



SCHOOL OF ECONOMICS  
AND MANAGEMENT  
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# Determinants of Mergers and Acquisitions in the Energy Industry

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*- Evidence from the European Market*

Master Thesis in Business Administration,  
Corporate and Financial Management

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## Abstract

Title	Determinants of Mergers and Acquisitions in the Energy Industry
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Background	The energy industry has experienced politically imposed changes in recent years. A wave of M&A has occurred in the last decade and to study how companies position themselves to it can shed some light on the effects of restructure in an industry.
Purpose	The aim of this thesis is to investigate what are the determinants behind firms engaging in M&A transactions based on theories and hypotheses that attempt to explain these strategic decisions.
Theoretical framework	The theoretical perspective used in this study is based on the main theories explaining merger activity. Hypotheses proposed by prior research are also considered.
Methodology	Financial data of companies operating in the energy industry and that were active in any year between 1995 and 2005 is extracted. After that, a multinomial regression analysis is used to find what drives a firm to be involved in an M&A activity using the numbers and ratios gathered and/or calculated.
Conclusion	Our results find that some established theories help explain some of the merger motives. Both acquirers and targets tend to be firms with established positions in the market and larger enterprise values. In addition, firms with low expected growth opportunities have a stronger tendency to be active in the takeover market. Finally, we find that relatively high amounts of cash are positively related to being an acquirer.

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# 1. Introduction

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*This introductory chapter explains the motives of our research problem stating the purpose of it, based on the background in the industry. Finally, it delimitates the boundaries of the research and provides a brief outline of the study.*

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## 1.1 Background

*“A well-functioning internal energy market is essential if all three of Europe’s energy challenges of competitiveness, sustainability and security of supply are to be met.”*  
(European Commission, 2008)

When most of the European energy markets were still monopolized in the 1990s, the European Union (EU) started to impose liberalizing directives on the member states (European Commission, Competition; Energy Overview). First opening up markets for competition, then in recent years pushing them to decrease their emissions and invest in renewable energy, have naturally come to affect the industry. A wave of mergers and acquisitions (M&A) among energy companies, have swept across Europe over the last decade. The changing scene for energy companies is an interesting research area and in our thesis we have chosen to focus on the M&A activities right when the changes were starting to be imposed, namely between 1995 and 2005.

## 1.2 Problem Discussion

Most research in the merger activity field is concerned with measuring the abnormal returns of stock prices around the announcement of the deal. This approach is founded on the assumption that the market is efficient when pricing a firm’s stock and assessing the benefits and losses of a strategic decision in a fast and precise manner. This type of study is well fitted for evaluating what deal characteristics are rewarded in the market but does not address the issue of determining the sources driving these decisions. Additionally, the literature on the determinants that drive a firm to the takeover market is not as vast as other areas. Our thesis intends to add on to the research for investigating the motivation for these strategic choices. For this reason, we

decide to study the rationales for M&A in a time period where the Energy Sector is experiencing changes that will modify the structure of the industry permanently.

Jensen suggests in his 1986 seminal paper that oil companies in the 80's which experienced a large increase in free cash flow, used it to undertake value destroying diversification programs in the form of the acquisition of unrelated businesses. Consistently with Jensen, Verde (2007), a European energy researcher, argues that there is a trend for European companies to opt to invest their additional cash flow in acquisitions as an alternative to investing them in exploration, generation or transmission activities.

The disciplinary effects of debt on managers are discussed extensively in literature. Jensen (1986) explains how a firm with large interest payments would be clearly less likely to carry out value destroying acquisitions. We intend to test these hypotheses in rationales for merger activity in the energy industry.

A much often cited motive for M&A is to interpret them as a source for cost cutting via cost synergies. This leads to believe that a firm would always be keen on finding opportunities to increase its asset base capacity and decreasing costs per unit produced. The theory behind this motive is economies of scale. Mahoney and McCormick (1988) in a study of the US industry find evidence to suggest that merger is partially motivated by cost considerations. Jensen (1983) also finds cost synergies as benefits coming from takeovers and therefore a driver for this type of activity.

If excess capacity is a motive for M&A activity we would expect to find firms working close to capacity to stay away from undertaking acquisitions. Andrade et al (2004) in an across industry US based study support this hypothesis. These researchers find evidence to state that excess capacity is a strong determinant for consolidation in an industry via mergers.

The specific asset acquisition hypothesis is a wide explanatory motivation for merger activity across industries. Therefore, the desired valuable asset will vary and will be dependent on specific industry characteristics. McLaughlin and Mehran (1995) in a study that measures abnormal return on stock prices from merger announcement effects, find that the positive effect of stock in regulated target utilities is much smaller compared to cases where utilities operate in

countries classified as unregulated environments. They interpret this as an indication that regulation restrains merger activity.

Transferring poorly managed or organizationally weak resources to more successful performing firms has been found to be a strong driver for M&A activity in the literature. The perspective that sees the market for corporate control as an effective method to discipline manager is thoroughly discussed by Jensen and Ruback (1983). These researchers propose that this effect on the takeover market allows resources to be transferred to more efficiently run corporations.

To our knowledge no study has investigated the rationales behind merger activity in the European energy sector. For that reason we want to test these hypotheses and evidence that has been found significant when driving consolidation in other industries to this sector. We expect to find among others, that higher amounts of cash drive acquisitions, that firms operating in regulated countries are not as engaged in M&A activity and that excess capacity is determining the consolidation in the European market.

### 1.3 Purpose

The aim of this thesis is to investigate what are the determinants behind firms engaging in M&A transactions based on theories and hypotheses that attempt to explain these strategic decisions. Research of this kind has been done across industries and industry specific; this study intends to test whether the established theory applies for the European energy industry.

### 1.4 Delimitations

The study is concerned about the determinants of M&A within the energy industry. Therefore, in our definition of the European energy market we include all companies active between the years 1995 and 2005 in the sector classifications Electricity, Oil & Gas Producers or Gas, water & Multiutilities, according to Thomson Financial Datastream categorization. The time frame we consider gives space for the effect of the restructuring of the industry given the political and economic changes. We do not take into account “alternative energy” since the sector, though high growth in recent years yet has an insignificant share of the electricity production (Eurostat, 2008). Sub-contractors and service companies to our three sector classifications are also not

regarded in this thesis. This said, there might be companies in our sample having divisions or subsidiaries in these disregarded sectors but we stick to Datastream categorization and let the main business set the classification.

The European energy market is in this thesis geographically all EU members plus Switzerland and Norway, totalling 29 countries. EU+2 or European Union plus Norway and Switzerland is an acknowledged classification, given that these countries are well integrated in the European Commission policies. Additionally, the energy interconnections of these countries with the EU cannot be disregarded (ERGEG Monitoring report, 2007). We will come back to the sample and data recovery in the method chapter.

## 1.5 Thesis Outline

Chapter 2 provides a description of the energy industry in Europe with a focus on the deregulation process and other specific characteristics that have been proposed as drivers for merger activity in the field. It also describes some specific examples of merger events in the industry.

Chapter 3 is designed to provide the reader with the theoretical background of the motives for M&A activity. It also describes several of the hypotheses behind the rationales for merger activity while discussing which of them are applicable for the sector in focus and generates the hypotheses used in the study.

In chapter 4, the methodology and data collection used in this thesis is described. The chapter discusses our research approach and research method as well as motivates our choice for the regression analysis used in the study. We conclude this chapter by describing the reliability and validity of our research.

The empirical findings of the study are provided in Chapter 5. Furthermore, the analysis and interpretations of the outcome are discussed and compared to prior research.

Finally, in chapter 6 the conclusions of our research are given as well as the proposed further research that can be aimed at in the field.

## 2. The Energy Industry

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*This chapter will give a brief description of the industry structure followed by a section about the evolution and the current regulatory environment on the European energy market. Characteristics of some merger events will be discussed at the end of this chapter.*

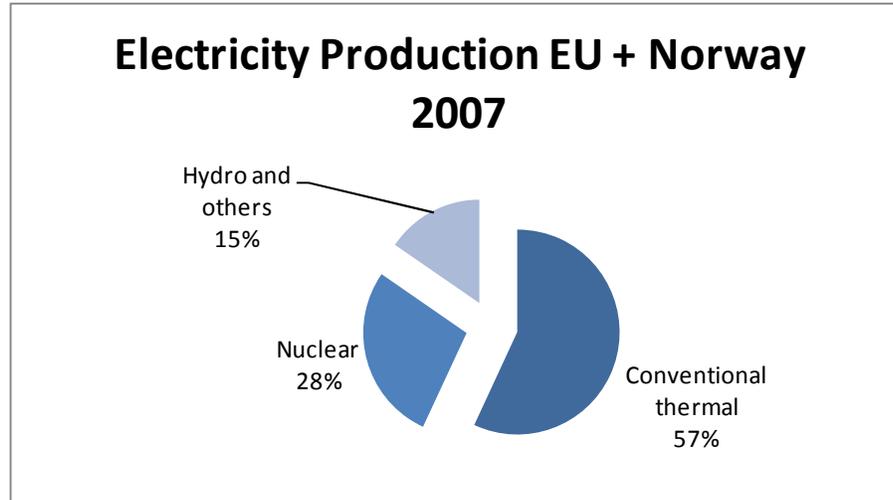
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### 2.1 Industry Structure

The European energy industry has taken several steps towards the goal of one internal energy market for electricity and gas, initiated by the European Commission in the early 1990s. Much of the focus is on gas and electricity, when the European energy market is discussed, but some of the energy sources have uses besides electricity generation (Hiro & Amaya, 2003). For instance both gas and oil have uses such as heating houses and as fuels for vehicles (Hiro & Amaya, 2003).

The energy industry can be divided into upstream, transport and downstream activities, where upstream represents areas such as production, wholesale and exploration (European Commission, Case GDF / Centrica / SPE, 2004). Downstream involves supplying and retailing (European Commission, Case GDF / Centrica / SPE, 2004). Numerous companies in this sector are not only active in the production and/or retailing but also control the utilities transporting the good. Transportation of for example gas and electricity are usually characterized by limitations in the interconnection between countries and even between regions within a country (Möllgaard & Kastberg Nielsen, 2004). The European Commission stresses in their report from 2008 the importance of infrastructure investments and states that electricity and gas markets within the EU are to be regarded as national due to the congestion phenomena in the grids (European Commission, 2008).

The energy production and consumption pattern do differ widely between countries in the EU. Statistics from 2007 of the total electricity production in the EU-27 plus Norway, gives us an overview.



Source: Eurostat 2008

Exhibit 1: Electricity Production for 2007 in the EU and Norway

Conventional thermal accounts for 56,9% of the production, nuclear 27,7% and hydro and others for 15,4% (Eurostat, 2008). The rather high dependency on fossil fuels is a cause of concern since oil and gas production is declining in the region with increasing imports as a result (The European Oil and Gas Industry Market Assessment, 2005). Imports from countries with different political systems, than EU countries, raise the risk of disruption of the energy supply (The European Oil and Gas Industry Market Assessment, 2005). Gas, oil, coal and other such primary fuels' security of supply is a prioritized area for the EU Commission (Newbery, 2002).

The product markets have different characteristics. Gas plants tend to be flexible in production output while nuclear is not. Oil is easier and cheaper to store than gas, since gas needs to be liquidized in order to store (Hiro & Amaya, 2003). There is a price linkage between oil and gas and since the EU electricity system is increasingly being dependent on gas, oil price fluctuations affect the electricity price (European Commission, 2008). Hidroelectric resources can control their generation, and are thereby regarded as storable (Knittel & Roberts, 2005). The product electricity is special in the sense that it cannot be stored and that the demand is inelastic, at least in the short run (Knittel & Roberts, 2005). Therefore small changes in the supply can have large consequences for the price (Knittel & Roberts, 2005).

To better match different market's deficits and surpluses, wholesales for electricity came into the European market, with Nord Pool for the Nordic countries, German-based EEX and Paris-based Powernext among others. The trend has generally been an increasing number of energy exchanges after being just one, London's International Petroleum Exchange, for some time in the 1990s (Wilcox, 2000). This trend seems to have taken a new pattern in 2008, where a wave of mergers and cross-border consolidation has occurred (Energy Risk, European energy outlook). European Power Exchange was the result of Powernext and EEX merging their spot and futures operations (Energy Risk, European energy outlook) and Nord Pool sold a division to NasdaqOMX. Europe's largest gas exchange was also created in 2008, after APX Group acquired Endex (Energy Risk, European energy outlook). The mergers can perhaps lead to increased liquidity in the market places and to make the European energy market more homogenized (Energy Risk, European energy outlook).

## 2.2 Liberalization of the European Energy Market

The previous section described wholesale markets for energy coming to play and how they continue to evolve. This would not have been possible if the energy market would not have taken liberalizing steps and freeing up the typically state-owned, vertically integrated public utilities for gas and electricity (Newbery, 2002). The European Commission has been a mean to deregulate the European energy market, where it has focused on gas and electricity, mostly the downstream and transport activities. Several steps have been accomplished but as of year 2009 fourteen countries still have regulated prices for gas and electricity (European Commission, 2009). Three have just regulated electricity prices and one country has only regulated gas prices (European Commission, 2009).

But downstream energy activities have taken major steps; one such is that from the 1 July 2007 all consumers in the EU can choose their energy supplier (European Commission, 2008). All national retail markets are thereby open for competition. A condition for this competition to be effective is that suppliers have access to the transmission system (Newbery, 2002). Regarding the transport activities, many countries still have more to do. According to Newbury (2002), the best solution for competitive markets is to separate the ownership of transmission and

generation. The number of countries with ownership unbundling of electricity operators was at the end of 2008 fifteen (European Commission, 2009). The same figure for gas network operators was twelve (European Commission, 2009). Unbundled Transmission System Operators (TSOs) have strong positive effect on the investments in interconnectivity capacity, compared to vertically integrated TSOs (European Commission, 2008). For the interconnectivity some progress has happened over the last decade, besides new interconnections. A compensation agreement, for Transmission System Operators between countries, is one important step to enable interconnectivity in the electricity market. In 2007 all but six countries, of the EU-27 + Norway and Switzerland, participated to be compared with only ten in 2002 (ERGEG Monitoring Report, 2007). As already mentioned in section 2.1, congestion on the interconnections of both gas and electricity are limiting competition. The European Commission do still regard the energy markets as national and one problem is the lack of transparency of each TSO's network availability, where most electricity operators choose not to disclose all information (ERGEG Monitoring report, 2007).

Arguably liberalizing, but the EU member states have signed and ratified the Kyoto Protocol and taking that further the member states have “agreed to a 20% reduction in CO<sub>2</sub> emissions by 2020” (Capgemini, 2008). One way to push for efficiency measures in the CO<sub>2</sub> emitting installations was the implementation of CO<sub>2</sub> emission rights in January, 2005, following an EU directive from 2003 (Mansanet-Bataller et al, 2008). The objective with the allowances was also to establish a market price for emissions (Mansanet-Bataller et al, 2008). The implementation of CO<sub>2</sub> emission rights has not yet come to fully affect emitting industries, such as energy, since the rights have to a large degree been handed out for free by the EU members' governments (Capgemini, 2008). The second commitment period started in 2008 and the next is to start in 2013 (Mansanet-Bataller et al, 2008). When the third round starts, costs of “tens of billion of euros” can be expected for the energy companies, as now 100% of the emission rights will be auctioned to the power sector (Capgemini, 2008). Apart from reductions in total emissions, the 2013 “Climate Package” is expected to boost renewable energy's share of total energy supply, since allowances costs is expected to be passed onto the electricity prices (Capgemini, 2008).

## 2.3 Merger Events in the Industry

The companies in the energy industry have reacted to the ongoing liberalization of the European energy market. The unbundling of previously integrated activities, CO2 emissions rights and other measures changing the competition can be part of the explanation of the increased M&A activity in recent years. Swedish Vattenfall just motivated its purchase of Dutch Nuon, to be able to get a critical size to handle needed investments (i.e. R&D) in coming years (Press release, 2009-02-23). Economies of scale is a driving force in the recent years merger wave (Verde, 2008). Though markets are still to a large extent regarded as national, multiple geographic presences, seems to be a way to prepare for the consequences of a completely liberalized market. Verde (2008) calls the trend “cross-border mergers”. Despite a cross-border merger with no horizontal overlaps it may bring competition limitations. One example shows on the complexity of this energy market in change. The joint acquisition of Spanish Hidrocantabrico, indirect by French EdF and Portuguese EDP. The Spanish market was isolated and in need of new interconnections, which the exporters EdF and EDP had the incentive to invest in. The Commission noticed that, after acquiring Hidrocantabrico, the incentive to invest in interconnections would decrease as EdF and EDP could profit directly on the relatively high energy prices on the isolated Spanish electricity market (European Commission, Case EnBW / EDP / Cajastur / Hidrocantabrico, 2002). The deal was finally accepted by the Commission but with some undertakings on EdF regarding further investments in interconnections (European Commission, Case EnBW / EDP / Cajastur / Hidrocantabrico, 2002).

A second trend analyzed is the creation of “national champions”, which are the result of increasing protectionism in the energy sector (Verde, 2008). The French government intervened when Suez was a prospect target and created such a national champion uniting state owned GDF with Suez. Some remedies followed the merger, due to the dominant position it created in some smaller markets (European Commission, Case Gaz de France / Suez, 2006). Another example is Spain, which actually violating EC law when it stopped Spanish Endesa from merging with foreign suitors (European Commission, “*Competition; Energy Overview*”). The political dimension is obvious but the reasons may be two folded, both securing the vital energy

infrastructure and paving the way for national companies in the world of globalization (Verde, 2008).

A third trend, intensified after 2003, is the vertical mergers, where electric generators are securing the supply by merging with the energy source, often gas (Verde, 2008). This trend repeats the pattern observed in the USA in the 1990s, after implemented deregulations of gas and electricity (Bergstrom & Callender 1996).

## 3. Theoretical Background

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*This chapter presents the theory in which M&A shareholder value creation is founded. Firstly, we describe the theoretical motives for M&A by a review of the literature in the subject. Additionally, we discuss which of these determinants are relevant for the energy industry.*

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### 3.1 Motives for Mergers and Acquisitions

An extensive body of research has been made to study the effects of M&A activity on shareholder value. A great part of this research is composed of event studies which focus on the stock price movements around the announcement of activity in an attempt to assess and anticipate shareholder value creation. On the other hand, some researchers have been concerned with the rationales driving these strategic actions. Studies made in this area have found that certain firm- and industry-level characteristics are able to explain to a certain degree the consolidation within an industry.

#### 3.1.1 Economies of Scale

*Economies of Scale* is a much cited motive for M&A activity among bidding managers and therefore a well known reason for mergers in all industries. Jensen (1983) by making an overview of the scientific evidence mentions synergies as one of the gains coming from takeovers. Gaughan (2002) points out that merger planners tend to cite cost-reducing operating synergies such as economies of scale as the main source of operating synergies. Following the assumption that a larger firm would be able to realize more benefits through economies of scale, one can hypothesize that smaller firms would be more likely to engage in M&A activity as a mean to enjoy lower costs. Mahoney and McCormick (1988) found, in a study in the US, that the cost savings from consolidating resources depended on the degree of similarity of the merged processes and product lines. In the same study they conclude that “the more lines of business a merger brings together, matching product associations found in existing firms and facilities, the greater the probability that merger is motivated by cost considerations”( Mahoney and McCormick 1988).

### 3.1.2 Excess Capacity

*Excess Capacity* is generally regarded as an industry level characteristic that drives merger activity. Firms facing gaps in their production capacity will reduce asset efficiency and therefore decrease their return on invested capital. In general, the argument for M&A activity is that firms with excess capacity are more likely to look for ways to consolidate resources in an attempt to solve the issue. Danzon et al (2007) in a study similar to ours test several variables to model the probability that a firm will engage in M&A activity or not, based on pre merger characteristics. Their study is conducted on the Pharmaceutical and Biotech industries, where they find that large firms that expect to have excess capacity are more likely to merge in response to it. They argue that gaps in production of profitable products drive mergers in a similar way to how technology and regulatory shocks create consolidation in other industries (Danzon et al 2004). This is consistent with a study made on M&A during 1970 to 1994 by Andrade et al (2004) who argue that consolidation through mergers is a response to excess capacity in both the decades of the 1970's and 1980's. Based on the variables sales growth, capacity utilization and industry concentration the study finds that mergers are efficient to rationalize resources. As the reader may note, excess capacity and economies of scale are interrelated. A merger motivated by excess capacity should also be analyzed by management as a likely source of economies of scale.

### 3.1.3 Specific Asset Acquisition

*Specific Asset Acquisition* refers to the probability that a firm will engage in merger activity given that its expansion is driven by a determined already established objective. Such objectives will vary due to particular industry characteristics; for instance a specific valuable asset might be a company already established in a foreign country or a firm that decides to merge with another one based on regulatory reasons. The latter example is important in the energy sector and is brought up by McLaughlin and Mehran (1995) in an event study on M&A activity in the US utility industry. They argue that in the case of utilities, firms are more likely to acquire a competitor that is already established in a certain market instead of increasing capacity internally given the lengthy process of getting concession to construct a power plant or gaining regulatory approval. In their study McLaughlin and Mehran (1995) find evidence that regulated target utilities are less likely to be acquired and the announcement effect is much smaller than the

unregulated cases suggesting that regulation constrains M&A activity. Verde (2008) in his paper on the energy industry and EU merger policy suggests, after analyzing the energy liberalization process in the US, that in Europe the liberalization is creating integrated pan-European players which would benefit from a single market while minimizing the risks of becoming a target.

### 3.1.4 Financing / Agency Issues

*Financing / Agency Issues.* Historically, a large percentage of acquisitions are financed by cash. Even though, this trend has decreased in the last decades, the financing for most M&A still includes partial cash. Jensen (1986) proposes based on the theory of free cash flow that managers with large cash flows are more likely to undertake value destroying mergers. The rationale behind this theory is that managers with low expected growth and few investment opportunities will tend to use the cash flow in unprofitable projects. Consistent with this theory, Verde (2008) suggests that the extra cash that European energy companies have accumulated is used in M&A to detriment of longer-term investments such as generation, transmission or exploration activities. Verde (2008) hypothesizes that this trend is a result of the “short-terminism” investment decisions, favoring a lowest-risk and lowest-uncertainty strategy. Interestingly and unlike what the theory of free cash flow would predict, Danzon et al (2007) find in their study on pharmaceutical firms a low correlation between cash and M&A activity; even proposing that firms with high levels of cash flow do not tend to engage in M&A at all.

In terms of leverage, Jensen (1986) also suggests that firms with unused debt capacity will be more likely to engage in M&A activity than those which are highly leveraged compared to their industry peers. The reason is that debt imposes certain degree of discipline on managers. Those who have to make interest payments would be more careful when accepting projects with low or negative net present values. Andrade and Stafford (2004), mentioned earlier, find evidence suggesting that acquirers tend to have unused borrowing power while the opposite is true for targets.

### 3.1.5 Market for Corporate Control and Undervalued Target

*Market for corporate control and Undervalued Target.* Fama and Jensen (1983) as described in Jensen and Ruback (1983) define corporate control as “having the rights to determine the

corporate resources – that is the rights to hire, fire and set compensation of top-level managers”. Jensen and Ruback (1983) suggest that the takeover market is an effective disciplinary method for management to aim for shareholder value; enables transfer of poorly managed resources to more efficiently ran corporations. Consistent with this theory, Andrade and Stafford (2003) find evidence which suggest that firms with high Tobin’s q (proxy q) are more likely to engage in M&A as acquirers. Furthermore, Danzon et al (2007) conclude that underperforming firms, measured by a low Tobin’s q, are more prone to be targets. Evidence suggests that target companies are usually acquired when they are perceived as undervalued and Tobin’s q is here a good proxy to assess undervaluation, where a low q indicates that a firm is performing below its potential value.

### 3.1.6 Corporate / Strategic Focus

*Corporate / Strategic Focus* is a much studied subject in M&A activity; researchers have tried to account for the effect that it has in determining a merger. Strategic focus will vary depending on the nature of competition in each industry. Berry (2000) in an event study of 21 US electric utility mergers argues that a combination of a gas and electric utility can provide a one-stop shopping for customers looking for an energy provider in a related diversification manner. Berry (2000) finds evidence to support this statement, as the stock price around the announcement of an electric/gas merger is positive and significant. He concludes that shareholders perceive profitable opportunities from electric/gas mergers as the two industries converge. Within the European energy industry Verde (2007) perceives a trend that he calls inter-industry M&A where mainly gas and electric companies converge. Verde (2007) argues that this strategy can be explained by electricity companies attempting to secure supply and minimize risks supplying natural gas while gas companies get access to a captive market; resulting in vertically integrated companies. Burns et al (1998) analyze post performance of utility mergers and acquisition during the period from 1981 to 1993. Interestingly, the study shows that, unlike in unregulated industries, bundling mergers such as a gas/electric one increase value. Conglomerate mergers, as in other industries, destroy shareholder value and Horizontal and Vertical mergers show insignificant change.

### 3.1.7 Deregulation

*Deregulation* is an industry shock that is often cited as a reason for industry consolidation via mergers and acquisitions. Mitchell and Mulherin (1996) have found evidence through an analysis of the M&A activity in the last century that mergers strongly occur within industry waves due to industry shocks. A change in an industry is defined as being a shock when it modifies the industry structure. Examples of industry shocks are technological changes, deregulation and severe variation in input prices. Mitchell and Mulherin (1996) find significant evidence to suggest that broad factors such as deregulation drive an important amount of M&A activity. In further research and consistent with these latter results, Leggio and Lien (2000) in an event study of the announcement effect of M&A occurred during 1983 to 1996 in US electric utilities, find supporting evidence to state that targets of regulated industries earn positive abnormal returns but returns are not as large as those in a non-regulated industries. Leggio and Lien (2000) suggest that the lengthy process of a regulated merger to receive approval from regulators and shareholders along with the merger requiring to be in the best interest of rate payers reduces the attractiveness of the deal. They also affirm that traditionally regulated utilities began diversifying into unregulated industries where returns are not set by regulators.

Tax motivation as a determinant of merger activity is a reason often brought up by management in order to fund an acquisition. Gilson et al (1988) have shown the benefits of tax factors in M&A activity as described in Gaughan (2002).

Hubris Hypothesis comes as a motivation for merger activity when management is thought to be willing to create “empire building”. Research has shown that company size is positively correlated with management salary; additionally, size factor increases the resources under management control. Hubris hypothesis is thought to drive some acquisitions in the takeover activity.

## 3.2 M&A Determinants in the Energy Industry and Hypotheses Generation

In the previous section we outlined a brief review of research investigating reasons driving M&A activity. Even though we describe studies made on energy companies, most of the research previously discussed is based on across industries studies or it concentrates on certain industries

such as the pharmaceutical one. In order to construct a set of variables that add explanatory power specifically for the energy industry, we now turn to discuss the applicable factors affecting the industry and the measures we consider for each of them.

Economies of Scale are often used as a motive for M&A activity in all industries; therefore, we would expect to see smaller companies being more active acquirers than larger firms which are supposed to be working on their highest efficient capacity. These small firms would acquire other or merge in an attempt to achieve lower costs of production given their potential production output. According to Verde (2008) given the process of liberalization in the European energy industry, firms have aimed to broaden their activities by having a bigger presence in the market and lowering their risks of being taken over.

*H1. Relatively small companies are more active in the market for corporate control*

*H1a. Smaller companies would be more active acquirers in an attempt to achieve economies of scale*

As mentioned earlier, Excess Capacity has been found to drive some of the M&A in certain industries in some markets. This capacity creates the need to fill in those “gaps” in production and pushes the company to add market for the firm. As energy firms are capital intensive by nature, in order not to decrease the asset productivity they are forced to look for ways to keep it at an acceptable level. We measure excess capacity by the change in percentage change in sales from the previous year since a relatively slow sales growth would suggest that the productivity of assets will soon be declining. A high Tobin’s q (proxy) is our second measure for this variable. We expect high q firms, which outperform their peers, to be working close to their limit capacity. On the other hand, low q firms with few growth opportunities will decrease their asset productivity. A third measure for excess capacity is the percentage change in operating profit; a firm that expects low sales growth and given the high fixed costs in the industry, would experience excess capacity while decreasing its operating profit. Our fourth and final measure for this variable is the ratio of sales to assets. According to Brealy and Myers (1996) a firm with a high ratio of sales to assets could signal that it is working close to capacity.

*H2. Firms facing excess capacity would engage in M&A activity to fill in the gaps in production output*

*H2a. Companies with a slow growth of sales would be more active acquirers*

*H2b. Low  $q$  firms would more likely engage in M&A activity*

*H2c. Firms with declining operating profit would more likely engage in M&A activity*

*H2d. Companies with a high sales to assets ratio are more prone not to engage in any M&A activity*

Specific asset acquisition is based on the rationale of a firm having access to a certain valuable advantage deriving from acquiring another firm. The range of valuable assets is wide, going from a specific market area to obtaining an already established production capacity. In the energy sector, researchers have found that certain strategic objectives are achieved by merging companies. Given the deregulation process that is taking place in the EU energy industry; this element has become an important focus of research in the industry. Deregulation, as we have discussed earlier, is an industry shock driving M&A activity. We argue that deregulation makes certain firm assets more attractive for other firms. For instance, Leggio and Lien (2000) have found evidence suggesting that electric utilities have diversified into unregulated businesses where the return on equity is not predetermined by regulators. Leggio and Lien (2000) suggest that the reason why electric utilities earn negative returns around the announcement of a merger is that they operate in a regulated environment. For the purposes of this study, the existing research and based on the readily available data we treat the variables of specific asset acquisition and deregulation as one. Existing research leads us to believe that deregulation is an important factor driving M&A in the industry. Therefore, we would expect to see a higher merger propensity in companies operating in non regulated countries where process for energy projects approval and government intervention is low relative while the opposite is true for regulated nations.

*H3. Firms in deregulated countries are more likely to engage in M&A*

Financing and Agency issues are the following theories that we test in the regression analysis. Financing theory tells us that firms with excess cash would be more likely to undertake investments even if these have a negative net present value. Consequently, and consistently with Verde's (2007) hypothesis, we would expect the firms with larger free cash flows to engage more frequently in M&A even if they destroy shareholder value. We measure cash capacity by the ratio of cash to sales of a firm. This is a direct measure of a firm's most liquid asset. Further, research on M&A has found that firms with unused debt capacity tend to engage in M&A more frequently than firms with high levels of debt. We measure debt capacity by the book value of debt to the book value of equity of a firm. We would expect to find firms with low ratios of debt to equity acquiring other firms more actively.

*H4. High levels of cash drive firms to be active acquirers*

*H4a. Highly leveraged firms are more likely not to engage in M&A activity*

Market for corporate control theory proposes that in a perfect market poorly managed resources are to be transferred to more competent management. This theory suggests that underperforming firms are more likely to be targets while strong and financially healthy firms would be more active acquirers. We measure a firm's performance in four ways. Our first measure is the market to book value ratio as a proxy for Tobin's q. Low Tobin's q firms are companies with low expected growth opportunities and therefore outperformed by their peers and more likely to be targets. This could also indicate that a firm is below its potential value and therefore more appealing to be acquired. A second measure is the percentage change in operating profit from year t-1 to t0. A decrease in operating profit would indicate poorly managed firms. The third measurement is the percentage change in sales from year t-1 to t0 proposing that a firm with a high growth of sales has high expectations of strong performance. The energy industry being a capital intensive business, we add a fourth and final measure a ratio for the efficient use of assets. We expect the ratio of Return on Assets (Net income over assets) to give a direct evaluation of the management's ability to use assets in an efficient way.

*H5. Weak performers are more likely to be engaged in M&A*

*H5a. Low q firms are more likely to be targets*

H5b. *Targets show a decrease in operating profit as a pre-merger characteristic*

H5c. *Targets would show a lagging percentage change in sales*

H5d. *Firms with low ROA are more prone to be targets*

Corporate / Strategic focus is a variable suitable for event studies. There is some research on the energy industry that uses event studies to measure the value creation in mergers given certain corporate focus such as horizontal, vertical, conglomerate or bundled. These studies, however, concentrate on merger information exclusively and do not address the factors driving M&A activity in reference to non merging firms. This variable is not included in our study given that non merging firms in our sample would not have a value and therefore the result would not be valid.

Tax motivation is a rationale that helps driving mergers, however, whether a transaction can be executed free of tax or not is a case by case assessment out of the scope of this study. Readily available data was not found in this respect and this factor cannot be taken into account.

Hubris hypothesis proposes top management's desire for empire building as a reason for M&A activity. Given the highly qualitative feature of this variable it is not possible to determine whether a company's management is affected by this hypothesis in its decisions or not. This variable has been disregarded in our study.

We have included all the variables that based on theory and the energy industry's characteristics add the most explanatory power to our study.

### Hypotheses summary

Hypothesis 1. Relatively small companies are more active in the market for corporate control
Hypothesis 1a. Smaller companies would be more active acquirers to achieve economies of scale
Hypothesis 2. Firms facing excess capacity would engage in M&A activity to fill in production gaps
Hypothesis 2a. Companies with a slow growth of sales would be more active acquirers
Hypothesis 2b. Low q firms would more likely engage in M&A activity
Hypothesis 2c. Firms with declining operating profit would more likely engage in M&A
Hypothesis 2d. High sales to assets ratio firms are more likely not to engage in any M&A activity
Hypothesis 3. Firms in deregulated countries are more likely to engage in M&A
Hypothesis 4. High levels of cash drive firms to be active acquirers
Hypothesis 4a. Highly leveraged firms are more likely not to engage in M&A activity
Hypothesis 5. Weak performers are more likely to be engaged
Hypothesis 5a. Low q firms are more likely to be targets
Hypothesis 5b. Targets show an decrease in operating profit as a pre-merger characteristic
Hypothesis 5c. Targets would show a lagging percentage change in sales
Hypothesis 5d. Firms with low ROA are more prone to be targets

Exhibit 2: Summary of the hypotheses

It is important to notice that even though there are overlapping measurements for distinct variables; the only mutually exclusive outcome is in the hypotheses 2a and 5c where the theories of excess capacity and market for corporate control diverge in the interpretation of the variable percentage change in sales. We test in this study the relevance of these hypotheses.

## 4. Methodology and Data Collection

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*In this chapter we describe the methodology used in our research. We here describe distinctively how we approached our study, giving a description, justification, and the steps followed in the data collection and the choice of regression analysis used.*

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### 4.1 Research Approach

The aim of this study is to find the determinants of mergers and acquisitions in the energy industry as previously stated. In order to achieve this goal, a quantitative approach has been adopted. Thus, there was a need for gathering the industry's empirical data and processing this data using a type of regression to obtain the adequate type of results. Our study is focused on the European energy industry, as we believe that the study of M&A in a specific continent is more relevant because the determinants for undertaking this type of activity can vary across regions, leading to inconclusive results. For the same reason, we believe that studies on M&A should be conducted on industries independently, where energy is a good example of an industry with large geographic differences.

It is important to add that this type of study relies on data of publicly listed companies, therefore not representing the whole population in the market involved in M&A activity. Any reached conclusion concerns and can only be related to publicly listed companies.

### 4.2 Research Method

The methodology used in our study is motivated by similar studies that were done in the field of M&A. In order to pinpoint the forces driving a firm to be involved in the takeover market we use a quantitative approach and to a lesser extent a qualitative one.

The quantitative data relies on accounting information and gives an objective outcome for the research. On the other hand, the qualitative dimension allows us to bring in a strategic and political dimension to the study.

The following sections will present a detailed description of the methodology used.

#### 4.2.1 The Source of Information

In order to accomplish our research, both financial data and theoretical background were needed. The information was gathered from sources that are considered reliable. In addition, some financial ratios used were calculated from the data extracted from these databases. The following databases were used in order to conduct our study:

Database	Description
Thomson Financial DataStream	Extraction of complete financial information about companies such as balance sheets, income statements, ratios, and some other information as market value for example
Reuters 3000Xtra	Extraction of description and information about all M&A activities that occurred during the specified time frame
ELIN@Lund	Lund University database for searching and obtaining articles
SSRN (www.ssrn.com)	Database for searching and obtaining articles

Table 1: Sources of information

#### 4.2.2 The Sample and Excluded Observations

Our study regards the listed companies in the 27 member states of the European Union plus Norway and Switzerland. Following is a list of all the countries included:

Countries Included in the Study					
Austria	Denmark	Greece	Lithuania	Poland	Spain
Belgium	Estonia	Hungary	Luxembourg	Portugal	Sweden
Bulgaria	Finland	Ireland	Malta	Romania	Switzerland
Cyprus	France	Italy	Netherlands	Slovakia	UK
Czech Republic	Germany	Latvia	Norway	Slovenia	

Table 2: Countries included in the study

In order to get a sample for our study, several collection and processing steps were done. Following is a description of what is considered as sectors of the energy industry under the Datastream classification:

- Electricity
- Oil & Gas Producers
- Gas, Water & Multi-utilities

The first step involved gathering financial data, between the years 1995 and 2005, for all companies within the energy industry and within the geographical boundaries. For that purpose, Thomson Financial DataStream was used. We decided to exclude companies that did not reach a market value higher than \$100 million at least once throughout the period, as a measure to secure sample reliability. Danzon et al (2007) did the same procedure for their biotech and pharmaceuticals companies sample by excluding the ones that never had net sales of at least \$20 million in any year during the sample period and never had an enterprise value of at least \$1 billion claiming that they are limiting their sample to firms with significant economic value.

The following table gives a summary of our sample data which consists of 1957 firm-years of 302 firms:

Countries	Number of firms in the initial sample	Number of firms excluded	Number of firms in the final sample
Austria	5	0	5
Belgium	9	3	6
Bulgaria	0	0	0
Cyprus	0	0	0
Czech Republic	22	5	17
Denmark	4	1	3
Estonia	1	0	1
Finland	4	0	4
France	23	5	18

Germany	29	5	24
Greece	8	0	8
Hungary	5	0	5
Ireland	9	2	7
Italy	27	1	26
Latvia	0	0	0
Lithuania	0	0	0
Luxembourg	3	2	1
Malta	0	0	0
Netherlands	4	1	3
Norway	16	4	12
Poland	10	1	9
Portugal	3	0	3
Romania	0	0	0
Slovakia	0	0	0
Slovenia	2	0	2
Spain	21	2	19
Sweden	13	4	9
Switzerland	16	3	13
UK	161	54	107
<b>Total firms in the sample</b>	<b>395</b>	<b>93</b>	<b>302</b>

Table 3: Number of firms in the sample before and after exclusions

Of these 1957 firm-years that were gathered, 376 firm-years were excluded given the missing data for at least one of the variables used, making them invalid for the regression analysis. At the end, our sample consisted of 1581 firm-years.

Afterwards, M&A deals that occurred between 1995 and 2005 needed to be extracted. Reuters 3000Xtra was used for that purpose. In order not to exclude deals where non-European companies are involved as either a target or an acquirer, where the counterpart is a European company, two steps were conducted. First, we collected the list of M&A deals in the energy

industry where European companies were acquirers. Then we gathered the deals where the target was a European company. In order to get concrete M&A deals we excluded the ones that were considered as only “investments” by Reuters. These investments are basically the accumulation of a firm’s stocks by another firm and therefore do not imply a merger of operations that would require reorganization, so they were not considered. At last, 990 deals were collected from Reuters 3000Xtra of which 795 were involving European companies as acquirers and 743 were involving European companies as targets. The two last figures includes the 555 cases where both the acquirer and target are from the EU. We then take the 302 companies in our sample and match them with merger events for each company year.

The M&A deals were gathered from the following Reuters’ classifications:

- Energy
  - Energy equipment and services
    - Oil and gas drilling
    - Oil and gas equipment and services
  - Oil and gas
    - Coal and consumable fuels
    - Integrated oil and gas
    - Oil and gas exploration and production
    - Oil and gas refining and marketing
    - Oil and gas storage and transportation
  
- Utilities

- Electric utilities
- Gas utilities
- Independent power producers and energy traders
- Multi-utilities
- Water utilities

## 4.3 Regression Analysis

In the following sub-sections we describe the choice of regression we use, as well as the items of this chosen regression method.

### 4.3.1 Choice of Regression Model

As mentioned before, other studies were of assistance when settling for the methodology used. The multinomial logistic regression analysis allows us to have the freedom required to determine the outcome required. The analysis consents more than two different outcomes modeled by the independent variables and therefore it is appropriate to use it in this type of study.

This kind of regression was used in some similar other studies, of these we can cite:

- Size, Target Performance and European Bank Mergers and Acquisitions. (Azofra et al, 2008)
- Accounting for distress in bank mergers. (Koetter et al, 2007)
- Determinants of bank growth choice. (Wansley et al, 2000)
- Determinants of merger and acquisition activity in Australian cooperative deposit-taking institutions. (Worthington, 2002)

This multinomial logistic regression model can be a useful tool for modeling where the dependent variable is a discrete set of more than two choices (Agresti, 1996). In our case, the dependant variable, that will be discussed in the next section, is whether the firm is an acquirer, target, or is not involved in an M&A activity. So clearly, when you have a dependant variable that is nominal and not dichotomous or binary, with more than two different outcomes possible, the multinomial logistic regression is the type of regression that should be used.

The multinomial model has been used for many years in economics, but is used less often in finance. (Wansley et al, 2000). The model was developed by McFadden (1973) in his study of consumer choice according to Wansley et al (2000).

We use the book “applied logistic regression” of Hosmer and Lemeshow (2000) to illustrate this regression. In order to conduct the multinomial logistic regression, a reference group should be chosen. It is usually the largest group or what is called the control group; it is the group to which the others are compared to. In our case, it would be comparing the group of companies that acquired or that were targeted with the companies that were not involved in any kind of M&A activity given that this group reflects a good benchmark for assessing merger decisions. In order to further exemplify this regression and if we assume that we have p covariates and x is a constant term of length p+1 where  $x_0 = 1$  the two logistic functions are:

$$\begin{aligned}
 (1) \quad g_1(x) &= \ln \left[ \frac{P(Y = 1|x)}{P(Y = 0|x)} \right] \\
 &= \beta_{10} + \beta_{11}x_1 + \beta_{12}x_2 + \dots + \beta_{1p}x_p \\
 &= x'\beta_1
 \end{aligned}$$

and

$$\begin{aligned}
 (2) \quad g_2(x) &= \ln \left[ \frac{P(Y = 2|x)}{P(Y = 0|x)} \right] \\
 &= \beta_{20} + \beta_{21}x_1 + \beta_{22}x_2 + \dots + \beta_{2p}x_p \\
 &= x'\beta_2
 \end{aligned}$$

The conditional probability of the model in general terms is then:

$$(3) \quad P(Y = j|x) = \frac{e^{g_j(x)}}{\sum_{k=0}^2 e^{g_k(x)}}$$

where the vector  $\beta_0 = 0$  and  $g_0(x) = 0$

So if there are three different outcomes  $Y = (0, 1, 2)$  for dependant variable with the group having  $Y=0$  as the reference group, the conditional probability of each group is:

$$(4) \quad P(Y = 0|x) = \frac{1}{1 + e^{g_1(x)} + e^{g_2(x)}}$$

$$P(Y = 1|x) = \frac{e^{g_1(x)}}{1 + e^{g_1(x)} + e^{g_2(x)}}$$

and

$$P(Y = 2|x) = \frac{e^{g_2(x)}}{1 + e^{g_1(x)} + e^{g_2(x)}}$$

### 4.3.2 Dependent Variable

Our dependant variable is if a firm is involved in a M&A activity, specifying which type of activity it is (acquirer or target) and under which firm year it occurred. We decided to call this variable ACT on behalf of “activity” and it will take the following outcomes for each case:

- Value of 0: If there was no M&A activity on that specific firm-year. The group having the variable 0 will serve as a reference (or control) group for the other groups. Having the largest group as the reference is the most common and it also correct to compare companies that were involved in M&A activity with those that were not.

- Value of 1: If there was a M&A activity on a specific firm-year and the firm involved was an acquirer.
- Value of 2: If there was a M&A activity on a specific firm-year and the firm involved was a Target.

### 4.3.3 Independent Variables

On the other side of the regression formula the variables that are explaining the outcome of the dependant variable are listed. Concerning the choice of these variables, the following is the list and description of each variable:

- The natural logarithm of the total market value of the firm:  
 $\text{Log(MV)}$  The natural logarithm of the market value is used instead of the market value in \$US. We faced the problem of having firms with very high market values compared to the smallest firms' market values. In order to avoid heteroskedasticity we have calculated the logarithm of these values, making the variance among numbers considerably smaller and adding reliability to the results.
- Market to book value of equity:  
 $\frac{\text{Market Value of Equity}}{\text{Book Value of Equity}}$  This variable will be used to explain two motives behind M&A in the energy industry and they are the excess capacity and the market for corporate control. Datastream database contains a market to book value of equity that excludes intangibles, but we calculated our own given that firms include intangibles when considering which companies to acquire.
- Change in sales  
 $\frac{\text{Sales}_t - \text{Sales}_{t-1}}{\text{Sales}_{t-1}}$  This variable will also be used to explain two motives behind M&A activities in the energy industry, specifically the excess capacity and the market for corporate control hypotheses.

- Change in operating profit

$$\frac{\text{OperatingProfit}_t - \text{OperatingProfit}_{t-1}}{\text{OperatingProfit}_{t-1}}$$

This variable will be used to explain the same theories as the percentage change in sales.

- Sales to assets

$$\frac{\text{Sales}}{\text{Total Assets}}$$

This variable will be used to explain the excess capacity motive for undertaking M&A activity.

- Return on assets

$$\frac{\text{Net Income}}{\text{Total Assets}}$$

This variable will be used to explain the market for corporate control motive for being involved in M&A activity.

- Cash to sales

$$\frac{\text{Cash and Equivalent}}{\text{Total Assets}}$$

This variable will explain the financing motive on being involved in M&A activity.

- Debt over equity

$$\frac{\text{Book value of debt}}{\text{Book value of equity}}$$

This variable will explain the agency motive in being involved in M&A activity.

- Deregulation

Dummy variable used to explain the specific asset acquisition motive and that takes a value of 0 if the company is operating in a deregulated country and 1 if the company is operating in a regulated country.

#### 4.3.4 Summary of the variables

To conclude this section, we present here a table with all the variables used in our regression with a description and a list of supportive theory for each one of them:

Variable	Description	Supportive theory
<b>Dependant variable</b>		
• Activity (ACT)	Outcome dependant on whether a company is an acquirer, target, or not involved in any M&A activity	-

Explanatory variables		
• Market Value (log(MV))	Natural logarithm of the total market value of the firm in USD	(Mahoney& McComick, 1988) / (Jensen & Ruback, 1983)
• Market to book value of equity (MTB)	$\frac{\text{Market Value of Equity}}{\text{Book Value of Equity}}$	(Andrade & Stafford, 2004) / (Jensen & Ruback, 1983)
• % Change in sales (CS)	$\frac{\text{Sales}_t - \text{Sales}_{t-1}}{\text{Sales}_{t-1}}$	(Andrade & Stafford, 2004) / (Jensen & Ruback, 1983)
• % Change in operating profit (COP)	$\frac{\text{Operating Profit}_t - \text{Operating Profit}_{t-1}}{\text{Operating Profit}_{t-1}}$	(Andrade & Stafford, 2004) / (Jensen & Ruback, 1983)
• Sales to assets (STA)	$\frac{\text{Sales}}{\text{Total Assets}}$	(Andrade & Stafford, 2004) / (Jensen & Ruback, 1983)
• Return on assets (ROA)	$\frac{\text{Net Income}}{\text{Total Assets}}$	(Jensen & Ruback, 1983)
• Cash to sales (CTS)	$\frac{\text{Cash and Equivalent}}{\text{Total Assets}}$	(Jensen, 1986)
• Debt to equity (DTE)	$\frac{\text{Book value of debt}}{\text{Book value of equity}}$	(Jensen, 1986)
• Deregulation (DR) <i>dummy variable</i>	0 if the company is operating in a deregulated country and 1 if the company is operating in a regulated country	(Verde 2008, McLaughlin 1995 and others)

Table 4: Description and supportive theory of the variables used in the study

### 4.3.5 The regression equation

Now that we discussed all the items and features of our regression equation, we draw a final regression function according to the set of variables discussed previously and the function modeled by Azofra et al (2008) in their study of European Bank Mergers and Acquisitions:

$$(5) \text{ Probability } (ACT_i = j) = \Lambda(\alpha_i + \beta_{1j}\log(MV) + \beta_{2j}MTB + \beta_{3j}CS + \beta_{4j}COP + \beta_{5j}STA + \beta_{6j}ROA + \beta_{7j}CTS + \beta_{8j}DTE + \sum_k \lambda_{kj}REG_{ki} + \varepsilon_i)$$

Where  $i = 1, \dots, 1581$ ;  $j = 0, 1, 2$ ;  $k = 1, 2$ ;  $\Lambda(\cdot)$  the multinomial logistic function

## 4.4 Reliability and Validity

To ensure the quality of a work as well as its accuracy, one should prove the reliability and validity of the study.

### 4.4.1 Reliability

The gathering of data was extracted from valid databases. The financial information about firms was only taken from Thomson Financial Datastream, and the list of M&A deals that occurred during our studied period was taken only from Reuters 3000Xtra.

The processing of data was done the same way for all companies, with a standardized Excel spreadsheet including all the data we needed in our research.

There was an omission of the variables that turned out to have poor explanatory power after running our regression for the first time.

### 4.4.2 Validity

A sample of 302 firms was gathered, which represents the whole European energy industry less the firms in the same industry with a market value that never exceeds \$100 million, to keep the firms with significant economic value.

Comparison between our sample and other samples of similar studies shows that we can consider ours as being valid. Andrade (2004) had 2969 firms but across-industries and for a longer time

period (between 1970 and 1994) but Danzon et al (2007) had 383 firms in their one industry sample though for a longer time period as well (between 1988 to 2001).

Variables taken are measures that are considered as representatives of the theory that has been tested in the field. In addition several tests were conducted to ensure the validity of our choice as well. A correlation matrix to ensure non-correlation of the variables as well as a T-test to examine if the means of the groups are statistically different is performed. There was a focus on only one region, that is Europe, for the industry chosen to ensure that the companies studied have similar regulatory and business environment in order to let us draw solid conclusions about our findings that might be biased if several geographical locations are taken; for instance, comparing the US market to the Asian one. A valid econometric model was used. As stated in the choice of regression section, the multinomial logistic regression is the method that was used in similar studies and thus can be considered as valid.

# 5. Empirical Findings and Analysis

This chapter presents the results found in the regression analysis performed and the consequent analysis of the determinants for M&A. It starts by defining some key concepts for interpretation of the model and descriptive statistics of our sample followed by the outline of results from the regression. Finally we analyze the results in respect to the theoretical background in the field.

## 5.1 Empirical Findings

### 5.1.1 Statistical Key Terms

The significance factor Sig. represents the probability of a variable affecting the outcome in the population. Different levels of significance are used among researchers to assess the importance of an independent variable influencing the dependant one. For the purposes of this study we will consider a level of less than 90% as not significant, as generally agreed by in statistics literature in this type of studies. Table 5 outlines the Sig. values and their significant probabilities.

Significance	Confidence interval	Sign
$\leq 0.01$	99%	***
$\leq 0.05$	95%	**
$\leq 0.10$	90%	*
$\geq 0.10$	No Significance	

Table 5. Significance Factor and Probabilities considered

B coefficients are the estimated coefficients for the model. In the logistic regression model this coefficient is measured against the reference category, which in our case is the largest group; including those that were not involved in M&A activity.

Odds ratios are an important characteristic in the multinomial logistic model. In the software used in this study, this ratio is represented by  $\text{Exp}(B)$ . In general terms, if an odds ratio of a coefficient is  $> 1$  it indicates that a unit increase in the variable will raise the probability of the

outcome falling into that group in comparison to the reference group. On the other hand, if an odds ratio is  $< 1$  it would indicate that the probability of the outcome falling into that category reduces as a unit increase in the variable is added.

### 5.1.2 Descriptive Statistics

Descriptive statistics of the variables are shown in Table 6

**Descriptive statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
LOGMV	1581	3.1748	8.3414	5.8582	0.9212
MTB	1581	-6.7804	51.6586	2.1784	2.6061
CS	1581	-0.9837	872.4166	1.397	25.1062
COP	1581	-167.8769	444	0.643	13.1326
STA	1581	-0.3224	4.8593	0.6015	0.5641
ROA	1581	-2.4119	0.4501	0.0303	0.1398
CTS	1581	-15.5538	1406.8622	2.4298	42.7522
DTE	1581	-27.9594	32.7197	0.7971	1.8734
Valid N(listwise)	1581				

Table 6: Descriptive statistics for the sample using SPSS

For the dummy variable of whether a firm is in a regulated country or not, our sample is composed by 68% and 32% of regulated and unregulated firm years respectively. The number of acquirers and targets is shown in Table 7.

**Case Processing Summary**

	N	Marginal percentage
ACT	1315	83.20%
	222	14%
	44	2.80%
Valid	1581	100%
Missing	0	
Total	1581	
Subpopulation	1572 <sup>a</sup>	

<sup>a</sup> The dependant variable has only one value observed in 1572(100%) subpopulations

Table 7: The case processing summary using SPSS

As previously discussed in the methodology chapter, companies that did not have a market value of at least 100 million USD during the timeframe were not taken into account. Even though that limitation was set, some wide differences can still be found in some independent variables. Two types of procedures in this case are discussed in research; truncation of data and leaving the data in its raw form (Tucker 1996). We have decided not to remove “unwanted” firm years since that would represent a reduction in the validity of our model. Deleting unwanted extreme values to smooth the sample ignores the real life conditions that allow these extreme situations to take place.

### 5.1.3 Correlation Matrix of the Variables

We check for multicollinearity and can conclude that correlation exists to an insignificant extent among our independent variables (See table 8). Generally, multicollinearity increases the standard errors for coefficient estimators and since our goal is to explain determinants of mergers, the low degrees are important for the explanatory reliability. The variables correlated to the highest degree are Debt to Equity and Market to Book, at a 99% significance level, but the degree (0,258) does not cause our concern for further analysis.

#### Correlations

	LOGMV	MTB	CS	COP	STA	ROA	CTS	DTE	REG
LOGMV	1								
MTB	0.147	1							
CS	-0.270	0.050	1						
COP	-0.100	-0.017	0.008	1					
STA	0.131	0.005	-0.022	0.038	1				
ROA	0.239	-0.003	-0.025	0.034	0.101	1			
CTS	-0.250	0.011	-0.002	-0.017	-0.056	-0.046	1		
DTE	0.087	0.258	0.006	0.001	-0.066	-0.059	-0.020	1	
REG	0.180	-0.047	0.022	-0.025	0.094	0.025	-0.035	0.023	1

Table 8: The correlation matrix for the variables using SPSS

### 5.1.4 T-test for the Variables

The variables did not have high degrees of correlation, which otherwise would have implied low t-statistics when running the One-sample test. Instead the test shows, that there is significance and that the null hypothesis can be rejected.

### T-test for the variables

	t	df	Sig.(2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
LOGMV	252.837	1580	0.000	5.858	5.813	5.904
MTB	33.237	1580	0.000	2.178	2.050	2.307
CS	2.213	1580	0.027	1.397	0.159	2.636
COP	1.947	1580	0.052	0.643	-0.005	1.291
STA	42.403	1580	0.000	0.602	0.574	0.629
ROA	8.617	1580	0.000	0.030	0.023	0.037
CTS	2.260	1580	0.024	2.430	0.321	4.539
DTE	16.919	1580	0.000	0.797	0.705	0.890
REG	27.549	1580	0.000	0.324	0.300	0.350

Table 9: The T-test for the variables using SPSS

#### 5.1.5 Regression Results

We now turn to describe the results from the regression analysis performed. The multinomial logistic model allows us to distinguish between several outcomes. In this case, recall that we have determined three possible results: being an acquirer, being a target and not being involved in any of those. We have assigned the group number 0 for an outcome of no M&A activity, group 1 for acquirers and group 2 for the outcome target. When testing for all the nine variables described, the regression yields the results presented in the table in the appendix (Appendix 1).

The regression results have more success explaining the reasons behind these strategic decisions for acquirers than for the targets. The sample includes mergers in the European energy industry for the period 1995 to 2005 where targets are few in comparison to acquirers. This is due to reasons such as the fact that some of the targets in the energy sector were not listed companies and energy companies making diversifying acquisitions outside the industry this study comprises.

When focusing first on acquirers, we find that four of the nine variables show significance affecting the outcome. Both market value (LOGMV) and percentage change in sales (CS) show significance at the 99% level and also a positive relation to the acquirer outcome. The variable for market to book value (MTB) is significant at the 95% level with a negative coefficient and

finally at the 90% level the cash to sales (CS) variable shows some impact with a weak positive relation. In the case of the targets, the results yield significance only for the market value variable. (Appendix 1)

In order to construct a model that comprises the most powerful explanatory variables, we present the results of a regression that includes only the variables that appeared significant in the first analysis plus the variables return on assets (ROA) and Debt to Equity (DTE) which show the closest results to the 90% level among the non significant variables. The results of this analysis are presented in Table 10.

In this second analysis the variables that had shown significance are still important in the model. Furthermore, the variable DTE appears significant at the 90% level and positively related to being an acquirer. The variable ROA shows a strong coefficient but remains insignificant. Finally in the case of the outcome target the only significant variable is still market value, although it appears now within the 95% level.

ACT	a	B	Std. Error	Wald	df	Sig	Exp (B)	95% Confidence Interval for Exp(B)		
								Lower Bound	Upper Bound	
1	Intercept	-9.339	0.627	221.577	1	0.000				
	LOGMV	1.252	0.099	160.243	1	***	0.000	3.469	2.88	4.244
	MTB	-0.122	0.050	6.042	1	**	0.014	0.885	0.803	0.976
	CS	0.029	0.009	10.97	1	***	0.001	1.03	1.012	1.047
	ROA	-1.044	0.768	1.846	1		0.174	0.352	0.078	1.587
	CTS	0.02	0.001	3.466	1	*	0.063	1.002	1	1.005
	DTE	0.089	0.052	2.881	1	*	0.090	1.093	0.986	1.211
2	Intercept	-5.328	1.065	25.023	1	0.000				
	LOGMV	0.376	0.184	4.182	1	**	0.041	1.456	1.016	2.087
	MTB	-0.163	0.116	1.971	1		0.160	0.85	0.677	1.067
	CS	0.006	0.034	0.034	1		0.855	1.006	0.942	1.075
	ROA	1.226	2.338	0.275	1		0.600	3.406	0.035	332.781
	CTS	-0.003	0.017	0.023	1		0.879	0.997	0.965	1.031
	DTE	-0.004	0.100	0.002	1		0.967	0.996	0.818	1.213

a. The reference category is: 0

Table 10: The regression results for the significant variables using SPSS

## 5.2 Analysis of Results

*Economies of scale* are measured by the logarithm of market value of firms in this study. Based on the hypothesis that a larger production capacity gives a firm the advantage of lowering the costs per unit produced, we expected to find smaller companies being more active in the M&A activities. The coefficients for market value in the regression both for the acquirers and targets are significant and strongly positive. Contrary to what economies of scale would predict, larger firms are more likely to be both acquirers and targets in the market for corporate control. Based on the odds ratios, a firm that increases by one unit its LOGMV would raise its risk of becoming a target by a factor of 1.456. These results strongly suggest that larger firms are more likely to be involved in both types of merger activities. This outcome is supported by the idea that once the EU energy market is a single and liberalized one, being a pan-European player is important (Verde 2007). The strong and positive coefficient for LOGMV suggests that if market value increases by one unit a firm would increase its risk to become an acquirer by a factor of 3.496. The evidence found is consistent with Danzon et al (2004) whose results indicate that larger firms measured by enterprise value are more likely to be involved in all types of merger activities.

H1. *Relatively small companies are more active in the market for corporate control – Rejected*

H1a. *Smaller companies would be more active acquirers in an attempt to achieve economies of scale – Rejected*

*Excess Capacity* is in this research measured by four variables: Percentage change in sales (CS), Tobin's q proxy (MTB), percentage change in operating profit (COP) and the ratio of sales to assets (STA). The outcome of the regression analysis finds the Hypothesis 2 to be slightly supported, the explanatory variables and their interpretation is described below.

H2. *Firms facing excess capacity would engage in M&A activity to fill in the gaps in production output – Supported to some extent*

For the first variable, the coefficient for percentage change in sales is significant but weak when finding it as a driver for merger activity. Our results show that an increase in sales by one unit would increase a firm's risk to become an acquirer by a factor of 1.030 given that other variables

are held constant. We find a positive relation between a firm's increase in sales and engaging in acquisitions but it is not a strong determinant for the activity to take place. The outcome is inconsistent with Andrade et al (2004) who in their study find a strong positive coefficient in sales growth, which they interpret as a driver for acquisitions based on managerial optimism.

*H2a. Companies with a slow growth of sales would be more active acquirers – Rejected*

Based on the proxy for Tobin's q and the excess capacity hypothesis for M&A activity, we would expect to see high q firms to be working close to capacity and therefore avoid merger activities. Additionally, this measure is also a direct interpretation of expected growth opportunities for a firm. Therefore, a low q firm would be experiencing excess capacity and be expected to broaden it given the poor growth opportunities that the market forecasts for the company. The significant and negative coefficient for our Tobin's q proxy (MTB) suggests that a firm that increases its q by one unit would also decrease its risk of engaging in M&A activity. Specifically, a unit increase in the MTB ratio reduces the risk of becoming an acquirer in comparison to not being involved in any type of activity by a factor of 0.885. In the case of targets, we find a similar case with a unit increase in MTB decreasing the likelihood of falling in the group of targets. However, in the case of targets even though the coefficient for MTB is negative and strong, it remains insignificant at the 90% level.

*H2b. Low q firms would more likely engage in M&A activity – Supported*

The percentage change in operating profit does not show significance at any level. Therefore there is no evidence that a decline of this item would drive M&A activity. Danzon et al (2007) find mixed results in their case too, since they propose that a rapid growth of operating expenses explains what they call pooling mergers but their outcome was not significant in the case of acquirers.

*H2c. Firms with declining operating profit would more likely engage in M&A activity – Not significant*

The coefficient for the sales to assets ratio (STA) was taken out of the model due to low explanatory relevance. The variable not being significant can possibly be explained by the

energy industry having long investment horizons, implying that resources or assets are not appearing as sales in the near time, making the sales to assets measure dubious.

H2d. *Companies with a high sales to assets ratio are more prone not to engage in any M&A activity – Not significant*

The outcome of these five variables discussed above partially supports the result found by Andrade et al (2004) who argue that consolidation through mergers was due to excess capacity in the merger waves of the decades of the 70's and 80's. This result is also consistent with Danzon et al (2007) who find evidence suggesting that relatively low Tobin's q firms are more likely involved in merger activity. This excess capacity is firm-wise and should not be interpreted as a industry-wide characteristic.

*The Specific Asset Acquisition* in this study is defined as the tendency of firms operating in unregulated countries to participate in the takeover market relative to firms in countries classified as regulated. Given the research that Verde (2007) and others have conducted suggesting that merger activity in the energy sector is being partially driven by this specific asset acquisition. Contrasting to the trend described by some researchers in the field, the variable REG measuring this tendency does not show significance and thus there is no evidence that regulation restrains M&A activity in the European energy industry, at least not in the time frame considered in this study.

H3. *Firms in deregulated countries are more likely to engage in M&A – Not significant*

*Financing Hypothesis* tells us that having high ratios of cash increases the risk of a firm becoming an acquirer. Our results support this hypothesis but find the determinant to be important to a small degree. The variable cash to sales (CTS) is significant at the 90% level but the interpretation of the results does not lead to a conclusion similar to the one made by other studies, which is that high levels of cash drive firms to be active acquirers. According to our results, an increase of one unit of cash will lead to an increase in the firm's risk of being an acquirer by a factor of 1.002. Cash has a small positive effect determining mergers in the European market but it is not an essential driver for acquiring other energy companies; possibly because there are other means such as using stock or debt for the financing purpose.

#### *H4. High levels of cash drive firms to be active acquirers – Supported*

As previously mentioned, *cash to sales* has a slightly positive effect on firms to engage in acquisitions, but a bit surprisingly higher debt to equity drives acquisitions even more. The hypothesis for highly leveraged firms not to engage in M&A activity can thereby be discarded. According to our results, an increase in one unit of debt to equity would increase the risk of the firm being an acquirer by a factor of 1.093 within 90% significance. Reasons for this result could be that larger firms tend to be more active in M&A in combination with that larger firms may have easier to finance their operations with debt. However, the correlation matrix shows no sign of correlation between market value and leverage. We propose that one of the reasons of acquiring another company in the energy industry might be to reduce the level of leverage. This remains just an assumption as the results for the same variable for targets does not allow us to conclude it further.

Jensen (1986) argues that in the oil industry debt puts pressure on firms as they get obliged to be efficient by not undertaking low-return projects. Our results are inconsistent with this proposal.

For the capital intensive European energy industry, given the studied time period, debt to equity levels does not have the same impact on firm's probability to merge, as they did in prior research.

The business risk may also differ considerably whether a company has core activities in exploration or runs transportation utilities. The ability to finance a firm with debt is thereby dependent on what core activities the firm runs; this may be an additional reason why more highly leveraged firms are more likely to engage in M&A activity. We propose that lower business risk companies are more prone to undertake M&A activity.

#### *H4a. Highly leveraged firms are more likely not to engage in M&A activity – Rejected*

*Market for corporate control* is measured in this study by four variables: Tobin's q proxy (MTB), percentage change in sales (CS), percentage change in operating profit (COP) and return on assets ratio (ROA).

Accordingly with the market for corporate control theoretical background, in an efficient market, underperforming firms are more likely to either acquire assets to increase their profitability or

become targets transferring resources to more capable management. A firm's Tobin's q (market to book ratio) is a direct measure of a firm's expected growth opportunities and thus a proxy for performance. Results from the regression find that higher q firms are less likely acquirers in the takeover market. A unit increase in the MTB ratio reduces a firm's risk to become an acquirer by a factor of 0.885. The outcome coefficient in the case of targets is negative and thus also supportive of this theory. However, it is not as strong as in the acquirers' case, given that the coefficient fails to appear in the 90% significance level.

H5. *Weak performers are more likely to be engaged in M&A - Supported*

H5a. *Low q firms are more likely to be targets – Not Significant*

A decline in *operating profit* would be expected from targets given the market for corporate control theory. In our results the coefficient supports the statement but it fails to appear within the significance level. The outcome does not allow for further explanatory reasons.

H5b. *Targets show a decrease in operating profit as a pre-merger characteristic – Not significant*

A lagging *percentage change in sales* (CS) would indicate a firm is more likely to be a target in order to transfer resources to more efficient corporations. We find a positive coefficient in the CS coefficient supporting the theory; however the coefficient is insignificant. In the case of acquirers, the coefficient is positive and significant suggesting that an increase in sales of one unit increases the probability of a firm to be an acquirer by a factor of 1.030.

H5c. *Targets would show a lagging percentage change in sales – Not Significant*

We expected to find a positive relation between being a target and having low *return on assets (ROA)* given the theory of market for corporate control. However, in the case of targets there is no significance in our study to state that. In the case of acquirers, the coefficient ROA is also insignificant at the 90% level but a very strong one leading to suggest that an increase in ROA decreases the risk of a firm to be an acquirer and makes it more prone to be a target.

H5d. *Firms with low ROA are more prone to be targets – Not significant*

## 6. Conclusion and Further Research

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*In this final chapter the concluding remarks from the research are presented. Finally, we suggest some ideas for further research within the area.*

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### 6.1 Conclusion

The aim of this thesis is to investigate the determinants for firms to engage in M&A transactions with a focus on the European energy industry and based on theories and hypotheses that attempt to explain these strategic decisions. The results are partially consistent with previous M&A studies in other industries but also have explanatory dimensions that are specific to the energy industry.

Our results show that market value, Tobin's q, cash to sales, debt to equity ratio, and change in sales are drivers for M&A activity to various extents. It appears that performance measurements in certain items are more important drivers in the acquisition choice. This may be a response of the capital intensity and nature of the business.

Our results strongly suggest that larger firms are more active players in the takeover market than relatively smaller firms. Both acquirers and targets tend to be firms with established positions in the market and larger enterprise values. In terms of performance, firms with low expected growth opportunities have a stronger tendency to be active in the takeover market. Moreover, the outcome shows that relatively high amounts of cash are positively related to being an acquirer. This outcome supports in general the financing hypothesis, market for corporate control theory and excess capacity proposition.

Furthermore, the agency hypothesis does not seem to have the effect expected by the theory supported. The outcome suggests that higher leverage is positively related to being an acquirer.

We find no evidence that deregulation is a driver for merger activity suggesting that the specific asset acquisition does not have significance in the time frame and industry of the research. A corporate focus approach might demonstrate better results in this respect.

The study shows that some of the theories for the M&A determinants have explanatory power in the Energy industry but adaptation to specific industry context should be addressed. The present research adds on to the literature of M&A activity rationale.

## 6.2 Further Research

The European energy industry is an interesting field for research. The industry is experiencing changing conditions and it has become a good opportunity for academics to test industry shock theories on it.

An interesting line of research in the industry is to evaluate the importance of the strategic focus in the decision process. Firms in the industry are both adopting vertical and horizontal integration strategies in an attempt to stay competitive in the single energy market that EU commission is supporting.

This thesis examines exclusively the drivers of merger activity. A study that analyzes the long term post performance of these M&A deals can shed some light beyond the abnormal returns for stock that event studies measure.

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## 8. Appendices

### Appendix 1

ACT	a	B	Std. Error	Wald	df	Sig.	Exp (B)	95% Confidence Interval for Exp(B)		
								Lower Bound	Upper Bound	
1	Intercept	-9.342	0.633	218.12	1	0.000				
	LOGMV	1.257	0.102	151.735	1	***	0.000	3.516	2.879	4.295
	MTB	-0.118	0.050	5.694	1	**	0.017	0.888	0.806	0.979
	CS	0.029	0.009	11.266	1	***	0.001	1.03	1.012	1.048
	COP	0.006	0.005	1.805	1		0.179	1.006	0.997	1.015
	STA	-0.098	0.155	0.403	1		0.526	0.906	0.669	1.228
	ROA	-1.029	0.778	1.749	1		0.186	0.357	0.078	1.643
	CTS	0.002	0.001	3.398	1	*	0.065	1.002	1	1.005
	DTE	0.083	0.053	2.433	1		0.119	1.087	0.979	1.206
	REG	0.052	0.167	0.095	1		0.758	1.053	0.758	1.462
	2	Intercept	-5.274	1.068	24.372	1	0.000			
LOGMV		0.348	0.187	3.456	1	*	0.063	1.417	0.981	2.046
MTB		-0.161	0.118	1.873	1		0.171	0.851	0.676	1.072
CS		0.007	0.033	0.04	1		0.842	1.007	0.943	1.074
COP		-0.001	0.017	0.06	1		0.936	0.999	0.966	1.032
STA		0.01	0.259	0.024	1		0.876	1.041	0.627	1.729
ROA		1.245	2.371	0.276	1		0.599	3.474	0.033	362.02
CTS		-0.002	0.016	0.02	1		0.887	0.998	0.968	1.029
DTE		-0.006	0.102	0.004	1		0.953	0.994	0.814	1.214
REG		0.223	0.325	0.471	1		0.493	1.25	0.661	2.366

a: The reference category is: 0

Table 11: The regression results for all variables using SPSS

## Appendix 2

Country	R/NC/N	Country	R/NC/N
Austria	N	Lithuania	NC
Belgium	R	Luxembourg	N
Bulgaria	NC	Malta	NC
Cyprus	NC	Netherlands	N
Czech Republic	N	Poland	N
Denmark	N	Portugal	R
Estonia	N	Romania	N
Finland	N	Slovakia	N
France	R	Slovenia	N
Germany	N	Spain	R
Greece	R	Sweden	N
Hungary	N	UK	N
Ireland	R	Norway	N
Italy	R	Switzerland	N
Latvia	NC		

N: Non-regulated ; R : Regulated ; NC: No Companies in the Sample

Source: Haar and Jones (2008) and European Commission Benchmarking Reports (2007)

Table 12: Regulated and non-regulated European energy markets