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COMPARATIVE EFFICIENCY ANALYSIS OF
STORA ENSO OYJ AND UPM-KYMMENE OYJ 2013–2019

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ABSTRACT

Nowadays manufacturing companies are seeking for more efficient production from countries, such as China or Uruguay, and whether these operations actually increase the overall efficiency should be throughly analysed. The objects of this research are Stora Enso Oyj and UPM-Kymmene Oyj, the two biggest pulp and paper manufacturers in Finland. The aim of this research is to find out how has the overall efficiency of Stora Enso Oyj and UPM-Kymmene Oyj changed from 2013 to 2019 due to globalisation and how do these companies perform against each other. As efficiency is a complex phenomenon, the following methods are used in the analysis: overall efficiency matrix, growth rate of companys overall efficiency, Free cash flow variance analysis, benchmark index of company's overall efficiency and comparative efficiency matrix.

Based on the analysis the following conclusions can be made:
- UPM was outperforming Stora Enso in terms of overall efficiency from 2014 to 2019 and the company was able to increase its efficiency. However it should pay more attention to how the excess cash is used, due to the weak asset usage as well as capital management compared to Stora Enso.
- Stora Enso was investing almost 2 billion euros to Uruguay and did not achieve benefits from the operation during the period analysed. Stora Enso should focus on the risk management in case of these investments are not starting to increase the efficiency. The company should also pay more attention to labor intensity and expense management due to fluctuating profitability and high fexed costs.

Keywords: financial statement analysis, efficiency analysis, paper and pulp industry

INTRODUCTION

Nowadays companies are constantly spreading their operations around the world in order to gain growth and more efficient production. There are two ways for manufacturing companies to start new operations globally; companies may start their operations from scratch and set up a subsidiary by themselves or they can acquire a company from the same field of business at the target country. Both of these ways require high investments, which the companies assume that will generate more profit and cash and increase the overall efficiency. Analysing profitability is rather simple with ratios, but analysing company's overall efficiency is a complex phenomenon.

Historically the motive of Finnish paper and pulp companies has shifted from acquisitions to resource control to portfolio optimization and then to globalization. (Lamberg & Peltoniemi , 2020, p. 10) Finnish pulp and paper manufacturing industry has gone through the face of globalisation and this has required heavy investments into foreign countries. The two biggest pulp and paper manufacturers in Finland: Stora Enso Oyj and UPM-Kymmene Oyj are together contributing 9.4% to the Finland's total GDP. (The World Bank) In 2019 both of these companies had the majority of their production in Finland and the paper and pulp industry employed over 140,000 employees either directly or indirectly through subcontractors and forest industry in general. (Metsäteollisuus Ry, 2017) The new strategies of these companies implemented in the beginning of 21th century include shutting down old mills in Finland and opening new mills in various countries including China, Uruguay and Brazil. Even though both of these companies are decreasing production in Finland, the geographic distribution of manufacturing plants of these companies is very different. The ongoing investments of Stora Enso Oyj and UPM-Kymmene Oyj raises question whether these strategic changes and investments actually increase the overall efficiency of the companies analysed.

The **actuality** of this paper is supported by the fact that globalisation requires heavy investments and the therefore the results, including changes in overall efficiency, should be thoroughly analysed.

The **aim** of this research is to find out how has the overall efficiency of Stora Enso Oyj and UPM-Kymmene Oyj changed due to globalisation and how do these companies perform against each other.

The **objects** of this research are Stora Enso Oyj and UPM-Kymmene Oyj, the two biggest pulp and paper manufacturers in Finland. The period analysed is 2013–2019, because both companies started and finished major operations in China and South America during the period. The paper will examine the changes in overall efficiency of these companies based on the compiled efficiency matrix and will answer the following **research questions:**

1. How has the overall efficiency of Stora Enso Oyj and UPM-Kymmene Oyj changed during 2013–2019? Why?
2. Which company was more efficient during 2013–2019, Stora Enso Oyj or UPM-Kymmene Oyj? Why?
3. How have the changes in overall efficiency affected the Free cash flows of the companies analysed?
4. How could these companies improve their efficiency in the future?

The **data** used in this research is from publicly available financial statements of Stora Enso Oyj and UPM-Kymmene Oyj from 2013 to 2019. The financial statements include statement of financial position, income statements and cash flow statements. The comparability of data is verified, since both companies are operating in pulp and paper industry and both companies use IFRS accounting principles.

In order to provide answers to the research questions the following **methods**: efficiency matrix analysis 2013–2019, analysis of benchmark indices of companies' overall efficiency (BICOE), analysis of growth indices of companies' overall efficiency (GICOE) and variance analysis of the change in Free cash flow.

This research paper consists of three chapters. The first chapter of this paper is theoretical overview of financial statement analysis, which includes the general methods, use of the financial statement analysis and the concept of efficiency matrix. The second part of this paper provides an overview of the paper and pulp industry and the companies analysed including their global positioning, latest events and structural strategy. The third and final part of this paper presents the compiled and

applied efficiency matrices for these companies with conclusions and presents the result of growth and benchmarking indices of Stora Enso Oyj and UPM-Kymmene Oyj.

1. THEORETICAL OVERVIEW OF FINANCIAL STATEMENT ANALYSIS

Financial statement analysis is a process of collecting, processing and interpreting financial data and other pertinent information provided by companies. The goal of this process is to assist the users of analysis making decisions, which require more in-depth information from the company's financial performance and condition. (Cascarino , 2017, p. 237–238) The financial statement analysis includes various tools for analysts to provide relevant information for the users to make appropriate economic decisions. (Robinson, et al., 2015, pp. 3-4 & 19; Peterson & Fabozzi, 2006)

1.1.   Financial statement analysis

The financial statement analysis is based on the financial statements, which the company has provided. These statements include statement of financial position, income statement, cash flow statement and statement of changes in owners' equity, which provide important quantitative information for internal and external users in making financial decisions. In addition to the financial statements there are three more sources of information for an analyst to use; the notes of financial statements, board of director's report and auditors report. (Robinson, et al., 2015, p. 261)

Prior to any analysis conducted by professional, it is important to check the data quality. The data quality can be determined by the accounting standards as well as how has the company followed those standards. The auditor's report is a very good indicator of how fair image the financial statements provide from the company's financial performance, position and cash flows. In comparative financial statement analysis, the audited data does not always provide comparable data. (Clatworthy, et al., 2012) The accounting standards are flexible and adjustments to financial statements should be made prior to any analysis conducted, because accounting standards such as IFRS and IAS allow some flexibility in accounting and create distortion. (Young, et al., 2013, p. 119) To overcome this problem, it is crucial for analyst to adjust the financial statements in order to secure the comparability of data.

The information used in financial statement analysis depends on the desired outcome of the analysis, which can be determined by setting up a set of questions related to the company's financials. (Robinson, et al., 2015, p. 261) The questions are usually made by the users of financial statement analysis and these users are usually divided into two subcategories; external and internal users. The internal users include managers, employees and directors whereas the external users include investors, debtors, regulators, labour unions, customers and competitors. (Subramanyam & Wild, 2015, p. 10&13) The information that these interested parties are looking for is very different, for example debtors including banks and investors, are looking for short- or long-term liquidity of the business and the ability to generate positive cashflows, whereas managers of the company are focusing on the the profitability efficiency and value creation. (Young, et al., 2013, p. 119 & 121)

1.2 Financial analysis techniques

1.2.1 Common financial statement analysis techniques

Ratio analysis is one of the most commonly used techniques in financial statement analysis. (Leppiniemi & Kyykkänen, 2013) Ratio examines the relationship between two or more financial statement line items. Ratios can be divided in different groups based on what area of financial performance, position or cashflow they describe. (Mills & Robertson, 1999, p. 118) These categories differ by the source, but in general the categories include liquidity, solvency, profitability, cash flow and asset utilization ratios. (Subramanyam & Wild, 2015, pp. 35-36; Rist & Pizzica, 2015) The ratio itself is not an ending point of an analysis, it is just a tool for an analyst to point out those strengths and weaknesses of a company, that should be further examined. (Robinson, et al., 2015, p. 266) The benefits of using financial ratio analysis are the facts that the ratios are easy to compute and compare. Therefore, comparing ratios between companies can be difficult, because there are no standards for ratios, but each entity creating ratios uses its own set of formulas. Furthermore, even though the ratios of two different companies with same accounting principles are calculated with the same formulas, the figures may not be comparable. This is due to the fact that accounting standards allow some flexibility in bookkeeping (Gibson 2000, p.162, Subramanyam & Wild 2008, p.36)

1.2.2 Concept of efficiency matrix analysis

The overall efficiency is composed of two types of efficiency; technical and allocative. Technical efficiency is achieved by producing maximum output with specific amount of resources, whereas allocative efficiency is achieved by producing specific output with as little resources as possible.

The overall efficiency of a company is a complex phenomenon, which cannot be expressed as one single ratio and models including multiple ratios are rather hard to understand and time consuming to make. (Siimann, 2018, p. 8) In 1980 Estonian academic Uno Mereste published a visual form of the efficiency matrix to analyse the efficiency of a nation, which was further developed to analyse the efficiency of a company. The further studies modified the matrix into more understandable form and models for the use of different industries were created. This theory overview is mainly focusing on the approach developed by Siimann. (Siimann, 2018)

The efficiency matrix approach has the following advantages: (Vensel, 2001, pp. 69–70; Root, 1987, pp. 6–7, Siimann, 2011 referenced in Alver & Siimann 2015)

- The efficiency matrix presents the financial information in clear and understandable form, the relationships between indicators are easy to understand and follow.
- The efficiency matrix can be compiled to full fill the needs of the user, either it is a country, business, business segment, sector or industry.
- The matrix model provides a systematic picture of the efficiency of a company, and even users without business background are able to use it.
- The efficiency matrix includes multiple ratios in clear model, which is difficult to achieve without systematic model.
- The matrix model can be adjusted with different indicators for different situations and developed further.

The efficiency matrix developed by Siimann (2018) in Table 1.1 consists of eight **quantitative indicators** that are arranged in the order of finality. The order of finality means that by raising capital the company can invest into resources, and the use of these resources generate expenses. Through expenses the company earns income, profit and cash flows. These indicators are arranged based on the following scheme (Siimann, 2018, p. 71):

CAPITAL → RESOURCES → EXPENSES → INCOME → PROFIT → CASH FLOW

Table 1.1. The company's overall efficiency matrix.

Quantitative factor	Free cash flow (F)	Net operating cash flow (R)	EBIT (P)	Sales (S)	Operating expenses (O)	Average Assets (A)	Average number of employees (E)	Average Capital (C)
Free cash flow (F)	11 1	12 $\frac{R}{F}$ Op. cash flow to Free cash flow	13 $\frac{P}{F}$ EBIT to Free cash flow	14 $\frac{S}{F}$ Sales to Free cash flow	15 $\frac{O}{F}$ Op. expenses to Free cash flow	16 $\frac{A}{F}$ Assets to Free cash flow	17 $\frac{E}{F}$ No of employees to Free cash flow	18 $\frac{C}{F}$ Capital to Free cash flow
Net operating cash flow (R)	21 $\frac{F}{R}$ CM Free cash flow to Op. cash flow	22 1	23 $\frac{P}{R}$ EBIT to Op. cash flow	24 $\frac{S}{R}$ Sales to Op. cash flow	25 $\frac{O}{R}$ Op. expenses to Op. cash flow	26 $\frac{A}{R}$ Assets to Op. cash flow	27 $\frac{E}{R}$ No of employees to Op. cash flow	28 $\frac{C}{R}$ Capital to Op. cash flow
EBIT (P)	31 $\frac{F}{P}$ Free cash flow to EBIT	32 $\frac{R}{P}$ PCM Op. cash flow to EBIT	33 1	34 $\frac{S}{P}$ Sales to EBIT	35 $\frac{O}{P}$ Op. expenses to EBIT	36 $\frac{A}{P}$ Assets to EBIT	37 $\frac{E}{P}$ No of employees to EBIT	38 $\frac{C}{P}$ Capital to EBIT
Sales (S)	41 $\frac{F}{S}$ Free cash flow to Sales	42 $\frac{R}{S}$ ICM Op. cash flow to Sales	43 $\frac{P}{S}$ IPM EBIT to Sales	44 1	45 $\frac{O}{S}$ Op. expenses to Sales	46 $\frac{A}{S}$ Assets to Sales	47 $\frac{E}{S}$ No of employees to Sales	48 $\frac{C}{S}$ Capital to Sales
Operating expenses (O)	51 $\frac{F}{O}$ Free cash flow to Op. expenses	52 $\frac{R}{O}$ ECM Op. cash flow to Op. expenses	53 $\frac{P}{O}$ EPM EBIT to Op. expenses	54 $\frac{S}{O}$ EIM Sales to Op. expenses	55 1	56 $\frac{A}{O}$ Assets to Op. expenses	57 $\frac{E}{O}$ No of employees to Op. expenses	58 $\frac{C}{O}$ Capital to Op. expenses
Average Assets (A)	61 $\frac{F}{A}$ Free cash flow to Assets	62 $\frac{R}{A}$ RCM Op. cash flow to Assets	63 $\frac{P}{A}$ RPM EBIT to Assets	64 $\frac{S}{A}$ RIM Sales to Assets	65 $\frac{O}{A}$ REM Op. expenses to Assets	66 1	67 $\frac{E}{A}$ No of employees to Assets	68 $\frac{C}{A}$ Capital to Assets
Average number of employees (E)	71 $\frac{F}{E}$ Free cash flow to No of employees	72 $\frac{R}{E}$ Op. cash flow to No of employees	73 $\frac{P}{E}$ EBIT to No of employees	74 $\frac{S}{E}$ Sales to No of employees	75 $\frac{O}{E}$ Op. expenses to No of employees	76 $\frac{A}{E}$ RM Assets to No of employees	77 1	78 $\frac{C}{E}$ Capital to No of employees
Average Capital (C)	81 $\frac{F}{C}$ Free cash flow to Capital	82 $\frac{R}{C}$ KCM Op. cash flow to Capital	83 $\frac{P}{C}$ KPM EBIT to Capital	84 $\frac{S}{C}$ KIM Sales to Capital	85 $\frac{O}{C}$ KEM Op. expenses to Capital	86 $\frac{A}{C}$ Assets to Capital	87 $\frac{E}{C}$ KRM No of employees Capital	88 1

Source: (Siimann, 2018, p. 82)

The first three (capital, resources and expenses) can be named as input indicators, these indicators are required to create output. In order of finality the first indicator is **capital** which is needed for the company to be able to finance its resources. Companies have three options for acquiring capital; owners' equity, financial liabilities and other sources such as payables and provisions. The first two options are the most expensive ones: equity investors usually require dividends and and creditors require interests, whereas other sources of capital are the cost most cost-effective when paid in time. (Brealey , et al., 2001, p. 179 & 508) After the company has acquired capital, it can invest into **resources**, which is the second group of indicators in order of finality. Resources include non-current assets, current assets and employees. The company's overall efficiency matrix developed by Siimann includes two resource indicators, average number of employees and average assets. The average values of these balance sheet items are used in order to achieve comparability with income statement and cashflow statement items, which are periodic. (Siimann, 2018, p. 83) The use of resources creates **expenses**, which is the third group of indicators. The indicator chosen by Siimann (2018) is operating expenses, since it reflects the part of expenses which is required to generate sales.

The last three indicators are output indicators, which are the results of input indicators. The fourth indicator is **income,** which is presented as sales revenue in Siimann's 2018 model. When the

company recognizes its income, the **profit** can be calculated by subtracting the expenses from the income. The profit indicator can be chosen, however it is important to reduce the interest expense from the income because it provides the best comparability with companies with different capital structures by including the interest, since interest is profit by nature. (Siimann, 2018, p. 83) The EBITDA (earnings before interest tax and depreciation and amortization) is used in this paper and can be calculated by adding the depreciation and interest expense to earnings before taxes. The last indicators are **cashflow** indicators, which are Net operating cash flow and Free cash flow. Prior to analysis the cash flow statement should be adjusted due to flexibility in IAS7 standard. According to Siimann (2018), the best comparability is achieved by stating interest and corporate income tax paid as part of financing cash flow, and interest and dividends received as part of investing cashflow. (Siimann, 2018, p. 83) As a result, the effects of taxation and difference in capital structure are minimized, because the cash flow from financing activities is not included in the model nor other output indicators.

The 8x8 efficiency matrix is divided into two fields by the main diagonal from element 11 to 88 in Table 1.1, whose elements always add up to one. This is due to the fact that all the elements in main diagonal consist of quantitative indicators divided by themselves. The upper field from the diagonal presents the reverse efficiency field, whereas the field below the diagonal is the efficiency field. The reverse field elements are naturally presenting the reverse values of the corresponding efficiency field elements. Due to this, the section analysed focuses below the main diagonal onto efficiency field, which includes 28 elements.

The efficiency field can be divided into 28 elements, but only 21 submatrices are created. According to Siimann (2018) this is due to the fact that there are two resource indicators and two cash flow indicators, and only one of the indicators can be used in submatrices. Out of 21 submatrices only 17 are analysed, because four submatrices, including capital-, expense-, income- and profit matrix, include only one relevant indicator. The increments of the elements provide information from the company's overall efficiency, the relationships can be examined, and the strengths and weaknesses pointed out.

The overall efficiency matrix compiled from annual reports includes the values of all 28 elements, the annual change of these elements and the compound annual growth rate (CAGR) of these elements. The improvement analysis of these 28 elements can executed by making an efficiency

roadmap, which sorts the elements into four categories; improvements, strengths, weaknesses and setbacks.

The variance analysis is focusing on the key element (Element 81 in Table 1.1), Free cash flow to Average capital, which is the product of the elements under the main diagonal of the efficiency matrix. These main elements include:

- Free cash flow to Net operating cashflow
- Net operating cash flow to EBIT
- EBIT to Sales revenue
- Sales to Operating expenses
- Operating expenses to Average assets
- Average assets to Average number of employees
- Average number of employees to Average capital

The relationship between main elements and the key element can be re-arranged (Formula 1.1) to examine the change in Free cash flow caused by the elements. (Siimann, 2018)

$$F = C \times \frac{E}{C} \times \frac{A}{E} \times \frac{O}{A} \times \frac{S}{O} \times \frac{P}{S} \times \frac{R}{P} \times \frac{F}{R}$$ (1.1)

where

F –   Free cash flow,

C –   Average capital,

$\frac{E}{C}$ –   Average number of employees to Average capital,

$\frac{A}{E}$ –   Average assets to Average number of employees,

$\frac{O}{A}$ –   Operating expenses to Average assets,

$\frac{S}{O}$ –   Sales revenue to Operating expenses,

$\frac{P}{S}$ –   EBIT to Sales revenue,

$\frac{R}{P}$ –   Net operating cash flow to EBIT,

$\frac{F}{R}$ –   Free cash flow to Net operating cash flow.

The impact of each component to change in Free cash flow can be calculated using chain linking method, where each component is replaced one by one. This provides information of relative and absolute impact, that each component caused during the period analysed.

1.2.3 Benchmark index of company's overall efficiency (BICOE)

The static ranking problem of companies' overall efficiency using publicly available information can be solved using the benchmark index of company's overall efficiency (BICOE). This benchmarking method is used to find the unused reserves that the economic entity is holding. (Siimann, 2018, p. 100) The benchmarking can be done between two or more companies, in comparison to industry average or to current market leader. As BICOE is using geometric mean, the assumption of using BICOE is that both profit and cash flow indicators have a positive value. The information used in BICOE is derived from the company's overall efficiency matrix by dividing each efficiency field element of the company analysed by corresponding element of the benchmark company's efficiency field element. Formula (1.2) is used to calculate the elements of a comparative efficiency matrix:

$$C_{ij}^{A/0} = \frac{x_{ij}^A}{x_{ij}^0} \tag{1.2}$$

where

$C_{ij}^{A/0}$ – index matrix efficiency field element

x_{ij}^A – efficiency field element of company analysed

x_{ij}^0 – efficiency field element of benchmark company

After the comparative efficiency matrix is derived, it is possible to calculate the benchmark index of company's overall efficiency with following formula:

$$BICOE = \sqrt[\frac{n^2-n}{2}]{\Pi c_{ij}^{A/0}} \tag{1.3}$$

where

$c_{ij}^{A/0}$ – efficiency field elements of comparative matrix

n – number of quantitative indicators

After the BICOE is calculated, the indices of different companies can be compared and the most efficient company in terms of static ranking can be found. By comparing the values of different company's comparative efficiency matrices elements, the reasons for current ranking can be found and explained. This method is rather time consuming, and BICOE can be calculated with just a single formula, without compiling the index matrix:

$$BICOE = \sqrt[28]{\Pi_{j=1}^8 C_j^{8-(2j-1)}} \tag{1.4}$$

where

C_j – the benchmark index of the company analysed.

Both of the methods mentioned above provide equal results, the first method is more time consuming though. The first method (Formula 1.2 & 1.3) provides more insights to the reasons of current ranking, because all 28 efficiency field elements can be analysed through the index matrix. Therefore, the author of the thesis uses will use the Formula 1.2 and Formula 1.3. The BICOE is compared to value 1.00, which is the value of the benchmark company's BICOE. For example, if the company analysed has a BICOE of 1.2, the company analysed is 20% more efficient than the company used as benchmark.

1.2.4 Growth index of company's overall efficiency (GICOE)

Growth index of company's overall efficiency (GICOE) is used to solve the dynamic ranking problem. (Siimann, 2018, p. 100) This method provides an overview of how the overall efficiency of an economic entity has changed during the period analysed. The data for comparison is taken from the same company from previous period or any base period chosen. GICOE method uses the information from company's overall efficiency matrices, the efficiency field elements from period analysed divided by base period efficiency field elements.

$$i_{ij}^{t_1/t_0} = \frac{x_{ij}^{t_1}}{x_{ij}^{t_0}} \qquad\qquad (1.5)$$

where

$i_{ij}^{t_1/t_0}$ – growth index matrix efficiency field element,

$x_{ij}^{t_1}$ – efficiency field element of period analysed,

$x_{ij}^{t_0}$ – efficiency field element of previous period.

The result is a comparative efficiency matrix and growth index of company's overall efficiency is computed by the following formula:

$$GICOE = \sqrt[\frac{n^2-n}{n}]{\prod i_{ij}^{t_k/t_0}} \qquad\qquad (1.6)$$

where

$i_{ij}^{t_k/t_0}$ – efficiency field elements of the index matrix,

n – number of quantitative indicators.

GICOE can also be calculated with one single formula:

$$GICOE = \sqrt[28]{\prod_{j=1}^{8} I_j^{8-(2j-1)}} \qquad\qquad (1.7)$$

where

I_j –   the growth index of company analysed.

GICOE can only be computed with the following assumptions; all numbers have a positive value, and the model has an even number of quantitative indicators. The GICOE it uses geometric mean, which cannot be computed with negative values. The methods provide equal answers, but the first method (Formula 1.5 & 1.6) provides more insights to the reasons behind the growth index, because each index matrix element can be analysed. The value of GICOE is compared to number one, for example if the company's GICOE is 1.2, the company's overall efficiency has increased by 20% compared to base period.

To conclude the efficiency matrix is a systematic model with financial ratios, that is easy to use and understand. It allows the user of financial analysis to study the efficiency of an entity, benchmark the efficiency and compare the growth of efficiency. The efficiency matrix is flexible tool for analyst, the indicators can be replaced, as long as the ratios are in relationship with each other. The author of this thesis focuses on the approach developed by Siimann in 2018. Next chapter introduces the companies analysed as well as the basic economics of pulp and paper industry.

2. OVERVIEW OF PAPER AND PULP INDUSTRY AND THE COMPANIES ANALYSED

The long-term worldwide consumption of finished products of paper and cardboard has increased steadily from 1960's to 2012, from 61.5 million tons per year to 400 million tons per year respectively. During the period analysed, the growth of global consumption slowed down as in 2013 the consumption was 404.5 million tons per year and in 2017 it was 423.3 million tons per year. (Suorsa, 2020) Even though the consumption of paper and board has increased globally, the production in Finland has decreased from 11.8 million tonnes per year in 2010 to 9.5 million tonnes per year in 2019. (Suorsa, 2020). The increasing global consumption and decreasing Finnish production supports the fact that the paper and pulp production is globalising, as the previous studies made by Oinonen and Hetemäki suggested. (Oinonen, 2008; Hetemäki, 2007) This was based on a fact that from 2001 to 2008 Finnish paper companies shut down over 20 machine lines and large mills in Finland. The declining sales prices and increasing global demand has forced the Finnish companies to change their strategies. The new trend for Finnish paper and pulp companies was to move more production abroad, and it was estimated that the paper and pulp production in Finland would decrease by 30% from 2010 to 2020. (Hämäläinen & Tapaninen, 2009) Because of the size of these Finnish paper and pulp manufacturing companies, this would dramatically impact the export quantity of paper and pulp and therefore decrease Finland's GDP. The decrease in production was not as significant as estimated in 2008, but the trend indicated in the research was correct. The decrease in production in Finland is not the only effect caused by globalization and modernisation of equipment. The number of employees working in pulp, paper and wood industry in Finland has also decreased during the last decade due to movement of production abroad according to new global strategies.

The paper and pulp industry require high investments into fixed assets, such as machinery and biological assets. The investments into fixed assets are more challenging for new established companies due to the high demand of capital, whereas large Finnish companies such as Stora Enso Oyj and UPM-Kymmene Oyj are mature companies with sizeable financial resources. The

competitive advantage of Finnish paper mills is that they have a local access to great amounts of wood and water – which are the main components producing pulp and paper. (Hämäläinen & Tapaninen, 2009)

2.1 Competition overview

The pulp and paper industry is a growing one, altough it has some signs of maturing. (Statista 2020). It is typical for any pulp and paper company to have high logistics costs due to global demand and heavy weight of the finished products. Because of the high logistic costs and global demand, there are many large pulp and paper producers all over the world. There are ten companies generating revenue over 5 billion USD per year, at least one company from every continent. The International Paper (U.S) is the superior industry leader, with annual revenue of 22,380 million USD in 2019. The analysed companies; Stora Enso Oyj and UPM-Kymmene Oyj are among the top four pulp and paper manufactures globally in terms of revenue in USD. The closest competitors of these Finnish companies are Oji Holdings (Japan) and Nippon Paper Group (Japan). The sizing is based on sales revenue in millions USD in 2019 and is presented in Table 2.1.

Table 2.1 Top 5 companies in paper and pulp industry based on sales revenue in 2019

Company	Revenue in million USD
International paper (USA)	22,380
Oji Holdings (Japan)	14,010
UPM-Kymmene (Finland)	11,290
Stora Enso (Finland)	11,090
Nippon Paper Group (Japan)	9,730

Source: (Statista, 2020)

Based on Table 2.1 the International Paper is a superior leader of the industry with a revenue of 22,380 million USD. Oji Holdings is the second largest company in terms of revenue (14,010 million USD), being leading operator in Asian markets. The companies analysed ie Stora Enso Oyj and UPM-Kymmene Oyj are the industry leaders in Europe and in authors opinion have a strong position as only major paper and pulp manufacturers in Europe. The fifth largest company is

Nippon Paper Group from Japan with annual revenue of 9,730 million USD in 2019. These two Japanese companies supply paper and pulp products for constantly increasing markets in Asia. The companies analysed Stora Enso Oyj and UPM-Kymmene Oyj are introduced and the general stragegic changes are presented in subchapters 2.2 and 2.3.

2.2 Overview of Stora Enso Oyj

Stora Enso Oyj (Stora Enso) was established in 1998 by a merger of two companies; Swedish forest product company Stora and Finnish forest company Enso-Gutzeit Oy. The initial strategy of Stora Enso was to acquire wood product businesses in Europe, but in 2000 the company bought Consolidated Papers of North America and started gradually increase production in South America, Asia and Russia. In 2019 Stora Enso had approximately 26,000 employees in 30 countries; 25% in Finland, 20% in Sweden, 19% in China, 3% in South America, 4% in Russia and 28% in other European countries. (Stora Enso, 2020) The geographical distribution of employees has remained almost at the same since 2013 due to the modernisation of equipment, which makes the plants less labour intensive.

Stora Enso provides renewable solutions for packaging solutions, wooden construction materials, biomaterials and paper. The current strategy of the company is to produce renewable, recyclable low carbon alternatives for traditional fossil-based materials. The company's long-term target is to produce everything that is made from fossil-based materials from trees. (Stora Enso, 2020) The company has already decreased its CO_2 emissions by 25% from year 2010 and continues the process towards zero emissions. The production of Stora Enso is divided into five divisions; Consumer Board, Packaging Solutions, Biomaterials, Wood Products and Paper. The sales revenue proportions by division from 2013 and 2019 are presented in Figure 2.1.
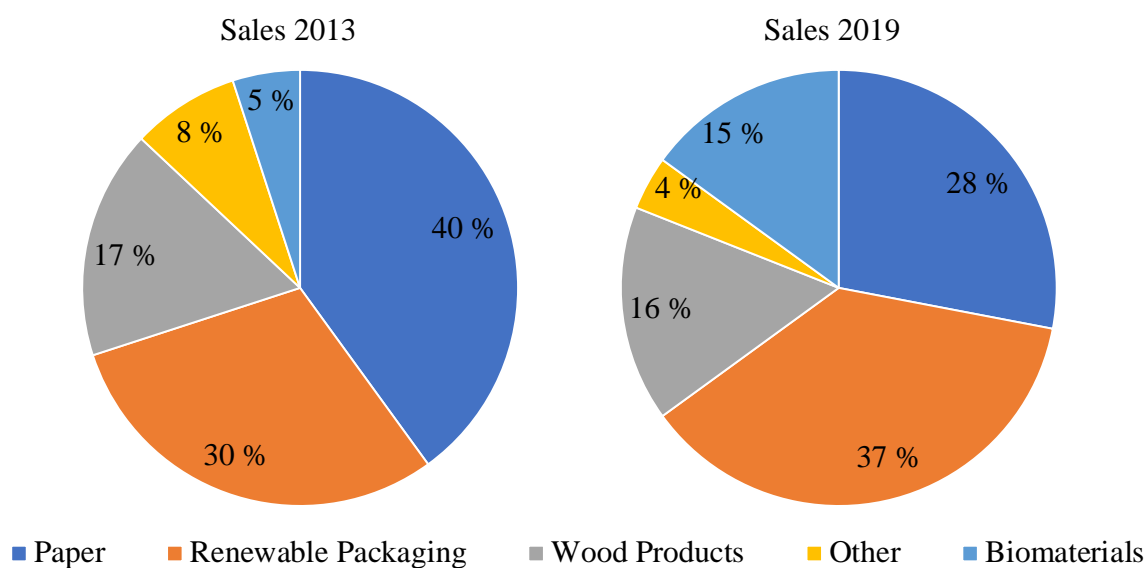
Figure 2.1 Stora Enso sales by division 2013 and 2019.
Source: Compiled by author based on Stora Enso's annual reports 2013 and 2019.

Stora Enso has divided and renamed its divisions during the period analysed, but the author has adjusted the figures in order to improve comparability. In 2014 the company made a decision to divide the Renewable Packaging into two divisions; Consumer Board and Packaging Solutions. During the year 2014 two divisions were renamed; Building and living division as Wood products and Printing and reading as Paper. According to Figure 2.1 the composition of sales has changed during the period analysed: The Biomaterials division has increased its proportion of total sales from 5% to 15% and the Paper divisions share of total sales has decreased from 40% to 28%. This is due to the strategic decision to transform from traditional paper and cardboard producer to a renewable materials company, with new innovations in field of Biomaterials. (Stora Enso, 2015) The structural change, however, is ongoing and the company is still investing to the Paper division as it is a stable source of income, with 28% sales proportion. (Stora Enso, 2020). The Wood Products and Renewable Packaging divisions have maintained almost the same proportion of sales during the period analysed. The proportions of operational EBIT by departments is presented in Figure 2.2. The operational EBIT presented in Figure 2.2 is not a standard measurement, but computed by Stora Enso, which means it is not comparable for other companies. In author's opinion the Figure 2.2 contains important information from the strategic dynamics of Stora Enso and therefore should be presented and analysed.
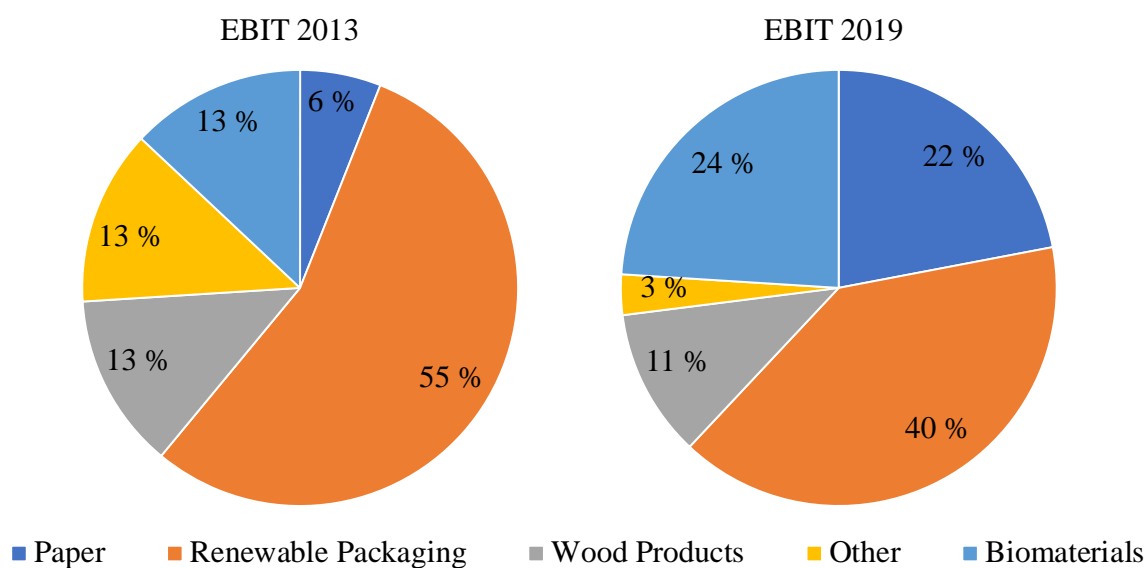
Figure 2.2 Stora Enso Oyj operational EBIT by division 2013 and 2019.
Source: Compiled by author based on Stora Enso's annual reports 2013 and 2019.

Based on figure 2.2, the EBIT generation of Paper division has increased from 6% to 22%. The low profitability of Paper (Printing and Reading) division in 2013 was due to permanent shut down of mills, which decreased sales by 11%. (Stora Enso, 2014, p. 25) The share of EBIT of Biomaterials division has increased from 13% to 24% during the period analysed due to transformation process to biomaterials company. By comparing Figure 2.1 and Figure 2.2 the profit proportion of Paper division has increased from 6% to 22%, despite the sales proportion has decreased from 40% to 28% during the period analysed 2013–2019. This is mainly due to modernisation of equipment and globalisation, less labour-intensive machinery and reduced logistics costs.

The following operational changes occurred in Stora Enso based on annual reports (2013–2019):
2013
- Permanent closure of three paper machines in Sweden.
- Weakening of Brazilian real had a negative effect on equity. (208 million euros)
- New machinery built to Ostroleka containerboard mill in Poland and renovation of Skoghall mill in Sweden. (228 million euros)
- Invested 760 million euros to Montes del Plata pulp mill, Uruguay.
- Renovations of three mills in Finland and Sweden. (96 million euros)

2014

- Vesiluoto mill in Finland and Corbehem mill in France were permanently shut down.
- Montes del Plata pulp Mill starts operations in Uruguay, one of the largest investments in company history.
- Increase in shareholding of Bergvig Skog as forests are considered as strategic assets. (97 million euro)
- Started a project to build a paper and pulp plant to Guangxi, China. (230 million euros)
- Acquisition of Virdia, U.S. (21 million euros)

2015

- Sold one mill from Germany and one mill from Spain.
- Permanent closure of packaging unit in Komarov Hungary.
- Construction of Beihai consumer board mill in China is progressing.
- Laminated Veneer Lumber line project started in Varkaus, investment of 43 million euro.
- Modernisation of Sunila mill was completed.

2016

- Sold Arapoti mill in Brazil, Suzhou mill China and IL Recycling Ab from Sweden.
- Modernization of Murow sawmill in Poland. (28 million euro)
- Inauguration of new consumer board mill in Beihai, investment of 800 million euro.
- Laminated Veneer Lumber line started up in Varkaus.
- Phased start-up process for xylose began in Raceland U.S.

2017

- Invested 31 million euro to the PE-coating plant in Guangxi region in China due to increasing demand in market.
- Part of Kvarnsveden mill in Sweden will be closed down.
- Increase production in of Beihai mill in China and Varkaus Kraftliner mill in Finland.
- Starting first deliveries of intelligent packaging.

2018

- Investments in Beihai, Varkaus and Murow continued.
- Bio composite granules production starts in Hylte Mill, part of process of becoming renewable materials company.
- Acquisition of forest assets in Bervig Skog.
- Stora Enso increased its ownership of Cellutech AB to 100%.

2019

- Oulu paper mill was converted into packaging materials unit.
- Finalisation of the cross laminated timber (CLT) investment at Gruvön sawmill.
- Conversion of Enocell mill into dissolving pulp for textile applications.
- Decision to consolidate Varkaus and Kitee sawmill, Kitee sawmill shut down.

As the events during period analysed indicate, Stora Enso is consolidating and shutting down old mills in Europe and investing small amounts to European mills, whereas the company is investing billions of euro to other countries such as Uruguay and China. The strategy of Stora Enso is to survive in the competitive markets, which means that it is investing into low cost countries in order to maintain its profit margin. (Stora Enso, 2014)

2.3 UPM-Kymmene Oyj

UPM-Kymmene Oyj (UPM) was established in 1996, when Repola, Kymmene, UPM, Kymin paperiteollisuus, Kaukas and Wisaforest merged. Most of the companies that UPM was formed of, were established from late 19th century to early 20th century. After the merger UPM started to acquire companies from Europe and other continents and is the third largest pulp and paper manufacturer globally by revenue. In 2019 UPM had approximately 18,700 employees in 46 countries. The geographical distribution of employees was the following in 2019; 39% in Finland, 21% in Germany, 20% in other European countries, 9% in China, 5% in North America, 3% in Uruguay and 3% in other countries. (UPM, 2020)

UPM acquires its raw materials in ecologically responsible way and produces renewable packaging materials, eco-friendly label materials, wooden construction materials, consumer paper, carton and biofuels. The strategy of UPM is very similar to Stora Enso's strategy, both are developing materials and processes in order to prevent climate change and create alternatives for fossil-based materials. The company's target for 2030 is to reduce its CO_2 emissions by 80% from current amount. (UPM, 2020) The product lines of UPM include of six divisions; Biorefining, Energy, Raflatac, Speciality Papers, Communication Papers and Plywood. The sales proportions by division in 2013 and 2019 are presented in Figure 2.3
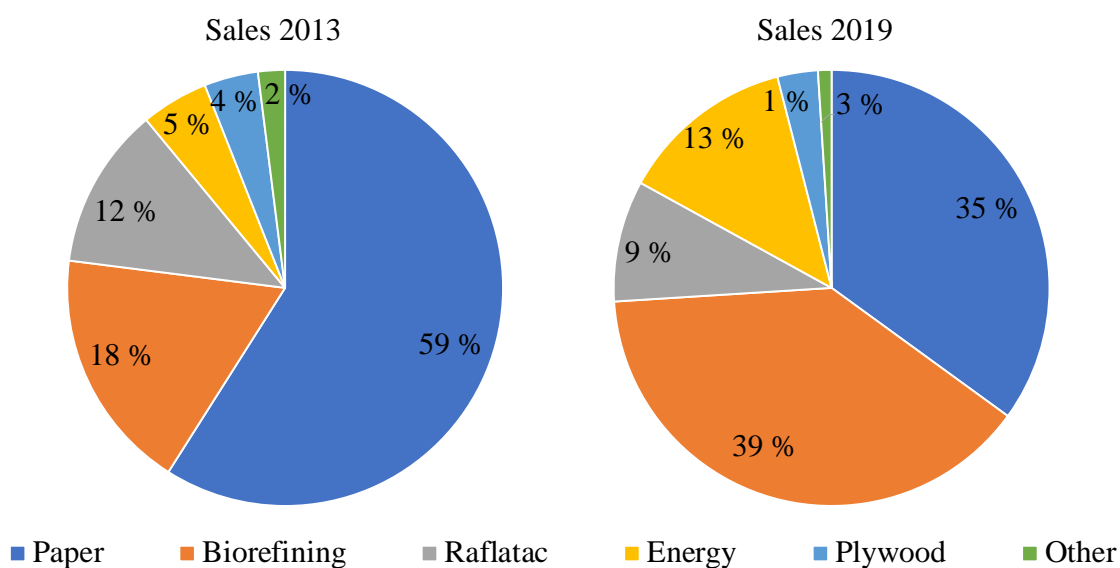
Figure 2.3 UPM-Kymmene Oyj sales revenue by division in 2013 and 2019
Source: Compiled by author based on UPM-Kymmene Oyj annual reports of 2013 and 2019.

Based on the Figure 2.3 the sales composition has changed radically during the period analysed. The most significant difference in revenue generation is that the Paper divisions share of revenue has decreased from 59% to 35% in just six years. The Biorefining generated 18% of total revenue in 2013, whereas in 2019 it generated 39% of total revenue. These structural changes of revenue generation are due to the company's decision to focus on renewable materials instead of traditional paper and pulp production. (UPM, 2020) Even though the investing is focusing on Energy and Biorefining divisions, the company itself informs that the paper manufacturing is the cornerstone of the business, a steady source of income, and it will continue producing paper and cardboard as well in the future. (UPM, 2020) Compared to Stora Enso the sales proportions by division of UPM have changed more in relative terms, which indicates that the company is transforming faster than its competitor. As the sales proportions by division of the company have changed during the period analysed 2013–2019, the operational EBIT composition has changed as well and is presented in Figure 2.4. The operational profit presented in Figure 2.4 is not comparable with other companies. As mentioned in previous subchapter, the author of this thesis presents it in order to analyse the dynamics of the company.

EBIT 2013   EBIT 2019

- Paper - Biorefining - Raflatac - Energy - Plywood - Other
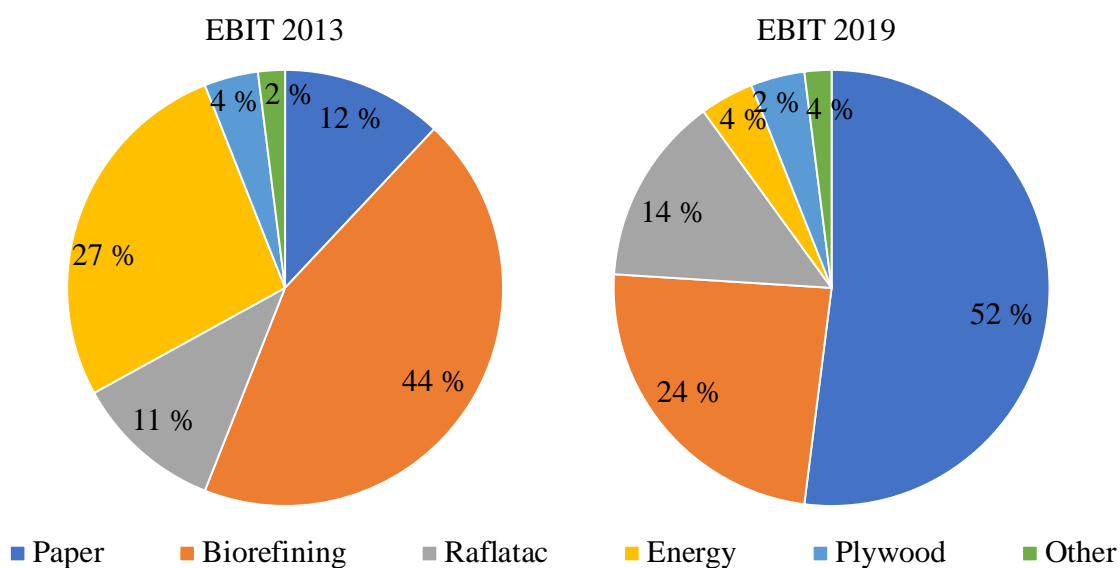
Figure 2.4 UPM-Kymmene Oyj operational EBIT by division in 2013 and 2019
Source: Compiled by author based on UPM-Kymmene Oyj annual reports of 2013 and 2019.

Based on the Figure 2.4 the most significant differences in EBIT composition are due to Paper and Biorefining division. Even though the Paper divisions share of sales has decreased 24%, the profit generation has increased from 12% to 52%. The sales profitability of the paper department in 2013 was low due to decreased demand, lower pricing and challenging economic environment especially in Europe. In 2013 the company decided to redact the production in Europe by 520,000 tonnes, which was over half of the production capacity. (UPM, 2014) Other reasons for the increased profitability of Paper division are the investments into manufacturing plants and relocation of plants, which has reduced the logistic costs. Despite of the increased proportion of Sales, the EBIT generation of Biorefining department has decreased from 44% to 24%, mainly due to the increase in Paper and Energy divisions EBIT proportions.

During 2013–2019 the most important events occurred based on UPM's annual reports (2013–2019):

2013

- Sold Pestovo sawmill in Russia.
- Intends to sell UPM Kaukas sawmill in Finland.
- State of Uruguay grants a permit for a new mill in Uruguay.

2014

- UPM continues developing biodiesel processes in co-operation with Valmet.

- Permanent closure of Docelles paper mill in France.

- Plans to expand Changshu mill in China.

- Invests 160 million euro to Kymi pulp mill Finland

2015

- Biorefinery was established to Lappeenranta Finland

- Changshun China factory was expanded

- Three mills closed in Finland as a part of profit improvement programme

- UPM sells Tilhill Forest RY (RY is registered association in Finnish)

2016

- Permanent closure of Madison Paper Industries USA

- Investment to Kymi pulp mill

- Expansion of Wroclaw plant Poland

- Announces to reduce production in whole Europe

2017

- UPM bought Southwest Label Stock Distribution Ltd from Texas USA

- Permanent closure two machines in Austria and US

2018

- UPM expands the capacity to produce biofuels in Uruguay.

- Increases capacity in Changshu mill in China and Nordland mill Germany

- Acquisition of terminals in South Korea and USA

2019

- Nordland factory in Germany was renewed to other purposes

- Decision to invest into a new world class pulp mill into Paso de Los Toros Uruguay (2.4 billion euro)

- Closing two mills; one in Finland, one in France

As the important events indicate, UPM is investing billions of euros to Uruguay aiming to improve profitability. The annual reports from the period analysed state that the desired profitability in todays globalising markets is hard to achieve with plants only in Europe due to global demand and high logistic costs. The company is investing to growing Asian markets and reducing production in Europe.

In general both of the companies had increased investments to South America and China, due to emerging markets and favourable costs. In stragegic manner, Stora Enso started its operations in Uruguay in 2014 whereas UPM has not finished its project yet. The efficiency analysis in the next Chapter answers the question whether the Stora Ensos investments have already increased efficiency compared to UPM.

3. EFFICIENCY ANALYSIS OF STORA ENSO OYJ AND UPM-KYMMENE OYJ

The aim of this chapter is to throughly analyse the efficiency of both companies: Stora Enso and UPM. As mentioned in Chapter 1, the financial analysis requires comparable data. In order to secure the comparability, author of this paper has viewed the annual reports, which indicated that the data from 2013 to 2019 is audited and the accounting policies are similar. However, both of the companies adopted IFRS 16 right-of-use asset standard in 2019. The IFRS 16 requires companies to account the long-term lease liabilities (over one accounting period), which increases the total assets and liabilities significantly and therefore key ratios change. (Morales-Díaz & Zamora-Ramírez, 2018) However both of the companies adopted the standard in 2019 and the impact to the balance sheet total was approximately 500 million euro for UPM and Stora Enso. Because the companies are very similar in size, the author of this thesis will not change the period analysed.

The layout for company's overall efficiency matrix is presented in Table 1.1 and with Formula 1.3 it is adopted and the overall matrices for companies analysed can be compiled. The Net operating cash flow and Free cash flow are computed according to definition presented in Chapter 1. The adjusted cash flows, among other relevant financial information are retrieved from the annual reports and adjusted for both companies analysed; Stora Enso (Appendix 1) and UPM (Appendix 2). The following adjustments were made to the stated cash flows:

- Interest paid and income tax paid was substracted from the stated Net operating cash flow and added to the stated Financing cash flow.

- Interest received and dividends received were substracted from the stated net operating cash flow and added to the investing cash flow.

- After the adjustements, the adjusted Net operating cash flow and Free cash flow were computed.

The profit indicator in Table 1.1 is EBIT, but according to Siimann this can be adjusted. (Siimann, 2018, p. 43) Therefore the profit indicator used in this analysis is changed to EBITDA, due to high impairment charges for both companies during the period analysed. For example, the impairment charges of Stora Enso in 2013 (593 million euro) and 2014 (293 million euro) among other years, would cause unwanted distortion to the efficiency analysis. The impairment charges occur when. Company has acquired companies or assets with surplus price and the expectations about the changes future cash flows generated by those assets decline. (Chen, et al., 2015) expectations of However, it must be taken into account that the impairment charges effect assets and equity through fair recognition. (PKF International Ltd, 2019) In author's opinion the substantial impairment charges are not creating an fair image of overall efficiency, because the imparment charges are non-cash based and reflecting the future value of certain assets, hence not the overall efficieny of an entity.

The next two subchapters present the efficiency analysis for both comapanies, including the variance analysis (Formula 1.1), overall efficiency matrices (Table 1.1) and growth rates of overall efficiency (Formula 1.5 and 1.6)

3.1 Overall efficiency analysis of Stora Enso Oyj

The eight quantitative indicators and their dynamics of Stora Enso for the period analysed 2013–2019 are presented in Table 3.1, which uses the data from Appendix 1. As the initial data suggests the three output indicators (Free cash flow, Net operating cash flow and EBITDA) have increased on average from 3% to 8% per year, whereas the compound annual growth rate of Sales, Operating expenses and Average number of employees have decreased 1–2%. The notable change caused by the implementation of IFRS 16 was in 2019 as Average capital and Average assets increased by 13% due to the liability to account the long-term lease liabilities.

Table 3.1 Stora Enso Oyj initial indicators and their dynamics 2013–2019

Year / QI (in mil €, excl. E)	Free cash flow (F)	Net operating cash flow (R)	EBITDA (P)	Sales (S)	Operating expenses (O)	Average assets (A)	Average no of employees (E)	Average capital (C)
2019	900	1,627	1,884	10,055	8,987	13,951	26,096	10,839
2018	863	1,333	1,805	10,486	8,820	12,310	26,067	9,571
2017	746	1,419	1,400	10,045	8,767	12,048	26,206	9,353
2016	1,142	1,526	1,083	9,802	8,639	12,344	26,269	9,674
2015	536	1,435	1,768	10,040	8,776	12,604	26,783	9,919
2014	381	1,086	1,086	10,213	9,188	13,150	29,009	10,446
2013	736	1,214	1,207	10,563	9,731	13,573	28,921	10,877
2019/2018	1.04	1.22	1.04	0.96	1.02	1.13	1.00	1.13
2018/2017	1.16	0.94	1.29	1.04	1.01	1.02	0.99	1.02
2017/2016	0.65	0.93	1.29	1.02	1.01	0.98	1.00	0.97
2016/2015	2.13	1.06	0.61	0.98	0.98	0.98	0.98	0.98
2015/2014	1.41	1.32	1.63	0.98	0.96	0.96	0.92	0.95
2014/2013	0.52	0.89	0.90	0.97	0.94	0.97	1.00	0.96
CAGR 2019/2013	1.03	1.05	1.08	0.99	0.99	1.00	0.98	1.00

Source compiled by author based on Appendix 1.

The input indicators were decreasing over the course of 2013–2015 due to weakened European market conditions and permanent closure of several mills caused by the asset restructuring program launched in 2013. (Stora Enso, 2014) From the output indicators the Free cash flow decreased most significantly in 2014 by 48% compared to 2013, which was mainly caused by high capital expenditure in order to start the operations at Montes Del Plata mill in Urugay. (Stora Enso, 2015) Based on the data 2016 was extraordinarily good year in terms of Free cash flow (2-folded compared to 2015) as the profit indicator EBITDA decreased by 39% mainly caused by high fixed costs and structural decline of paper prices. However, the annual increase of EBITDA was significant in 2015 (63%), 2017 (29%) and 2018 (29%), which was according to Stora Enso, caused by the increasing ability to supply products to Asian markets. (Stora Enso, 2015) In order to analyse the efficiency further the overall efficiency matrix of Stora Enso is compiled and due to its length presented in Appendix 3.

Based on Appendix 3, 20 out of 28 qualitative efficiency field indicators were increasing on average from 1% to 10% per year. The most significant increase during the period analysed was in terms of profitability as all profitability indicators have increased from 7% to 10% on average per year. Only eight qualitative indicators were decreasing (F/R, F/P, R/P, S/A, S/C, O/A, O/C, E/C), especially indicators related to earnings quality (Net operating cash flow to EBITDA).

EBITDA to Average number of employees increased most significantly on average (CAGR 1.1) due to the restructuring process, which a resulted decrease of 2,300 employees during 2013 and 2014. (Stora Enso, 2014) The Stora Enso's overall efficiency matrix suggests, that the asset and capital turnover ratios decreased on average (Sales to Average assets and Sales to Average capital) due to the IFRS 16 implementation in 2019. Capital turnover ratios were actually increasing from 2013 to 2018 (CAGR above 1), but almost half a billion increase in assets and liabilities caused the ratios to drop in 2019. In order to analyse the Stora Enso's overall efficiency matrix further, the annual growth indices of company's overall efficiency (GICOE) are obtained by using formula 1.3. As the data set in Table 3.2, suggests, the overall efficiency of Stora Enso was increasing on average 3% per year. In 2014 the overall efficiency declined the most with almost 17 % compared to previous period due to high capital expenditure to Uruguay, Montes del Plata mill.

Table 3.2 Growth indices of Stora Enso's overall efficiency 2013–2019

Year	GICOE
2019/2018	100%
2018/2017	105%
2017/2016	92%
2016/2015	117%
2015/2014	125%
2014/2013	83%
CAGR 2019/2013	103%

Source compiled by author based on Appendix 3.

As the company's overall efficiency is a complex phenomenon, in order to analyse the absolute and relative impact of each element in the main diagonal, a variance analysis can be conducted. As introduced in Chapter 1, each component of the main diagonal of the overall efficiency matrix has an impact on the key element Free cash flow. With Formula 1.1 and chain-linking method the conditional Free cash flow F(conditional), the relative (%F) and the absolute (F) impact of each indicator to change in Free cash flow can be calculated. The variance analysis of Stora Enso is presented in Table 3.3

Table 3.3 Variance analysis of Stora Enso Oyj

Year	F	C	E/C	A/E	O/A	S/O	P/S	R/P	F/R
2019	900	10,839	2.408	1.871	0.644	1.119	0.187	0.864	0.553
2018	863	9,571	2.724	2.118	0.717	1.189	0.172	0.739	0.647
2017	746	9,353	2.802	2.175	0.728	1.146	0.139	1.014	0.526
2016	1,142	9,674	2.716	2.128	0.700	1.135	0.110	1.409	0.748
2015	536	9,919	2.700	2.125	0.696	1.144	0.176	0.812	0.374
2014	381	10,446	2.777	2.206	0.699	1.112	0.106	1.000	0.351
2013	736	10,877	2.659	2.131	0.717	1.085	0.114	1.006	0.606
ΔF(Component)	ΔF	$\Delta F(C)$	$\Delta F(E/C)$	$\Delta F(A/E)$	$\Delta F(O/A)$	$\Delta F(S/O)$	$\Delta F(P/S)$	$\Delta F(R/P)$	$\Delta F(F/R)$
2019 ΔF(Conditional)		977	864	978	879	828	901	1053	900
ΔF	37	114	-113	114	-99	-52	73	153	-153
%(ΔF)		309 %	-306 %	308 %	-267 %	-140 %	198 %	412 %	-414 %
2018 ΔF(Conditional)		763	742	762	751	779	962	701	863
ΔF	117	17	-21	20	-12	28	183	-261	162
%(ΔF)		15 %	-18 %	17 %	-10 %	24 %	156 %	-223 %	139 %
2017 ΔF(Conditional)		1,104	1,139	1,115	1,159	1,170	1,476	1,062	746
ΔF	-396	-38	35	-25	44	11	306	-414	-316
%(ΔF)		10 %	-9 %	6 %	-11 %	-3 %	-77 %	105 %	80 %
2016 ΔF(Conditional)		523	526	525	528	523	328	570	1142
ΔF	606	-13	3	-1	3	-4	-195	242	572
%(ΔF)		-2 %	0 %	0 %	0 %	-1 %	-32 %	40 %	94 %
2015 ΔF(Conditional)		362	352	365	364	375	620	503	536
ΔF	155	-19	-10	13	-1	11	246	-117	33
%(ΔF)		-12 %	-6 %	9 %	-1 %	7 %	159 %	-75 %	21 %
2014 ΔF(Conditional)		707	738	713	695	712	662	658	381
ΔF	-355	-29	31	-25	-18	17	-49	-4	-277
%(ΔF)		8 %	-9 %	7 %	5 %	-5 %	14 %	1 %	78 %

Source: compiled by author based on Table 3.1

Based on the variance analysis (Table 3.3), the following conclusions can be made:

- In 2014 a decrease of 355 million euros in Free cash flow was mainly caused by a decrease in Free cash flow to Net operating cash flow (from 0.606 to 0.351), which implies that the company stepped up its investment activities. Share acquisitions and capital expenditure in order to start operations in Uruguay had a negative impact on Free cash flow. (Stora Enso, 2015, p. 15)

- In 2015 increase in Free cash flow by 155 million euro was mainly due to increase in EBITDA to Sales (from 0.106 to 0.176) wich had a positive impact to the Free cash flow by 159%. The acquisitions exceeded 989 million euro, whereas the exchange rate had a positive impact of 215 million euro. The succesful investments to Uruguay, in Biomaterials department caused a positive effect of 105 million on operating profit. (Stora Enso, 2016, p. 27)

- In 2016 increase in Net operating cash flow to EBITDA (from 0.812 to 1.409) had a positive impact to he total change in Free cash flow by 94%. The total increase in Free cash flow was 606 million euro as the company was able to decrease its working capital (283 million euro), and sales in China increased by 11% compared to 2015. (Stora Enso, 2017, p. 8)

- In 2017 Free cash flow decreased by 396 million euro due to decrease in Net operating cash flow to EBITDA (from 1.409 to 1.014) which decreased Free cash flow by 306 million euro. The company did not mention any significant reasons for the decrease in Free cash flow.

- In 2018 Free cash flow cash flow increased by 117 million euro, mostly caused by increase in EBITDA to Sales (0.139 to 0.172) by 183 million euro and Net operating cash flow to Free cash flow (162 million euro), whereas Net operating cash flow to EBITDA had a negative effect of 223% to total change. The exhange rates had a negative impact of 149 million euro, whereas increased active sales mix management increased EBITDA significantly. (Stora Enso, 2019, p. 4)

Year 2019 is complex to analyse due to the increase in average assets and average capital caused by IFRS 16. In general the company was able to create strong EBITDA, whereas investments to new mills in Uruguay and China increased the capital expenditure and therefore had a negative effect to the key element: Free cash flow. According to the growth rate of companys overall efficiency (Table 3.2) the companys overall efficiency increased during the period analysed, which indicates that the investments to new mills have been favourable in terms of efficiency. In order to analyse the changes in overall efficiency compared to the UPM, the initial data of UPM needs to be analysed.

3.2 Overall efficiency analysis of UPM-Kymmene Oyj

The initial quantitative indicators and their dynamics of UPM are presented on Table 3.4 and the data suggests that UPM's Free cash flow, Net operating cash flow and EBITDA increased the most on average per year (0–17%), whereas input indicators on average decreased or remained stable during the period analysed (-2–0%) The annual average growth rate of both cash flow indicators, Free cash flow and Net operating cash flow, was the most significant during the period analysed. The investments made to the new mills have had an positive effect on the overall efficiency of the company, even though the cash outflows have been substantial. Next table 3.4 presents UPM's overall efficiency Matrix.

Table 3.4 UPM-Kymmene Oyj initial indicators and their dynamics 2013–2019

Year / QI (in mil €, excl. E)	Free cash flow (F)	Net operating cash flow (R)	EBITDA (P)	Sales (S)	Operating expenses (O)	Average assets (A)	Average no of employees (E)	Average capital (C)
2019	1,637	2,048	1,826	10,238	8,531	14,359	19,185	11,025
2018	1,322	1,654	2,276	10,483	8,710	13,532	19,271	10,176
2017	1,584	1,794	1,668	10,010	8,492	13,489	19,489	10,216
2016	1,609	1,861	1,665	9,812	8,365	14,052	19,858	10,833
2015	912	1,340	1,621	10,138	8,840	14,194	20,246	10,977
2014	1,115	1,353	1,365	9,868	8,708	14,397	20,852	11,264
2013	645	937	1,070	10,054	9,091	14,771	21,898	11,593
2019/2018	1.24	1.24	0.80	0.98	0.98	1.06	1.00	1.08
2018/2017	0.83	0.92	1.36	1.05	1.03	1.00	0.99	1.00
2017/2016	0.98	0.96	1.00	1.02	1.02	0.96	0.98	0.94
2016/2015	1.76	1.39	1.03	0.97	0.95	0.99	0.98	0.99
2015/2014	0.82	0.99	1.19	1.03	1.02	0.99	0.97	0.97
2014/2013	1.73	1.44	1.28	0.98	0.96	0.97	0.95	0.97
CAGR 2019/2013	1.17	1.14	1.09	1.00	0.99	1.00	0.98	0.99

Source compiled by author based on Appendix 3

Based on Table 3.4 the average annual growth of input indicators of UPM was between zero and -0.98. However, as mentioned in previous subchapter the data from 2019 was affected by the adoption of IFRS 16 standards, which resulted a significant increase in Average capital (8% from 2018) and Average assets (6% from 2018). The cash flow and profit indicators were increasing by 9% to 17% per year on average. The annual decrease of the key element, Free cash flow was significant in 2015 and 2018 as Free cash flow decreased 18% and 17% respectively compared to the previous year. In 2018 the increased working capital (-208 million euro) due to high wood inventories, decreased the Net operating cash flow (8% decrease from 2018), which effected the Free cash flow as well. In absolute terms Free cash flow increased the most in 2016 (from 912 million euro in 2015 to 1,609 million euro in 2016), which was mainly due to decreased working capital (195 million euro) and decreased capital expenditure (81 million euro from 2015). (UPM, 2017) In order to analyse UPM's efficiency further, the overall efficiency matrix is compiled and presented in Appendix 4.

Based on Appendix 4 all the qualitative indicators of the efficiency matrix have increased during the period analysed, except the Average number of employees to Average capital. The qualitative indicators reflecting cash flow and profitability have increased the most on average, due to increased profitability. For example the increments of the the return on Average assets in terms of

cash flows and EBITDA have increased from 10% to 17% per year on average. The pattern is very similar with return on capital (F/C, R/C and P/C) and expense efficiency indicators (F/O, R/O and P/O). The only decreased indicator was Average number of employees to Average capital, which has decreased 1% per year on average.

The growth indices of companys overall efficiency are presented in Table 3.5, which indicates that the UPM's overall efficiency has increased 8% per year on average. The years 2014 and 2016, the company was able to increase its efficiency by 28% and 24% respectively compared to previous year.

Table 3.5. Growth indices of UPM-Kymmene's overall efficiency 2013–2019

Year	GICOE
2019/2018	104%
2018/2017	98%
2017/2016	101%
2016/2015	124%
2015/2014	98%
2014/2013	128%
CAGR 2019/2013	108%

Source compiled by author based on Appendix 4.

From the overall efficiency matrix set in Appendix 4 and the GICOE in Table 3.6, it can be obtained that in 2014 25 out of 28 qualitative indicators inreased compared to previous year. The company was able to decrease the working capital (70 million euro) and launched the profit improvement program, which was aimed to save 200 million in fixed costs per year. The Free cash flow indicators (F/S, F/O, F/E, F/A and F/C) inreased by 76% to 82% compared to 2013. In order to study the efficiency further, variance analysis is conducted for the data and presented in Table 3.1.

Table 3.6 Variance analysis of UPM-Kymmene Oyj

Year	F	C	E/C	A/E	O/A	S/O	P/S	R/P	F/R
2019	1,637	11,025	1.740	1.336	0.594	1.200	0.178	1.122	0.799
2018	1,322	10,176	1.894	1.424	0.644	1.204	0.217	0.727	0.799
2017	1,584	10,216	1.908	1.445	0.630	1.179	0.167	1.076	0.883
2016	1,609	10,833	1.833	1.413	0.595	1.173	0.170	1.118	0.865
2015	912	10,977	1.844	1.426	0.623	1.147	0.160	0.827	0.681
2014	1,115	11,264	1.851	1.448	0.605	1.133	0.138	0.991	0.824
2013	645	11,593	1.889	1.482	0.615	1.106	0.106	0.876	0.688
ΔF(Component)	ΔF	ΔF(C)	ΔF(E/C)	ΔF(A/E)	ΔF(O/A)	ΔF(S/O)	ΔF(P/S)	ΔF(R/P)	ΔF(F/R)
2019 ΔF(Conditional)		1,432	1,316	1,403	1,295	1,291	1,061	1,637	1,637
ΔF	315	110	-116	87	-108	-4	-230	576	0
%(ΔF)		35 %	-37 %	28 %	-34 %	-1 %	-73 %	183 %	0 %
2018 ΔF(Conditional)		1,578	1,566	1,589	1,625	1,659	2,161	1,460	1,322
ΔF	-262	-6	-11	23	36	34	503	-701	-138
%(ΔF)		2 %	4 %	-9 %	-14 %	-13 %	-192 %	268 %	53 %
2017 ΔF(Conditional)		1,517	1,579	1,545	1,633	1,641	1,612	1,551	1,584
ΔF	-25	-92	62	-35	89	8	-30	-61	33
%(ΔF)		367 %	-247 %	138 %	-356 %	-32 %	118 %	243 %	-132 %
2016 ΔF(Conditional)		900	895	903	863	883	937	1,267	1,609
ΔF	697	-12	-6	8	-40	20	54	330	342
%(ΔF)		-2 %	-1 %	1 %	-6 %	3 %	8 %	47 %	49 %
2015 ΔF(Conditional)		1,087	1,083	1,099	1,132	1,146	1,324	1,104	912
ΔF	-203	-28	-4	17	33	14	179	-220	-192
%(ΔF)		14 %	2 %	-8 %	-16 %	-7 %	-88 %	108 %	95 %
2014 ΔF(Conditional)		627	614	629	618	633	823	931	1,115
ΔF	470	-18	-13	14	-11	15	190	109	184
%(ΔF)		-4 %	-3 %	3 %	-2 %	3 %	40 %	23 %	39 %

Source: compiled by author based on Table 3.4

Based on table 3.1.1 the absolute change in key element, Free cash flow can be studied further by analysing the changes caused by elements in the main diagonal:

- In 2014 the increase in Free cash flow was caused by increased EBITDA to sales (P/S) by, 40% and the Free cash flow to Net operating cash flow (F/R) increased by 39%. In absolute terms the annual increase of Free cash flow was 470 million euros. This was mainly due to the reduced fixed costs caused by profit improvement program and decrease in working capital. (UPM, 2015, p. 70–71)

- In 2015 the Free cash flow decreased by 203 million euro due to decrease in both earnings quality indicators, which had an absolute impact of -220 million euro (R/P) and -192 million euro (F/R). The high capital expenditure caused by profit improvement. program (520 million

euro) decreased the Free cash flow, whereas the company was able to cut variable and fixed costs and gained 114 million euro from favourable exhange rates. (UPM, 2016, p. 80)

- In 2016 the Free cash flow increased by 697 million, due to increase in Net operating cash flow to EBITDA and Free cash flow to Net operating cash flow, by 47% and 49% respectively. Most significant reasons for increase in key element was the decreased working capital (195 million euro). (UPM, 2017, p. 91)

- In 2017 the decrease in Free cash flow was mainly caused by increase in working capital (absolute impact -92 million), however the working capital decreased (91 million euro). (UPM, 2018, p. 95)

- 2018 the decrease in Free cash flow (-262 million euro) was caused by decrease in Net operating cash flow to EBITDA by -701 million euro (relative contribution 268%), whereas sales profitability (EBITDA to Sales) had a positive impact of 502 million euro (relative contribution -192%). The sales prices increased in all departments and decreased working capital (209 million euro) had a negative effect on Free cash flow. (UPM, 2019, p. 100)

- In 2019 the increase in the key element was caused by increase in earnings quality indicator Net operating cash flow to EBITDA, which had a impact to the total change by 183% (576 million euro) This was mainly due to decrease in working capital (276 million euro) and the implementation of IFRS 16 standard, when lease payments were reported in financing cash flow. (UPM, 2020, p. 121–122)

To conclude the most of the changes in Free cash flow were caused by the change in cash flow and EBITDA indicators. The qualitative indicators under the main diagonal present the increase in Free cash flow as the company's overall efficiency improved. Free cash flow increased from 645 million euro in 2013 to 1638 million euro in 2019. The nex subchapter will answer to the question, which of the companies analysed was more efficient: UPM or Stora Enso.

3.3 The comparative overall efficiency analysis

As the previous subchapters implied, both of the companies analysed have increased their efficiency based on the growth indices. The variance analysis provided information on annual basis and the changes caused by each indicator were analysed. In terms of overall efficiency growth rates, UPM has increased its efficiency more (CAGR 1.09) compared to Stora Enso (CAGR 1.03) As the overall efficiency of an entity inreases the company uses its resources more efficiently and

is able to generate Free cash flow Based on the overall matrices of Stora Enso (Appendix 3) and UPM (Appendix4) the comparative efficiency matrix can be computed by using Formula 1.1. The author has chosen UPM as company to be analysed and Stora Enso as benchmark company, in order to analyse the main weaknesses of the current market leader and the most significant weaknesses of Stora Enso. The Table 3.7 presents the overall efficiency matrix of UPM and Stora Enso.

Table 3.7 Comparative Efficiency matrix of UPM-Kymmene and Stora Enso Oyj

Year/QI	Free cash flow (F)	Net operating cash flow (R)	EBITDA (P)	Sales (S)	Operating expenses (O)	Average assets (A)	Average no of employees (E)	Average capital (C)
Denominator (F)								
Denominator (R)	F/R							
2019	1.44							
2018	1.23							
2017	1.68							
2016	1.16	1						
2015	1.82							
2014	2.35							
2013	1.14							
Denominator (P)	F/P	R/P						
2019	1.88	1.30						
2018	1.21	0.98						
2017	1.78	1.06						
2016	0.92	0.79	1					
2015	1.86	1.02						
2014	2.33	0.99						
2013	0.99	0.87						
Denominator (S)	F/S	R/S	P/S					
2019	1.79	1.24	0.95					
2018	1.53	1.24	1.26					
2017	2.13	1.27	1.20					
2016	1.41	1.22	1.54	1				
2015	1.69	0.92	0.91					
2014	3.03	1.29	1.30					
2013	0.92	0.81	0.93					
Denominator (O)	F/O	R/O	P/O	S/O				
2019	1.92	1.33	1.02	1.07				
2018	1.55	1.26	1.28	1.01				
2017	2.19	1.31	1.23	1.03				
2016	1.46	1.26	1.59	1.03	1			
2015	1.69	0.93	0.91	1.00				
2014	3.09	1.31	1.33	1.02				
2013	0.94	0.83	0.95	1.02				
Denominator (A)	F/A	R/A	P/A	S/A	O/A			
2019	1.77	1.22	0.94	0.99	0.92			
2018	1.39	1.13	1.15	0.91	0.90			
2017	1.90	1.13	1.06	0.89	0.87			
2016	1.24	1.07	1.35	0.88	0.85	1		
2015	1.51	0.83	0.81	0.90	0.89			
2014	2.67	1.14	1.15	0.88	0.87			
2013	0.81	0.71	0.81	0.87	0.86			
Denominator (E)	F/E	R/E	P/E	S/E	O/E	A/E		
2019	2.47	1.71	1.32	1.38	1.29	1.40		
2018	2.07	1.68	1.71	1.35	1.34	1.49		
2017	2.86	1.70	1.60	1.34	1.30	1.51		
2016	1.86	1.61	2.03	1.32	1.28	1.51	1	
2015	2.25	1.24	1.21	1.34	1.33	1.49		
2014	4.07	1.73	1.75	1.34	1.32	1.52		
2013	1.16	1.02	1.17	1.26	1.23	1.44		
Denominator (C)	F/C	R/C	P/C	S/C	O/C	A/C	E/C	
2019	1.79	1.24	0.95	1.00	0.93	1.01	0.72	
2018	1.44	1.17	1.19	0.94	0.93	1.03	0.70	
2017	1.94	1.16	1.09	0.91	0.89	1.02	0.68	
2016	1.26	1.09	1.37	0.89	0.86	1.02	0.68	1
2015	1.54	0.84	0.83	0.91	0.91	1.02	0.68	
2014	2.71	1.16	1.17	0.90	0.88	1.02	0.67	
2013	0.82	0.72	0.83	0.89	0.88	1.02	0.71	

Source: compiled by author from Appendix 3

As Table 3.7 indicates, the efficiency related to asset turnover (Sales to average Assets) due to less intensive asset usage (Operating expenses to Average assets) was higher with Stora Enso. However, UPM's generated more Free cash flow to Net operating cash flow on average. For further investigation the overall efficiency indices are calculated and presented in Table 3.8.

Table 3.8 Overall efficiency benchmark indices of UPM-Kymmene and Stora Enso

Year	BICOE
2019	126%
2018	122%
2017	131%
2016	119%
2015	113%
2014	143%
2013	94%

Source: compiled by author

Based on Table 3.8 and data from previous chapter the following conclusion can be made:

2013

- The only year when Stora Enso was more efficient (by 6%) than UPM. This was mainly due to UPM's weak performance, which launched the profit improvement program.

2014

- UPM was 43% more efficient than Stora Enso. Stora Enso's overall efficiency declined by 17%, mainly due to asset simplifying program, which included many permanent closures and high investments to Montes Del plata mill in Uruguay in order to restructure the asset base. UPM's overall efficiency increased by 28% as the company was able to generate more cash compared to sales, whereas Stora Enso's investment activities decreased the Free cash flow. (Free cash flow to Net operating cash flow decreased)

2015

- UPM was 13% more efficient than its competitor Stora Enso. Stora Enso's investments to Urugay started to generate cash flows and company's overall efficiency rose by 25% due to increased sales profitability, and therefore stronger cash flows (increased EBITDA to Sales). UPM's overall efficiency decreased by 2%, due to higher Operating expenses to Average assets and therefore reduced cash flows.

-

2016

- UPM was 19% more efficient than its competitor Stora Enso. Despite of the benchmark index Stora Enso's overall efficiency increased by 17% compared to 2015, whereas UPM's overall efficiency grew by 28% compared to previous year. Both companies were able to decrease the working capital and therefore generate strong cash flows.

2017

- UPM was 31% more efficient compared than Stora Enso. Stora Enso's overall efficiency decreased by 8% whereas UPM was able to increase its overall efficency by one per cent.

2018

- UPM was 22 % more efficient than Stora Enso, however Stora Enso's overall efficiency grew by 5 % whereas UPM's overall efficiency decreased by 2%. Stora Enso decreased its capital expenditure and therefore was able to increase the Free cash flow.

2019

- In most recent year 2019, UPM was 26% more efficient than Stora Enso.The company was able to improve two important qualitative indicators compared to Stora Enso. UPM's Net operating cash flow to EBITDA was 30% higher than Stora Enso's (2% lower in 2018). UPM was also able to improve the capital turnover ratio (Sales per Average capital) compared to previous year. However return on assets (EBITDA to Average assets) decreased compared to Stora Enso.

The compiled overall efficiency matrix of UPM and Stora Enso highlights the fact that during the period analysed UPM's asset usage intensity ratios (Sales to Average assets) and capital turnover (Sales to Average apital) were lower. In terms of capital employed Stora Enso was more efficient. The companies sales profitability (EBITDA to Sales) and earnings quality (Net operating cash flow to EBITDA) were fluctating due to the fluctuating market conditions and high capital expenditure to new and existing mills. In author's opinion the improvements for the companies are therefore insufficient to analyse on yearly basis, however general improvement suggestions can be made by obtaining patterns from comparative efficiency matrix (Table 3.7).

UPM should focus on following areas in order to improve its efficiency:
- UPM should pay more attention to how the excess cash (Free cash flow) is used due to weak asset usage (S/A, O/A) and capital management (S/C, O/C) compared to Stora Enso.

- UPM's strenght was to generate strong Free cash flow through the period analysed. According to the statement of financial position (Appendix 2) the company was able to reduce its non-current debt by 2,290 million euro, whereas the equity has increased substantially. The company should invest the cash (Free cash flow) more efficiently (increased cash and cash equivalents and retained earnings).

Stora Enso should focus on the following:

- Stora Enso should focus on risk management of the investements made to China and Uruguay, and follow how the investments are generating cash. The company had problems with expense management (R/O, P/O, S/O) and labour intensity (R/E, P/E, S/E).

- The company should stabilize its fixed and variable costs in order to make profit (volatile profit margin (P/S).

CONCLUSION

The aim of this paper was to study how the overall efficiency of two biggest Finnish paper and pulp manufacturers, Stora Enso Oyj and UPM-Kymmene Oyj changed due to globalisation from 2013 to 2019. The objects were chosen due to global positioning as leading European paper and pulp manufacturers and similar strategies to increase production in South America and Asia. The heavy investments and new strategies raised a question whether the overall efficiency of these companies had actually increased.

To answer to the first research question, how and why the overall efficiency of Stora Enso and UPM had changed from 2013 to 2019, the overall efficiency matrices and growth indices for company's overall efficiency were calculated. Stora Enso's overall efficiency had increased on average 3% per year and UPM as much as 8% per year on average. Stora Enso increased its efficiency by restructuring its asset base and by investing to new emerging markets to China and Uruguay. The most significant improvement was achieved in terms of profitability, whereas the company was able to reduce the number of employees and other expenses. UPM increased its efficiency by divesting its European mills and investing to the growing Asian markets. UPM was able to generate strong cash flows through the period analysed. The Free cash flow increased from 645 million euro to 1,637 million euro during the period analysed.

The second question which of the companies analysed was more efficient and why, was answered by compiling the comparative efficiency matrix and benchmark indices for each year analysed. In terms of efficiency UPM was outperforming Stora Enso from 2014 to 2019. The only year when Stora Enso was more efficient than UPM was in 2013 by 6%. From 2014 to 2019 UPM was 13% to 43% more efficient than Stora Enso, mainly due to the improvements in earnings quality (Net operating cash flow to EBITDA) and increased Free cash flow. The main reason for the benchmarked differences were the amount and timing of capital expenditure. Stora Enso's investment to Uruguay in 2014 and 2015 exceeded 2 billion euro, whereas UPM is entering Uruguay's biorefining markets in 2022 with an investment of 2.4 billion euros.

The third question how the changes in overall efficiency effected the Free cash flow was answered by component variance analysis. The variance analysis indicated that UPM's improved sales profitability and earnings quality effected the Free cash flow the most in a positive manner. All the indicators in the main diagonal indicated that the company's overall efficiency was increasing along the Free cash flow. Stora Enso's improved overall efficiency was mainly due to increase in sales profitability and its Free cash flow was affected positively by increased overall efficiency. However, the company's investments to Uruguay affected negatively to the Free cash flow, which indicates that the overall efficiency will increase further in the future if the investment is successful.

The fourth question was how the companies could improve their overall efficiency based on the overall efficiency matrices and the comparative efficiency matrix and the following improvements could be made:

- UPM should pay more attention to how the excess cash (Free cash flow) is used, due to the weak asset usage as well as capital management compared to Stora Enso. The company accumulated its retained earngins (cash and cash equivalents) during period analysed, and if no alterantive investment choices were available, the company should return the cash to investors as dividends.

- Stora Enso was investing almost 2 billion euros to Uruguay and it should focus on the risk management in case of these investments are not starting to increase the efficiency and generate Free cash flow. The company should also pay more attention to labor intensity and expense management due to fluctuating profitability and high cost structure.

The throughly analysis of the companies indicated that the high investments made by Stora Enso were not increasing the overall efficiency compared to UPM during the period analysed. However, Stora Enso has already made the investments whereas UPM is about to start the investments in 2020. In authors opinion this will change the results of overall efficiency analysis during next years and the companies should be re analysed when the investments are made. To continue the study the author suggests to take a broad sample of companies and benchmark them.

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APPENDICES

Appendix 1. Stora Enso Oyj financial data

Stora Enso Oyj initial data for matrix compilation 2013–2019

Indicator	2019	2018	2017	2016	2015	2014	2013
Average capital (mil €)	10,839	9,571	9,353	9,674	9,919	10,446	10,877
Average number of employees	26,096	26,067	26,206	26,269	26,783	29,009	28,921
Average assets (mil €)	13,951	12,310	12,048	12,344	12,604	13,150	13,573
Operating expenses (mil€)	8,987	8,820	8,767	8,639	8,776	9,188	9,731
Sales revenue (mil €)	10,055	10,486	10,045	9,802	10,040	10,213	10,563
EBITDA (mil €)	1,884	1,805	1,400	1,083	1,768	1,086	1,207
Net operating cash flow (mil €)	1,627	1,333	1,419	1,526	1,435	1,086	1,214
Free cash flow (mil €)	900	863	746	1,142	536	381	736

Source: compiled by author based on Stora Enso Oyj annual reports 2013–2019

Stora Enso Oyj income statement 2013–2019

Indicator (mil €)	2019	2018	2017	2016	2015	2014	2013
Sales revenue	10,055	10,486	10,045	9,802	10,040	10,213	10,563
Other operating income	165	92	147	123	128	168	140
Costs and expenses	(8,987)	(8,820)	(8,767)	(8,639)	(8,776)	(9,188)	(9,731)
Change in net value of biological asssets, net	442	(68)	(72)	(261)	(89)	(114)	165
Share of results of equity accounted investments	229	181	66	156	519	87	102
Depreciation, amortization and impairment charges	(597)	(479)	(515)	(398)	(763)	(766)	(1,189)
Operating profit	**1,305**	**1,390**	**904**	**783**	**1,059**	**400**	**50**
Financial expense, net	(168)	(180)	(162)	(242)	(245)	(280)	(239)
Profit before tax	**1,137**	**1,210**	**742**	**541**	**814**	**120**	**(189)**
Income tax	(281)	(221)	(128)	(134)	(31)	(30)	118
Net profit/loss	**856**	**988**	**614**	**407**	**783**	**90**	**(71)**

Source: compiled by author based on Stora Enso Oyj annual reports 2013–2019

Stora Enso Oyj statement of financial position 2013–2019

Indicator (mil €)(as 31 dec.)	2019	2018	2017	2016	2015	2014	2013
Intangible assets	471	497	466	418	433	399	274
Property, plant and equipment	5,610	5,234	5,310	5,611	5,598	5,419	5,534
Other non-current assets	4,875	2,869	2,658	2,670	2,766	2,614	2,411
Right-of-use assets	508	–	–	–	–	–	–
Total non-current assets	**11,463**	**8,601**	**8,434**	**8,699**	**8,797**	**8,432**	**8,219**
Cash and cash equivalents	876	1,130	607	953	808	1,446	2,073
Inventories	1,391	1,567	1,321	1,346	1,373	1,403	1,445
Trade and other receivables	1,289	1,487	1,319	1,273	1,324	1,484	1,555
Other current assets	34	64	89	55	59	82	160
Total current assets	**3,590**	**4,248**	**3,336**	**3,627**	**3,564**	**4,415**	**5,233**
Total assets	**15,053**	**12,849**	**11,770**	**12,326**	**12,361**	**12,847**	**13,452**
Share capital	1,342	1,342	1,342	1,342	1,342	1,342	1,342
Share premium	77	77	77	77	77	77	77
Reserves	894	588	555	737	474	749	650
Retained earnings	5,116	4,707	4,034	3,650	3,495	2,902	3,144
Equity attributable to owners	**7,429**	**6,714**	**6,008**	**5,806**	**5,388**	**5,070**	**5,213**
Non-controlling interest	(7)	18	47	62	125	167	60
Total equity	**7,423**	**6,732**	**6,055**	**5,868**	**5,513**	**5,237**	**5,273**
Non-current debt	3,232	2,265	2,046	2,655	3,342	3,530	4,201
Other non-current liabilities	1,483	704	706	814	791	953	841
Total non-current liabilities	**4,713**	**2,970**	**2,752**	**3,496**	**4,133**	**4,483**	**5,042**
Current debt	948	1,078	966	1,115	854	1,362	1,288
Trade and other payables	1,854	1,960	1,888	1,774	1,765	1,631	1,698
Other current liabilities	116	109	109	100	96	134	151
Total current liabilities	**2,917**	**3,147**	**2,963**	**2,989**	**2,715**	**3,127**	**3,137**
Total liabilities	**7,630**	**6,117**	**5,715**	**6,458**	**6,848**	**7,610**	**8,179**
Total equity and liabilities	**15,053**	**12,849**	**11,770**	**12,326**	**12,361**	**12,847**	**13,452**

Source: compiled by author based on Stora Enso Oyj annual reports 2013–2019

Appendix 1 continued

Stora Enso adjusted cash flow statement 2013–2019

Indicator (mil €)	2019	2018	2017	2016	2015	2014	2013
Stated net operating cash flow	1,649	1,092	1,202	1,360	1,216	888	1,015
Subtractions:							
Dividend received	343	24	20	58	32	19	38
Interest received	7	3	3	12	18	22	16
Income tax paid	(178)	(152)	(97)	(92)	(78)	(39)	(46)
Interest paid	(150)	(116)	(143)	(144)	(191)	(200)	(207)
Adjusted net operating cash flow	**1,627**	**1,333**	**1,419**	**1,526**	**1,435**	**1,086**	**1,214**
Stated investing cash flow	(1,077)	(497)	(696)	(454)	(949)	(746)	(532)
Additions:							
Dividend received	343	24	20	58	32	19	38
Interest received	7	3	3	12	18	22	16
Adjusted investing cash flow	**(727)**	**(470)**	**(673)**	**(384)**	**(899)**	**(705)**	**(478)**
Free cash flow	**900**	**863**	**746**	**1,142**	**536**	**381**	**736**
Stated financing cash flow	(856)	(73)	(829)	(769)	(933)	(879)	(312)
Additions:							
Income tax paid	(178)	(152)	(97)	(92)	(78)	(39)	(46)
Interest paid	(150)	(116)	(143)	(144)	(191)	(200)	(207)
Adjusted financing cash flow	**(1,184)**	**(341)**	**(1,069)**	**(1,005)**	**(1,202)**	**(1,118)**	**(565)**
Net cash and cash equivalents at the beginning of the year	1,128	603	949	807	1,444	2,061	1,917
Change in cash and cash equivalents	(285)	521	(323)	137	(666)	(737)	171
Translation adjustment	19	4	(23)	5	29	120	(27)
Net cash and cash equivalents at year end	**863**	**1,128**	**603**	**949**	**807**	**1,444**	**2,061**

Source: compiled by author based on Stora Enso Oyj annual reports 2013–2019

Appendix 2. UPM-Kymmene Oyj financial data

UPM-Kymmene initial data for matrix compilation 2013–2019

Indicator	2019	2018	2017	2016	2015	2014	2013
Average capital (mil €)	11,025	10,176	10,216	10,833	10,977	11,264	11,593
Average number of employees	19,185	19,271	19,489	19,858	20,246	20,852	21,898
Average assets (mil €)	14,359	13,532	13,489	14,052	14,194	14,397	14,771
Operating expenses (mil€)	8,531	8,710	8,492	8,365	8,840	8,708	9,091
Sales revenue (mil €)	10,238	10,483	10,010	9,812	10,138	9,868	10,054
EBITDA (mil €)	1,826	2,276	1,668	1,665	1,621	1,365	1,070
Net operating cash flow (mil €)	2,048	1,654	1,794	1,861	1,340	1,353	937
Free cash flow (mil €)	1,637	1,322	1,584	1,609	912	1,115	645

Source: compiled by author based on UPM-Kymmene Oyj annual reports 2013-2019

UPM-Kymmene Oyj income statement 2013–2019

Indicator (mil €)	2019	2018	2017	2016	2015	2014	2013
Sales revenue	10,238	10,483	10,010	9,812	10,138	9,868	10,054
Other operating income	97	87	83	140	13	91	60
Costs and expenses	(8,531)	(8,710)	(8,492)	(8,365)	(8,840)	(8,708)	(9,091)
Change in net value of biological assets	26	452	103	88	352	78	68
Share of results of equity accounted investments	3	6	5	5	3	3	2
Depreciation, amortization and impairment charges	(490)	(422)	(450)	(545)	(524)	(658)	(545)
Operating profit	**1,344**	**1,895**	**1,259**	**1,135**	**1,142**	**674**	**548**
Financial income	(55)	(57)	(72)	(55)	(67)	(4)	(73)
Profit before tax	**1,307**	**1,839**	**1,186**	**1,080**	**1,075**	**667**	**475**
Income tax	(234)	(342)	(212)	(200)	(159)	(155)	(140)
Net profit/loss	**1,073**	**1,496**	**974**	**880**	**916**	**512**	**335**

Source: compiled by author based on UPM-Kymmene Oyj annual reports 2013–2019

Appendix 2 continued

UPM-Kymmene Oyj statement of financial position 2013–2019

Indicator (mil €)(as 31 dec.)	2019	2018	2017	2016	2015	2014	2013
Intangible assets	564	531	525	546	570	570	561
Property plant and equipment	4,083	4,186	4,281	4,657	4,895	4,707	4,757
Other non-current assets	4,901	4,783	4,339	4,514	4,794	4,992	5,169
Right of use assets	590	–	–	–	–	–	–
Total non-current assets	**10,140**	**9,501**	**9,144**	**9,715**	**10,259**	**10,269**	**10,487**
Cash and cash equivalents	1,536	888	716	992	626	700	787
Inventories	1,367	1,642	1,311	1,346	1,376	1,356	1,327
Trade and other receivables	1,576	1,833	1,783	1,726	1,876	1,856	1,948
Other current assets	103	131	113	131	56	14	50
Total current assets	**4,565**	**4,496**	**3,922**	**4,187**	**3,934**	**3,926**	**4,112**
Total assets	**14,722**	**13,996**	**13,067**	**13,911**	**14,193**	**14,195**	**14,599**
Share capital	890	890	890	890	890	890	890
Share premium	–	–	–	–	–	–	–
Reserves	3,260	3,281	3,019	3,120	3,206	3,394	3,486
Retained earnings	5,912	5,623	4,752	4,225	3,846	3,194	3,073
Equity attributable to owners	**10,062**	**9,792**	**8,660**	**8,234**	**7,942**	**7,478**	**7,449**
Non-controlling interest	113	5	4	3	2	2	6
Total equity	**10,175**	**9,797**	**8,663**	**8,237**	**7,944**	**7,480**	**7,455**
Non-current debt	1,195	753	789	1,835	2,797	3,058	3,485
Other non-current liabilities	3,260	3,281	3,019	3,120	3,206	3,394	3,486
Total non-current liabilities	**2,730**	**2,194**	**2,254**	**3,364**	**4,328**	**4,717**	**5,019**
Current debt	104	25	324	584	269	406	643
Trade and other payables	1,654	1,881	1,765	1,594	1,619	1,549	1,419
Other current liabilities	60	100	60	132	33	43	63
Total current liabilities	**1,818**	**2,005**	**2,150**	**2,309**	**1,921**	**1,998**	**2,125**
Total liabilities	**4,548**	**4,199**	**4,404**	**5,673**	**6,249**	**6,715**	**7,144**
Total equity and liabilities	**14,722**	**13,996**	**13,067**	**13,911**	**14,193**	**14,195**	**14,599**

Source: compiled by author based on Upm-Kymmene Oyj annual reports 2013–2019

Appendix 2 continued

UPM-Kymmene Oyj adjusted cash flow statement

Indicator (mil €)	2019	2018	2017	2016	2015	2014	2013
Stated net operating cash flow	1,847	1,391	1,558	1,686	1,185	1,241	735
Subtractions:							
Dividend received	2	2	10	4	1	2	2
Interest received	2	2	2	6	6	7	3
Income tax paid	(176)	(252)	(216)	(145)	(140)	(81)	(157)
Interest paid	(29)	(15)	(32)	(40)	(22)	(40)	(50)
Adjusted net operating cash flow	**2,048**	**1,654**	**1,794**	**1,861**	**1,340**	**1,353**	**937**
Stated investing cash flow	(415)	(260)	(222)	(262)	(435)	(247)	(297)
Additions:							
Dividend received	2	2	10	4	1	2	2
Interest received	2	2	2	6	6	7	3
Adjusted investing cash flow	**(411)**	**(256)**	**(210)**	**(252)**	**(428)**	**(238)**	**(292)**
Free cash flow	**1,637**	**1,322**	**1,584**	**1,609**	**912**	**1,115**	**645**
Stated financing cash flow	(783)	(959)	(1,604)	(1,057)	(825)	(1,096)	(132)
Additions:							
Income tax paid	(176)	(252)	(216)	(145)	(140)	(81)	(157)
Interest paid	(29)	(15)	(32)	(40)	(22)	(40)	(50)
Adjusted financing cash flow	**(988)**	**(1,226)**	**(1,852)**	**(1,242)**	**(987)**	**(1,217)**	**(339)**
Net cash and cash equivalents at beginning of the year	888	716	992	626	700	787	486
Change in cash and cash equivalents	649	172	(268)	367	(75)	(102)	306
Translation adjustment	(1)	0	(7)	(1)	1	15	(5)
Net cash and cash equivalents at year end	**1,536**	**888**	**716**	**992**	**626**	**700**	**787**

Source: compiled by author based on UPM-Kymmene Oyj annual reports 2013–2019

Appendix 3. Overall efficiency matrix of Stora Enso Oyj

Year / QI (in mil €, excluding E)	Free cash flow (F)	Net operating cash flow (R)	EBITDA (P)	Sales (S)	Operating expenses (O)	Average assets (A)	Average no of employees (E)	Average capital (C)
Denominator (F)	1							
Denominator (R)	F/R							
2019	0.55							
2018	0.65							
2017	0.53							
2016	0.75	1						
2015	0.37							
2014	0.35							
2013	0.61							
2019/2018	0.85							
2018/2017	1.23							
2017/2016	0.70							
2016/2015	2.00							
2015/2014	1.06							
2014/2013	0.58							
CAGR 2019/2013	0.98							
Denominator (P)	F/P	R/P						
2019	0.48	0.86						
2018	0.48	0.74						
2017	0.53	1.01						
2016	1.05	1.41	1					
2015	0.30	0.81						
2014	0.35	1.00						
2013	0.61	1.01						
2019/2018	1.00	1.17						
2018/2017	0.90	0.73						
2017/2016	0.51	0.72						
2016/2015	3.48	1.74						
2015/2014	0.86	0.81						
2014/2013	0.58	0.99						
CAGR 2019/2013	0.96	0.97						
Denominator (S)	F/S	R/S	P/S					
2019	0.09	0.16	0.19					
2018	0.08	0.13	0.17					
2017	0.07	0.14	0.14					
2016	0.12	0.16	0.11	1				
2015	0.05	0.14	0.18					
2014	0.04	0.11	0.11					
2013	0.07	0.11	0.11					
2019/2018	1.09	1.27	1.09					
2018/2017	1.11	0.90	1.24					
2017/2016	0.64	0.91	1.26					
2016/2015	2.18	1.09	0.63					
2015/2014	1.43	1.34	1.66					
2014/2013	0.54	0.93	0.93					
CAGR 2019/2013	1.04	1.06	1.09					
Denominator (O)	F/O	R/O	P/O	S/O				
2019	0.10	0.18	0.21	1.12				
2018	0.10	0.15	0.20	1.19				
2017	0.09	0.16	0.16	1.15				
2016	0.13	0.18	0.13	1.13	1			
2015	0.06	0.16	0.20	1.14				
2014	0.04	0.12	0.12	1.11				
2013	0.08	0.12	0.12	1.09				
2019/2018	1.02	1.20	1.02	0.94				
2018/2017	1.15	0.93	1.28	1.04				
2017/2016	0.64	0.92	1.27	1.01				
2016/2015	2.16	1.08	0.62	0.99				
2015/2014	1.47	1.38	1.70	1.03				
2014/2013	0.55	0.95	0.95	1.02				
CAGR 2019/2013	1.05	1.06	1.09	1.01				

Appendix 3 continued

Denominator (A)	F/A	R/A	P/A	S/A	O/A		
2019	0.06	0.12	0.14	0.72	0.64		
2018	0.07	0.11	0.15	0.85	0.72		
2017	0.06	0.12	0.12	0.83	0.73		
2016	0.09	0.12	0.09	0.79	0.70	1	
2015	0.04	0.11	0.14	0.80	0.70		
2014	0.03	0.08	0.08	0.78	0.70		
2013	0.05	0.09	0.09	0.78	0.72		
2019/2018	0.92	1.08	0.92	0.85	0.90		
2018/2017	1.13	0.92	1.26	1.02	0.98		
2017/2016	0.67	0.95	1.32	1.05	1.04		
2016/2015	2.18	1.09	0.63	1.00	1.01		
2015/2014	1.47	1.38	1.70	1.03	1.00		
2014/2013	0.53	0.92	0.93	1.00	0.97		
CAGR 2019/2013	1.03	1.05	1.07	0.99	0.98		

Denominator (E)	F/E	R/E	P/E	S/E	O/E	A/E	
2019	0.03	0.06	0.07	0.39	0.34	0.53	
2018	0.03	0.05	0.07	0.40	0.34	0.47	
2017	0.03	0.05	0.05	0.38	0.33	0.46	
2016	0.04	0.06	0.04	0.37	0.33	0.47	1
2015	0.02	0.05	0.07	0.37	0.33	0.47	
2014	0.01	0.04	0.04	0.35	0.32	0.45	
2013	0.03	0.04	0.04	0.37	0.34	0.47	
2019/2018	1.04	1.22	1.04	0.96	1.02	1.13	
2018/2017	1.16	0.94	1.30	1.05	1.01	1.03	
2017/2016	0.65	0.93	1.30	1.03	1.02	0.98	
2016/2015	2.17	1.08	0.62	1.00	1.00	1.00	
2015/2014	1.52	1.43	1.76	1.06	1.03	1.04	
2014/2013	0.52	0.89	0.90	0.96	0.94	0.97	
CAGR 2019/2013	1.05	1.07	1.10	1.01	1.00	1.02	

Denominator (C)	F/C	R/C	P/C	S/C	O/C	A/C	E/C	
2019	0.08	0.15	0.17	0.93	0.83	1.29	2.41	
2018	0.09	0.14	0.19	1.10	0.92	1.29	2.72	
2017	0.08	0.15	0.15	1.07	0.94	1.29	2.80	
2016	0.12	0.16	0.11	1.01	0.89	1.28	2.72	1
2015	0.05	0.14	0.18	1.01	0.88	1.27	2.70	
2014	0.04	0.10	0.10	0.98	0.88	1.26	2.78	
2013	0.07	0.11	0.11	0.97	0.89	1.25	2.66	
2019/2018	0.92	1.08	0.92	0.85	0.90	1.00	0.88	
2018/2017	1.13	0.92	1.26	1.02	0.98	1.00	0.97	
2017/2016	0.68	0.96	1.34	1.06	1.05	1.01	1.03	
2016/2015	2.18	1.09	0.63	1.00	1.01	1.00	1.01	
2015/2014	1.48	1.39	1.71	1.04	1.01	1.01	0.97	
2014/2013	0.54	0.93	0.94	1.01	0.98	1.01	1.04	
CAGR 2019/2013	1.03	1.05	1.08	0.99	0.99	1.01	0.98	

Source: compiled by author based on Appendix 1

Appendix 4. Overall efficiency matrix of UPM-Kymmene Oyj

Year / QI (in mil €, excluding E)	Free cash flow (F)	Net operating cash flow (R)	EBITDA (P)	Sales (S)	Operating expenses (O)	Average assets (A)	Average no of employees (E)	Average capital (C)
Denominator (F)	1							
Denominator (R)	F/R							
2019	0.80							
2018	0.80							
2017	0.88							
2016	0.86	1						
2015	0.68							
2014	0.82							
2013	0.69							
2019/2018	1.00							
2018/2017	0.91							
2017/2016	1.02							
2016/2015	1.27							
2015/2014	0.83							
2014/2013	1.20							
CAGR 2019/2013	1.03							
Denominator (P)	F/P	R/P						
2019	0.90	1.12						
2018	0.58	0.73						
2017	0.95	1.08						
2016	0.97	1.12	1					
2015	0.56	0.83						
2014	0.82	0.99						
2013	0.60	0.88						
2019/2018	1.54	1.54						
2018/2017	0.61	0.68						
2017/2016	0.98	0.96						
2016/2015	1.72	1.35						
2015/2014	0.69	0.83						
2014/2013	1.36	1.13						
CAGR 2019/2013	1.07	1.04						
Denominator (S)	F/S	R/S	P/S					
2019	0.16	0.20	0.18					
2018	0.13	0.16	0.22					
2017	0.16	0.18	0.17					
2016	0.16	0.19	0.17	1				
2015	0.09	0.13	0.16					
2014	0.11	0.14	0.14					
2013	0.06	0.09	0.11					
2019/2018	1.27	1.27	0.82					
2018/2017	0.80	0.88	1.30					
2017/2016	0.96	0.94	0.98					
2016/2015	1.82	1.43	1.06					
2015/2014	0.80	0.96	1.16					
2014/2013	1.76	1.47	1.30					
CAGR 2019/2013	1.16	1.14	1.09					
Denominator (O)	F/O	R/O	P/O	S/O				
2019	0.19	0.24	0.21	1.20				
2018	0.15	0.19	0.26	1.20				
2017	0.19	0.21	0.20	1.18				
2016	0.19	0.22	0.20	1.17	1			
2015	0.10	0.15	0.18	1.15				
2014	0.13	0.16	0.16	1.13				
2013	0.07	0.10	0.12	1.11				
2019/2018	1.26	1.26	0.82	1.00				
2018/2017	0.81	0.90	1.33	1.02				
2017/2016	0.97	0.95	0.99	1.00				
2016/2015	1.86	1.47	1.09	1.02				
2015/2014	0.81	0.98	1.17	1.01				
2014/2013	1.80	1.51	1.33	1.02				
CAGR 2019/2013	1.18	1.15	1.10	1.01				

Appendix 4 continued

Denominator (A)	F/A	R/A	P/A	S/A	O/A	
2019	0.11	0.14	0.13	0.71	0.59	
2018	0.10	0.12	0.17	0.77	0.64	
2017	0.12	0.13	0.12	0.74	0.63	
2016	0.11	0.13	0.12	0.70	0.60	1
2015	0.06	0.09	0.11	0.71	0.62	
2014	0.08	0.09	0.09	0.69	0.60	
2013	0.04	0.06	0.07	0.68	0.62	
2019/2018	1.17	1.17	0.76	0.92	0.92	
2018/2017	0.83	0.92	1.36	1.04	1.02	
2017/2016	1.03	1.00	1.04	1.06	1.06	
2016/2015	1.78	1.40	1.04	0.98	0.96	
2015/2014	0.83	1.00	1.20	1.04	1.03	
2014/2013	1.77	1.48	1.31	1.01	0.98	
CAGR 2019/2013	1.17	1.14	1.10	1.01	0.99	

Denominator (E)	F/E	R/E	P/E	S/E	O/E	A/E	
2019	0.09	0.11	0.10	0.53	0.44	0.75	
2018	0.07	0.09	0.12	0.54	0.45	0.70	
2017	0.08	0.09	0.09	0.51	0.44	0.69	
2016	0.08	0.09	0.08	0.49	0.42	0.71	1
2015	0.05	0.07	0.08	0.50	0.44	0.70	
2014	0.05	0.06	0.07	0.47	0.42	0.69	
2013	0.03	0.04	0.05	0.46	0.42	0.67	
2019/2018	1.24	1.24	0.81	0.98	0.98	1.07	
2018/2017	0.84	0.93	1.38	1.06	1.04	1.01	
2017/2016	1.00	0.98	1.02	1.04	1.03	0.98	
2016/2015	1.80	1.42	1.05	0.99	0.96	1.01	
2015/2014	0.84	1.02	1.22	1.06	1.05	1.02	
2014/2013	1.82	1.52	1.34	1.03	1.01	1.02	
CAGR 2019/2013	1.19	1.16	1.12	1.03	1.01	1.02	

Denominator (C)	F/C	R/C	P/C	S/C	O/C	A/C	E/C
2019	0.15	0.19	0.17	0.93	0.77	1.30	1.74
2018	0.13	0.16	0.22	1.03	0.86	1.33	1.89
2017	0.16	0.18	0.16	0.98	0.83	1.32	1.91
2016	0.15	0.17	0.15	0.91	0.77	1.30	1.83
2015	0.08	0.12	0.15	0.92	0.81	1.29	1.84
2014	0.10	0.12	0.12	0.88	0.77	1.28	1.85
2013	0.06	0.08	0.09	0.87	0.78	1.27	1.89
2019/2018	1.14	1.14	0.74	0.90	0.90	0.98	0.92
2018/2017	0.84	0.93	1.37	1.05	1.03	1.01	0.99
2017/2016	1.04	1.02	1.06	1.08	1.08	1.02	1.04
2016/2015	1.79	1.41	1.04	0.98	0.96	1.00	0.99
2015/2014	0.84	1.02	1.22	1.05	1.04	1.01	1.00
2014/2013	1.78	1.49	1.31	1.01	0.99	1.00	0.98
CAGR 2019/2013	1.18	1.15	1.10	1.01	1.00	1.00	0.99

Source: compiled by author based on Appendix 2

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