Tension within a global regime and natural resource issues contributing to the dynamics of a national industry: interpreting the change of the Finnish forest-based industry 1996-2017.

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Abstract

This paper makes two contributions to the growing stream of research on the role and fate of established industries and their incumbent actors in transitions. First, I apply the multidimensional framework developed by Turnheim and Geels on an on-going change process with strong links to sustainability transitions. Through a longitudinal case study, the change of the Finnish forest-based industry is analyzed. This industry differs in many ways from the national, fossil-based regimes typically studied in the transitions literature.

Second, the theoretical purpose of the paper is to integrate three admittedly relevant, but often overlooked factors into the analysis of industry regimes. The forest industry is but one example of a more or less global socio-technical regime (albeit with notable national variation). Its production is based on and linked to a renewable natural resource, which is societally and territorially embedded. The forest-based industry is a multi-functional regime, as its produce takes part in fulfilling several societal functions (media, packaging, construction, hygiene, energy etc). These features affect the change dynamics of the forest-based industry, making it complex and different.

After 2000, the forest-based industry in Finland, Europe and North America has faced many types of challenges, ranging from shrinking paper consumption and increasing competition from low-cost producers to new bio-based business opportunities, climate and energy policies on different spatial levels, and shifting public discourses. Due to these factors, the forest-based industry has commonly been expected to undergo a both necessary and potentially beneficial transformation, containing a switch in focus from old produce (such as paper) to new produce (such as bio fuels, bio chemicals and bio materials).

However, actual forest-industrial development has not followed the expected track. After a decade of crisis and capacity cuts, the Finnish forest-based industry has since 2013 been able to return to decent economic performance, modest growth and investments. This can be considered an achievement. Still, the puzzling issue is the fact that new produce, entrants and technologies have not had any role in the process, but the forest-industrial regime, its incumbents and its produce have, by and large, stayed the same (except for substantially downscaled printing paper production). Why has a seemingly well-grounded reorientation of the forest-based industry not proceeded? Which factors can explain this? Through the study of such a case, it is possible to gain new empirical and theoretical insights about destabilisation and industry change.

Keywords: destabilisation, forest-based industry, industry regimes, natural resources

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1. Introduction

In recent years, research has increasingly paid attention to the role and fate of existing industries and incumbent firms during transitions (Turnheim & Geels 2012, 2013; Karltorp & Sanden 2012). While many case studies have shown that such actors indeed can be affected (even destabilised) by different change-inducing pressures and, therefore, typically try to affect transitions in different ways, the knowledge about the factors influencing industry and firm behavior and fate (ranging from extinction to renaissance) during transitions is still scarce (van Mossel et al 2018). The purpose of this paper is to contribute to this growing literature.

Many disciplinary literatures have conceptualized and studied processes, in which industries have been destabilized, delegitimized or disrupted, either by economic, socio-politic and technological pressures or by too slow or unsuccessful firm-level reorientation. However, each of these literatures focuses on only a few dimensions, pressures, shocks or endogenous organizational factors. This has been seen as a limitation, as sustainability transitions are understood as being multi-dimensional and co-evolutionary processes (Kungl and Geels 2017).

Because of this, a conceptual framework aiming at better understanding of the multi-dimensional interplay between external pressures and endogenous responses in industry destabilisation has been developed (Turnheim and Geels 2013). This framework, known as the Triple Embeddedness Framework (TEF) , has not been in wide use yet (Geels 2014). Only two historical case studies of the UK coal industry (Turnheim and Geels, 2012, 2013) and a contemporary case study of the German electricity industry between 1998 and 2015 have been made on the basis of TEF (Kungl and Geels, 2017). This paper is built on that framework, aiming at two contributions. First, I use the TEF to analyse the on-going change of the Finnish forest-based industry, a case strongly related to sustainability transitions. Second, I try to bring relevant, but hitherto largely neglected factors into the framework. I study how the many linkages between the Finnish and the global forest-industrial regime have affected the change process. I highlight the role of natural resources (forests, but also energy), thereby adding territorial and societal embeddedness to the picture. I also analyse how the multi-functionality of the forest-based sector has impacted its capacity to manage change.

My research setting is the Finnish forest-based industry. Since late 19th century, it has been a dominant and stable industrial sector in Finland and a big actor in the European market (for sawn wood, pulp and paper). However, since 1990s the development of the Finnish forest-based industry has been full of big changes and surprising turns, taking place during three distinct phases.

The first phase (between late 1990s and early 2000s), was characterized by good economic performance, high share prices, fast growth and strong internationalization. The industry consolidated, resulting in the Big-3 (Metsä Group[1], Stora Enso, UPM). It grew strongly, mainly through big international acquisitions, reaching top-10 globally in total turnover 2002. The big moves were mainly focused on strengthening the industry´s position in the global printing paper business, its biggest and most profitable segment since long. New production capacity was mostly based on recycled or plantation fibre, while energy was not considered a key issue (due to energy market liberalization and low prices).

During the second phase (between mid-2000s and 2013) the forest-based industry in Finland (and in most Western countries alike) suffered from a heavy economic crisis, leading to big losses, halved share prices and many factory closures. The focus on global growth and paper production was downplayed to some extent, but the Finnish industry still considered its established strategy and production structure to be viable

[1] Until 2012 known as Metsäliitto. For sake of clarity, I use the present name throughout the text.

and stay the same. However, turnover growth was thought to originate from new bio-based products in the future, to take place in big *bio refineries* (based on forest biomass). Due to high energy prices and strengthening climate policies, energy issues were key concerns and energy products such as bio fuels were assumed to soon grow into a major forest-industrial segment.

In the still on-going third phase (starting 2013), the Finnish forest industry has been able to restore its profitability to satisfying levels and to return to turnover growth. The economic situation and the prospects of the industry is on a more stable ground than any time during the last 15 years. In accordance with this, the Big-3 companies now seek to underline that they have undergone *transformation*, resulting in an "increasing share of businesses with strong long-term fundamentals for profitability and growth" (Pesonen 2016).

The strategy and main focus of the Finnish forest-based industry have without doubt changed. Contrary to renewal targets and expectations, the focus has however not shifted from old to new produce, but from old to old produce, i.e. from paper to pulp and board products. The share of new produce (in turnover) is yet only marginal. Big bio refineries have not been built and most such plans have been shelved. The forest-based energy segment has lost its attraction for the forest-based industry for the time being (due to low energy prices and tough competition from other types of RETs). Instead, the investments and growth options of the Finnish (and the global) forest-based industry are at present strongly linked to growing pulp and board demand in Asia.

At the same time, the current opportunities of the industry are much dependent on the availability of long-fibred boreal softwood. To ensure sufficient strength of end products, this fibre quality is a necessity in a considerable share of all paper and board production and cannot still today be substituted with recycled and plantation fibre. This factor has suddenly turned some few parts of the boreal forest area with abundant and accessible forests into a strategic resource for old and new actors interested in forest-based business opportunities. As Finland belongs to these areas, many domestic and international (especially Chinese) investors have in recent years published project plans based on increased utilization of Finnish forests[2]. This setting will most likely not stay the same very long, but it is anyway a clear deviation from a long-standing view of the global forest-industrial community, stating that "pulp moves south".

This paper aims to explain these changes in performance and strategic focus of the Finnish forest-based industry. They indicate a change of the established `industry regime´, consisting not only of technical knowledge, but also of business models, shared mind-sets and regulations (Geels 2014). External pressures on the Finnish forest industry are part of the explanation, e.g. digitalization contributing to the crisis of paper production, fluctuating cost levels, the global downturn in 2008/9, changing product and market structures, a changing role of key natural resources, climate and energy policies on different levels and critical public discourses.

But endogenous responses to these pressures are most likely also a part of the explanation. These responses include (mis)interpretations (e.g. underestimation of the threat of ICT and overestimation of the role of energy) and flawed strategic choices (e.g. overpriced take-overs around 2000). The industry´s responses have also notably been influenced by domestic policies in Finland. While the country´s `national business system´ has not stayed unchanged, it still contains many features that can be derived to its birth on a forest-industrial basis. The analytical challenge is to investigate how the interactions between external pressures and endogenous responses resulted in a change of the focus and activity of a previously big and powerful industry.

Against this background, the change of the Finnish forest-based industry can be considered suitable for analyzing the interplay not only between many types of pressures and responses, but also for studying tension between a `national´ and a `global´ industry regime, appearing and handled in different ways during

[2] At present, annual forest use is close to maximum levels of sustainable cuttings. They will be exceeded, if published plans will turn into investments.

the process. Through this, the paper aims to add some conceptual novelty to the literature on industry and regime change. Its main contribution is however empirical. The change of the European, North American and global forest-based industry has been subjected to many studies since the outbreak of its crisis. Most of the literature has focused on the early stages of the process, on the pulp and paper industry (PPI) and on drivers (and barriers) for change, new possibilities and change-inducing strategies and instruments. Empirically, I add novelty to this literature. I study the forest-based industry as a whole (all its business segments, not only PPI). I include the recent and very different period of "pulp renaissance" into the analysis. I acknowledge the linkages between national and global regimes. I study the important (albeit constantly changing) role of natural resources in the process, affecting business strategies, localization of production and policies on different levels.

The paper is structured as follows. Section 2 presents conceptualizations on industry destabilisation and how these are integrated in a multi-dimensional framework. The section also suggests how the framework can be extended to cover global dimensions of industry regimes and the role of natural resources. Section 3 presents methods, sources and the demarcation of case study periods. Section 4 consists of a longitudinal case study of the Finnish forest-based industry, guided by the analytical tools from the conceptual framework. Section 5 analyses the results from the case study and section 6 concludes the paper.

2. Analytical framework

Factors and processes changing industrial sectors and other economic activities have been studied in many disciplines and theoretical literatures. The multi-disciplinary fields of innovation studies and socio-technical transitions have developed and refined many useful concepts in analyzing different factors and mechanisms explaining why change of economic sectors and their dominant actors (incumbents) typically is slow and incremental, even though technological alternatives, new entrants, market prospects and socio-political pressures challenging such a trajectory might exist.

While incremental development, lock-in and stability are still typical characteristics of many (maybe even most) economic sectors, some big and visible sectors have in recent years been exposed to considerably increased pressures. Major global developments, such as climate change, energy security, resource efficiency, food safety, the stagnant state of major economies and the rapid change of energy markets have challenged incumbent firms in sectors such as oil, coal, gas, electricity, automobiles and food. Large incumbent firms in these sectors can have a role in meeting these challenges through reorientation of their strategies and activities. These industries are associated with big societal and environmental problems, making them highly visible in public debate, while they also have a lot of political influence and often show reluctance to address challenges and initiate substantial change.

In a positive scenario, accumulation of economic and socio-political pressures might stimulate incumbent firms in such sectors to overcome typical lock-in mechanisms and reorient. But how should such interactions between incumbents and broader environments be properly analyzed? Which specific mechanisms and what kind of dynamics contribute to the process? Is it possible to trace different patterns for different industries, countries and issues? Can comparison and generalization be made on the basis of varying combinations of similar mechanisms found in case studies?

The Triple Embeddedness Framework (TEF) has been developed with such questions and above-mentioned industries in mind. Drawing on ideas from many literatures (evolutionary economics, institutional theory, industrial economy, organization studies, strategy literature), the TEF has been constructed to provide conceptual and methodological tools for analyzing the co-evolution of firms-in-industries and their environment (see Geels 2014 for elaboration).

A key conceptualization in the TEF is that industries are populations of firms, which are exposed to two different types of selection pressures (Fig.1). Firms are embedded in their economic environment, in which they are exposed to pressures stemming from different economic actors and factors, ranging from suppliers (delivering necessary resources) to markets, competitors and customers. Key criteria for development and sound performance of firms in this environment include competitiveness, efficiency and financial performance. Firms are also embedded in their institutional environment, in which they are exposed to pressures stemming from the socio-political environment, consisting of policymakers, administration, civil society (NGOs, social movements, activists) and the wider public. In this environment, legitimacy of firms and their activities is the key criteria for smooth and generally acceptable business operations.

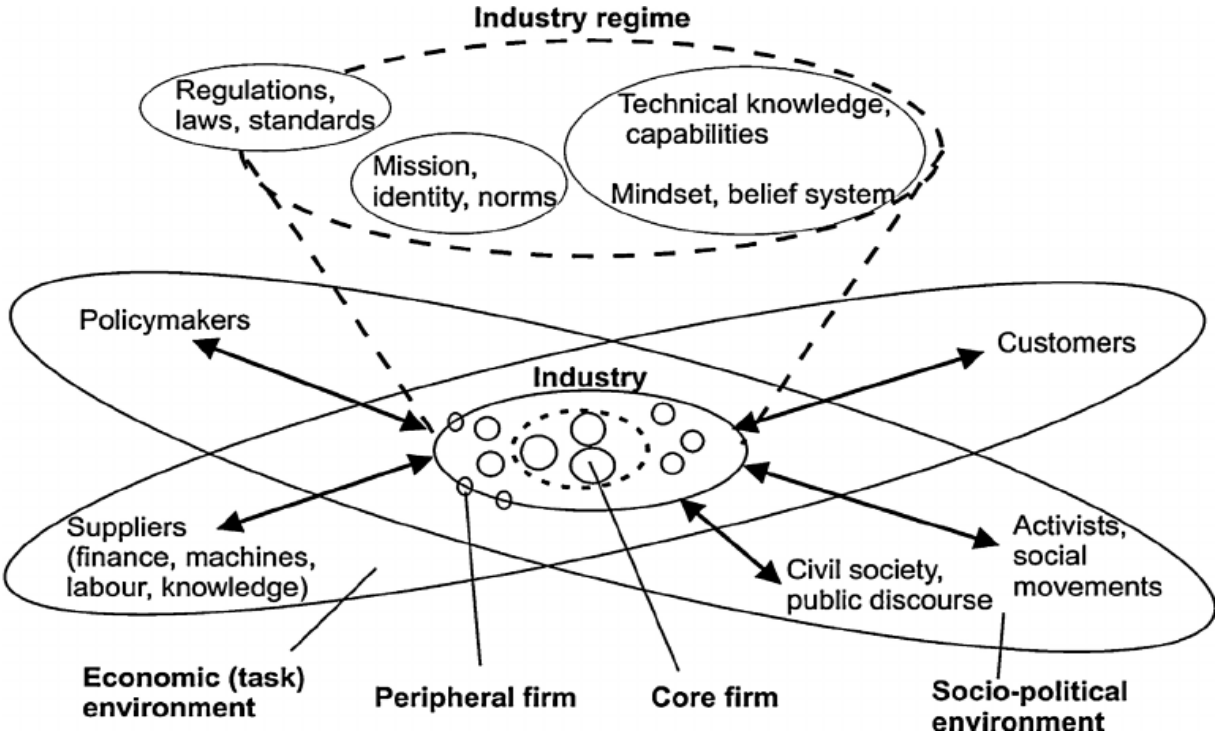

Figure 1. The Triple Embeddedness Framework (Geels 2014)

When firms-in-industries interpret, respond to and act on different types of pressures, their thinking and activity is framed and influenced by the `industry regime´, the third type of embeddedness conceptualized in the TEF. This concept refers to several types of industry-specific factors framing "how things are in our industry", established over time and changing only slowly: cultural and cognitive factors (such as identity, mind-sets and norms), technology-related factors (knowledge, technical and production infrastructure, capabilities) and regulatory factors (laws, regulations, standards). Using the prevailing industry-specific lenses of the industry regime, firms-in-industries interpret the pressures from the economic and institutional environments and respond strategically to these, in order to minimize problems and better their performance.

The main types of strategies used by firms are economic positioning (focused on competition, capacity and product management, costs and prices, supply chains), innovation and technology strategies (focused on R&D and technology choices), corporate political strategies (targeting decision-making) and framing strategies (targeting the general audience and societal atmosphere). The responses have been further divided into externally-oriented and internally-oriented strategies. Externally-oriented (horizontal) strategies aim at defending the existing industry regime against pressures (from markets, policies and society). These strategies are commonly used by firms as long as the aggregate pressure is considered moderate and temporary. Retrenchment in the form of cost-cutting and tightening control is typical early on. It is usually

followed by local search and incremental innovation, if problems are found to be too big and prevailing to be denied.

If the pressures and performance problems continue and deepen, firms might start to implement internally-oriented (vertical) strategies. More distant search and exploration of technical alternatives is initiated, if pressures accumulate and problems turn out to be structural. Questioning and change of core beliefs, business models, products and mindsets might eventually take place, if the pressures and performance problems are major and persistent. This might lead to substantial change or even abandonment of the established industry regime.

Depending on the aggregate impact of different pressures and the amount, character and timing of reorientation, firms in an exposed sector might decline further, be able to keep their position in the market or succeed to strengthen it. When using the framework, acknowledging the existence of multiple but also changing exogenous pressures is important. The strength, direction and character of pressures change over time. Policies can turn from supportive to restrictive, or vice versa. In technological development, breakthroughs and disappointments can take place. Surprising turns of this kind have to be taken into account and assuming linear increase of pressures (or impact) should be avoided.

I will apply the multi-dimensional framework to analyze the developments in the Finnish forest industry. I also try to integrate three relevant, but mostly neglected factors into the framework, thereby aiming at a conceptual and empirical contribution to the literature on change of industries, especially those based on natural resources.

The first factor to add to the framework and, more generally, to research concerning transitional change of industries and regimes is the global dimension and its influence on regime and niche dynamics on all spatial levels. This issue has not been totally ignored in the literature, but it is safe to say that it is a conceptually and empirically neglected theme. Because of this, a strong plea for bettering the quality and relevance of transitions research by considering the many linkages between global, national and local developments inside and between regimes has recently been presented (Fuenfschilling & Binz 2018).

The regime concept in itself is spatially often. It has not been defined as if sectoral regimes would exist only on a national (or sub-national) level. Global developments affecting such regimes are without doubt integrated in analyses of different sectoral regimes. In the Multi-Level Perspective, this takes mainly place through considering landscape pressures, commonly described as global factors beyond the influence of (sub)national regimes. Also the TEF considers the global influence on pressures and responses on the regime and firm level.

So conceptually, there are no reasons why transitions research should not consider how global developments, institutions and rationalities exert influence on different sectoral regimes (and niches alike), affecting their change dynamics and, most likely, resulting in cross-border commonalities in regime and niche development. Practically, this kind of analysis is seldom done. In most of the transitions literature, sectoral regimes are analyzed mainly as national (or sub-national) entities and niches are mainly analyzed as local phenomena.

While the prevailing focus on the (sub)national level has produced a lot of detailed knowledge on regime dynamics, many factors important for a more generalized understanding of regime dynamics and sector-specific change dynamics have been omitted or only barely touched upon. As many established sectors exist in most countries, their national regimes are far from unique constructs, but most likely they are to a large extent results of cross-border processes. This applies especially to infrastructure and basic industry sectors, (providing food, water, housing, energy, transport, materials etc) to the population. While a lot of variation between such national regimes certainly exists, the amount of commonalities between them is likely to be big as well.

This is due to the fact that many features suggesting the existence of global socio-technical regimes can be found in infrastructure sectors worldwide. Many of them show a strongly internationalized business actor structure, the dominant technologies do not show wide variation, their technical development is much influenced by a global "consultocracy", they are affected by international and global regulation (agreements, certificates, standards, treaties) and they are steered by a dominant rationality that has reached validity beyond national borders (Fuenfschilling & Binz 2018).

The global regimes are still far from homogenous. Variation due to national and local differences in conditions and interests is a part of their nature. Global regimes can exist in a range of versions between "strong" and "weak", but are not likely to develop into isomorphism and full balance between all levels and interests. This is because they inevitably contain some inherent tension between global rationality and local interests. The global regimes involve and affect many actors, having different interests, roles and possibilities to influence the regime. As a perfect balance between these is not possible, this can also open up for change of the global regime along different pathways (top-down, from below or through globally connected niches).

The global forest-based industry fits well into these contours of a global regime. It is a major producer of printing, packaging and construction products worldwide, with local production in numerous countries. Since more than a century, a big and growing part of its produce has been traded internationally both within and between continents. An internationalised actor structure of big forest-industrial companies - with production in numerous countries and 2-4 continents - has been in existence since 1990s. More importantly, the technology used for large-scale forest industrial production worldwide shows strong similarity, reflecting a dominant rationality and globally centralized supplier structures (of knowledge, planning and technology). Through many mechanisms, the forest-based industry, its use of natural resources (forests, water, energy) and its effects on the environment have been exposed to increasing international regulation.

While a global forest-industrial regime clearly exists, it is far from strong and homogenous, when its different national regimes, their role in the global regime and their relation to their societal and ecological environment are considered in any greater detail. Since 1980s, many factors have contributed to greater homogenization of both forest-industrial firms and national forest regimes globally. Still, they show clear diversity. This applies at least to the boreal area, where Canada, Sweden and Finland and their main forest-industrial firms have been key actors in the global market since long (Lehtinen, Donner-Amnell and Saether 2004).

Different forest ownership structures, regional material flows, `local´ ownership of companies, varying environmental concerns and national economic structures have been seen as key factors explaining and up-keeping variation. Because some of these national differences might never disappear, international forest-industrial companies can most likely never fully streamline their activity in different parts of the world nor will national forest-industrial regimes fully converge). Still, how the relation between the global forest-industrial regime and the different national regimes develops, on what grounds and what the consequences are, is an open question. I try to incorporate this issue into the TEF framework.

The forest industry´s great and prevailing dependence on renewable, territorially and societally embedded natural resources is a crucial factor contributing to its specific character (deviating from many other industrial regimes) and to variation (also tension) inside its global regime. How socio-technical regimes connect to natural resources (both renewable and non-renewable) and how their character and change dynamics are affected by this connection is an underexplored issue in transitions research, both conceptually and empirically. This is odd considering that this stream of research underlines sustainability goals, which cannot be achieved nor convincingly studied without integrating use and governance of natural resources into the analysis and advancement of targeted systemic transitions.

While the availability, price and consequences of using natural resources (energy, minerals, agricultural land, forests, lakes and water) are important for many industrial sectors, agriculture and forest industry both have a comparatively stronger relation to its territorial and renewable resource base and the surrounding society than most resource-based sectors. It is clearly expressed by the fact that these sectors rely on very long-term arrangements in their land use. They directly own the land, lease it on a long-term-basis, use publicly owned or governed land, rely on long-term cooperation with private land and forest owners or combine these solutions. Consequently, the forest is much more than a mere resource for the forest-based industry. The forest represents a notable share of the capital and asset structure of many firms still today. But much more important is the fact that the forest industry´s indispensable forest dependency over time has created complex connections and balancing acts between the forest industry and the state, land owners, other users of forest land and other (also competing) forms of forest land use (from subsistence agriculture to hunting, recreation, tourism and biodiversity protection). These strong ties both to forest land in itself and to the institutional arrangements necessary for enabling long-term use of it are a key explanation to the industry´s still modest rate of globalization of production and ownership.

In Finland, the national forest-industrial regime has been strongly shaped by forest ownership structures and by the state´s strong involvement in the forest industry and in sectors closely related to it (such as energy, metal and ICT industry) and in building a modern welfare state on such a basis. With only 10 percent of forests in its own hands, the forest industry has been (and still is) mostly dependent on numerous small-holders of forests (of which many are farmers and other countryside dwellers) and to a lesser extent on the state (owning large tracts of forest in Northern and Eastern Finland). Forest industry was long a major employer through its factories, forest logging and transport, which has created strong links to unions and the political left. Thus, the national forest industry regime is very broad-based and complex, containing all major social and economic groups and interests. While tension (even conflict) between different interests has occurred at times, growth and good performance of the industry has been a uniting goal, resulting in benefits for all if achieved (as mostly has occurred).

In Finland´s development from a poor into an affluent state, the growth of the forest industry and related sectors, the state´s active role in steering and funding investments (to support industry and agriculture, but also education and health services) and an even distribution of the benefits have been key factors. While the Finnish economy and export long were dominated by the forest industry, especially since 1990s they started to develop into a much more versatile direction, with many types of technology sectors (including ICT) and chemical industry growing into big roles. Still, the forest industry´s export share has stayed bigger (between 20 and 30 per cent) than in any other country in the world.

This is also a main explanation to the strong involvement of the state in the national forest industry regime. The state is a big owner (even a majority owner) in many companies directly connected to the forest industry, as suppliers of forest, energy, transport fuels, rail transport, chemicals, technology and technical research. So satisfying growth and performance of the forest industry directly adds to state revenues. Still, the forest industry´s strong societal position originates more from how it has contributed to export, growth, employment, income distribution (through salaries and stumpage) and regional development (through its production and timber procurement throughout the country) and from its strong connections to most spheres of society (from banks and shareholders to political parties, unions and forest owners). Due to the long dominant and still strong role of the forest industry in the economy and the economic-political model, Finland stands out as a very peculiar case in the literatures on National Business Systems (NBS) and Varieties of Capitalism (VOC).

Since 1980s, some tension between forest industry and other export sectors and, more generally, between different societal goals and interests have surfaced. Should Finland still focus on safeguarding the interests of its old industrial sectors or should a focus on new sectors be preferred? While mostly supporting forest-industrial development in different ways, the Finnish state has of course also had to consider and safeguard

other societal goals and interests as well. So political and legislative regulation of issues with notable importance for the forest industry have over time turned into a more neutral direction, acknowledging other interests and international developments.

As a last factor adding complexity to the analysis of the case, the global features of the national forest-industrial regime have to be mentioned. From its birth, the Finnish forest industry has been strongly export-oriented, with 80-90 per cent of turnover stemming from international markets and customers. The industry increasingly started to locate new production and buy existing facilities in its main markets in the 1980s, growing into a key player e.g. in British, German and French paper production during 1990s. Soon thereafter, it launched an outright globalization strategy, leading to notable, still prevailing presence also in South America and China. The industry is since long more internationally owned than before. So the Finnish forest industry is more than a strictly Finnish industry or only a part of a national industry regime; it is also a part of national regimes in many other countries. Additionally, a few Finnish firms supplying the forest industry (with consultancy, technology, chemicals) have grown into leading actors in their business segments. Through these features, the boundaries between the Finnish and the global forest industry (and regime) are not easily drawn.

The third factor to integrate into the framework is the flexibility and multi-functionality of the forest-industrial regime. Many regimes serve more than one social function, have links to other regimes, produce less known products and use or upkeep different technologies. This broad and multi-functional character of industry regimes and its impact on change processes have been studied through the umbrella concept multi-regime interaction (Raven 2006; Sutherland et al 2015). Large-scale forest-industrial production requires (besides capital and labor) a lot of wood, energy, water, chemicals and technology. In order to secure a stable flow of key resources, most forest-industrial companies have historically been big forest owners, have had a lot of energy production in their own hands (at mill sites or through stakes in energy companies) and have localized their production close to forests, ridges and waterways. Because of large resource use, the same mill site has been used for different types of production. Big integrated units, typically combining saw milling with production of pulp, paper and energy, have been common in the forest industry.

Chemical processing of wood takes mainly place on the basis of two different technological concepts. Depending on the end product, the forest bio mass is either grinded to mechanical pulp or cooked with chemicals to chemical pulp, and then further processed. Most printing paper products are mainly made out of mechanical pulp, while most other paper and board products are made mainly or entirely out of chemical pulp. Grinding wood is a very energy-intense process and some of the qualities of the fibre are lost, but the fibre yield is high and the amount of side-streams is small. When chemical pulp is produced, the fibre yield is low, but strength and other qualities of the wood fibre are preserved better, the process results in many side-streams and is self-sufficient with energy. Chemical pulping also contains the capability to produce many chemicals and biofuels, a feature not shared by mechanical pulping. Until 1960s, many sulphite pulp mills produced substantial volumes of such by-products (Novotny & Laestadius 2014).

As most forest-industrial firms typically have produced many types of paper and board products, they have used the two different concepts in parallel and adjusted pulping processes flexibly depending on the developments of the end product markets. The forest-industrial production processes result anyway in many voluminous side-streams (such as bark, saw dust, chips, black liquor, tall oil, heat, ash and sludge). Many of these can be (re)used in the production process, in energy production or further processed. Through these features, many forest-industrial mill sites are “forest biomass refineries”, producing many sorts of products for different uses, markets and customers. Most forest-industrial companies in the Nordic countries, Canada and the USA have still today a broad profile, consisting of several different business segments. The typical forest company produces a rather wide range of products for different end uses and thereby fulfills several societal functions. The multi-functionality of this industry is an important part of its industry regime, adding

to its resilience. I will explore how these `hidden´ features have been reflected in the forest industry´s way of handling fluctuation and change.

How should these different factors be considered, when analyzing the Finnish case on the basis of the TEF? I try to incorporate them in the following way. When analyzing different pressures, a part of them stem from the global forest-industrial regime, to which the Finnish industry (and most major domestic societal actors as well) is linked in many ways, described above. Pressures can originate from competing companies and international consultancy (promoting strategies and measures deviating from those of the national regime), but also from Finnish actors (e.g. criticizing national and local consequences of firms´ increased international activities) or from international NGOs and civil society (criticizing activities of Finnish firms abroad). As key supply-side factors, natural resources have a big influence on the forest industry´s development and performance. They might often turn into new challenges, requiring strategic response from the industry.

The responses of the national regime can reflect its societally complex and multi-functional character. As the regime and its firms have many global links, the responses can lead to action in many places outside Finland, affecting the balance between global, national and local interests. The responses can also be shaped by domestic societal goals (such as support of the industry if it is in trouble or creation of more economic benefits in Finland through expansion of the domestic production, not the international one).

3. Methods and data sources

I will analyze the destabilisation of the Finnish forest industry, using the framework presented above. I will focus on the three biggest firms, as they are dominant in production and export. Because most theorizations of change processes of industrial sectors suggest that they typically take place over an extended span of time, I use a longitudinal case study design. 1996 is used as the starting point, because that was when consolidation and internationalization of the Finnish forest industry really got off. I have divided the case into four sub-periods, based mostly on qualitative considerations (major changes of firm strategies, important policies, external shocks) and time series trends (especially the turnover and profitability of the industry and the relation between the euro and the dollar). For the first period (1996-2001) all considered factors show an upward trend. Some of the upward trends (turnover) continue in the second period (2002-7), but several developments indicate a shift (shrinking printing paper market, falling value of dollar, rising costs). Starting with the global economic downturn, some of the trends (price of electricity, value of dollar) fluctuate or reverse during the third period (2008-12). The fourth period (2013-2017) is mostly characterized by upward trends, except for printing paper market development.

The case study offers an in-depth description of the four periods, guided by the analytical categories of the framework. For each sub-period I first describe pressures and challenges in operational and institutional environments (market developments; new entrants; new products and technologies; policies; public attention and discourse; social movement activity). Then I describe industry response strategies (economic positioning; innovation strategies; political strategies; public framing). I end each period with a brief summary.

The description of external pressures draws mainly on secondary sources, while the analysis of industry responses is based on many primary sources, such as annual reports, press releases and presentations by companies and news articles in daily papers and business journals. The description of external pressures and response strategies also draws on information from expert interviews, Delphi questionnaires and company visits, conducted as parts of my earlier research projects, concerning the development and future of the

forest industry and the bio economy (Donner-Amnell 2004 and 2007; Donner-Amnell and Rytteri 2010; Donner-Amnell and Ottosson 2016).

4. Case study

4.1. Small pressures, good margins and big moves (1996-2001)

Pressures in task and institutional environment

Market developments. Demand growth was good in all forest-industrial business segments and profitability was high. The high value of USD and the low price for oil, energy and other resources contributed to this. Change-inducing pressures were mainly caused by the capital market. Higher shareholder value and better profitability over time were underlined as expectations that any business sector should try to live up to. As the structure of the forest industry in Europe and North America still was rather dispersed and most companies had production only in a few countries and on one continent, bigger size, stronger international presence, more activity in low-cost countries, focusing on core segments (and accordingly divesting of non-core activities) were brought forward as possible steps in the preferred direction.

Policies. Several political decisions made in Finland altered the conditions for the forest industry in different ways, but they did not cause much pressure at this point. The potentially most important decision was to join Europe´s common currency area, leading to membership in the euro area from 1999 and a currency rate that could not be adjusted to the needs of the Finnish forest industry. This was a big change, but its potential consequences on the possibilities to guarantee (price) competitiveness of the industry were not discussed. The energy market was deregulated, in order to strengthen the role of consumers and increase competition. Again, only little discussion about possible effects occurred. After years of debate, Finland reformed its forest legislation in 1997 and increased protection of old-growth forest, in order to show its commitment to sustainability and biodiversity goals. The Kyoto protocol, aiming at halting climate change, was signed 1997, leading slowly to increased debate on alternative ways of cutting carbon emissions.

New entrants and technologies. ICT, Internet and mobile phone technology developed rapidly during this period. The Finnish company Nokia grew into the global giants of its field and ICT surpassed the forest industry as the biggest export sector in Finland. This was a huge change of the economic structure and the identity of the country. However, ICT´s possible effects on printed media and advertisement were not discussed, as global paper demand still grew and "home printing" was seen as a promising growth segment. Low-cost producers of pulp and paper (in South America and Asia) and "too severe" environmental demands and regulations (from EU and markets) were seen as much more concrete threats to the Finnish forest industry.

Public attention. The new international strategies and moves of the forest companies raised some concern among citizens, forest owners and unions. The most frequent theme was how the industry´s domestic production, employment and stumpage will be affected by the strategies. This discussion was fueled by claims repeatedly occurring in media, stating that "new paper machines will not be built in Finland anymore". Additionally, the economic risks linked to big international moves and to production in tension-ridden tropical environments were brought forward.

Social movements. Such pressure occurred, with two types of focus. The old-growth forest struggle was a continuance of a long process that had started in late 1980s. It still contained some on-site protests against logging of forest areas considered valuable and different forms of campaigning, now relying more on international networks and media. Specific parts of the new international company strategies provided a new focus for social movement activity. Stora Enso had since long had a plantation project in Indonesia, which was interpreted to lead to large-scale production at a later stage. UPM struck a large-scale cooperation deal

with the Asian forest company APRIL in 1997, concerning fine paper production and use of Indonesian forests. These projects caused criticism from NGOs, some researchers and intellectuals. Also Forestry Master Plans made by Finnish forest consultant companies for tropical countries in which Finnish forest cluster technology companies had strong interests were subjected to criticism. However, UPM withdrew from the APRIL-deal in 1999, which decreased criticism.

Industry response strategies

Economic positioning strategies. Before 1996, the Finnish forest industry had consisted of many middle-sized and small companies. A process of consolidation and internationalization had been going on since 1980s. Now when rapid growth continued and profitability was very good, the process really got pace, leading to concentration of most forest-industrial production into 3 big companies with an intention to enter the international scene more strongly than before.

The merger resulting in the formation of UPM-Kymmene (later known as UPM) took place in 1995, induced by a merger between two of its key owners (commercial banks). Enso had since 1918 been a state-owned company. In 1996, the government decided to change it into a stock-listed company (with the state still as the biggest shareholder). In 1998, Stora Enso was born through a merger between Enso and Stora, one of the Big-4 in Swedish forest industry. Metsä Group had originally been founded as a cooperative in 1930s to safeguard the interests of the forest owners in the timber market. From the 1950s onwards, it gradually developed into a big actor in the Finnish forest-industrial field. Much of Metsä Group´s industrial activity was operated by its stock-listed subsidiary Metsä-Serla.

The Big-3 made smaller acquisitions even earlier, but the really big ones were done 2000-2001. Stora Enso acquired the American paper company Consolidated Paper in 2000. UPM acquired the German paper company Haindl in 2001. Metsä-Serla acquired the Swedish fine paper producer MoDo Paper in 2001, soon changing its name to M-Real. As a result, Stora Enso, UPM and Metsä Group soon dominated domestic forest-industrial production, were the 3 biggest forest companies in Europe and in the top-10 also globally. UPM and Stora Enso had notable presence in Europe, North America and Asia; Metsä Group only in Europe. They all had strong stakes in production of paper for printing and copying, but also other traditional segments (such as pulp, sawn wood and packaging products).

Of the Big-3, only Stora Enso adopted a core asset strategy in any notable way. It divested a large part of its huge energy production capacity in Sweden to the Finnish energy company Fortum and sold its vast forest resources to new companies (Bergvik Skog in Sweden and Tornator in Finland), in which it still retained a strong minority position. UPM did not divest its vast forests nor its huge energy assets, making the company more independent of fluctuation in these markets. Metsä Group never had big energy or forest assets, but through its ownership base it had close connections to the forest owners.

Corporate political strategies. During this sub-period, the forest industry did not have to devote much effort on communicating their wishes concerning policies. The two consecutive coalition governments (in office between 1995 and 2003) lead by the Social Democratic Prime Minister Paavo Lipponen were keen to ensure good growth conditions for the 3 biggest export sectors - the forest industry, ICT and technology industry – so most implemented policies were without big tension occurring well in tune with forest industry´s expectations.

Technical innovation strategies. The Finnish forest industry had been enlarging its technological know-how in papermaking during a long time. As it had continuously modernized its facilities and built cost-effective new, big paper machines during the 1980s and 1990s, the Finnish forest industry now represented the competitive edge in its main segments (Ojala et al. 2006). Therefore, the innovation activities were rather restricted and mainly focused on further fine-tuning and bottle-necking of paper production.

Public framing. The forest industry tried to communicate a new and different message to the general public in Finland. On one hand, the industry underlined that the growth potential was bigger elsewhere and restricted in Finland. This was why the industry´s internationalization was presented as a necessity, enabling growth, attraction of more foreign capital and better profitability. This will inevitably result in less focus on (and less growth of) domestic production and to a looser relation between the forest industry and Finland. On the other hand, the forest industry reminded that it has a lot of activities in Finland, which will be cared for and developed alongside the new ones abroad.

Summary. This turned out to be a period of relatively small pressures on the forest industry. The forest industry continued to grow also in Finland despite its increased international presence. These developments made that public criticism of the forest industry stayed small, even though there were more doubts than before. The atmosphere in the industry was still full of confidence concerning its traditional strengths and the recent strategic choices. The character and the activity of the industry did not change much, but its structures were changed by internationalization. The forest industry´s long-standing focus on energy-intense printing paper production in large, integrated units, was reinforced by acquisitions and investments. Because divesting of other segments and assets stayed rather small, the broad profile in production and assets did not change much. The environmental profile of the regime was modified to meet the challenges stemming from increasingly international operations.

4.2. Pressures rising, but only weak responses occurring (2002-7)

Pressures in task and institutional environment

Markets. The world economy grew rapidly during this period, with China and other new economies as the strongest motors. The US economy was hampered by warfare in Iraq. This was reflected as strong devaluation of the US dollar from 2004 onwards. As global demand for resources now was bigger than ever, the price of many resources started to rise and reached around 2006-7 levels not experienced before. The high oil price in combination with an increasing global concern for climate change and finite resources resulted in a strong interest in bio energy and bio fuels, also supported by some new policy goals and measures.

While the forest industry benefitted from growing demand for most forest-industrial products, many other factors caused pressure on its established regime and business model. The low value of dollar resulted in low margins for the increasing export outside Europe and it also reversed the trade streams between Europe and North America, thereby worsening over-capacity and product prices in Europe. However, the most alarming factor was shrinking demand for printing paper in the Western market, leading to low profitability of the industry and questioning its strong paper focus.

Policies. The sub-period brought with it several new challenges for the Finnish forest industry, but also one important decision supporting its energy-intense strategy. In 2002, the Finnish parliament approved a permit for the energy company TVO (with forest industry as the biggest owner) to build a third nuclear plant in Olkiluoto (OL3), planned to start operation in 2009. In order to show commitment also to renewable energy, new small-scale forms of support for forest-based energy production were introduced simultaneously. The forest cluster companies received some new R&D-funding through a new programme for Centres of Top-level Excellence in selected fields (2006).

EU issued a biofuel directive 2003. In Finland, it was implemented as obligatory low-rate blending of ethanol in gasoline, thereby creating a niche market for liquid biofuels. The Kyoto protocol entered into force in 2005. As a consequence, EU´s emissions trading started, aimed as a market-based incentive to cut carbon emissions. Although the new mechanism had been in preparation for long, many industry actors had not anticipated its impact on electricity prices and demanded compensation. Russia decided to impose duties

on exported timber from 2007 onwards. This had direct impact on the Finnish forest industry, whose import volumes from Russia had risen to 20 million cubic metres during early 2000s.

New entrants and technologies. The quick expansion of ICT and its effects on paper consumption could not be ignored anymore. Competition from pulp producers in South America and paper producers in China increased as a result of expanded production. Production of liquid biofuels appeared as a promising segment, although many issues related to policies, technologies, feedstock, economy and sustainability were far from settled. The Finnish oil companies Neste and St1 decided to start biodiesel and bioethanol production in Finland. However, they chose imported palm oil (Neste) and domestic organic waste (St1) as their feedstock, not forest biomass nor field crops.

Public attention. A possible paper cartel was investigated in 2004, but nothing proving it could be found. However, UPM confessed the same year that the Big-3 firms had run a timber price cartel for years. Even though the industry´s profits decreased, many top managers still received wage increases and bonus programs. These news added to a critical attitude towards the industry. When the industry started to cut capacity and personnel by closing entire facilities, a strong critical mood appeared. The forest industry had not closed capacity for ages and was still interpreted as an affluent actor.

Social movements. Stora Enso initiated in 2003 a joint pulp mill project with Aracruz in South Bahia, Brazil. Botnia, a subsidiary of Metsä Group, decided in 2005 to build a pulp mill in Fray Bentos, Uruguay, close to the border to Argentina. These projects were exposed to criticism and social movement activity in many forms on the local and international level during many years. The companies were ill prepared for such challenges, so to develop and implement the necessary skills to meet them was a lengthy process. The Botnia case was finally resolved in the international court in Hague, issuing (in 2010) the mill a permit to continue operation.

Industry response strategies

Economic repositioning. As the printing paper segment had been the Finnish forest industry´s biggest and most valuable one a long time, declining paper consumption was much debated inside and outside the industry. Is it a temporary or a structural change? How should it be tackled? While North American forest-industrial companies had started closing capacity soon after 2000, most European producers hoped that the paper market will recover and that competitors will have to take the blow first. So many firms, also the Finnish ones, postponed tough decisions on capacity cuts and focused on cost-cutting, effectivization, outsourcing and divestments instead from 2004 onwards.

The first Finnish company to start cutting capacity and personnel was UPM, which slightly downscaled its mechanical wood industry in 2004. In 2005, the forest industry tried to cut personnel costs by initiating a big change in the delicate power balance between employer and employees on the mill level. This led to a major labor market struggle, including a 6 week long lock-out and pause in production, finally ending in a meagre compromise. As this was a very exceptional phenomenon, it received massive attention and functioned as a wake-up call. The forest industry was thereafter interpreted to suffer from acute economic problems.

Despite this, the decisions made by UPM and Stora Enso in 2006-2007 to permanently close entire mills (in Voikkaa, Kemijärvi and Summa) were met with surprise, outrage and strong criticism. The firms referred to falling profits and rising costs (such as the Russian timber export duties). In a strategic perspective, the clearly biggest change during this sub-period was made by Stora Enso. In 2007, it announced that it will sell all its American operations, which had been making losses for years. The new CEO of the company stated that the forest industry is not a global industry, why Stora Enso should focus on profitable activity only in selected environments. Through this, he clearly distanciated himself from the company´s earlier ambitions, stressing global presence and size.

Innovation strategies. The first new visions targeting a rapid transformation of the forest industry were formulated by forest cluster actors. A research strategy published in 2006 targeted a 50 % growth of turnover until 2015 and a doubling of turnover until 2030, with planned growth originating exclusively from new products (Maailman johtavana… 2006). Most actors considered liquid biofuels as being the only new segment in which such rapid growth of turnover would be possible. R&D targeting such goals was increased by the companies. However, no big investments in new products took yet place, as they were considered risky and most companies suffered from low profitability.

Corporate political strategies. As most domestic policies related to the forest industry were supportive or neutral, the industry´s strongest worries concerned EU policies, such as emissions trading. The industry spoke strongly for receiving free emission permits, as it considered its production system to form a closed carbon cycle. While the industry had a positive attitude towards a strengthened role of bio energy, it criticized planned incentives, claiming that they will result in timber market distortion and price increases. When a debate concerning the need and the ways to renew the forest industry started, the industry underlined that more public R&D resources would definitely be needed, but should mainly be allocated to the present forest-industrial companies and their collaborators and not be dispersed to other actors. The industry took a strong position in societal debate on future paper production. It publicly disliked that scenarios suggesting a possible decrease of paper production had been presented by researchers. There was distrust between the firms after UPM had revealed the timber cartel, which affected the industry regime.

Public framing. The industry tried to deliver a two-sided message to the worried but also critical audience. The industry stressed that the mill closures were sad, but necessary measures that had to be made in a very demanding environment. The industry asked all Finnish citizens to understand cost-cutting measures and to support the industry in its survival struggle. At the same time, the industry tried to underline that it has what it takes to perform well and grow in the future.

Summary. The external pressures grew big during this sub-period, except for supportive domestic policies. Besides growing market pressures on profitability and paper production, public discourse concerning the industry turned into a much more critical direction than before. However, global growth continued, the other business segments performed better and production grew even in Finland, reaching record levels 2006-7. The co-existence of disparate trends made the activity of the forest-industrial regime strongly divided these years. Besides concern for the profitability of the industry and the future of paper production, also confidence in the industry´s capacity to defend its old structure against threats and to create new business segments on the basis of its skill base existed. On this basis, the forest industry considered that cost-cutting has to be intensified and some exploration of alternatives has to be made, but there is yet no need for deeper reorientation. However, the firms started to take steps in diverging directions. Of the Big-3, only UPM showed no signs of re-evaluating the strong focus on printing paper.

4.3. Continued performance problems lead to heavy downsizing, strong lobbyism and partial reorientation (2008-2012)

Pressures in task and institutional environment

Markets. The global recession starting in USA in 2008 dominated this sub-period. Main economies and their central banks did a lot to avoid a deepening and lengthy dip. Especially in China but also on other continents, a return to rather rapid growth took eventually place. However, the Western economies and especially the EU recovered very slowly. The value of the US dollar and the oil price fluctuated strongly. However, the dollar value trend was rising, while the oil price trend was decreasing. The price of many resources returned to a rising curve. The global recession worsened forest industry´s economic crisis, as it made the printing paper market shrink more rapidly than before. The other business segments performed poorly 2008-9, but started then to recover due to continued demand growth in Asia.

Policies. Many states and international institutions tried to fight recession by implementing programmes fostering *green growth*, usually containing support for investment in renewable energy and resource efficiency. A renewal vision for forest-based activities appeared in many policy documents and studies produced by national and international institutions. In the vision, forest industry was presented as a key actor in present and future bio economy.

EU´s RES directive (the 20-20-20-package) came into force in 2008, being much in line with green growth ambitions. The implementation of the directive created ”windows of opportunity” for renewable energy production. After the Fukushima accident in 2011, the political will to increase renewable energy production and phase-out nuclear and fossil-energy strengthened, albeit with great variation between countries. This new political landscape contained options, but also challenges for the forest industry.

In Finland, this sub-period brought with it strong political and economic support for the forest industry´s struggle for survival and renewal. The industry was seen as suffering from acute economic challenges in the short term, but containing a substantial growth potential in the long term. Accordingly, a lot of public resources was directed to many different measures (ranging from infrastructure investment to increased R&D-funding and lowered timber taxation) intended at a stabilization and renewal of the industry. The Finnish government decided to lower employers´ costs by abolishing the obligatory folk pension fee and replace it by increased energy taxation. As these decisions at first caused energy-intense sectors such as the forest industry more costs than gains, they were soon compensated by low energy tax rates.

The forest industry got direct and indirect access to more R&D-resources than before, as the Finnish government reorganized funding of research and education. Through a new law on universities, the old technical university was transformed into Aalto University, which received additional resources.

However, the biggest political issue related to the forest industry in Finland concerned future energy needs and the ways to cover them. The forest industry´s use of electricity had notably decreased, mainly because of capacity closures. Some forecasts expected such a development to continue in the future, thereby lowering the energy needs and making an energy future without more nuclear energy a fully viable option. After a heated debate, the Parliament through a majority vote issued permits for two new nuclear plants. One of these was given to TVO, despite its documented problems with its OL3 project, suffering from delay and doubled costs. The Parliament also introduced rather generous feed-in tariffs and other new instruments for renewable energy, with a focus on wind power and bio energy.

New entrants and technologies. Policy goals, generous subsidies, large-scale investment, shrinking costs and the political consequences of Fukushima together gradually caused a breakthrough for renewable energy in many countries. The development was not that strong in Finland due to the prevailing focus on nuclear power, but especially wind power expanded strongly in Sweden and Norway. This started to be felt also in Finland, because of the common energy market in the Nordic countries (Nordpool). In 2011, Neste decided to build two big plants for production of biodiesel in Rotterdam and Singapore. As palm oil was told to be the major feedstock, this raised criticism.

Public discourse and legitimacy. The wave of factory closures and lay-offs was exposed to a lot of criticism by unions, local communities and some politicians. The Pulp Movement trying to save the pulp factory in Kemijärvi received a lot of sympathy in media and from many citizens. Also the state´s passivity (as a main owner of Stora Enso) was criticized. A court decision in 2009 confirmed that a timber cartel run by the forest companies had been in existence 1997-2004. This lead to big fines for two of the firms and increased criticism among forest owners and lead to compensation claims. Stora Enso´s activities in South America and China continued to be exposed to scrutiny in media and criticism from NGOs.

Industry response strategies

Economic positioning. While the domestic support for the forest industry was a clear advantage, most other factors hindered the forest-industrial firms from focusing strongly on anything else than tackling worsening finances and decreasing paper consumption. These years it was finally evident, that the industry had to close a lot of printing paper capacity permanently and continue cost-cutting on all levels to restore its economy.

The Big-3 closed or divested many facilities in Finland and abroad. The companies´ choices started to reflect diverging interpretations of their role in the printing paper market. Even though UPM cut capacity just like the others, it also acquired the printing paper company Myllykoski with 7 paper mills mostly situated in Central Europe. In contrast, Metsä Group divested all its printing paper facilities and made small investments in board production instead. Stora Enso closed more capacity in Finland than in Sweden, because Finland´s membership in the Eurozone made Finnish production even more economically problematic. Otherwise, Stora Enso continued to implement a strategy with a strong focus on production in low-cost countries, acquiring stakes in Asian companies and planning new mills in China and South America.

As energy prices soon returned to a high level, the energy market now appeared as a new potential segment. The forest-industrial firms invested in bioenergy production at many mills and made plans aiming at biofuel production on forest feedstock. Of the Big-3, UPM had the strongest belief in the energy market. The firm considered its nuclear energy stakes and biofuel plans as key elements in its best case scenario for rapid increase of turnover originating from new produce (UPM 2012).

Innovation and technology policies. R&D activity focusing on developing biofuel production continued. The companies´ plans for big biofuel units and their applications for subsidies for such units from EU´s NER-fund received wide media coverage. Also drawbacks could be noted, as no decisions to build biofuel plants were yet made and the joint biodiesel pilot plant built and run by Stora Enso and Neste in Varkaus (Eastern Finland) was closed after only a few years.

Corporate political strategies. The forest industry lobbied strongly for new nuclear plant permits and were partners in the consortium planning to build a 4th nuclear plant in Olkiluoto (OL4). In public debate, the industry assured that its electricity needs soon will return to a high level due to a recovery of its energy-intense paper production and emerging production of biofuels.

Public Framing. To counter critical public discourse caused by closures, the forest industry continued to implement a strategy containing two different messages. Closures and cost-cutting measures were defended as necessary just as before, but also presented as regrettable and re-employment programmes were implemented for lay-off personnel at many closed mills. The industry reformulated its renewal vision into a more general bio economy vision, claimed to generate substantial growth in the decades to come. According to the vision, the forest industry is the key sector, when combatting climate change.

Summary. The forest industry was exposed to mounting and diverse pressures during this sub-period. Especially its printing paper production was more troubled than ever. The industry was forced to close a lot of excess capacity, which caused criticism and a gloomy atmosphere. However, this was to some extent balanced by two factors. Most economic sectors were hit by the recession and had to restructure, which notably rebalanced public attention between different sectors. While domestic policies concerning the forest industry and energy needs were much debated, the end result was strong support for the industry´s prevailing energy-intense strategy, also as direct financial support (through energy tax breaks). While the industry now acknowledged that cutting capacity cannot be avoided and new alternatives have to be explored and advanced, it still believed in its established structure and in the possibility to quickly increase the role of new elements (such as biofuels, low carbon power generation and tropical pulp) in it.

4.4. Back to basics? Growth in old segments, stand-still in new opportunities (2013-17)

Pressures in task and institutional environment

Markets. The Western economies still experienced only weak recovery, as they were strained by high debts and austerity policies. The world economy was in a stagnant state. The growth pace in China and most other developing economies slowed down, but was in most cases still higher than in the West. Weak growth in Western economies and continuously shrinking printing paper consumption acted as pressures on the Finnish forest industry, but with a much smaller impact than before. This pressure was also more than counter-parted by a factor with growing positive impact. Demand growth for pulp and board in Asia was very strong. It was partly caused by a surprising mechanism. The dropping of world paper consumption caused a growing demand for fresh pulp, to compensate for the much smaller volumes of recycled fibre.

During this period, also some other key economic factors on the global level impacting the forest industry behaved in surprising ways. Starting in 2014, the value of USD and the oil price made a sharp turn to factors stabilizing the forest industry. As USA succeeded to stabilize its economy better than Europe, the value of the US dollar returned to the high levels prevailing in the 1990s. The oil price has been more than halved from the high levels prevailing between 2005 and 2013 and is not forecasted to rise back soon (IEA 2016). A low oil price can possibly incentivize some economic activity, but for biofuel production it is certainly not an encouraging signal. Accordingly, it did not grow strongly anymore. Production of renewable energy belonged to the clearly growing activities in many settings, which together with low demand growth put pressure on price levels and traditional energy producers.

These market developments considerably changed the economic setting for the Finnish forest industry. All economic worries did not disappear and the expectations attached to new produce had to be downplayed, but a return to turnover growth, decent profitability and more stable prospects seemed possible.

Policies. International policies caused worries and insecurity but also some positive incentives for the forest industry, while Finnish policies supported the industry´s growth and renewal targets as strongly as before. On the global level, the climate agreement signed in Paris in 2015 was the only political decision with potential impact on the forest industry. As its implementation on the EU and national level was not yet decided, a lot of political debate emerged about the consequences of different strategies, goals, indicators and instruments.

Many issues with potential impact on forest use and forest industry were discussed, policy proposals concerning them were presented, to be finally settled and agreed in 2017 or later. Among these were EU´s next climate and energy package (including the role of renewable energy), the criteria for sustainable use of (forest) biomass and the choice of parameters for surveying the role played by forests in climate change abatement. In Finland, Sweden and some other European countries with a lot of forest per capita, there was widespread (but also contested) concern that the coming EU-level decisions will not sufficiently acknowledge the major positive role that forest use and management was interpreted to be playing in climate policies, but could – in a worst case scenario – act as a hindrance for present and growing use of forests.

The only EU decision during this sub-period with a direct impact on the Finnish forest industry was the sulphur directive (issued 2014). As its content indicated a big change of maritime transport in the Baltic, affecting Finland´s large forest-industrial export trade, the directive was widely debated and often presented as a big threat to transport costs and the competitiveness of the industry.

Finnish policies on the aforementioned and other issues related to the forest industry were to a considerable extent influenced the poor economic performance of the country and its main export sectors these years. The forest industry was now recovering, but not strongly growing. The ICT sector (which had been biggest in Finnish export since 2000) was in trouble and its size diminished strongly. The situation of most other economic sectors and of the state finances also caused concern. Against this background, many policies

implemented in Finland during this period were strongly focused on restoring and bettering the conditions of the export sectors.

One of the biggest decisions was to lower company taxation notably to 20 per cent (2014), which aimed at stimulation of business and investments. When implementing the EU sulfur directive, the government compensated the industry for occurring new costs and subsidized investment in technologies meeting the new demands, which added to the order books of Finnish technology companies. In 2016, it was decided on emissions trade compensation for industries, to be paid in the case they will be suffering from higher costs caused by possibly rising electricity prices. The forest industry had to accept one unpleasant decision. The Finnish government cancelled TVO´s permit for the OL4 nuclear plant, due to the huge timetable and budget problems faced by TVO´s OL3 project.

Many governmental strategies and policies did not only intend to practically enable better performance of the export sectors, but contained also a new vision for the Finnish industry, relying strongly on promising bio economy, clean tech and green growth prospects, supported by forecasts showing growing global energy, resource and food needs. The new vision was seen and presented as a way for Finland to both ensure the interests and possibilities of the Finnish industrial sectors and to actively take part in solving global economic, environmental and social challenges.

The forest industry was the strongest - but not only - focus in the vision. The government´s bio economy strategy (2014), the national forest strategy (2015), the governmental program of Prime Minister Sipilä´s government (2015) and the government´s climate and energy strategy (2016) rested on the idea of boosting export, creating employment and meeting Finland´s climate obligations by increased use and processing of forest biomass into traditional and new forest produce, with biofuels and bio energy in a key role, while also securing sustainability and carbon storage in forests.

While many actors embraced the vision, the targets and potential consequences were subjected to criticism. Besides strong sustainability concerns, some actors claimed that many instruments necessary for materialization of the vision were actually lacking, why the vision could fail or lead to problematic consequences.

New entrants and technologies. During this sub-period, the Finnish energy market was changed by rapid development in the renewable energy field, which had been dominated by the forest industry (representing close to 70 per cent of it) and local energy companies. Wind power investment and capacity expanded strongly in Finland, incentivized by rather generous feed-in tariffs. However, this development was much stronger in Norway and Sweden. Due to the common Nordic energy market, this lead to shrinking energy prices and difficulties for many traditional energy producers (Berninger et al 2017). Also some other new niches, such as production of biogas, use of LNG in maritime transport and biofuel production based on organic side-streams and waste expanded, contributing to a more versatile energy market and slightly decreased power of the energy industry. Many new entrants of domestic and foreign origin announced project plans aiming at production of pulp, biofuels and other forest-based products. This was a new phenomenon in the Finnish forest-based sector, still dominated by the Big-3.

Public attention. The public discourse concerning the forest industry turned from a pessimistic and reserved atmosphere into a much more positive one. This was much due to the good news provided by the industry these years. Especially its decisions to invest in many of its mills in Finland were greeted, as the firms had invested mainly abroad during earlier periods. The atmosphere was disturbed only by two events. During early 2014, a Swedish TV documentary succeeded to reveal that child labor had been used in Stora Enso´s contracting chain in Pakistan. As this was in stark conflict with the firm´s governance and responsibility principles, Stora Enso´s CEO soon decided to leave the company. Through lengthy court processes, many forest owners tried to get compensation for income losses they claimed to have suffered because of the forest industry´s timber cartel.

Industry response strategies

Economic repositioning. The economy of the Finnish forest industry stabilized these years, mainly due to strongly growing demand in Asia and the increasing value of USD. This gradually led to a renaissance for (and investment in) pulp and board production. Also the market for sawn wood and other products for construction (such as plywood and house modules) was firmly growing. The economy of the firms was strengthened also by closing and divesting printing paper capacity, due to the continuously bleak prospects of this segment. While the situation of and prospects for most traditional business segments now were good, only meagre development took place in new produce and new business segments. No big bio refineries were built nor did biofuel production based on forest biomass strongly expand.

The response strategies and the trajectories of the forest-industrial firms showed much greater variety than during earlier sub-periods. Of the Big-3, Metsä Group changed the most these years. In a strategic perspective, the most important change was the firm´s final exit from traditional paper produce. Metsä Group´s last remaining paper machines (in Husum, Northern Sweden) were converted to board production. However, the firm´s most spectacular decision (made in 2015) was to build the biggest pulp mill ever in Finland (in Äänekoski, Central Finland). As the new mill was planned to produce much more turnover from side-products (up to 20%) than traditional pulp mills, partly in cooperation with other companies, it was portrayed as a bio product mill and an emerging industrial symbiosis.

While UPM still stayed as a firm with a strong paper focus, it sold and closed several paper mills and depreciated the value of the paper production assets in the balance sheet by 2 billion euros (in 2013). At the same time, the value of the energy assets was revaluated by 1 billion euros. This reflected a strongly changed view of the company´s strategy and future. However, the expectations attached to quick growth of the energy segment had to be downplayed. This was due to three factors. The energy prices shrank, the plans for big biofuel units had to be shelved for the time being and the nuclear power projects turned from potential cash cows to huge disappointments. The OL3 plant was still not ready for operation. UPM`s only bigger investments were focused on enlarging pulp production at its Finnish mills.

Stora Enso´s response strategies followed the earlier path. Many units were sold, with many being paper mills, reflecting further downplaying of the paper segment. Stora Enso´s growth market business was strengthened by the start-up of the board plant in Beihai (China) and the pulp factory in Uruguay. However, the pulp mill project in China was shelved. Stora Enso made no bigger investments during the period. Small sums were invested in some of its Finnish and Swedish units.

Innovation activities. The biggest change was that the firms put their planned big biofuel projects on the shelf, despite the promised EU subsidies for them. This happened mostly because of technological and political challenges, but the low oil price was most likely an additional disincentive. Also the heat and power market lost its attraction for the forest industry for the time being, as the prices were low and quite a lot of competing renewable energy production entered the market. The Big-3 companies engaged in many types of R&D-activities in many fields, acquired some small new entrants and started to produce small amounts of new side-products at some mills in a try-out manner. However, the aggregate turnover and profit impact of these activities was still so small that no firm reported it separately.

Corporate political strategies. As most domestic policies treated the forest industry in a favorable way, the industry´s political strategies focused on only a few issues, feared to weaken the industry. The forest industry opposed a plan included in the program of the coalition government (2011-15) to initiate stronger taxation on uranium and the energy companies´ wind-fall profits. The plan was dismissed. Although the forest industry´s interests were well cared for in most decisions, the industry repeatedly claimed that it was mistreated by policies and suffered from higher costs and taxes than its competitors in other countries. In 2016, a debate emerged about enterprise subsidies. Their volume had grown against governmental targets

and some actors claimed that they rather contributed to preservation than to renewal of the industry. The forest industry claimed that the subsidies were essential for its competitiveness and renewal and lower than elsewhere.

Public framing. The industry presented itself as a transformed and strong actor in an emerging global bio economy, gradually boosting the turnover and importance of the industry. Through its many decided and planned investments, the industry was described as contributing strongly to the otherwise weak state of the national economy. The most important message was that Finnish (and EU-level) policies should be carefully planned and implemented, not to endanger the expected growth prospects.

Summary. Many factors that earlier had put strong pressure on the forest industry weakened or turned into a direction supporting it (the value of USD, the oil price). Most importantly, pulp and board demand continued to grow, while the markets and policy incentives for new forest-based produce did not grow as earlier assumed. Finnish policies continued to support the forest industry´s competitiveness in different ways, while EU-level policy drafts concerning forest-related issues caused some concern. The industry reoriented these years more than before. While the response strategies and trajectories of the firms now showed great variety, downplaying the role of paper production was a common feature. During this sub-period, the Finnish forest industry made most of its profit by producing pulp and board. This also led to increased investments in its domestic facilities. This emerging "pulp renaissance" in Northern Europe is a big change, as "pulp moves south" long was presented as an irreversible global trend.

Due to favorable exogenous factors and endogenous responses, the forest industry reached firm ground, performed very well and started to grow again these years. This was good news for the troubled Finnish economy, but the industry´s finally successful "survival struggle" did not end without a downside. The industry is smaller (in volumes and turnover) than before, the same applies to its societal importance and its growth prospects are modest. The Finnish forest industry´s deflated gross value of production has decreased (from 24.8 at the most to 19.5 billion euros in 2016), the turnover of the Big-3 has decreased (from 32.2 billion euros in 2002 to 24.3 in 2016) and the employment of the industry has decreased (from 70.000 employees in 2005 to 40.000 in 2015). However, annual forest harvest in Finland has reached record levels in recent years, which commonly has been interpreted as an indication of a revival of forest industry and forestry in the country.

5. Analysis

Applying the conceptual framework

The case study showed that the Finnish forest industry experienced a "globalization hype" around the turn of the millennium. Until mid-2000s, a strategic focus on growth, global presence and printing paper production prevailed. This focus has been destroyed by several disruptive changes. During 2000s, two big shifts have taken place in the global forest-based industry, strongly affecting the Finnish industry. China has replaced the Western economies as the most important growth market for the global forest industry and pulp has replaced printing paper as its most important business segment (in a growth and profitability perspective).

They have disrupted the printing paper segment and destabilised the established industry regime, but have opened up new (albeit changing) options for the industry as well. A lengthy process, which has contained a lot of hesitation, turns and fierce tries to postpone restructuring and reorientation, has eventually resulted in an abandonment of the industry´s long established strategy (with energy-intense printing paper production as its core), a smaller societal importance of the industry and a slight reformulation of the industry´s business models, technologies and mind-sets (resulting in a return to a "retro-fitted" version of an old strategy mainly based on pulp, board and sawn goods).

Through an interplay between many factors and surprising developments, the main strategic focus of the forest-based industry has changed and its main growth market is now in Asia. Low-cost fibre and expensive energy were seen as strategic resources only some years back, with increased activity in low-cost, fast growing countries considered the most important way of achieving profitable growth. Now boreal softwood is a strategic asset for the forest-based industry, changing its growth and production localization strategy. Consequently, many investments have in recent years been made in Finland and Northern Europe.

To explain this outcome and why the process took place in the way it did, I first apply the conceptual model and then check the additional factors for further nuance. The first part of the conceptual model concerns the development of exogenous pressures. For each period, Table 1 summarizes the main pressures. Based on the summary, the following conclusions can be drawn:

The industry faced numerous pressures, which changed in strength and direction. Some pressures were mostly negative (new entrants, social movements), although their strength and impact on developments stayed rather limited. Policies were mainly supportive on the domestic level, while international policies slightly added to the negative pressure. Other pressures (market developments, public discourse) changed from positive to negative and back to positive, although at different speeds. This shows how important it is to analyze the aggregate impact of multiple pressures.

The industry changed, because an increasing number of pressures turned negative for its established business model. Already in the first period (1996-2001), there was some negative pressure from the capital market and public discourse. This had only limited effect, because especially the economic conditions were very favorable. In the second period (2002-2007), the negative pressures from market developments, new technologies and public discourse increased, but turnover growth still continued and some new technologies (biofuels) appeared as new options, also supported by high oil prices and policies.

In the third period (2008-2012) most pressures turned negative, except for political pressure in Finland, which offered a lot of economic support for the troubled forest industry. The pressures did not lead to rapid change still at this point, because the firms still believed in most of their established segments and in quick development of new ones, interpreting the problems (shrinking markets, economic crisis, public image) more as temporary than structural.

The industry was fully convinced of the need for remarkable change of its strategies and activities only in the fourth period (2013-17). At this point, the continuous shrinking of paper consumption could not be denied anymore. Also the markets, policies and economic incentives for new produce (such as forest-based bio fuels, bio chemicals, biomaterials and production of power and heat) were found to be developing much more slowly than anticipated earlier. The old focus on printing paper had to be abandoned, but there was not yet enough ground for a focus on new produce. Instead, the firms made a turn back to a focus on old business segments (such as pulp, board and sawn goods), as demand for these continued to grow strongly in Asia and other market developments (such as the rising value of USD) boosted the industry´s overall profitability.

When considering the change of the industry, a puzzling issue is the fact that the pressure on the industry regime was without any doubt arguably strong (even disruptive) between 2005 and 2013. Some new business possibilities (biofuels, power generation) were on offer, also supported by national and EU policies and economic incentives (high oil and electricity prices). On this basis, a different and maybe more radical transition pathway could have been possible, but did not materialize. What actually happened? This can be explained by a complex combination of factors.

	Market pressures	Polititical pressures	New entrants and technologies	Public discourse and legitimacy	Social movement pressures
1996-2001	++ Rising demand	+ Energy market liberalisation	- Rapid ICT development	- Concern for domestic production	- Old-growth forest struggle
	++ High USD value,	- + Finland joins the eurozone	- Low-cost producers	+ Strong growth contributing to positive image	- NGOs criticise operations in Asia
2002-2007	- Shrinking paper demand	+ One nuclear plant permit	- Rapid ICT development	- Timber cartel revealed	- Pulp mill projects in SA criticised
	+ Rising demand (other products)	+ EU biofuel directive	+ - Biofuels as a new option. Competitors build first plants.	- Capacity and personnel cuts criticised	
	- Shrinking value of USD	- Russian export duties on timber	- Low-cost producers	- Image of firms decreases	
2008-2012	-- Shrinking paper demand	- RET support	- RET growth	- Factory closures criticized	- The Pulp Movement
	- + Shrinking demand, recovering by end of period (other products)	+ 2 nuclear plant permits	+ Energy market as an option	- Timber cartel fines	- Industry activities in SA criticised
	+ Rising USD value	+ Industry gets lower energy taxes; higher R&D support	- Competitors upscale biofuel production		
2013-2017	++ USD value rising to a high level	+ Company taxation lowered	- RET growth	++ Domestic investments improve image of industry	- Industry activities in Asia and SA criticized
	+++ Rising demand (esp. softwood pulp and board)	- One nuclear plant permit cancelled	- New actors appear in forest-based processing	- Timber cartel compensation court processes	
	- Shrinking paper demand	- + EU sulphur directive, industry gets compensation	- Energy market not attractive, as prices fall		

Table 1. Exogenous pressures for change in economic and socio-political environment (- reflects negative developments for the forest industry, + reflects favorable. -- and ++ refers to the intensity of the effect. +- or -+ means that the direction of an effect changed over time).

The strongest pressure concerned printing paper production. To change the paper-focused strategy and the related mind-set took a long time, but when the paper segment had made losses for years and the hopes of a turn of the paper consumption trend waned, closing paper capacity started to get pace 2009-10. Together with revived demand growth in other segments, this gradually led to lessening pressure on the industry.

But surprises, disappointments and other non-linear developments also strongly influenced the change process, counteracting the forest industry´s "best case renewal scenario". Starting in 2014, the oil price dropped from a high to a modest level, showing no signs of rising back to the high level prevailing between 2004 and 2013 (IEA 2016). The new Finnish nuclear facilities were heavily delayed and troubled. Power generation in Northern Scandinavia turned into a low-margin business segment due to excess capacity (caused by increased renewables capacity and stagnant consumption growth). The automotive industry started to focus much more on electric than bio-based mobility technology long ago; this process has got strong pace in recent years.

The economic, political and technological challenges related to use of woody biomass for biofuel production turned out to be much bigger than expected, which was a big disappointment. Political ambitions and instruments did not substantially strengthen to speed up the process. Therefore, the assumed turn from 1st generation biofuel production (mainly based on field crops) to 2nd generation production (based on wood and other non-food sources) did not take off. However, some competitors (such as the Finnish oil companies Finnish Neste and St1) have succeeded to develop and scale up 2nd generation biofuel production (based on organic waste and vegetable oil), through which they obtained a dominant position in the biofuel market in the Nordic countries. These developments made the energy market a much less interesting new segment for the forest industry.

Also the global markets for other new or semi-new forest-based products have grown less than expected and they are still rather small and demanding. Dissolving pulp, based on forest fibre, is a good example of this. As a sustainable substitute to cotton and fossil-based synthetic fibres, its market has grown in recent years. Still, its size is only 7 million metric tonnes (2014). Most of it is produced by China and India, while production elsewhere is small. In Finland, only Stora Enso produces small quantities. Lignin, tall oil, turpentine and other products that can be derived from the pulping process and have several end uses also belong to the category of promising side products. However, their market is still very small and the competition from established petro-chemical industry is hard.

While the forest industry´s renewal strategy was strongly supported by Finnish policies, the new segments did not develop as assumed, but was heavily affected by technological disappointments, changes in energy markets, shrinking oil prices and lack of robust international policies. When the firms eventually conceived that their established strategic focus (on paper production) had to be abandoned, but no firm ground for a focus on new produce was emerging, they made a move to a focus on other "old" segments (such as pulp, board and construction products) instead. While this move was based on many long-standing elements of the *industry regime*, it would not have taken place without the help provided by exogenous factors (strong demand growth for pulp and board in China).

The second part of the conceptual framework concentrates on firm responses to exogenous pressures. As described in the case study, the Finnish forest industry faced a range of economic, political, social and technical challenges. As the issues were complex and partly interlinked, interpreting them and prioritizing responses was crowded with difficulties. On the basis of the case study, I conclude that five strategic mistakes in particular contributed to industry problems. The strategic mistakes were based on wrong interpretations and assessments. Some of these mis-interpretations related to established mind-sets (e.g.

underestimating decrease of paper consumption), while others turned out to be wrong in retrospect and could not have been anticipated.

Some of the mis-interpretations can be related to established beliefs and self-confidence. These features have a long history in the Finnish forest industry. During the last 20 years, they originated especially from very fast growth and positive economic performance from early 1990s until early 2000s, with growth of turnover continuing until 2007 despite increasing financial concerns. The long and short history of growth and resilience despite external challenges contributed to an interpretation of the strong negative pressures in the second and third period as much as a typical business-cycle phenomenon as a structural change.

Period	Strategic mistakes	Wrong interpretation and assessments
2000-2003	Overpriced takeovers	Too expensive acquisitions, mainly of paper production, soon hit by a structural crisis.
2004-2010	Ignoring the structural crisis of the market for printing paper	Established mindsets and trust in own competitiveness postponed timely reorientation.
2003-2014	Implementation of new mill projects in Asia and South America	While the aim was to benefit from large-scale production in low-cost countries, many of the projects were initially planned or implemented in an arrogant way, leading to large protests, delays, extra costs, decreased image and shelving a few of them.
2006-2014	Confidence in the renewal potential of the industry	The industry believed that new produce will emerge `by itself´, incentivized by high oil prices and strong political will.
2009-2014	Fighting for additional nuclear power	Belief in the energy-intense printing paper segment, overestimation of the industry´s electricity needs and the energy business segment.

Table 2. Strategic mistakes that contributed to destabilisation

This way, the temporality of the response strategies implemented by the forest-industrial firms show a good match with four of the five phases of decline suggested by Collins (2009). In his model, the first two phases consist of "hubris born of success" and "undisciplined pursuit of more". In the Finnish forest industry, thesetwo consecutive phases took place between 1996 and 2003. The third phase "denial of risk and peril" took place between 2004 and 2007. The fourth phase, "grasping for salvation" took place between 2008 and 2012. "Capitulation to irrelevance or death", the last of Collins´ five phases, did not materialize in the Finnish case, as many factors turned in a direction providing the industry a feasible way out of the structural crisis.

The case also confirms the proposition from section 2 that firms tend to respond to external pressures by implementing externally-oriented strategies (economic positioning, corporate political strategies and framing strategies), even when performance and legitimacy problems show to be persistent. Internally-oriented strategies (aiming at changes of business models, technologies and mind-sets), started to be considered by firms during the last years of the second period (2002-2007), their implementation started in a hesitant manner in the third period (2008-12), but serious implementation of them happened only in the last period (2013-17). As the Finnish forest industry has succeeded to stabilize its economy, restore its profitability and return to turnover growth, its reorientation can be considered a success in the short term. In the mid- and long-term, it is far from clear that its reorientation is sufficient. The options for notable growth of turnover and added value of the industry are limited as long as the present focus on "retrofitted" business segments is prevailing (Hietala and Huovari 2017). The Finnish case resonates well with findings in the studies of the UK coal and German electricity industry (Geels et al 2016, Kungl and Geels 2017). They showed that mind-sets, mission and business models often are the hardest regime elements to change.

Discussing the influence of the global regime, natural resources and multi-functionality

On the basis of the case study, I revisit the three factors presented in the conceptual framework in section 2. The first factor to check for its influence on the Finnish forest industry`s change is the global dimension, here mainly studied through the changing relation between the global and the national forest-industrial regime. The second factor to check is the role of natural resources. As this factor is strongly inter-related with the global dimension, I analyse these two together. The multi-functionality of the forest industry is analysed separately, as it is an issue with a more technical character.

As described in section 2, the Finnish forest industry has been affected by the global dimension since its birth, through its predominantly international markets, competitors, international suppliers (of technology, market intelligence, capital etc.). However, as its entire production took place in Finland and relied almost solely on domestic forest and energy resources, the regime had a very national character until 1990s. The global dimension was felt mainly through the demand, price and performance cycles of the industry, which produced different challenges to be acted upon by the domestic actors. While this included some tension at times, national compromises could usually be reached on most issues, as the positive (mainly) and negative consequences of taken action were shared by all actors.

Between mid-1990s and early 2000s, the setting changed substantially. Globalization of trade, business sectors and national economies took pace. The forest industry was considered a mature sector, which would need to consolidate and grow internationally to speed up its growth and better its profitability. Growth elsewhere than in Finland was preferable, as cheap fibre (recycled or plantation fibre) could be obtained in main and emerging markets. The energy markets were liberalized in many countries and energy prices were low. Some forest-industrial actors did not consider forest and energy as key assets, so they were sold. The many big moves made by the Finnish companies changed their production, ownership and character in a much more international direction. This raised concern among domestic actors, but because the forest industry still grew also in Finland and the Finnish economy was performing very well, tension between different actors and interests did not appear.

In mid-2000s, the Finnish forest industry´s international and paper-focused strategy started to be challenged by many issues. Shrinking paper consumption was the most difficult one. While it was clear that the strategy could not guide the activity anymore, the industry postponed more substantial restructuring of its capacity for the time being. The industry concentrated instead on heavy cost-cutting, lobbying the Finnish state for different supportive measures and taking steps to strongly enter the energy market. Energy products (especially bio fuels) appeared as a big opportunity for the forest industry, as the energy prices were sky-high and policies on many levels targeted and subsidized low-carbon energy. Some of the industry´s pulp mill projects in emerging economies ran into problems and Russia imposed high export duties on timber.

These developments turned the industry´s focus back towards Finland again, as the Finnish forests gained more importance again and many measures could best be done in Finland (and in cooperation with Finnish actors). In line with this, the Finnish state returned to an economic strategy focused on supporting the forest industry, because it was feared to shrink heavily otherwise. The new export sectors (especially the Nokia-dominated ICT-sector) were in a shaky condition and were not considered a stable basis for the national economy for the time being.

After 2013, several new factors and surprising turns have changed the setting for the global and the Finnish forest industry. The energy market lost its attraction for the forest industry, because the energy prices decreased, other types of RETs gained a strong position in the power market and the priority in low-carbon mobility moved from bio fuels to electricity. However, the most important change is that pulp and board for

the Asian market have risen into the fastest growing and most profitable business segments. Their production is in turn much dependent on long-fibred softwood from the boreal area. Global expansion on the basis of cheap tropical fibre proved to be demanding. The massive and cheap global volumes of recycled fibre started to shrink due to decreasing paper consumption. China started also to restrict import of recycled fibre. These developments were not forecasted by the global forest regime. If they get stronger, they turn into a disruptive factor in the global forest fibre market.

Globally, Northern Europe is the only region capable of notable further expansion of this production in the near future. By sudden, the softwood fibre of Northern Europe has therefore turned into a strategic resource for the global forest industry and into a benefit that competing production regions do not have. This has led to a high rate of investment in the Finnish forest-industrial facilities, loggings in Finland increasing to a high level and has turned Finland into a hot spot for forest-industrial investors. Even though the setting most likely will not stay unchanged for long, it is close to a full turnaround in the business logic of the global and Finnish forest industry. Now Finland, the boreal region, their natural resources and domestic actors are very important for the forest-based industry again.

The third factor concerned how the broad and multi-functional character of the forest-industrial regime has impacted its way of tackling the challenges. While all business segments of the industry have faced problems at some point, printing paper production has been in increasing trouble soon after the turn of the millennium. When entire paper mills, earlier providing most of company profits, were permanently closed, there was large media coverage and public attention. The mostly stable performance of most other forest-industrial business segments has been a much less spectacular phenomenon. They have always represented a substantial part of the forest industry´s turnover and acted as a safety net, but have long been underrated and shadowed by the booms and busts of printing paper production. Only recently, when the paper-heavy strategy has lost its long-standing attractiveness and profitability, the other segments have been viewed with different eyes.

As long as paper production was the most profitable and growing segment, most development efforts were focused on it, even though many possibilities for bio-based produce since long had been known to relate to other business segments and production processes. Now a turnaround has taken place not only in company strategies, but in exploration of new possibilities. The focus is now on 1) the different ways of separating, processing and refining the numerous chemical ingredients contained in wood 2) mechanical wood processing (for construction purposes). Chemical pulp will most likely still long be the most important product derived from wood fibre, but the importance of other well-known and totally new products will most probably increase in the mid-term future (20-30 years).

In an economic and business management perspective, the most important notion opened up by the turnaround of exploration in forest-based possibilities is that this is where to look not only for growth, but for added value. In a general societal perspective, the most important change originating from a renewed focus on chemical pulping and mechanical wood processing (instead of printing paper production) is that this strategic focus is much less energy-intense. In the long run, the forest industry can possibly be self-sufficient with energy, while also producing different energy products for the market. The Finnish forest industry´s energy consumption has decreased substantially (from 28.1 GWh in 2006 to 19.0 GWh 2016). This development will most likely continue, as energy-intense paper production is forecasted to shrink further and pulp production (which is self-sufficient with energy) is forecasted to increase (Pöyry 2016).

6. **Conclusion**

This paper has explained the character and the outcome of the Finnish forest industry´s change process by applying a multi-dimensional conceptual framework. One part of the analysis was the increase of negative exogenous pressures on the industry (decreasing paper demand, shrinking USD value, low-cost competition, rising costs, declining public image,). The industry was further challenged by the global economic recession and developments in the energy market and policies (strongly fluctuating prices, changing policy goals and instruments).

The second part of the analysis underlined that the lengthy and difficult adaptation process was due to strategic mistakes (overpriced takeovers, underestimation of the change of the printing paper market, flawed implementation of mill projects in low-cost countries, fighting for additional nuclear power, belief in rapid renewal), which depended on mis-interpretations and established beliefs. The forest-industrial firms underestimated the structural character of their problems and initiated serious strategic reorientation at a late stage. They expected that new business segments (such as bio fuels, low-carbon energy, bio chemicals and wood construction) will evolve and expand rather quickly, incentivized by high resource prices and strong political will, why they did not devote much resources and strong effort on advancing them.

The paper integrated three inter-related factors into the analysis. A global forest-industrial regime influenced the change process of the Finnish forest industry in different ways. Until mid-2000s, it contributed to internationalisation of the industry. Thereafter, its impact has increasingly been counter-balanced especially by natural resource issues. Together with other factors, they turned the industry´s focus from global expansion back to Finland again for the time being. This was eased by the multi-functional character of the industry. It made a notable strategic shift comparatively smooth, as the technology and product choices it rested upon had been in use for long and had only to be modified and up-scaled.

All in all, the exogenous and endogenous factors affecting the change process of the Finnish forest industry changed remarkably along the way. A process of disruptive change, enabled by strong external pressure and rapidly developing new possibilities, seemed possible a decade ago. But due to non-linear developments, the pressures on the industry decreased and turned to new demand for old produce (pulp and board), while the development of new possibilities was poor and hampered by many factors. In this setting, the forest industry chose to utilize a possibility that had existed in its structures since long, but without being seriously implemented as a strategy in its own right before.

The strategic turnaround - from a focus on paper production to a focus on existing and new possibilities linked to chemical pulping – is recent, far from established and still strongly dependent on one single factor (growing demand for boreal softwood pulp and board in Asia). It is difficult to categorize also because the change has mostly taken place inside the incumbents, while new entrants, new technologies, institutions and policies have not yet had any notable role in the process. As the actor structure, the technology and most of the produce are the same as before, this cannot be named creative destruction. Still, the change can be categorized than more than a shere U-turn. It is a reorientation of a special, incremental and intra-industrial kind. Most likely, its character will not stay the same very long, but will be affected by new non-linear developments (in markets, actors, policies, technologies, competing sectors etc.).

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