood-based bioenergy markets and trade (e.g. Heinimö et al., 2008), on related roles and complementary resources between forest- and energy-industry companies (Pätäri, 2010) or diffusion of forest biorefineries or multi-storey wooden construction (Näyhä and Pesonen, 2012; Hurmekoski et al., 2015). Pätäri et al. (2016) used Delphi-methodology in predicting how sustainability megaforces will shape the future of the European pulp and paper sector as a part of the bioeconomy in 2030, but the study did not consider future prospects of the wood products industry. Wan et al. (2012), based on a small-scale two-stage Delphi study among Finnish sawmill managers, concluded that increasing bioenergy production to meet larger demands in the energy markets and managing both by internal resources and external investment risks also brings new management challenges to firms, but small- and medium-sized firms lack capacity for taking financial risks under the high uncertainty of energy policies.

To summarize, no studies have addressed the role of the sawmilling industry in the wood product and raw material markets despite the

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introduction of political programmes at both EU and national levels specifically to support local, small- and medium-scale, wood-based production of bioenergy. In principle, a wood-fuel powered mill could, through efficiently combined heat and power (CHP) production, receive an additional €20 per MWh of electricity produced (Finlex, 2012). This should make especially the smaller scale (less than 8 MVA) production of wood-based bioenergy, integrated with sawmilling, more profitable. The key purpose of the feed-in tariff scheme is to help meet the national objective set by the EU to increase utilization of renewable energy sources. However, based on the experiences until mid-2012, the efficiency of the feed-in system, with its 750,000 eur investment subsidy cap, has been negligible in attracting new investments to CHP production among sawmills (Indufor, 2012), and industry associations have frequently demanded doubling of the annual subsidy cap to 1.5 million eur (e.g. Suomen Sahat, 2014).

On a broader perspective beyond energy policies, there are also various sources of uncertainty in the present operational environment of the sawmill industry. For example, in the case of a major sawnwood exporting country, such as Finland, there are various problems related to purchasing raw material, due to the increasing trend of setting aside forest land for conservation or recreation (Finland's National Forest Programme, 2015) and the uncertainty related to importation of wood from Russia (e.g. Solberg et al., 2010). In addition, due to the age-class distribution of forests, the proportion of thinnings, compared to clear-cuttings, is expected to increase during the next decades (Nuutinen et al., 2007), further challenging the sawlog supply as well as the profitability of sawmilling in Finland. However, an increase in the amount of thinnings may have positive effects on energy potential due to the smaller size of logs from thinnings compared to those from clear-cuttings, and consequently, the greater amount of by-products from processing. On the demand side, the success of sawmills in global markets depends largely on their competitiveness in export markets for products (e.g. EVA and Capful Ltd., 2009). In recent years, in Europe the oversupply of wood products in the economic recession has led to a decrease in production and shutdown of production capacity in several countries.

To ensure the future competiveness and potential of the wood products sector in mitigating climate change, sawmill management would need to improve their ability to foresee changes in both product- and raw-material markets (Lähtinen and Toppinen, 2008). To support the sawmill industry in adapting to a changing environment, as well as contribute to climate change mitigation, there is thus an urgent need to understand the drivers of change and their possible interaction effects, as well as the factors that determine firm and industry profitability. Specifically, in order to guarantee competitiveness and adaptive capacity over time, sawmill companies should develop management tools for anticipating fluctuations in the raw material and product markets, including wood-based bioenergy. Clearly, there is a demand for practically oriented futures research where the operating environment and strategic decision-making of the wood products industry is simultaneously analysed. This should not only be done in the context of marketing, processing and procurement processes (e.g. Nuutinen et al., 2009), but also in the bioenergy market as part of societal development aligned with sustainable development, especially related to climate change mitigation and adaptation.

In this paper we present a foresight study exploring the future operating environment of the Finnish sawmill industry in an era of climate change mitigation policies. The primary focus is on identification of external drivers and analysis of their causal effects on profitability determinants related to the potential business models of sawmills in Finland. In this study, the concept of business model is understood as a blueprint of how companies do business (Osterwalder et al., 2005), referring here to the choice of core competitive strategy and degree of vertical integration as the main elements. To fulfil the aim, our study integrates various foresight methods (Popper, 2008): Delphi technique linked with qualitative methods such as thematic interviews, expert panels and scenario workshops.

2. Material and methods

2.1. Scenario building and Delphi method

According to Kuusi (1999) scenarios are hypothetical sequences of events constructed for the purpose of focusing attention on causal processes and decision points, which are built to construct entities with logical structure and inter-dependencies in order to understand the complexity of the changing environment. A scenario describes the possible future situation and the course of events leading from the original situation to the future situation (Godet and Roubelat, 1996; O'Brien, 2004). A set of scenarios introduces a variety of ideas, challenges current assumptions, broadens perspectives and increases our understanding of what the new situation means and what its collective response should be (van der Heijden, 2000; Duinker and Greig, 2007). The scenarios help to structure uncertainty, establish the limits of plausible futures and therefore, improve the quality of executive decision making (Wack, 1985; Wilson, 2000; Burt, 2006). A collection of scenarios can also be called a futures map, although we do not explicitly consider this concept here.

The scenarios are ideally constructed by a variety of people organized in networks to create alternative representations of the future (Roubelat, 2000). The participation of a diverse group of people in a systematic process of collecting, discussing, and analysing scenarios promotes the building of shared understanding. Throughout scenario planning a variety of quantitative and qualitative information can be incorporated in the decision-making process (Peterson et al., 2003). Schoemaker (1993) emphasized complexity, uncertainty and interdependence as typical features of a scenario process. However, not even among futurists is there consensus on how to categorize and delineate different approaches to scenario building (e.g. Höjer et al., 2008). Börjeson et al. (2006) distinguish three main groups of techniques: 1) generating techniques for collecting and structuring ideas, knowledge and views (e.g. the Delphi method, use of surveys and workshops), 2) integrative modelling techniques for projecting the effects of some kind of development with more or less explicit constraints (with e.g. time series analysis, optimising modelling), and 3) formalized consistency techniques (morphological field studies, cross-impact analyses).

Foresight methods, such as trend analysis and extrapolation, simulation and scenario analysis, have been applied in the forest industry. However, existing futures studies in the field have taken a narrow a view on the sawmilling segment of forest industry (e.g. Uotila, 2003; Hetemäki and Hänninen, 2009) or have suffered from the lack of sound methodological foundations (e.g. Hartikainen, 1994; CEI-Bois, 2004; Suomen puutuoteteollisuus…, 2007; The Finnish Forest Cluster, 2010).

The Delphi method is a qualitative research method based on a group technique originally aimed at obtaining the most reliable consensus of expert opinions. More recently the Delphi method based on dissentious opinions (so-called Policy Delphi), has replaced the traditional target for reaching consensus in a group of experts, stakeholder and synthesizers. The four key features of the Delphi method, applicable for scenario building, are anonymity, repeated iterations of knowledge elicitation, group statistical response and controlled feedback (see, for example, Gupta and Clarke, 1996; Rowe and Wright, 1999; Landeta, 2006). Anonymity guarantees that neither the identity nor the status of participants influences the response. Iteration means that Delphi panellists are consulted at least twice on the same issue. Group statistical response means that all the opinions form part of the final answer and controlled feedback is reflected in the way information is processed after each round through a study group co-ordinator.

A participatory approach, such as Delphi, has some advantages in collecting information on drivers. For example, when the future