Dissertation Forestales 172

In search of sustainable competitive advantage in the wood products industry: Evidence from China and Finland

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Academic Dissertation

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ABSTRACT

Given the dramatic changes such as globalization, increasing energy costs, technology development and climate change that are occurring in the global business environment, the wood products industry faces the challenges of rising production costs, rapid technology transfer and increasing corporate environmentalism. Consequently, the traditional sources of competitive advantage based on economies of scale are no longer sufficient in today's highly competitive and dynamic market. Implementing a purely conventional low-cost strategy has thus become a less viable option for companies to sustain their competitiveness. Wood products companies must develop sustainable value-creation strategies in order to generate firm-level value added and create sustainable competitive advantage (SCA). Although understanding the sources of SCA has become an active area of research in the strategic management literature, research in this area that is specific to the wood products sector is in its nascent stages.

This study contributes to the evolution of research on competitive advantage in the wood products industry by approaching it from the dynamic capability perspective (DCP) and natural resource-based view (NRBV) of the firm. Both quantitative and qualitative data and research methods were used to facilitate comparative analysis at multiple levels of decision-making. This dissertation examines the sources of SCA and the corresponding changes in competitive strategies in the wood products industry in two contexts: China and Finland. The results indicate a growing trend in transitions from production to market and to stakeholder orientation, from a cost leadership to a differentiation strategy, and from low value-added to high value-added products in both countries. Along with these transitions, the sources of SCA have changed from focusing solely on tangible resources to integrating intangible resources.

This study provides useful references for strategic planning and analysis for producers in both emerging and established wood products markets, and also helps enrich our knowledge of using the DCP and NRBV of the firm as foundation theories to conduct strategic business research. As a preliminary step in understanding business dynamics and future development trends of the wood products industry, this dissertation opens up interesting avenues for future research. Both the type of strategic analysis and the research design used in this study could be applied to analyzing the wood products industry in other emerging or established markets.

Keywords: Sustainable competitive advantage, marketing strategies, dynamic capability perspective, natural resource-based view, wood products industry, China and Finland

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First and foremost, praises and thanks to almighty God for his unparalleled grace, mighty love, superior guidance and protection, and showers of blessings throughout my life. He is my hope, my light, and my strength. Without the grace, wisdom and strength bestowed upon me by God, this dissertation would not have been possible. Through his grace, my future holds nothing but promise.

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Helsinki, Finland, February 2014

Minli Wan

To God, my family, and my friends

(This photo was taken when I was writing my dissertation summary in the USA in 2013)

LIST OF ORIGINAL ARTICLES

In addition to the summary, this doctoral dissertation comprises the following four articles, which are referred to by their Roman numerals. Articles I, II and IV are reprinted with the permission of the publishers. Article III is the author's version of the manuscript.

I Toppinen, A., Wan, M. and Lähtinen, K. 2013. Strategic orientations in the global forest sector. In: The Global Forest Sector: Changes, Practices, and Prospects. Hansen, E., Panwar, R. and Vlosky, R. (Eds.). CRC Press. p. 405-428
DOI: 10.1201/b16186-22

II Wan, M., Toppinen, A. and Hänninen, R. 2011. Econometric analysis of China's plywood market. *Forest Products Journal* 60(7/8): 679-687.
DOI: http://dx.doi.org/10.13073/0015-7473-60.7.679

III Wan, M., Lähtinen, K and Toppinen, A. 2014. Strategic transformation in the value-added wood products companies: Case study evidence from China. Submitted revised manuscript to *International Journal of Emerging Markets*.

IV Wan, M., Lähtinen, K., Toppinen, A. and Toivio, M. 2012. Opportunities and challenges in the emerging bioenergy business: The case of the Finnish sawmill industry. *International Journal of Forest Engineering* 23(2): 13 p. (PDF-online).
DOI: 10.1080/14942119.2012.10739965

DIVISION OF LABOUR IN CO-AUTHORED ARTICLES

	I	II	III	IV
Conception and design	AT	RH, MW, AT	MW, AT, KL	MW, KL
Planning and implementation	MW, KL, AT	RH, MW, AT	MW	MW, AT, KL
Data collection	MW	MW	MW	KL, MT
Data analysis	MW, KL	MW, RH	MW, KL	MW, KL, MT
Writing the article	MW, KL, AT	MW, AT, RH	MW, KL, AT	MW, AT, KL, MT
Overall responsibility	MW, AT	MW	MW	MW

MW = Minli Wan, AT = Anne Toppinen, KL = Katja Lähtinen, RH = Riitta Hänninen, MT = Matti Toivio

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1. INTRODUCTION

1.1 Background of the study

The forest products industry is a diverse industry that contributes to the economic development and social well-being of rural and urban communities worldwide and is an important component of society in many countries. It is typically divided in two main categories: the pulp and paper industry, and the wood products industry. This dissertation focuses on the wood products industry because this category is receiving increasing attention for its potential role in emerging countries such as China, and its relative importance in established markets such as Finland is expected to increase in the future, compared with the pulp and paper industry (Hetemäki and Hänninen 2009, 2013). In addition, the sustainable use of wood and wood products in green building applications promotes a healthy environment and a strong economy (Ritter et al. 2011).

In the 20th century, production and trade in the global wood products sector was dominated by European and North American countries. Countries such as Canada, United States, Finland and Germany have traditionally been large producers and important players in international markets (Global wood and…perspectives 2007). However, globalization, the recent financial crisis and rapid economic development in some emerging economies have caused international wood products markets to undergo profound changes in the 21st century. Emerging players such as China, Brazil and Russia have gained importance in the international marketplace (Laaksonen-Craig and Toppinen 2008). Using sawn softwood and plywood (softwood and hardwood) as examples, Figures 1-4 indicate a decline in production and consumption in developed countries and an increase in production and consumption in emerging economies. The abbreviation BRIC in the figures represents Brazil, Russia, India and China, which are four of the world's fastest-growing economies.

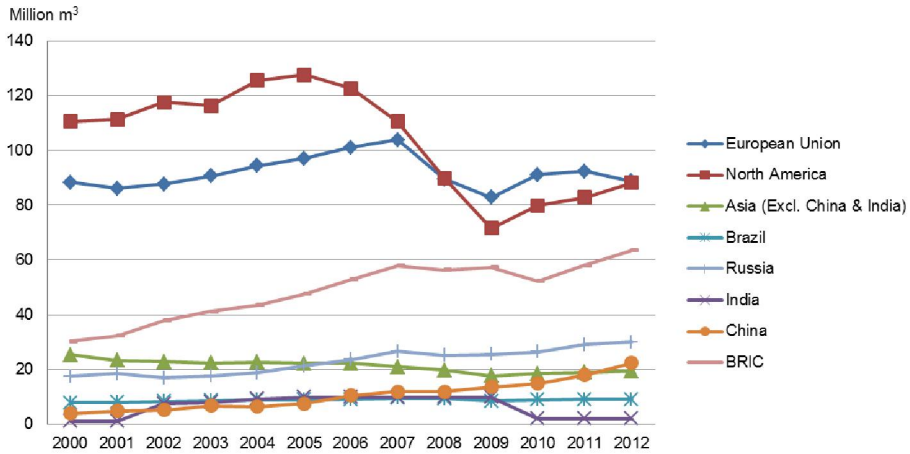

Figure 1. World sawn softwood production by region in 2000-2012 (Source: FAOSTAT 2013)

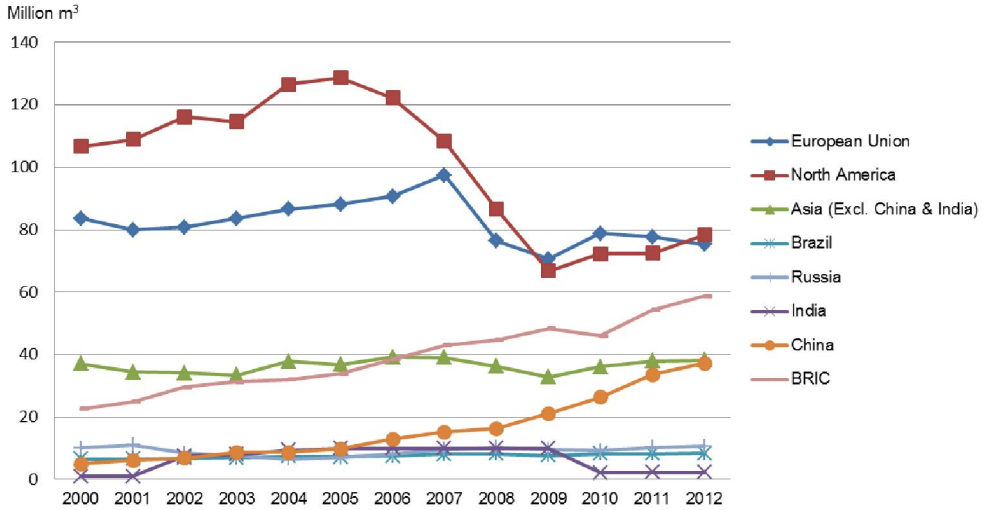

Figure 2. World sawn softwood consumption by region in 2000-2012 (Source: FAOSTAT 2013)

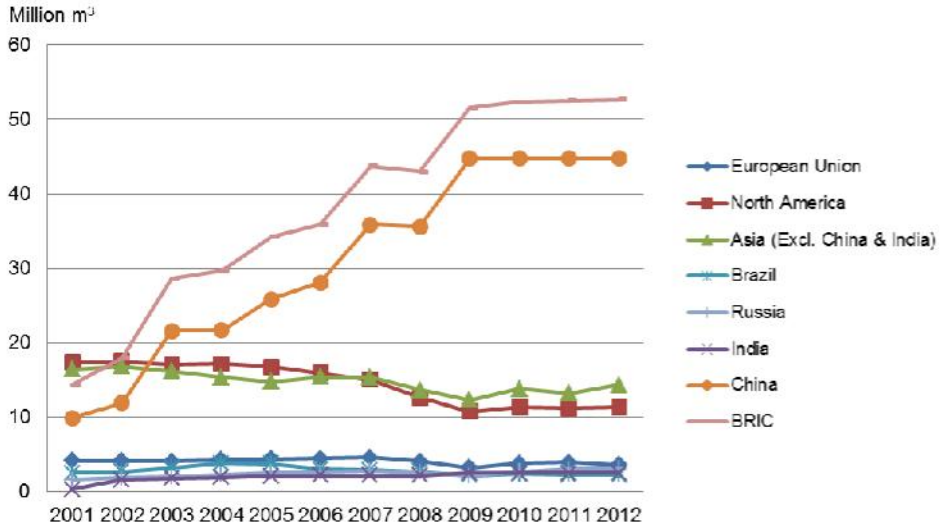

Figure 3. World plywood production by region in 2000-2012 (Source: FAOSTAT 2013)

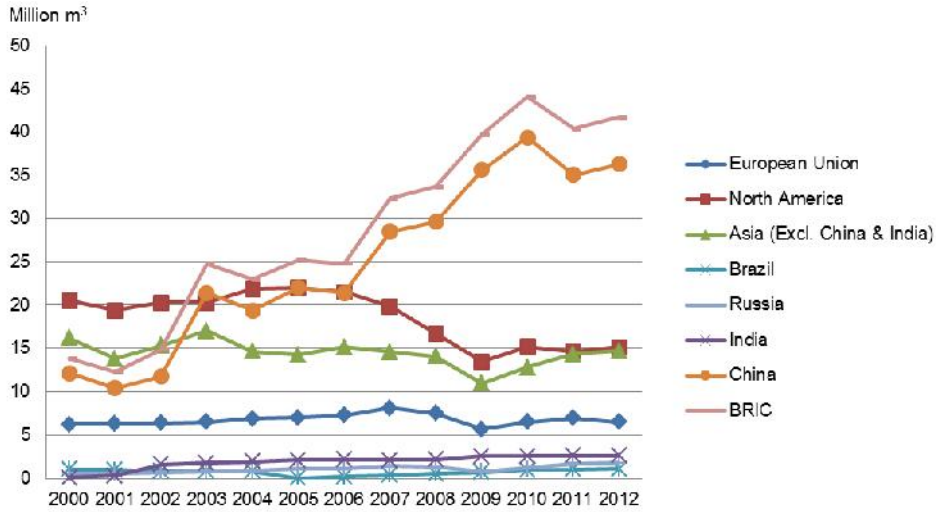

Figure 4. World plywood consumption by region in 2000-2012 (Source: FAOSTAT 2013)

Of the emerging globally producing and consuming countries, the most important is China. China's wood products industry has developed quickly driven by burgeoning domestic demand and overseas demand for the Chinese value-added wood products. This rapid development has manifested in a dramatic increase in the proportion of Chinese wood products in domestic and international markets. This phenomenon has predominantly been due to its exports of secondary processed wood products (Global wood and wood… 2007). However, with a per capita timber consumption of 0.24 cubic meters, Chinese consumption is only one fourth of the world average (Sun and Candy 2011). This low value indicates that China has a huge potential for increases in domestic consumption in wood and wood products in response to its growing economy and rising living standards. Hence, China is expected to continue its expansion of the market share. Together with the other BRIC countries, China will be one of the four key players in global trade by 2020 (Global wood and wood… 2007). Since production and consumption of wood products in the BRIC countries are growing rapidly (see Figures 1-4), these markets will provide significant market-driven opportunities. The following figures (Figures 5 and 6) show that export volumes of sawn softwood and plywood in the BRIC markets were mainly from Russia and China, respectively.

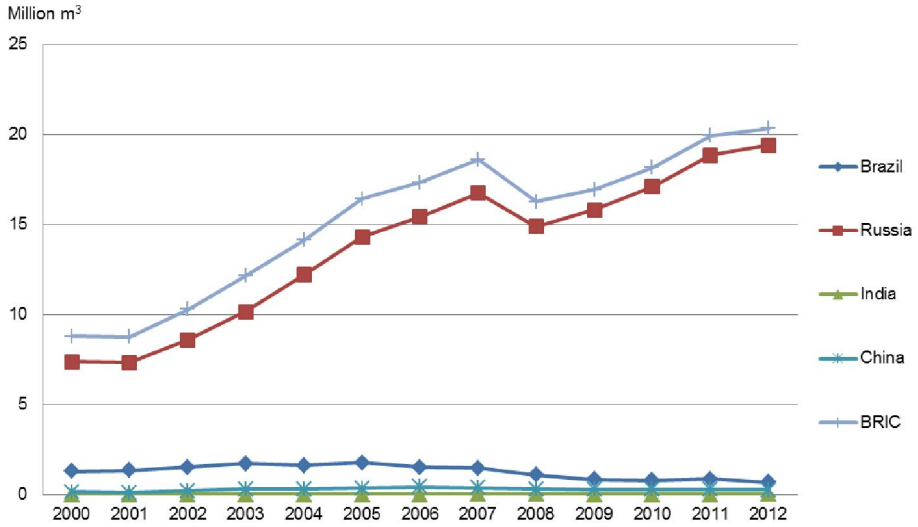

Figure 5. World sawn softwood exports by the BRIC region in 2000-2012 (Source: FAOSTAT 2013)

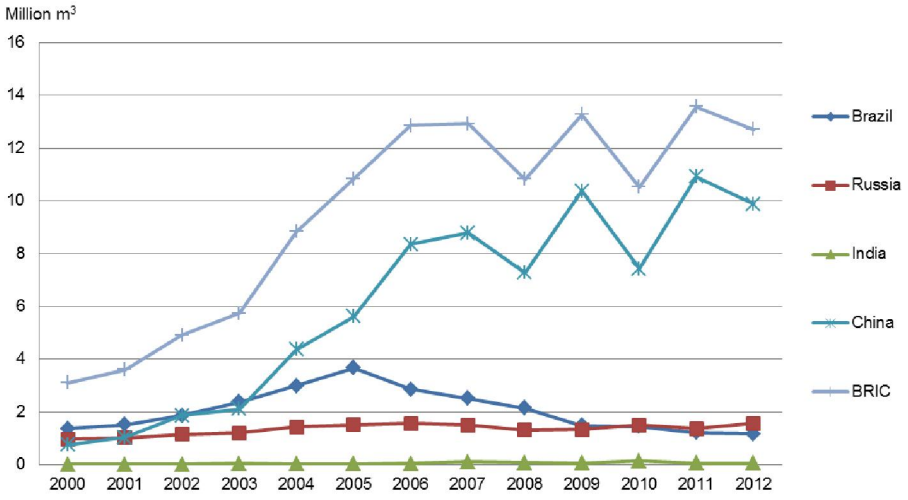

Figure 6. World plywood exports by the BRIC region in 2000-2012 (Source: FAOSTAT 2013)

Low-cost production has traditionally been the main source of competitiveness for the Chinese wood products companies in global markets (Han et al. 2009). However, this is changing with rising production costs, rapid technology transfer and increasing corporate environmentalism. In addition, the appreciation of the Chinese Renminbi and anti-dumping measures introduced by importing nations have also weakened the cost advantage for Chinese companies. Consequently, implementing a purely conventional low-cost strategy has become a less viable option for the Chinese wood products companies to sustain their competitiveness. Industry experts have suggested that instead of competing merely on costs, Chinese manufacturers should start concentrating more on the differentiation of products to develop sustainable competitive advantage (SCA) (Wan et al. 2014).

The forest industry occupies an important place in the economy of Finland. However, in recent years, the Finnish paper industry has undergone an era of change (Hetemäki et al. 2006, 2011; Häyrynen et al. 2007; Hetemäki and Hänninen 2009, 2013) with Finnish firms experiencing declining demand and price trends in their traditional export markets. Likewise, the Finnish wood industry has also experienced a decline in competitiveness and market position. Nevertheless, it seems that the relative importance of the Finnish wood products industry will increase in the future and the long-term future prospects for the wood industry are better than for the paper industry (Hetemäki and Hänninen 2009, 2013).

Global competition, weak demand in European countries, the growth of developing countries and changes in energy costs are the current challenges faced by the Finnish wood products industry (Häyrynen et al. 2007; Lähtinen 2007; Stendahl and Roos 2008). This implies that the capabilities developed in the Finnish wood products industry in the past do not guarantee a high level of performance and competitiveness either today or in the future. In order to regain competitiveness and vitality, the Finnish wood product companies must focus more on product differentiation by developing sustainable value-creation strategies and new downstream production capabilities.

From the viewpoint of the Finnish sawmill industry, the business environment has experienced dramatic changes since the 1990s due to reduced cost competitiveness of firms. In order to generate firm-level value added, along with manufacturing mass-produced lumber based on raw material-oriented strategies (Lähtinen and Toppinen 2008), the Finnish sawmills have recently shown an interest in using their by-products for bioenergy production (Wan et al. 2012). The Finnish sawmills have also invested in engineered wood products production. Such innovative products will meet international customer needs, and balance economic growth with environmental sustainability. The potential for the Finnish sawmills to collaborate with energy firms to co-produce bioenergy products appears to be particularly strong in the integrated wood biorefinery segment. Such collaboration would present a promising opportunity for making higher value-added products along with an increase in flexibility of production and product assortment, and thus help companies gain sustainable competitiveness (Mäkelä et al. 2011; Wan et al. 2012; Toppinen et al. 2013).

1.2 Motivation and purpose of the study

A firm's competitive advantage (CA) is the outcome of a chosen strategy that generates higher returns for the firm compared to its competitors. The competitiveness of a firm is affected by both external and internal factors of the firm (Caves 1980). Therefore, the firm's strategic choices are determined by both the external economic environment facing the industry and the internal resources used by that firm.

China is an important emerging producer and consumer of wood products. It is also the fastest-growing wood products market in the world and one of the most important regions influencing the global trade of both imports and exports of wood products. In contrast, as a major established player, Finland's wood products production and exports have declined over the past decade. Meanwhile, Finland is facing competitive pressures from emerging global players such as China. For example, China is a strong competitor of Finland in the European plywood markets. In response to these challenges, Finland has been working to enhance its global competitiveness by intensifying the clustering of forest research capabilities and operations, increasing investments in innovation and higher value-added products, in addition to securing new markets (Oinas 2005; Järvinen and Linnakangas 2012). However, the market environment of China's rapidly expanding wood products industry have scarcely been studied in an international context, and few previous studies have focused on the sources of competitiveness and business strategies to achieve and maintain competitiveness in the Chinese and Finnish wood products companies.

The overall aim of this Ph.D. study is to examine the sources of sustainable competitiveness in both an emerging market (China) and an established market (Finland) from external and internal perspectives by focusing on the following issues:

(a) to provide information on the determinants that affect the development of China's wood products industry by analyzing the plywood market as an example;

(b) to provide information on the importance of different resources and capabilities that enable developing the competitiveness of the Chinese and Finnish wood products companies and to contribute to the theories of the dynamic capability perspective (DCP) and the natural resource-based view (NRBV) of the firm.

At the market level, the focus of analysis is on China's plywood segment because plywood is not only an important export product of China's wood products industry but also an important raw material for China's large wooden furniture industry in international markets (Wan et al. 2011). At the firm level, in the case of China, the focus is on the Chinese value-added wood products companies as China is the world's most important producer, consumer and exporter of value-added wood products and also has a great potential to increases its domestic consumption in the future. In the case of Finland, the focus is on the Finnish sawmill industry as sawmilling is the oldest industry in the Finnish forest-based sector and one of the biggest producers of sawn goods in Europe (Forest industries – A… 2013). Using sawmill by-products to produce bioenergy and further to develop the bioenergy business presents both opportunities and challenges for the Finnish sawmill industry to create SCA in the future.

1.3 Structure of the study

This Ph.D. study is implemented in four parts — *articles I-IV*, of which *article I* provides an overview of the state of the art and a theoretical foundation for the whole study, *article II* provides empirical insights into market dynamics from the external perspective, and *articles III and IV* serve as tools to provide empirical evidence for the theoretically driven *article I* from the internal perspective. The specific aims of each article are as follows:

Article I: to explore the strategic orientations in the global forest industry by first studying strategies for CA from different strategic perspectives, and then identifying the history of strategic evolution and the possible future paths of strategic orientations in the

forest industry;

Article II: to analyze the market situation of the Chinese wood products industry by specifying and estimating the econometric models for the demand, supply and exports of Chinese plywood;

Article III: to examine the Chinese managers' perceptions of the sources of sustainable competitiveness and the strategic transformation that occurs in the Chinese value-added wood products companies within the DCP- and NRBV-based framework;

Article IV: to explore the Finnish managers' perceptions of the sources of sustainable competitiveness, the value-creation opportunities and the consequent managerial challenges for developing the expanding bioenergy business at the Finnish sawmills within the DCP- and NRBV-based framework.

2. THEORETICAL BACKGROUND

The business success of a firm is affected by its external and internal environments. The external environment can be divided into macro and micro environments, whereas internal factors are resources and capabilities that generate grounds for a firm to achieve sustainable competitiveness within the external environment (Barney 1991). External and internal factors are interconnected, and they work together to assist firm managers' strategic decisions on seeking competitiveness in a certain business environment.

One of the most important elements in the outlook for the wood products industry is the outlook for the supply, demand, and trade of wood products. Accordingly, *article II* focuses on the macro environment part that contains the categories of demand, supply and trade in the analysis of the business environment of China's plywood industry. Demand, supply and price are crucial elements that directly affect resource allocation, thus the theory of demand and supply is used to explain the workings of a market economy. Demand is the amount of product that a buyer is willing and able to buy at a specified price, and supply is the amount of product that a producer is willing and able to sell at a specified price. Exports are yielded when the quantity supplied is greater than the quantity demanded, conversely, imports are yielded when the quantity supplied is less than the quantity demanded (Samuelson and Nordhaus 1995).

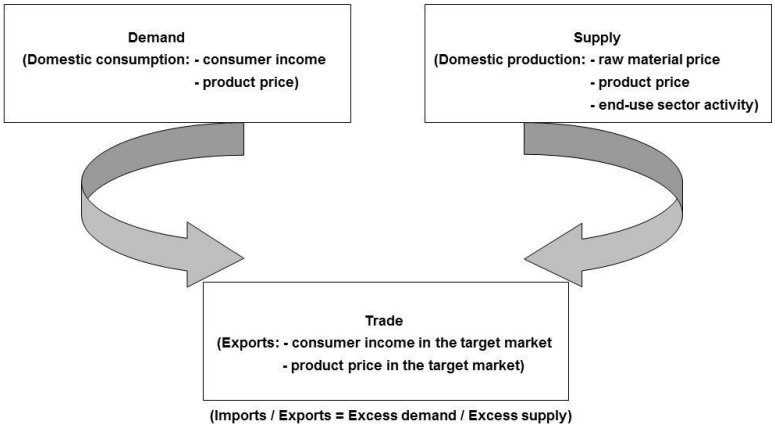

Figure 7. Analytical structure of article II

Analysis of China's plywood market is based on the simple econometric model structures presented in previous research on forest products market modelling (Buongiorno 1979; Wang and Wu 2000; Buongiorno et al. 2003). Compared with the export volume, the growth in the import volume of China's plywood was insignificant over the study period (Wan et al. 2011). Thus, China's imports of plywood were excluded from the model structures. The above figure (Figure 7) shows the analytical structure of *article II*, where the three different models: demand, supply and export models are specified. China's demand for plywood was modelled using the consumer demand theory (Buongiorno 1979) and was hence explained by consumer income and the real domestic price of plywood in China. China's supply of plywood was presented as a function of price, which included product price and raw material price (Koutsoyiannis 1977), and the end-use sector activity (Buongiorno et al. 2003). The end-use sector activity was described by the production volume of wooden furniture. China's exports of plywood were modelled using the Armington (1969) import demand theory and were therefore explained by consumer income in the export markets and the real export price of Chinese plywood. The United States was the largest export destination of Chinese plywood and thus represented the whole of China's export markets in this article.

In addition to the market-level research *article II*, *articles III and IV* focus on examining the internal strategic resources that contribute to sustainable competitiveness of the selected wood products companies. The theoretical assumptions of the resource-based view (RBV) of the firm can be used in the empirical managerial decision-making to determine the strategic resources available to a company. The RBV is driven by the factors that are internal to the organization (Reed et al. 2000) and centers on firms' internal resources. According to the RBV (Barney 1986; Dierixck and Cool 1989; Barney 1991, Conner 1991; Grant 1991; Penrose 1995; Grant 2005; Barney et al. 2011), the competitiveness of an individual firm in a dynamic business environment in any industry (Brown and Blackmon 2005) is based on the availability of heterogeneous firm-specific resources and the capability of that firm co-ordinating those production factors in a strategically successful way (Helfat and Peteraf 2003). In general, a firm's resources are classified into tangible and intangible resources. According to Barney (1991), the most important resources for a firm are valuable, rare, imperfectly imitable and non-substitutable

(VRIN) resources. As such, valuable and rare (VR) resources contribute to temporary competitive advantage (TCA). The VR resources must be difficult to imitate and difficult to substitute in order that TCA can be transformed into long-term CA or SCA (Barney 1991; Amit and Schoemaker 1993; Acedo et al. 2006; Bonsi et al. 2008).

The traditional RBV is a static view of dynamic process of a firm required for achieving SCA. In the course of market globalization, the sources of competitiveness have changed from static efficiency and the usage of physical production factors to more dynamic processes that require continuous learning and innovations (Porter 1994; Teece 2007; Njuguna and Kenya 2009). The achievement of superior performance requires firms to be flexible and capable of adapting to changing market conditions by unique and rational exploitation of internal resources (Barney 1991). Teece et al. (1997) introduced the DCP as an extension of the static RBV to address how VRIN resources can be created dynamically and how the current stock of valuable resources can be replenished under the changing business environment (Ambrosini and Bowman 2009). Moreover, Hart (1995) extended the RBV to the NRBV to include the opportunities and constraints the natural environment places on a firm to examine the role of the natural environment in a firm's core capability development. That author also addressed how resources and capabilities rooted in the firm's interaction with its natural environment can lead to SCA. The natural environment refers to the functions of ecosystem that sets the boundaries for economic activities within the business environment.

The theoretical background of empirical *articles II-IV* is based on the above-mentioned two extensions of the RBV, i.e., the DCP and NRBV of the firm. The central premise of an offshoot of the DCP suggests that the resources of a firm need to fit in with the environment and change over time to maintain its market relevance and achieve SCA (Teece et al. 1997). Dynamic capabilities are firms' abilities to integrate, build and reconfigure internal and external competencies to address rapidly changing and complex environments (Teece et al. 1997; Verona and Ravasi 2003). Examples of dynamic capabilities include research and development (R&D) (Helfat 1997), product innovation processes (Danneels 2002), and resource acquisition processes (Karim and Mitchell 2000). The NRBV connects environmental challenges with firms' resources that are operationalized through three interconnected strategic capabilities: pollution prevention, product stewardship, and sustainable development (Hart 1995). The NRBV assumes that these strategic capabilities contribute to SCA by either lowering production costs or reducing the use of limited resources (Hart 1995). Hart and Dowell (2011) revisited this earlier approach in the light of a number of important developments that have emerged recently in both the RBV and the research on a sustainable enterprise. They found that the NRBV of the firm should be considered in the light of dynamic capabilities of firms and the role of the NRBV must be examined to understand how firms incorporate environmental sustainability into their quest for SCA. In the context of deforestation and forest degradation in China (Chen et al. 2011), the application of the NRBV could lead firms to seek SCA by improving material and energy efficiency and by developing technological capabilities for reducing carbon emissions. This can be done, e.g., through sustainable wood procurement and the efficient use of wood materials. Some Chinese wood products companies have adopted forest certification in their wood procurement processes and have used forest residues, small fuel wood and sawmill by-products to produce products to secure access to raw materials and thus add value to end products.

The below figure (Figure 8) shows the theoretical framework of all three empirical studies. It describes the strategic management process of a firm from the internal resource

and capability perspective, with a simultaneous focus on the external business environment and natural environment. The internal perspective concerns the strategic decisions on resource deployment and capability building to generate above-average returns at the firm level (Barney 1991). The external environment in this study focuses on the macro environment that contains the categories of demand, supply, trade (imports and exports), and those factors traditionally considered in a PEST (political, economic, social and technological factors) analysis (Juslin and Hansen 2002). Examples of the PEST factors include changes in government policy or regulations, economic growth trends, demographic trends, R&D, and technological changes. Figure 8 illustrates that in strategy building, managers' perceptions of the external environment largely dictate the resources that are chosen to be exploited, developed and protected within a firm (Barney 1986; Dierickx and Cool 1989; Barney 1991; Grant 1991; Fahy 2002). Managers should choose a strategy that allows the firm to obtain strategic resources and capabilities, and utilize them optimally relative to the opportunities and challenges that arise from the external environment to achieve sustainable competitiveness. The resources and capabilities of the firm are linked to the external environment via its business processes that comprise activities such as material purchasing, product manufacturing, and service provision (Porter 1985).

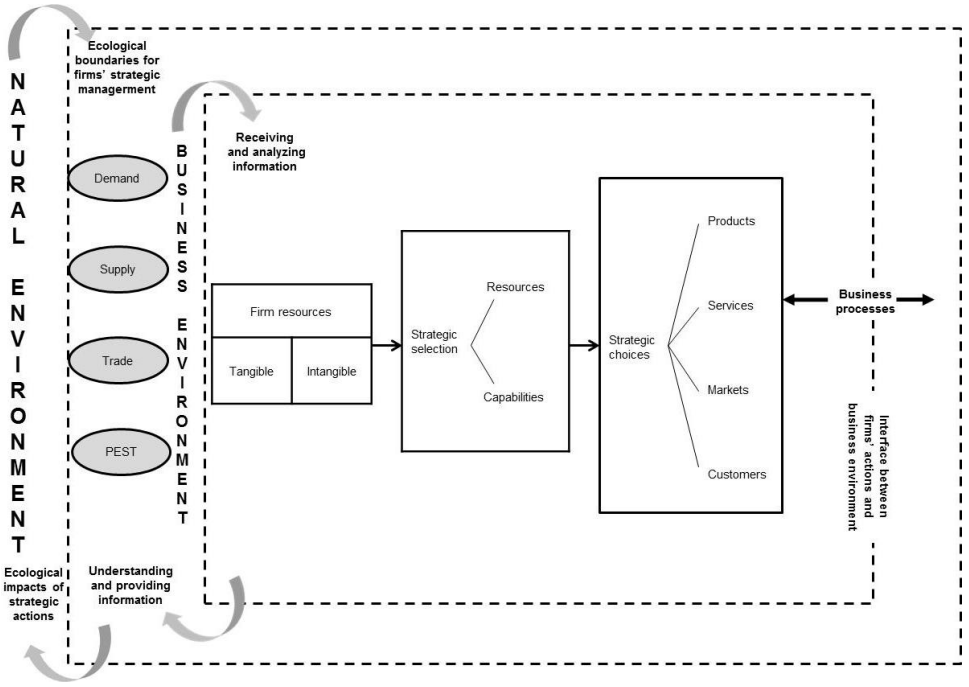

Figure 8. Theoretical framework of articles II-IV (Adapted from Lähtinen 2007)

3. METHODS, DATA, VALIDITY AND RELIABILITY

3.1 Research methods and data collection

Of the four articles included in this dissertation, *article I* is a literature review paper that covers the historical evolution and the possible future paths of strategic orientations in the global forest industry, *article II* is a quantitative study based on the econometric modelling method that used time-series data, *article III is* a qualitative case study based on the semi-structured interview method, and *article IV* is also a qualitative study based on the semi-structured interviews but in combination with a two-stage Delphi method. It can be said that this dissertation uses data triangulation to examine the sources of SCA and the corresponding changes in competitive strategies in the wood products industry in two contexts: China and Finland.

A methodological review of past literature is a crucial initial approach to taking for any academic research (Webster and Watson 2002). As a review paper, *article 1* relies solely on the analyses of publications collected through an extensive review of relevant literature that ranges from multidisciplinary journal articles to books, from general management theories to theories applied to the forest industry. A review of the previous research relating to the historical evolution of forest industry strategies over the past decades enables strategic shifts and trends in the global forest industry to be observed. *Article I* is an important component of this dissertation as it raises and highlights the study problems and provides the substantial motivation for the study. Therefore, it serves as the foundation for the whole Ph.D. research. By discovering what was known and what remains to be studied in this field, *article I* helps us know where to direct our efforts. The results of *article I* are based on previous empirical evidence from other countries and some theoretical insights, *articles III and IV* respectively provide empirical evidence from China and Finland for the findings drawn from the existing data presented in *article I*, whereas *article II* provides empirical analysis of the business environment of China.

An econometric model is a tool used to explain and possibly forecast future developments in a market by measuring economic relationships between different variables using statistics. *Article II* is entirely based on secondary data collected from various sources, including the research literature, journals, magazines, consultation reports, industry analyses, and news. The annual time-series data from 1993 to 2007 obtained for variables in the econometric models were gathered from original official statistical sources. The use of single-equation regression models enabled the average elasticities of demand, supply and exports to be obtained for the estimation period. With the variables of the models being co-integrated, it was also possible to use the Engle-Granger (1987) method to obtain short-term dynamics. However, the results of *article II* can only be considered as indicative due to the small number of observations in the models.

Figure 9. Map of survey regions in China for article III

Qualitative approaches have increasingly been applied in marketing research since the 1990s. Figure 9 shows that the data gathering for *article III* was targeted at the medium and large-sized wood products companies in two locations of China. The first location is Guangdong Province, which is located in South China and is one of the most advanced regions in the field of wood processing in China (Luo et al. 2009). The second one is the forest-rich Heilongjiang Province, which lies in Northeast China and has strong traditions in timber producing and wood processing industries (Sun et al. 2005). A semi-structured questionnaire was developed for this study. Data were gathered by conducting qualitative single-round interviews with 28 managers from seven companies in these two regions.

Futures studies can be considered to be an activity that aims at supporting strategic future-oriented actions (Schwarz 2008). Such studies play a significant role in management (Pätäri 2009). The Delphi method has been used as a qualitative research method and as a valuable foresight tool in numerous studies. For example, a study by Pätäri (2009) analyzed industry- and company-level factors that influenced the development of the forest energy business using this method. Similarly, Näyhä and Pesonen (2012) investigated forest biorefinery diffusion in Scandinavia and North America using the same method. The Delphi method is a widely used approach for gathering data from experts within certain topic areas (Hsu and Sandford 2007), with the panel of experts being used as the source of information and questionnaires acting as the medium of interaction (Pätäri 2009). With the aim of achieving a convergence of opinions on a specific issue (Hsu and Sandford 2007), the Delphi method typically entails at least two rounds of experts answering questions, in which experts are provided with the anonymous summary of their opinions from the previous round.

In *article IV*, a two-round Delphi method was used. After receiving experts' responses to the first-round questionnaire, a facilitator made a thorough analysis of them, which was then used to construct the second-round questionnaire. Following the Delphi method, a summary of the first-round questionnaire's results was sent to all the participants when the second-round questionnaire was given in this study. After finishing the thorough analysis of the second-round questionnaire's responses, in the final phase of the survey, which entailed

the conclusion and reporting round, the results and conclusions of the study were reported to the participants again. Because the Delphi method is used for gaining information from special focus groups formed by experts, it can be used to study issues with a high level of uncertainty, such as current issues and future predictions on the production and investments in bioenergy.

The focus of the data gathering for *article IV* was on the Finnish non-integrated and privately-owned medium-sized sawmills, whose core business is sawn wood production. The selection of this industry segment or sampling companies is based on the assumption that the business of these sawmills would be most closely linked to using their by-products for bioenergy production. Two rounds of qualitative semi-structured interviews, which are based on the Delphi method, were carried out with the managers of sawmills who were responsible for the firm-level strategic decision-making. The first-round data were obtained from 25 sawmill managers in the autumn of 2010 for analyzing the main resources for developing the bioenergy business at the Finnish sawmills. The second-round data gathering was completed in the autumn of 2011 and was used to identify further the relative importance of different processes and the related strategic resources in the bioenergy value chain of sawmills. A value chain approach modified from Porter (1985)'s value chain model was used to analyze the survey data at this stage. The modified value chain model constitutes six primary activities related to the bioenergy business, which are: raw material procurement, inbound logistics, bioenergy production, outbound logistics, marketing and sales, and end-user services. These activities allow sawmills to bring a product from its conception to end use and beyond (Kaplinsky and Morris 2001). Moreover, the major factors that affect the future of bioenergy business for the Finnish sawmills were examined. In the second round, the same 25 sawmill managers were initially contacted again for interviews. However, by this time two sawmills had ceased their operations, thus the sample size was reduced to 23.

3.2 Validity and reliability

Validity and reliability are two factors any researcher should be concerned about, when designing a study, analyzing the results and judging the quality of the study (Patton 2002). Validity refers to the extent the measuring device or data collection method measures what is intended to be measured and how truthful the research results are **(**Leech et al. 2008**)**. Reliability refers to the degree to which the same measurement tool or procedure produces stable and consistent results on repeated trials (Carmines and Zeller 1979). It determines whether the result is repeatable (Golafshani 2003). A measurement tool or method is said to have a high reliability if it produces the same result under consistent conditions. Using an instrument with high validity and reliability is extremely important for the success of a research study. Both theoretical and empirical aspects were taken into account in all phases of the research implementation in this Ph.D. study to support the validity and reliability of the research results of *articles II-IV*.

It should be emphasized that the indicative results of *article II* affects the validity and reliability of the results. Nonetheless, the obtained elasticities of this study are broadly in line with economic theory and the earlier research, and much effort has been devoted to gathering data and comparing different data sources on many occasions.

In qualitative studies, surveys in the form of questionnaires are instruments that allow researchers to make inferences about unsolved phenomena based on observations. Each

respondent receives the same survey with the same wording and a consistent number of items (Groves et al. 2004). In a well-conducted survey, questions must encompass and measure as many elements of constructs as possible (Nunnally and Bernstein 1994). Additionally, questions must be asked in such a way that participants interpret them correctly, consistently and unequivocally. When incorrect or inaccurate answers are provided, measurement errors occur. Measurement errors are defined as differences between the true answer and the response given in the completed questionnaire. When these errors repeatedly appear in one direction, the results become biased (Groves et al. 2004).

Theoretically, both the validity and reliability of the results of *articles III and IV* were supported by using the concepts of the value chain, the RBV, the DCP and the NRBV in designing the questionnaire and analyzing the results. Empirically, several aspects were taken into account in different phases of the study to ensure the validity of the results. First, the operationalization of the research questions in the questionnaire was tested by consulting industry experts before conducting the interviews in these two studies. Second, the selection of case companies in both China and Finland was implemented in collaboration with the people possessing local knowledge of company characteristics in order for data gathering to focus on the companies that were the case studied. Third, top managers responsible for making actual strategic decisions in the companies were selected as interviewees to improve validity. Fourth, the entire data gathering was implemented and conducted in local languages, which were the native languages of the interviewers, collaboration partners and company managers, but were translated into English afterwards to avoid possible problems caused by language barriers. Therefore, the validity of the applied method in these two articles can be considered to be good.

Special attention was paid to ensuring the anonymity of the respondents and the companies in the interviews when presenting the research findings to support the reliability of the results empirically. In *article III*, the main findings of the interviews were presented as anonymous quotes in the results section to increase the transparency of the qualitative analysis, and the interview data indicate the consistency of different managers' perceptions of specific issues. Undertaking these steps can enhance the researchers' ability to assess the accuracy and convince readers of the accuracy of the research findings. In *article IV*, respondent validation was used as in both the second-round and final survey phase of the Delphi process. The same respondents were given an opportunity to review the first-round results and also the final outcome of that study. All these measures ensure that the results were double-checked and guarantee the accuracy of the results. Moreover, the reliability of the information is most likely to be quite high because of the simplified and narrow structure in *articles III and IV* in addition to the exact and systematic execution of the survey under local conditions.

4. SUMMARY OF SEPARATE ARTICLES

This section briefly summarizes the main objectives, results and contributions of each article included in the Ph.D. dissertation. Table 1 shows a summary of the four articles comprising the dissertation.

Table 1. Summary of the four research articles comprising the Ph.D. dissertation

	Review paper	**Market-level analysis**		**Firm-level analysis**
	I	II	III	IV
Title	Strategic orientations in the global forest sector	Econometric analysis of China's plywood market	Strategic transformation in the value-added wood products companies: Case study evidence from China	Opportunities and challenges in the emerging bioenergy business: The case of the Finnish sawmill industry
Level of the study	Industry-level study	Market-level study	Firm-level study	Firm-level study
Objective	Provide a historical review of the evolution of a strategic lens for studying competitive strategies and the historical evolution and possible future paths of strategic orientations in the global forest industry.	Produce market-level information by analyzing the development of China's wood products industry and by estimating the macro-economic factors that affect the demand, supply and exports of Chinese plywood.	Examine the managers' perceptions of the sources of sustainable competitiveness in the Chinese value-added wood products companies and analyse how those sources change as strategic transformation unfolds.	Explore the managers' perceptions of the sources of sustainable competitiveness, the value-creation opportunities and the consequent managerial challenges for developing the bioenergy business at the Finnish sawmills.
Theoretical background		Model structures (from the external perspective)	The DCP and the NRBV (from the internal perspective)	The DCP and the NRBV (from the internal perspective)
Data and method	*Article I* relies on the analyses of publications collected with an extensive review of relevant literature that ranges from multidisciplinary articles to books, from management theories to theories applied to the forest industry.	*Article II* is entirely based on secondary data, among which quantitative annual time-series data were collected from original official statistical sources and analyzed using the econometric modelling approach.	*Article III* is based on the data gathered through qualitative semi-structured interviews with 28 managers from seven Chinese wood products companies and analyzed using the case study method.	*Article IV* is based on the data gathered through qualitative semi-structured interviews with managers from 23 Finnish non-integrated medium-sized sawmills using the Delphi method and analyzed using the case study approach.

	Review paper	Market-level analysis	Firm-level analysis	
	I	II	III	IV
Main findings	The results of *article I* suggest that along with the strategic shift in the forest industry, trends in transitions from a cost leadership to a differentiation strategy and from low value-added to high value-added products occur. Moreover, the strategic orientations of the forest industry have evolved through four stages: forestry orientation, production orientation, market orientation, and stakeholder orientation. Towards the future, a growing strategic service orientation in business-to-business markets is foreseen to be a possible fifth paradigm in the historical evolution of the forest industry.	The results of *article II* suggest that most of the growth in China's plywood demand is primarily driven by the growth in consumer income, whereas an increase in product price only has a small negative effect. In contrast, an increase in raw material price has a significant negative impact, but the end-use sector activity has no significant effect on China's plywood supply. Moreover, the growth in China's plywood exports is due to the consumer income growth in the US market.	The results of *article III* imply that in the sample of Chinese wood products companies, there is a growing interest in shifting from non-branded to original equipment manufacturing to original brand manufacturing business model, from low value-added to high value-added wood products, and from a cost leadership to a differentiation strategy. As strategic transformation unfolds, the amount of resources and the strategic importance of intangible resources increase, and linkages between these resources become more complex, which requires more profound capability building.	The results of *article IV* indicate that raw material, technological and personnel know-how, collaboration and services are regarded as strategic resources for the Finnish sawmills to developing the bioenergy business. The Finnish sawmills can increase value added and improve profitability by efficiently using their by-products in bioenergy applications. However, increasing bioenergy production to meet larger demands in the energy markets and managing both internal resources and external investment risks also bring new challenges for management.

4.1 Strategic orientations in the global forest sector

The objective of *article I* is to provide a historical review of the evolution of a strategic lens for studying competitive strategies, and the evolution and possible future paths of strategic orientations in the global forest industry from a holistic perspective by compiling and analyzing the research findings from previous studies.

In *article I*, the lens for studying competitive strategies in the global forest industry was found to have proceeded from the market-based view to the RBV and finally to the stakeholder view, which integrates the market-based view, the RBV and the socio-political dimension of a firm's strategy. This transition indicates that the focus of strategic perspectives in the global forest industry has shifted from being based on external factors to internal factors and finally to including both external and internal factors of the firm. The evolution of strategic orientations from forestry orientation to production orientation to market orientation and finally to broader stakeholder orientation over the same period shows that the focus of strategic orientations has shifted from wood procurement to the cost-efficient production to customer needs and finally to the needs of broader stakeholder groups, including both primary and secondary stakeholders. According to Clarkson (1995), primary stakeholders are those without whose continuing participation the company cannot survive, e.g., shareholders and employees, secondary stakeholders are those who may not participate in direct transactions with the company or may not be necessary for the company's survival but otherwise affect or are affected by the company's activities, e.g., community activists and advocacy groups. Stakeholder orientation is driven by the public's growing demand for environmental and social commitments of companies. The ways in which stakeholder orientation affects corporate strategy are crucial to sustain and improve the long-term corporate marketing performance (Mitchell et al. 2010). Both stakeholder view and stakeholder orientation encourage the integration of social and environmental considerations with economic development into managerial decisions, so they are viewed as a broad and long-term philosophy (Zink 2005). The emerging green economy is regarded as a vehicle for promoting effective sustainable development mediated by reducing environmental risks and ameliorating ecological scarcities (Green economy in… 2012). Effort to promote the green economy has been made to boost material and energy efficiency in industry and buildings, to develop renewable energy sources, to create a resource-saving 'recycling economy', and to transform traditional sectors through the use of energy-efficient and environmentally sound technologies (Wang et al. 2012).

The results suggest that along with the strategic shift in the forest industry, a trend moving from a cost leadership to a differentiation strategy implementation occurs (Sajasalo 2002), and this trend manifests in the shift from low value-added to high value-added products production. An increased emphasis on the importance of production positioning, R&D, advertising, marketing channels, and cooperation networks for companies to gain access to strategic resources implies that the sources of SCA are shifting from tangible resources to more intangible resources. In response to an increasingly competitive environment and ever-increasing demand for customer satisfaction, it is imperative for firm managers to differentiate their products further from those of their competitors. With the rise of the service economy, a growing strategic service orientation (SSO) emphasizing value co-creation between producers and customers in the business-to-business markets is foreseen to be the possible fifth paradigm in strategic orientations in the forest industry (Vargo and Lusch 2004a; Vargo and Lusch 2004b; Karpen and Bove 2008; Vargo and Lusch 2008; Toppinen et al. 2013). This foreseeable SSO indicates a continuation of a

strategic shift from producing tangible goods to providing intangible services.

4.2 Econometric analysis of China's plywood market

Article II provides empirical quantitative insights into market dynamics in China. The objective of this study is to obtain new market-level empirical information by analyzing the development of China's wood products industry and by estimating the macro-economic factors that affect the demand, supply and exports of Chinese wood products. The data show that managers are able to make appropriate strategic decisions to ensure the future of the company. Plywood is the most important primary wood product in China in terms of its consumption, production and exports, e.g., China accounted for 56 per cent of global plywood production in 2010 (80 years of… 2011). This makes China the largest plywood market globally (Wan et al. 2011). China's plywood industry was therefore studied as an example of powerful market dynamics in *article II*.

As expected from economic theory, the estimated results of the demand model suggest that both consumer income and product price are important determinants for China's plywood demand. The magnitude of long-run income and price elasticities of China's demand for plywood (1.11 and -0.33) indicate that income is the dominating driver but price only has a small impact on demand. A similar magnitude of the long-run income impact was reported by Li et al. (2006) for China's paper market and by Buongiorno (1979) for international plywood market. With the roughly unitary income elasticity of demand, China's plywood demand increases at almost the same rate as China's economic and consumer income growth. The low price elasticity of demand reflects the possibility that the volume of plywood used in Chinese construction, wooden furniture or other relevant segments is small in relation to the other inputs. Consequently, the price of such products might not play such an important role. This was found to be exactly the case in China. Although there is an increasing domestic demand for plywood in China, the actual consumption of plywood is in relatively small quantities in the construction and furniture sectors given China's huge population. The low price elasticity might also be due to the use of a proxy price variable, i.e., the export price variable, instead of the unavailable domestic price variable. In addition, problems might arise from using the Engle and Granger (1987) method, which cannot be used for two-stage least squares estimation in the case of possible price endogeneity. In the short run, income and price respectively have considerably lower effect and no effect on China's plywood demand, compared with the long-run impact.

The domestic supply elasticity of Chinese plywood in relation to raw material price (log price) and the end-use sector activity (production of domestic wooden furniture) are -1.67 and 0.72, respectively. Product price (plywood price) was dropped from the equation because the estimated coefficient in the model showed a wrong sign that is against economic theory. The result reveals that an increase in raw material price has a larger negative impact, but the end-use sector activity has a smaller impact on China's plywood supply. This finding can be compared with that of Taiwan's plywood supply model of Wang and Wu (2000), meaning that a change in raw material price has a larger effect on plywood supply than on the end-use sector activity in both China and Taiwan. The smaller effect of the end-use sector activity on plywood supply might also be related to the small proportional use of plywood, e.g., in the furniture sector, in China. The continuing trend of rising log prices in the global market and China's limited forest resources would severely decrease China's supply of plywood in the future. Chinese companies will therefore have to

find new sources for logs to secure the access to raw materials for wood products production. Apart from developing forest plantations, Chinese companies could produce wood products by efficiently using small-diameter fuel-wood and wood residues. This not only solves the problem of a lack of raw materials, but is also conducive to environmental protection and adds value to wood and wood products.

Moreover, the unrealistically high US income elasticity of Chinese plywood exports of 17.13 implies that the growth in Chinese exports is mainly driven by the growth in the US consumer income. This result is consistent with the result obtained from the demand model, i.e., the growth in China's plywood demand is mainly driven by the growth in the Chinese consumer income. The export price of a product, i.e., plywood price, was dropped because the estimated coefficient also showed a wrong sign. The possible reason for wrong signs of the estimated coefficients in both supply and export models might have arisen from the use of the proxy variables or from the multicollinearity between some independent variables.

Apart from economic factors, other factors may affect China's demand, supply and exports of plywood but cannot be included in the econometric analysis, e.g., population growth, urbanization, construction demand, expanding wood processing capacity, anti-illegal logging and anti-dumping actions, the green building movement, and the formaldehyde standards set up in the United States and European nations on Chinese plywood exports (Gregg and Porges 2008; O'Donnel 2010). In addition to the unavailability of some data, the reason for reducing the variable selection in the models is due to limited degrees of freedom in the estimation with such a small sample.

In short, *article II* contributes to the macro-level analysis of the external environment effects on China's plywood industry although its results can be considered as indicative.

4.3 Strategic transformation in the value-added wood products companies: Case study evidence from China

Within a relatively short time period, China has made remarkable progress in wood products production and exports and has therefore emerged as a significant player in the global wood products market. As the most important exporter of value-added wood products (Ganguly and Eastin 2011), China exports large quantities of price-competitive value-added wood products, primarily wooden furniture (49% of global exports), followed by plywood (30% of global exports) and wood flooring (Castaño 2007). However, given the intensified global competition, China's wood products industry should redefine its strategies to remain competitive in the present and also in the future. Accordingly, it is crucial for managers to assess the current status, competitiveness, the emerging challenges and future development trends of China's wood products industry.

Article III draws upon the theoretical insights of the DCP and NRBV of the firm and analyzes the managers' perceptions of the sources of SCA in the Chinese value-added wood products companies and how those sources change as strategic transformation unfolds.

In this study, the seven Chinese case-study companies were classified into three groups. The first group is non-branded (NB) companies that focus on producing low value-added products for domestic low-end markets without a brand of their own. The second group comprises original equipment manufacturing (OEM) companies that mainly produce low value-added products for international low-end markets and entered international markets by the OEM route. The third group consists of original brand manufacturing (OBM) companies that rely heavily on capital, technology and brands and principally producing

high value-added products for domestic high-end markets. The results indicate a growing interest in shifting from NB to OEM to OBM business model, from low value-added to high value-added products production and from a cost leadership to a differentiation strategy adoption in the analyzed Chinese value-added wood products companies. The results also suggest that different resources associated with firms' competitiveness are emphasized as strategic transformation unfolds. When the Chinese case-study companies move from NB to OEM and further to OBM strategies, the amount of resources and the importance of intangible resources increase, and the sources of SCA in Chinese companies change from focusing solely on tangible resources to integrating intangible resources into the resource pool and further to the dynamic integration of tangible and intangible heterogeneous resources.

In the NB companies with the lowest level of value-added production and internationalization, the strategic focus is only on tangible resources such as cheap land, raw material, and labour. In contrast, in the OEM companies that provide manufacturing services for international buyers, intangible resources, such as international collaboration and good reputation, are emphasized along with tangible resources to be able to meet international buyers' needs and to be capable of operating in international markets. Despite this fact, OEM companies are still production-oriented and still adopt a cost leadership strategy although they have a tendency to be more market-oriented. The results show that these two types of companies compete in the markets with 'simple' resource pools, *inter alia*, with few valuable and rare resources that have high cost-efficiency creation potential supporting TCA in the short run. However, this competitive position cannot be sustained when new lower-cost competitors are emerging in the markets. In contrast, the relative importance of intangible resources such as technological know-how, personnel know-how, management expertise and corporate culture, are high in the OBM companies that produce high value-added products and implement a differentiation strategy. Furthermore, the ties between individual tangible and intangible resources in OBM companies are also deeper than those in NB and OEM companies. For example, in OBM companies, the use of tangible raw material is closely linked to the collaboration in acquiring certified wood and the use of tangible machinery is closely linked to personnel know-how. These imperfectly imitable and non-substitutable resource combinations and capability building processes trigger the dynamic creation of VRIN resources and the achievement of SCA.

The Chinese wood products companies should increase value-added production and deepen distinctive dynamic capabilities in developing intangible resources and skills, especially build dynamic capabilities in environmental issues, to ensure successful strategic transformation and sustain competitiveness. This can be done through R&D, product innovation, alliances and acquisitions, and organizational structure reconfiguration to adapt to the changing environment. Overall, the strategic transformation occurring in the Chinese wood products companies shows a trend moving from production orientation to market orientation. The transition from a cost leadership strategy to a differentiation strategy that result in higher value-added products production can also be reflected in the emphasis on the NRBV-type of resources, such as sustainable wood procurement and the efficient use of wood.

In summary, *article III* provides empirical qualitative insights into a growing trend showing movements from production orientation to market orientation and from a cost leadership strategy to a differentiation strategy in the Chinese companies studied. The sources of SCA in the Chinese wood products companies also change along with these transitions. This study merits a micro-level analysis of the effects of internal resources and

capabilities on the sustainable competitiveness of Chinese companies.

4.4 Opportunities and challenges in the emerging bioenergy business: The case of the Finnish sawmill industry

By taking into account stakeholders' interest in social and environmental issues, the global pursuit for sustainable development has emerged as a market driver with the potential to grow profits and present new business opportunities for increasing value creation (Green products: Using… 2010). The limitations of using fossil fuels in energy production call for seeking alternative, renewable, and sustainable sources of energy. Producing wood-based bioenergy is regarded as a sustainable energy alternative to fossil fuels in both the short and long term. The Finnish forest industry is one of the world leaders in producing and utilizing wood-based bioenergy, which represents 80% of bioenergy production and consumption in the country (Finland is at… 2010). In response to reduced cost competitiveness, some Finnish sawmills have increasingly shown an interest in investing in the development of the bioenergy business to generate firm-level value added. *Article IV* explores the Finnish managers' perceptions of the sources of SCA, the future value-creation opportunities and the challenges for developing the bioenergy business at the Finnish sawmills in cooperation with energy firms.

The results of article IV indicate that raw materials, technological know-how, personnel know-how, collaboration and services are identified as the most important production factors for bioenergy production by the Finnish sawmills. In terms of collaboration, cooperation with the suppliers of wood raw materials and partnerships with district heating plants of the local communities are emphasized as a strategic resource to create SCA for the bioenergy business of sawmills. In the bioenergy value chain, the availability and procurement of raw materials and customer relationship management are regarded as the most important processes. Of the factors that affect the future of bioenergy business of the Finnish sawmills, market demand for bioenergy, governmental energy policies and financial support are considered to be the most important. Prices of raw materials and bioenergy products as well as the quality of customer relationships also play important roles in developing the bioenergy business for the Finnish sawmills.

As a future-oriented approach, the Delphi method used in *article IV* aims at executing a foresight analysis. According to the data summarized from two rounds of interviews, the recent renewable energy boom, the Finnish government policy support for bioenergy, advanced technological and logistical know-how in using wood-based fuels in energy production, the structural change of the Finnish forest industry in reducing the demand for sawmill by-products in traditional applications (e.g., in the pulp and paper industry) have provided potentially fruitful opportunities for the Finnish sawmills to initiate value-creation businesses by producing bioenergy. Nevertheless, increasing bioenergy production to meet larger demands in energy markets and managing both internal resources and external investment risks also bring new challenges for management. For instance, changes in the sawn wood market demand caused by general economic cycles make the bioenergy business vulnerable to sawmill business cycles. Moreover, risky and capital-intensive investments with high costs are particular an obstacle for the small-scale combined heat and power (CHP) production and pellet production, and there are also some investment risks in partnership with energy firms. In terms of policy, some political decisions made in Finland, e.g., the Finnish energy subsidy for small-diameter wood from young forests (Liukko 2012)

is especially harmful to the Finnish non-integrated sawmills as it only supports the use of energy wood in biogas production, and thus it becomes a distorting factor in the competition among energy producers. Additionally, the volatile bioenergy policy changes are considered to be major factors of uncertainty in predicting the future development of business environment and they further increase the risk level of future investments in bioenergy capacity.

The results of this study suggest a growing trend in transitions from production orientation to more a diversified market orientation in line with sustainable development and from a cost leadership to a sustainable value-creation strategy at the Finnish sawmills. The data also indicate that most of the resources that contribute to SCA are intangible. This case study provides empirical evidence for the development discussed in the review paper *article I* from an established market perspective.

5. DISCUSSION AND CONCLUSIONS

5.1 Theoretical and methodological contributions

The main contribution of this Ph.D. study lies in the area of strategic management, especially in the application of the DCP and NRBV of the firm. This study is grounded on the DCP and NRBV-based theoretical framework. The primary focus of this study is to identify and examine the strategic resources and dynamic capabilities that have SCA-creation potential and fit in with the changing external business and natural environments. A typical issue emphasized in the DCP literature is innovation, which is a key process of organizational renewal (Winter 2003) and the only way to sustain a firm's CA in the long run (Schumpeter 1938; Rumelt 1984; D'Aveni 1994). Therefore, innovation constitutes an ideal setting for studying dynamic capabilities (Winter 2003). In general, successful firms are based on strategic innovation practices (Amor 2000; Lumpkin and Dess 2004), whereas innovative products and services are developed with a lot of R&D effort. Compared with other industries, R&D investments in the global wood products industry are relatively small, which might be a factor that leads to the lack of SCA in this industry. Wood products companies should intensify their R&D effort in developing innovative products in order to create SCA. Such innovative products include eco-friendly flooring and wood-based bioenergy to differentiate themselves from their competitors.

Given its local use of renewable natural resources (wood, water and land) and moderate consumption of chemicals and energy, the wood products industry is on the edge of achieving sustainable development. The ever-changing competitive environment and the dual pressure from resource shortages and environmental protection initiatives have triggered the need for wood products companies to develop new resources and capabilities to sustain their competitiveness in the challenging financial situation of rising costs. This dissertation emphasizes the utilization of firm-specific VRIN resources and capabilities through the implementation of sustainable value-creation strategies and activities based on the dynamic resource-based approach in two very different cultural contexts.

The theoretical framework introduced in this study was adapted from the framework developed in Lähtinen (2007). It provides a tool for the empirical examination of strategic

resources that contribute to a firm's SCA within a certain business environment and natural environment. It also enables the assessment of the effects of both the external environment and the internal resources on a firm's competitiveness. Compared to the framework used in Lähtinen (2007), the present study's framework not only integrates the internal factors with the external dynamic business environment of the firm, but also takes the external natural environment into consideration. In recent years, empirical applications of the RBV or NRBV in the analysis of firm-level competitiveness have required special attention to be paid to the study design and data quality (Armstrong and Shimizu 2007). However, despite the plethora theoretical literature on the RBV and NRBV, its actual empirical applications (Andersen and Kheam 1998; Fahy 2002; Schroeder et al. 2002; Camelo-Ordaz et al. 2003; Galbreath 2005; Newbert et al. 2008) have been far scarcer. In particular, the Delphi method has seldom been used in the context of addressing the RBV or NRBV. This study contributes to the empirical applicability by assessing the theoretical assumptions of the NRBV in two vastly different contexts.

In terms of research methodology, the data and research methods used in this dissertation comprise the theoretical literature review (*article I*), the market-level annual time-series data analyzed with the quantitative modelling approach (*article II*), and the firm-level interview data analyzed with the qualitative method (*articles III-IV*).

In *article II*, the econometric method was used to estimate the economic factors that affect the demand, supply and exports of plywood in the Chinese market. In this area, earlier econometric-based studies have been scarce due to the lack of available data. Econometric modelling allows for scientific measurement of the relations between various key variables over a certain time period. Based on these measurements, the findings are presented in objective terms, without excessive dependence on 'expert opinions' that are often seen as individual preconceptions, and estimations are often used as evidence in a wide range of policy settings. Moreover, econometric analysis also has the advantage of ensuring that consistent assumptions, e.g., the economic growth as a whole, are made in all countries. This makes it possible for the preparation of alternative consumption scenarios with different assumptions for independent variables such as GDP, prices, etc.

In *articles III and IV*, the qualitative semi-structured interview method was used to gather expert opinions from China and Finland, respectively. However, the aims of both studies are not to compare the two countries directly. Therefore, some difference in qualitative methods emerges between these two studies. In *article III*, a single round of interviews was conducted with the managers in China, whereas in *article IV*, two rounds of interviews based on the Delphi method were carried out with the managers in Finland. The reason for applying different methods to these two studies is that *article III* focuses on the traditional wood products segment, where historical data are available, and a single-round interview method is therefore considered to be sufficient to get reliable and stable data. In contrast, *article IV* focuses on the emerging bioenergy segment, which lacks historical data and is considered to have a high level of uncertainty due to the nature of the emerging business and the volatile bioenergy policy changes in the business environment, therefore a two-round interview method is more applicable to be used in this case.

5.2 Managerial implications and future outlook for the Chinese and Finnish wood products industries

In addition to the theoretical and methodological contributions described above, data given

in this dissertation also provide new insights into practical business management, i.e., new empirical results about the Chinese and Finnish wood products industries.

The findings of this study have clear implications for managers, particularly in wood products companies, who seek SCA and make future investment plans. On the one hand, the findings produce new information and increase the understanding about market dynamics of China's wood products industry. On the other hand, the findings provide decision makers with insights into how to improve the understanding of the significance of resources and capabilities of the wood products companies. These results also highlight the importance of selecting a strategy within a firm that adjusts firm-specific resources to the changing external environment through empirical evidence from both emerging and established market regions. In seeking sustainable competitiveness, the task of firm managers is to build a resource portfolio and select a suitable strategy within the competitive environment.

Given the dramatic changes in global markets and the economic recession that started in 2007, all companies, regardless of whether they are emerging or established wood products companies, are experiencing reduced cost competitiveness. If companies' aim is to achieve SCA in a highly competitive and dynamic business environment, they must develop new value-creation strategies by concentrating more upon the differentiation of products or focusing more on niche markets with less competition. The results of this dissertation show that success in implementing value-creation strategies requires that companies develop their internal tangible and intangible resources, deepen the ties between them, and dynamically develop their resources and integrate these into special capabilities, such as innovations, services, and stronger brands. Although cost efficiency can create a basic prerequisite for company competitiveness, it is intangible resources, such as innovative products and processes, exceptional customer service, good reputation and close collaboration with key stakeholders, that differentiate a successful company from its competitors. In particular, collaboration and innovation have been emphasized as the key sources of SCA. For instance, in many emerging markets, close and long-term relationships between firms and local authorities and the use of local knowledge play a pivotal role in helping firms succeed. Firms must have differentiated products or services that are rare and costly imitate to develop SCA. In the real world, innovation leads to product differentiation, which generates economic progress and creates SCA for firms. Firms that do not allocate resources sufficiently to innovate will be more likely to continue to fall further behind their competitors.

The pursuit of environment protection has been put on the agenda at both national and global levels with the growing public awareness of environmental issues and the challenge of global sustainable development. Therefore, emphasis on the NRBV-type of resources by implementing ecologically and socially acceptable forest management practices, e.g., adding some intangible characteristics such as certification labels to wood raw materials, can improve corporate credibility, enhance reputation, thereby adding value for the company and its end-products.

The interviews with managers in this study suggest that there is limited consciousness about the strategic importance of sustainable development and renewable raw material base in the global industry setting, especially in developing countries. From a strategic standpoint, ignoring environmental issues due to the consideration of short-run costs benefits greatly limits companies' understanding of their surrounding environment. Moreover, this reactive stance may bring negative consequences when public perceptions of the importance of social level sustainable development are changing. Hence, firm managers

should try to minimize environmental impacts from the earliest planning stage to the dismantling stage (Hart 1995). The establishment of a track record in product stewardship enables companies to build upon a good reputation, which will facilitate the gradual adoption of a sustainable development strategy (Hart 1995; Hart and Dowell 2011), and thus add value to end-products. The implementation of pollution prevention practices also allows companies to lower production costs.

Apart from product stewardship and pollution prevention, sustainable development is another strategic capability emphasized in the NRBV. More recently, increased focus on the economic and ecological nexus of sustainable development has been addressed by green growth (OECD 2011). Green growth is a pattern of development that decouples economic growth from heavy dependence on resource use, carbon emissions and environmental damage (China 2030: Building… 2013). The objective is to promote growth and development through reducing pollution and greenhouse gas emissions, minimizing waste, increasing the efficient use of natural resources, maintaining biodiversity, and strengthening energy security (OECD and green growth 2012). As a pathway to achieve sustainable management (Inclusive green growth… 2012), the concept of green growth supports the development of green industries, jobs and technologies, whilst allowing for a smooth transition into a green or sustainable economy (Towards a green… 2011, Morssy 2012). The overall objective of green growth is to integrate economic development, environmental sustainability and social equality into all levels of decision-making, which ranges from government, industry, right down to consumers. The Chinese government is using a variety of policy tools to achieve more sustainable development. A Green Revolution launched in the 12th Five-Year Plan (2011-2015) in China indicates that the Chinese government has implemented sustainable development as a national strategy (Schwerin 2012). In the business world, the Chinese wood products companies' measurement of efficiently using forest residues to produce wood products shows a growing movement towards green development. The wood-based bioenergy business developed by the Finnish sawmills also shows the Finnish wood products industry's contribution to green development. With this movement, the development of new 'sustainable' competencies, innovations and new technologies will present fundamental challenges for the wood products industry.

When comparing the empirical studies *articles III and IV*, it is noticeable that some similarities and differences exist between their results. Both studies aim at evaluating the sources of firm SCA and the corresponding strategies, and their results illustrate the emerging trends that move the adoption from a cost leadership strategy to a more complex differentiation strategy and move the production from low value-added products to high value-added products in the wood products industry. Both studies show the growing importance of intangible resources for creating firm-level SCA in emerging and established markets. They also show that as the role of value-added production increases, the amount of resources increase and linkages between them become more complex, which requires and supports a more profound capability building. In spite of these similarities, nonetheless, these two articles focus on two vastly different contexts. *Article III* focuses on the emerging global player, i.e., the Chinese value-added wood products companies, whereas *article IV* focuses on the established global player, i.e., the Finnish sawmills. The emerging player still focuses on producing traditional wood products, e.g., plywood, wooden furniture and wood flooring. In contrast, the established player has expanded its focus to develop the emerging bioenergy business as a way of generating firm-level value added by efficiently using wood materials such as its by-products. This difference demonstrates some of the different strategic orientations between the emerging and established producers, with the

former transiting from product orientation to market orientation and the latter showing an interest in transiting from product orientation to more diversified market orientation in line with sustainable development.

Looking into the future, the Chinese and Finnish wood products industries may face different opportunities and challenges, thus managers of firms in both countries must make different strategic choices and seek competitiveness with heterogeneous resources in the face of their particular changing environments. In response to the weakening price competitiveness of China's wood products industry and the increasing challenge from lower-cost countries, Chinese firms can no longer implement a purely conventional low-cost strategy. Instead, they must adjust their business strategies to create SCA. With the improvement of living standards and the rapid growth of China's middle class, there is an increasing demand for high-end differentiated products in the Chinese market. Currently, Chinese consumers have increasingly been concerned about their quality of life, especially when buying consumable goods such as clothing and durable goods such as furniture for their children. For instance, in the past 10 years, the Chinese children's furniture market has developed rapidly. A survey recently conducted in two developed cities in China (Shanghai and Shenzhen) by Wan et al. (2013) found that the use of natural materials and the awareness of environmental friendliness had increasingly become important concerns among Chinese consumers in developed regions in China. This growing niche market presents a promising high-end market potential for furniture producers to develop their competitiveness by providing eco-friendly wooden children's furniture in developed markets in China. This market also presents a potential opportunity for domestic and international suppliers of wood raw materials. All these indicate that China's wood products industry is entering a period of strategic transformation, pursuing strategic upgrading from traditional low-cost manufacturing strategies to innovation differentiation strategies and from low value-added to high value-added products. In order to succeed in high-end markets and make Chinese brands world-renowned, the Chinese wood products companies should strengthen R&D investments, develop innovative products, enhance international experience and long-term close relationships with key stakeholders including international partners, boost advertising, develop effective marketing channels, improve brand management, and build a strong reputation for quality and customer service (Wan and Li 2012). The resource base of China's wood products industry should be transformed by increasing investments in intangible resources and by paying attention to dynamic capability building in environmental issues to enhance future domestic and international competitiveness (Sharma and Vredenburg 1998). However, in China, both state and industry-led environmental initiatives are at an early stage, and public discussions of the domestic environmental impacts of consumption have only recently appeared in the media. Currently, there is no legislative requirements to demonstrate the legality or sustainability of imported timber (Huang et al. 2013), and the wood product companies' awareness of forest certification and growing importance of other environmental issues in international markets are still in their infancy (Chen et al. 2011). Given that the European Union and the United States are the world's largest wood products consumer markets and forest certification has become a mandatory prerequisite for the entry to the global forest products markets, Chinese companies must work hard to develop the NBRV-type of resources and capabilities in order to tap into global markets.

In the case of Finland, the Finnish wood processing production is forecast to decrease by one fifth from 2007 to 2020 (Hetemäki and Hänninen 2009). This decrease is primarily due to weakening of Finland's main export markets and reduced competitiveness of the

Finnish production relative to Finland's major competing countries in West Europe, Asia, and Sweden. However, the turnover of the Finnish wood products industry may increase if the share of higher value-added wood products or wood-based bioenergy increases (Hetemäki and Hänninen 2009). The challenge facing the Finnish wood products industry is to increase the firm-level value added and sustain international competitiveness. The Finnish wood products companies should thus accelerate investments in R&D and innovation to produce higher value-added wood products and/or promote energy efficiency. Therefore, personnel know-how and technological know-how will be the main strategic resources to achieve SCA for Finnish companies. In addition, cooperation networks with companies' key stakeholders and excellent customer service will continue to play a crucial role in creating future opportunities for wood processing.

5.3 Limitations of the study

The overall research setting and subject of this study is still in its infancy, not only because the phenomenon under scrutiny is only just emerging and has not hitherto been the subject of extensive research, but also from the perspectives of strategic management and business dynamics. However, the use of multiple research methods in this study enables the current research to range in scope from the analysis of the traditional wood products business of the emerging producing country to that of the emerging bioenergy business of the established producing country from different angles.

Even though, some limitations can be pointed out. In terms of the literature review in *article I*, the main limitation is that some of the findings, e.g., the emergence of SSO, were based on more theoretical insights than on empirical evidence. However, we firmly believe that differentiated services will play an increasingly important role in achieving SCA as they will lead to resources that are unique and hard to imitate (Wernerfelt 1984). For *article II*, it was only possible to estimate relatively simple time-series models for Chinese plywood and to use proxies for describing the empirical variables in some models due to data limitations, which have caused some unsatisfactory results. Moreover, the robustness and generality of the results is somewhat reduced due to the limited availability of data. The limitations of *articles III and IV* are the explorative nature and the case study approach based on the data collected from relatively small samples. A further limitation of these two studies is the potential for bias from managers providing their opinions based on what they would like to be the case, rather than in reality, thus the empirical results cannot be generalized to the industry level. On the other hand, companies should be as homogeneous as possible in terms of their size, products, etc. in order to study strategic resources within the RBV-framework and to be able to identify the internal factors that affect their business success. In terms of the RBV, it is better to have small and 'profound' samples than large and superficial samples.

This study can, nevertheless, provide references for strategic planning and analysis for both emerging and established wood products markets, and enrich our knowledge of the role of the DCP and NRBV of the firm and their implications in strategic business research. The findings can serve as a useful reference for wood product companies that plan their investments, and as a reference for government agencies and public authorities that plan economic, trade, and forest policies.

Overall, this study can be considered to be a preliminary step in understanding the business dynamic and possible future development paths of the wood products industry. It

can be concluded that the general strategic development patterns in both the Chinese and Finnish wood products companies have followed theoretically grounded premises from the DCP and NRBV of the firm. Wood product companies can thus improve their profitability and competitiveness by increasing their value added or reducing their production costs. Increased value added can be attained by further upgrading end-products or the efficient use of by-products in, *inter alia*, energy applications.

5.4 Future research needs

This dissertation opens up interesting avenues for future research. First, both the strategic analyses and research designs used in this study could be applied to wood products industries in other contexts, e.g., in emerging markets such as those of Russia, Brazil, India and Vietnam, or established markets such as those of Sweden, Germany, Canada and the United States. The sources of SCA, strategic transformation, and the current and future strategic approaches to achieving SCA could be studied in the wood products industry in those market regions by applying the DCP and NRBV of the firm. The findings could then be compared with those of the current study.

Second, *article III* is not a longitudinal case study and no historical data were collected, thus the strategic transformation found can be attributed to the observed differences among the case-study companies and a theoretical construction was built to explain the transformation processes. It will be possible and interesting to conduct a Delphi-type study in China to study further the future development of the Chinese wood products market and industry. It will also be especially worthwhile to find out if those companies that were interviewed would follow the strategic transformation and if the sources of firm SCA would change accordingly.

Third, this study can provide a foundation for further discussions regarding the use of wood as a source of renewable energy at the local level. As the bioenergy sector develops, some preliminary studies focusing on the Chinese renewable energy business, e.g., biomass, solar and wind, would be relevant. In addition, the issues that deal with how profits and risks are shared in the collaboration between sawmill and energy firms would merit further investigation not only in Finland but also in other contexts.

Finally, future research involving quantitative studies should focus on effort to incorporate longer data spans or high-frequency data in the estimations in order to achieve more satisfactory statistical results. Such studies would also need to gather more accurate data instead of proxy variables from reliable and recent sources. Although our findings can be applicable to a range of topics, there is a great need for further analyses, models and synthesis regarding China, this world's fastest-growing wood products market. Moreover, future studies involving qualitative studies should be targeted at obtaining more comprehensive data to achieve more representative results, e.g., from various segments of the Chinese wood products companies. Comparative analysis of markets in other emerging wood products supplying countries such as Vietnam and India could also enable interesting cross-country comparisons. Furthermore, from the viewpoint of pursuing global sustainable development, the consumer sector should also be studied as a principal factor in developing the market demand for sustainable products and services (Young et al. 2010; Borin et al. 2011; Rettie et al. 2011; Toivonen 2012), especially in emerging markets (Wan et al. 2013).

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APPENDIX 1: INTERVIEW QUESTIONNAIRE FOR ARTICLE III

1. Background information:
1) Position and responsibilities of the interviewee: _____
2) Name of the company: _____
3) Establishment year of the company: _____
4) Registered capital of the company (in CNY): _____
5) Pattern of ownership (state-owned, collective, private or joint venture): _____
6) Number of employees: _____
7) Average annual income of the workers (in CNY): _____
8) Annual turnover in 2010 (in CNY): _____

2. Sourcing and procurement of wood raw materials:
1) Log consumption in 2010 (m^3):
Hardwood logs: _____ (Species: _____)
Softwood logs: _____ (Species: _____)
2) Log sources in 2010 (Where did you obtain your wood raw materials?):
Hardwood logs: _____
Softwood logs: _____
Domestic logs: ___% total logs consumed; Imported logs: ___% of total logs consumed.
3) How is the wood procurement organized in your company? Is your company located near the raw material base? Who are your co-operative partners in wood procurement? What kind of relationships do you have with them, long-term or short-term, formal or informal?
4) Are there any significant changes in your use of raw materials in recent years? If yes, what are the changes? What caused the changes and what are the consequences of the changes?

3. Product manufacturing:
- *Production at the mill in 2010:*
1) What are the major forest products produced in your company? _____
What product had the highest production volume in 2010 and how much was it? _____
2) Volume of sawn wood production (m^3):
sawn hardwood: _____; sawn softwood: _____
3) In addition to sawn wood**,** what other products do you produce, e.g., wood pellets, briquettes, etc.?
4) What types of products do you produce? Do you focus on manufacturing large quantities or small amounts of products? What kinds of customer segments do you serve?
5) How do you deal with sawmill by-products (chips, sawdust and bark)? Are they for internal use or sold outside the company? If selling outside, who are your customers?
- *Use of energy and value added creation:*
1) Do you produce energy by yourself or do you purchase energy from outside? If you purchase energy from outside, have you considered using by-products to produce energy in the future? Do you think it could be a way to generate value added for your company?
2) What is the share of renewable energy in the total energy consumption of your company?

- *Production technology:*
1) Where and how does your company acquire its production technology?
2) Do you have robots or computer control system in the process of production?
3) How is machinery and equipment maintained? Who maintains it?
4) Have you conducted R&D? Do you get government support for technology and innovations?
5) In comparison with other sawmills, does your company have a competitive advantage in advanced production technology?
6) Does your company participate in developing personnel skills and know-how? As a manager, how do you see your role in leading your subordinates to develop production technologies and their own professional skills?

4. Marketing and sales:
1) Is your company located in close proximity to your major customers' markets? How do you market your products?
2) Are your products sold domestically and/or overseas?
Domestic sales: ___% (To the provinces/regions of:_____);
Overseas sales: ___% (To the countries of:_____).
3) Which mode of transport do you use for the delivery of raw materials and final products?
4) How do you differentiate your products or services from those of your competitors?
5) How is the cost structure of your product split? How do you control production costs?
6) How do you measure and pursue profitability – through optimized production technology, raw materials, labour or delivery costs or by other ways?
7) Are you familiar with the Forest Stewardship Council (FSC) and The Programme for the Endorsement of Forest Certification (PEFC) Chain of Custody (CoC) systems? Have your customers shown any interest in certified products? Will the absence of a wood certificate affect your customers' purchase decision?
8) Does your company possess an environmental or quality certification such as ISO9001 or ISO14001? Do your customers require such certifications? Are they willing to pay higher prices for environmentally friendly wood products?

5. Managerial opinions on sources of competitiveness and future development goals of their companies:
1) In your opinion, what are the most important resources and capabilities used in China's wood products industry? The following table provides you with some relevant resources:

Tangible resource	**Intangible resource**
Geographical location	Management expertise
Raw material	Personnel know-how
Labour	External collaboration
Factory and machinery	Organizational culture
Finance and strategy	Technological knowhow
	Reputation and services

2) What factors enhance and affect the development of China's wood products industry? Have Chinese wood products companies received any government support in the past few years? How to improve the competitiveness of China's wood products industry?

3) How do you perceive the competitiveness of your company? How do you achieve competitiveness – by cost efficiency or by more value added creation? Compared with your main competitors, what are your strengths and weaknesses?
4) When facing increasing competition, what measures do you take?
5) What are the opportunities and challenges do you see for the successful development of your company and also China's wood products industry in the future?

APPENDIX 2: FIRST-ROUND INTERVIEW QUESTIONNAIRE FOR ARTICLE IV

Questions:

1. Is the energy produced by your sawmill sold outside? (If it is not sold outside, it means that the energy is used internally by your company.)
(Bioenergy production in this context refers to the process of producing bioenergy from sawmill by-products or other wood biomass. For example, heat generation is part of the sawmill business.)
☐ Yes ☐ No *(If your answer is 'No,' please move on to Question 12.)*

2. Does your company produce heat, combined heat and power (CHP), wood pellets, wood briquettes, or other bioenergy products?

3. How long has your company sold bioenergy outside the company? Since year _____

4. What kind of raw materials do you use to produce bioenergy for sale?

5. Who are the most important customers to which your company sells the bioenergy products?

6. In addition to production equipment and machinery and financial resources, what other production factors are required for bioenergy production by your company?
(Other production factors include, among other things, the location of your company, management expertise, personnel know-how, etc.)

7. Does your company have cooperation in bioenergy production with other companies, or the municipality?
☐ Yes ☐ No *(If your answer is 'No,' please move on to Question 9.)*

8. What kind of cooperation does your company have with your partners? What kind of partners does your company cooperate with?
(Forms of cooperation include informal cooperation such as participation in joint events and projects; short-term cooperation; long-term cooperation; and business partnership such as joint investments and venture, and also business associates.)

9. What was the share of bioenergy sales in your company's turnover in 2009? _____%

10. What kind of investments has your company made for promoting bioenergy production? When were those investments made?

11. Have the subsidies from government or the establishment of feed-in tariffs for bioenergy affected your investment activities? If yes, how have they affected your investments?

12. Does your company have a bioenergy investment plan for the future?
☐ Yes ☐ No *(If your answer is 'No,' please move on to*

Question 15.)

13. What are the reasons for your future investment plan for bioenergy production?

14. What kind of bioenergy investments do you plan to make?

a) Expansion of your current production capacity:

☐ Yes ☐ No

b) Development of a totally new type of bioenergy production:

☐ Yes ☐ No *(If your answer is 'No,' please move on to Question 15.)*

c) Will the new bioenergy investments be the production of heat, CHP, wood pellets, wood briquettes, or pyrolysis oil?

15. Are there any special questions or viewpoints you would like to bring up in this context?

APPENDIX 3: SECOND-ROUND INTERVIEW QUESTIONNAIRE FOR ARTICLE IV

Questions:

1. How important are the following value chain processes to your company's bioenergy business?
(Scale of importance is from 1 to 5: 1 = not important, 2 = slightly important, 3 = moderately important, 4 = very important, 5 = extremely important)
a) ___ Availability and procurement of raw materials
b) ___ Storage and inventory of raw materials
c) ___ Availability and acquisition of machinery
d) ___ Operation and maintenance of machinery
e) ___ Manufacturing of bioenergy products (including upgrading products)
f) ___ Distribution of bioenergy products
g) ___ Marketing of bioenergy products
f) ___ Customer relationship management

2. How does your company prefer the following forms of cooperation in your bioenergy business?
(Scale of importance is from 1 to 5: 1 = not preferred, 2 = slightly preferred, 3 = moderately preferred, 4 = highly preferred, 5 = extremely preferred)
a) ___ Informal cooperation (e.g., participation in joint events and projects)
b) ___ Short-term cooperation (less than one year)
c) ___ Long-term cooperation (more than one year)
d) ___ Business partnership (e.g., joint investments and ventures, business associates)

3. Which process (see Question 1) and what kind of cooperation (see Question 2) would be especially beneficial to your company's bioenergy business? Please provide an answer on the following line: e.g., 1c/2b.

_____

4. How important are the following factors to your company's future bioenergy business (present -> 2020)?
(Scale of importance is from 1 to 5: 1 = not important, 2 = slightly important, 3 = moderately important, 4 = very important, 5 = extremely important)
a) ___ Media and public opinion
b) ___ Governmental energy policies and financial support
c) ___ Reduction in production of the pulp and paper industry
d) ___ Prices of raw materials
e) ___ Prices and taxation of fossil fuels (including peat)
f) ___ Prices and subsidies of bioenergy
g) ___ Sufficient and stable demand for bioenergy
h) ___ Vicinity of potential customers
i) ___ Quality of customer relationships (reliability, continuity, satisfaction, etc.)
j) ___ Input of private investors and sponsors

k) ___Finding suitable partners for cooperation
l) ___ Firm´s geographic location
m) ___ Development of manufacturing technology
n) ___ Available inbound logistics
o) ___ Available outbound logistics
p) ___ Personnel know-how
q) ___ Availability of competent workforce
r) ___ Marketing of bioenergy products

5. Choose a proposition that best describes your company's situation:
a) ___ *'If our company reaches the desired objectives (including material, technical, financial, and political objectives, etc.) in the future, we will start or continue our investments in bioenergy production.'*
b) ___ 'Even if our company does not reach the desired objectives (including material, technical, financial, and political objectives, etc.) in the future, we will start or continue our investments in bioenergy production.'
c) ___ 'Our company does not intend to start or continue any investments in bioenergy production.'