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The Merger Endgame in the Aluminum and Paper industries

Opportunities for Norsk Hydro and Norske Skog

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ABSTRACT

The development of the Aluminum and Paper industry is assessed by A.T. Kearney's Merger Endgame framework. The implications for Norsk Hydro and Norske Skog are also addressed along with value creation opportunities for the corresponding stockholders.

The Merger Endgame framework reveals that up/midstream in the Aluminum industry is entering the Balance and Alliance Stage while downstream is deconsolidating. The implications for Norsk Hydro are that the ability to cooperate and build joint ventures will be increasingly important in up/midstream while the rivalry is likely to increase downstream. Norsk Hydro has invested heavily in up/midstream and is well positioned for such a development in this business area. However, the company's expansion in up/midstream and the increasing rivalry downstream imply that the management does not have the capacity to build top performers within these two business areas which rely on different skills. The greatest value creation opportunity is therefore to further demerge downstream operations in order to secure operational mobility and responsiveness to shifting market conditions.

The Merger Endgame framework reveals that the Paper industry has entered the Focus Stage. The implication for Norske Skog is that the industry will continue to consolidate but at a slower speed. Financial distress and unsustainable prices in Europe are limiting Norske Skog's ability to invest in value creation opportunities or assess acquisition targets on its own. Further consolidation in Europe might limit the current overcapacity problem but the Merger Endgame framework reveals that the consolidation speed is decreasing. From the perspective of the stockholders the greatest value creation opportunity is therefore to sell to liquidate. However, Norske Skog is not considered an attractive acquisition target and potential acquirers are limited. If neither a partner is found nor a consolidation within the newsprint or magazine segments occurs, there is a severe risk of bankruptcy in the future for Norske Skog.

The Merger Endgame framework's main strength is its potential to make Porter's five forces analysis more dynamic. The main weakness is the uncertainty regarding the correctness and precision of the framework. Further empirical research is needed to evaluate the framework as there are several weaknesses in its empirical foundation.

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1. Preface

This master thesis is a part of Norwegian University of Science and Technology's Financial Engineering graduation program. It is written in collaboration with A.T. Kearney during spring 2011 in Oslo. The master thesis is about industry consolidation and implements a framework developed by A.T. Kearney in 2003.

The idea for the thesis evolved during fall 2011 and became clear first in January 2011. My motivation for the subject is strong as M&A is a crucial aspect of most industries and is widely discussed in the academia, both within the strategic and financial fields.

I will like to thank my eminent supervisor Einar Belsom for several interesting discussions and support throughout the spring. I will also like to thank Halvor Molland and Michael Peter Steffen at Norsk Hydro, and of course Caroline Skaarer at A.T. Kearney.

Jørgen Bakken

Oslo, June 2011

2. Introduction

Mergers & Acquisitions[1] (M&A) is important in any industry on a global scale. M&A has grown tremendously both in number of transactions and total dollar value since the sixties. In 1967 the total value of all transactions was under 20 billion[2], in 1984 it grew to 100 billion, and in 2005 it was around 2.7 trillion (Hillier, Grinblatt og Titman, 2008). Since 1992 more than thousand transactions have been done each year only in the U.S. alone (Eckbo, 2010).

The Merger Endgame framework, developed by consulting firm A.T. Kearney, aims to predict the consolidation process of any industry. Every industry consolidates on a global scale and progresses through four different stages from birth to death in an average of 25 years (Deans, Kroeger og Zeisel, 2003). As industries continue to consolidate companies must consider external growth in order to keep up with domestic and international competitors.

My purpose in this paper is to assess likely development paths for the Aluminum and Paper industries on a global scale using A.T. Kearney's Merger Endgame framework and also identify value creation opportunities for the stockholders of Norsk Hydro and Norske Skog in the predicted consolidation process. The framework's theoretical and empirical foundation as well as practical challenges are also discussed. The main results are outlined in the Abstract.

In general the Merger Endgame framework has the potential to make Porter's five forces (and related frameworks') analysis more dynamic. My use of the case-examples Norsk Hydro and Norske Skog shows that these two frameworks are good supplements and provide a forward-looking element to the analysis. Nonetheless, there are still uncertainties regarding the correctness and precision of the Merger Endgame framework. Further empirical research is therefore needed to evaluate the framework and improve its empirical foundation.

The rest of this paper has the following outline: In the next section A.T. Kearney's Merger Endgame framework's theoretical and empirical foundation is reviewed and discussed. The Aluminum and Paper industries are then analyzed with special focus on the implications for Norske Skog and Norsk Hydro. Finally, the framework's strength and weaknesses in general and in these particular cases are discussed.

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[1] *Mergers & Acquisitions is used as defined by Bettonnes, Eckbo og Thorburn (2008, s. 292); "we use the term … for any acquisition of corporate control through the purchase of the voting stock of the target firm, regardless of whetever the bid is in the form of a merger agreement or a tender offer."*

[2] *All figures in this paper are given in U.S. dollars if nothing else is stated.*

3. A.T. Kearney's Merger Endgame framework

In this section A.T. Kearney's Merger Endgame framework is presented and discussed. This section is based on Deans, Kroeger and Zeisel's *Winning the Merger Endgame* from 2003.

3.1 Empirical foundation

The theoretical and empirical foundation of the Merger Endgame framework is presented in this section. Important aspects are the dataset used, parameters and methodology.

3.1.1 Dataset

In the development of the Merger Endgame framework two different databases were used. The first database, A.T. Kearney's Value-Building Growth database, includes more than 25,000 global firms and represents 98 % of world market capitalization. This made it possible to analyze the buildup of industry concentration over time. In the purpose of broadening the scope of the analysis the empirical results where compared to the Thomson Financial's SDC Platinum Worldwide M&A database that keeps track of more than 135,000 mergers and acquisitions. Only those with a transaction value of more than 500 million were used because smaller transactions would not be significant in a global context. Moreover, the transactions had to involve only publicly traded companies and the acquirer had to have at least 51 % interest at the close of the deal. As a result 1,345 transactions by 945 acquiring companies were used. All the data taken from these databases were from the time period 1990 to 1999.

3.1.2 Parameters

In order to measure industry concentration two different parameters, the Three-firm Concentration Ratio (CR_3) and the Hirschman-Herfindahl Index (HHI), were used.

The CR_3 measures the combined share of industry sales, expressed in percent, held by the three largest firms in an industry. Thus, it is a measure of the relative size of an industry's three largest firms. It is given as:

$$CR_3 = s_1 + s_2 + s_3,$$

where s is market share in percent.

The HHI on the other hand, is the sum of the squared market shares of all the firms in an industry. It is given as:

$$HHI = s_1^2 + s_2^2 + s_3^2 + s_4^2 + \ldots + s_n^2,$$

where s is market share in percent and n is the number of firms in the industry.

As the formulas show, the HHI takes into account both the relative size and distribution of the firms in the whole industry, while CR_3 only accounts for the size of the three largest firms. As a result the HHI increases both as the number of firms in the industry decreases and as the disparity in size among the remaining firms increases. In measuring the concentration rate a 90 % correlation was found between the two different parameters.

In the calculation of the market shares, s, revenue figures measured in U.S. dollars were used. Revenue figures not in U.S. dollars were converted by the year-end exchange rate.

3.1.3 Methodology

In order to perform quantitative analyses selected companies from A.T. Kearney's Value-Building Growth were ordered after industries defined by the Standard Industry Classification. For each industry the average concentration in the time period1995 – 1999 was measured by the parameters the CR_3 and the HHI. Important industries ranked by the average CR_3 for 1995 to 1999 are shown in figure 3.1.[3]

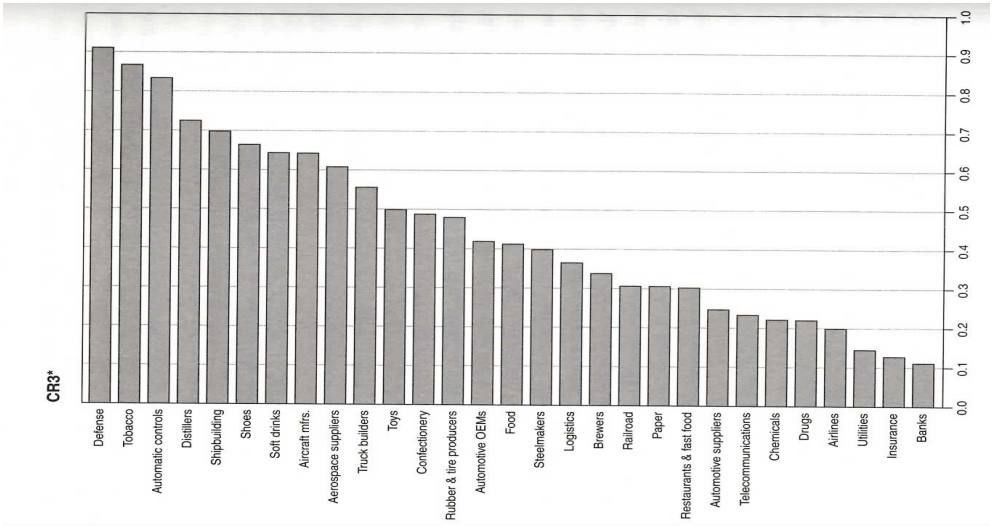


Figure 3.1: Important industries ranked by the average CR_3 for 1995- 1999.

Next, the average concentration for each industry was measured with the CR_3 and the HHI in two five-year time frames from 1990 – 1994 and 1995 – 1999. Based on the difference in the average concentration degree in these two time frames it was possible to determine if an industry is consolidating or deconsolidating. This is also called the direction or speed of

[3] *The corresponding HHI ranking is shown in appendix A.1.*

(de)consolidation. Figure 3.2 shows the value for some selected industries.

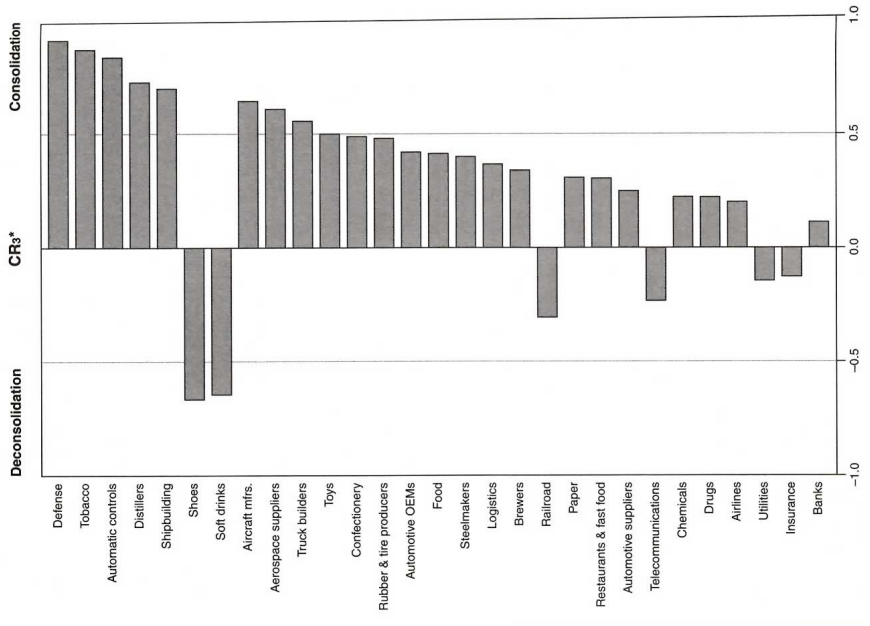
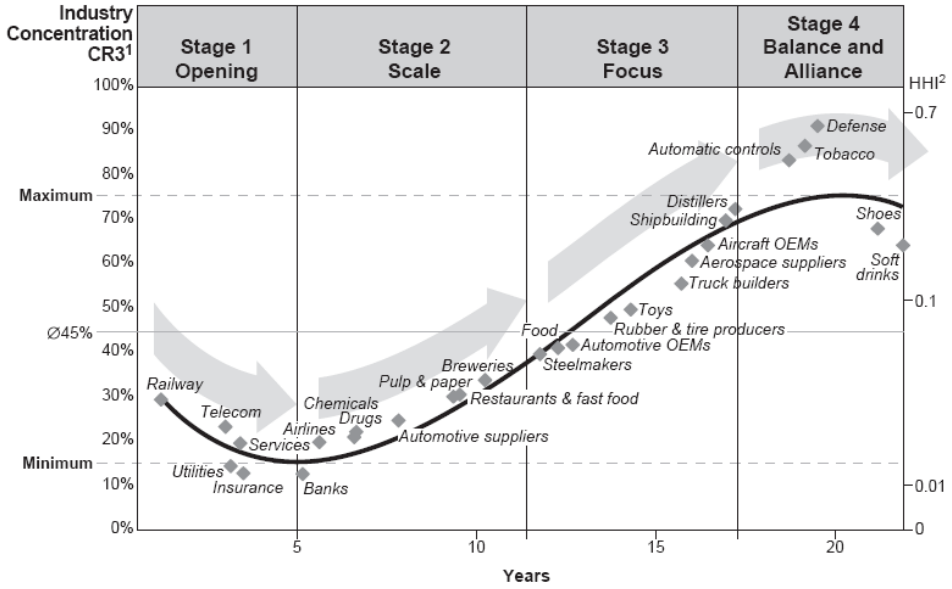


Figure 3.2: The level of (de)consolidation for some important industries.

The similarities between concentration (figure 3.1) and (de)consolidation (figure 3.2) were then explored. Some industries tend to be modestly concentrated and deconsolidating, such as the railway, telecom, utilities and insurance. While it seems to be a relationship between concentration level in 1995 – 1999 and the speed of the consolidation for the other industries, except for shoes and soft drinks. By assuming that an industry will develop similar to the next industry's concentration level and keep a constant (de)consolidation speed, one can calculate the time it takes to reach the next industry's consolidation level by using the given (de)consolidation speed. Such examples are the railway industry's deconsolidating speed to reach the telecommunication's less concentrated level and the airline's given consolidation speed to reach the same concentration as drugs. In this way it is possible to get a curve of more than 20 years by using only 10 years of historical data.

3.2 Empirical results

The result of the empirical study is that the consolidation in any industry on a global scale tends to follow a certain predictable s-shaped pattern. The Merger Endgame curve, as the pattern is called, is based on two sets of values: the concentration degree on the y-axis and the time of (de)consolidation on the x-axis. The Merger Endgame curve is shown in figure 3.3.



[1]CR3 = Market share of the three largest companies of the total market based on Value-Building Growth database (25,000 companies)
[2]HHI = Hirschman-Herfindahl Index corresponds to the sum of the squared market shares of all companies and is greater than 90%; the axis logarithmically plotted.

Figure 3.3: The Merger Endgame s-curve (Deans, Kroeger and Zeisel, 2003, p. 6). The HHI is logarithmically plotted. Note that the industries plotted on the curve are not up to date.

The concentration degree on the y-axis is measured by the CR_3 and the HHI. The time of (de)consolidation on the x-axis is as mentioned retrieved by calculating how much time an industry will use to reach the same level of concentration as the next industry, given its (de)consolidation speed is held constant. The industries in the first Opening Stage are deconsolidating, while industries in the remaining three stages are consolidating until the end of the last Balance and Alliance Stage where there is some degree of deconsolidating (for example shoes and soft drinks). The Merger Endgame curve spans around 25 years on average for any industry with a standard deviation of five years. During these 25 years an industry will commence, deconsolidate, consolidate and then dissolve. As shown in figure 3.3 these 25 years are split into four different stages. By understanding the different characteristic of each stage it is possible to predict and develop merger actions and consolidation trends.

The stages in the Merger Endgame framework have the following characteristics:

1) *The Opening Stage* consists of industries that are newly created, spin-offs, and older industries that have been recently deregulated. The number of transactions is small and the industry's concentration decreases as newcomers enter.

2) *The Scale Stage* is where the value of scale becomes the important key to success as there are no more uncovered market segments within the industry. In other words, the strategy shifts from claiming ground to building a corporate powerhouse. As a result the industry's concentration increases through high M&A activity.
3) *The Focus Stage* is where some major players dominate. The M&A transactions are fewer but bigger in total dollar value as major companies get acquired. In this stage scale is not enough and firms focus on finesse such as adjusting cost structure, optimizing the value chain and outsourcing non-core businesses to gain flexibility and cost advantages. In other words, the focus is more internal than external in this stage. The companies that have fallen behind and have not been acquired at this point may be forced to choose niches until they become attractive to consolidators, or go bankrupt.
4) *The Balance and Alliance Stage* is dominated by very few and large companies that are the winners in their industry consolidation race. However, the room to maneuver is reduced as external growth is no longer an option. The companies are also often subject to government regulation because of their perceived oligopoly or near monopoly market position. There are many options at this point in the curve for the companies. A common strategy is to grow by pursuing new growth opportunities in unrelated industries or by spin-off companies in related industries. The future of the industry at this stage is uncertain. Some decline while other find renewed life.

In order to increase the understanding of industry consolidation A.T. Kearney has performed research on corporate population and profitability across the Merger Endgame stages.

Based on more than 25,000 global firms from the A.T. Kearney's Value-Building Growth database the corporate population across the Merger Endgame stages was examined. An industry's average corporate population, the number of companies in an industry, expands and contracts as the industry moves through the four stages, as figure 3.4 shows. The number of firms is greatest at the end of stage one due to deregulation. In stage two, however, the population contracts nearly 70 % as consolidation begins. In the two final stages, the number of companies is reduced even more, only to experience a slight increase at the end of stage four due to new entries. This development of corporate population fits with the empirical result retrieved by Deans, Kroeger and Zeisel that states that an industry's position on the Merger Endgame curve is strongly correlated with the merger activity. The merger activity is higher within the industries on the low part of the s-curve than those on the high end.

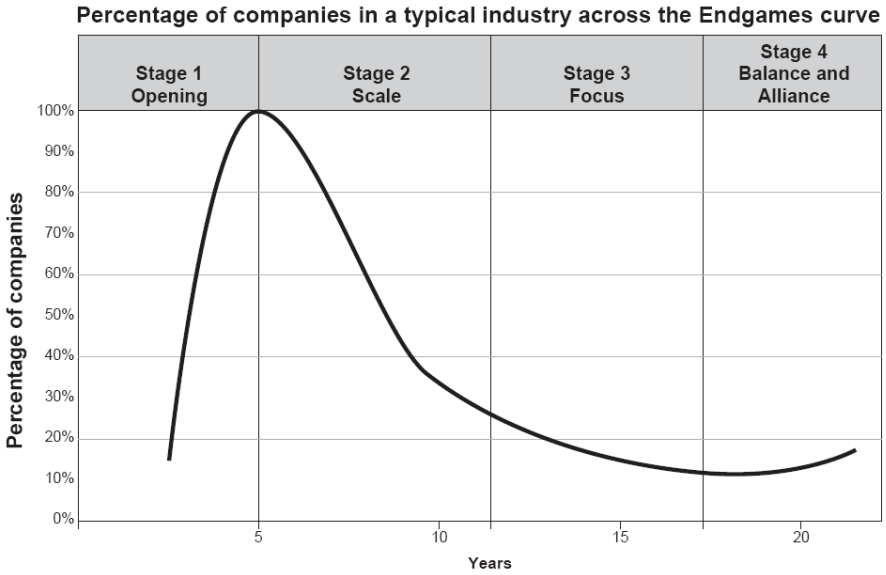


Figure 3.4: Percentage of companies on average in an industry across the four Endgame stages (Deans, Kroeger and Zeisel, 2003, p. 14).

Figure 3.5 and 3.6 show average revenue growth and profitability across the Merger Endgame stages in an industry. The average revenue growth is fairly stable across all four stages. In the Opening Stage revenue growth is 10.6 % in average, falls to 7.6 % in the Scale Stage as companies consolidate, and then stabilizes at 8.8 % and 8.1 % in the two final stages.

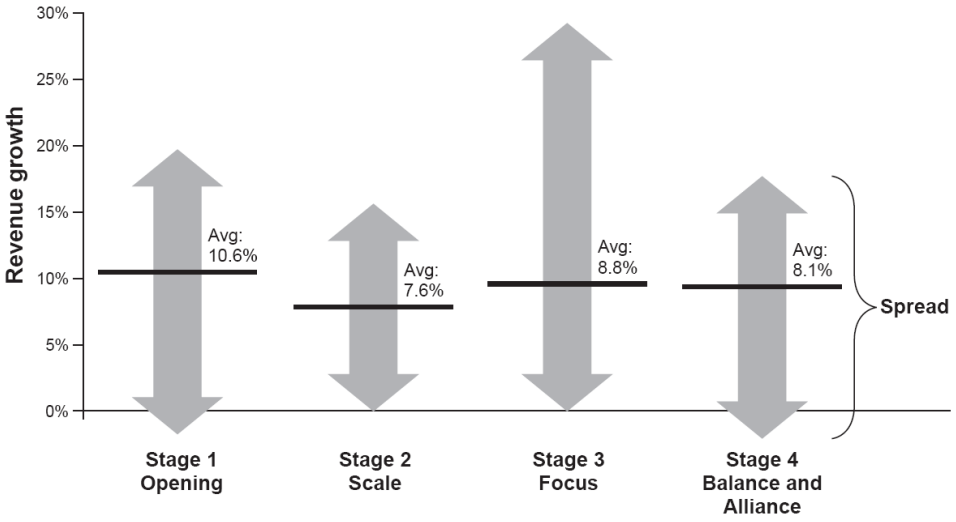


Figure 3.5: Revenue growth across the Endgame stages (Deans, Kroeger and Zeisel, 2003, p. 17).

The average profitability however is not as stable, as figure 3.6 shows. From the Opening Stage to the second Scale Stage the average profitability drops from its highest to its lowest point on the whole curve. During the two next stages it increases again.

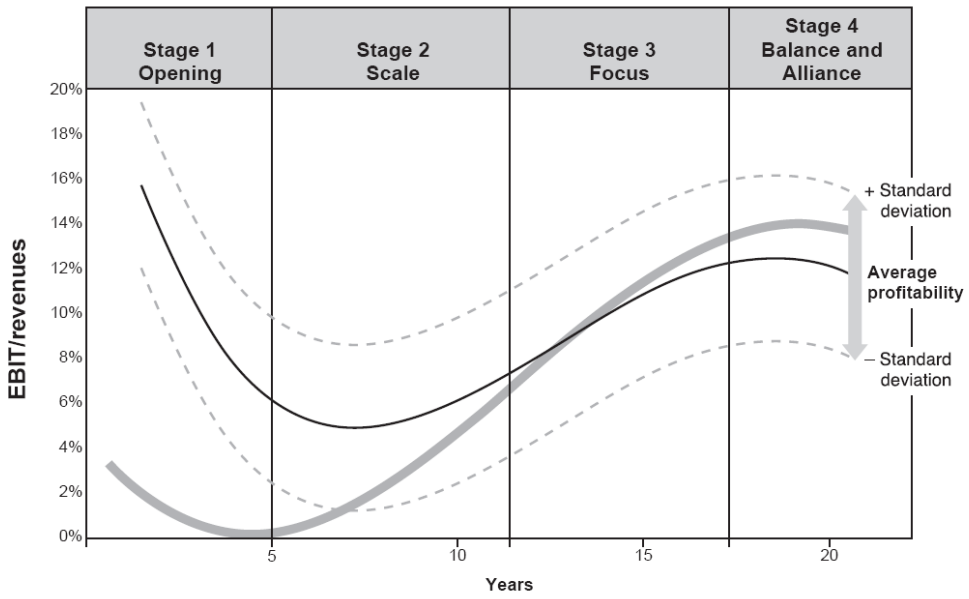


Figure 3.6: Average profitability across the Endgame stages on the s-curve (Deans, Kroeger and Zeisel, 2003, p. 17).

Deans, Kroeger and Zeisel offer an explanation for the described development in average profitability along the curve. The Opening Stage is often dominated by companies in old state-run industries that have been recently privatized. Often, these companies use monopolistic prices that lead to high profits. In the Scale Stage the industry's number of firms reaches maximum and many firms respond by competing on price, a strategy that drives down the industry's average profitability. In the following two stages most of the competitors are eliminated, giving room to increase the prices to healthy profits. However, the threat of newcomers is ever present so the average profits never reach as high as in the Opening Stage.

3.3 Practical implications

The Merger Endgame framework reveals some practical implications. These are not derived through quantitative analyses as with the empirical results but still offer some useful insight into the possibilities that the framework offer.

External growth is an important aspect of the Merger Endgame framework and Deans, Kroeger and Zeisel therefore offer a simple tool to evaluate acquisition targets. This tool, called the value-building growth matrix, is shown in figure 3.7.

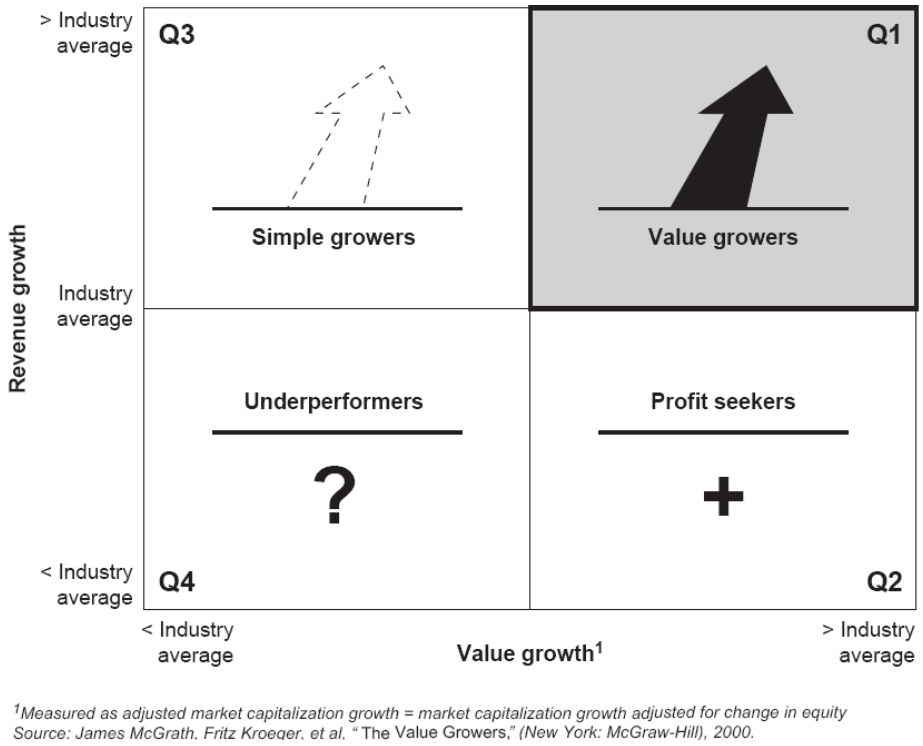


Figure 3.7: Matrix to evaluate acquisition targets (Deans, Kroeger and Zeisel, 2003, p. 11).

The value-building growth matrix is a concept where acquisition targets are categorized as *Simple growers*, *Value growers*, *Underperformers* or *Profit seekers* based on growth in revenue and adjusted market cap. Purchasing a company in the underperformers segment involves a turnaround as it is performing below industry average in both revenue and value growth. Simple growers and Profit seekers are considered more reasonable acquisitions targets, as they often involve less of a turnaround. Value growers are performing above industry average measured in both revenue and value growth, but tend to be expensive.

The value-building growth matrix can be used together with the Merger Endgame curve to develop M&A strategies. For private equity investors, for example, it might be a good idea to buy turnaround targets in the lower part of the s-curve and sell them at the beginning of the Focus Stage. If they wait longer increased concentration may make it difficult to stay competitive and sell at a favorable price within the industry due to fewer potential buyers.

3.4 Empirical discussion

In this section the Merger Endgame research's empirical foundation and results are discussed. Important issues are dataset and parameters, methodology, and theoretical implications.

3.4.1 Dataset and parameters

The empirical foundation of the Merger Endgame is based on a wide scope of firms and industries. The first database, A.T. Kearney's Value-Building Growth database, included more than 25,000 global firms and represents 98 % of world market capitalization. The dataset from the second database, the Thomson Financial's SDC Platinum Worldwide M&A, covered only one percent of the companies but is significant in terms of value as only companies in transactions with a total value of more than 500 million were used. Further, only publicly traded companies were used in the research. In general it is unclear how this sampling has affected the outcome and if the framework applies for other than publicly listed companies. However, the problem is not the size of the dataset but the fact that the time period it covers, 1990 – 1999, coincides with the stock market boom. As a consequence the results drawn may not reflect normal market and industry conditions.

In the quantitative analyses two different measures are used to determine the industry concentration, where the HHI is considered a reliable parameter (Tirole, 1988). The HHI has a 90 % correlation with the CR_3 making the measure seem reliable.

3.4.2 Methodology

In the quantitative analyses the industry segmentation is done in a systematic way and the measure of concentration is reliable. However, a period of ten years, split into two five-year time frames, may seem short to conclude on the rise and fall of all industries on a global scale. Some of the underlying assumptions also seem difficult to grasp. The model assumes a constant (de)consolidation speed based on a single measure of the difference in concentration between two five-year time frames. This speed may vary and change rapidly. Another assumption is that an industry will develop similarly to the next industry's concentration level. This may not be the case as they may evolve differently.

3.4.3 Results and theoretical implications

The most obvious critic of the results retrieved by the Merger Endgame research is the fact that not all industries evolve accordingly to the s-curve. Several industries such as Oil and Tobacco have existed longer than the 20 - 30 years expected by the Merger Endgame (Kalpic, 2008). Further, several industries have not evolved accordingly to the s-curve where industry consolidation is an irreversible process after the first stage (with the exception of the end). The oil industry for instance is less concentrated now than for 50 years ago (Kalpic, 2008).

Important theoretical implications retrieved from the Merger Endgame research are that all industries are global and that economies of scale are the most important driver for growth. Both implications are controversial in a scientific context. There are examples of industries that are not global. The Fast Moving Consumer Goods retail industry for instance, has major differences between local countries and the overall global concentration of the industry (Kalpic, 2008). Moreover, not all industries are scale-sensitive and the reasons for industry (de)consolidation are not clearly understood in any empirical study up to date.

The most important theoretical implication is however that all industries, including niche markets, consolidate and tend to follow a similar course. This result has different implications for CEOs and stockholders as they do not necessarily operate with the same goals or incentives. CEOs have incentive to cause their firms to grow due to increased power and the fact that compensation is positively correlated to growth in sales (Jensen, 1986). Another incentive to grow for a CEO is the reduced risk of losing his job as large firms are less likely to become acquisition targets (Hillier, Grinblatt and Titman, 2008). Based on these incentives the goal of any CEO is to keep the company running as long as possible as the industry moves up the Merger Endgame curve. There is no optimal size: The goal is to grow bigger than the competitors and stay ahead while at the same time avoiding getting acquired or go bankrupt.

This perspective does not necessarily coincide with the stockholders' for several reasons. Rajan, Servaes and Zingales (2002) show that large companies tend to become less effective and use its internal resources in a suboptimal way, resulting in a relatively reduced market value. Penrose (1959) points out that firm size is limited in the long-run by its internal management resources as CEOs are not able to run huge companies in an optimal way. Moreover, empirical research shows that M&A-transactions often result in value creation for the stockholders of the acquisition targets and destroys value for the acquirer's stockholders (McNamara, Haleblian og Dykes, 2008; Langetieg, 1978; Dodd, 1980 and Asquith, 1983). Based on these empirical results stockholders will not always benefit from being a part of the company as long as possible as the industry moves up the Merger Endgame curve. In some cases they should rather cash out and walk away before the company grows too large.

3.5 Conclusion

The Merger Endgame research has several weaknesses in its empirical foundation. The major weaknesses are the dataset's short time span of ten years and that it coincides with the stock market boom. As a consequence the results drawn may not reflect normal market and industry

conditions. However, even with some weaknesses in the empirical foundation, the Merger Endgame research brings some interesting insight into the development of industries on a global scale. The most important theoretical implications are that all industries, including niche markets, consolidate and tend to follow a similar course. The implications effect managers and stockholders in different ways. Management has incentive to stay ahead of competition by external growth while stockholders in some cases are better off selling the company before it grows beyond optimal size.

4. Analysis of the Aluminum and Paper industries

In the following sections the Aluminum and Paper industries are presented. Important aspects for each industry are product characteristics, product applications, value chain breakdown, cost drivers, and supply and demand by nations. Each industry is then analyzed using A.T. Kearney's Merger Endgame and the Hill and Jones's (2008) framework. The latter integrates Porter's five forces with the PESTEL framework. The purpose of the analysis is to assess the industries' fundamentals, profitability and their future developments.

Norsk Hydro and Norske Skog are presented after each industry accordingly. Important aspects for each company are latest development, recent performance, debt situation, operation and assets overview, profitability of operations, operating revenues by region, and market position and competitive strategy. Each company is then analyzed in the light of the implications from the Merger Endgame framework. The perspective is of the equity holders when the companies' value creation opportunities are identified. However, corresponding incentives of the management are also addressed.

4.1 The Aluminum industry

The Aluminum industry belongs to the sector Basic Materials. It is a global industry that consists of several listed and non-listed companies. The largest aluminum producers are multinational with production and distribution facilities around the world.

4.1.1 Product characteristics

Aluminum is the third most abundant element on earth and exists in very stable combinations with other materials such as silicates and oxides (UC Rusal, A2010[4]). It is the most consumed non ferrous metal annually.

[4] *A is short for annual report.*

Aluminum is a versatile metal with a range of properties (UC Rusal, A2010). It is lightweight and is about one-third the weight of an equal volume of copper, steel or brass. It is strong in the sense that it can withstand heavy loads and pressure, and when alloyed appropriately its strength approaches that of steel. It has higher strength-to-weight-ratio than any other metal and high value-to-weight. It has corrosion resistance and is flexible to form and shape. It has high electrical and thermal conductivity. It is relatively inexpensive and highly recyclable. The disadvantages related to aluminum are that it is considered a difficult alloy to weld and have toxic effects, such as affecting the central nervous system, in elevated concentrations.

4.1.2 Applications

Aluminum is important in virtually all segments of the world economy and serves a wide scope of different industries and markets. On a global scale the customer industries can be split into transportation, packaging, electrical, engineering, consumer goods, construction, and others, as shown in figure 4.1 (Norsk Hydro, A2010).

Aluminum is used in automobiles, airplanes, trucks, railcars, railways and marine vessels in the transportation segment (Norsk Hydro, A2010). In the packaging segment, it is used extensively for the protection, storage and preparation of food and drinks. Cans and foil stock are examples of such products. Aluminum is used mainly in transmission lines above and below ground in the electrical segment, while it is used in machinery in the engineering industry. Consumer goods involve products such as tools, cooking appliances and cooking utensils. Aluminum's characteristics are well suited for the constructing segment and the metal is used in windows, doors, siding, cladding and weatherproofing.

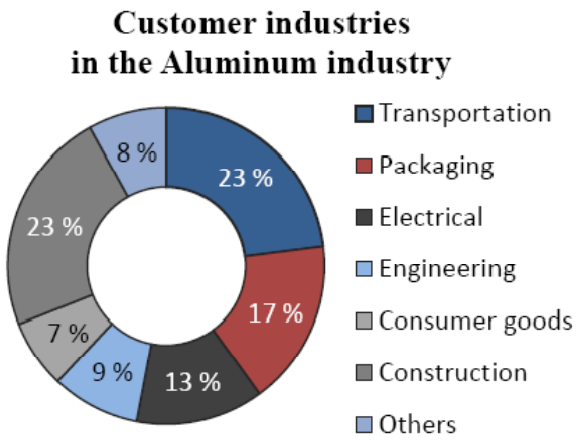


Figure 4.1: Customer industries in the Aluminum industry (Norsk Hydro, A2010)

As some products, especially in the packaging segment, have a short life span, recycling has become more important the last 20 years. About 25 percent of new aluminum products are made from consumer scrap and more than 75 % of all aluminum produced is still in use through continuous aluminum recycling (Norsk Hydro, A2010).

4.1.3 Value chain breakdown

The Aluminum industry's value chain can be structured as shown in figure 4.2.

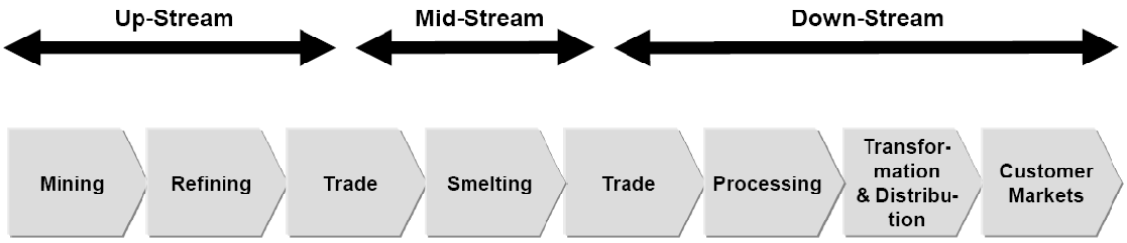


Figure 4.2: The Aluminum industry's value chain (Norsk Hydro, A2010).

Upstream includes mining and alumina refining (Norsk Hydro, A2010). In the mining part ore bauxite is found and in the following refining part alumina is produced by the Bayer Process. This refining process involves washing, grinding, and dissolution in caustic soda, filtration, precipitation and separation from water. Between two and three tonnes[5] of bauxite are required to produce one tonne of alumina depending on the quality.

Midstream includes smelting. Primary aluminum is produced by the Hall-Heroult process which involves dissolving alumina in a chemical bath and passing electric current through it. The process is highly energy intensive and requires about 13-16 KWh to produce one kg of aluminum. About two tonnes of alumina are required to produce one tonne of primary aluminum. Secondary aluminum is produced in special resmelters. Scrap is generated throughout the value chain when producing aluminum end-products and is collected in the marketplace. The primary and secondary aluminum is in the form of commodities.

Downstream includes processing within rolling, extrusion or casting. In rolling mills the aluminum is rolled into plate, sheet and foil. In extruding plants it is formed into various shapes, while in foundries it is cast into various forms. Various metals may be alloyed to modify the aluminum's properties. In the following transformation part the semi-finished aluminum products are converted into final products by fabrication processes. Customer markets include the industries listed in figure 4.1.

4.1.4 Cost drivers

The Aluminum industry is highly capital intensive (UC Rusal, A2010). It matters however where on the value chain the company operates. Alumina refining and smelting in the up- and midstream are the most capital intensive, while downstream is less capital intensive.

[5] *1 tonne = 1 metric ton*

Figure 4.3 shows the average cost structure in the production of primary aluminum. Key input factors needed to produce primary aluminum are energy and alumina from bauxite and caustic soda (A.T. Kearney, 2007). Remaining costs are other raw materials, labor and other costs.

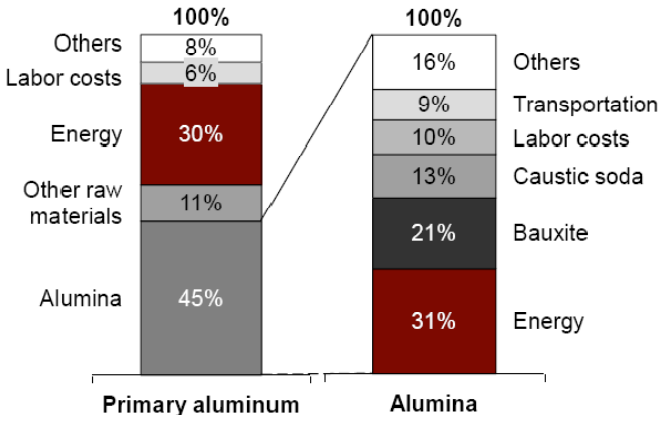


Figure 4.3: Average production cost structure (A.T. Kearney analysis, 2007).

Energy is the largest cost driver in primary aluminum production constituting approximately 30 % of the total production costs. The second most important cost driver is alumina. As alumina is relatively inexpensive to transport, primary aluminum smelters do not need to be located close to alumina refineries. Primary plant location decisions are therefore driven by access to inexpensive and stable energy sources. For this reason the significant world primary aluminum production is found in areas like Russia, Scandinavia and the Middle East.

Country	Reserves	%
Australia	7,860	26.69
Guinea	5,900	20.03
Brazil	2,900	9.85
India	2,650	9.00
Jamaica	2,000	6.79
Others	8,140	27.64
Total	29,450	100.00

Table 4.1: Reserves of bauxite in million tonnes (Indiainfoline, 22.3.11).

The most important costs in the production of alumina are energy and bauxite. Bauxite ore can be found in tropical regions such as Caribbean, parts of Africa, South America and Australia (Indiainfoline, 22.3.11). The largest reserves can be found in Australia, Guinea, Brazil, India and Jamaica, as shown in table 4.1. Vietnam, China, Greece, Turkey and the Urals in Russia also have some smaller reserves. The tendency in the industry is to construct alumina refineries close to the mines as bauxite is expensive to transport.

Another, less important cost driver is caustic soda. It is used to make alumina along with bauxite and comprises 13 % of the overall cost structure of alumina in average.

The production of secondary aluminum costs a fraction of primary aluminum as it only requires 5 % of the amount of electricity used in primary production (Garen, Jespen and Scott, 2009). The need for an inexpensive power source is therefore reduced compared to primary production. Transportation costs are important so location decisions are driven by sources of scrap and location of downstream costumers, who are often the sources of scrap.

4.1.5 Supply and demand by nations

In order to understand the fundamentals of the Aluminum industry and the most important markets, it is necessary to study the supply of bauxite, alumina and primary aluminum and the demand for primary aluminum in different regions.

SUPPLY OF BAUXITE

World output of bauxite was 199 million tonnes in 2009 (Mineralsuk, 20.2.11). Australia remained the largest producer with a 33 % share of the total. China overtook Brazil's position and become the second largest producer with a 15 % share. China's production of bauxite has increased by 72 % from 2005 to 2009. Other major producers are Indonesia (8 %), Guinea (7%) and India (7%). The production of bauxite by nations is shown in figure 4.4.

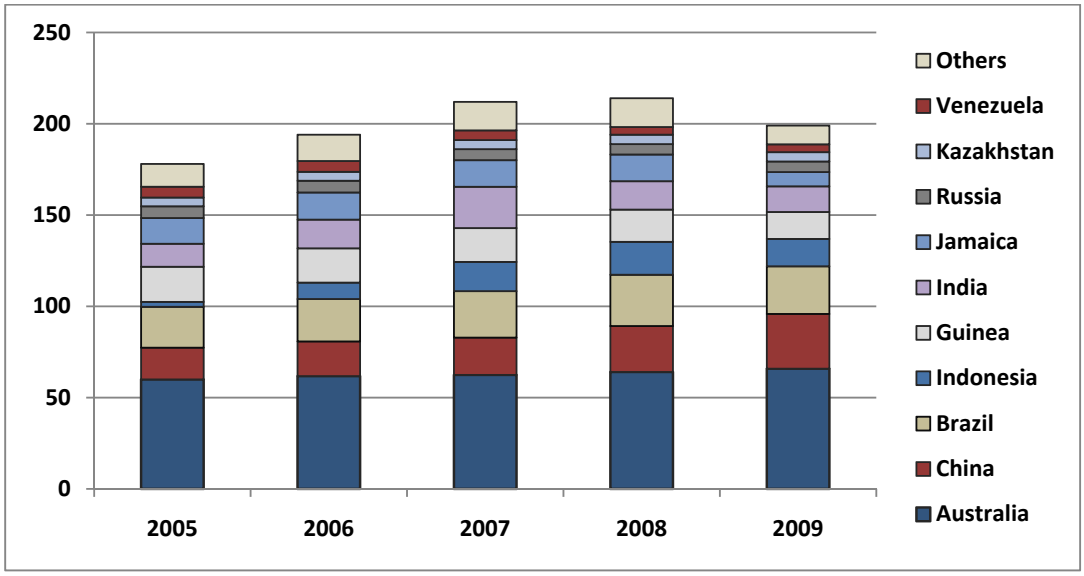


Figure 4.4: The most significant producers of bauxite in million tonnes from 2005 to 2009 (Mineralsuk, 20.2.11). All producers are listed in appendix A.2.

SUPPLY OF ALUMINA

World output of alumina was 76.8 million tonnes in 2009 (Mineralsuk, 20.2.11). China remained the world's largest producer with a share of 31 % of the total world production. Australia continued as the second largest producer with a share of 26 %. Brazil has increased its alumina production by 66 % since 2005 to 2009, and had 11 % of the total share in 2009. Other significant producers are the US (4%), India (4%) and Russia (4%). The production of alumina by nations is shown in figure 4.5.

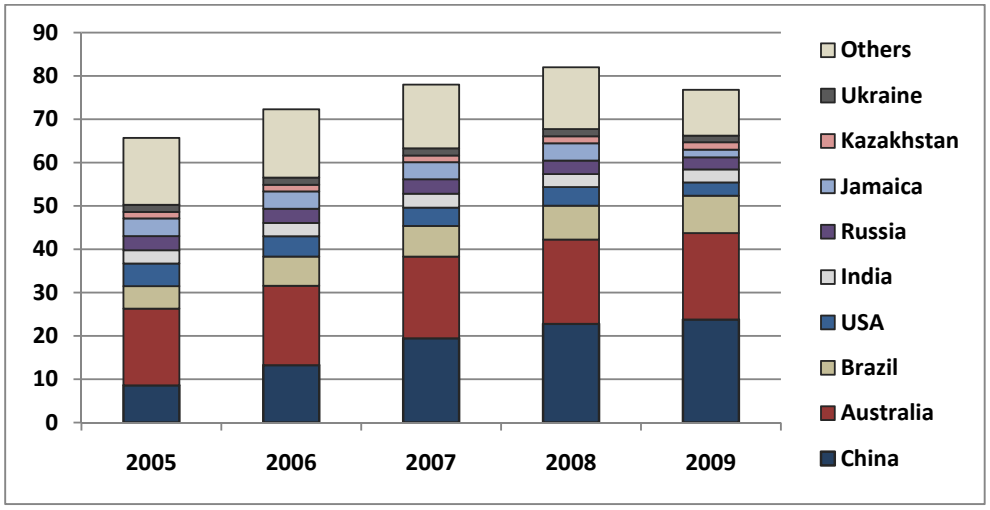


Figure 4.5: Producers of alumina in million tonnes from 2005 to 2009 (Mineralsuk, 20.2.11). All producers are listed in appendix A.2.

SUPPLY AND DEMAND OF PRIMARY ALUMINUM

The demand for primary aluminum has grown rapidly since 1950 (UC Rusal, A2010). The production was two million tonnes in 1950, and then grew to 9.5 million in 1970. It reached 15 million in 1990 and 40.2 million in 2010.

The production of primary aluminum by nations is shown in figure 4.6. The production has been fairly stable the last five years, with the exception of China that has increased its overall output of primary aluminum by 80 % between 2006 and 2010 (Mineralsuk, 20.2.11 and UC Rusal, press release, Feb. 2011). Russia and Canada are other major producers.

The primary aluminum consumption by nations is shown in figure 4.7. Especially the BRIC-countries (Brazil, Russia, India and China) have driven the growth in demand over the last five years (mcxindia, 15.3.11). Western Europe and North America have shown a steady, strong demand but especially North-America experienced a contraction in 2009 and 2010.

China is both the largest producer and consumer of primary aluminum with a share above 33 % of both in 2010. The country has a significant impact on the supply and demand.

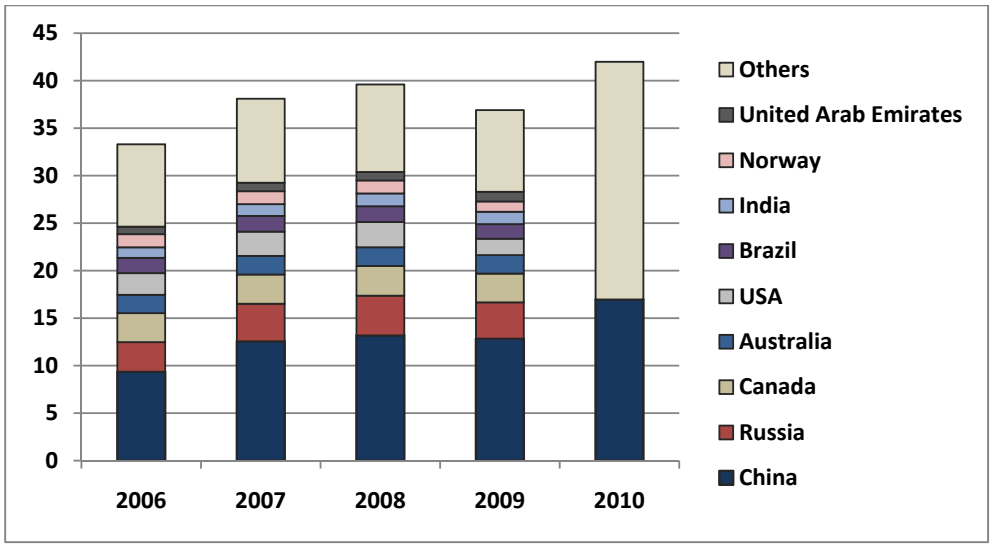


Figure 4.6: Production of primary aluminum in million tonnes from 2006 to 2010 (Mineralsuk, 20.2.11 and UC Rusal, press release, Feb. 2011). All producers are listed in appendix A.2.

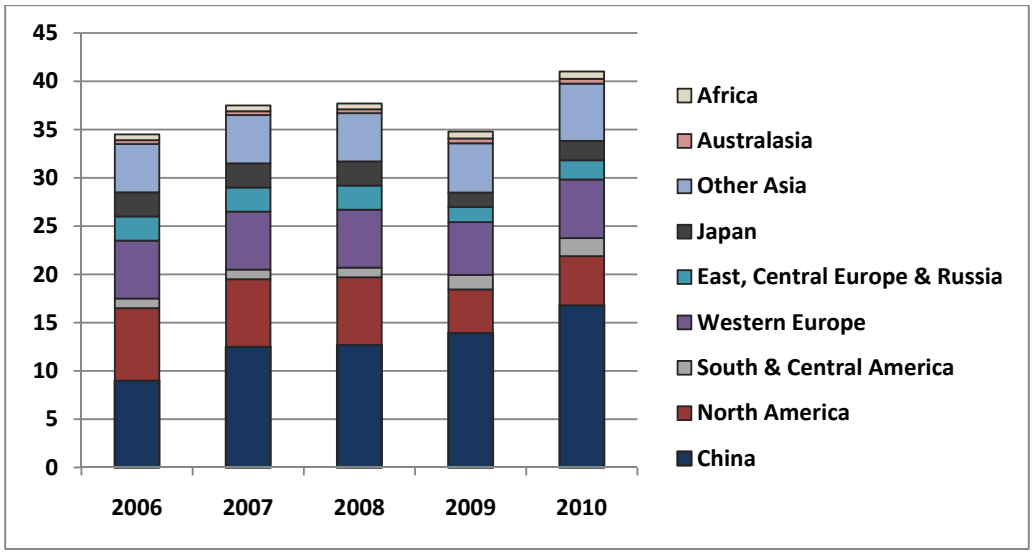


Figure 4.7: Consumption of primary aluminum in million tonnes from 2006 to 2010 (mcxindia, 15.3.11 and UC Rusal, 11.3.11).

In the period 2007 – 2009 the production of primary aluminum was significant higher than the consumption. This led to a price decrease that affected several producers negatively.

4.1.6 The outside-in analysis

The Aluminum industry is highly concentrated.[6] The CR_3 was 62.1 % in 2010, down from 72.7 % in 2006. However, by excluding specialized downstream companies the concentration has increased from 58.8 % in 2006 to 63.4 % in 2010.

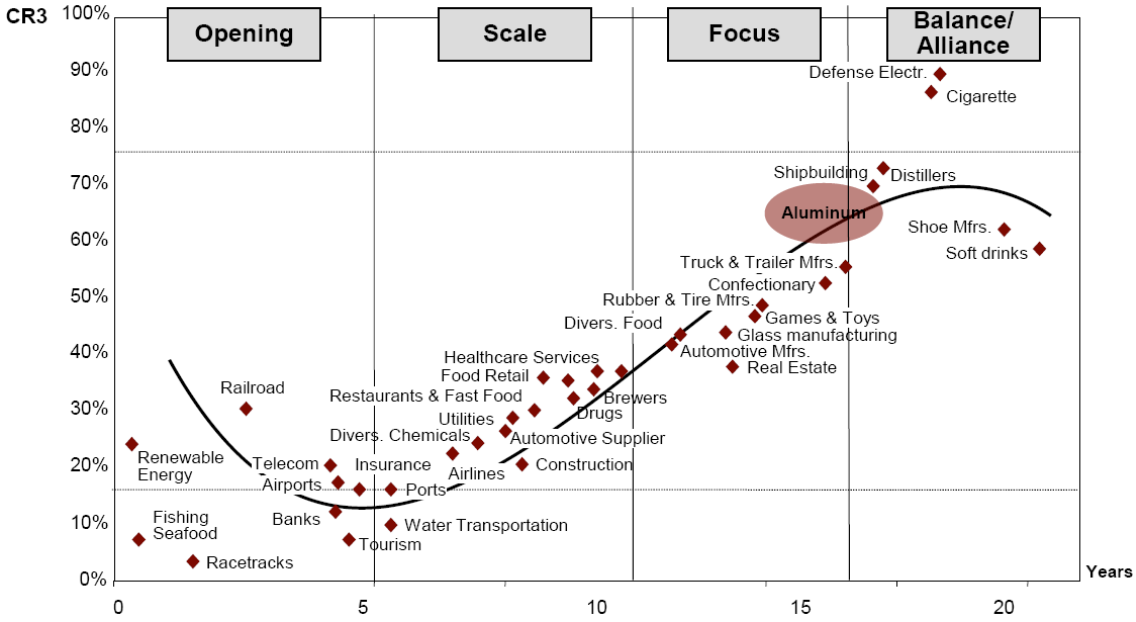


Figure 4.8: The Aluminum industry plotted on the s-curve.

In late 2006 RUSAL, SUAL and the aluminum assets of Swiss-based Glencore created United Company Rusal PLC (UC Rusal). This transaction completed the 15-year process of consolidating the Russian Aluminum industry and made UC Rusal the world's largest producer of primary aluminum before Alcoa. Then in 2007 Rio Tinto, one of the world's largest mining companies, acquired Alcan and displaced UC Rusal at the top. These mergers have increased the concentration in the industry. At the same time high demand in emerging countries like China and India has given companies like Aluminum Corp of China (Chalco), Hindalco and several small caps in downstream the opportunity to expand their market shares. Government owned smelters in the Middle East, like Dubal and Alba, have also grown in market cap in this period. This has driven down the concentration in the industry but not enough to stop an increase of 4.6 % in up/midstream between 2006 and 2010.

In recent years cooperation has become important in up/midstream. Currently half of Norsk Hydro's primary smelters are based on joint ventures (Norsk Hydro, A2010). Another

[6] *An overview of analyzed companies and calculations of the s-curve and CAGR growth portfolio 2006 – 2010 are presented in appendix A.3.*

tendency in the industry is that fully integrated companies such as Alcoa and Norsk Hydro are diminishing their presence in downstream by sales or spin-offs to increase their focus in the up/midstream part of the value chain (Garen, Jespen and Scott, 2009).

The high concentration level, a positive consolidation direction and increased reliance on cooperation indicate that the up- and midstream part of the Aluminum industry is headed towards the Balance and Alliance Stage, as shown in figure 4.8. The downstream segment on the other hand is deconsolidating and may experience increased competition in the future.

4.1.6.1 Porter's five forces and PESTEL

The purpose of the Porter's five forces analysis is to measure the rivalry in an industry and assess the possibilities of profitability. The forces are rivalry among existing firms, determinants of supplier power, threat of substitutes, threat of new entrants and determinants of buyer power. Several relevant macroeconomic elements from PESTEL are added to the analysis. These factors are political, economic, social, technological and environmental.

RIVALRY AMONG EXISTING FIRMS

There are a variety of business models in the Aluminum industry. Fully integrated companies like Rio Tinto Alcan, Alcoa and Norsk Hydro cover the complete value chain, from bauxite mining, alumina refining, and aluminum smelting into downstream fabrication and customer service. Others like UC Rusal, BHP Billiton and Century Aluminum have the same approach but are less specialized in the downstream segment. Dubal and Alba are examples that focus on smelting as they acquire alumina and sell ingot and other commodity like types of aluminum products. While companies like United Anodisers, ESS DEE Aluminum, Alicon Castalloy Ltd and Century Extrusions are specialized in the downstream segment. A full overview and description of the companies in the industry is presented in appendix A.3.

The performance of the Aluminum industry from 2006 to 2010 is shown in figure 4.9 and 4.10. In figure 4.9 the bubbles are adjusted market cap for 2010, while they are revenues in figure 4.10. The industry's compounded annual growth rate (CAGR) for adjusted market cap in the period 2006 to 2010 is 10.9 %. The value has grown from 164,878 to 249,737 million. The CAGR for revenues is approximately 1.0 %, whereas the value has grown from 148,429 to 154,622 million.

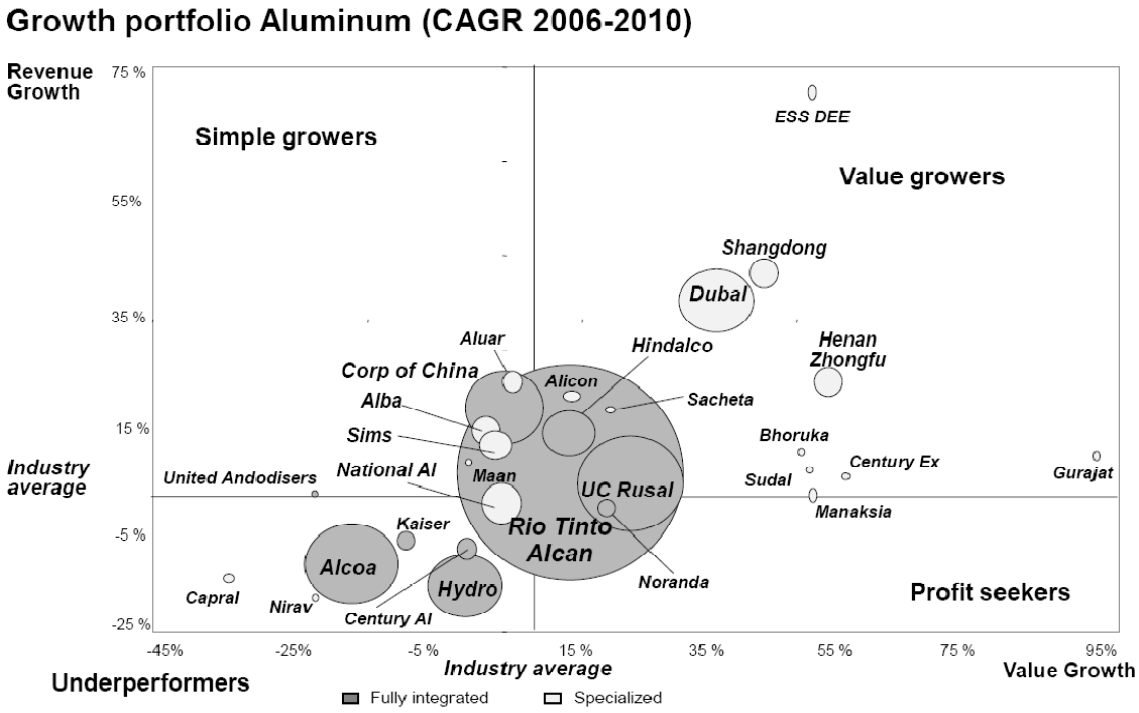


Figure 4.9: Performance in the Aluminum industry from 2006 – 2010. Value growth is CAGR of adjusted market cap 2006-2010. Bubble size is adjusted market cap for 2010.

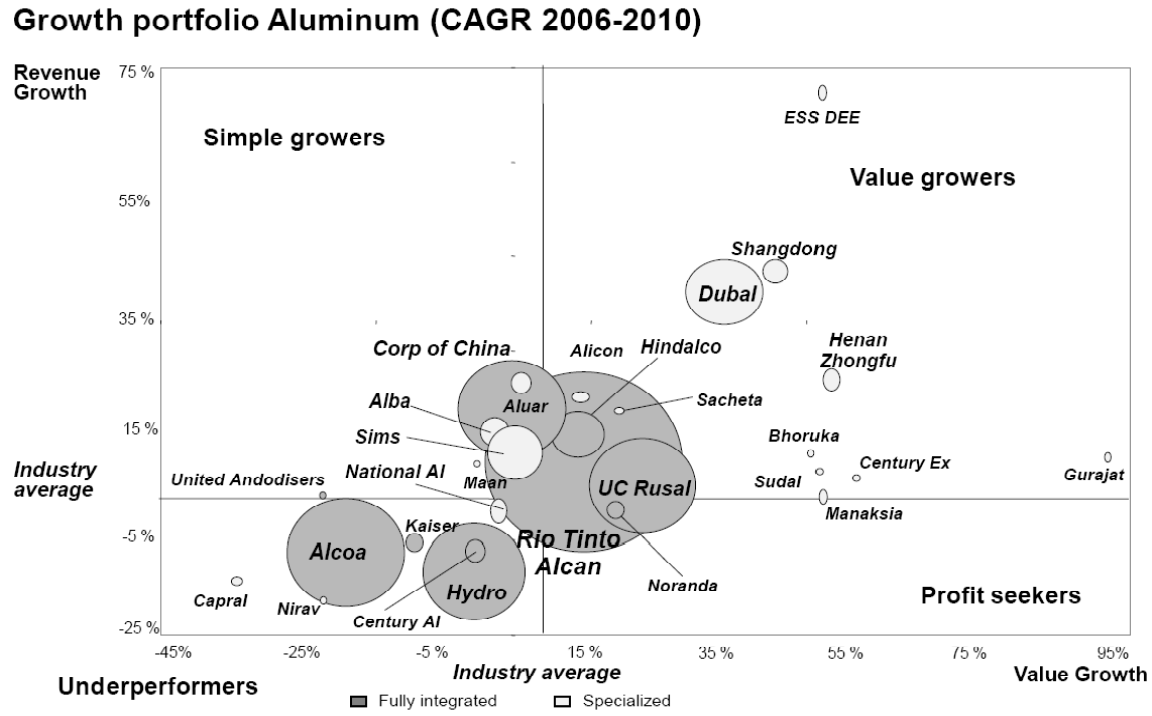


Figure 4.10: Performance in the Aluminum industry from 2006 – 2010. Value growth is CAGR of adjusted market cap 2006-2010. Bubble size is revenue for 2010.

The fully vertically integrated companies dominate the industry in size. Rio Tinto Alcan, Hindalco and UC Rusal have outperformed the industry's average measured in both revenues and adjusted market cap growth from 2006 to 2010. Among the remaining fully integrated companies Chalco is a simple grower, while Alcoa and Norsk Hydro are underperformers. The greatest value growers are specialized companies from India, China and the Middle East.

The revenue growth in the Focus Stage according to the Merger Endgame research spans from 0 % to 30 % with an average of 8.8 %. The span in the Aluminum industry from 2006 to 2010 is – 19 % to 70 %, with an average close to 1 %. The average operating income margin[7] is higher than expected both in 2006 and 2010. In the Focus Stage the operating margin spans from 3 % to 15 % according to the Merger Endgame research, whereas the average operating margin spans from 7 % to 12 %. In 2006 the range was – 1.9 % to 45 % for the Aluminum industry, with an average of 23 %. In 2010 it was 2.8 % to 34 %, with an average of 27.2 %.

The highest average operating income margins are found in up/midstream. The companies specialized in downstream made an average operating income margin of 23.6 % in 2006 and 8.4 % in 2010. The remaining companies that are not operating only in downstream made an average operating margin of 35.8 % in 2006 and 11.9 % in 2010.

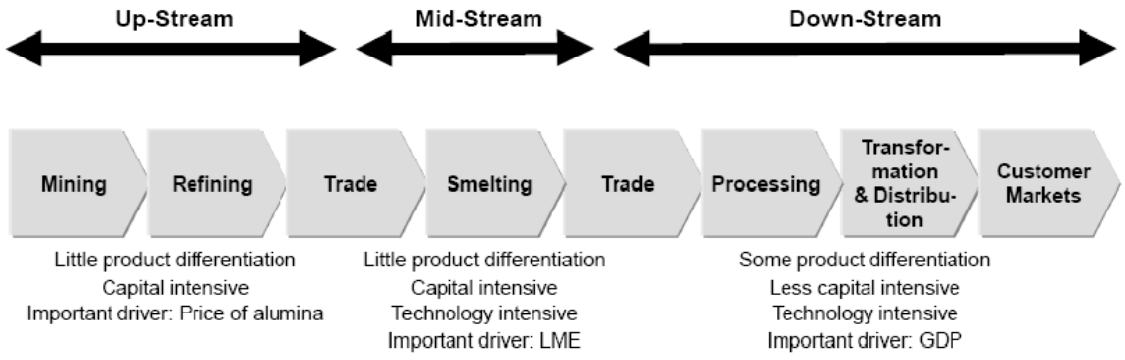


Figure 4.11: Overview of important factors in the value chain of aluminum production.

In the upstream segment considerable machinery and equipment are involved, so mining activity and alumina refineries require substantial investment (Garen, Jespen and Scott, 2009). Bauxite is chemically and physically heterogeneous, and so the refineries are often specific to the site of the mine and are dedicated to that mine. Bauxite mines and alumina refineries, once constructed, also are largely irreversible, making the costs of the initial investment sunk.

[7] *Operating income margins refers to EBIT/Revenues. As this size does not take into account the financial costs the high average operating margins found in the Aluminum industry may reflect that the industry is capital intensive with high start-up costs.*

Primary aluminum smelting requires a large investment in plant and equipment (Garen, Jespen and Scott, 2009). The smelters have a running time up to 40 years but often require technological upgrades. The production is continuous, which makes it critical to have a reliable source of alumina and electricity. Cut in power supply may lead to severe destructions and the smelters are costly to start up. Access to inexpensive power supply and shore proximity are dominant factors in locating primary aluminum smelters as alumina is a commodity-like product with relatively high value-to-weight that makes it cheap to transport.

There are significant economies of scale in modern aluminum smelters. Minimum efficient scale for a modern smelter is 300,000 tonnes per year. Primary aluminum is a commodity quoted on several exchanges, namely the London Metal Exchange (LME), the Tokyo Commodity Exchange (TOCOM), the Shanghai Futures Exchange (SHFE) and the New York Mercantile Exchange (NYMEX). These exchanges are highly transparent and provide direction of the world's aluminum prices. As a consequence independent downstream companies can make arm's length transactions with primary aluminum producers.

The reduced possibility for product differentiation and ways to pass (increased) costs on through to the customer in the up- and midstream part of the value chain, means that the focus is mainly on process improvement that can increase the profitability of operations rather than differentiation (Grimsrud and Kvinge, 2006). Incumbents have historically been eager to backward integrate, upgrade current processing technology and increase the use of secondary aluminum in order to become cost efficient and secure high operating income margins. The primary smelting is fairly technology intensive and primary aluminum production has made significant progress in energy efficiency. Modern production technology uses approximately 25 percent less energy than the average in 1990 (Qatalum, 24.3.11).

In downstream value-adding to the primary aluminum creates possibilities for product differentiation (Grimsrud and Kvinge, 2006). As mentioned this stream can be broken into rolling, extruding and casting. The production of rolling products requires a relatively large investment, offers little degree of product differentiation and is driven by economies of scale. As a consequence there exist a limited number of rolling mills worldwide and these operate with a large capacity. Extruders and casters on the other hand are not driven by economies of scale and offer some degree of product differentiation. There are therefore several small extruders and casters in the world that serve local customers. Most of the extruded and casted products are commodity-like but some are special, high-tech products used in industries such

as aerospace and engineering. The specialized products are often technology intensive and developed in close relation with the end-customer.

The important drivers of profitability for each stream in the Aluminum industry can be broken down as seen in figure 4.11. The demand for primary aluminum is in direct positive correlation with world GDP growth (A.T. Kearney, 2009). This correlation is shown in figure 4.12 for the period 1980 to 2006. A high world GDP growth means high demand for end-products in construction, packaging and other costumer industries. This will increase the demand for primary aluminum, putting upwards pressure on the commodity's price listed at exchanges such as the LME. Next, the prices of bauxite and alumina are affected as the prices of these resources tend to follow primary aluminum's over time (Norsk Hydro, A2010).

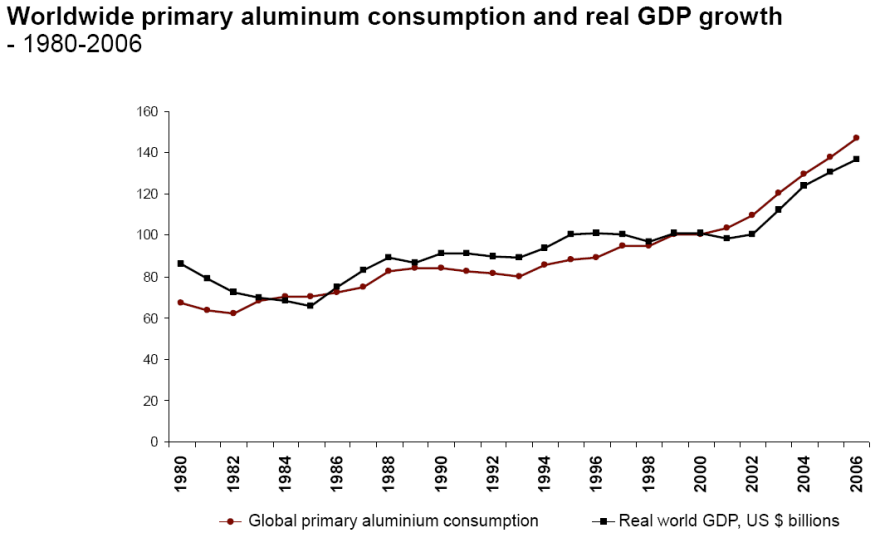


Figure 4.12: Global demand for primary aluminum is in direct positive correlation with world GDP growth (A.T. Kearney, 2009).

Environmental regulations affect the industry. Countries that are part of the Kyoto Protocol are obliged to decrease their pollution emissions. In this way the Aluminum industry in the European region is affected. The EU Emissions Trading Directive established an internal emission trading system in CO_2 emission allowances for the period 2005 – 2012 (Norsk Hydro, A2010). In April 2009, the EU formally approved its "20-20-20" climate change package. The goal is to cut greenhouse gas emissions by 20 %, improve the energy efficiency by 20 % and increase the energy share of renewable energy by 20 %, all within 2020. In order to fulfill these goals there is today a levy on CO_2 that have increased the price on electricity in the European region. As aluminium is a globally traded commodity the European-based

companies are not able to pass the levy, nearly $^1/_3$ of the electricity price[8], through to the customer. The Norwegian Aluminum industry is affected through the EØS. Countries like the US, Australia, Japan, China and Qatar among others are not part of the Kyoto Protocol.

The rivalry is intense in the up/midstream part of the Aluminum industry. In order to stay competitive companies strive to reduce operation costs as there is no product differentiation. This has driven up the concentration in up/midstream as incumbents seek economies of scale and resource control in order to minimize costs. At the same time the incumbents are getting their positions threatened by a rapidly smelting capacity expansion in the Middle-East, China and India. However, the operating margins are higher than expected by the Merger Endgame mainly due to a strong demand for primary aluminum in 2006 and 2010 that offset the rivalry.

The companies specialized in downstream offer smaller operating margins than those in up- and midstream due to lower concentration. The reason is that it is easier for newcomers to access the market as the required start-up capital is lower. As a result the segment has many small companies that are relatively equal in size. The rivalry is to some extent offset by the possibility for product differentiation and greater diversity in manufacturing and processing.

DETERMINANTS OF SUPPLIER POWER

The main reason for the consolidation seems, in line with the Merger Endgame's logic, to be driven by economies of scale. Another reason is the need to control and secure resources.

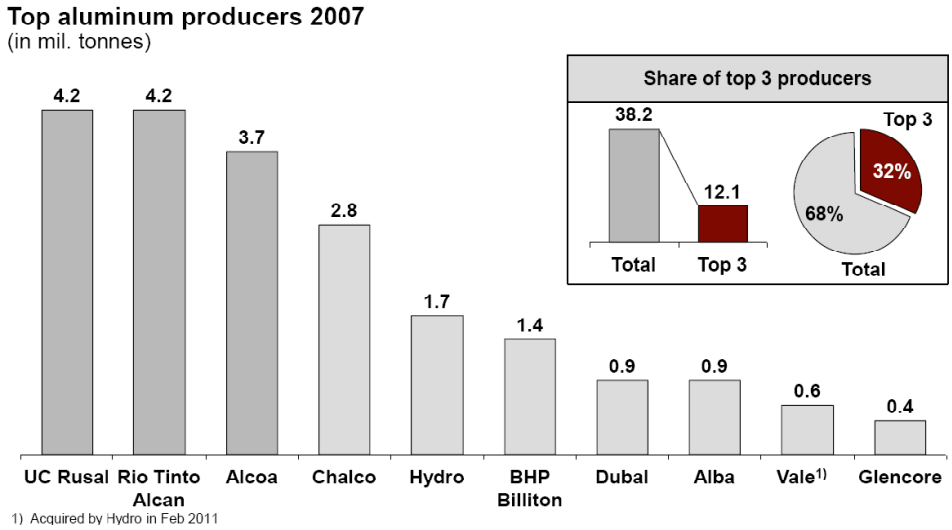


Figure 4.13: Top ten producers of primary aluminum in 2007 (A.T. Kearney, 2009).

[8] *Interviews Norsk Hydro, 31.3.11*

In 2007 ten companies produced 54 % of the world's primary aluminum, as shown in figure 4.13 (A.T. Kearney, 2009). The top three, Rio Tinto Alcan, Chalco and UC Rusal, accounted for 32 %. The same year 72 % of bauxite was directly processed by integrated aluminum manufactures, while only 28 % was traded freely. The fully integrated companies Rio Tinto Alcan, BHP Billiton, UC Rusal, Alcoa Inc, BHP Billiton, Chalco and Norsk Hydro accounted for nearly 60 % of the world's output of bauxite in 2007 (Garen, Jespen and Scott, 2009). The top two, Rio Tinto Alcan and Alcoa, by themselves accounted for more than 30 %.

The three largest producers of primary aluminum, Rio Tinto Alcan, Alcoa and UC Rusal, accounted for around 46 % of world output of alumina in 2007 (Garen, Jespen and Scott, 2009). The top six, which also includes BHP Billiton, Chalco and Norsk Hydro, accounted for almost 64 % of the world's total.

It has not been much change between the producers of primary aluminum since 2007. In 2009 the nine companies produced 53 % of the world's primary aluminum, as shown in figure 4.14 (Norsk Hydro, 2010). The top three, Rio Tinto Alcan, Chalco and UC Rusal, accounted for 31 % of the total, one percent less than in 2007.

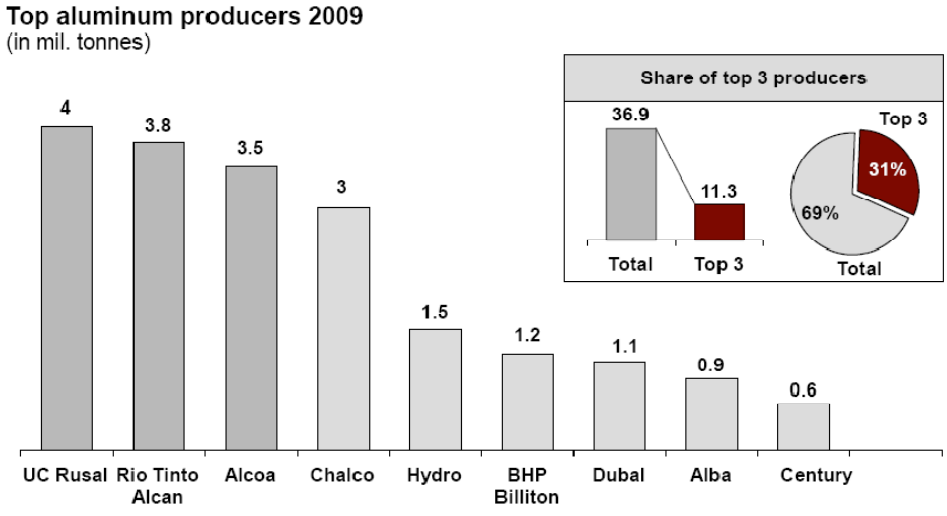


Figure 4.14: Top nine producers of primary aluminum in 2009 (Norsk Hydro, 2011).

The large, fully integrated companies have invested heavily in up- and downstream and manage every aspect of the value chain. As a consequence the largest producers of bauxite and alumina are also the largest producers of primary aluminum. This major backward integration has reduced the supplier power in the industry for the incumbents.

The primary aluminum smelters rely on a stable supply of energy. About 30 % of the required energy is on average generated in own power plants (A.T. Kearney, 2007). The remaining energy is normally traded on medium to long term contracts in the marketplace. The Nordic countries have had a common Nordic electricity market since the late 1990's (Norsk Hydro, A2010). In countries like China and India the energy sector is highly regulated and the government is the only supplier in the market. Since energy stands for a significant part of the cost structure, price changes can have a drastic effect on the profitability of operations.

In general the supplier power is moderate in up/midstream but severe for specialized smelters that are not backward integrated. It is more modest in downstream as companies can make arm's length transactions with primary aluminum producers through commodity exchanges.

THREAT OF SUBSTITUTES

Aluminum faces the threat of several substitutes. Steel is a substitute in the automobile and construction sector (US Geo Surevy, 2000). Copper is a substitute within the power sector and in electrical applications due to higher conductivity. Composites, wood and steel are substitutes in construction, while glass, plastics, paper and steel are substitutes in packaging.

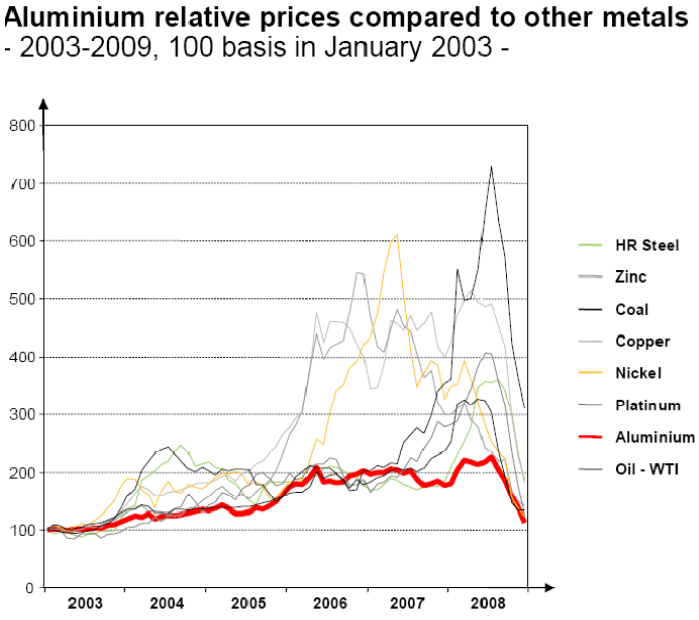


Figure 4.15: The relative price of aluminum (A.T. Kearney, 2009).

Social and environmental factors have played an important role for the increase of aluminum demand. Aluminum is highly recyclable and therefore considered environmental friendly. However, it also offers other characteristics. In the automotive industry for instance, cars can

become more fuel efficient because aluminum is lighter than steel. It is estimated that a ten percent reduction of car weight corresponds to a nine percent increase of fuel consumption efficiency (The US Aluminum Association, 24.3.11).

Aluminum is in general a diverse metal with properties like high strength-to-weight ratio, recyclable, durability, high corrosion-resistance and relatively low cost as seen in figure 4.15 (A.T. Kearney, 2009), making the threat of substitutes seem weak in the industry.

THREAT OF NEW ENTRANTS

Favorable operating income margins and a growing demand for aluminum have lead to a worldwide smelting capacity expansion. Emerging economies like China and India are driving the growth in demand and have opened up for local newcomers. Figure 4.16 and 4.17 show their GDP growth (TradingEconomies, 10.2.11). At the same time specialized Middle-East based smelters like Dubal and Alba are becoming major producers in the world.

Figure 4.16: India's GDP growth rate (TradingEconomies, 10.2.11).

Figure 4.17: China's GDP growth rate (TradingEconomies, 10.2.11).

The industry is affected by political factors. Companies like Chalco in China, Dubal in Dubai and Alba in Askar are fully or partly owned by the government and are in many cases granted

favors, such as subsidies and favorable tariff agreements (Garen, Jespen and Scott, 2009). The goal is to create national champions.

In China the costs of building new smelting capacity are low by world standards due to cheap labor and bauxite reserves (Garen, Jespen and Scott, 2009). However, the growth in economic activity and the Chinese households' real income are straining the nation's capacity to satisfy all the competing demands for electricity. The power is therefore not cheap by world standards and the electricity costs in primary smelting are 45 % compared to the world's average of 31 % (steelguru, 16.3.11). Figure 4.18 shows the country's high average power costs. Tightening in power supply by the government will most likely make China a net importer the following years if several smelters are not upgraded (UC Rusal, 1.4.11).

India is self-sufficient with raw material and has one of the largest reserves of bauxite in the world, as shown in table 4.1. Raw material account for 35 % of the cost structure of primary aluminum production compared to the global average of 45 % (Garen, Jespen and Scott, 2009). In general the energy costs are high compared to other producers. Nonetheless, National Aluminum Company (Nalco) and Hindalco operate their own power plants and have one of the lowest production costs in the world, making them highly globally competitive.

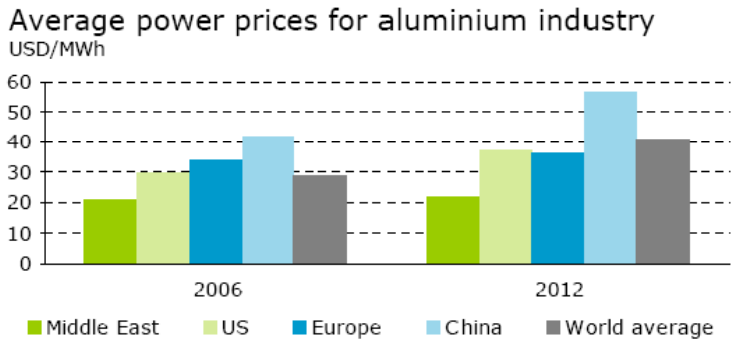


Figure 4.18: Average power prices for the Aluminum industry (Norsk Hydro, 1.4.11).

In the period 2006 – 2010 small caps that are specialized in downstream from emerging markets have gained market shares. India is a good example with companies like United Anodisers NV**,** Sudal Industries Ltd**,** Sacheta Metals Ltd**,** Nirav Commercials Ltd**,** Manaksia Ltd**,** Maan Aluminum Ltd**,** Gujarat Foils Ltd and Enkei Castalloy Ltd. Gujarat Foils Ltd is the biggest grower with an almost 99 % CAGR of adjusted market cap between 2006 and 2010. The high growth can be explained by relatively low barriers of entry in the sense of moderate capital requirements, a high underlying demand, superior understanding of local culture and

ways of doing business, along with political initiative in the form of for example high duty on imported downstream products from China (Garen, Jespen and Scott, 2009).

The specialized Middle-East based smelters like Dubal and Alba have access to cheap energy sources but rely on import of labor and raw material (Garen, Jespen and Scott, 2009). The Middle East's power price advantage is shown in figure 4.18.

The threat of newcomers seems immense in up/midstream. As the technology applied in alumina refining and smelting is well known and fairly standard it will always be the risk of overcapacity driven by low cost producers. Several smelters in high cost countries may become unprofitable due to oversupply if the demand growth cannot keep up. However, this threat is somewhat offset by the fact that the largest primary aluminum producers control most of the bauxite/alumina resources. As a consequence many of the specialized smelters will rely on the major companies in the industry in order to further expand their capacity. The threat of newcomers is also immense in downstream due to relatively low barriers of entry.

DETERMINANTS OF BUYER POWER

The CR_3 estimates show that up/midstream is highly concentrated but the ability to control the supply side of primary aluminum still seems limited due to new entrants. The concentration level is lower in downstream and this part of the value chain is expected to continue to deconsolidate. The general implication of this is that the ability to control the demand side for companies in downstream will become reduced in the future. As a result the buyer power for the companies involved in up/midstream may become weaker over time.

An indirect part of buyer power is speculation. The price of primary aluminum is highly volatile, as shown in figure 4.19 (A.T. Kearney, 2009). It is mainly driven by fundamentals but trading by financial investors in the derivative markets can have a significant influence on price developments in the short and medium term, occasionally in contradiction with developments in the physical market (Norsk Hydro, 2010). According to Norsk Hydro's annual report for 2010 this may have been the case in 2009 and 2010.

Another indirect part of buyer power is hedging. The high price volatility implies that companies in up/midstream must be prepared for periods with low revenues. In the Aluminum industry several tactics are used in order to secure a predictable revenue stream. BHP Billiton and Rio Tinto Alcan apply diversity in operations and mine a variety of different metals and ores around the world (Garen, Jespen and Scott, 2009). This reduces the financial risk but also

enables the companies to take advantage of economies of scope and create synergies. Others, like Norsk Hydro and Hindalco, stabilize their cash flow by operating both in up/midstream and downstream. Norsk Hydro also applies one year forward contracts on primary aluminum (Norsk Hydro, A2010). Another risk is currency movements. Aluminum is normally priced in U.S. dollars so currency movements can have a significant impact on short-term profitability.

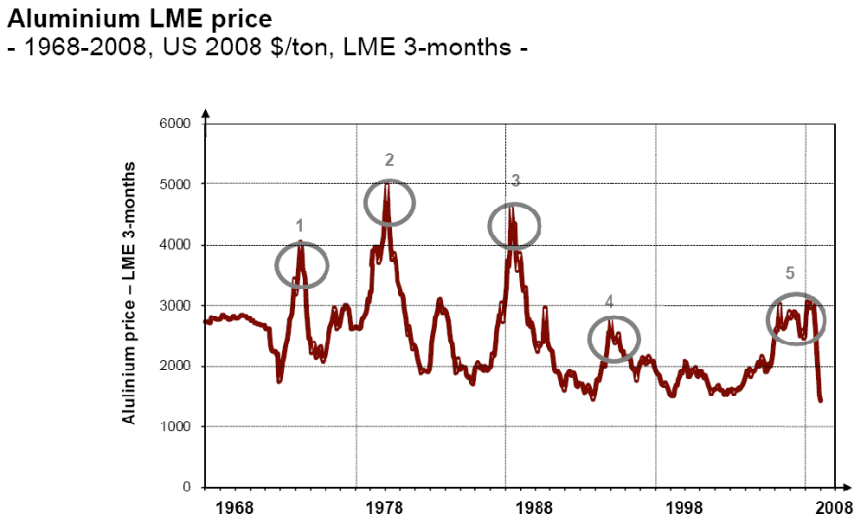


Figure 4.19: LME 3-months aluminum price in USD/tonne from 1968 to 2008 (A.T. Kearney, 2009).

The relative concentration between companies in downstream and their customers is less important because downstream companies have the possibility to create customer lock-ins by product differentiation. By doing so it becomes possible to pass increased costs through to the customers. Nonetheless, backward integration is common in this part of the value chain. Toyota for instance, is resmelting and casting in-house (Garen, Jespen and Scott, 2009).

Companies in downstream are in general less profitable than those in up/midstream but tend to have less fluctuation in prices (Kumar, 2009). The financial risk is still present however. Novelis, one of USA's largest downstream companies, had entered into fixed-price long-term contracts with four major companies in the beginning of 2005. During the year the raw materials prices rose sharply and Novelis started losing money on those deals.

In general the buyer power is moderate for up/midstream. It can potentially become weaker for companies in downstream as customer lock-ins is possible by product differentiation. However, backward-integration is a severe threat in this part of the value chain.

4.1.6.2 Summary and overview of industry trends

The Porter's five forces analysis shows that the Aluminum industry is an attractive industry. The value created is mainly shared among the rivals and little is leaked to the other forces. In up/midstream the rivalry is intense due to little product differentiation but is considerably offset by the growing demand for primary aluminum. In downstream the rivalry is to some degree offset by the possibility for product differentiation. As a consequence the operating margins in the Aluminum industry are higher than anticipated by the Merger Endgame.

Nonetheless, there are severe threats for the industry's future profitability. The largest threat is that the growing demand for primary aluminum and high operating margins will motivate newcomers to continue to rapidly expanding their capacity and finally trigger worldwide oversupply. The Porter's five forces analysis is summarized in figure 4.20.

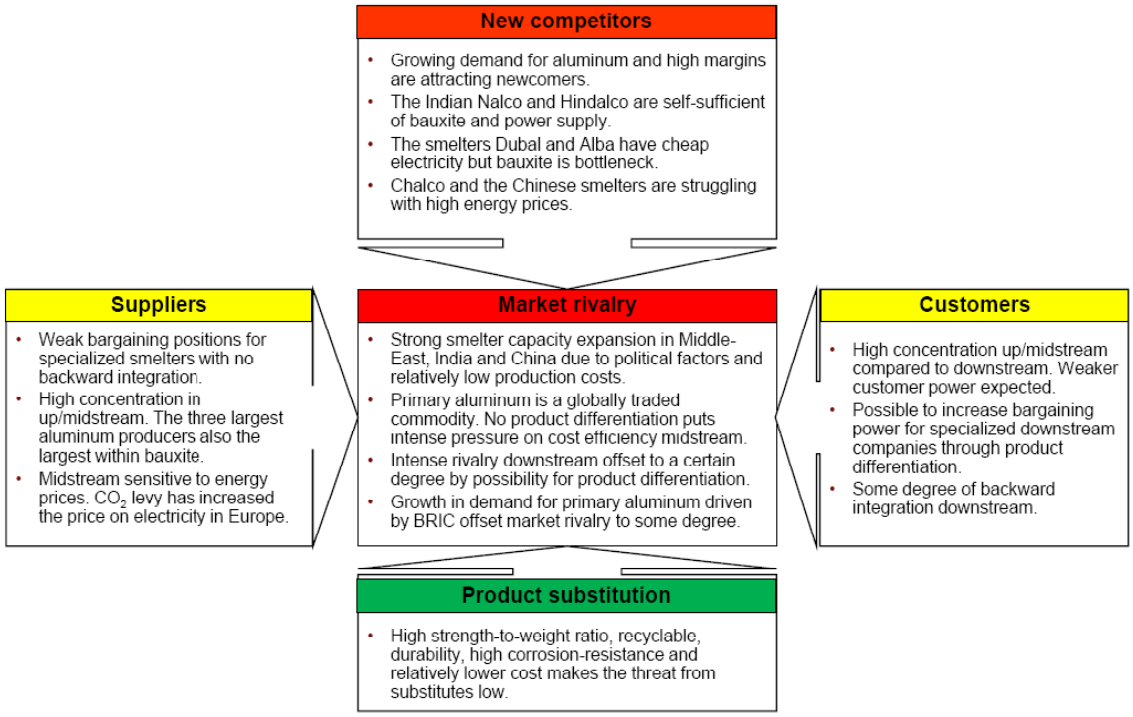


Figure 4.20: Porter's five forces in the Aluminum industry.

The Aluminum industry has now passed the Focus Stage where the focus has been less on scale and more on internal finesse. Several fully integrated companies have diminished their presence downstream during this stage. The main reason is that the production of primary aluminum and product development in downstream require different skills, making it difficult

to compete in both business areas at the same time. The advantages of a full integration are also minimal because primary aluminum is a commodity traded worldwide.

The Merger Endgame reveals that up/midstream is entering the Balance and Alliance Stage where cooperation and joint ventures will be increasingly important. This tendency is already reflected in Norsk Hydro's operations where currently six of twelve primary smelters are based on joint ventures. The Merger Endgame reveals that downstream is showing a negative consolidation direction. The reasons are newcomers, spin-offs from incumbents and a limited degree of scale-sensitivity within most of the downstream segments. It is expected that the continuing deconsolidation in this part of the value chain will increase the rivalry over time.

Company (Nation)	**Cost of production (USD/tonne)**
Kaiser (US)	1,315
Hydro (Norway)	1,305
VAW (Germany)	1,298
Alcoa (US)	1,251
Pechinery (France)	1,200
Comalco (Australia)	1,200
Reynolds (US)	1,188
Alumax (US)	1,176
Alcan (Canada)	1,113
Hindalco (India)	1,060
Alusaf (S.Africa)	1,026
Nalco (India)	900
World Average	1,249

Table 4.2: Comparable cost of aluminum production in 2006 (India Infoline, 22.3.11).

A trend in the industry is the shift away from high cost countries in continental Europe and the US to the Middle-East, India, Iceland and some parts of Africa, Asia and South America (Norsk Hydro, A2010). Table 4.2 shows comparable cost of primary aluminum production in 2006 for some major companies in the industry. Producers from USA, Norway and Germany are among the most expensive, measured in USD/tonnes, while India and South Africa are represented with the lowest costs (India Infoline, 22.3.11). In December 2009 the European Aluminum Association stated that approximately 66 % of the aluminum producers in Europe will be shut down due to the constant increasing electricity prices (Euopean Aluminum Association, 24.3.11). This equals a primary aluminum capacity of two million tonnes.

The outlooks for primary aluminum are positive. The market anticipates a price increase as 27-months futures for primary aluminum are traded 150 USD/tonne above the current spot price at 2,600 (LME, 24.3.11). The futures price for primary aluminum is shown in figure

4.21. Norsk Hydro expects the demand for primary aluminum to grow nearly 7 % outside China to 24.3 tonnes and around 10 % in China to 16.8 million in 2011 (Norsk Hydro, Press release Feb 2011). The company believes the market will be in a manageable surplus globally.

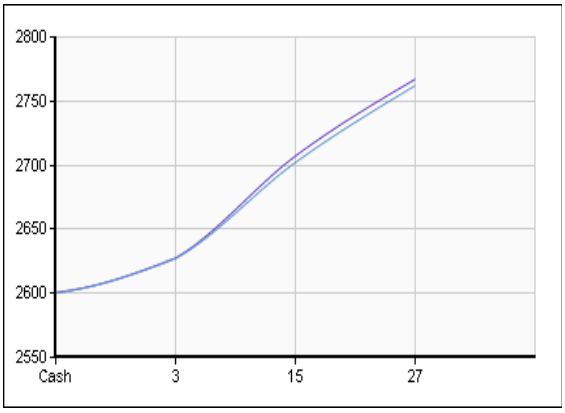


Figure 4.21: Future on primary aluminum measured in USD/tonne (LME, 24.3.11).

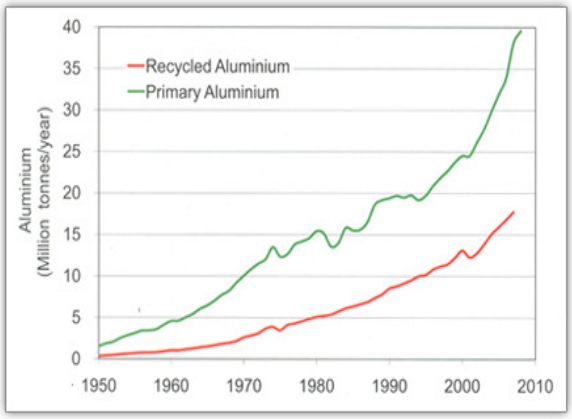


Figure 4.22: Consumption of recycled and primary aluminum (Aluminum Association of India, 24.3.11).

In a longer perspective it is forecasted that the primary aluminum demand will increase nearly 76 % to 70 million tonnes from 2010 to 2020 (Norsk Hydro, Press release Feb 2011). Moreover, the demand for secondary aluminum is anticipated to continue to grow due to environmental, operational and social factors (A.T. Kearney, 2009). Figure 4.22 shows the production of primary and secondary aluminum the last 50 years.

Brazil, Russia, India and China have contributed over a third of world GDP growth the past ten years (Goldman Sachs, 2010). Estimates show that the BRIC-countries will continue to grow and contribute with approximately 45 % of world GDP the next decade. China's share is 30 %, while the remaining countries have approximately 5 % each. The growth will mainly be driven by a rapidly emerging middle class that is increasing its consumption.

4.1.7 Presentation of Norsk Hydro

In this section Norsk Hydro is first presented and then assessed in the light of the outside-in analysis and the Merger Endgame framework.

PRESENTATION

Norsk Hydro is listed on Oslo Stock Exchange under the ticker NHY (Norsk Hydro, A2010). It was founded in 1905 and is headquartered in Oslo, Norway. It employs 23,000 people and operates in more than 40 countries on all continents. Svein Richard Brandtzæg has been the

CEO since 2009. As of April 4 2011 the Norwegian government's Ministry of Trade has a 46 % ownership interest.

In the end of 2010 the company had total assets worth 16.15 billion financed with 65 % equity. At 28.4.11 the company has a trailing price-to-book ratio (P/B) of 1.67.

LATEST DEVELOPMENT

Norsk Hydro has restructured its operations during the last ten years. The agricultural division was in 2004 demerged into the independent company Yara International, listed on the Oslo Stock Exchange. In 2007 the oil and gas division was merged with Statoil. From being a diversified company with stakes in oil and gas, fish, agriculture and magnesium, Norsk Hydro's current focus is limited to the aluminum value chain and energy.

In recent years Norsk Hydro has shut down parts of its primary aluminum smelting capacity in Europe. Between 2004 and 2005 the energy price rose 16 % in the EU and 6.7 % in Norway (Grimsrud and Kvinge, 2006). The average price for the Aluminum industry in 2005 was 0.107 USD/kWh in EU and 0.0287 in Norway. As Norsk Hydro did not manage to renew its long-term energy contracts it was in 2006 forced to shut down two smelters in Germany, Stade and Hamburger Aluminium Werk (Norsk Hydro, 29.3.11).

Stricter government emission policies launched in 2000 led to the closing of production lines using Søderberg technology in 2003. This affected the plants at Høyanger, Årdal and Sunndal. Only Sunndal got the production lines replaced with the improved prebaked technology in 2004. The Søderberg line at Karmøy was upgraded and did meet the government's emission requirements but was later shut down in 2009 due to high costs.

Norsk Hydro has reduced its exposure in downstream. Late in 2009 the Automotive division at Raufoss was given away to the German company Benteler with a loss of 44.55 million (Norsk Hydro, 29.3.11). In 2012 the extrusion plant at Karmøy will be phased out, while operations at the extrusion plants at Magnor and Raufoss are strengthened.

Norsk Hydro's reduction in downstream has been met with heavy investments in up/midstream abroad. In 2010 Norsk Hydro launched Qatalum in Qatar, one of the largest and most cost-efficient aluminum plants in the world, with a capacity of 585,000 tonnes of primary aluminum in the first phase (Norsk Hydro, 29.3.11). The infrastructure has been designed to allow for an expansion up to 1.2 million. The plant is a joint venture with Qatar Petroleum that ensures a stable supply of electricity with a dedicated gas power plant with an

installed capacity of 1,350 MW. Qatalum will mainly serve Asia and the US but can potentially also serve Europe (Interview Norsk Hydro, 31.2.11).

In February 2011 Norsk Hydro acquired Vale SA's aluminum operations in Brazil for 4.9 billion. The deal involved control of Paragominas, the world's third largest bauxite mine. It has currently a capacity of 7.5 million tonnes bauxite but the goal is to produce 10 million during 2011. The deal also involved a 91% ownership in the world's largest alumina refinery, Alunorte, along with 51% of the Albra's aluminum plant and 81% of the CAP alumina refinery project. The Alunorte refinery has a capacity of 6.3 million tonnes alumina. The CAP project has currently a capacity of 1.9 million tonnes alumina but can be expanded to 7.4 million. Albra has a capacity of 560,000 tonnes primary aluminum. Norsk Hydro intends to sell the bauxite/alumina not used in its own primary aluminum production to the market place (Interview Norsk Hydro, 31.2.11).

The last ten years of restructuring and strong operational focus in order to stay competitive is in line with what is expected in the Merger Endgame's Focus Stage.

RECENT PERFORMANCE

Norsk Hydro's recent performance is shown in figure 4.23 (Netfonds, 9.4.11). The company has experienced declining revenues from 2006 to 2009. Turmoil in the world economy led to a weak demand for primary aluminum that affected Norsk Hydro's profitability negatively.

Figure 4.23: Market performance 17.9.97 – 9.4.11 in NOK (Netfonds, 9.4.11).

As stated earlier Norsk Hydro has underperformed in the period 2006 to 2010 compared to the industry overall. The average operating income margin for companies not specialized in downstream was 35.8 % in 2006 and 11.9 % in 2010. Norsk Hydro's corresponding operating

margins were 29.5 % and 4.3 %. The net income margins in the same period were 9.7 % and 2.8 %. Norsk Hydro's revenues, EBIT and earnings are shown in figure 4.24.

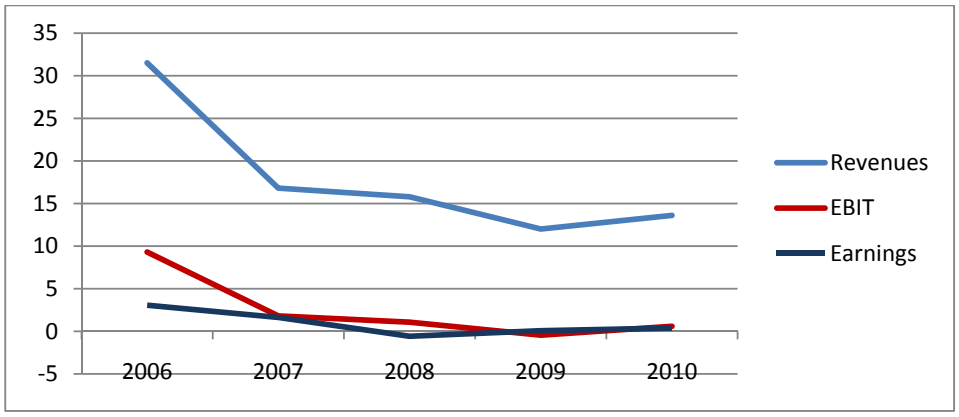


Figure 4.24: Performance 2006 – 2010 in billions (Norsk Hydro, A2010).

DEBT SITUATION

Norsk Hydro current credit ratings are BBB by S&P and Baa2 by Moody's with positive outlooks. These evaluations imply that the bonds issued are investment grade.

At the end of 2010 Norsk Hydro had interest-bearing non-current liabilities of 2.97 billion (15,706 million NOK) and interest-bearing current liabilities of 3.0 billion (15,836 million NOK). It also had 2.07 billion (10,929 million NOK) in cash and cash equivalents. This gives a net interest-bearing debt of 3.9 billion (20,613 NOK). The book value of equity excluded minority interest in the end of 2010 was 10.63 billion (56,221 million NOK). This gives a gearing of 36.7 %. Norsk Hydro's long term goal is to keep the gearing below 40 %. The acquisition of Vale in 2011 was done by equity and will reduce the gearing. As of December 2010 Norsk Hydro has no outstanding bonds.

OPERATIONS AND ASSETS

In 2010 68 % of the capital employed was related to primary aluminum, 15 % in rolled products, 11 % in extruded products and 6 % in energy (Norsk Hydro, A2010). The capital employed is shown in figure 4.25.

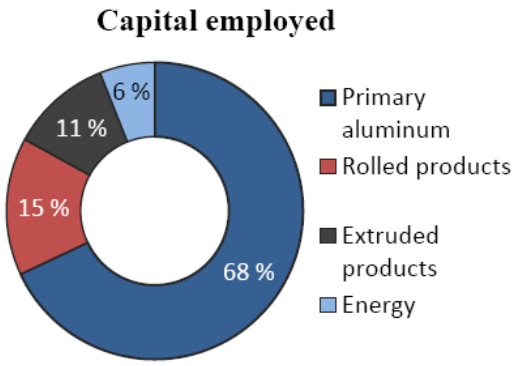


Figure 4.25: Capital employed (Norsk Hydro, A2010).

Primary aluminum: Norsk Hydro produced primary aluminum at 11 wholly or partly

owned primary aluminum plants in 2010. These include the Norwegian plant in Sunndal, which is the largest and most modern primary smelter in Europe, and the new 50 percent owned Qatalum. Norsk Hydro's primary smelters are shown in table 4.3.

In 2010 Norsk Hydro covered approximately 50 % of the energy consumption of the wholly owned Norwegian smelters by their own hydropower production. The remainder was mainly covered by external supply contracts with Statkraft that expire in 2020. Norsk Hydro also has a power contract with the Swedish company Vattenfall for the supply of close to 18 TWh over an eight-year period starting in 2013. This will cover 85 % of Søral's power need until the end of 2020. Energy for the remaining smelters is covered with medium- to long-term contracts with the exception of the German smelter Neuss, which is covered in the short-term market.

Plant	**Country**	**Capacity (000' tonnes)**	**Ownership (%)**	**Power contract expires**
Karmøy	Norway	120	100	2020
Årdal	Norway	190	100	2020
Sunndal	Norway	390	100	2020
Høyanger	Norway	60	100	2020
Søral	Norway	90	49.9	2012
Slovalco	Slovakia	165	55.3	2013
Neuss	Germany	235	100	Short-term
Kurri Kurri	Australia	180	100	2017
Tomago	Australia	65	12.4	-
Qatalum	Qatar	500*	50	Self-sufficient
Alouette	Canada	115	20	-
Albras	Brazil	460	51	Self-sufficient
Total (weighted)		1,827		

*500 in 2011 and then 585 from 2012. Potentially 1.2 million.

Table 4.3: Hydro's primary aluminum smelters (Norsk Hydro, A2010).

Metal market: Norsk Hydro has stand alone resmelters in Luxembourg, the UK, Germany, Spain, France, Taiwan and two in the US, along with casthouses integrated in their primary metal plants. It has return agreements for scrap from customers and other third-parties. The secondary aluminum is sold to external producers or shipped to own downstream production.

Rolled products: Norsk Hydro produces rolled products at five rolling mills located in Europe and one in Malaysia. In 2010 more than half of the European production was produced in the Grevenbroich mill, which is the largest and one of the most modern and efficient rolling operations in the world. More than half of the metal processed was sourced internally. The

full overview of Norsk Hydro's rolling mills is shown in table 4.4. Several sales offices support this function in Europe, Brazil, the US, Malaysia and Singapore.

Plant	Country	Capacity (000' tonnes)	Ownership (%)
Grevenbroich	Germany	650	50
Hamburg	Germany	180	100
Slim	Italy	95	100
Karmøy	Norway	95	100
Holmestrand	Norway	83	100
AISB	Malaysia	30	81
Total (weighted)		802	

Table 4.4: Hydro's rolling mills (Norsk Hydro, A2010).

Extruded products: The producers of extruded products are organized into three geographical business sectors: Extrusion Eurasia, Extrusion North America and Extrusion South America. Extrusion Eurasia operates 19 extrusion plants in 11 countries in Europe and eight sites dedicated to fabrication activities. As of the end of 2010, this sector employs around 3,300. Extrusion North America operates eight plants in North America and employs around 1,325. Extrusion South America is the third-largest extruder in South America with plants in Argentina and Brazil. The sector employs 400.

Norsk Hydro operates within Precision Tubing in extruded products and is a global provider of heat transfer applications with eight manufacturing facilities located in Belgium, Brazil, China, Denmark, Germany, Mexico, the UK and the US. Extruded products also include Building System under the brands Technal, Wicona and Domal/Alumafel. As of the end of 2010, this sector employs 2,850 in 140 locations in Europe, three in Asia and two in the Americas, including sales, distribution and service.

Energy: Norsk Hydro operates 17 hydroelectric power plants in Norway, with a total installed capacity of 1,762 MW. They are located in three main areas, Telemark, Sogn and Røldal-Suldal, and managed from Rjukan in Telemark. The capacity is planned to be expanded by 54 MW within year 2015. In addition to sourcing power to cover approximately 50 % of the yearly demand of the Norwegian aluminum operations, Norsk Hydro sells energy to former petrochemicals industry and about one TWh of electricity to local communities. The company also has minority shares in two solar energy companies, NorSun and Ascent Sun.

Norsk Hydro's value chain is loosely connected with internal transactions of resources. The price of primary aluminum at the LME for instance, is used as a reference point between

midstream and downstream transactions to secure internal competition and profitability. It seems natural that bauxite and alumina are integrated the same way after the acquisition of Vale's assets. However, the prices of bauxite and alumina are not listed on any commodity exchange like the LME and the prices are therefore not worldwide transparent.

PROFITABILITY OF OPERATIONS

Revenues and operating income margins by operations are shown in figure 4.26 and 4.27.

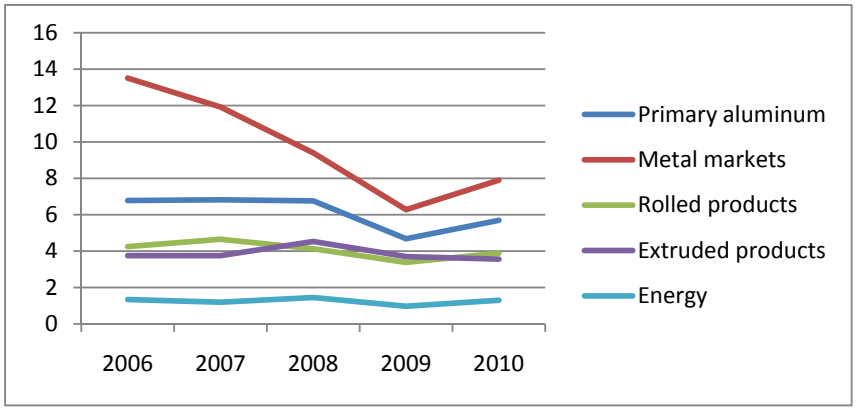


Figure 4.26: Revenues in billion USD by operations (Norsk Hydro, A2006-2010).

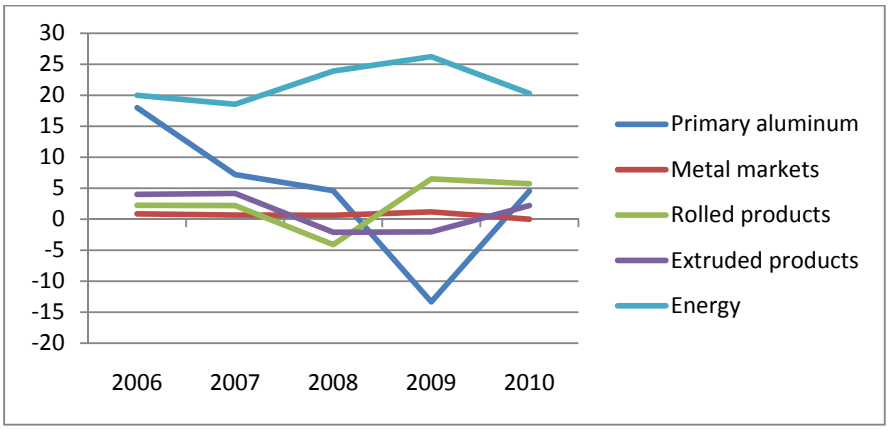


Figure 4.27: Operating income margins in percent by operations (Norsk Hydro, A2006-2010).

The primary aluminum segment offers high but volatile operating income margins, while downstream offers lower but less volatile margins. Presence in both up/midstream and downstream stabilizes the cash flow. Energy shows strong margins and can be used to hedge against periods with low primary aluminum prices (and high energy prices in Norway).

OPERATING REVENUES BY REGION

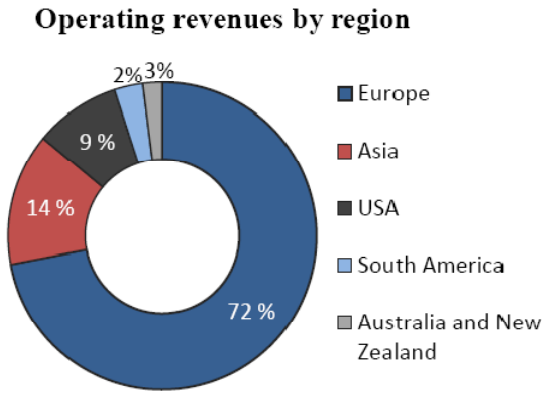


Figure 4.28: Hydro's operating revenues FY2010 by region (Norsk Hydro, A2010).

Norsk Hydro's major customer base is found in Europe. This region made up 72 % of the operating revenues in 2010, as shown in figure 4.28. Asia represented 14 %, USA 9 %, South America 3 %, and Australia and New Zealand 2 %.

MARKET POSITION AND COMPETITIVE STRATEGY

In 2010 Norsk Hydro was the fifth largest producer of primary aluminum in the world. The company invests heavy in R&D with the goal of increasing its operating margins and is currently a leader in the utilization of electrolysis technology in primary aluminum smelters (Interviews Norsk Hydro, 31.3.11).

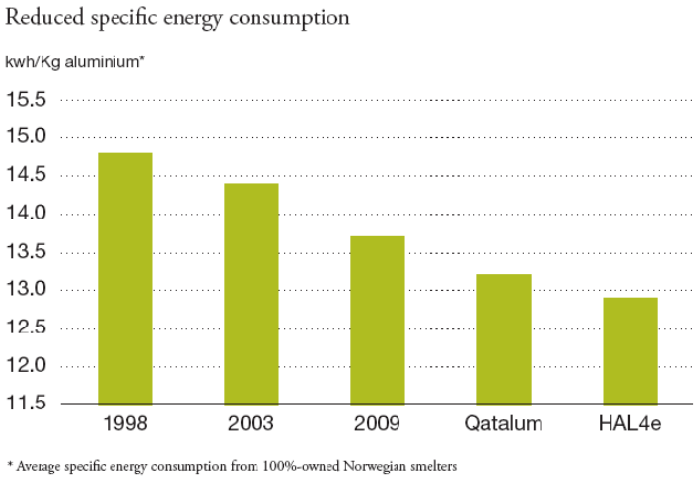


Figure 4.29: Reduced energy consumption in kwh/Kg aluminum (Norsk Hydro, A2009).

The average energy consumption in the wholly owned primary smelters has been reduced from nearly 14.9 kwh/Kg in 1998 to 13.7 in 2009 due to the installment of the prebake technology (Norsk Hydro, A2009). Qatalum operates close to 13.2 kwh/Kg, while the goal is 12.9 with the next generation technology, HAL4e. The development is shown in figure 4.29.

Norsk Hydro's primary smelters are today close to the industry's average cost level or slightly above this level (Interviews Norsk Hydro, 31.3.11).[9] A low primary aluminum price forced Norsk Hydro to reduce its production at several primary smelters during 2009. This was the case for Sunndal and Søral in Norway, Slovalco in Slovakia and Neuss in Germany. Neuss reduced its production with 78 %, from 235,000 to 50,000 tonnes. The total reduction in 2009 amounted to 248,000 tonnes and the capacity was kept idle for all these smelters during 2010, with the exception of Slovalco that was re-opened.

Qatalum in Qatar plays an important role in Norsk Hydro's primary smelter portfolio and has secured the company an important foothold in the Asian market. This primary smelter along with two more in Australia are already supplying the Chinese market and gaining market shares (Interviews Norsk Hydro, 31.3.11). Qatalum can compete with the Chinese primary smelters and secure a sustainable operating income margin.

Norsk Hydro is one of the leaders in resmelting (Norsk Hydro, A2010). Normally half of the company's total sales of metal each year come from secondary aluminum. It relies on long term agreements with its customer and other third-parties to secure a steady supply of input.

Market sector	**Shipment**	**Key characteristic**	**Important customers**
Lithography	19 %	Leading supplier globally	Kodak, FujiFilm and AGFA
Packaging and Building	43 %	Strong position within high value-added foil and the liquid packaging market.	TetraPark, Ball, Rexam and Crown (Packaging)
Heat-Exchanger, Automotive and General Engineering	38 %	Largest supplier within Heat-Exchanger and second largest supplier within Automotive in Europe.	Beht, Denso and Modine (Heat Exchanger). BMW and Daimler (Automotive)

Table 4.5: Norsk Hydro rolled products data (Norsk Hydro, A2010).

Norsk Hydro is the largest producer of rolled products in Europe with a market share of 19 %. Approximately 75 % of the revenues come from this region. It serves a broad specter of market sectors: Lithography, Packaging and Building, Automotive, Heat Exchanger and General Engineering. Norsk Hydro competes on cost effectiveness provided by economies of scale and strives for product differentiation through high value added products. It holds leading global positions within products such as aseptic foil, heat exchanger and sheet for printing plates. The latter market is characterized by high customer quality requirements. Key points regarding rolled products are shown in table 4.5.

[9] *Norsk Hydro does not share exact numbers regarding their primary smelters' competiveness.*

Norsk Hydro is a global supplier within extruded products and serves mainly Europe and North-America. It also has an extruder in South-America that is the third-largest in the region. Norsk Hydro operating in the following sectors: Building and Construction, Transportation and Consumer Goods and Other. As the business segment offers no economies of scale Norsk Hydro's extruder facilities are small in size and located near the customer. Norsk Hydro secures product differentiation through high quality, close customer relationships and tailored solutions that meets individual needs. It is a leader in environmental friendly building solutions and has a strong position in precision tubing used in heat transfer in the automotive industry. Key points regarding extruded products are shown in table 4.6.

Market sector	**Shipment**	**Key characteristic**	**Important customers**
Building and Construction	50 %	Leading on environmental friendly building solutions	Own brands
Transportation	33 %	Strong position in precision tubing used in heat transfer	Volkswagen, Denso, BMW, Delphi, TI and Valeo.
Consumer Goods and Other	17 %	Mostly tailored	-

Table 4.6: Norsk Hydro extruded products data (Norsk Hydro, A2010).

Norsk Hydro is ranked second in terms of electric power generation in Norway after Statkraft. It has long-term energy contracts provided by the government that expire in 2020, except for Sørdal's contract that expires in 2012. Since the signing of these agreements the energy prices in Europe have risen due to the CO_2 levy. About $^1/_3$ of the energy price at Nord Pool is a result of the levy (Interviews Norsk Hydro, 31.3.11). The contract with Vattenfall to secure energy supply to the smelter in Søral from 2012 to 2020 is affected by the levy and is thus more expensive than the other contracts. Norsk Hydro claims the company can no longer invest in Norway or the rest of Europe if the government does not compensate for the CO_2 levy when the contracts expire in 2020 (Økonomisk rapport, 31.3.11).

4.1.8 The Merger Endgame's impact on Norsk Hydro

Norsk Hydro is an underperformer in the highly concentrated Aluminum industry. The up/midstream part of the industry is entering the Balance and Alliance Stage while the competition is expected to increase downstream. The opportunities and threats implied by the Merger Endgame framework are listed in the SWOT in figure 4.30.

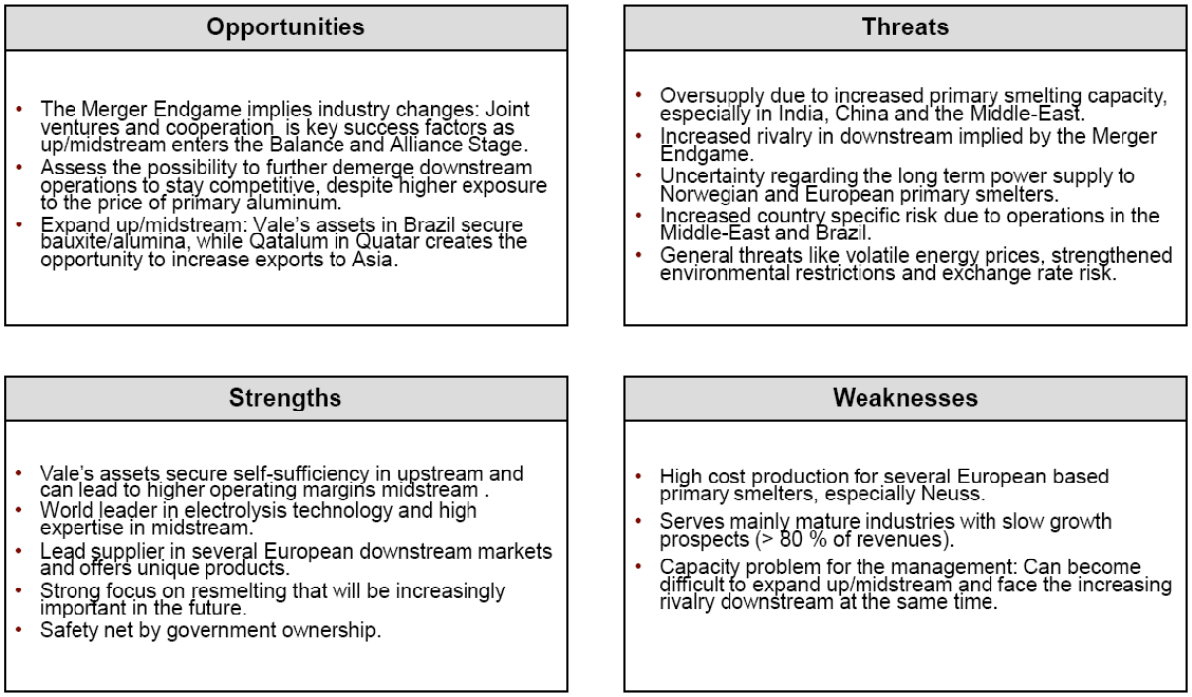


Figure 4.30: Norsk Hydro's SWOT.

The ability to enter joint ventures will be increasingly important in up/midstream as the industry enters the Balance and Alliance Stage and the fundamentals of the industry change. Norsk Hydro is well positioned to benefit from this development being an attractive partner in upcoming joint ventures with global presence, backward integration with large reserves of resources, global leader in electrolysis technology, project management experience and strong focus on resmelting that will be increasingly important in the future. The company also has a history of joint ventures. Currently six of twelve primary smelters are joint ventures.

In the Balance and Alliance Stage backward integration and resource control will become important. Norsk Hydro is well positioned in upstream and will become one of the few major suppliers of bauxite/alumina in the world with the integration and expansion of Vale's assets in Brazil. Bauxite/alumina have no transparent worldwide prices and the high concentration in upstream with few suppliers compared to buyers implies that Norsk Hydro will have the

upper-hand in a bargaining position. The backward integration will generate growth in sales revenues from bauxite/alumina and might increase operating margins in midstream.

Porter's five forces reveal the threat of new entrants, especially in midstream. This is in line with the Merger Endgame that anticipates a deconsolidation during the Balance and Alliance Stage. Thus, Norsk Hydro must continue to focus on cost structure in order to stay globally competitive. The uncertainties regarding the future development of power regimes in Norway and EU are forcing Norsk Hydro to operate the German primary smelter Neuss on short-term energy contacts only (Interviews Norsk Hydro, 31.3.11). The high energy prices make it less cost efficient than Karmøy Søderberg that was shut down in 2009 and currently 78 % of the capacity is idle. The operating costs of the primary smelter Neuss is shown in figure 4.31.

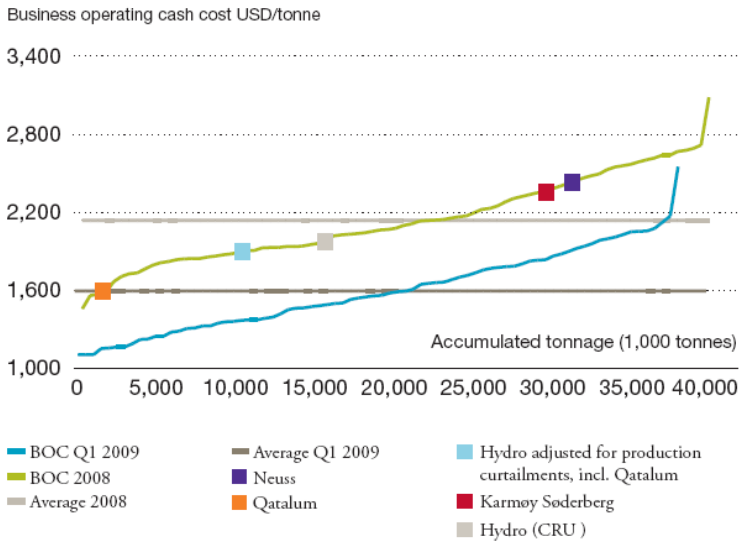


Figure 4.31: Operating costs of selected primary smelters (Norsk Hydro, A2008).

EU will present guidance for how each country can indirectly or directly compensate for the CO_2 levy in order to prevent carbon leakage in 2013 (Interviews Norsk Hydro, 31.3.11). The situation in Germany is special as the power prices are high compared to the rest of the world, even with compensation for the CO_2 levy. With the rapidly expansion of primary aluminum capacity by low-cost producers in India, China and the Middle-East the Neuss smelter will most likely struggle to compete and stay idle over long periods due to unprofitability. The best strategic option seems to be to replace the primary smelter with low energy-intensive resmelters and shipping from Qatalum or other primary smelters located in Norway.

The production in Norway will most likely continue. Some uncertainty remains regarding the expiration of the Norwegian primary smelters' power contracts in 2020 but the Norwegian government is currently agreeing on following EU's directions in 2013 and compensate for the CO_2 levy (Interviews Norsk Hydro, 31.3.11). This compensation will maintain the Norwegian smelters' global competiveness. The Norwegian government is also a major stockholder that will strive to keep production in Norway. Altogether, the future of primary production in Norway looks promising despite some degree of uncertainty.

Porter's five forces reveal intense rivalry downstream and the Merger Endgame shows a deconsolidation that may increase this rivalry in the future. Norsk Hydro has a strong position within rolled products in Europe and is positioned for further growth in emerging markets within extruded products (Interviews Norsk Hydro, 31.3.11). It has penetrated China and Brazil with unique, high-end extruded products and brands within construction and automotive. The resmelter in Taiwan secures a steady supply of extrusion ingots to Chinese extruders, keeping the operation costs low. The company's strategy in downstream is organic growth and the most efficient way to expand in the emerging markets is by leveraging on excising customers in Europe and the US that have operations abroad. It is in general difficult to predict how the increased rivalry will affect Norsk Hydro's current positions downstream.

Norsk Hydro has demerged and sold several downstream operations. It now has the option to demerge downstream operations further. Operations in up/midstream and downstream do not create any operational synergies and the only benefit by having downstream integrated is that it stabilizes the cash flow. The question is if the CEO can build top performers within almost unrelated business areas that rely on different skills. Rajan, Servaes and Zingales (2002) show that resources in conglomerates tend to move from profitable to less profitable divisions. The result is a suboptimal use of resources that reduces the value of the company. Norsk Hydro's value chain however, is loosely connected with internal transactions of resources. The price of primary aluminum at the LME for instance, is used as a reference point between midstream and downstream transactions. This solution is healthy for the profitability and reduces the likelihood of a suboptimal use of resources. However, it also undermines the benefits of a fully integrated value chain as downstream functions must pay the same as the competitors.

A more severe threat is the combination of Norsk Hydro's large expansion in up/midstream and the expected increased rivalry in downstream that will require quicker response to market changes by the management in both business areas. This is in line with Penrose (1959) who

considers the growth of the firm as limited only in the long-run by its internal management resources. This was the case for Norsk Hydro in 2002 when the management was forced to decline a relatively attractive investment in a primary smelter on Iceland due to the acquisition of the German Aluminum company VAW and other projects (Grimsrud and Kvinge, 2006). In the perspective of the stockholders the company will utilize its resources better by demerging downstream operations into independent units that respond quicker to market changes. The stockholders can hold shares in the downstream spin-offs in order to hedge against the more volatile cash flow from operations that is expected.

From the perspective of the management the attractiveness of the solution may differ. According to Jensen (1986) managers have incentive to cause their firms to grow beyond optimal size. The reasons are increased power and the fact that compensation is positively correlated to growth in sales. In the case of spin-offs Norsk Hydro's CEO will have his power decreased. However, if the CEO's compensation is related to the stock market he will have increased incentive to act in the interest of the stockholders (Hillier, Grinblatt and Titman, 2008). In 2010 the CEO at Norsk Hydro had a base salary of 5.65 million NOK (Norsk Hydro, A2010). His maximum annual bonus potential is 50 % of the base salary based on operative goals. No bonus was paid to the CEO in 2010. From 2011 30 % of the CEO's annual base salary after tax must be invested in Norsk Hydro's shares given the present year had a positive EBIT result. As the shares must be held for at least three years this latter compensation agreement creates a degree of long term incentives for the CEO. In general however, it is difficult to predict if these incentives are strong enough to make the CEO acknowledge a potential demerger that will reduce his power and influence over the company.

Norsk Hydro serves mainly mature industries with slow growth prospects. The little geographical diversity was crucial during the economic downturn in the late 2000's as the GDP growth fell in Europe and US. This is one of the reasons why the company underperformed in the period 2006 – 2010. The recent restructuring of operations to Brazil and Qatar will lead to a more stable cash flow. Norsk Hydro is also well positioned to assess value creation opportunities in many of the emerging markets and thereby stabilizing the cash flow further. However, this expansion abroad has increased the overall country risk for the company as operations in Brazil and Qatar are considerably more risky than those in Norway and Europe. This implies a higher required return on equity by the stockholders and a higher weighted average cost of capital for Norsk Hydro. This cost is not explicit and might lead to conflicts between stockholder and management in the pursuit of growth.

4.1.9 Conclusion and strategic overview

The Merger Endgame implies that up/midstream is entering the Balance and Alliance Stage while downstream is deconsolidating. This has several implications for Norsk Hydro.

Norsk Hydro has invested heavily up/midstream and is well positioned to face the change implied by the Merger Endgame. The company is considered a strong potential partner in upcoming joint ventures and can benefit from this when up/midstream enters the Balance and Alliance Stage where cooperation becomes increasingly important. However, the Merger Endgame's expected deconsolidation during this stage implies that the rapidly primary aluminum capacity expansion now witnessed in low cost countries may continue. In order to stay globally competitive Norsk Hydro should phase out the costly primary smelter Neuss.

In the perspective of the stockholders the combination of Norsk Hydro's large expansion in up/midstream and an expected increase in rivalry downstream makes it highly uncertain if the management has the capacity to build top-performs within these two business areas which rely on different skills. The greatest value creation opportunity is therefore to further demerge downstream operations into independent units that respond quicker to market changes and is better suited to face the increased competition. This change can become controversial as the managements' incentives might not coincide with the stockholders' in this case.

Norsk Hydro's expansion in unstable countries implies a higher average weighted cost of capital as the country specific risk increases. This cost is not explicit and might lead to conflict between stockholder and management in the pursuit of growth in Asia and South-America. Strategic markets will continue to be Europe and the US but Qatalum will make Asia and especially China an important part of the future's revenues. In Asia and South-America downstream growth can be achieved by product differentiation and leverage on existing customer relations. This holds especially true for extruded products.

4.2 The Paper industry

The Paper industry belongs to the sector Paper & Paper Products. It is a global industry that consists of several listed and non-listed companies. The largest paper producers are multinational with production facilities around the world.

4.2.1 Product characteristics

Paper is a thin, versatile material attracted from fibers in wood (Norske Skog, A2010). It is mainly used for writing upon, printing or for packaging. Paper is recyclable. The fibers can typically be recycled five to seven times before they become too short to be recycled again.

4.2.2 Applications

There are more than 5,000 products made from paper and papermaking by-products that serve a wide range of different consumer industries (A.T. Kearney, 2007). The major business segments are fine paper, packaging and household goods. Fine paper involves paper for writing and printing, newsprint for newspapers, magazines, books and special paper. Packaging involves paperboard that is used to protect consumer and industrial goods. Examples of household goods are toilet paper, tissues and birthday cards.

4.2.3 Value chain breakdown

The Paper industry's value chain can be structured as shown in figure 4.32.

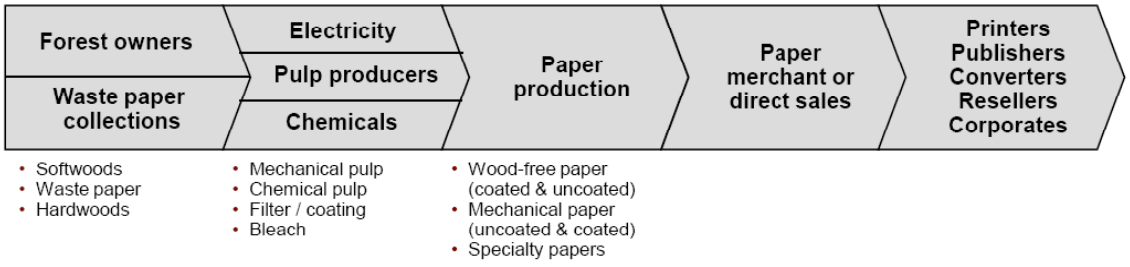


Figure 4.32: The Paper industry's value chain (A.T. Kearney, 2007).

In the first phase of paper production hard- and softwood from the forest owners or wasted paper are collected (A.T. Kearney, 2007). Softwoods have longs fibers and are suited for rough products, while hardwoods have short fibers and are suited for products with a smooth surface. Many products are a blend between both hard and soft wood.

In the second phase pulp is made in pulp mills. The cellulose fibers in the wood or wasted paper are separated from each other through either a mechanical or a chemical pulping process. These pulp methods are not substitutes but complements in papermaking.

The most common type of chemical pulping is the Kraft process. This process consists of a high temperature chemical bath with strong bases (like alkaline solutions) and sodium sulfide that dissolve the material. The method produces pulp with strong fibers and a wide range of fiber sources can be used, for example all types of wood and some non-wood species like

bamboo and kenaf. In this method less than 50 % of the tree is used. The pulp can be bleached with chlorine compounds, depending on the end-product's requirements.

Traditional mechanical pulping involves physically shredding trees into pulp with grind stones. New mechanical pulping methods are more efficient. In thermomechanical pulping the wood chips are squeezed between two revolving disks under high temperature and pressure, while chemi-thermomechanical pulping uses mild chemicals which increase pulp brightness and reduce shive content. Mechanical pulping uses about 90 % of the tree but the pulp has weak fibers that tend to discolor over time. It can be bleached but not to a great extent.

Wasted paper is turned into deinked pulp in a deinking process where printing inks and other unwanted elements are removed by chemicals.

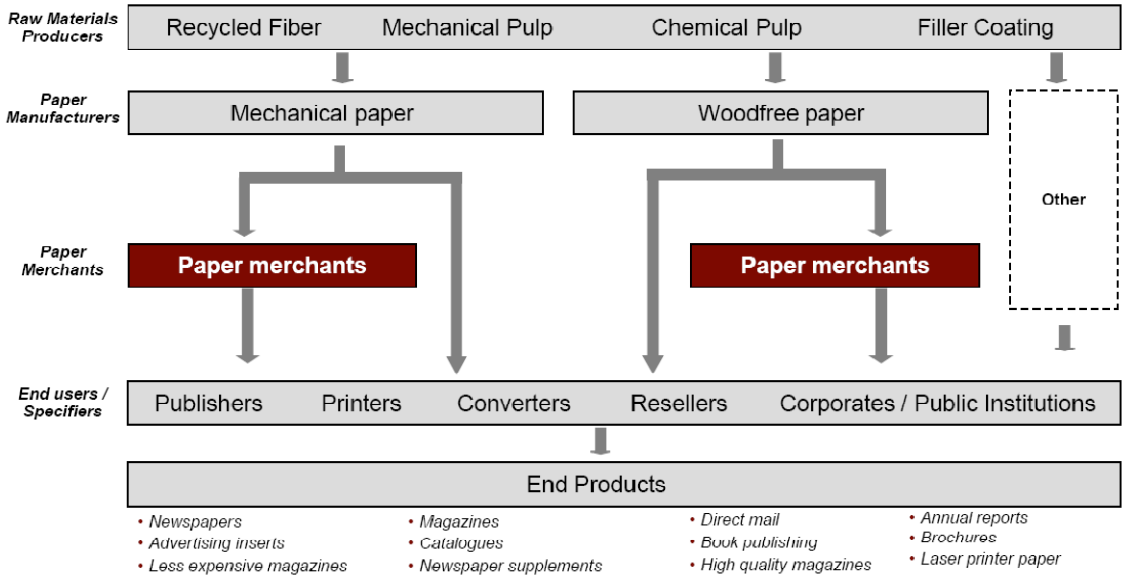


Figure 4.33: The making of paper (A.T. Kearney analysis, 2007).

In the third phase pulp is turned into paper in paper mills. Papermaking consists of preparation, forming, pressing and drying. The most energy intensive processes are preparation and drying. Bleached Kraft pulp is used to make high quality paper where strength, whiteness and resistance to yellowing are important. Mechanical pulp is used to create mechanical paper that relies on high ink absorbency and compressibility.

Wood-free paper has high quality and is mainly made by Kraft pulp. Typical end-products are annual reports, laser print paper, high quality magazines, book publishing, brochures and direct mail advertising. Mechanical paper has lower quality and is mainly made by

mechanical and deinked pulp. Typical end-products are newspapers and newspaper supplements, paper towels, low quality magazines and catalogs. In the process the paper can be coated by a compound to impart certain qualities such as surface gloss, smoothness or reduced ink absorbency. Special paper is made by Kraft pulp and filler coating.

In the fourth phase the paper is sold directly or through paper merchants to printers, publishers, converters, resellers or corporations. The process is summarized in figure 4.33.

4.2.4 Cost drivers

The Paper industry is capital intensive. A modern paper machine with a yearly 300,000 – 500,000 tonnes capacity costs 200 – 500 million to install and takes roughly three years to set up (Thollander and Ottosson, 2007). Production disruptions are also costly.

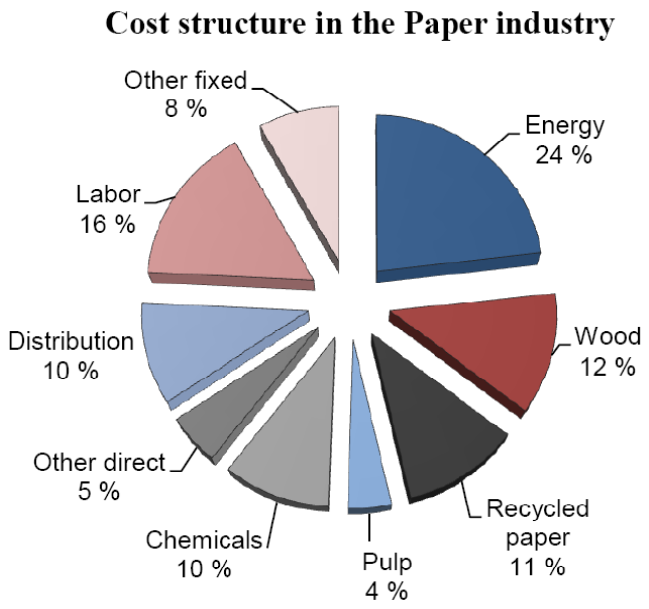


Figure 4.34: Cost structure in the Paper industry (Norske Skog, Seminar report 7.4.11).

A paper producer, like Norske Skog, has around 25 % fixed and 75 % variable costs (Norske Skog, Seminar report 7.4.11). Figure 4.34 shows the cost structure in the production of paper. Key input factors are energy, wood, recovered paper, pulp and chemicals. The remaining costs are distribution, labor and other costs.

The Paper industry is energy intensive and energy contributes with around 24 % of the total production costs. Other significant costs are the pulp bought on the marketplace and the raw material used to make pulp, such as wood, recycled paper and chemicals.

The largest forest areas are found in Russia, Brazil, Cananda, the US, China, Australia, Congo, Indonesia, Peru and India (FAFO report, 2005). These ten countries account for 66 % of the world's total forest area of 3,953 million ha. Further details are shown in figure 4.35.

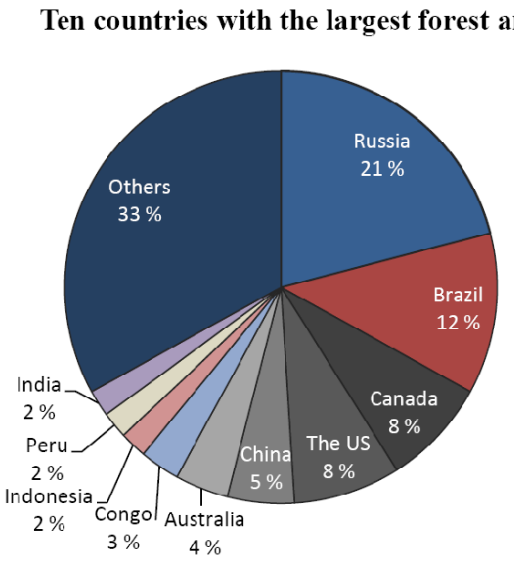


Figure 4.35: Largest forest areas in the world (FAFO report, 2005).

However, there is variation in both energy and wood used in papermaking depending on the pulp used. Chemical pulping uses twice as much wood per tonne than mechanical pulping but is self-sufficient in its energy consumption as half of the wood is dissolved and used as fuel in the chemical recovery phase (Szabo et.al., 2009). Mechanical pulping uses wood very efficiently but at the expense of a much higher electricity consumption. Recovered paper pulping uses only a fraction of the energy compared to the other pulping methods.

There are certain ways to cut costs throughout the value chain. Energy can be produced by chemicals from the Kraft pulping and from waste such as wood and paper from the paper mills (Szabo et.al., 2009). The heat produced by mechanical pulping can be used as drying steam in paper processing.

As wood, pulp and recovered paper have a fairly low value-to-weight production location is determined by access to fiber resources (Barr, 2006). The cost structure depends on processing options, labor wages, energy prices and access to raw material.

4.2.5 Supply and demand by nations

In order to understand the fundamentals of the Paper industry and the most important markets, it is necessary to study the supply and demand of paper in different regions.

North America, Europe and Asia are the largest consumers of paper (Szabo et.al., 2009). In 2004 these regions accounted for more than 90 % of the total paper and paperboard consumption of 360 million tonnes, with almost equal shares amongst them. All together Oceania, Africa and Latin America accounted for less than 8 % this year.

Europe, North-America and Asia's demand for fine paper, excluding packaging and household goods, is shown in figure 4.36. Fine paper has struggled with decreasing demand in Western-Europe and the US the last years, while the demand in Asia and especially in China has increased (UMP, Presentation 10.3.11). In 2010 the world's fine paper capacity was 158 million tonnes, while the demand was 137 million.

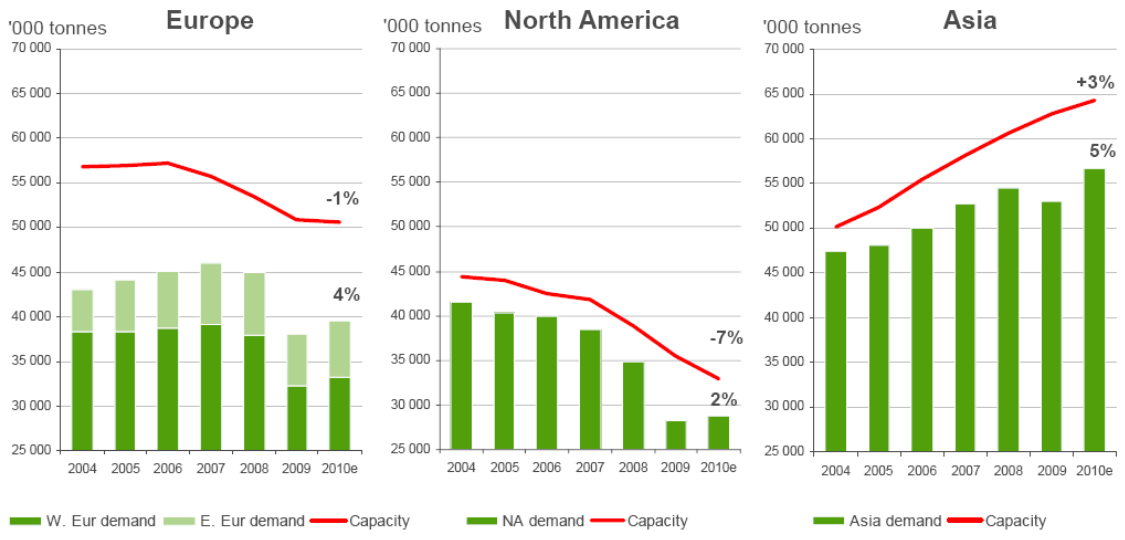


Figure 4.36: Fine paper demand in Europe, North-America and Asia (UMP, Presentation 10.3.11).

Since the 1990's the paper producers in Western Europe have struggled with decreasing demand, overcapacity and unsustainable prices in several product segments (A.T. Kearney, 2007). Figure 4.37 shows the capacity utilization and supply and demand for graphic paper, a segment that includes newsprint, magazine and books, in Western-Europe from 1990 to 2006. The tendency is that newcomers enter the market or paper manufactures invest in new capacity in times of high utilization and prices, thereby triggering a new cycle of oversupply.

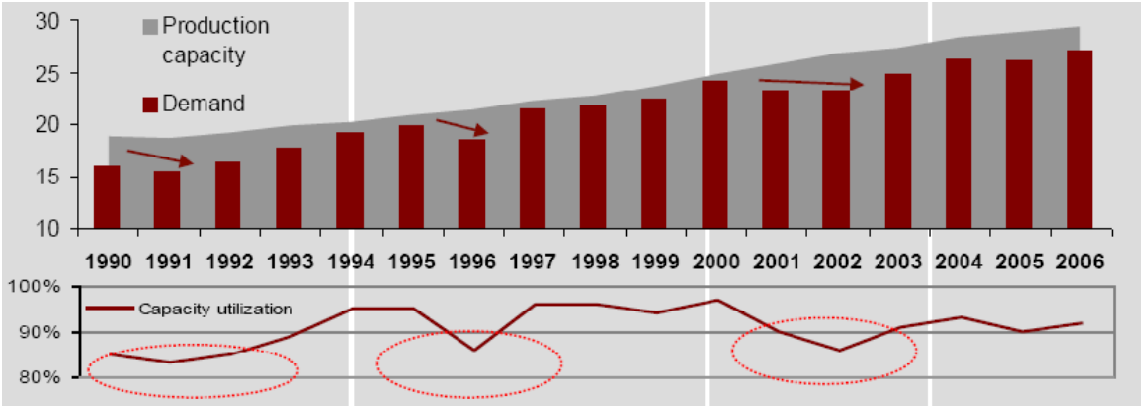


Figure 4.37: Capacity utilization and graphic paper supply and demand in Western-Europe 1990 – 2006 (A.T. Kearney, 2007).

The export of fine paper from America, Europe, Asia & Oceania and Africa are modest compared to the overall production. In 2010 Europe was the world's largest net exporter of fine paper and exported 6.3 million tonnes or 12.6 % of the total production of 50 million (UMP, Presentation 10.3.11). The net export to Asia & Oceania was 3.2 (3.7 – 0.5) in 2010,

down from 3.3 (3.6 – 0.3) in 2006. The net export to America was 1.8 (2.6 – 0.8) in 2010, down from 2.7 (3.4 – 0.7) in 2006. The relatively low export compared to the overall production indicates that the Paper industry has a strong local focus.

4.2.6 The outside-in analysis

The Paper industry is moderately concentrated.[10] The CR_3 was 35.4 % in 2010, up from 33.3 % in 2006. However, for companies such as Norske Skog that are involved in newsprint and magazine paper the concentration is higher. In 2010 the CR_3 was 47 %.

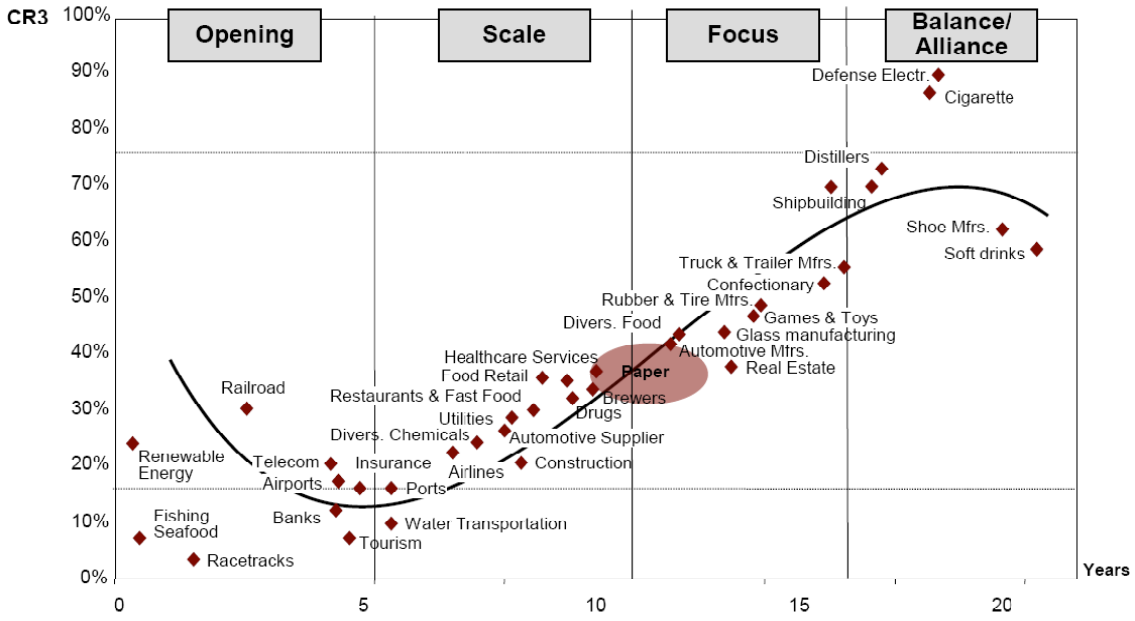


Figure 4.38: The Paper industry plotted on the s-curve.

For several years the dominant strategy within the Paper industry has been to construct large paper mills that are able to utilize economies of scale. In the period 1991 – 2006 the number of mills has been reduced in countries within the Confederation of Europe Paper Industries (CEPI) while the production has increased (A.T. Kearney, 2007). The development of paper mill size from 1991 to 2006 is shown in figure 4.39.

However, since the beginning of the 1990's the Paper industry has struggled with decreasing demand, overcapacity and unsustainable low prices in several product segments. Especially in Europe the low prices have forced companies to focus on internal processes. Several companies have created spin-offs and demerged divisions in order to become more

[10] *An overview of analyzed companies and calculations of the s-curve and CAGR growth portfolio 2006 – 2010 are presented in appendix A.4.*

specialized. Svenska Cellulosa Aktiebolaget (SCA) for instance, has invested heavily in tissue making since 2007 and reduced its position in packaging (SCA, A2007 – 2010). Norske Skog has sold non-newsprint mills, power stations, forest properties and invested nearly 9.3 billion in newsprint from the beginning of 2000 (Norske Skog, A2000 – 2010).

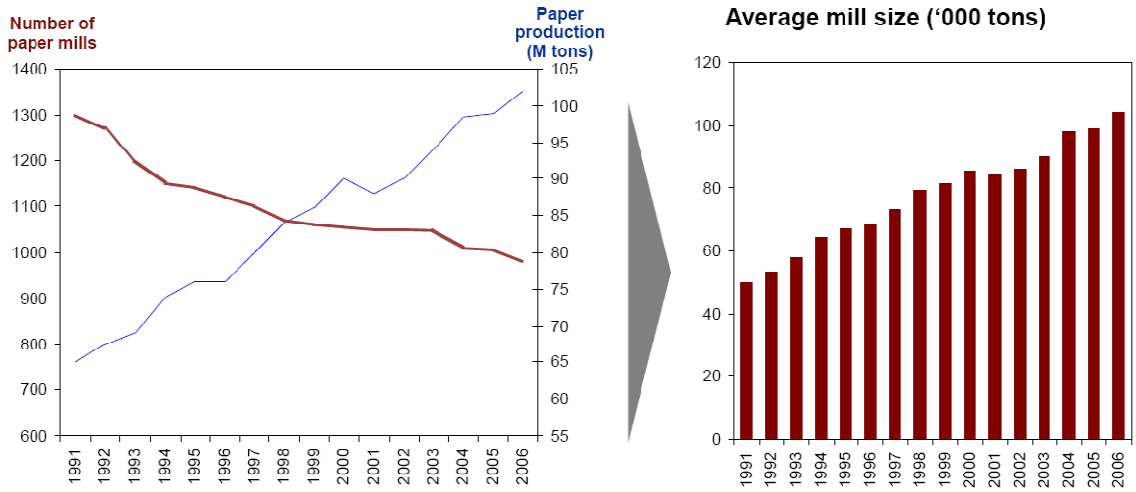


Figure 4.39: Number of paper mills and paper production in CEPI countries (A.T. Kearney, 2007)

The moderate concentration level, positive consolidation direction and increased internal focus indicate that the Paper industry has passed the Merger Endgame's Scale Stage and has now entered the Focus Stage, as shown in figure 4.38.

4.2.6.1 Porter's five forces and PESTEL

The Paper industry is analyzed with Porter's five forces and the PESTEL framework.

RIVALRY AMONG EXISTING FIRMS

There are a variety of business models in the Paper industry. Fully integrated companies such as UPM/Myllykoski and SCA are involved in wood, pulp and paper making, while others are specialized. Norske Skog is specialized in newsprint and magazine paper, CSS in greeting cards, Nordbord in wood products and Fibria Celulose in wood and pulp. A full overview and description of the companies in the Paper industry is presented in appendix A.4.

The performance of the industry from 2006 to 2010 is shown in figure 4.40 and 4.41. In figure 4.40 bubble size is adjusted market cap for 2010, while it is revenues in figure 4.41. The industry's CAGR for adjusted market cap in the period 2006 to 2010 is nearly – 1 %. The value has declined from 294,403 to 282,150 million. The CAGR for revenues is approximately 1.7 %, whereas the value has grown from 165,181 to 176,356 million.

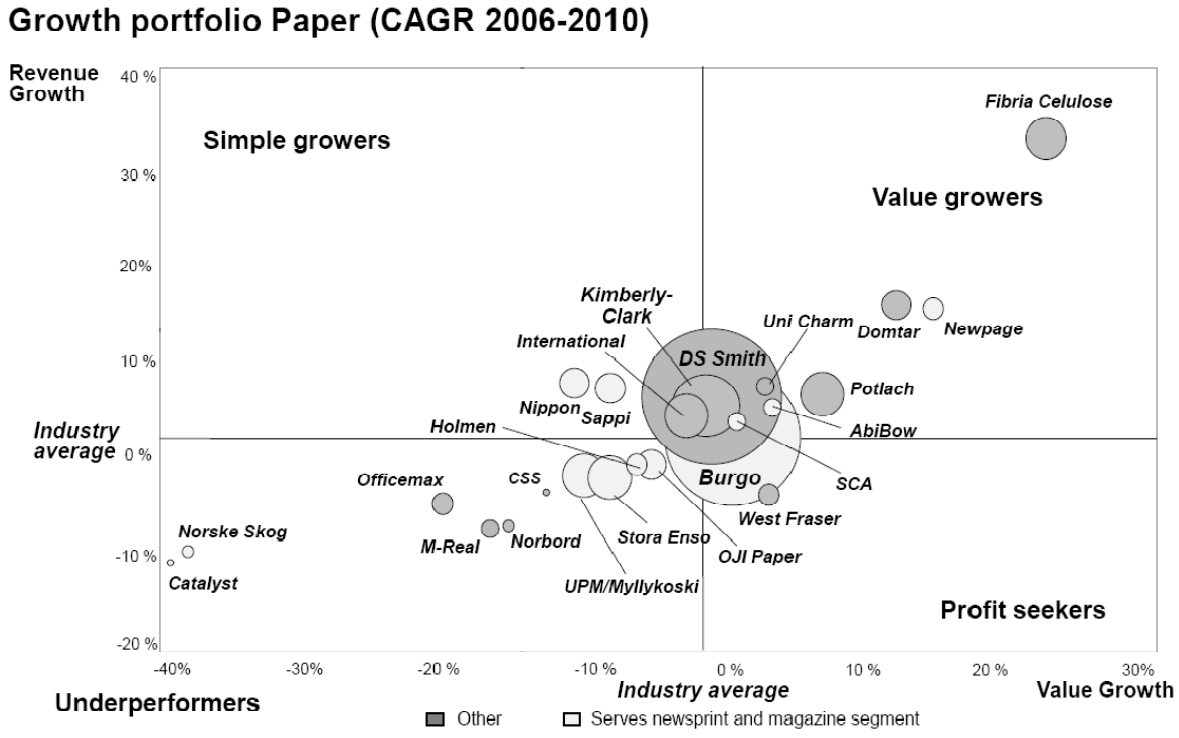


Figure 4.40: Performance in the Paper industry 2006 – 2010. Value growth is CAGR of adjusted market cap 2006-2010. Bubble size is adjusted market cap in 2010.

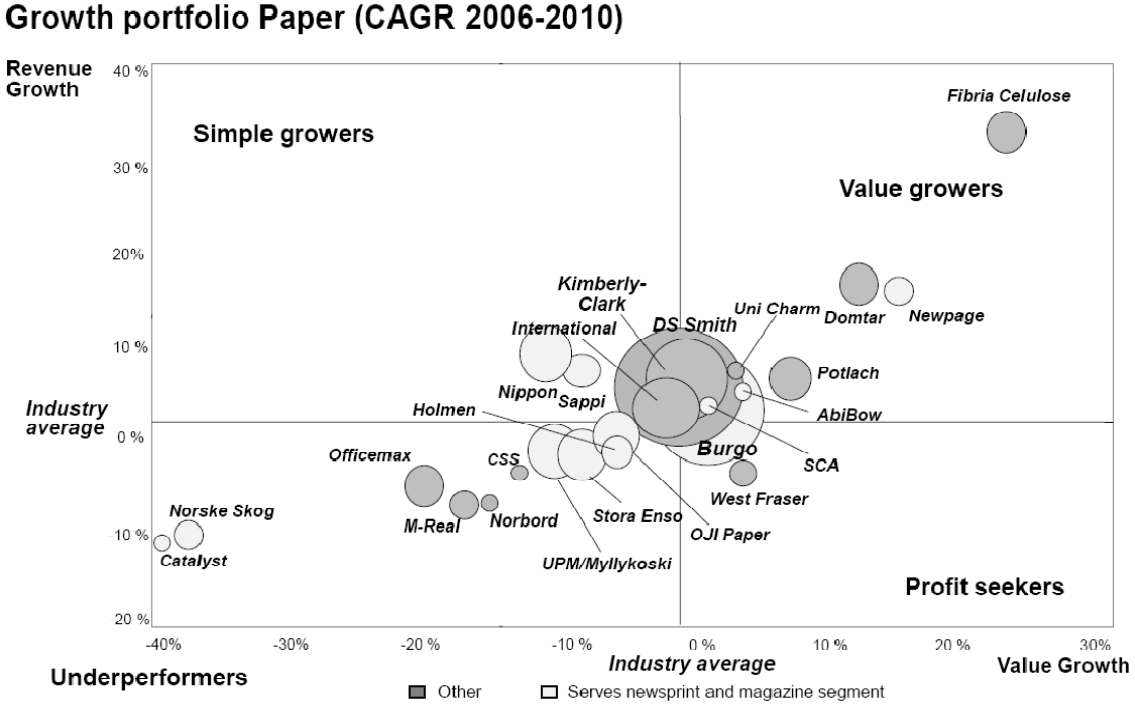


Figure 4.41: Performance in the Paper industry from 2006 – 2010. Value growth is CAGR of adjusted market cap 2006-2010. Bubble size is revenues in 2010.

DS Smith, Burgo and Kimberly-Clark dominate the industry in size. DS Smith is involved in packaging and fine paper for the office. Burgo is involved in magazine paper, fine paper, printing paper and household. Kimberly-Clark is involved in household goods. All three have shown a growth around the industry's average, measured in CAGR, from 2006 to 2010. Among the companies that serve the newsprint and/or magazine segments Newpage, SCA and AbiBow are value growers, Nippon and Sappi are simple growers, and UMP/Myllukoski, Stora Enso, Holmen, OJI Paper, Norske Skog and Catalyst are underperformers. The greatest value grower overall is the Brazilian Fibria Celulose that is specialized in wood and pulp.

The revenue growth in the Focus Stage spans from 0 % to 30 % according to the Merger Endgame research, with an average of 8.8 %. The range in the Paper industry from 2006 to 2010 is – 10.1 % to 32.8 %, with an average close to 1.7 %. The average operating income margin is lower than expected in both in 2006 and 2010. In the Focus Stage the operating margin spans from 3 % to 15 % according to the research, whereas the average operating margin spans from 7 % to 12 %. In 2006 the range was – 16.8 % to 22.7 % for the industry with an average of 5.4 %. In 2010 it was – 33.8 % to 35.4 % with an average of 6.5 %.

Companies that serve the newsprint and/or magazine segments offer lower average operating margins than the industry overall. In 2006 the average operating margin was 1.7 % and in 2010 it was 2.6 %. Catalyst and Norske Skog serve this segment and both showed negative operating margins in 2006 and 2010. Norske Skog owned around 35 % of Catalyst's shares from the beginning of 2000 but sold out in 2005 (Norske Skog, A2006).

Since the 1990's the Paper industry has become global and the competition has increased as a consequence of this change (Norske Skog, Annual meeting 2003). The Paper industry is capital intensive throughout the value chain, from operations within wood, pulp and paper manufacturing. The production technology is based on well known principles and available technology (Szabo et.al., 2009). Nonetheless, there is still focus on innovation that can improve product quality, optimize production efficiency and increase the scale. In the industry it is crucial to have economies of scale. In Scandinavia for instance, newsprint machines narrower than seven meter wide were not considered competitive in 2000. The state of the art machines at the time were ten meters wide with a speed around 1800 m/min.

The companies that operate at the beginning of the value chain in Paper industry deal with commodities like wood and pulp. This means that the chances of passing costs through to the customer or achieving above industry profit by product differentiation are strictly limited. In

the production of paper there is a great diversity of different paper types in terms of quality and user needs. Most of these are, however, commodities that are classified by grades (Conservatree, 26.4.11). The greatest possibilities for product differentiation and customer lock-ins seem to be within household goods and fine paper. CSS for instance, specializes in greeting cards and is capable of achieving product differentiation (Szabo et.al., 2009).

The increased competition and limited possibilities for product differentiation have put pressure on production costs. Most of the European paper manufactures have started operations in South-America, Australia, Tasmania and New Zealand (Norske Skog, Annual meeting 2003). The reason is that the wood in these regions can be harvested after 20 years, while it takes 90 – 100 years in Russia, Scandinavia and Canada. The use of recovered paper in paper production has also increased in order to reduce costs.

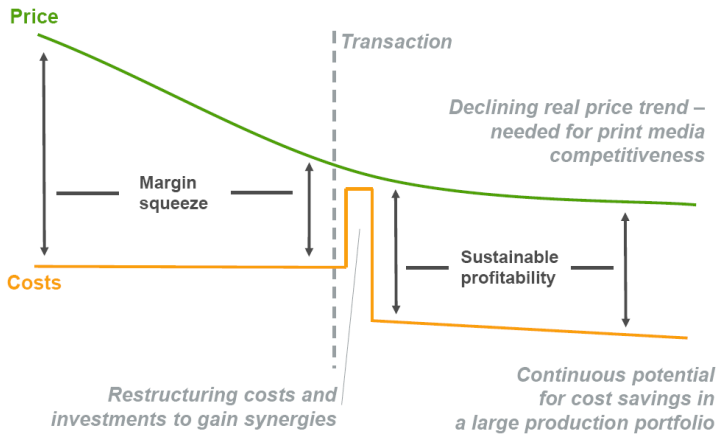


Figure 4.42: UPM's acquisition of Myllykoski (UMP, Presentation 10.3.11).

The Paper industry is known to be highly cyclical (Szabo et.al., 2009). The analysis of the industry reveals that most of the companies that have performed close to average are not specialized but involved in several aspects of the value chain. On the other hand, the largest underperformers Norske Skog and Catalyst, and the largest value grower Fibria Celulose, are all specialized. Norske Skog and Catalyst mainly serve the newsprint and magazine paper segments that have been struggling with falling demand from 2006 to 2010, while Fibria Celulose produces pulp that has experienced a price increase in the period.

There has been a strong focus on scale in the industry from the early 1990's, as stated in figure 4.39. However, in recent years there have been examples of acquisitions in order to control the supply side in the industry. When UPM acquired Myllykoski for 900 million EUR in December 2010, the market cap of Norske Skog increased by 7.4 % due to a sign of

possible decrease on the supply side of newsprint and magazine paper (DN, 26.4.11). UMP however explains the acquisition by annual synergy benefits exceeding 100 million EUR from 2012 onwards that will mainly come from cost reduction and improved efficiency (UMP, Presentation 10.3.11). Figure 4.42 shows the logic behind the acquisition.

The rivalry is intense in the Paper industry due to overcapacity within several segments in mature markets and strictly limited possibilities for above industry average profits by product differentiation. The result is lower operating margins than expected by the Merger Endgame.

DETERMINANTS OF SUPPLIER POWER

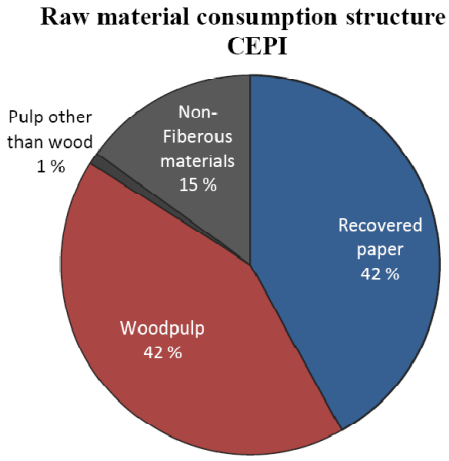


Figure 4.43: Raw material consumption structure in CEPI (CEPI stats, 26.4.11)

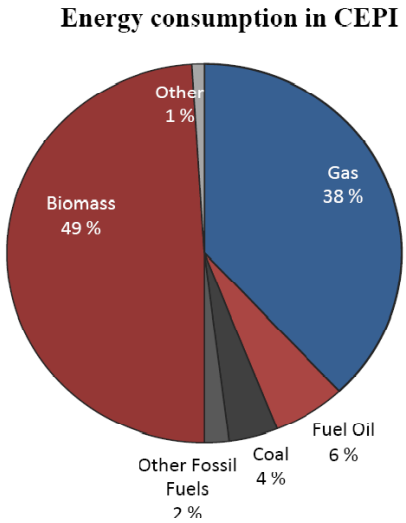


Figure 4.44: Energy consumption in CEPI (CEPI stats, 26.4.11)

The average raw material consumption and energy consumption structure for CEPI countries are shown in figure 4.43 and 4.44 accordingly. The most important raw materials are pulp, recovered paper and energy. Recovered paper and pulp both account for 42 % each of the raw material used in the average paper manufacturing in the CEPI countries (CEPI stat, 26.4.11). Biomass accounts for nearly 50 % of the energy used in paper manufacturing on average.

UPM, Abibow and Stora Enso are the three largest companies measured in newsprint and magazine paper capacity, as shown in figure 4.45 (Norske Skog, Seminar report 7.4.11). Norske Skog is ranked as number four in total capacity. The top three have a nearly 75 % share in newsprint in North-America and nearly 60 % in Western-Europe. They also have a share above 60 % in coated and uncoated magazine paper in both regions. UPM dominates in magazine paper capacity in Western-Europe after the acquisition of Myllykoski, as shown in

figure 4.46 (Norske Skog, Seminar report 7.4.11). In newsprint, however, the position is somewhat weaker: UPM has 26 % share, Stora Enso 21 % and Norske Skog 14 %.

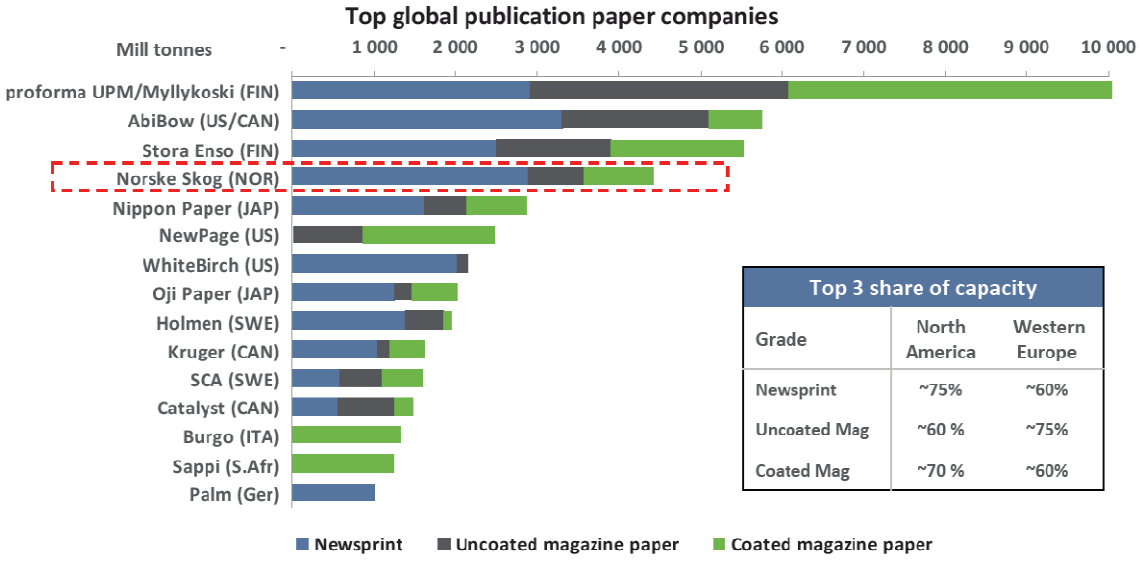


Figure 4.45: The largest global companies within newsprint and magazine paper (Norske Skog, Seminar report 7.4.11).

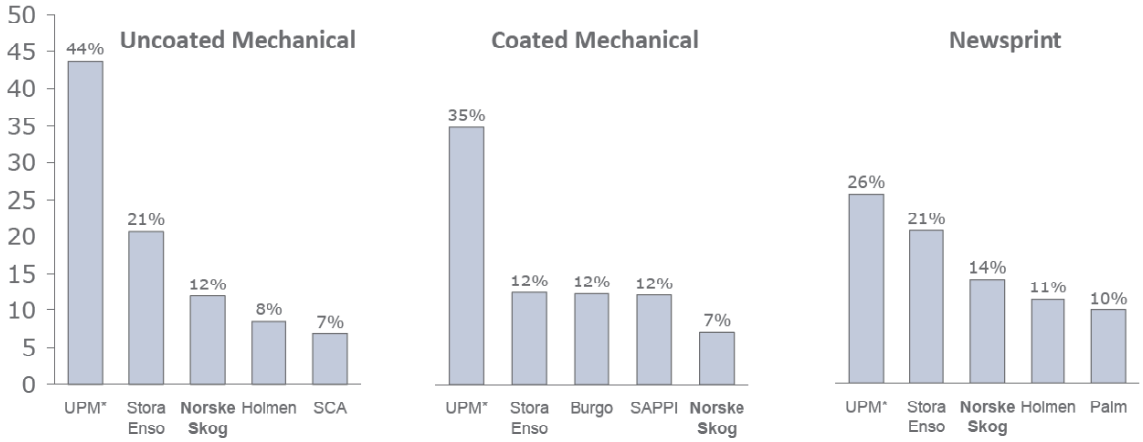


Figure 4.46: Capacity share in Western-Europe (Norske Skog, Seminar report 7.4.11)

All the three major players – UPM, Abibow and Stora Enso – are backward integrated with large wood reserves (Szabo et.al., 2009). They are traders of wood, pulp and biomass and do not rely on suppliers. In 2010 pulp was the largest contributor to total revenues for UPM and compensated to a certain degree for falling revenues in fine paper (UPM, A2010).

Norske Skog and Catalyst do not own large forest reserves. Norske Skog does not operate with long term contracts on recovered paper or pulp, and thus relies on spot market prices

(Norske Skog, Seminar report 7.4.11). Figure 4.47 and 4.48 show that the spot prices for recovered paper and pulp are volatile and that both have shown an upwards going trend since the 1980's. The price increases have put pressure on Norske Skog and Catalyst's operating margins – that are at the same time pressured by falling demand and declining sales.

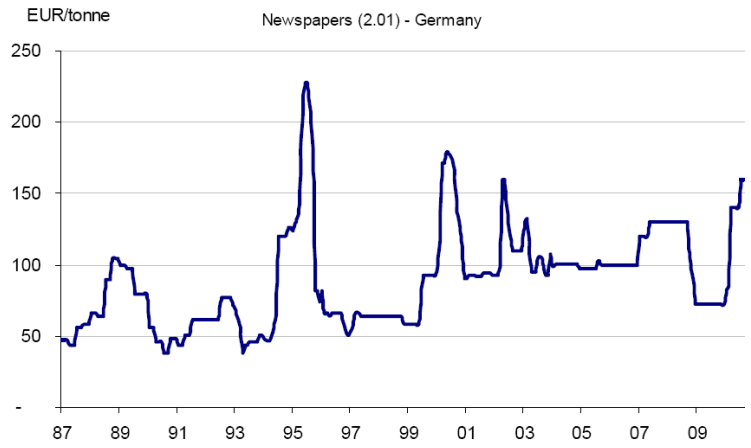


Figure 4.47: Price of recovered newspapers in Germany in EUR/tonne (Norske Skog, Seminar report 7.4.11).

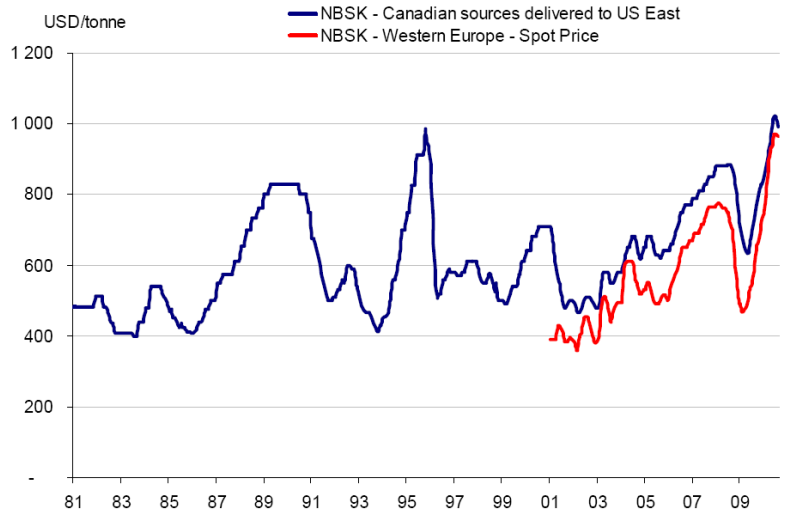


Figure 4.48: Price of pulp in Canada and Western-Europe in USD/tonne (Norske Skog, Seminar report 7.4.11).

The price of recovered paper and pulp tend to adjust to the demand of produced paper. If the paper manufactures do not sell, they will end up with full inventories. This will then reduce the demand and put downward pressure on the prices. However, especially pulp is a diverse

product with several applications that also serves other industries (Norske Skog, A2007). This puts upwards pressure on the demand side in general and also the price of pulp.

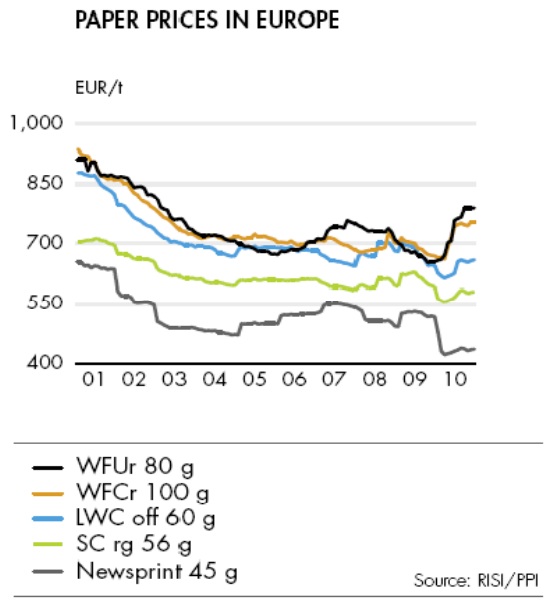


Figure 4.49: Price of different types of fine paper in EUR/tonne in Europe (UMP, A2010).

Figure 4.49 shows the price for different types of fine paper in Europe. It is clear that the newsprint segment is the least attractive segment measured in price. With the assumption of somewhat equal amount and type of pulp in the production, the operating margin within newsprint is most exposed to the increasing fiber source costs.

The companies that own wood resources have access to biomass. Others, like Norske Skog, have a mix between short, mid and long term energy contracts in the market place (Norske Skog, A2010). In general the supplier power is moderate in the Paper industry but it is more severe for companies like Norske Skog and Catalyst that are not backward integrated or own large forest reserves.

THREAT OF SUBSTITUTES

There are several substitutes within household goods and packaging (CPBIS report, 2007). Plastic, glass and metal can substitute paper packaging. However, paper is in many situations superior as it is relatively inexpensive, recyclable and more flexible. Within household goods products such as toilet paper and tissues have no good substitutes, while others, like greeting cards, can be substituted by electronic communication. In general the threat of substitutes seems only modest within household goods and packaging due to the papers' characteristics.

There are several substitutes in the newsprint and magazine paper segments (CPBIS report, 2007). Especially electronic communication, such as TV, radio and the Internet, is reducing the demand for newsprint. This trend is shown in figure 4.50. The demand for newsprint is shrinking drastically in North-America, while it is decreasing slower in Europe (Norske Skog, Seminar report 7.4.11). The reason is that Europe has a strong tradition for newspaper reading and a strong subscriber base compared to North-America. The drop in demand for magazine paper is smaller than for paper in both Europe and North-America, as shown in figure 4.51.

The threat of substitutes is immense in the newsprint and magazine paper segments considering the significant drop in demand both in Europe and North America.

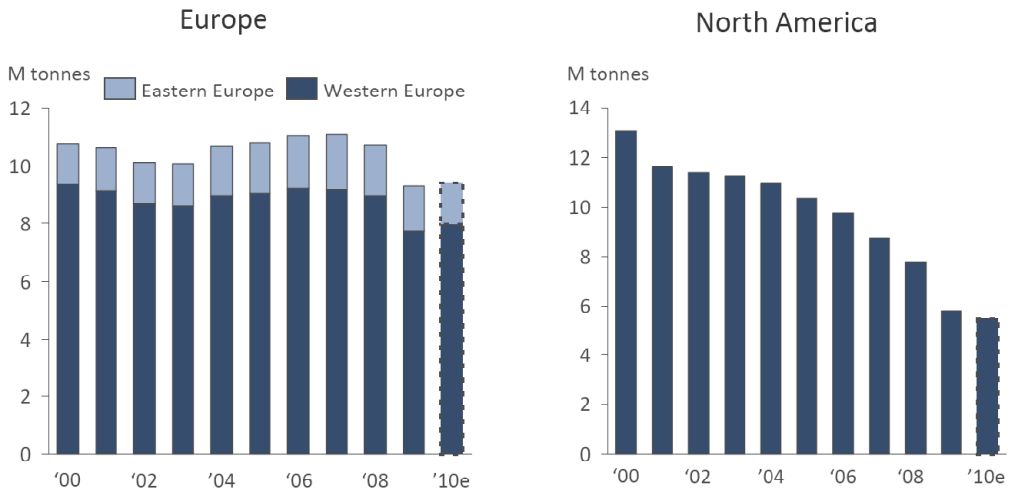


Figure 4.50: Demand for newsprint in Europe and North-America (Norske Skog, Seminar report 7.4.11).

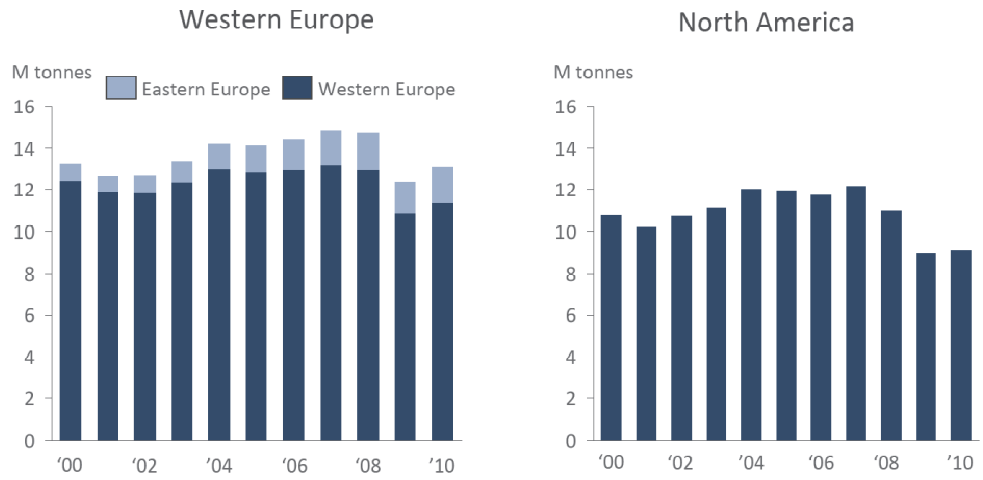


Figure 4.51: Demand for magazine paper in Europe and North-America (Norske Skog, Seminar report 7.4.11).

The threat of substitutes is immense in the newsprint and magazine paper segments but seems more moderate within household goods and packaging.

THREAT OF NEW ENTRANTS

The trend in the industry is to penetrate markets by physical presence rather than reliance on shipping due to the generally low value-to-weight ratio for paper. It is possible for newcomers

to enter most markets as the production technology is based on well known principles and is fairly available (Szabo et.al., 2009). However, this seems unlikely within the paper segments that are struggling with overcapacity in the mature markets. The current price levels are too low to justify the large investments needed. Packaging and consumer goods on the other hand offer higher prices and it is more likely that newcomers will enter within these segments.

In general newcomers will most likely seek emerging markets where the supply and demand is more balanced. In emerging markets such as China, India and Brazil the paper capacity has expanded during the last years in order to meet increased demand (CEPI stats, 26.4.11). Capacity expansion in the period 1994 to 2004 is shown in figure 4.52.

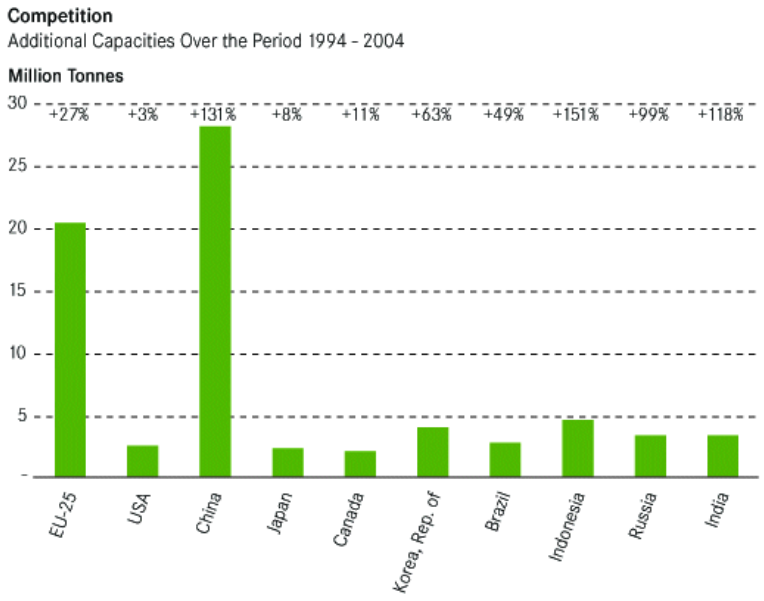


Figure 4.52: Percentage capacity increase in selected countries (CEPI stats, 26.4.11)

As long as there is overcapacity in the mature markets it seems unlikely that newcomers will seek presentation in these regions. A larger threat, shown several times throughout the last 20 years, is that already established players expand their capacity when the prices finally rise and thereby trigger a new cycle of overcapacity. Nonetheless, new entrants in emerging markets with sustainable demand such as India may rise.

DETERMINANTS OF BUYER POWER

The CR_3 estimates show that the concentration is moderate for the paper producers. Their ability to control the supply side is limited and explains why oversupply is a major problem in the industry. The concentration of customers in general is less concentrated than the paper

producers (Szabo et.al., 2009). As a consequence the buyer power is modest as the customers are not able control or manipulate the demand side.

The customer loyalty is in general limited and there are examples of customers leveraging their inventory capacity by increasing stocks at lower prices and reducing stocks as prices increase (A.T. Kearney, 2007). However, the buyer power can be reduced by the industry's few niche producers that are able to create customer lock-ins through product differentiation.

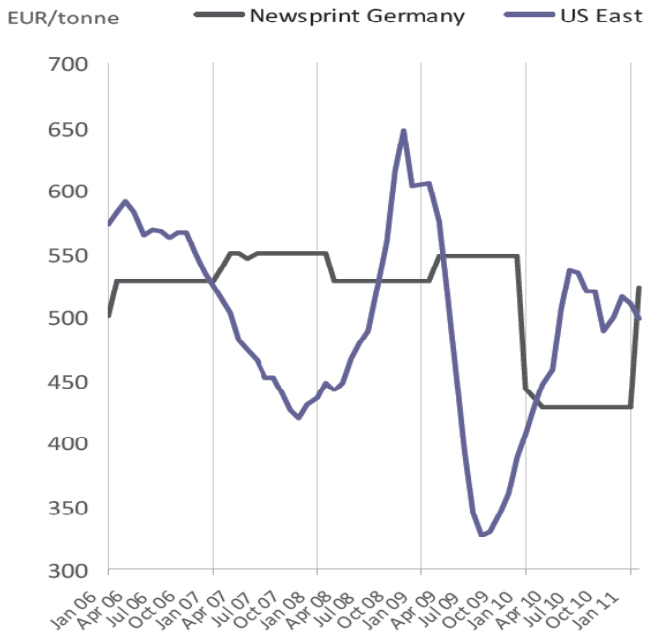


Figure 4.53: Spot price of newsprint in Europe and the US (Norske Skog, Seminar report 7.4.11).

An indirect part of buyer power is hedging. Several tactics are used in order to secure a predictable revenue stream. UPM is well product diversified and is involved in pulp, energy and paper products that stabilize the cash flow (UPM, A2010). The company also operates with a mix of three, six and twelve-month contracts on their products. Norske Skog on the other hand is more exposed to the volatility in the spot market. The company is not well product diversified and mostly operates with three month contracts on their products (Norske Skog, Seminar report 7.4.11). The volatility of newsprint in Germany and the US is shown in figure 4.53. A related risk is currency movements. As commodities are priced in U.S. dollars (or EUR) currency movements can have a significant impact on short-term profitability.

In general the buyer power is moderate in the Paper industry but can be reduced by niche companies that are able to create customer lock-ins through product differentiation.

4.2.6.2 Summary and overview of industry trends

The Porter's five forces show that the Paper industry is not an attractive industry. The created value is leaked to product substitutes and limited possibilities for product differentiation produce an intense rivalry that is further amplified by overcapacity in several paper segments. As a consequence the operating margins are lower than anticipated by the Merger Endgame.

The Paper industry's main threat is continued overcapacity in segments like newsprint and magazine paper in the mature markets that will keep the industry's future profitability low. Figure 4.54 summarizes the Porter's five forces analysis.

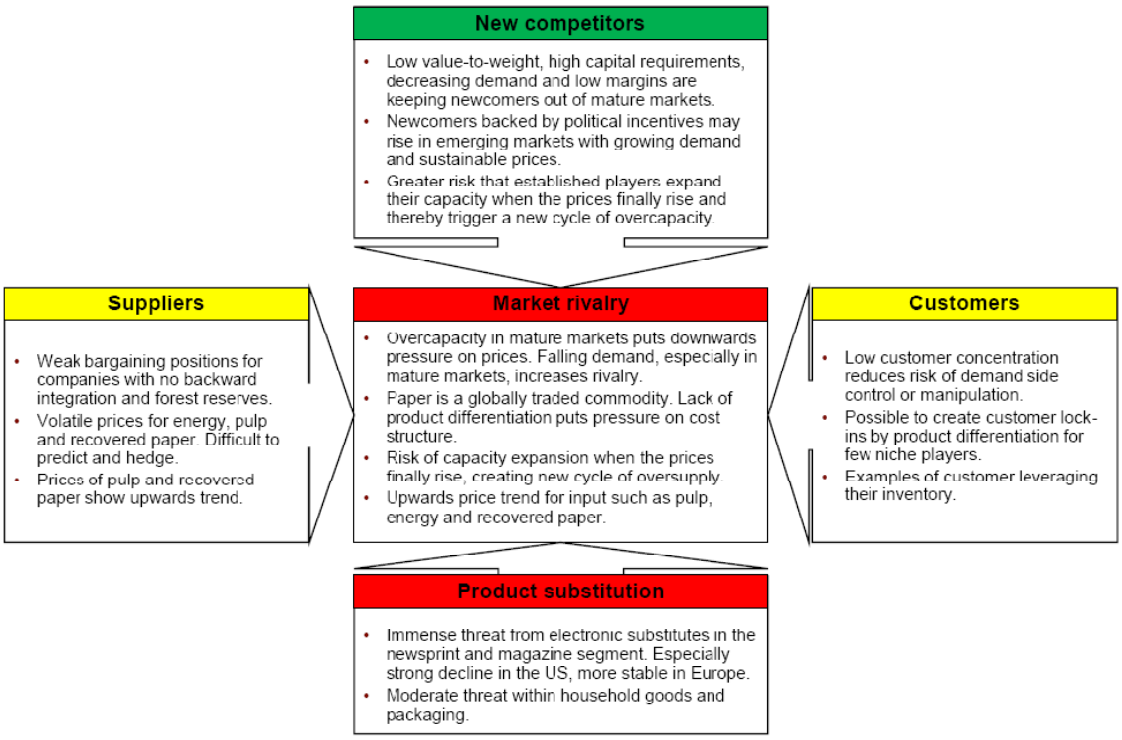


Figure 4.54: Porter's five forces for the Paper industry.

The Paper industry has entered the Focus Stage in the Merger Endgame framework. This means that companies now must focus less on scale and rely more on internal process improvements in order to stay competitive. It also means that the industry will continue to consolidate but at a slower speed. The declining speed is bad news for companies involved in paper segments that are experiencing overcapacity as a further consolidation within these segments can increase the control over the supply and put upwards pressure on the prices.

An industry trend is that the demand of fine paper is expected to shift to emerging markets. Figure 4.55 shows UPM's outlooks for the fine paper demand. In North-America and Europe

the demand will continue to decline, while it will increase in China and other emerging markets (UMP, Presentation 10.3.11). The trend for European paper manufactures is to penetrate emerging markets by investing in physical assets in these regions.

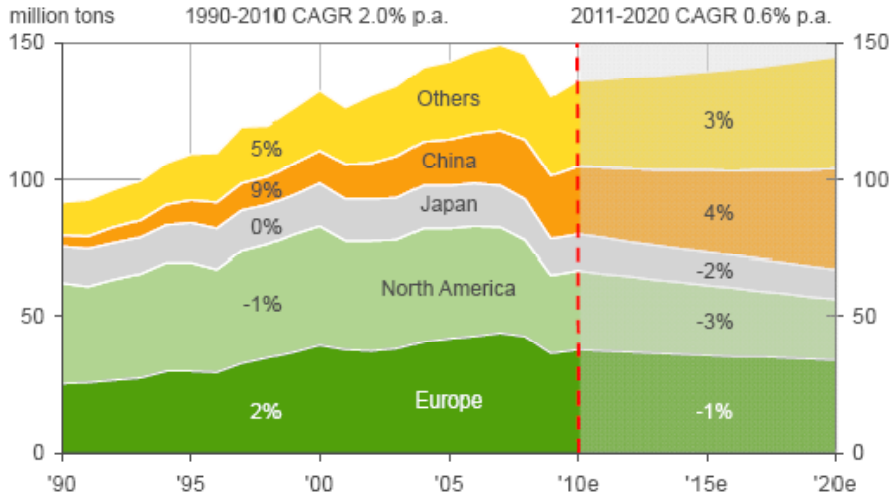


Figure 4.55: Outlook for demand of fine paper (UMP, Presentation 10.3.11).

It is difficult to predict the price developments within the industry due to the high volatility. On short to midterm the outlook for the newsprint and magazine paper prices are positive (UMP, Presentation 10.3.11). The upwards going price trend for recovered paper is expected to continue due to cost and environmental advantages. Prices of pulp, wood and chemicals are difficult to predict even on short term but has shown an upwards going price trend.

4.2.7 Presentation of Norske Skog

In this section Norske Skog is first presented and then assessed in the light of the outside-in analysis and the Merger Endgame framework.

PRESENTATION

Norske Skog is listed on Oslo Stock Exchange under the ticker NSG (Norske Skog, A2010). It was founded in 1962 and is headquartered in Lysaker, Norway. It employs 5 300 people and operates in Europe, South-America, Asia and Oceania. Sven Ombudstvedt became new CEO in January 2010. The company has no controlling shareholder.

In the end of 2010 the company had a book value of total assets of 5.59 billion financed with 35 % equity. At 1.5.11 the company had a trailing P/B of 0.28.

LATEST DEVELOPMENT

In the late 1990's Norske Skog increased its focus on newsprint and magazine paper. It has invested nearly 9.3 billion in newsprint in Europe, Asia, Oceania and South-America (Norske Skog, A2000 – 2010) since 2000. At the same time it sold non-newsprint mills, power stations, forest properties and other non-core activities. Norske Skog is currently involved in newsprint, magazine paper and energy to some limited extent.

In 2007 the company nearly went bankrupt due to several years of oversupply and low prices within the newsprint segment. The company still struggles financially and is forced to sell assets in order to pay back debt. The last few years have been dominated by asset sales and closure of operations. The company has also kept a low investment level in this time period.

As the industry moves through the Focus Stage, Norske Skog is already focusing on core operations with a strict cost reduction program. However, the company seems to have limited its own competitiveness in the industry by relying solely on newsprint and magazine paper.

RECENT PERFORMANCE

Norske Skog's recent performance is shown in figure 4.56 (Netfonds, 2.5.11). The business has not been profitable in the period 2006 to 2010. Turmoil in the world economy led to weak demand for paper throughout 2008 to 2010 and further reduced the revenues.

Figure 4.56: Market performance 17.9.97 – 2.5.11 in NOK (Netfonds, 2.5.11).

As stated Norske Skog has underperformed in the period 2006 to 2010 compared to the industry overall. The average operating income margin for companies that serve the newsprint and/or magazine segments was 1.7 % in 2006 and 2.6 % in 2010. Norske Skog's corresponding operating margins were – 9 % and – 12.8 %. The company's net income

margins in the same period were – 13 % and – 10.5 %. Figure 4.57 shows Norske Skog's revenues, EBIT and earnings from 2006 to 2010.

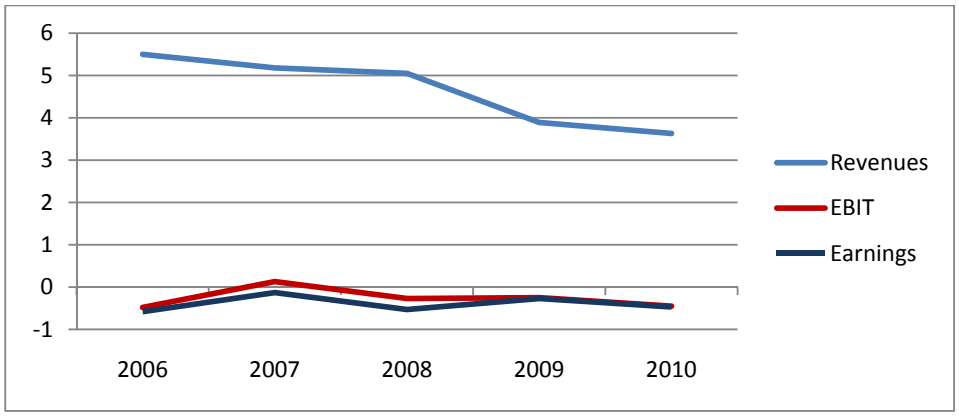


Figure 4.57: Performance 2006 – 2010 in billions (Norske Skog, A2010).

DEBT SITUATION

Norske Skog's current credit ratings are B- by S&P and B2 by Moody's with negative outlooks (Norske Skog, A2010). These evaluations, done in 2008, imply that bonds issued by the company are highly speculative. The loan portfolio is shown in figure 4.58. At the end of 2010 Norske Skog had approximately 832 million (4.4 billion NOK) in cash.

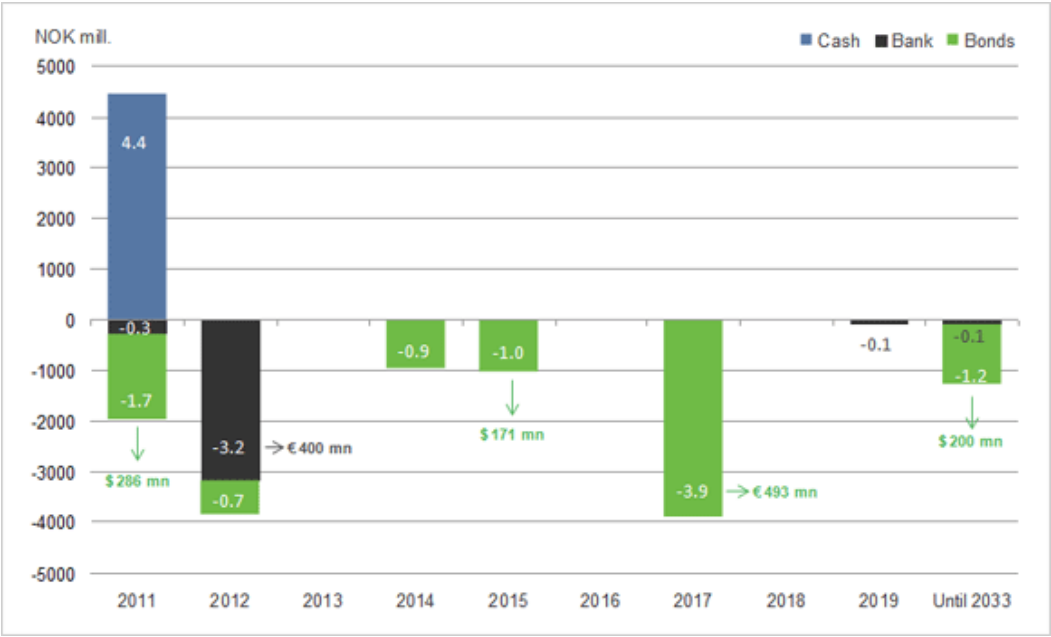


Figure 4.58: Norske Skog's loan portfolio in million NOK (Norske Skog, A2010).

Norske Skog's issued bonds are shown in table 4.7. The interest rates reflect that the status is "junk", whereas the highest is 15.5 %. All the bonds are senior unsecured.

Maturity	Currency	Cupon	Original amount	Outstanding amount
Oct '11	US$	7.625 %	$ 600 mn	$ 285 mn
Oct '15	US$	6.125 %	$ 200 mn	$ 171 mn
Oct '33	US$	7.125 %	$ 200 mn	$ 200 mn
Jun '17	EUR	7.000 %	€ 500 mn	€ 493 mn
Mar '12	NOK (NSG 16)	N3m + 1.05%	NOK 1,100 mn	NOK 655 mn
Jun '14	NOK (NSG 17)	15.50 %	NOK 530 mn	NOK 520 mn
Jun '14	NOK (NSG 18)	N3m + 11.5%	NOK 220 mn	NOK 210 mn
Oct '14	NOK (NSG 15)	5.40 %	NOK 300 mn	NOK 195 mn

Table 4.7: Norske Skog's issued bonds (Norske Skog, A2010). N3m is three months Nibor.

The 400 million EUR bank loan that matures in 2012 involves several banks, listed in table 4.8. The loan is most likely secured as financial covenants for it are net equity[11] of more than nine billion NOK (10.18 billion NOK per 31 December 2010) and gearing below 1.4.

Bank	Amount (EUR)	Bank	Amount (EUR)
SEB (agent)	28.75	HSH Nordbank	21.50
Danske Bank	28.75	JP Morgan	21.50
ING	28.75	Nordea	21.50
RBS	28.75	Unicredit	21.50
BNPParibas	21.50	Banco Itau	14.00
Citigroup	21.50	Bayern LB	14.00
DBS	21.50	HSBC	14.00
Deutsche Bank	21.50	NATEXIS	14.00
DnBNOR	21.50	Westpac	14.00
Handelsbanken	21.50	*Total*	*400.00*

Table 4.8: Norske Skog's bank loan in million EUR (Norske Skog, A2010).

As of December 2010 Norske Skog has interest-bearing non-current liabilities of 2.22 billion (11,717 million NOK) and interest-bearing current liabilities of 369.5 million (1,954 million NOK). This gives a net interest-bearing debt of 1.75 billion (9,271 million NOK). The book

[11] *Net equity is defined as equity minus intangible assets.*

value of equity excluded minority interest in the end of 2010 was 1.92 billion (10,161 million NOK). This gives a gearing of 0.91. With hedge reserves and fair value hedge into account, the level of gearing is reduced to 0.87.

Norske Skog faces large debt repayments in 2011 and 2012, of 1.954 and 3.84 billion NOK, as shown in figure 4.58. Interest payments and income aside, the current 4.4 billion NOK in cash is 1.394 billion less than what is needed to cover the debt payments in 2012 after the debt is paid for in 2011. The most likely scenario is that the 400 million EUR bank loan is refinanced within 2012. This loan is assumed secured and is prioritized before the other non-secured senior debt in case of bankruptcy and liquidation. As of December 2010 the company has total non-current assets of 19,271 million NOK in book value, whereas 15,909 million is property, plant and equipment. Most of the latter is related to paper mills. The total current assets less cash and cash equivalents are 10,027 million in book value. It is difficult to estimate the market value of the paper mills but with the assumption that the current assets excluded for cash can be transformed into cash (inventories, receivables and other current assets), this alone is around 10,027 million NOK or 1,266 million EUR. Thus, Norske Skog will most likely be able to refinance within 2012 as the banks can secure their loans.[12]

OPERATIONS AND ASSETS

Norske Skog is not a significant forest owner (Norske Skog, A2010). It owns forest in Australia and Brazil that contribute a small proportion of the wood consumed yearly. In the beginning of May 2011 the company announced that it is selling the forest in Brazil to Participacoes for 63.5 million in order to improve its financial situation (DN, 3.5.11).

Norske Skog owns 14 wholly and partly-owned mills in 11 countries in Europe, Asia, Oceania and South-America (Norske Skog, A2010). Around 53 % of newsprint is manufactured in Europe, 29 % in Oceania, 10 % in South-America and nearly 7 % in Asia. All the magazine paper is produced in Europe. The paper mills are listed in table 4.9.

Norske Skog has invested little in its paper mills compared to peers such as Stora Enso and Holmen the last years (DN, 22.1.11). The company also has the oldest paper machines compared to these companies. The paper machines located at the mills are product specific.

[12] *At 27.5.11 it was announced that 140 million EUR are refinanced with DNB Nor, SEB, Nordea and Citibank (DN, 6.6.11 and Skog.no, 27.5.11). The loan has duration of three years and interest rate is set to 13 %.*

However, it is possible to upgrade some of these to produce higher quality or other grades (Pulp and paper Canada, 2.5.11). Such upgrades require capital investments and industrial know-how. Potential re-use of excising equipment can reduce the required investments costs.

Name and region	**Ownership (%)**	**Newsprint**	**Uncoated magazine paper**	**Coated Magazine paper**	**Total capacity (adjusted)**
Skogn, Norway	100	560	-	-	560
Saubrugs, Norway	100	-	545	-	545
Follum, Norway	100	150	-	140	290
Golbey, France	100	620	-	-	620
Bruck, Austria	100	125	-	280	405
Walsum, Germany	100	-	-	435	435
Parenco, Netherlands	100	125	140	-	265
Total Europe	-	*1580 (53.5 %)*	*685 (100%)*	*855 (100%)*	*3120 (69.4 %)*
Albury, Australia	100	280	-	-	280
Boyer, Autralia	100	270	-	-	270
Tasman, New-Zealand	100	315	-	-	315
Total Oceania	-	*865 (29.3 %)*	-	-	*865 (19.2 %)*
Pisa, Brazil	100	185	-	-	185
Bio Bio, Chile	100	125	-	-	125
Total South-America	-	*310 (10.5 %)*	-	-	*310 (6.9%)*
Singburi, Thailand	100	130	-	-	130
MNI, Malaysia	34	250	-	-	70
Total Asia (adjusted)	-	*200 (6.7 %)*		-	*200 (4.5%)*
Total capacity	-	*2955*	*685*	*855*	*4495*

Table 4.9: Overview of paper mills (Norske Skog, A2010). All figures in 000' tonnes.

The book value of property, plant and equipment per region from 2007 to 2010 is shown in figure 4.59. In order to improve the financial situation Norske Skog has sold several mills in Asia during the last four years (Norske Skog, A2010). In 2008 it sold its activities in South Korea and in 2009 it divested its two mills in China. In Europe it has sold several properties, including the main office Oxenøen for 82 million in 2008. It has also sold several paper mills in this region, such as Steti in the Czech Republic. The net interest bearing debt was reduced by nearly one billion during 2008 and 2009.

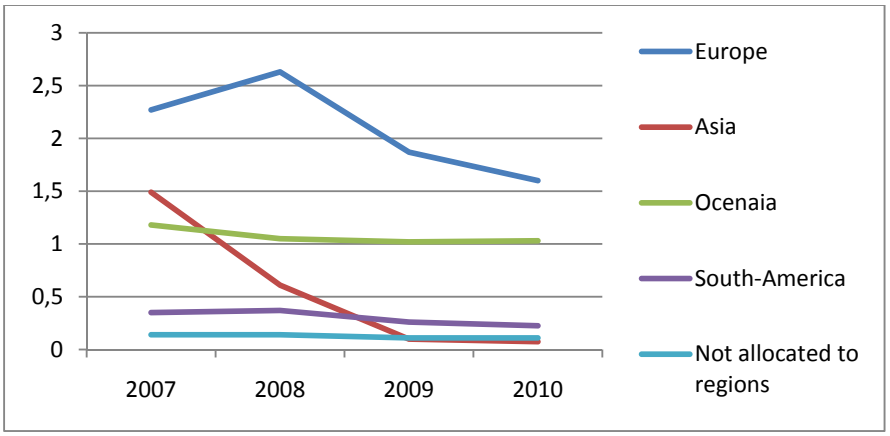


Figure 4.59: Book value of assets in billions in different regions 2007 – 2010 (Norske Skog, A2007-2010).

PROFITABILITY OF OPERATIONS

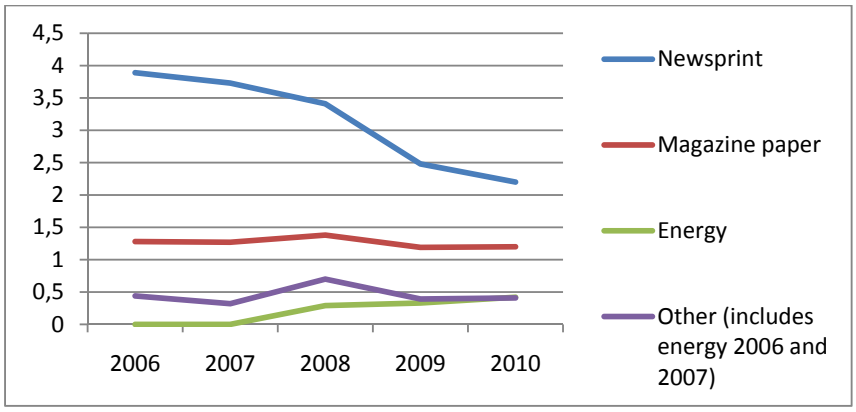


Figure 4.60: Revenues in billion by operations (Norske Skog, A2006-2010).

Norske Skog's revenues in the period 2006 to 2010 are shown in figure 4.60 (Norske Skog, A2010). Newsprint revenues are declining as a consequence of mill closures, weakened demand and lower prices. The revenues from magazine paper have been steady in the period. Revenues from sale of excess energy have risen as a result of the closure of a paper machine

at Norske Skog Follum in the summer of 2008 and the closure of Norske Skog Union in 2006. Due to a new contract structure with effect from the beginning of January 2011, the revenues from energy are expected to decline. Other activities involve corporate functions, real estate, trading and sorting of recovered paper, and purchase and resale of wood.

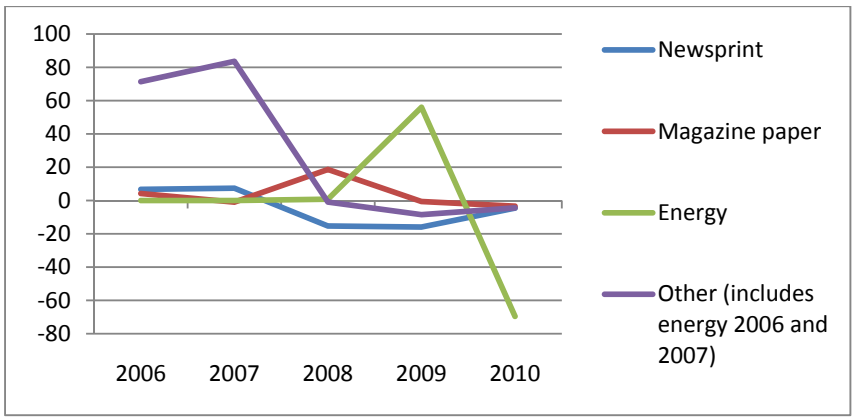


Figure 4.61: Operating income margins in percent by operations (Norske Skog, A2006-2010).

The operating margins for the two most important segments, newsprint and magazine paper, have in the period 2006 to 2010 been negative or close to zero, as shown in figure 4.61.

OPERATING REVENUES BY REGION

Norske Skog's major customer base is found in Europe. This region made up 63 % of the operating revenues in 2010, as shown in figure 4.62. North-America represented 4 %, South-America 7 %, Oceania 3 %, Asia 3 % and Africa 1 %. The revenues have been stable the last three years, with the exception of Europe and Asia, where the revenues have declined as a consequence of mill closures, capacity reductions and asset sales.

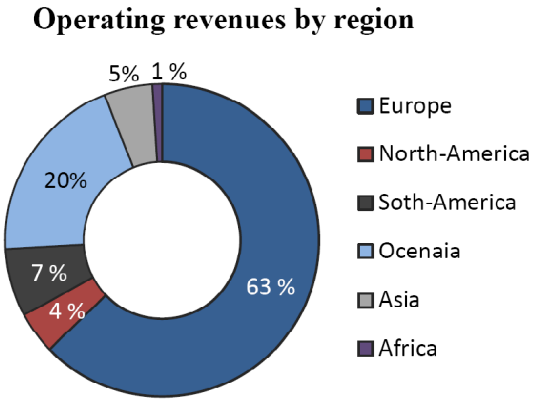


Figure 4.62: Operating revenues by region (Norske Skog, A2010).

MARKET POSITION AND COMPETITIVE STRATEGY

Norske Skog is not backward integrated (Norske Skog, A2010). The company therefore relies on contracts with third parties for energy, wood, pulp, chemicals and recovered paper.

The energy consumption in 2010 amounted to 15,400 GWh, where 8,800 GWh was electricity, 500 GWh self-generated heat energy and 6,100 GWh was purchased heat energy (Norske Skog, A2010). About 75 % of the electricity is purchased under long-term contracts, mainly in South-America, Oceania and Norway (Norske Skog, Q1 2011). The exposure to spot prices in the electricity market is mainly in continental Europe and Asia where the need for electricity is sparse due to an outspread use of recovered paper. As stated the revenues from sale of excess energy in Norway are not likely to continue due to new contracts in 2011.

Norske Skog has long term contracts for wood at favorable prices in South-America and Oceania (Norske Skog, A2010). It has long term volume contracts in Norway. It is buying wood on the spot market in Asia and continental Europe but the mills in these regions rely mostly on recovered paper as stated earlier. The closure of mills in Asia and continental Europe has reduced Norske Skog's exposure to the volatile but increasing price trend of recovered paper. Table 4.10 shows the mills where recovered paper is used in newsprint.

Paper mill	**Recovered paper (%)**
Albury, Australia	33
Bruck, Austria	92
Golbey, France	62
Praneco, Netherlands	100
Skogn, Norway	33
Singburi, Thailand	100

Table 4.10: Recovered paper (in percent) used in newsprint (Norske Skog, A2010).

Norske Skog buys chemicals and pulp at spot prices in the market place. Overall, Norske Skog believes that the expected price increases within newsprint and magazine paper will be offset by increased costs of input factors in 2011 (Norske Skog, Q1 2011).

Norske Skog is a significant global producer within newsprint and magazine paper. It is number three in capacity for uncoated and number five in coated in Western-Europe. The main customer base for magazine paper is Europe. The revenues have been stable but the operating margins have been volatile and at times negative.

Norske Skog is well positioned within newsprint in Oceania and South-America. It has long term contracts at favorable prices for wood and energy in both regions. In Oceania Norske Skog is the only local producer, with a high market share. It has long term volume contracts with pricing formula linked to USD and exports to Asian countries as well. In South-America

Norske Skog is the largest local producer. It has shown long term growth in this region and is exporting to North-America. The operating margins are the lowest in Asia (Norske Skog, Q1 2011), and may have been the reason for the recent mill sales in the region. In Europe there are still signs of overcapacity within newsprint that may lead to further capacity closures.

Year	2006	2007	2008	2009	2010
Mill utilization (Production/ capacity)	92	95	93	79	89

Table 4.11: Mill utilization (in percent) (Norske Skog, A2010).

The utilization of the mills has span from 79 % to 95 % in the period 2006 to 2010. It reached its second lowest in the period in 2010. Table 4.11 shows the utilization of the mills.

3.2.8 The Merger Endgame's impact on Norske Skog

Norske Skog is an underperformer in the moderately concentrated Paper industry that has entered the Focus Stage. The opportunities and threats implied by the Merger Endgame are listed in the SWOT in figure 4.63.

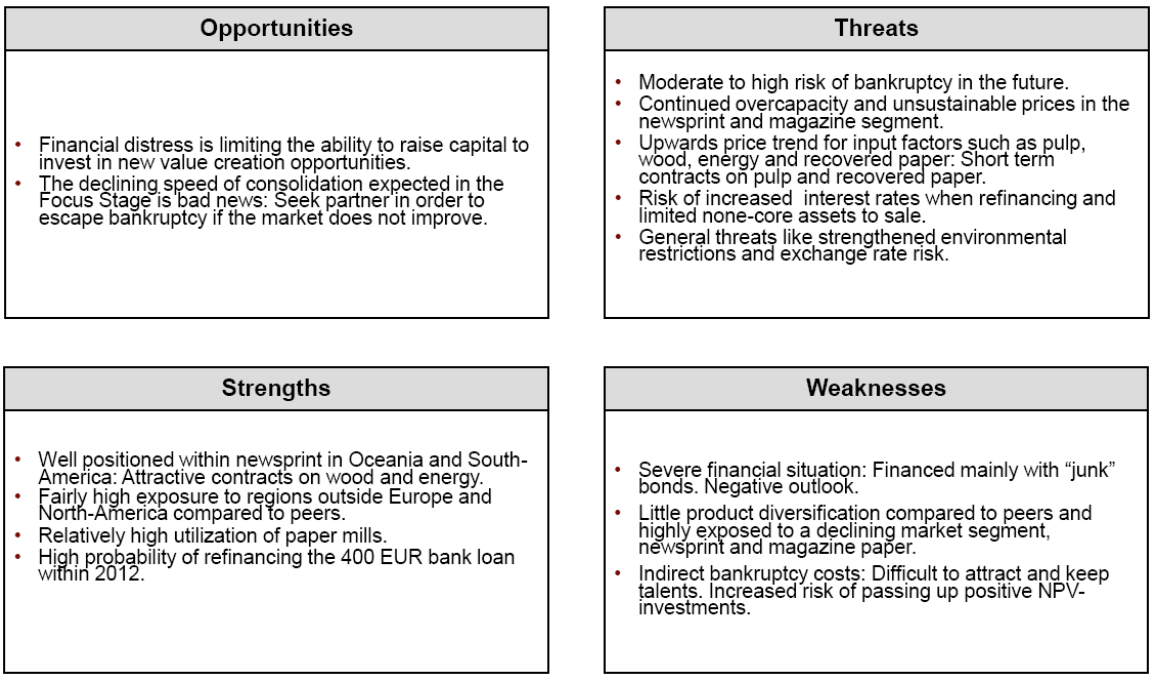


Figure 4.63: Norske Skog's SWOT

From the perspective of the stockholders the question is if Norske Skog should continue to operate or find a partner to consolidate. In the case of a bankruptcy the stockholders are ranked after the creditors and the outcome is highly uncertain considering the gearing of 0.91.

In the case of continued operations Norske Skog does not seem to possess any competitive advantages. It is specialized in the paper and magazine segments that are struggling with overcapacity in mature markets like Europe and North-America. In 2010 63 % of Norske Skog's total revenues came from Europe and 4 % from North-America. The demand for newsprint in these regions is expected to decrease in the future. Norske Skog shares the high exposure to Europe with several competitors such as SCA (above 77 % of revenues from Europe in 2009), Stora Enso (above 83 % of revenues from Europe in 2009) and UPM (above 73 % of revenues from Europe in 2009). However, these companies are backward integrated and product diversified. In this way the cost of input may be reduced and other products, such as pulp, can compensate for losses in the newsprint and/or magazine segments in periods.

Norske Skog is experiencing financial distress and is selling non-core assets in order to reduce its debt level. It seems capable to meet its financial commitments in 2011 and 2012 but there is a substantial possibility of default in the future. The "junk" bonds reduce the cash flow from operations but also affect the company's competiveness in several ways. The most severe weakness implied by the financial distress is the high weighted average cost of capital (Myers, 1977). The required return of debt is obvious and shown in the "junk" status of the bonds. However, the required return of equity has increased as well due to a more volatile market value of equity. The consequence is that the company will struggle to raise equity to invest in new market opportunities. For the moment the company's competitiveness is minimized due to limited possibilities to invest beyond fundamental maintenance. Myers (1977) also addresses the short horizon problem: At this point equity holders have a tendency to pass up positive NPV- projects that pay off over a long time horizon in favor of projects with less positive NPV that pay off faster. Another indirect bankruptcy cost is the difficulty to keep and recruit new talents and high performing managers (Sharpe, 1995). This latter trend may rise and become clearer if the financial situation does not improve.

The lack of competitive advantages and financial distress imply that Norske Skog will continue to struggle in the industry. Sooner or later the company will run out of non-core assets to sell and future deficits will put upwards pressure on the costs of refinancing. However, the Merger Endgame framework implies that the Paper industry will continue to consolidate in the Focus Stage but at a slower speed. It is therefore highly uncertain *when* a consolidation in the future will drive up the newsprint and/or magazine paper prices.

Another option is to find a partner to consolidate. However, despite the fact that the underlying business is generating cash, as shown in table 4.12, Norske Skog is not seen as a good acquisition target. It is classified as an underperformer involved in the unattractive newsprint and magazine segments. Regularly investments in maintenance of machinery and operational fixed assets are also required for the paper mills, as shown in table 4.13.

CFS	**2006**	**2007**	**2008**	**2009**	**2010**
Cash generated from operations	28,905	27,238	26,639	21,144	18,920
Cash used in operations	-24,608	- 23,547	-23,574	-18,734	-18,070
=	*4,297*	*3,691*	*3,065*	*2,410*	*850*
Cash from net financial items	-1,365	-1,011	-727	-548	-520
Taxes paid	-169	- 514	-361	-166	67
Net cash from operating activities	**2,763**	**2,166**	**1,977**	**1,697**	**397**

Table 4.12: Cash from operating activities in million NOK (Norske Skog, A2010).

CFS	**2006**	**2007**	**2008**	**2009**	**2010**
Purchase/Investments in operational fixed assets	-1,722	-1,746	-1,283	-580	-411

Table 4.13: Cash for maintenance in million NOK (Norske Skog, A2010).

Porter's five forces imply that newcomers will not invest in the newsprint segment in mature markets due to unattractive growth prospects. For the same reason it is unlikely that a potential partner is not already involved in the newsprint and/or magazine segments. The critical question for a potential partner or acquirer is if the discounted future cash flow (adjusted for maintenance) from the ongoing paper machines plus economies of scale or operational synergies exceed the liquation value. A possible acquisition premium must also be taken into account. Since the cash flow from operations is low in Europe due to oversupply and the fact that the acquisition offer modest economies of scale and operational synergies the chance is large that a company that is already heavily involved in newsprint and/or magazine paper in Europe might find the buy to liquidate alternative the most attractive.

Norske Skog's capacity within newsprint is 1.58 million tonnes and 1.54 million within magazine paper in Europe. In 2010 it had 14 % of the total newsprint capacity, 12 % of the total uncoated magazine paper capacity and 7 % of the total coated magazine paper capacity in Western-Europe. The control over the capacity enables a significant impact on the supply side of newsprint and magazine paper in Europe. As the European region is struggling with oversupply the best option is to close down capacity in order to increase prices.

In a takeover the acquirer will upgrade his assets portfolio in Europe to stay competitive. Excess capacity is scrapped, moved to regions where the supply and demand sides are more balanced or sold to companies outside Europe. These alternatives depend on the age of the equipment. In general potential upgrades of old equipment have shown costly. In 2006, Norske Skog decided to move one of the used paper machines at the discontinued mill Union in Skien to Pisa in Brazil (Norske Skog, A2006). The machine needed to be upgraded and the project had an original cost limit of 210 million. The machine was never put into use due to cost overruns. The latter option of selling assets to companies outside Europe also relies on the acquirer's position in other regions as the acquirer will avoid putting downwards pressure on prices in other regions where it operates.

The sell to liquidate alternative has several implications. The companies within newsprint and magazine paper in Europe that are not involved in the merger or acquisition will become free-riders that will benefit from the price increase. For this reason the alternative can only pay-off for the companies with the largest newsprint and/or magazine capacity in Europe. Another implication is found in the Porter's five forces analysis: when the prices become attractive there is a threat that established companies re-open idle paper machines or invest in new capacity, and thereby triggering a new cycle of oversupply. There are no guaranties.

Potential partners are involved in newsprint and magazine paper in Europe. Ranked by total magazine and newsprint capacity in West-Europe they are UPM, Stora Enso, Holmen, Burgo, SAPPI, Palm and SCA. UPM and Stora Enso are large in newsprint, coated and uncoated. Holmen is present in newsprint and uncoated. The remaining companies are involved in only one of the three with moderate shares. Given the free-rider incentive it seems unlikely that other than UPM, Stora Enso and Holmen will take on Norske Skog by themselves.

UPM, Stora Enso and Holmen are product diversified and are not experiencing financial distress. However, it seems unlikely that UPM has the capacity to take on a new acquisition targets in the near future. The company will use EUR 100-150 million to integrate Myllykoski that it acquired for EUR 100 million in equity and EUR 800 million in long-term debt late in 2010 (UPM, Q1 2011). As of April 2011 UPM has a gearing of 0.44. Stora Enso and Holmen have year-end 2010 gearings of 0.41 and 0.34 accordingly. It is also possible with a potential collaboration between several companies in a takeover. In September 2010 a Finnish newspaper claimed that Stora Enso, Norske Skog and Holmen were planning to merge (Blokhus, 2010). This was however not confirmed by any of the companies involved.

The acquisition of Norske Skog also involves assets located in other regions than Europe. Based on the company's competitiveness and strategic positioning the operations in South-America and Oceania are assumed attractive while the operations in Asia less attractive.

In the perspective of the stockholders the best solution is to seek a partner to merge with or get acquired. However, there are strict limitations of potential partners and the sale to liquidate option threatens the CEO's position and creates incentive to continue operations.

4.2.9 Conclusion and strategic overview

The Merger Endgame framework implies that the Paper industry will continue to consolidate in the Focus Stage but at a slower speed. This has several implications for Norske Skog.

Norske Skog is facing financial distress, operates in a segment threatened by overcapacity in Europe, and has few competitive advantages. The financial distress limits the company's ability to invest in new market opportunities or assess acquisition targets on its own. It seems capable to refinance within 2012 but there is a substantial possibility of default in the future.

Norske Skog has the choice of continued operations or to sell to liquidate. From the perspective of the stockholders the option to continue operations is risky. In the case of a bankruptcy there is uncertainty regarding the value of the assets. This option relies on a consolidation in the near future that drives up the prices as the demand in Europe is not expected to increase. A consolidation is not unlikely according to the Endgame Framework but the indication of decreasing speed of consolidation makes it highly uncertain.

From the perspective of the stockholders the sell to liquidate is the greatest value creation opportunity. Norske Skog is however not considered an attractive acquisition target and the potential acquirers are limited to UPM, Stora Enso, Holmen, Burgo, SAPPI, Palm and SCA that will gain on limiting the overcapacity problem within newsprint and magazine paper in Europe. Potential candidates may prefer to wait and speculate that Norske Skog goes bankrupt due to the free-rider problem and threat of returning overcapacity as they are product diversified and can carry losses in the newsprint and magazine segments. Moreover, the sale to liquidate option threatens the CEO's position and creates incentive to continue operations.

The future of Norske Skog is highly uncertain and depends on several factors that the company cannot control. If neither a partner is found nor a consolidation within the newsprint and/or magazine segments occurs, there is a severe risk of bankruptcy in the future.

5. Evaluation of the Merger Endgame framework

In this section the Merger Endgame framework is evaluated in general and in the cases of Norsk Hydro and Norske Skog. Strength and weaknesses are addressed.

The Merger Endgame framework's main strength is its potential to make the Porter's five forces analysis more dynamic. The work of Porter (1980, 1985) has been widely criticized, mainly for being too static (Mintzberg et al., 1998; Kim and Mauborgne, 2004, and Gilbert and Strebel, 1988). By combining the Merger Endgame framework with the Porter's five forces it becomes clearer where the industry is headed, and as the industry continues to consolidate and moves up the s-curve the internal rivalry will change. However, specific changes will rely on the industry's fundamentals and should be treated individually.

The Merger Endgame framework's main weakness is the uncertainty regarding the correctness and precision of the framework. Especially the time x-axis is difficult to use in practice due to a high uncertainty regarding the correctness of it. The framework's credibility will also gain on independent backing or proof in the academic world.

In the cases of Norsk Hydro and Norske Skog several strengths were revealed. In both cases the conclusion of the Porter's fives forces fit with the profitability outlined by the framework. The CR_3 estimates from the framework were also used to describe the customer power in both cases, giving the Porter's five forces analysis a more dynamic fundament. However, this goes both ways as both cases illustrate that the framework will have little practical use without other frameworks that address the industry's fundamentals, such as Porter and PESTEL.

In the cases of Norsk Hydro and Norske Skog some weaknesses and practical pitfalls were revealed. In both cases it was difficult to state any estimates on time intervals, for example when a consolidation will happen within the Paper industry. As a consequence the time x-axis was of little use. In the case of Norsk Hydro it was difficult to define the industry as it consisted of two unrelated streams, up/midstream and downstream. The definition of industries is critical as it effects the position on the s-curve. In the case of Norske Skog the framework's paradox is revealed: the framework is deterministic but at the same time the companies can choose not to consolidate and thereby changing the shape of the s-curve by expanding the time x-axis. This observation undermines the accuracy of the time x-axis.

In general the Merger Endgame has the potential to make Porter's five forces (and related frameworks') analysis more dynamic. My use of the two case-examples Norsk Hydro and

Norske Skog shows that these two frameworks are good supplements and provide a forward-looking element to the analysis. Nonetheless, there are still uncertainties regarding the correctness and precision of the Merger Endgame framework. Further empirical research is therefore needed to evaluate the framework and improve its empirical foundation.

6. Conclusion

The development of the Aluminum and Paper industry was assessed by A.T. Kearney's Merger Endgame framework. The implications for Norsk Hydro and Norske Skog were also addressed along with value creation opportunities for the corresponding stockholders.

The framework reveals that up/midstream in the Aluminum industry is entering the Balance and Alliance Stage while downstream is deconsolidating. Norsk Hydro has invested heavily in up/midstream and is well positioned to face the increasing reliance on joint ventures and cooperation in the Balance and Alliance Stage. However, the expansion in up/midstream and increasing rivalry downstream imply that the management does not have the capacity to build top performers within both business areas which rely on different skills. The greatest value creation opportunity for the stockholders is therefore to further demerge downstream operations to secure operational mobility and responsiveness to shifting market conditions.

The Merger Endgame framework reveals that the Paper industry has entered the Focus Stage. Financial distress and unsustainable prices in Europe are limiting Norske Skog's ability to invest in value creation opportunities or assess acquisition targets on its own. Further consolidation in Europe might limit the current overcapacity problem but the Merger Endgame reveals that the consolidation speed is decreasing. From the perspective of the stockholders the greatest value creation opportunity is therefore to sell to liquidate. However, Norske Skog is not considered an attractive acquisition target and potential acquirers are limited. Due to the free-rider problem and threat of returning overcapacity some candidates may prefer to wait and speculate that Norske Skog goes bankrupt. If neither a partner is found nor a consolidation occurs, there is a severe risk of bankruptcy in the future for Norske Skog.

Empirical research is needed to evaluate the correctness and precision of the Merger Endgame framework as there are several weaknesses in its empirical foundation. The major weaknesses are the dataset's short time span of ten years and that it coincides with the stock market boom. As a consequence the results drawn may not reflect normal market and industry conditions.

The Merger Endgame framework's main strength is its potential to make Porter's five forces analysis more dynamic. The main weakness is the uncertainty regarding the correctness and precision of the framework. Especially the uncertainty regarding the correctness of the time x-axis makes it difficult to use in practice. A final observation is the deterministic aspect of the framework, as companies can choose not to consolidate and thereby changing the shape of the s-curve by expanding the time x-axis. Or in the words of Morpheus from the Matrix (1999): *"… there is a difference between knowing the path and walking the path"*[13].

[13] *The Matrix is a science fiction movie from 1999.*

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APPENDIX

A.1 Industries ranked by consolidation level (1995- 1999)

Industries ranked by the average HHI for 1995- 1999 is shown in figure A.1.

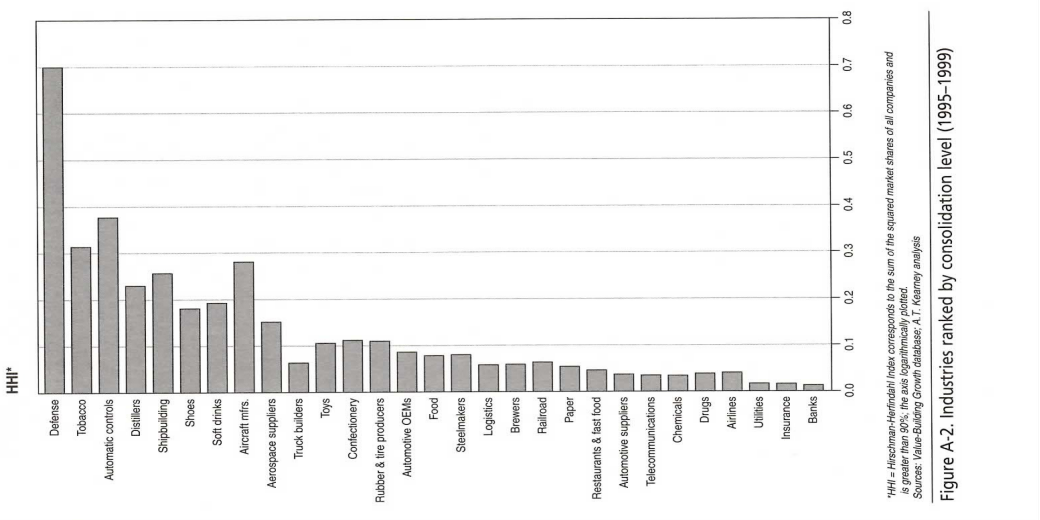

Figure A.1: Important Industries ranked by the average HHI for 1995- 1999.

A.2 Supply and demand by nations in the Aluminum industry

Country	2005	2006	2007	2008	2009
Bosnia & Herzegovina	1 031 600	854 047	866 933	1 018 333	555 820
France	175 000	160 000	* 160 000	* 160 000	* 160 000
Greece	2 441 443	2 162 900	2 125 900	2 174 000	1 935 000
Hungary	535 337	538 258	546 310	511 337	267 000
Montenegro	—	659 370	667 053	671 811	45 779
Russia	6 409 300	6 399 200	6 053 900	5 675 000	5 775 000
Serbia and Montenegro	672 345	—	—	—	—
Turkey	356 480	771 227	863 404	* 900 000	406 700
Ghana	606 700	841 775	1 033 368	796 000	440 000
Guinea	19 237 300	18 783 928	18 519 010	17 682 330	14 774 240
Mozambique	9 518	11 069	8 650	5 443	3 600
Sierra Leone	—	1 071 140	1 169 036	954 370	757 000
Tanzania	1 640	5 373	5 003	20 601	122 920
Jamaica	14 116 393	14 865 351	14 567 738	14 636 102	7 817 500
USA (a)	121 187	361 047	141 914	98 796	30 240
Brazil (b)	22 364 600	23 236 300	25 460 700	28 097 500	26 074 400
Guyana	1 694 126	1 478 670	2 242 928	2 092 237	1 484 935
Suriname	4 756 998	4 945 353	5 273 195	5 333 031	3 388 419
Venezuela	5 900 000	5 928 000	5 323 300	4 192 000	4 267 200
China	17 408 200	18 981 600	20 446 000	25 176 900	* 30 000 000
India (c)	12 595 803	15 732 535	22 624 960	15 554 385	14 048 000
Indonesia	* 2 700 000	* 9 000 000	* 16 000 000	* 18 000 000	* 15 000 000
Iran (d)	437 595	* 500 000	520 800	* 520 000	322 800
Iraq	—	—	—	4 928	250
Kazakhstan	4 815 400	4 883 800	4 962 600	5 160 100	5 131 000
Malaysia	4 735	91 806	156 785	295 176	263 432
Pakistan (e)	6 504	7 831	18 082	36 000	* 25 000
Vietnam	55 000	60 000	* 80 000	* 80 000	* 80 000
Australia	59 959 000	61 781 000	62 428 000	64 038 000	65 843 000
World Total	178 000 000	194 000 000	212 000 000	214 000 000	199 000 000

Figure A.2.1: Producers of bauxite (Mineralsuk, 20.2.11).

Country	2005	2006	2007	2008	2009
Azerbaijan	314 764	362 665	184 500	164 879	9 590
Bosnia & Herzegovina	447 260	393 580	303 799	294 455	191 792
France	* 600 000	* 636 000	* 600 000	* 572 000	* 317 000
Germany	* 830 000	* 850 000	* 900 000	* 900 000	* 900 000
Greece	782 000	780 000	761 746	771 769	718 797
Hungary	* 305 000	* 301 000	* 301 000	* 299 000	* 185 000
Ireland, Republic of	* 1 800 000	1 800 000	1 800 000	1 890 000	1 240 000
Italy	1 070 000	1 090 000	1 327 000	1 045 000	92 000
Montenegro	—	236 740	240 186	220 426	58 528
Romania	689 329	622 083	22 830	344	44 000
Russia	3 259 216	3 265 216	3 332 308	3 112 000	2 794 000
Serbia and Montenegro	235 196	—	—	—	—
Spain	* 1 400 000	* 1 400 000	* 1 300 000	* 1 300 000	* 1 300 000
Turkey	112 558	150 117	163 435	* 150 000	* 150 000
Ukraine	1 632 020	1 671 620	1 655 718	1 673 000	1 524 000
Guinea	722 370	529 200	542 100	593 000	530 000
Canada	1 400 340	1 476 959	1 454 390	1 491 523	1 232 604
Jamaica	4 085 634	4 099 548	3 940 589	3 995 358	1 773 600
USA	5 215 000	4 696 000	4 236 000	4 298 000	3 064 000
Brazil	5 191 100	6 735 000	7 077 600	7 822 300	8 625 100
Suriname	1 939 615	2 151 148	2 178 472	2 153 968	1 536 187
Venezuela	1 931 000	1 920 000	1 751 000	1 591 300	1 370 000
China	8 592 200	13 256 900	19 453 000	22 788 100	23 793 000
India	3 066 000	3 077 000	3 208 000	* 3 000 000	* 3 000 000
Iran (a)	130 100	167 783	220 000	* 220 000	* 200 000
Japan	* 780 000	* 780 000	* 650 000	* 600 000	* 550 000
Kazakhstan	1 505 415	1 514 509	1 544 462	1 607 829	1 706 000
Australia	17 704 000	18 312 000	18 844 000	19 446 000	19 939 000
World Total	65 700 000	72 300 000	78 000 000	82 000 000	76 800 000

Figure A.2.2: Producers of alumina (Mineralsuk, 20.2.11).

Country	2005	2006	2007	2008	2009
Azerbaijan	31 762	31 852	39 241	61 604	10 145
Bosnia & Herzegovina	131 094	136 190	147 193	155 909	130 042
France	440 000	442 879	430 159	389 000	345 000
Germany	647 900	515 539	551 000	605 880	291 750
Greece	165 300	164 500	167 937	162 339	134 737
Hungary	31 000	300	—	—	—
Iceland	273 318	328 424	446 297	761 204	813 880
Italy	192 900	194 200	179 500	186 400	165 800
Montenegro	—	121 762	135 151	111 513	63 600
Netherlands	333 820	285 317	296 900	317 000	306 000
Norway	1 391 000	1 383 000	1 362 000	1 368 000	1 090 000
Poland	53 582	55 939	53 379	46 730	16 851
Romania	243 607	262 056	283 449	288 156	228 630
Russia	3 647 061	3 117 249	3 955 417	4 190 000	3 815 000
Serbia and Montenegro	116 994	—	—	—	—
Slovakia	159 203	158 289	160 461	162 995	149 604
Slovenia	138 500	118 100	111 016	83 300	35 148
Spain	394 200	367 400	405 100	405 800	334 600
Sweden	102 107	101 668	99 842	81 913	69 708
Switzerland	44 800	12 000	—	—	—
Turkey	59 000	60 000	63 400	61 100	30 000
Ukraine	114 213	112 952	113 437	88 800	45 900
United Kingdom	368 477	360 325	364 595	326 900	313 702
Cameroon	86 400	88 400	87 000	89 700	73 000
Egypt	243 800	252 300	258 300	259 200	245 400

(continues on the next page.)

Ghana	13 400	75 800	12 900	9 300	—
Mozambique	553 700	564 000	559 900	536 000	544 700
Nigeria	—	—	—	10 600	12 900
South Africa	846 213	895 000	899 000	811 000	809 000
Canada	2 894 204	3 051 128	3 082 625	3 120 148	3 030 269
USA	2 481 000	2 283 800	2 553 900	2 658 300	1 727 200
Argentina	275 071	277 800	292 744	399 714	406 655
Brazil	1 497 600	1 604 500	1 654 800	1 661 000	1 535 900
Venezuela	624 000	617 100	615 700	607 800	561 100
Bahrain	749 987	872 393	865 883	871 658	850 000
China	7 806 000	9 358 400	12 558 600	13 178 200	12 846 000
India (a)	930 543	1 113 849	1 239 581	1 347 127	* 1 302 100
Indonesia	252 300	250 300	242 100	242 500	257 600
Iran (b)	218 754	205 462	215 981	241 300	281 300
Japan	6 400	6 500	6 600	6 600	5 100
Kazakhstan	—	—	12 000	106 000	128 000
Oman	—	—	—	49 000	351 000
Tajikistan	379 630	413 800	419 060	399 500	359 400
United Arab Emirates	724 565	789 341	889 548	891 723	1 009 800
Australia	1 903 000	1 929 000	1 957 000	1 974 000	1 943 000
New Zealand	351 449	335 300	351 100	315 500	271 000
World Total	31 900 000	33 300 000	38 100 000	39 600 000	36 900 000

Figure A.2.3: Producers of primary aluminum (Mineralsuk, 20.2.11).

A.3 Calculations related to the Aluminum industry

The companies from the Aluminum industry listed in table A3.1 are analyzed based on A.T. Kearney's research from 2007, Yahoo finance's Aluminum industry list February 2011 and Norsk Hydro's annual reports. BHP Billiton was excluded due to less than 8 % of revenues from aluminum in 2009 (BHP, A2009).

Name	**Ticker**	**Type**	**Analyzed**
Alcoa Inc	AAI.AX, AA	Fully integrated	Yes
ALUAR ALUMINO ARGENTIONO	ALUA.BA	Specialized: Mid and downstream	Yes
Alumina Ltd	AWC.AX	Specialized: Up- and midstream (Alcoa owns 60% of JV. Managed by Alcoa.)	-
Aluminum Corp of China	ACH	Fully integrated	Yes
Alba	ALBH	Specialized: Mainly smelting	Yes
BHP Billiton	BHP	Fully integrated	No. Less than 8 % of revenues from aluminum.
Dubal	-	Specialized: Mainly smelting	Yes
Shangdong Nanshan	SHA	Specialized: Downstream	Yes
Henan Zhongfu Ind	600595	Specialized: Downstream	Yes
Yunnan Aluminum	000807	Specialized: Mainly smelting	Yes
Bhoruka Aluminium Ltd	BHRKALM.BO	Specialized: Downstream	Yes
BHP Billiton	BHP	Specialized: Up and midstream	-
Capral Ltd	CAA.AX	Specialized: Downstream	Yes
Century Aluminum Co	CENX	Fully integrated	Yes
Century Extrusions Ltd	CENTEXT.NS & CENTEXTR.BO	Specialized: Downstream	Yes
Alicon Castalloy Ltd	ENKEICAQ.BO	Specialized: Downstream	Yes
ESS DEE Aluminum Ltd	ESSDEE.NS	Specialized: Downstream (Packaging)	Yes

(Merged with India Foils)			
Gujarat Foils Ltd	GUJFOIL.BO	Specialized: Downstream	Yes
Hindalco Industries Ltd	HINDALCO.BO, HINDALCO.NS	Fully integrated	Yes
Kaiser Aluminum Corp	KALU	Fully integrated	Yes
Maan Aluminum Ltd	MANALU.NS, MANALUM.BO	Specialized: Downstream	Yes
Manaksia Ltd	MANAKSIA.BO	Specialized: Downstream	Yes
National Aluminum	NALCO.BO, NATIONALU.NS	Specialized: Up and midstream	Yes
Nirav Commercials Ltd	NIRAVCOM.BO	Specialized: Downstream	Yes
Noranda Aluminum Holding	NAF.DE, NOR	Fully integrated	Yes
Norsk Hydro ASA	NHY.L, NOH1.DE	Fully integrated	Yes
Sacheta Metals Ltd	SACHEMT.BO	Specialized: Downstream	Yes
Sims Metal Management Limited	SMS	Specialized: Midstream (Remelting)	Yes
Sudal Industries Ltd	SUDAI.BO	Specialized: Downstream	Yes
United Anodisers NV	UAS.PA	Specialized: Downstream	Yes
United Company Rusal PLC	R6I.DE, RUAL.PA, RUSAL.PA	Fully integrated	Yes
Rio Tinto Alcan	RIO	Fully integrated	Yes

Table A.3.1: Companies analyzed in the Aluminum industry.

The data used to calculate the CR_3 for the s-curve and the CAGR 2006 – 2010 is listed below. Figures not in U.S. dollars were converted by the current exchange rate. The companies marked in blue are specialized in downstream.

Company	**Alcoa**	**Aluar**	**Corp of China**	**Bhoruka**	**BHP**	**Capral**	**Century Al**	**Century Ex**
(million USD)								
Adjusted market cap								
2010	15851,6233	1672,31	12261,02	4,8	0	58,185	1441,184	19,2
2006	26561,5214	1227,6	10383,04	0,855	0	296,808	1451,125	2,82
CAGR Growth	-0,12106816	0,080351245	0,042438682	0,53928409	0	-0,33459837	-0,00171705	0,615336588
Revenue								
2010	21013	966	18470	30,8	0	235	1169,27	27,19
2006	30379	495	9896	19,6	0	493	1558,57	18,5
CAGR Growth	-0,088034	0,181933336	0,168831217	0,119627769	0	-0,16908761	-0,06932698	0,101055903
EBIT								
2010	1030	208	523	2,5	0	4,39	103	2,45
2006	3740	174	2647	1,55	0	-9	309	0,92
EBIT/REV10	0,04901728	0,215320911	0,028316188	0,081168831	0	0,018680851	0,08808915	0,090106657
EBIT/REV06	0,12311136	0,351515152	0,267481811	0,079081633	0	-0,01825558	0,19825866	0,04972973

Alicon Castalloy	**ESS DEE**	**Gujarat Foils**	**Hindalco**	**Kaiser**	**Maan**	**Manaksia**	**National**	**Nirav**
29,04	251,59	10,004	7653,6	654,72	3,2448	136,915	5798,7	3,666
16,75	42,75	0,637	4440,119	796,22	2,5012	24,48	4252,38	8,58

0,14748086	0,557540377	0,990712588	0,14582367	-0,0477398	0,067234555	0,537835579	0,080624086	-0,19150695
52,81	131,05	30,5	4339	1079	15,3	196,6	1208	1,6
27,19	15,77	19,5	2531	1357	8,91	228	1196,4	3,6
0,180529217	0,697857874	0,118320554	0,1442591	-0,05569911	0,144730968	-0,03636589	0,002415175	-0,18350342
5,37	28,4	1,72	491,4	44,4	0,53	17,5	266	0,1
3,71	34,15	4	494	3191	0,74	13,5	539	0,12
0,101685287	0,216711179	0,056393443	0,1132519	0,04114921	0,034640523	0,089013225	0,220198675	0,0625
0,136447223	2,165504122	0,205128205	0,19517977	2,35151069	0,08305275	0,059210526	0,450518221	0,033333333

Noranda	**Norsk Hydro**	**Sacheta**	**Sims**	**Sudal**	**United Andodisers**	**UC Rusal**	Rio Tinto Alcan	**Alba**
975,28	11575,2	2,1303	2851,92	5	10,4994	23100	139231	3369,9
475,2	11621,79	0,9937	2386,56	0,88	30,2917	10264	82303	2531
0,196914757	-0,00100372	0,210030645	0,04554143	0,543909477	-0,23270882	0,22482441	0,14046003	0,07419028
1294,9	13612,61	9,93	6299,8	16,86	33,26	14000	56576	1997
1312,72	31515,18	5,18	3752	11,5	29,25	11740	46065	1500
-0,00341113	-0,1893089	0,176670518	0,13832424	0,100373018	0,032640356	0,04499686	0,052725859	0,07416674
67,4	591	0,29	194,5	1,97	1,79	2167	19235	500
205,9	9306	0,64	186,4	0,84	1,71	1761	17000	340
0,052050351	0,04341563	0,029204431	0,030874	0,116844603	0,0538184	0,15478571	0,339985153	0,25037556
0,156849899	0,29528627	0,123552124	0,04968017	0,073043478	0,058461538	0,15	0,369043743	0,22666667

Dubal	**Shangdong**	Henan Zhongfu	Yunnan Aluminum	Total
14630	2812	3165	2159,4	249737,132
4043	675	523,16	515,31	164878,372
0,37922508	0,42865671	0,568320415	0,430757831	0,10937879
8670	1380	957	809	154621,48
2396	360	462	1033	148428,87
0,37921849	0,39924623	0,199685723	-0,059276377	0,01027094
817	133	123	47	26607,71
226	47	54	86	40359,18
0,09423299	0,09637681	0,128526646	0,058096415	0,17208288
0,09432387	0,13055556	0,116883117	0,083252662	0,27190923

The CARG portfolio along with revenues and operating margins can be taken directly from the calculations listed above. The CR_3 is found by taken the three largest companies by revenues each year divided by the industry's total amount of revenues. For example in 2006 the three largest were Alcoa, Norsk Hydro and Rio Tinto Alcan: (30,379 + 31,515.18 + 46,065)/148,428.87 that equals 72.7 %. It is possible to exclude downstream (marked in blue) in these calculations, as done in the paper.

A.4 Calculations related to the Paper industry

The companies in the Paper industry listed in table A.4.1 are analyzed based on A.T. Kearney's research from 2003 and Norske Skog's annual reports. White Brick is excluded due to bankruptcy and several companies have no figures published. Estimated means that adjusted market value is retrieved by the industry average's price-to-earnings ratio P/E.

Name	Ticker	Segments	Analyzed
CSS	NYSE: CSS	Household goods. Specialized in greeting cards.	Yes
Norbord	TSX: NBD	Mainly wood products.	Yes
Fibria Celulose	NYSE: FBR	Mainly pulp.	Yes
Domtar	TSX & NYSE: UFS	Pulp, wood products and household goods.	Yes
SCA	OMX: SCA B	Pulp, wood products, household goods and fine paper. Newsprint and magazine segment.	Yes
DS Smith	LSE: SMDS	Packaging and fine paper for the office.	Yes
Sappi	NYSE: SPP	Wood products, pulp and fine paper. Magazine paper.	Yes
AbiBow	TSX: ABH	Wood products, pulp and fine paper. Newsprint and magazine segment.	Yes. Bankruptcy reorganization in 2009. Estimated.
Nippon Paper	JP 3893	Wood products, pulp, packaging and fine paper. Newsprint and magazine segment.	Yes
NewPage	Private	Newsprint and magazine segment.	Yes
White Brich	-	Did serve newsprint and magazine segment.	No. Filed for bankruptcy reorganization in 2010.
Kruger	Private	Packaging, household goods and wood products. Newsprint and magazine segment.	No. No data.
Catalyst	TSX: CTL	Fine paper. Newsprint and magazine segment.	Yes
Burgo	Private	Magazine paper, fine paper, printing and household goods.	Yes. Estimated
Palm	Private	Newsprint.	No. No data.
International Paper	NYSE: IP	Fine paper, household goods and packaging.	Yes
Potlach	NASDAQ: PCH	Wood products.	Yes
Officemax	NYSE: OMX	Fine paper for the office.	Yes
West Fraser	TSX: WFT	Wood products.	Yes
M-Real	OMX: MRLBV	Pulp and packaging.	Yes

UPM/Myllykoski	OMX: UMPV1	Wood products, pulp and fine paper. Newsprint and magazine segment.	Yes
Stora Enso	OMX: STERV	Packaging, wood products, pulp and fine paper. Newsprint and magazine segment.	Yes
Kimberly-Clark	NYSE: KMB	Household goods.	Yes
Georgia Pacific	Part of conglomerate Koch Industries	Pulp, household goods, packaging, and wood products.	No. No data.
Unicharm	TYO: 8113	Household goods.	Yes
OJI Paper	TYO: 3861	Packaging and fine paper. Serves newsprint and magazine segment.	Yes
Holmen	OMX: HOLM B	Newsprint and magazine segment.	Yes
Norske Skog	OSE: NSG	Newsprint and magazine segment.	Yes
Carter Holt Harvey	Private	Wood products, pulp and packaging.	No. No data.

Table A.4.1: Companies analyzed in the Paper industry.

The data used to calculate the CR_3 for the s-curve and the CAGR 2006 – 2010 is listed below. Figures not in U.S. dollars were converted by the current exchange rate. The companies marked in blue are involved in newsprint and/or magazine paper.

Company	**CSS**	**Norbord**	**Fibria Celulose**	**Domtar**	**SCA**	**DS Smith**	**Sappi**	**AbiBow**
(million USD)								
Adjusted market cap								
2010	182,845	636,84	7488	3209,68	1755,75	91424,5	2692,564	2295,99
2006	303,135	1156,32	3060	2026,5	1683,36	95091,2	4223,31	1875
CAGR Growth	-0,11872439	-0,13853413	0,250722902	0,12183447	0,01058167	-0,00978257	-0,10643064	-0,05194293
Revenue								
2010	448,45	892	4100	5850	17497	3375	6572	4746
2006	525,5	1252	1317	3306	16262	2694	4941	3876
CAGR Growth	-0,03886293	-0,08126528	0,328310239	0,15335567	0,01846805	0,05795951	0,0739169	0,05192794
EBIT								
2010	-31	20	767	448	1212	134	86	1682
2006	32,72	114	299	-556	1095	40	-5	-400
EBIT/REV10	-0,06912699	0,022421525	0,187073171	0,0765812	0,06926902	0,0397037	0,01308582	0,35440371
EBIT/REV06	0,06226451	0,091054313	0,227031131	-0,16817907	0,06733489	0,01484781	-0,00101194	-0,10319917

Nippon Paper	**NewPage**	**WhiteBirch**	**Catalyst**	**Burgo**	**Palm**	**International Paper**	**Potlach**
		Bankrupt			No data		
3016	1740	0	95,5	92969	0	11848,539	1284,4
5335	986	0	797,65	88648	0	13514,3	1098,04
-0,13288993	0,15257205	0	-0,41176921	0,01196922	0	-0,03235109	0,03996934
13283	3596	0	1283	3432	0	25179	539,45
9959	2038	0	1967	3272,5	0	21995	417,24

0,07465759	0,15253434	0	-0,10131897	0,01196829	0	0,03437646	0,06632923
497	86,3	0	-433	40	0	822	44,87
378	110	0	-71,5	101	0	3188	79,47
0,03741625	0,02399889	0	-0,33749026	0,01165501	0	0,03264625	0,08317731
0,03795562	0,05397448	0	-0,03634977	0,03086325	0	0,14494203	0,19046592

Officemax	**West Fraser**	**M-Real**	UPM/Myllykoski	**Stora Enso**	**Kimberly-Clark**	**Georgia Pacific** No data	Uni Charm
1506,27	1999,188	1190,64	7540	8032,02	25384,59	0	7560
3535,28	1688,46	2278	11250,95	10840,86	26265,6	0	5413,52
-0,19207741	0,04313547	-0,14973033	-0,0952147	-0,07223014	-0,00849318	0	0,08707751
7150	2885,9	3726	12763	14727	19746	0	4328
8965	3325,84	5289	14333	16391	16747	0	3279
-0,05498449	-0,03484963	-0,08384845	-0,02858699	-0,02640752	0,04204273	0	0,07185604
115,74	238,6	209	908	1324	2550	0	533
171,88	522,28	-246	525	992	1845	0	347
0,01618741	0,08267785	0,05609232	0,07114315	0,0899029	0,12914008	0	0,12315157
0,01917234	0,15703702	-0,04651163	0,03662876	0,06052102	0,11016899	0	0,10582495

OJI Paper	Holmen	Norske Skog	Total
4734,436	3074,4	489,328	282150,48
6083,58	4053,44	3196,179	294403,684
-0,06075854	-0,06677975	-0,374478497	-0,010571563
13915	2800	3522	176355,8
14723	2961	5345	165181,08
-0,01401178	-0,01387968	-0,099029834	0,01649995
450	221	-452	11472,51
475	327,2	-480	8884,05
0,0323392	0,07892857	-0,128336173	0,065053205
0,03226245	0,11050321	-0,089803555	0,053783702

The CAGR portfolio 2006 – 2010 along with revenues and operating margins can be taken directly from the calculations listed above. The CR_3 is found by taken the three largest companies by revenues each year divided by the industry's total amount of revenues. A.3

provides an example of this. It is possible to exclude those companies not involved in newsprint and/or magazine paper (marked in black) in these calculations, as done in the paper.