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The effect of firm-specific capital structure and macro-economic variables on merger and acquisition likelihood in a Latin American and a European cultural cluster

Supervisor:

Rikard Larsson, Ph.D.

Students:

Marie Guerre 870514-T342
Kathrin Kittler 880216-T342

Abstract

Title:	The effect of firm-specific capital structure and macro-economic variables on merger and acquisition likelihood in a Latin American and a European cultural cluster
Authors:	Marie Guerre and Kathrin Kittler
Advisor:	Rikard Larsson
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Keywords:	Mergers and Acquisitions, European cluster, Latin American cluster, Oil and gas industry, M&A likelihood, Exogenous variables, firm-specific variables, GDP per capita, Exchange rate, Commodity price, Leverage, Cash reserve, Company size
Purpose:	The purpose of this research paper is to analyze the change in the likelihood of M&A activity (dependent variable) in a European and a Latin American cluster due to changes in independent variables, demonstrating the ability of macroeconomic (GDP per capita, exchange rate, and commodity price) and firm-specific factors (Leverage ratio, cash reserve ratio, and company size) to influence business activities.
Theoretical	The paper looks at several papers, which study variables framework: affecting M&A likelihood, the cultural difference between the European and Latin American cluster, and the oil and gas industry.
Sample:	The European sample consists of 387 observations (68 M&A observations) of ten companies that are active in the oil and gas industry in seven countries between April 2002 and December 2011. The Latin American sample is composed of eight companies from six countries, and 38 M&A observations, which lead to a total sample size of 312 observations for the same time period.
Methodology:	A logit model is used to observe M&A likelihood. Five regressions are run: a pooled regression, a fixed effect logit regression, a random effect logit regression, a complementary log-log, and a random effect log-log regression.
Conclusion:	The oil and gas industry is an active M&A market as several waves have been registered in the last decade (consolidation, privatization, re-nationalization). The European and the Latin American clusters, show signs of dissimilarity and thus, M&A likelihood is not affected by the same variables in these two clusters. Leverage ratio is negatively correlated and significant in the Latin American cluster, whereas it is significant and positively correlated in the European cluster. Moreover, the control variable company size is significant and positively related to M&A likelihood in both clusters. However, cash reserve shows significance at high confidence levels in the European cluster with a positive correlation, whereas it is insignificant in the Latin American cluster.

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Contents

1. Introduction

In the following, the problem area of the underlying research, as well as the general research problem and the purpose of the project will be outlined. Additionally, this introductory chapter includes criteria for demarcations made, an introduction to the research process and a presentation of the outline of this paper.

1.1 Research topic

Businesses can grow organically by acquiring a larger market share and enlarging the customer base, or inorganically, by acquiring stakes in other businesses or merging with them. Although it is well-known that many merger and acquisition (M&A) activities do not fulfill pre-merger expectations, they are still considered as expansion strategy, on both global and domestic levels. This study focuses on the inorganic growth of oil and gas companies via M&A, which will be analyzed for two different cultural clusters. It is of particular interest whether factors that are influencing M&A activity are differing for companies with varying cultural backgrounds.

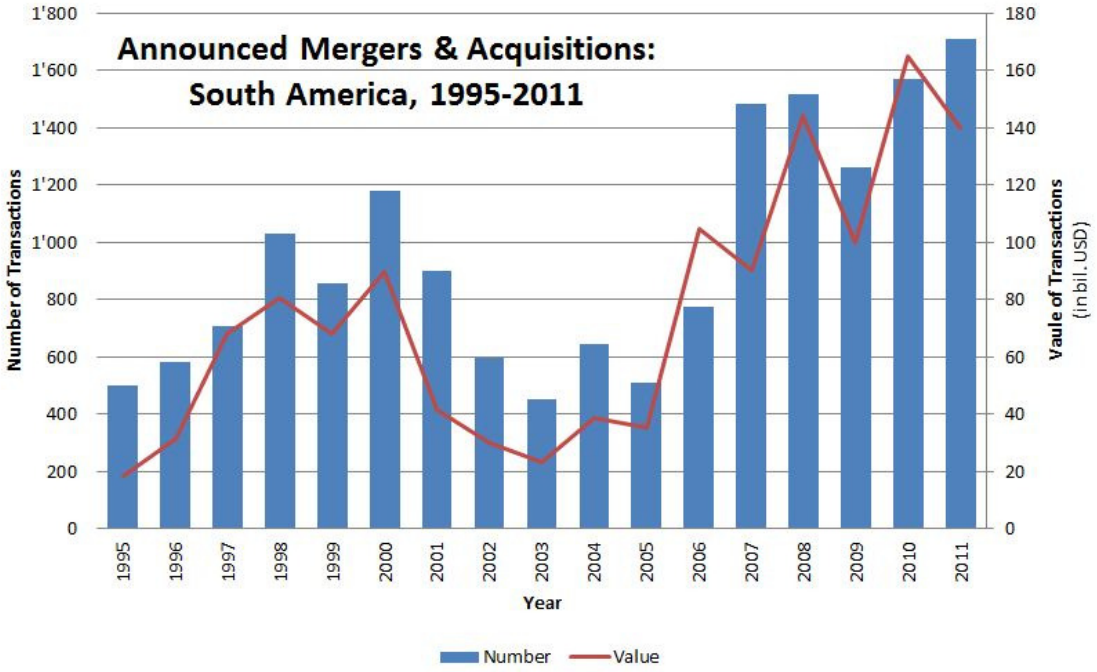
Research has shown that there exist M&A waves that do not have a specific duration, but that always seem to cede when there is a financial downturn or economic and country instability (Lipton, 2006). Harford (2004) states that shocks, which can be of technical, economic or regulatory nature, initiate those waves. So far, six waves have been experienced, which differ according to the strategic aims of companies in specific time periods. The first two merger waves that were ended by World War One and Two are classified as horizontal and vertical integration respectively. These were followed by the conglomerate merger wave in the 1960's and a wave of hostile takeover bids in the 1980's, which were both ended by stock market crashes. At the end of the 20th century there was a cross-border merger wave that stopped after the dot-com bubble in the year 2000. Recently, mergers were most frequent between 2003 and 2008; encouraged by national governments, the steep rise in commodity prices, and the development of financing possibilities. The latter comprise new ways of private equity and low-interest financing, as well as hedge funds and shareholder activism (Lipton, 2006).

These days, M&A growth is prevalent on a worldwide scope in every business line and includes cross-border as well as domestic deals. Consulting agencies, such as Deloitte and PricewaterhouseCoopers, as well as deal monitor journals state in most of their present analyses that M&A is an important way of growing in present times and that the activity is expected to increase further in the upcoming years.

To finance merger and acquisition activities, companies have two main options available: payment with own shares on the one hand, or with cash on the other hand. Past research studied different motives regarding the capital structure of firms. They referred to the concepts of wealth transfer, financial slack, and tax shield (Tou et. al., 2010). Most studies found that before pursuing M&A activities, acquirers are highly leveraged (Tou et. al., 2010; Bruner, 2001). Next to the leverage ratio, a company's cash ratio is said to be significant for M&A likelihood (e.g. Harford, 1997). When companies have high cash reserves, they are more likely to merge or acquire a potential target. This results from managers trying to make use of excess cash, which can even lead to mergers or acquisitions that are value-destroying. This is known as the free cash flow theory that was established by Jensen in 1986.

The studies on pre-merger and acquisition structures of companies have focused on general M&A samples only or have looked at samples from specific industries, but lack an analysis of how companies from different cultures are structured and which factors might make them more likely to pursue M&A. The studies of Geert Hofstede for example suggest that cultures vary in terms of what they are focusing on; either the past, the present or the future. They can be more short-term or more long-term-oriented and therefore their financial requirements might be evaluated differently by managers that decide on and change capital structures. It might be asked whether financial conditions, such as the leverage ratio or cash reserves, show the same pre-merger patterns when they are compared amongst different cultural backgrounds.

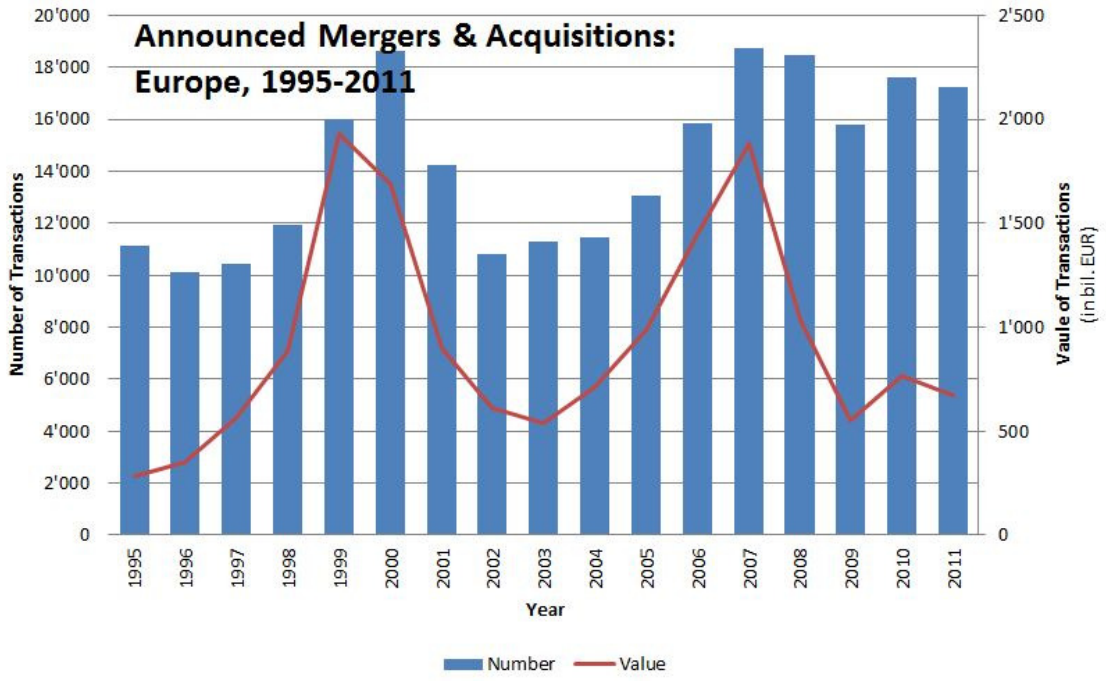
M&A value has been spiraling upwards in the past decade, especially in Latin America, where even during the financial crisis deal activity stayed at a high level. A drop of only 10% in M&A value was experienced, compared to a decrease of 27% in deals worldwide (Buchanan, 2011). After a slight drop in the number, as well as in the overall value of M&A in the early 2000s, activity has increased sustainably until recently (see Graph 1).



Graph 1: Mergers & Acquisitions: South America, 1995-2011 (Source: IMAA Institute, 2012)

This is linked to the fact that finance has increased for Latin American companies, be it due to cross-border and national loan and bond options, or new liability management possibilities. However, the most important development has been the transformation of the local Latin American debt markets. They are better structured these days, with banks being less government-oriented but focusing on lending to companies as well (Euromoney, 2007). A parallel development of re-nationalization of enterprises in many countries also gives the companies access to governmental financing tools.

In Europe, total M&A value peaked in 1999/2000 and 2007 and decreased considerably until 2009, but the total value is still at much higher levels than in Latin American countries (see Graph 2). Companies are more experienced in M&A activities, since the markets were liberalized prior to the Latin American markets. In both regions, the last merger wave from 2003 to 2008 could be observed, which makes them interesting to study as companies based in them differed according to their pre-merger financial constitutions in that period.



Graph 2: Mergers & Acquisitions: Europe, 1995-2011 (Source: IMAA Institute, 2012)

Moreover, these two regions have their own economic environment set by the MERCOSUR treaties for Latin America and the European Union agreements for the Europe, which justifies the grouping of countries into two clusters that are not only culturally, but also macro-economically comparable. With regards to cultural differences, the two regions are said to differ crucially in their long-term orientation levels, as well as their uncertainty avoidance indexes (Hofstede's studies), which allows a comparison of variables influencing M&A activity.

1.2 Research question

Different cultural characteristics as well as the different economic states in the clusters explained above should be reflected in the behavior of companies when it comes to M&A. A variation in the significance of the factors that affect M&A activity in Latin America's and Europe's oil and gas sectors can be expected. Herein, the research problem is to examine whether the firm-specific variables leverage and cash reserve have affected M&A of oil and gas companies domiciled in the clusters over the last decade, and, whether their significance differs amongst the two of them.

This leads to the following main research question: *Do the variables affecting M&A have the same level of significance in the European and the Latin American cluster?*

The sub-questions that must be answered previously are therefore:

Which variables are affecting M&A in the oil and gas industry in the European and the Latin American cluster?

Is there a significant difference in how firm's M&A decisions in the European and the Latin American cluster are affected by the variable 'leverage ratio'?

Is there a significant difference in how firm's M&A decisions in the European and the Latin American cluster are affected by the variable 'cash reserve'?

1.3 Purpose and relevance of the project

This study shall compare how M&A likelihood is connected to firm-specific and macro-economic variables in two different cultural clusters. Those are a Latin American cluster (excluding the Caribbean), and a European cluster that comprises Germanic Europe, Nordic Europe and the UK (see Chapter 3).

The explicit macroeconomic and firm-specific variables that are likely to have an effect on M&A decisions, and that will be studied hereinafter, can be subdivided into independent and control variables. The following figure illustrates which variables will be analyzed, and to which group they belong.

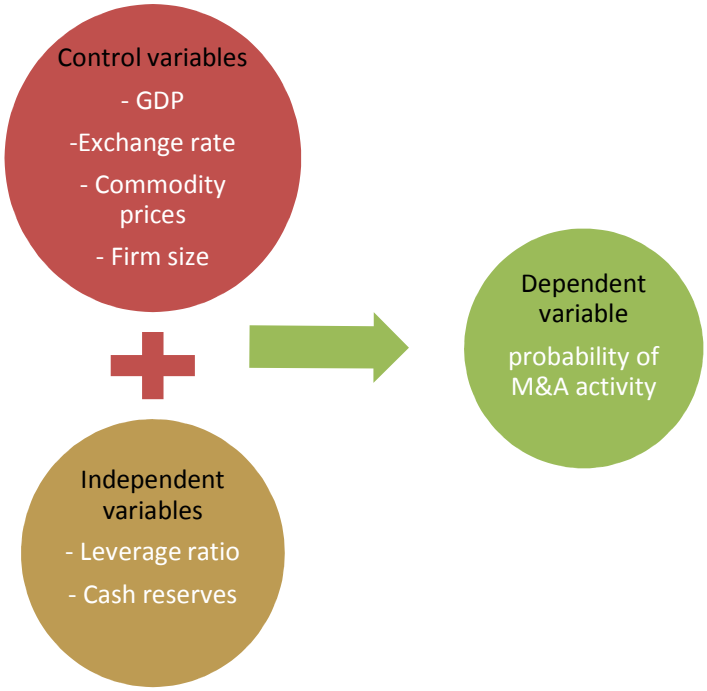


Figure 1: Overview of the variables studied

For cultural differences, the change in the dependent variable is assumed to differ for the Latin American and European clusters. The probability of M&A activity is expected to increase with the transformation of some independent variables and may decrease with others. Hence, it has to be found out whether the studied variables are positively or negatively correlated with the dependent variable. The independent variables that are of particular interest are the studied companies' leverage ratios and their cash reserves.

In this case, the oil and gas industry is investigated, since the players in this business line are highly dependent on and affected by the same exogenous factors, such as commodity prices, which are globally connected. Apart from that, other economic variables, for example GDP or exchange rate, which are rather cluster-specific, have a significant impact. The comparability of factors influencing firm decisions shall be of primary importance in this study. Moreover, the industry has been witnessing a high level of M&A activity in the past decade, where most transactions have taken place in the exploration and production sector.

The relevance of this project evolves due to a lack of existing papers in the area of analyses looking at pre-merger conditions and variables that affect M&A activity. It is also striking that most papers are focusing on macroeconomic variables only, whereas this project shall cover firm-specific factors as well. In the existing literature, the emphasis is put on post-merger performance and integration of companies. Samples of M&A are taken across industries or from single industries, but they do not focus on the comparison of M&A behavior between cultural clusters. Cultural issues are mainly tackled by looking at differences between the acquirer and the target; this study however shall elaborate whether acquiring country or firm factors are relevant to explain M&A activity as well.

1.4 Demarcations

The term M&A used in this paper includes not only mergers and acquisitions, but also takeovers. Two companies can merge in order to create a new company; the main focus of this action is to create value via positive synergies. Moreover, a company can acquire or take over a target firm by taking control over it, but this acquisition form will not lead to the creation of a new company. Acquisitions are considered only for the data sample if the stake a company acquired in its target is higher than 50% of the total value, which implies in most cases that the target can be controlled by the acquirer after the transaction.

When looking at M&A of Latin American and European companies, all activities that happened in this area of growth are analyzed over a period of 10 years, i.e. a sample period from

the beginning of 2002 to the end of 2011. This is because the first merger wave of the 21st century will be covered, as well as a whole business cycle of the industry looked at, i.e. the oil and gas industry. Moreover, the research is focusing on the buyer side solely, and specific variables for target companies will be excluded. The choice of a binary variable for the logit model used will need target-data for times without M&A activity, which is complicated to simulate.

Various studies on how to group cultures into a cluster exist and it is thus important to decide how to develop a coherent classification of countries. The cultural clusters are determined according to findings in past literature, especially according to Gupta et al. (2002) and the extensive research done by Geert Hofstede.

As the primary focus will be on financial factors that affect M&A, the standard strategic reasons that influence a company's decision to merge or to acquire shares in another company, such as the striving for diversification, synergy effects or a general expansion, will not be highlighted. Managerial motives that can determine M&A strategies will also not be analyzed. This study focuses on measurable financial variables on macroeconomic and firm-specific levels that are applicable for a regression analysis.

1.5 Thesis outline

Throughout the project, the research questions shall be answered with the analysis of an empirical study using a Logit model. The significance or insignificance of certain factors is identified by running regressions with variables sourced from previous researches. The starting point for gathering the relevant data, however, is a literature review that summarizes the past research on the topic of this project.

In chapter 2, the research methodology for this project is laid out, stating the overall approach and how data collection and its subsequent analysis are conducted. In addition, it shall display a critical review on the sources used for both the theoretical and the empirical studies.

Chapter 3 includes the source review, giving insight into former research and practical experiences from experts related to factors affecting M&A, M&A in the oil and gas industry, and the cultural clusters. Moreover, it states the expectations for the correlations between the independent or control variables with the dependent variable and hypotheses concerning the independent variables.

The empirical process and the results of the study undertaken are summarized in chapter 4, including an in-depth explanation of the methodology concerning the regression model used. The findings are subsequently analyzed and discussed in chapter 5.

Finally, main conclusions are drawn in chapter 6, which further includes suggestions for future research on the topic.

2. Methodology

This chapter expounds the overall methodology for the project at hand, which consists of four main research steps - an explanation of the construction of the two clusters, the choice of the studied industry, a source review (primary and secondary) and an empirical data analysis.

In order to answer the main research question, *Do the variables affecting M&A have the same level of significance in the European and the Latin American cluster?,* it is primarily important to identify possible factors that have a high impact on M&A decisions. This is done in an extensive literature review that summarizes the main findings on variables that were found to be significant by researchers in their past analyses, and that apply to the present research as well. It already partly answers the first sub-question of the project: W*hich variables are affecting M&A in the oil and gas industry in the European and the Latin American cluster?*

Secondly, the variables that shall be included in a regression analysis are to be separated into different types, and rescaled for proper analysis. This part of the research shall either empirically prove or disprove the expectations that result from the literature review, answering the second and the third sub-question of this research: *Is there a significant difference in how firm's M&A decisions in the European and the Latin American cluster are affected by the variable 'leverage ratio'?* and *Is there a significant difference in how firm's M&A decisions in the European and the Latin American cluster are affected by the variable 'cash reserve'?*

The review of the sources in chapter 3 represents a qualitative content analysis, whereas the empirical part in chapter 4 is a quantitative method for the evaluation of collected data.

2.1 Cluster formation

A cluster is a group of similar countries that have been put together to analyze the relationship between the dependent variables and the control and independent variables. Before explaining the method to generate the studied clusters, general criteria have to be defined for the companies composing the clusters. Since the oil and gas sector has a grey zone in terms of determining exactly how the business units are distributed proportionally, the companies that are taken into consideration have to be engaged in the exploration and production sector, in order to have a comparable base for the empirical analysis of M&A data. All companies are publicly traded, in order to ensure the availability of relevant financial data.

The clusters are composed by following the studies of Hofstede and Gupta mainly. The European cluster is composed of the Germanic countries, Nordic countries and the United King-

dom. Ten companies are identified to comply with the determined criteria (e.g. firms should have an exploration and production (E&P) division). All countries except Switzerland have at least one domestic oil and gas company active in the industry.

The Latin American cluster is also formed in accordance with Hofstede, Lowenthal and Gupta studies. This cluster is composed of all countries of South America as well as Mexico, but excluding the Caribbean. It should be mentioned that not all countries in the Latin American cluster have a domestic oil and gas company. Paraguay and Guyana are the two countries where no oil and gas companies were found.

2.2 Industry choice

With constant population growth and the continued development of developing countries, the demand for energy keeps increasing. Few papers are looking at that industry, as the gathering of information cannot easily be done due to national security.

This industry is chosen, as inhabitants/countries are dependent on energy. Because everyone needs energy on a daily basis, it is important to know how this industry will change through time. Oil and gas companies are mostly privately owned in the developed countries, whereas they are mostly state-owned in developing countries.

Oil and gas are finite resources; however the energy industry will still exist after they are depleted. Renewable methods such as solar and wind also generate energy, but as they are only sustainable with government subsidies, only a few variables affecting M&A can be recorded. In addition, coal and wood are as well materials from which energy can be produced; however, this paper will not look at these two materials as there has been a decrease in consumption in recent years.

The oil and gas sector is described as being a closed industry, where M&A strategy has been used to expand. Waves of consolidation and privatization have lead to the observation of a high number of M&A activities in the world. To be able to compare two clusters, it was essential to focus on one industry, as firm specific variables vary tremendously from one industry to another. The oil and gas industry is chosen as dependency will increase rather than decrease. Moreover, this industry is different from one cluster to another, as government control, regulations, and corruption level are not the same for countries at different stages of development.

2.3 Literature review

The key concepts for the literature review, which establishes the frame for the underlying project, are M&A, the oil and gas industry, factors or variables affecting M&A, cultural clusters, Latin America, and Europe. The review is carried out corresponding to these concepts. It shall support the choice of specific variables that are likely to affect M&A decisions, the country and company grouping according to cultural clusters, and finally, the choice for a particular industry.

Compliant with the key concepts, the literature review consists of three parts. Firstly, factors affecting M&A that are analyzed in the project are supported and explained in two subchapters according to whether they are independent or dependent variables. The information is mainly gathered from past research papers that can be found in databases, such as SSRN (Social Science Research Network) or the websites of the economic journals where they were originally published in (e.g. Journal of Financial Economics). A few papers are downloaded from university websites or other research institutes (e.g. Brookings Institution). In addition to that, two books were consulted that contained relevant information on the factors influencing M&A. Secondly, the choice of the cultural clusters, Latin America and Europe, and the countries that are grouped into those clusters are underlined with literature findings. The three main sources used were researches from Geert Hofstede, Lowenthal and Gupta et al. The final part of the review summarizes relevant industry information and emphasizes the high level of M&A activity in the oil and gas sector. Online information from the U.S. Energy Information Administration, as well as company websites and newspaper articles from the Wall Street Journal, and the World Oil Magazine are used as sources.

2.4 Primary sources

Primary sources are used in order to fill in the gaps in secondary sources, as few researches have focused on the variables affecting pre-M&A likelihood in the oil and gas industry. Qualitative data is collected to secure a coherent and more in-depth analysis of the industry, the clusters and the variables affecting M&A activity in the oil and gas industry. Three interviews of professionals in the oil and gas industry are conducted. The professionals are all actors in the oil and gas industry in Europe. These are a process Engineer at SMB, a production Unit Manager at ESSAR UK Ltd, and the head of oil research at Wood Mackenzie.

The interviews were conducted following two methods: a questionnaire of four questions, and a phone interview. The questions are related to the oil and gas industry, the variables suspect-

ing to affect M&A likelihood, and the differences between the two determined clusters. The experts answered by confirming or negating and developed their answers with their knowledge of the industry.

2.5 Empirical analysis

This section shall give a first overview of the empirical part of this study. The detailed description of the methodology used for data preparation and the regression analysis can be found in the empirical part in chapter 4.

Data collection is done by consulting finance databases and websites that offer downloadable data for GDP, exchange rates, and the additional macroeconomic variables studied. Values for the firms-specific variables, however, are collected from the financial statements of the companies analyzed for their M&A activities. It is important to note that the exogenous variables are country-based, whereas the firm-specific variables are company-specific.

For the M&A sample collected, a multi-regression analysis in the form of a Logit model is used. The model is developed with the help of the statistical software Stata. Finally, the results are interpreted and related to the sub-questions that ultimately help to answer the main research question. These results are discussed against the initial expectations (cf. chapter 5) and lead to future research suggestions in the concluding chapter.

2.6 Source criticism and reliability

The sources for the literature review presented in the following chapter are chosen in such a way as to ensure their reliability. Research papers obtained from databases (e.g. SSRN) are only taken into consideration if they were published in renowned journals, e.g. the Journal of Finance. Unpublished sources are considered only if they are available on university websites.

Nevertheless, it has to be stated that the authors of the papers used do not base all their assumptions on empirical research, but combine them with personal opinions and subjective experience. As to avoid one-sidedness, several sources are used to support any assumptions made. The same problem can be assigned to newspaper articles that are used for current information on the oil and gas industry. For this, attention is paid to the choice of articles that were published in well-known and generally accepted papers, such as the Wall Street Journal.

With regard to the studies of cultural clusters, e.g. Hofstede or Gupta et al., it has to be mentioned that the findings they publish are based on country averages for different scores ac-

cording to the dimensions they are researching. They must not be forcibly true for any company that operates in a cluster; they are important guidelines, not generally accepted rules.

All interviews were conducted the same way and reached the same conclusions, thus consistency is observed among the three interviewed professionals. Therefore, primary sources can be seen as reliable, as they are consistent with each other and also consistent with some secondary resources.

Annual reports of companies used for the values of the firm-specific variables analyzed have to be commentated on critically, since accounting and calculation methods used for financial data may differ. Moreover, they represent a somewhat subjective source, as they subliminally try to appear positive to (potential) investors. The sources for the macroeconomic empirical part of the study are the World Bank and the International Monetary Fund databases mainly, which are reliable sources to gather financial information. Therefore, they can be seen as even more trustworthy than the companies itself, and they are additionally keen to keep a reliable reputation. Nevertheless, they contain information from company reports and equity research databases likewise.

2.7 Limitations and constraints

This section depicts the limitations of the overall project, emphasizing especially those present for the source review, and methodological restrictions.

First of all, the thesis duration (8 weeks) is one of the main factors that limit the capability of the authors to generate an in-depth analysis of all variables that can have an effect on M&A activity. Therefore, some variables such as the stock price, market to book ratio, and the growth rate of assets, which have been identified to be influential variables on M&A activity are not included in this paper. The choice of variables present in the paper is due to an extensive literature review and personal judgment. Moreover, the lack of previous papers related to the factors influencing M&A is identified to be an additional limitation due to the fact that few comparisons between final results are possible.

As mentioned above, the stock price variable has been excluded from the regression analysis of this paper, even though it is determined to be significant in Chien-Chung Nieh's (2003) and di Giovanni's (2003) papers. This choice is ascribed to the fact that many studies have identified the stock price of the acquirer to decrease during and sometimes after the M&A process. As the purpose of the underlying study is to look at the variables influencing the pre-M&A process, it was decided not to use a variable that mainly influences post-merger per-

formances. However, the importance of the stock price variable in relation to M&A activity is acknowledged by the authors.

Another limitation can be drawn from the fact that Hofstede's work on cultural clusters has been critiqued. In his projects, several studies are used to create the Latin American and European clusters. Grouping countries to form clusters can be highly subjective, and as it is not an exact science, no cluster can said to be perfect.

The last identified limitation for this section is a lack of direct communication with actors in the oil and gas sector. Interviews with professionals in the oil and gas industry in the European cluster have been achieved; no communication was realized for the Latin American cluster though. It is believed that the reason why interviews could not be held is due to geopolitical reasons, as most of the companies in the Latin American cluster are or will soon be state-owned firms. Moreover, interviews can be seen as subjective as they result in the obtainment of personal points of view.

3. Review of sources

The present chapter includes the review of the secondary (literature review) and the primary sources (interviews), as well as the derivation of the hypotheses for the independent variables leverage and cash reserve.

3.1 Literature review

The present research looks at three main subject areas: factors that affect M&A activity, two cultural clusters - a Latin American and a European cluster – and the oil and gas industry. Relevant literature findings that influenced the choice of topic, and that represent a framework for the present paper, are explained in the following.

3.1.1 Factors affecting M&A likelihood

Mergers and acquisitions are a strategy that firms can use to expand. In the literature covering the variables affecting M&A from a pre-merger point of view, gaps can be observed, especially concerning firm-specific variables. This part of the literature review summarizes findings of past research that identified or further analyzed the impact of specific variables, classified as either independent or control variables.

3.1.1.1 Independent variables

This sub-chapter presents literature findings according to the independent variables, which are tested for their impact on M&A decisions in the Latin American and the European clusters for the oil and gas industry. Those analyzed in the course of the project are the companies' pre-M&A leverage and cash reserve.

3.1.1.1.1 Leverage

According to Baker and Martin (2011), an acquisition is influenced by a company's leverage ratio, since it concerns one of its primary investment decisions. This is supported by a study from Uysal (2010) who found that pre-merger leverage ratios influence the likelihood of a company to make an acquisition. He states that "Specifically, firms that are overleveraged relative to their target debt ratios are less likely to make acquisitions…" (Uysal, 2010, Abstract). In contrast, Uysal (2010) made out that firms with a so-called leverage deficit are less likely to pursue an acquisition, which was not found to be highly significant. "These findings are consistent with the view that building up spare debt capacity is valuable for firms with investment opportunities…" (Uysal, 2010, p. 26). Uysal's findings are supported by a study by

Tou et. al. (2010), who explain that before pursuing M&A activities, acquirers are highly leveraged. A study by Bruner (1988) examines how excess cash and unused debt capacity are connected with mergers for companies listed on the Fortunes 1000 in 1979. The author finds that before a merger, companies have significantly low leverage ratios and high financial slack.

Furthermore, the leverage ratio implicitly represents a company's availability of credit. Klein and Peek (2000) study the decline of FDI from Japanese companies during a period of stable stock prices and an appreciating yen. They observe that the availability of credit is one of the causes of the decreasing number of FDI, as prospective acquirers cannot raise sufficient funds to proceed with the action of M&A due to the deterioration in bank health. They also come to know that "…a single Moody's downgrade of a Japanese bank on average results in a decline of about one-third in the number of FDI projects into the United States by Japanese Firms that use that bank as their main bank." (Klein & Peek, 2000, p. 2). Moreover, highly levered firms will tend to be more dependent on their bank than a less levered firm. Therefore, it is clear that availability of credit will be a factor influencing M&A especially in today's bank climate.

3.1.1.1.2 Cash reserve

A firm's cash reserves are a determinant of the probability that it will make an acquisition in the near future. Harford (1997) assesses whether having high cash reserves - i.e. cash and marketable securities - increases the likelihood of acquisitions in the financial services sector. Applying a Probit model to his data, including control variables, such as leverage, the author is looking for the variables that fuel a certain choice of spending the reserve. The main finding is that "Cash-rich firms are more likely to make diversifying acquisitions and their targets are less likely to attract other bidders." (Harford, 1997, Abstract).

Lasov et. al. support this view saying that firms with higher cash reserves are in better position to acquirer firms that have low or smaller cash reserves. A company that is holding cash at the present time is better off to invest it in acquiring another firm or expanding when interest rates are record low, therefore, companies do not have any incentives to keep high cash reserves (Lasov et al 2011).

Rossi and Volpin (2003) also look at the importance of cash in the M&A process. They state that if there are clear regulations, M&A transactions have a high likelihood to be handled by swapping shares or by being paid with stocks, which demonstrate the presence of shareholder protection. However, if the country suffers from corruption, and a high degree of government

control, cash will be favored for payment of M&A activities. Without extensive debt financing possibilities however, companies tend to make payments in stocks (Maccio and Fasulis, 2004).

In addition to that, Jensen's free cash flow hypothesis (1986) can be applied. Jensen (1987) states that managers use excess cash for M&A activities, which can be value destroying, instead of distributing it to shareholders as dividends. This creates an agency conflict between managers and shareholders (Jensen, 1987). Since cash is a main resource for financing M&A, it is crucial to include it into an analysis of firm-specific factors.

3.1.1.2 Control variables

Several authors such as di Giovanni (2003), Erel, Liao and Weisbach (2011), and Chien-Chung Nieh (2003) have been studying how macroeconomic factors influence the behavior of firms; their work concentrated on variables such as GDP, exchange rate, stock prices and interest rate. These findings influence the choice of control variables of the present research, which are described in this section, next to the firm-specific control variable firm size.

3.1.1.2.1 GDP

GDP is considered to be the most influential factor in M&A activity. Di Giovanni (2003) studies the macroeconomic variables that affect M&A decisions; the variables identified are the GDP, the exchange rate, tax rate, the availability of credit, telecommunication, common language, and tax treaties, among others. The main variables used by di Giovanni will also be used in this paper, others, such as telecommunication will be left aside. Chien-Chung Nieh (2003) researches on how the macroeconomic factors such as GDP, Interest rate and stock price are correlated with M&A activities. They both demonstrate that a country with a high GDP would have a higher tendency to be an acquirer than a target. Chien-Chung Nieh uses impulse response, variance decomposition and a casualty test to demonstrate how influential GDP is in relation with M&A. Di Giovanni (2003) on the other hand uses the gravity model. Arulampalam, Devereux and Liberini (2010) also corroborate the results of the forenamed authors. In other words, GDP is considered to be a variable that is always significant when looking at the factors influencing M&A decisions.

Today, developing countries are the ones with the higher GDP growth, which will lead them to become active participants in world trade. For developing nations to become more competi-

tive they will have to follow expansion strategies either organically or inorganically with M&A (Lasov et al 2011).

Based on the above results, GDP is expected to have a significant impact and will be the main control variable used for the regression in this paper.

3.1.1.2.2 Exchange rate

Cushman (1985), Froot and Stein (1991), and Blonigen (1997) examine the effect of a depreciated US Dollar and its consequences. They find that the depreciation of the US Dollar leads to an increase of FDI in the United States. According to the above findings, it can be said that depreciation due to a weak exchange rate can be one of the causes of an increase in M&A activity. In addition, Williamson (2008) argues that the real exchange rate is a key determinant of macroeconomic stability. He explains that countries that keep a competitive exchange rate are being prudent investors. Most of the developed countries nowadays do not control their capital, however, some countries such as Argentina have neither maintained a competitive exchange rate, nor totally liberalized it.

Reed and Babool (2003) look at the impact of exchange rate on M&A decisions. Exchange rate changes are shown to have an elastic impact on M&A activity; the authors indicate that price effects are important in determining outward investment flows. They state that "...a 1% appreciation of a country's currency will increase its outward M&A flows by almost 4%" (Reed and Babool, 2003, p 75). Therefore, the exchange rate factor will be used as a second control variable in the regression analysis in the present research project.

3.1.1.2.3 Commodity prices

Browne and Cronin (2007) examine how commodity prices actually move when a change in money supply occurs. Their results show that when policy makers inject money into the market, this action will push up commodity prices and thus consumer prices. This describes commodity prices as money-driven, rather than event-driven. In other words, larger fluctuations in commodity prices can be expected in countries with higher monetary control. Their conclusion leads to analyzing commodity prices as a factor that would influence the M&A decision as well as post-merger performances. Byrne et al (2011) further study the co-movement, common factor and fundamentals of commodity prices. They argue that commodity prices are affecting both external and internal countries' balances "…as well as their respective fiscal and monetary policies." (Byrne et al, 2011, p. 2). The authors find that "…the real

commodity prices are positively correlated with US economic growth and the real price of oil." (Byrne et al, 2011, p. 19). Their final conclusion is that the real interest rate and real commodity prices have a negative relationship with shocks to the interest rates that are absorbed within a timeframe of 5 years.

Shocks to growth opportunities such as a jump in commodity price of oil and gas for instance can be a factor that increases M&A activity. This is due to the shocks affecting the profitability of the industry and, more specifically, profit margins. However, Harford (2004) stresses the fact that it is not only shocks to profitability that increases M&A activity, but also a low cost transaction cost. In other words, the increase in the number of M&A can be observed when sufficient capital liquidity is present, as capital liquidity will mitigate financing constraints that firms can encounter when pursuing M&A activity (Arikawa and Miyajima, 2006). These findings suggest an inclusion of commodity prices as another macroeconomic control variable.

3.1.1.2.4 Company size

Hagedoorn and Duysters (2002) study industry and company-specific effects of M&A. Within their paper they state that small and medium-sized companies have a lower likelihood of becoming active in M&A activities. Contrarily, bigger companies are more likely to acquire targets, merge, or establish a partnership with another party. Another paper that strongly suggests including firm size as an important variable, published by Gorton et al., concludes that "... acquisitions are more profitable in industries in which the largest firm is larger relative to the other firms, and [...] firms in industries with more medium-size firms are more likely to make acquisitions." (Gorton et al., 2005, p. 37).

To enhance its market competitiveness firms will use rapid ways to increase their size, which will lead them to pursue M&A in order to enable them to grow, whereas organic growth will also enable them to grow but at a much slower pace. (Višić, J., Škrabić B. 2010). As patterns have been observed according to company size, it shall be included as a firm-specific control variable.

3.1.2 Cultural clusters

"… [T]here is no perfect or widely accepted clustering of countries." (Gupta et al., 2002, p.12). However, there are widely accepted and relevant studies that allow a certain kind of cultural clustering according to different country characteristics. This subchapter illustrates

findings on cultural clusters in order to underline the exact choice of countries that will be grouped into the Latin American and the European cluster.

3.1.2.1 Latin American cluster

The continent of South America consists of three Latin cultures (Spanish, Portuguese, and French); therefore the term Latin America is used as a synonym for South America in this paper. South America is a continent inhabited by various populations. The different cultures come from the fact that countries forming Latin America have their own indigenous population and also have a divergent colonial heritage. Lowenthal (2012) explains in his article why the countries forming this continent cannot be seen as a cluster of their own. The nations of South America are as similar as they are different. The variations between the states are due to different histories, geographies, demographics, and ethnic compositions. But the differences do not stop at the differences of land and people; it continues with the varying political traditions, and economic and social development. Some countries such as Cuba, Venezuela and Bolivia are identified to be socialist countries, whereas the other countries are seen to be more capitalistic. Nevertheless, governments from South America share a common characteristic, they all nationalized companies at one point in history to maintain a total control over their countries.

Other research by Gupta, Hanges and Dorfman (2002) classifies South America as the Latin American cluster, being one of their so-called GLOBE clusters. They see this cluster as a homogenous group that share the same practices such as high power distance, low performance orientation, uncertainty avoidance, future orientation, and institutional collectivism. The authors present that the cluster has societies that do not worry too much about results, and which tend to "...enact life as it comes, taking its unpredictability as a fact of life." (Gupta et al., 2002, p. 14).

By taking into consideration this former research, Latin America in the present paper will be composed of Mexico, Venezuela, Colombia, Brazil, Argentina, Peru, Bolivia, Paraguay, Ecuador, and Chile. The study of Hofstede excludes Brazil in the Latin American cluster, but is included in the present study, as it follows the same strategy to attract FDI as the other countries within the cluster. This cluster is identified to have a pyramidal organization, which is due to the fact that it has high scores for the dimensions uncertainty avoidance and power distance (Hofstede, 2012) (see Appendix I). Power distance is defined as"... the extent to which the less powerful members of organizations and institutions (like the family) accept and

expect that power is distributed unequally." (ClearlyCultural, 2012, paragraph 1), and uncertainty avoidance represents a measure for a country's dealing with uncertainty and equivoque (ClearlyCultural, 2012). The Latin American cluster is located above rich reserves of oil and gas. The presence of these scarce resources all across the continent make the countries similar to each other in their desire to grow and become developed countries.

3.1.2.2 European cluster

Relating to the GLOBE clusters created by Gupta et al. (2002), Europe can be subdivided into Anglo, Nordic, Germanic, Latin, and Eastern European clustering groups, whereby the Germanic and Nordic clusters are found to be the most similar ones. The Latin and Eastern Europe clusters differ meaningfully from the two aforementioned groups. For the characteristics that are investigated empirically by the authors, such as institutional collectivism or uncertainty avoidance, only the UK, being the sole European country that falls under the Anglo cluster, comes comparably close to the Germanic and Nordic clusters. The latter comprise the Netherlands, Austria, Switzerland, and Germany on the one hand, and Finland, Sweden, Denmark, and Norway on the other. The high performance-orientation and weak in-group and institutional collectivism apply to all of the countries that belong to one of the three clusters (Gupta et al., 2002).

When comparing the five cultural dimensions developed by Geert Hofstede (Hofstede, 2012) for the countries, it can be reasoned that the Nordic and the Germanic clusters and the UK (belonging to the Anglo cluster) seem to show strong similarities. Four out of the five determined characteristics – uncertainty avoidance, power distance, long-term orientation and individualism – fall into very small and comparable ranges (see Appendix I). This introduces two new dimensions; long-term orientation, which compares steadiness and persistence, and individualism, which assigns scores according to whether a country has a more individualistic or collectivistic character (ClearlyCultural, 2012). The only dimension that is not supportive for a comprehensive cluster consisting of the three sub-clusters is masculinity, since the Nordic countries are generally considered to be more gender-equal than the Anglo and the Germanic countries (Hofstede, 2012). According to the masculinity index, the Netherlands could be grouped into the Nordic cluster rather than the Germanic European cluster, in which Hofstede's findings contradict the classification of Gupta et. al.

A reasonable clustering is therefore achieved by grouping Nordic, Germanic, and Anglo European countries into an overarching cluster for European companies, which will be adopted

for the current case. Additionally, it can be deduced that Eastern and Latin European companies, such as those located in Russia, France, or Spain, are ineligible for an M&A sample group within this research. It is valid to criticize leaving the Eastern European cluster out, since Russian oil companies are recognized as being especially strong in the European market. The cultural analysis would then however be based on one country mainly, which is firstly also part of Asia, and secondly in many ways not transparent with its business strategies, which makes an analysis of financial statements difficult and biased.

Comparing Latin America and Europe from a linguistic point of view, it is evident that Latin America is united with mainly three languages spoken all over the continent – i.e. Spanish, Portuguese, and French among the different indigenous local languages. In Europe, however, most countries have their own national language. The common language is English, which is used at companies engaged in international business. General experience shows that the reluctance of using the English language more often in the business world is still present in Latin America. "Latin America is the weakest of all regions, with an average English proficiency score barely surpassing the low proficiency cutoff." (Education First, 2011, p. 16) The sole countries that are classified above a low proficiency level are Mexico and Argentina. The main reasons stated in a study conducted by the Education First institution are that Spanish is already a common language and that public education is still lacking quality (Education First, 2011).

Most countries' companies that will be analyzed under the European cluster are subject to the same general business conditions under European Union legislation (except, Switzerland and Norway), which reinforces the expectations of behavioral similarities when M&A decisions are made. Latin America, on the other hand, has the Mercado Común del Sur (MERCOSUR) as a common market, with Argentina, Brazil, Uruguay, Paraguay, and Venezuela as full-fledged members. Bolivia, Chile, Ecuador, Colombia, and Peru are only part members, but since they are recognized as potential full-fledged members, they are officially associated with MERCOSUR (Gabler Wirtschaftslexikon, 2012).

3.1.3 The oil and gas industry

The world's oil demand growth with the modest increases in known reserves and the relentless risks of geopolitical instability are expected to keep the crude oil prices above $65 a barrel according to the April 2006 Short-Term Energy Outlook (U.S. Energy Information Administration, 2012). Due to population growth, the consumption of energy is supposed to increase

by 57% by 2025 (Nexans, 2006). "According to the European Association of Geoscientists and Engineers (Madrid, 2005), after five horrible years, exploration is in a recovery mode." (Nexans, 2006, p. 4). Natural gas is said to be cleaner than other sources of energy such as oil and coal. Gas is thus expected to maintain a growth of 2.8% per year due to its attractiveness to countries that are interested in reducing their greenhouse gas emissions.

According to Healy (2011) "... the Oil and Gas industry is one of the largest in the world." (Healy, 2011, p. 5). However, it is endangered by expropriation since it represents a tremendously lucrative industry with margins per barrel from $50 to $70. In addition, Healy reports that most countries that are oil and gas producers usually demonstrate weak institutions, which leads to high levels of corruption.

Figure 2 shows the importance of exploration and distribution as the main activity, with most investments, within the oil and gas sector. It accounts for 72% and 55%, respectively. As a consequence of the paramount importance and size of the industry, this paper will analyze this sector as it is expected to grow due to the emergence of developing countries. As it represents a highly profitable industry, there are many due to the fact that companies want to acquire knowledge on the location of resources, and corresponding technologies in different parts of the world through acquisitions of other companies.

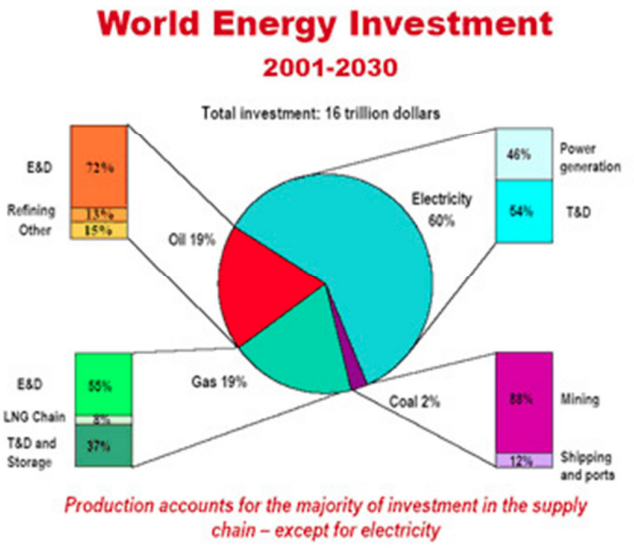


Figure 2: World Energy Investment 2001-2030 (Source: Nexans)

The business sector in Europe and Latin America still differs crucially, since the point of time of the liberalization of the markets lie in different periods. While the European industry went through the phase of liberalizing markets in the early 1990's (Harbo, 2008), the privatization

of Latin American oil and gas companies started in the very late 1990's and the beginning of the 2000's (Carano and Alexander, 2012). This led to a merger wave, outgoing from the newly privatized companies. It was also driven by a requirement of the companies to become key players in a lucrative business. Shortly afterwards however, countries - for example Bolivia and Colombia - re-nationalized companies, especially in the oil and gas industry. Only recently, the Argentinean government reversed the privatization of YPF owned by Repsol (Parks, 2012). Even nowadays, the oil and gas sector in Latin America keeps developing at a rapid pace, especially due to an increasing safety level (Stettner, 2012). This is the area where most discoveries of gas and oil fields have been made in the recent years, especially Brazil with pre-salt oil resources located in deep-water (Kennedy, 2010). This leads to increased activity of companies in the region and arouses interest by oil companies from overseas as well (Carano and Alexander, 2012).

Likewise, the European oil and gas sector is considered to be very liquid and the interplay of dynamic forces is fuelling M&A activity, i.e. predominantly the need for the big players to stock up resources. The European oil and gas industry is even more dependent on the acquisition of new shares in other businesses, as their own resources are scarce compared to those present in Latin America (Harbo, 2008) and the continuous rise in energy prices drives company mergers and acquisitions (Flynn, 2012). Since the worldwide need for oil and gas will most likely increase rather than decrease in future years, the sector is highly active in M&A procedures and constantly striving for expansion.

3.2 Primary sources

According to Teodorczuck (2012) Process Engineer at SMB, demand and supply of oil and gas will be the main factor dictating commodity prices. Moreover, geo-political events also highlight the tight situation of commodity prices.

National Oil Companies (NOCs) are mostly politically driven and suffer from corruption, whereas the Majors are market-driven, focusing on shares prices and keeping their investors. Teodorczuck also explains that during a crisis, majors will be focusing on their exploration units and therefore will be selling off their assets related to other units. In the 90s-2000s, a wave of consolidation took place in Europe, which he believes "[...] was driven by a requirement to beef themselves up to be part of the lucrative business." (Teodorczuck, 2012) in the oil and gas industry. Moreover, it was a "copycat effect" - one merger forces the other industry members to follow the trend to keep up. In relation to the NOCs Teodorczuck explicates that "[...] business principles do not apply as nationalist sentiments drives activities and that

politicians have the ability to change the goals of the state-owned firms." (Teodorczuck, 2012).

Matijasevich (2012), Production Unit Manager at ESSAR UK Ltd, explains that the oil and gas industry is a cyclical industry, due to the fact that "Good margins are achievable, which leads to a tremendous number of investments, which then translates into an oversupply few years later down the line when those new assets are in operation." (Matijasevich, 2012). He also argues about the omnipresence of corruption in the Latin American cluster, and the important role of government in less developed economies. Argentina is taken as an example to show how the government affects M&A, as it privatized its oil company YPF in 1993, and re-nationalized it in April 2012.

Lastly, Alan Gelder (2012) head of oils research at Wood Mackenzie further explains the difference between NOCs and Majors. One of the differences comes from the fact that NOCs are focusing more on internal development, whereas privately held companies are concentrating more on geographical and hydrocarbon supply type of diversification. Gelder also expounds that Majors are more transparent than NOCs and that their current goal is to maintain their production levels and profitability monetize hydrocarbon reserves. NOCs are influenced by various driving forces however. The head of oils research at Wood Mackenzie further states that the availability of credit has been decreased in Europe due to the financial crisis. However, credits are still available for Majors, but more difficult to obtain for smaller oil and gas companies in the European cluster. The availability of credit in the Latin American is dependent on the two main sources of loans: banks or the governments themselves. Gelder (2012) also explains that M&A are usually paid in cash, indifferently of the cluster.

3.3 Expectations and hypotheses

Given past literature findings and relating to own assumptions, the expected signs of the coefficient for the variables can be made. They are presented in Table 1.

Dependent variable	Independent variables	Control variables	Measure and source	Expected correlation
Likelihood of M&A activity	Leverage		Total liabilities/equity, companies' financial statements	-
	Cash reserves		Cash and cash equivalents/sales, companies' financial statements	+
		GDP	GDP in USD, World Bank --> changes	+
		Exchange rate	Daily exchange rate (measured against 1 USD), Federal Reserve Bank and OANDA --> changes	-*
		Commodity prices	Commodity price list oil and gas, Index mundi --> changes	+
		Company size	Number of employees, companies' financial statements --> changes	+
* this is because it is looked at log changes compared to the USD (if the change is positive, the currency is worth less and vice versa				

Table 1: Summary of variables, measures and expected correlations

The independent variables are hypothesized the following way:

Leverage:

1a) The leverage ratio will be significantly negatively correlated with M&A likelihood.

1b) The leverage ratio will explain a higher percentage of M&A likelihood in the Latin American cluster.

This is because in Latin America, companies are to a large extent controlled by the governments and have "easier" access to debt. Even companies that are private have better financing opportunities because of the transformations in the lending markets. European companies are more experienced in M&A deals and might be less sensitive to their leverage ratios.

Cash reserves:

2a) Cash reserves will be significantly positively correlated with M&A likelihood.

2b) Cash reserves will explain a higher percentage of M&A likelihood in the Latin American cluster.

These assumptions are made, since Latin American countries have a higher uncertainty avoidance index and therefore, they will require a certain level of liquid funds before considering M&A activities. Moreover, Latin American companies are considered to usually pay acquisitions in cash rather than with own shares, which is due to weaker governmental guidelines and higher corruption levels.

4. Empirical studies

The present chapter includes the empirical findings of this research. Firstly, the detailed methodology is laid out, describing the sample data, the variables analyzed and the regression models used. The results for both clusters are displayed and, finally, the limitations experienced during the empirical study are stated.

4.1 Methodology

These paragraphs will present the different steps taken to realize the analysis of the sample data. It will first give an explanation of how the data has been collected and transformed, and later describe the models used to analyze the effect of the variables on M&A activity, which are depicted in the literature review.

4.1.1 Sample

The sample is composed of eight companies situated in six different countries for the Latin American cluster, whereas the sample for the European cluster is formed of ten companies located in seven different countries. M&A activity is observed on a quarterly basis from April 2002 until December 2011. The companies forming the clusters are active players in the business line of exploration and production (E&P) in the oil and gas industry. This study looks at M&A, where an acquisition is considered to be the purchase of a stake equal to or bigger than 51% in the target company. This requirement is created, so that the acquirer has control rights, and can influence the target firm's business to a high extent.

In the Latin American cluster three companies (ENAP, PEMEX nationalized in 1938, and PDVSA nationalized in 1974) are state-owned; in other words they are national oil companies (NOCs). Three companies are partially controlled by the government (Ecopetrol partially nationalized in 2003, Petrobras partially nationalized in 1997, and Repsol YPF (in April 2012 YPF went back to be fully controlled by the Argentinian government)). Finally, only two companies in this cluster are privately held, COPEC (Chile) and Ultrapar Participações (Brazil). Therefore, the countries hosting the studied companies are Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela. 95 M&A activities were recorded from 2002 to the end of 2011 for the Latin American cluster. The sample is composed of 312 observations and 32 with a non-zero outcome.

In contrast to that, the firms considered for the European cluster are all privately held. Even though Switzerland belongs to the cluster identified, there is no company headquartered in

this country that matches the selection requirements for this empirical study. Therefore, the companies are based in Austria, Denmark, Germany, the Netherlands, Norway, Sweden, and the UK. The total sample for the European cluster comprises 387 observations, with 68 outcomes for the value 1 of the binary dependent variable.

4.1.2 Collection and transformation of the variables

The numerical findings of the GDP, exchange rate, commodity price of oil and gas, leverage, cash reserve and company size are explained below.

GDP per capita is collected from the World Bank data system. It is used to illustrate the state of the economy in the different countries and therefore in the two clusters studied. The difference of the logarithm[1] was taken to obtain a comparable basis for all nations. The "exchange rate" is taken from the Federal Reserve website[2] for the European cluster and from OANDA[3] for the Latin American cluster. The local currencies are measured daily against 1 US$ initially, then a three month average of the exchange rate is utilized as M&A activities are looked at on a quarterly basis. The logarithm of the present period divided by the previous one is used to compare countries between themselves. Commodity prices of oil and gas are found in the website Index Mundi[4]. The commodity price of crude oil is used to illustrate the change in oil price, whereas the commodity price of natural gas is utilized to show the price variation of gas. As these two commodities have not been varying in the same direction the two commodity price indexes are used to illustrate the change in price in both raw materials.

Cash and cash equivalents were divided by sales to calculate the firms' cash reserves. The second firm-specific variable is company size, which takes into account the number of employees of each firm. Finally, the leverage factor is calculated by dividing total liabilities with total equity. All values for the firm-specific variables calculations are found in balance sheets and annual reports of the studied companies.

All variables are lagged three months, as this study tries to identify if a change in the variables that occur a quarter before M&A activities has an influence on M&A likelihood. Subsequently, M&A activities are observed within time periods of three months as well. It has been decided that a monthly observation of M&A activity is too sensitive, since it is difficult to determine an exact date when a company decides on whether to merge or acquire a target. A

[1] (ln(t/t-1))
[2] http://www.federalreserve.gov/releases/h10/hist/dat00_bz.htm
[3] http://www.oanda.com/currency/historical-rates/
[4] http://www.indexmundi.com

choice of yearly or six months periods would however be too long, especially when considering that the financial crisis struck global markets only in the second half of 2007 and that economies recovered in the course of 2010.

4.1.3 Regression models

Before looking at the models used, the sample has to be econometrically explained. The dependent variable of the regression is defined by a Bernoulli model, which takes on the value 1 if M&A activity took place and 0 otherwise. Binary outcomes are estimated with the use of the maximum likelihood. Due to the fact that the sample is composed of several countries forming two clusters, the data is seen as panel data. Panel data can be described as repeated observations over time on the same cross-section. Using panel data has several advantages. Firstly, it increases the precision of estimation, due to the enlargement of observations that can be included. Secondly, it is a consistent estimation of fixed effects, "... which allow for unobserved individual heterogeneity that may be correlated with regressors." (Cameron and Trivedi, 2005, p. 468). Finally, it is a dynamic measurement, as it allows learning more about individual behavior than what is possible with a simple single cross regression.

Ascribed to the use of a Bernoulli variable, a logistic model is used to analyze both the European and the Latin American cluster.

The logistic model, or logit model, can be mathematically defined as follows:

$$p_i = Pr[y_i = 1|x_i] = \frac{exp(\beta_1+\beta_2 x_i)}{1+exp(\beta_1+\beta_2 x_i)} \quad 0<p_i<1 \qquad (1)$$

where β are the true parameters values. No loss of generality is assumed if only the probability of the outcome is being looked at, such as the analysis of the occurrence of the outcome y=1 with the probability p. A regression model is constructed by parameterizing the probability p in relation to its independent variable x. "The commonly used models are of single-index form with conditional probability given by" (Cameron and Trivedi, 2005, p. 469):

$$p_i \equiv Pr[y_i = 1|x] = F(x'_i\beta) \qquad (2)$$

"The standard binary outcome models are single-size index models, so the ratio of coefficients for two different regressors equals the ratio of the marginal effects" (Cameron and Trivedi 2005, P469). The odds ratio is also a relative measure of risk; therefore, in the binary models, risks can be expressed by coefficients or by the odds ratios.

As the outcome is Bernoulli distributed, which means that the binomial distribution is composed of only one trial, the probability mass function of this distribution is formed as follows:

$$f(y_i|x_i) = p^{y_i}(1-p_i)^{1-y_i}; y_i = 0,1 \qquad (3)$$

The density of the logistic regression implies log density; therefore it can be modeled as below:

$$lnf(y_i) = y_i lnp_i + (1-y_i)ln(1-p_i) \qquad (4)$$

Given independence over i and model (2), the log likelihood is defined:

$$\mathcal{L}_n(\beta) = \sum_{i=1}^{N}\{y_i lnF(x'_i\beta) + (1-y_i)ln(1-F(x'_i\beta))\} \qquad (5)$$

Maximum Likelihood Error (MLE) consistency is only reached when the conditional density of y given x is correctly specified, in other words the dependent variable should be a Bernoulli variable with two possible outcomes 1 and 0. Thus, the parameters distributions for a logit regression are modeled as follow:

$$p = \Lambda(x'\beta) = \frac{e^{x'\beta}}{1+e^{x'\beta}};$$

where Λ(.) is the logistic cdf, with $\Lambda(Z) = (e^Z/1+e^Z) = 1/(1+e^{-Z})$

The first order condition of MLE is defined:

$$\sum_{i=1}^{N}(y_i - \Lambda(x'\beta))x_i = 0 \qquad (6)$$

With an intercept in equation (6), it implies that $\sum_i \left(y_i - \Lambda(x_i\hat{\beta})\right) = 0$, so the logistic residuals sum to zero (Cameron and Trivedi, 2005).

If the parameter distribution is modeled in such a way $p = \Lambda(x'\beta)$ the logit model is employed. However, it should be mentioned that a mistake in the distribution parameters does not affect the results, as choosing the wrong distribution will lead to the same effect between all slope parameters and the ratio of slope; in other words the effect will be offset.

Four models have been run to analyze which variables affect M&A activity. The first model is a pooled model, which is the most restrictive one that specifies constant coefficients, so that:

$$y_{it} = \alpha + x'_{it}\beta + u_{it}$$

Where x_i represents the unobservable individual effects. The second model is an individual-specific effects model that allows each cross-section to have a different intercept term even though all slopes are the same, so that:

$$y_{it} = \alpha_i + x'_{it}\beta + \varepsilon_{it} \quad ; \quad \varepsilon_{it} = \text{IID over i and t.}$$

α_i are the independent variables that capture the unobserved heterogeneity and x_i represents the unobservable individual effects.

The third model is the Random effects (RE) model, which "... assumes that the unobservable individual effects x_i are random variables distributed independently of the regressors." (Cameron and Trivedi, 2005, p. 700).

$$y_{it} = \alpha_{it} + x'_{it}\beta_{it} + u_{it} \quad i = 1, \ldots, N \quad t = 1, \ldots, N$$

The coefficients vary over individuals and time in the RE model.

$$\alpha_{it} \sim [\alpha, \sigma_\alpha^2], \varepsilon_{it} \sim [0, \sigma_\varepsilon^2]$$

Finally, a complementary log-log model is used, as one of the outcomes is rare. It differs from the other models, as it is asymmetric around zero.

Then, the fixed effects are tested using the Hausman test. "A large value of the Hausman test statistic leads to rejection of the null hypothesis that the individual-specific effects are uncorrelated with regressors and to the conclusion that fixed effects are present." (Cameron and Trivedi, 2005, p. 711).

To complete the analysis of the variables suspected to affect M&A activity, five graphs are drawn which help identifying the relationship between different variables.

4.2 Results

In this section, results from the regressions that are also illustrated graphically will be given for each cluster.

4.2.1 Latin American cluster

The correlation matrix (see Table 2) illustrates the slight interdependence of the commodity price of crude oil and natural gas, which equal 0.38. It also shows the interconnection of the commodity price of crude oil with the exchange rate with a correlation of 0.32. All the other variables do not show any sign of interdependence with each other, as all values are below

0.08. As the correlation matrix shows few interconnections between the independent variables, this may show the different regression models to be insignificant.

	Exchan~e	GDP	CPOil	CPGas	Leverage	Cashre~e	Compan~e
Exchangerate	1.0000						
GDP	-0.0505	1.0000					
CPOil	-0.3240	-0.0403	1.0000				
CPGas	-0.0821	-0.0636	0.3780	1.0000			
Leverage	0.0309	-0.0311	-0.0686	-0.0392	1.0000		
Cashreserve	-0.0323	-0.0437	0.0325	-0.0168	-0.0725	1.0000	
Companysize	-0.0113	0.0748	-0.0041	-0.0050	-0.0224	-0.0347	1.0000

Table 2: Correlation matrix - Latin American cluster

The pooled regression (see Table 3) has a log likelihood equal to -151.03, a prob>chi2 of 0.05 and a Wald test of 14.35. Two variables show to be significant in this model, the first one is the leverage, significant at 1% confidence level with a coefficient of -0.40, whereas the second one is the company size that is significant at 10% confidence level with a coefficient of 1.1.

Model	Pooled logit		RE logit		FE logit		Complementary log log		RE log log	
	Coefficient	p>z	Coefficient	p>z	Coefficient	p>z	Coefficient	p>z	Coefficient	p>z
Exchange rate	2,0059390	0,268	2,0057650	0,283	2,3300000	0,217	1,8642240	0,241	1,8639610	0,238
GDP	0,4101961	0,661	0,4103666	0,618	0,1871337	0,822	0,4720846	0,580	0,3588743	0,631
CP Oil	0,5739110	0,547	0,5738526	0,565	0,6593674	0,510	0,3586645	0,681	0,4720420	0,587
CP Gas	-0,3159469	0,669	-0,3159119	0,680	-0,3433004	0,652	-0,2740261	0,674	-0,2740023	0,681
Leverage	-0,4006219	0,002	-0,4004987	0,005	-0,7073469	0,038	-0,3595509	0,002	-0,3594263	0,005
Cash reserve	0,2491277	0,893	0,2503096	0,904	-0,7313054	0,796	0,2832187	0,855	0,2850424	0,871
Company size	1,0821320	0,078	1,0814840	0,304	1,7506610	0,291	0,9089831	0,085	0,9083430	0,315
Constant	-0,7781745	0,009	-0,7783301	0,009	-	-	-0,9653015	0,000	-0,9654719	0,000
Log likelihood	-151,03344		-151,03345		-133,75252		-151,09921		-151,09922	
Prob>chi2	0,0453		0,1162		0,084		0,0345		0,1099	
Pseudo R2	0,0618		-		-		-		-	
Wald chi2/LR chi2	14,35		11,55		12,55		15,12		11,73	

Table 3: Regression results - Latin American cluster

The exchange rate is the variable with the highest coefficient, which equals to 2. Three variables are identified to have a negative coefficient, the variables are: the leverage ratio, the commodity price of gas and the constant.

The fixed effects regression (FE) (see Table 3) has a log likelihood of -133.75 and a prob>chi2 of 0.08. Only the leverage with a coefficient of -0.7 is significant at a 5% confidence level. The exchange rate has a coefficient of 2.33 and the company size has a coefficient of 1.75. Three variables also have negative coefficients, these are the leverage, the cash reserve and the commodity price of gas.

The random effects regression model (RE) (see Table 3) exhibits a log likelihood of -151.03, a prob>chi2 of 0.12 and a Wald test of 11.55. In this model, only the leverage is significant at a 1% confidence level with a coefficient equal to -0.40. The company size and the exchange rate have similar coefficients as in the two previous models, which equal 1.1 and 2 respectively. As in the pooled regression the commodity price of gas, the leverage and the constant have negative coefficients.

The complementary log-log regression (see Table 3) obtains a log likelihood of -151.1, a prob>chi2 of 0.03 and a Wald test of 15.12. Here, the leverage with a coefficient of -0.36 and the company size with a coefficient of 0.91 are significant at 1% and 10% confidence levels respectively. The negative coefficients are the same as in the RE regression model.

The complementary RE log-log model (see Table 3) has a log likelihood of -151.1, a prob>chi2 of 0.11 and a Wald test of 11.73. In this model only the leverage is significant -0.36 at a 1% confidence level. The exchange rate and company size obtain coefficients of 1.86 and 0.91 respectively. The negative coefficient variables are the same as in the RE model.

The Hausman test (see Appendix II) is used to illustrate if the models suffer from fixed effects. The result yields to a LR2 equal to 1.87 with a prob>chi2 equals to 0.97, which means that the null hypothesis cannot be rejected, and thus any of the RE model or FE can be used to estimate the probability of the binomial outcome. The result 0.97 for the p value leads to the non-rejection of the model as the p value is insignificant, and the result 1.87 reinforces the non-rejection hypothesis, as it is a low value.

With the help of the graphs, it is possible to see the relationship between the company size and the dependent variable (see Appendix VI). Moreover, leverage is also identified to affect

M&A activity (see Appendix 3). However, it is harder to see the link between cash reserve and the dependent variable (see Appendix IV).

To conclude, the best model is the one with the highest log likelihood, therefore the fixed effect model is the best with a log likelihood of -133.75. The null hypothesis of the Hausman test specifies that a high value in the test leads to a rejection. If there is rejection, it means that the individual-specific effects are uncorrelated with the variables and therefore fixed effects are present. As mentioned above, the null hypothesis cannot be rejected in the Latin American sample data. The RE model, the pooled regression, and the two complementary log-log regressions are very similar, with equivalent log likelihood, and the same negative coefficients. The only exceptions are in the pooled regression and complementary log-log regression where both the company size and the leverage are significant, whereas in the RE and the RE complementary log-log regression only the leverage is significant.

4.2.2 European cluster

For the European cluster the variables studied do not show significant correlations amongst each other either, which is again predicting that low levels of significance will be observed in the regressions. The strongest correlation (0.32) can be seen between the commodity prices as well, which is obvious from an economic point of view. Secondly, firm size and cash reserve seem to be slightly correlated (0.22) (see Table 4).

	Exchan~e	GDP	CPOil	CPGas	Leverage	Cashre~e	Compan~e
Exchangerate	1.0000						
GDP	0.1146	1.0000					
CPOil	-0.0939	-0.0176	1.0000				
CPGas	-0.0664	0.1170	0.3756	1.0000			
Leverage	0.0662	-0.1053	-0.0154	-0.0146	1.0000		
Cashreserve	-0.0063	0.0932	0.0323	0.0847	-0.0248	1.0000	
Companysize	-0.1274	0.1005	-0.0017	-0.0645	-0.1224	0.2188	1.0000

Table 4: Correlation matrix - European cluster

For this cluster, the pooled regression, the RE model, and the complementary log log model show the most similar results.

The pooled regression shows significance for leverage and company size at 10% and 5% confidence levels, respectively. Moreover, cash reserve shows a slight significance with a prob>z of 0.102. A log likelihood of -176.2 and the pseudo R^2 are not very convincing for this regression model however. The signs of the coefficients for the commodity price of oil and cash

reserve are negative and all others have positive signs, with the exchange having the highest coefficient of about 2.3 (see Table 5).

As it is the case for the pooled regression, the RE model and the two log log models show negative coefficients for the commodity price oil and cash reserve. Exchange rate has the highest coefficient in those models too. In the complementary log log model and the RE model company size shows to be the only significant variable at a 5% confidence level. The prob>chi2 of 0.54 in the RE regression is the highest probability observed in all regressions and the log likelihood is at -172.23. It is similar to the two log log models, which have likelihood values below -170 as well. The RE log log model has the lowest log likelihood of -177.75 and the highest Wald chi2 of 13.66. Furthermore, it has a prob>chi2 which is almost as high as for the RE model. The complementary log log has a low prob>chi2 though (0.078) (see Table 5).

Model	Pooled logit		RE logit		FE logit		Complementary log log		RE log log	
	Coefficient	p>z	Coefficient	p>z	Coefficient	p>z	Coefficient	p>z	Coefficient	p>z
Exchange rate	2,2614610	0,374	1,3366860	0,644	0,8534054	0,776	1,9037860	0,404	1,1529820	0,650
GDP	0,5026828	0,666	0,4965489	0,704	0,3846745	0,775	-0,2640482	0,752	0,4197861	0,719
CP Oil	-0,3178762	0,729	-0,4627393	0,602	-0,5331353	0,553	0,4114523	0,699	-0,3945280	0,612
CP Gas	0,2265722	0,751	0,2084165	0,785	0,2067183	0,788	0,1961171	0,756	0,1938631	0,770
Leverage	0,2592939	0,064	0,0384846	0,862	-0,1877068	0,464	0,2130593	0,049	0,0207666	0,913
Cash reserve	-0,5056357	0,102	-0,2574900	0,662	0,0516113	0,931	-0,4295736	0,132	-0,1822892	0,728
Company size	0,5939417	0,037	0,7693868	0,022	0,9058902	0,012	0,5010517	0,028	0,6493732	0,021
Constant	-1,9914140	0,000	-1,8205720	0,000	-	-	-2,0141740	0,000	-1,8880580	0,000
Log likelihood	-176,20138		-172,22803		-143,7545		-176,4188		-172,4561	
Prob>chi2	0,1083		0,5395		0,3146		0,0777		0,522	
Pseudo R2	0,0205		-		-		-		-	
Wald chi2/LR chi2	11,77		6,00		8,21		12,78		6,15	

Table 5: Regression results - European cluster

When studying the results of the FE model, it can be seen that only company size is significant (5% confidence level). As in all other regression models, it is positively correlated with M&A likelihood. The coefficient sign for cash reserve changes to a positive sign, whereas leverage has a negative sign in this model. Exchange and company size are the variables with the highest coefficients close to 1. The prob>chi2 is at a decent level with 0.31 and the log likelihood is -143.75 (see Table 5).

The Hausman test (see Appendix II) shows that the null hypothesis (fixed effects) cannot be rejected for the European cluster regressions either.

None of the models seem to properly display an overall acceptable regression model for the observations in the sample. The best results regarding the prob>chi2 test can however be obtained by the complementary log log model, and the FE panel regression has the highest log likelihood. Those two models seem therefore to be the most reliable from a statistical point of view. It must be stated that the complementary log log model is slightly less appropriate than the FE model, as it does not take the panel structure of data into account.

4.3 Limitations

The empirical study carried out is limited in some ways, which are described in the following.

Firstly, a relatively small sample could be analyzed only, since the consistency requirement concerning the oil and gas industry limited the choice of companies. Moreover, the necessity to gather financial data of the companies from financial statements restricted the number of companies to consider for the empirical part - due to the time frame of the project on the one hand and the availability of financial reports on the other hand. Three main NOCs are missing in the Latin American cluster, which are: YPFB (Bolivian NOC), PetroPeru (Peruvian NOC), and Petroecuador (Ecuadorian NOC).

Additionally, it is not always obvious in which exact month a company is merging with another company or acquiring a target. The choice of quarterly time periods can be argued to be too short. It is however not possible to look at yearly periods for example, since the financial crisis could not be analyzed separately in this paper in that case.

Furthermore, some variables are excluded in this research. This concerns especially the economic control variable interest rate. This is because data for many Latin American countries is not available in financial databases. All variables that compare the acquirer with its target have not been considered either, as no values can be obtained for the observations where the

dummy variable is assigned a 0 value. This would however not be appropriate for the logistic regression models used for this study. The fact that these variables could not be studied led to a small range of variables that are finally included in the regression models. Performance measures have not been looked at, since this study focuses on pre-merger conditions that influence M&A-likelihood, although many other research papers include regression models with post-performance dependent variables.

5. Discussion

This chapter provides a discussion on the results of the empirical part of this study. It examines the individual cluster results and compares them in a subsequent analysis.

5.1 Latin American cluster

The various regressions illustrate that leverage is the variable that affects M&A activity the most in the Latin American Cluster. For each one-unit change in leverage, the log odds of M&A activity (M&A versus no M&A) decreases by 0.7. The measure of leverage does not only illustrate a company's debt level, but also the availability of credit to the company, which is explained by Klein and Peek (2000). In other words, an already highly leveraged company keeps taking on debt, as loan institutions offer the possibility to do so. The companies in the Latin American cluster generally have a high leverage ratio as most of them (e.g. PDVSA, ENAP and PEMEX) are NOCs controlled by the government. Petrobras, Ecopetrol and Respol YPF are partially nationalized (the situation changed in April 2012 for YPF as the Kirchner government re-nationalized YPF). Because most of the companies in the clusters are NOCs, it is easy for them to access new lines of credit even though their leverage ratio is already tremendously high. The Chilean company ENAP illustrates an example of high leverage ratio. In 2007 ENAP recorded a leverage ratio of 4.50, while in 2010 the same ratio was reported to be equal to 26.04, and in 2011 this ratio decreased to 10.81. A private company could not have achieved a ratio as high as the Majors (private companies in the oil and gas industry) have strict obligation to their shareholders and need to be more profitable than the national companies (Teodorczuk, 2012). Here is an example to demonstrate the difference between Majors and NOC: Ultrapar Participações is a privately owned energy company in Brazil. Its debt ratio was equal to 0.99 in 2007, 1.50 in 2010 and 1.46 in 2011, which is significantly less than ENAP's ratios for the same time periods. However, even though high leverage ratios can be obtained in Latin America, the leverage is still negatively affecting M&A activity, which follows hypothesis 1a. The graph in Appendix III illustrates the relationship between leverage and M&A activity well. It can be seen that when leverage was sky rocketing, no M&A took place, and when the leverage ratio stabilized at a lower level M&A activity occurs. Therefore, hypothesis 1a (that leverage will be significantly negatively correlated with M&A activity) has been proved to be correct.

Company size was the second variable detected to significantly affect the dependent variable. However, this factor does not show any significance in the FE model, but it shows significance in the other models such as the pooled regression, where it obtained a coefficient of 1.1.

If company size matters in M&A activities, it means that the larger the company gets the more M&A activity will take place. According to Marcos Matijasevich, Production Unit Manager at ESSAR UK Ltd, companies are looking for synergies and economies of scale; it is for that reason that companies use M&A to enable them to grow. It is harder for a private firm with few employees to acquire another firm, owed to the fact that most companies in the oil and gas industry in Latin America are NOCs. Company size, as expected, is also significant and positively correlated with the dependent variable through the RE model, the pooled regression and the complementary log-log regression. Therefore, the size of a company, as expected, matters when looking at M&A activity as illustrated by Hagedoorn and Duysters (2002).

The hypothesis on cash reserve is observed to be non significant, but importantly, also negatively correlated with M&A activity in the FE model. The null hypothesis 2a is rejected. This can be explained due to the nature of the firms, which are held by the government. In other words, as NOCs can obtain credit when they request, they do not need to maintain a cash reserve to merge with or acquire other companies. Cash reserve in the Latin American cluster does not influence M&A activity; no pattern can be detected. Corruption and poor legislation in developing countries facilitate the acquisition of other firms without having the means (cash) to acquire them (Matijasevich, 2012). However, Gelder (2012) argues that most of M&A are paid by cash; this statement nonetheless cannot be proved with the models run.

All the other variables do not show any degree of significance. Most of them, such as GDP per capita and commodity price of oil have low positive coefficients. Moreover, exchange rate shows no significance in any models but has a high coefficient of approximately 2, which leads to the understanding that when a country currency appreciates, this prompts more M&A activity as foreign targets become cheaper as described by Cushman (1985), Froot and Stein (1991), and Bloningen (1997).

Cash reserve and commodity price of oil are the two variables that exhibit negative coefficients. In other words, when the commodity price of oil is high, M&A activity will be smaller. However, the negative coefficient of cash reserve is counter intuitive, as this would mean that if a company has more cash, it would not use it to inorganically expand. This figure can be explained by the high degree of corruption in this cluster. The graph in Appendix VII demonstrates that no patterns are established between commodity price of oil and gas and M&A activity. According to Anthony Teodorczuk, Process Engineer at SMB, commodity prices of oil and gas are mostly affected by supply and demand, and also by geopolitical events to a lesser extent.

Furthermore, no pattern between GDP and the dependent variable can be observed (see Appendix V), but some pattern between company size and M&A activity can be. This indicates that the state of the economy does not influence M&A activity whereas company size does. Company size has already been formerly identified to positively affect M&A likelihood (e.g. Gorton et. al. 2005, and Gelder, 2012). The non-pattern behavior of GDP with M&A activity can be explained as governments use their state-owned enterprises to stimulate the economy during crisis or during low growth periods.

In brief, the Latin American cluster is identified to be a somewhat corrupt cluster with poorer legislation, which enables NOCs to have a high level of available credit due to the state-owned nature of most firms. Companies do not have the need to hold cash due to the availability of credit. Company size is revealed to be positively correlated with M&A activity, as NOCs usually employ a high number of workers (e.g. PEMEX). PEMEX has been identified as the company with the largest number of employees and the smallest productivity in the world by the newspaper El Universal (August 27, 2008). Therefore, hypothesis 1a is revealed to be true (not rejected), whereas hypothesis 2a is not (rejected). Leverage and company size are the two most influential variables in the Latin American cluster. Gelder (2012) states that smaller companies tend to be more leveraged than bigger companies, which is seen to be true as ENAP is the most levered firm in the Latin American cluster and also the smallest one in terms of number of employees.

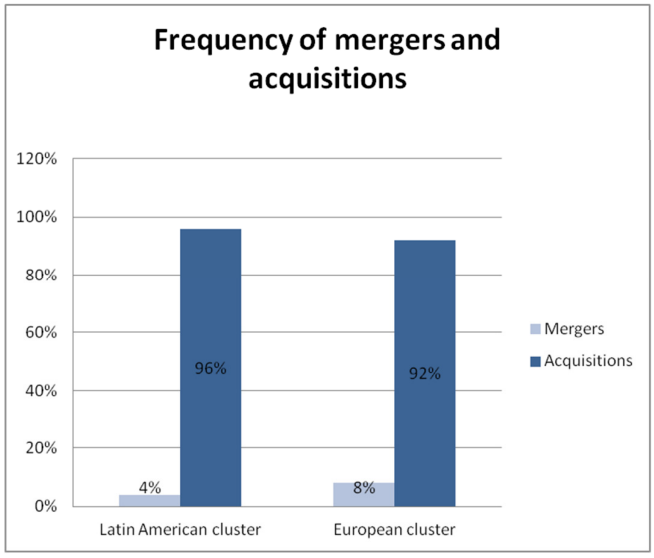


Figure 3: Frequency of mergers and acquisitions

During the studied period from the beginning of 2002 till the end of 2011, 95 M&A took place, where 96% were acquisitions and 4% were mergers (see Figure 3). Mergers are rare in

comparison with acquisitions, as governments usually do not accept the supervision of a business partner over how it should run its business. Both Teodorczuk and Matijasevich explain that developing countries such as the countries that form the Latin American cluster, will be concentrating on domestic M&A or inside-the-cluster M&A, as companies will prefer to merge with or acquire a firm that is located in a nearby country with similar culture.

Teodorczuk (2012) explains that NOCs are politically driven and thus unpredictable. However, a pattern can be observed during the financial crisis (see Appendix XII). Leverage ratio is seen as an influential factor of M&A decisions. When leverage was high in the third quarter of 2008, no M&A took place. Moreover, a higher level of leverage is recorded in 2009 than in 2007. Furthermore, company size also shows signs of the impact of the financial crisis. Low levels of change in firm size are recorded during the financial crisis (end 2008 and first quarter 2009), however right before the crisis in 2007 and shortly after (third quarter 2009) an increase in company size is observed (see Appendix XII).

5.2 European cluster

When looking at the results for the European companies, leverage is significant in most of the models run for the empirical analysis. Not all models can confirm the expectation that leverage is negatively correlated though. Those that show significance of leverage as independent variable suggest a rejection of hypothesis 1a, since leverage is positively correlated with M&A likelihood. This result reflects the former research of Tou et. al. (2010), but does not go along with Bruner's (1988) findings that companies are less leveraged before becoming active in M&A. Leverage being positively significant shows that companies in the European cluster are generally highly leveraged directly before pursuing M&A activities. The significance of leverage can also be observed when plotting the results in a graph (see Appendix VIII).

When looking at the specific time period of the financial crisis (see Appendix XIII), it can be observed that the leverage ratio of companies was significantly lower, which can be explained by the difficulty to obtain credit. The periods before and after the financial crisis indicate higher leverage ratios for the European companies, where M&A activity is also seen to be more frequent. It can be deduced that the leverage ratio under stable economic conditions shows the pattern of positive correlation with M&A likelihood.

The second independent variable, cash reserve, is only significant at high confidence levels in the pooled regression and the complementary log log models (14% and 11% confidence levels). This leads to the rejection of hypothesis 2a. It is negatively correlated with M&A likeli-

hood in almost all models. Only in the FE panel regression, which does not meet the expectations derived in chapter 3, is it positively correlated. This can be observed in a graph that summarizes the relationship between cash reserves and M&A likelihood as well (see Appendix IX). Economically, this could be explained because of European companies' transaction procedure during acquisitions: they often use share swaps or pay in shares. They do not have the extensive debt financing possibilities from their governments that are present in the Latin American cluster, which encourages payments in stocks (Maccio and Fasulis, 2004). Gelder's (2012) theory that companies in the oil and gas business tend to pay M&A in cash mainly, can therefore not be proved.

For the European cluster, the only variable that is significant in all regression models is the control variable company size (see Appendix XI). There is a strong link between company size and M&A likelihood. As expected, company size is positively correlated with M&A likelihood (see Table 5). This supports former research that found company size to be significantly correlated with M&A likelihood (e.g. Hagedoorn and Duysters, 2002), which has also been confirmed by primary sources (Gelders, 2012).

The other control variables are not significant in any of the models, which suggest that the companies' taken into consideration for the sample were not influenced by their country-specific economic variables included in this study.

For GDP, however, it can be observed that in times of negative GDP changes no M&A activity was present (see Appendix X). This pattern is not strong enough to show significance in the regression models though. The expected coefficient sign can be proved - it is positively correlated with M&A likelihood, which is economically relevant, since acquirer-country GDP is generally known to be at a high level when M&A activity is prevalent. The findings of former studies regarding this relationship can therefore be confirmed.

The commodity prices of oil and gas do not explain M&A likelihood in the regression models. Their coefficient signs are consistent throughout all of them; the oil commodity price is negatively and the gas commodity price is positively correlated with M&A likelihood. From an economic point of view, only the coefficient for the oil price is relevant. It is generally known that high commodity prices or a positive difference in commodity prices fuels M&A activity. As the variables do not show any significance, the reliability of the signs is questionable concerning the regression models used.

The exchange rate is positively correlated with M&A likelihood, although not significant. This, therefore, does not meet the expectations derived in chapter 3. When plotting the results, there is no pattern in exchange rate changes and M&A likelihood, which supports the insignificance of this variable in the regressions.

During the sample period, 80 M&A took place, of which 92% were acquisitions and 8% were mergers (see Figure 3). The frequency of mergers is low for the European cluster as well. It can, however, be seen that mergers are twice as frequent in the European cluster, which is most likely explained because of the European companies being privately held and having more experience in M&A.

5.3 Comparison

The European cluster and the Latin American cluster have some similarities and differences. One of their similarities is that the company size variable is significant in both complementary log-log regressions. The coefficient for that variable equals 0.91 (0.085) in the Latin American cluster and 0.5 (0.028) in the European cluster. Thus, the regression is supported by the study of Hagedoorn and Duysters (2002), who argue that larger companies are more likely to merge or acquirer a target than smaller companies.

A further similitude is in relation to the exchange rate variable, which has a high coefficient for both clusters (around 2) and is also always positive. This follows the study of Reed and Babool (2003), who demonstrate that the exchange rate has an elastic impact on M&A activity. In other words, with the appreciation of the local currency, acquirers are more likely to engage in M&A activity.

For both clusters the fixed effects model is the one with the highest log likelihood, which equals -133.75 in the Latin American cluster and -143.75 in the European cluster. Moreover, the Hausman test is also similar for the two clusters as its null hypothesis cannot be rejected in any one of them. In other words, none of the regressions for both clusters suffers from fixed effects.

However, the European and Latin American cluster are different as the leverage ratio's coefficient sign differs. The leverage ratio's coefficient is always negative in the Latin American cluster, whereas it is always positive for the European cluster, except in the FE regression where it also negative. The difference in the sign can explain that highly levered firms in Latin America will have more difficulties to merge with or acquire a target, while a highly levered firm in Europe will be more likely to follow M&A strategies to expand. Leverage ratio is

significant in all models at a maximum of a 5% confidence level for the Latin American cluster, but it is only significant in the pooled regression and the complementary log-log regression in the European cluster. This can be explained as leverage level has a larger influence in the Latin American cluster than in Europe. Tou's et. al. (2010) theory states that companies are usually highly levered before an acquisition, which seems to be true for the Latin American cluster, whereas it is not for the European cluster. However, because leverage ratio is negatively correlated with M&A activity Tou's et. al. theory does not hold for the Latin American cluster. Leverage ratio as explained in the literature review demonstrates the company's ability to obtain new credit, this also shows that it is easier for the Latin American companies to attain new credit lines compared to their European counterparts, therefore we do not reject hypotheses 1a and 1b.

Cash reserve is significant at an 11% confidence level in the logistic model in the European cluster, however this variable does not change any sign of significance even at 10% confidence level in the Latin American cluster. This means that hypothesis 2a is not rejected for the European cluster but it is for the Latin American one when choosing a slightly higher confidence level than 10%. At a small confidence level, hypothesis 2a would also be rejected for the European cluster. Hypothesis 2b is rejected, as cash is more explanatory in the European cluster than in the Latin American one.

Another difference can be seen in the negative coefficients. Commodity price of gas and leverage ratio are the two variables that obtain a negative coefficient for all models in the Latin American cluster. However, commodity price of oil and cash reserve are the variables that attain negative coefficient in the European cluster. The difference is explained as keeping cash is less important in Europe since M&A are mostly done by swapping shares, whereas most of the process in Latin America is handled with cash, which follow Rossi's and Volpin's (2003) theory.

The same correlation between commodity price of oil and commodity price of gas is recorded for both clusters (0.38). However, in the European cluster cash reserve is correlated with company size (0.22), whereas it does not have any interrelation in the Latin American cluster but commodity price of oil has interdependence with exchange rate (0.32) in that cluster but not in the European one. The variation in correlations is an explanation for the different results obtained for the European and Latin American cluster.

Summing up and referring to the main research and its sub-questions, it can be stated that there are in fact differences in the significance of the variables affecting M&A likelihood in the two clusters studied. Leverage ratio, company size, and to some extent cash reserve, are the variables that mostly influence M&A likelihood, whereas the control variables do not have a high significance in the models. Leverage differs in the level of significance; a higher significance can be shown for the Latin American cluster. It is also differently correlated with M&A likelihood - negatively in the Latin American cluster and positively in the European cluster. Finally, the variable cash reserve shows slight significance for the European cluster, whereas it is not significant at all for the Latin American cluster. The results are summarized in table 6.

Dependent variable	Independent variables	Control variables	Expected correlation	Observed correlation	Significant?
Likelihood of M&A activity	Leverage		-	- Latin American cluster; + European cluster	yes
	Cash reserves		+	+ Latin American cluster; - European cluster	no (only at 11% confidence level in the European cluster
		GDP	+	+	no
		Exchange rate	-	+	no
		Commodity price oil	+	+ Latin American cluster; - European cluster	no
		Commodity price gas	+	- Latin American cluster; + European cluster	no
		Company size	+	+	yes

Table 6: Results for coefficient signs and significances

6. Conclusion and future research suggestions

This study looks at how firm-specific and macro-economic variables influence M&A likelihood in two cultural clusters. The oil and gas industry is used to illustrate differences for specific Latin American and European companies within their macro-economic environments. As the demand for energy will keep increasing due to population growth and industrialization of developing countries, it is interesting to study what affects M&A decisions in that particular industry.

Cultural aspects as well as government actions are different in these two areas and one can expect to see a contrast in the variables affecting M&A likelihood, as the way of doing business differs too. The European cluster is determined to be a more regulated, and transparent cluster, whereas the Latin American cluster suffers from corruption and a lack of clear regulations. Even though the two clusters are linked as they are united by a supra "government" - the European Union in Europe and MERCOSUR in Latin America - the two clusters are different as they are not at the same level of development.

With the use of logistic regression models, a comparison of the significance of the variables and the coefficient signs is made for the two clusters. The models are not fully reliable due to the fact that most of the control variables (GDP, exchange rate, and commodity price) are not affecting M&A likelihood. However, consistent results can be seen for leverage, company size and cash reserve. Therefore, the models are assumed to be interpretable.

In this study it is shown that the European and the Latin American regression results are in fact not similar in all points. Leverage ratio is the most significant variable in the Latin American cluster, which is negatively correlated with M&A activity. On the other hand, leverage is less significant in Europe and even positively correlated with the dependent variable. Tou's et. al. (2010) and Uysal's (2010) findings that companies are usually highly leveraged before an acquisition, can only be confirmed for the European cluster. Contrarily, for the Latin American cluster, Bruner's (1988) findings could be repeated, since a positive correlation is found.

Cash reserve also differs from one to the other cluster. This variable is shown to be significant at an 11% confidence level in the European cluster, but not in the Latin American cluster. These findings do not support Jensen's free cash flow hypothesis, but rather a study on the payment method of European companies with stocks (Maccio and Fasulis, 2004), since cash reserve is negatively correlated with M&A likelihood in the European cluster.

Company size is the variable that is consistent. Firm size is positively correlated and significant in both clusters. Former research that found company size to be significantly correlated with M&A likelihood can thus be supported (e.g. Hagedoorn and Duysters, 2002).

GDP per capita, exchange rate, and commodity prices are the control variables and they do not affect M&A activity significantly. Previous research (e.g. di Giovanni, 2003) found these variables to be significant, but these results cannot be confirmed for the cluster choice in the present study.

The time-frame of the thesis has tremendously affected the number of variables chosen for the regressions and limited the sample size, as more time is needed to obtain more information from NOCs in the Latin American cluster. This also affected the choice and the number of variables studied, which could be more numerous in future studies, e.g. including stock price or market-to-book ratios. Some variables have not been studied due to a lack of availability of data, which has influenced the exclusion of interest rates, for example.

A future research suggestion would be to enlarge the sample in order to get more reliable results in the regression models. It has to be considered though that the industry restrictions (oil and gas and the requirement to be active in E&P) would have to be relaxed. In order not to lose the consistency benefits of these restrictions, one may want to study NOCs that are in the E&P sector and compare them to the Majors on a worldwide scale. This would enable the researcher to keep a comparable base and at the same time enlarge the sample data, as many NOCs are present in the Middle East region, and Majors are present in most capitalist countries.

With a bigger sample, it would be possible to look at different periods of time for the M&A observations. That way the sensitivity to the variables could be studied even more in depth, in order to see whether the macro-economic control variables will become more significant and explanatory in the regressions.

It might be of interest to study how companies in two cultural clusters choose targets and if a variation can be seen there as well. This makes it necessary to change the regression model, since a logistic regression is not suitable for acquirer-target analyses, unless a high amount of data can be simulated appropriately. With a different model, differences in tax rates could be looked at, as well as differences in GDP, regulations and country risk, for example.

The choice of cultural clusters and a classification of countries stay a somewhat subjective matter. Within a bigger time-frame, more studies on how to group countries and companies could be considered to support a specific cluster choice.

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Gelder, Alan, Head of Oil Research at Wood Mackenzie [interview] held May 21, 2012

Teodorczuk , Anthony, Process Engineer at SMB [interview] held May 13, 2012

Matijasevich, Marcos, Production Unit Manager at ESSAR UK Ltd [interview] held April 28, 2012

Appendix I: Hofstede scores for the cultural clusters

Latin American cluster

	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long-term Orientation
Argentina	49	46	56	86	-
Brazil	69	38	49	76	65
Chile	63	23	28	86	-
Colombia	67	13	64	80	-
Ecuador	68	8	63	67	-
Mexico	61	30	69	82	-
Peru	64	16	42	87	-
Venezuela	81	12	73	76	-
var	80	185	228	47	-
range	32	38	45	20	0
average	65	23	56	80	65

European cluster

	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long-term Orientation
Austria	11	55	79	70	31
Switzerland	34	68	70	58	40
Netherlands	38	80	14	53	44
Germany	35	67	66	65	31
Finland	33	63	26	59	41
Sweden	31	71	5	29	20
Denmark	18	74	16	23	46
Norway	31	69	8	50	44
UK	35	89	66	35	25
var	81	95	932	271	87
range	27	34	74	47	21
average	30	71	39	49	36

Appendix II: Hausmann tests

Latin American cluster

	Coefficients (b) FEla	(B) REla	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Exchangerate	2.33	2.005765	.3242346	.2723008
GDP	.1871337	.4103666	-.2232329	.1108619
CPOil	.6593674	.5738526	.0855147	.0669949
CPGas	-.3433004	-.3159119	-.0273884	.
Leverage	-.7073469	-.4004987	-.3068482	.3089021
Cashreserve	-.7313054	.2503096	-.9816151	1.922281
Companysize	1.750661	1.081484	.6691764	1.282721

b = consistent under Ho and Ha; obtained from xtlogit
B = inconsistent under Ha, efficient under Ho; obtained from xtlogit

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 1.87
Prob>chi2 = 0.9666
(V_b-V_B is not positive definite)

European cluster

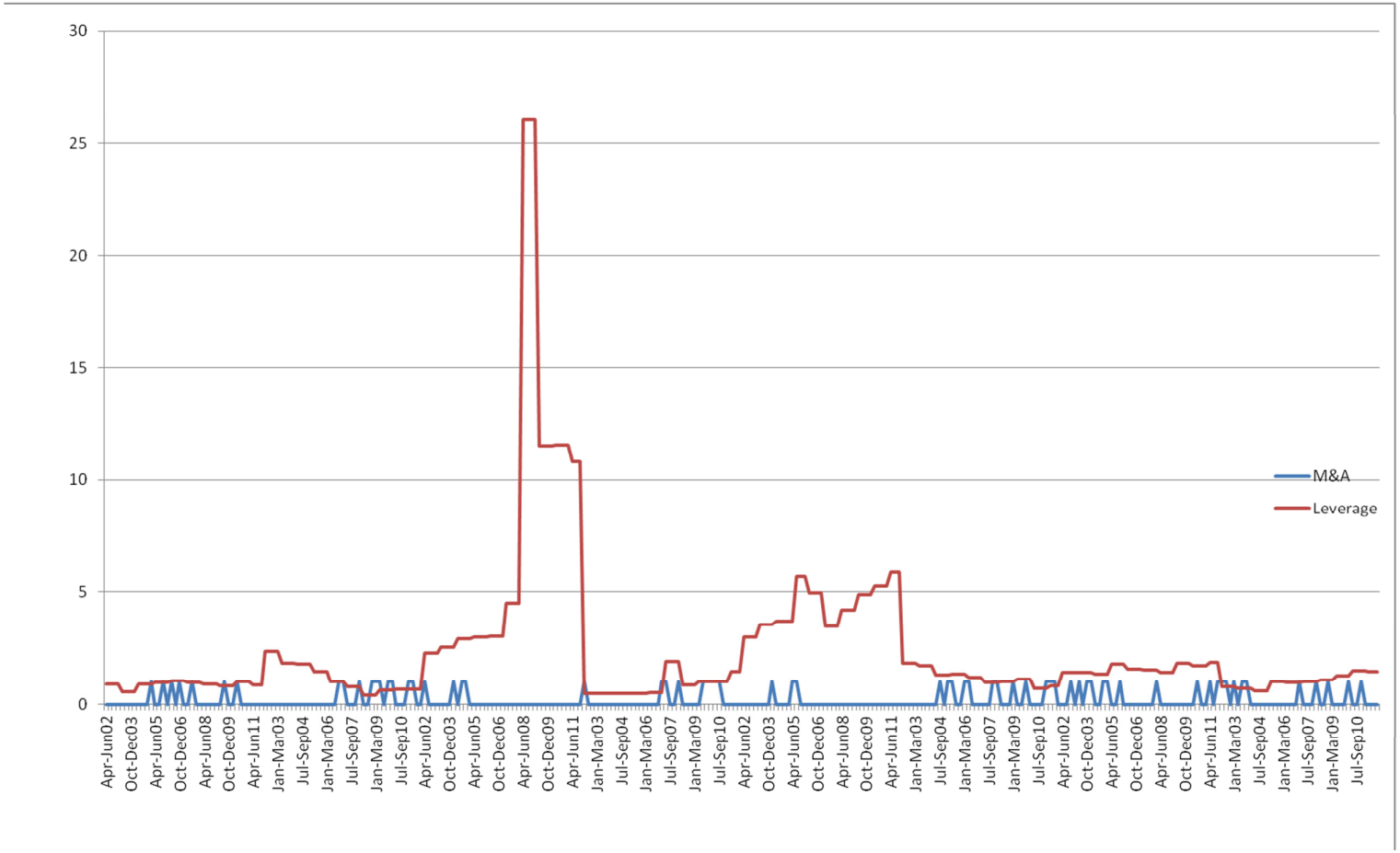
	Coefficients (b) FEeurope	(B) REeurope	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Exchangerate	.8534054	1.336686	-.4832804	.7766832
GDP	.3846745	.4965489	-.1118744	.3244475
CPOil	-.5331353	-.4627393	-.070396	.1428444
CPGas	.2067183	.2084165	-.0016982	.0853394
Leverage	-.1877068	.0384846	-.2261914	.1291845
Cashreserve	.0516113	-.25749	.3091013	.0778887
Companysize	.9058902	.7693868	.1365034	.1321307

b = consistent under Ho and Ha; obtained from xtlogit
B = inconsistent under Ha, efficient under Ho; obtained from xtlogit

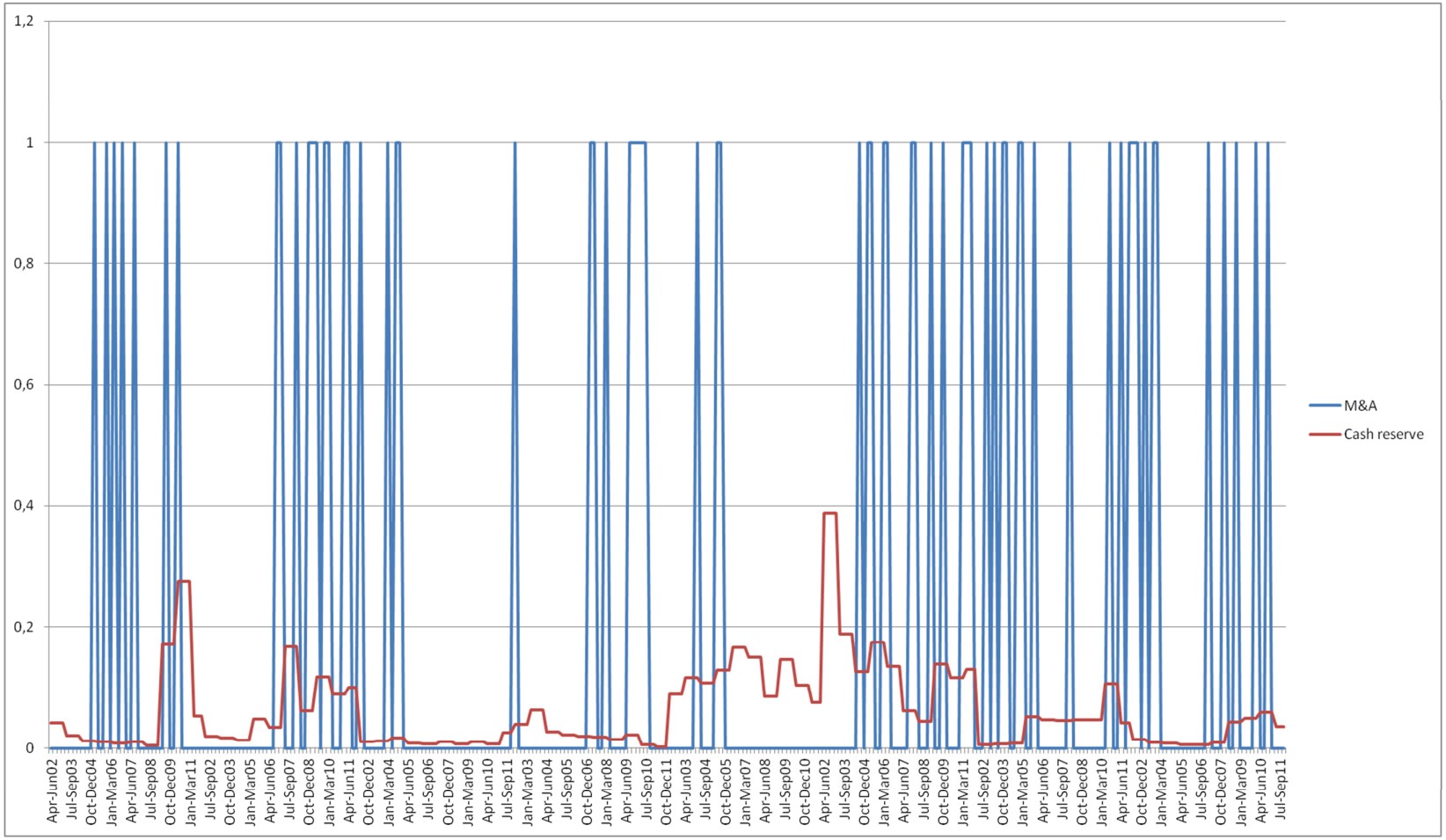
Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 7.54
Prob>chi2 = 0.3745
(V_b-V_B is not positive definite)

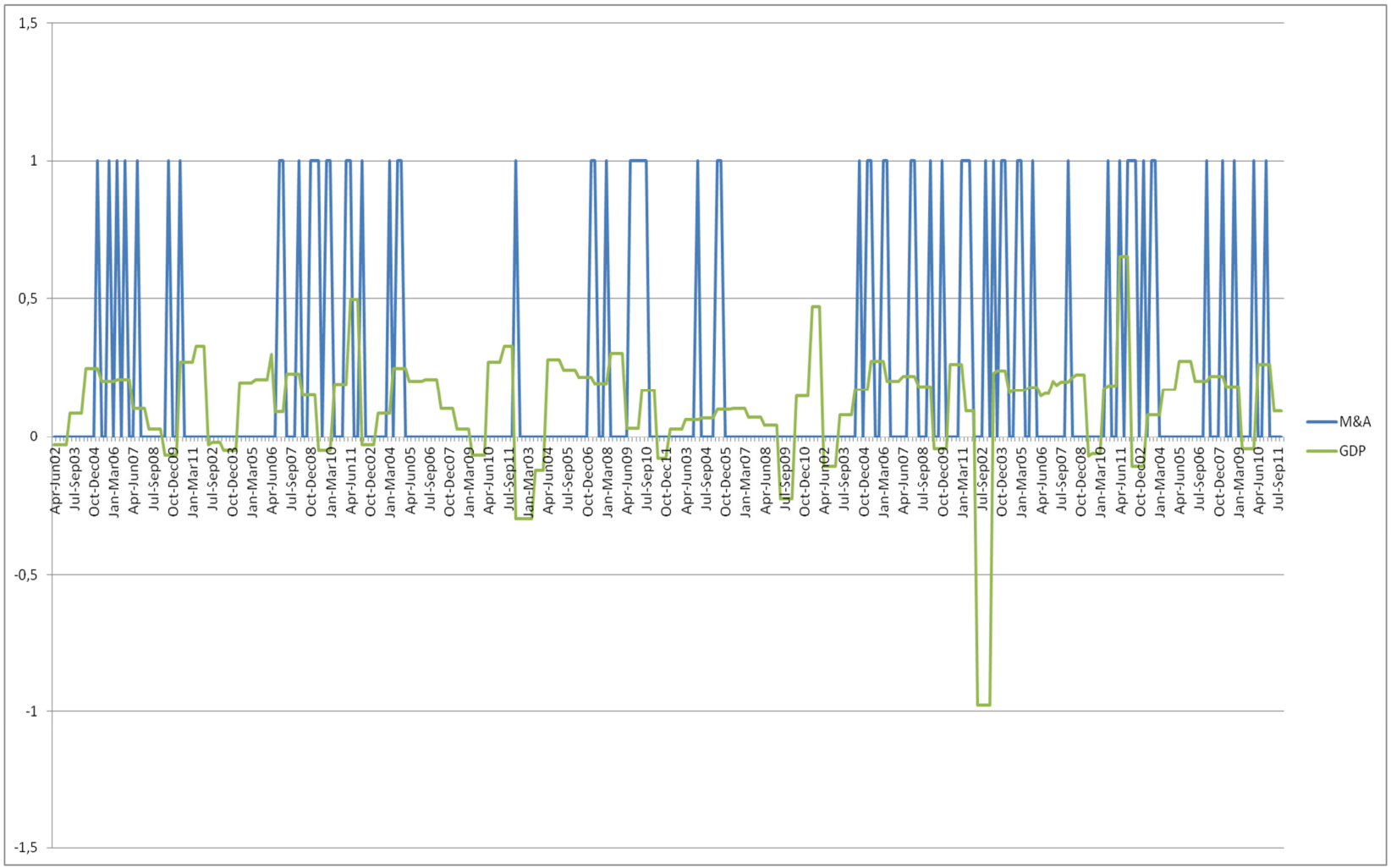
Appendix III: Relationship leverage - M&A likelihood (Latin American cluster)



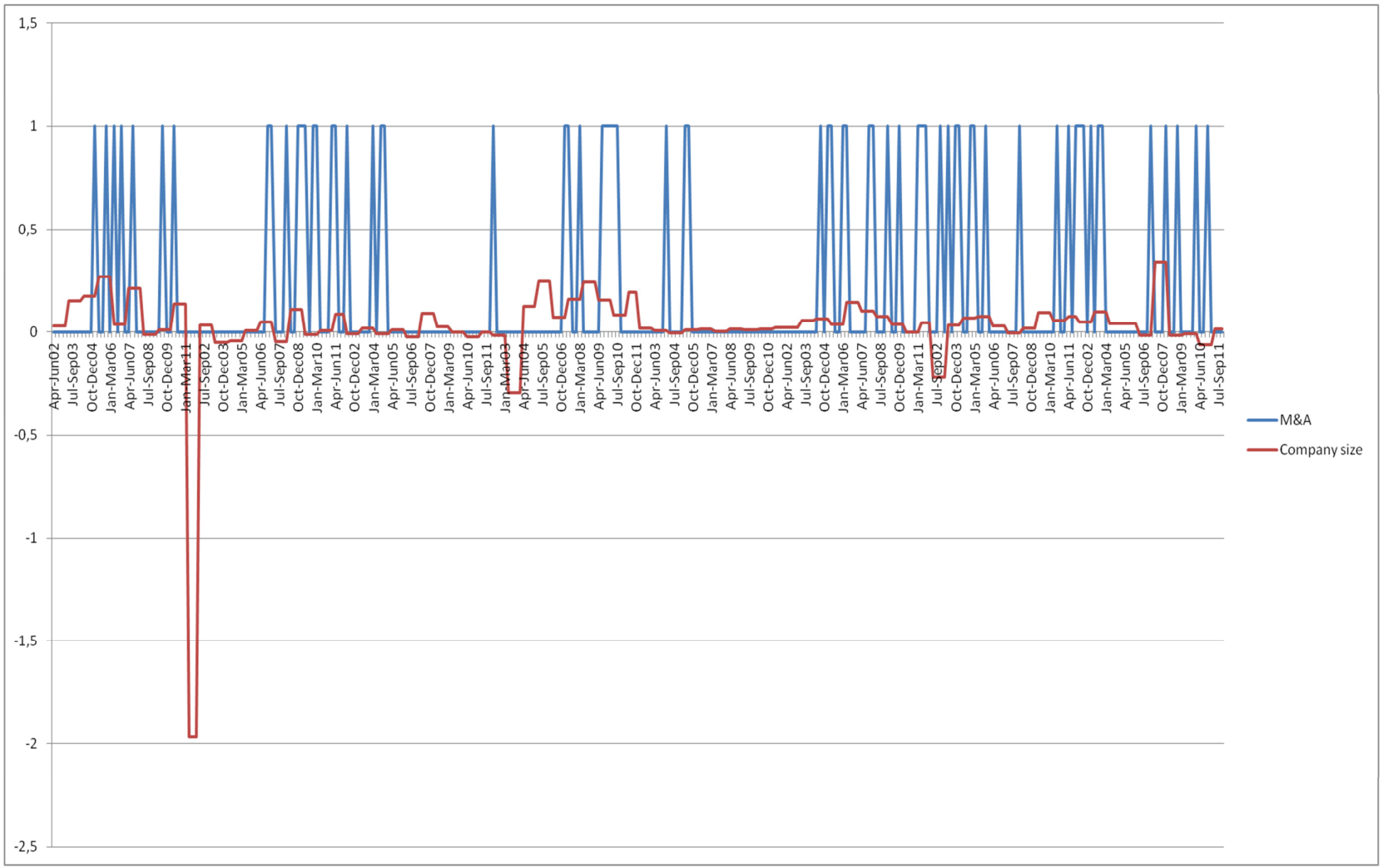
Appendix IV: Relationship cash reserve - M&A likelihood (Latin American cluster)



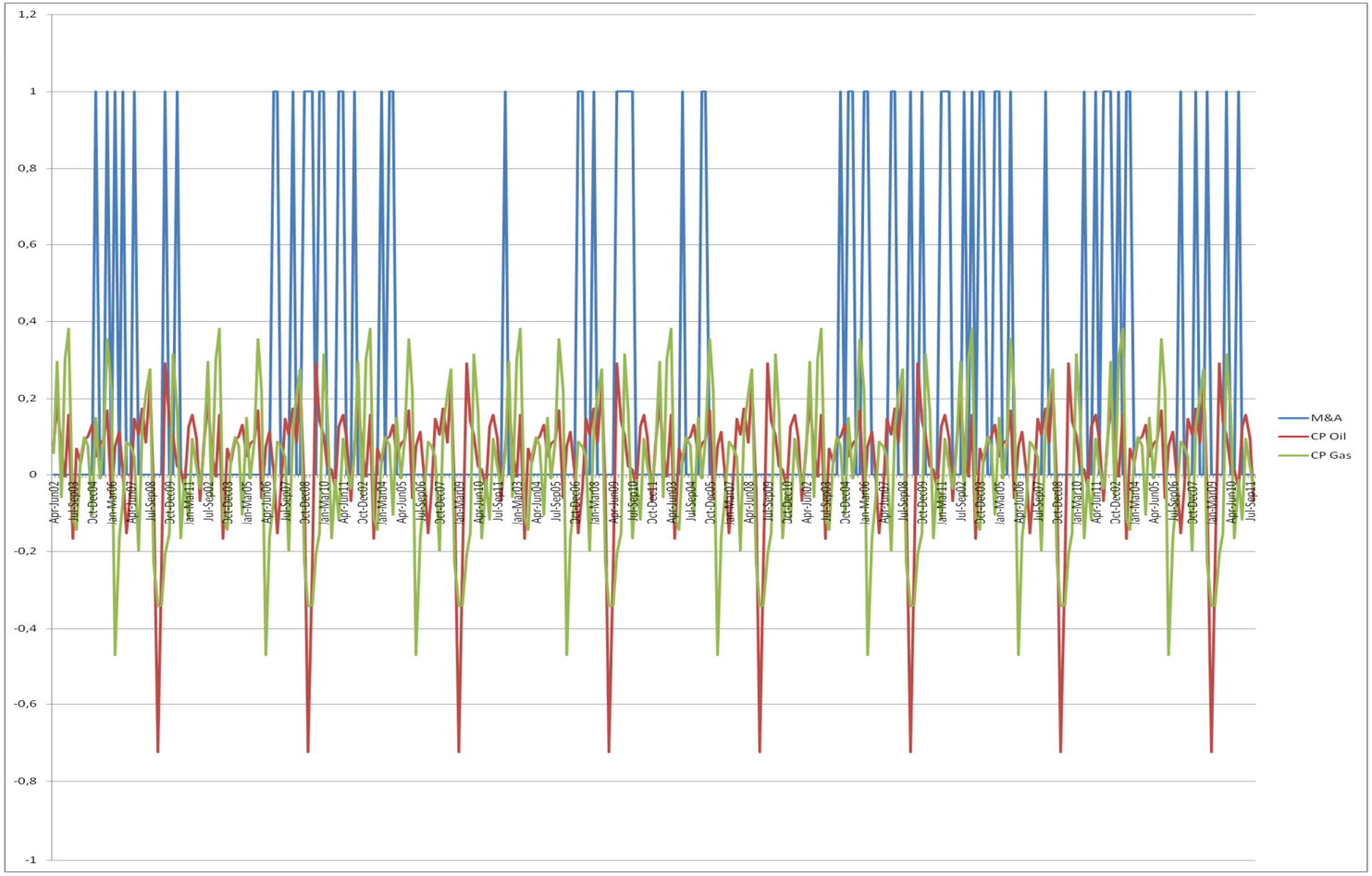
Appendix V: Relationship GDP - M&A likelihood (Latin American cluster)



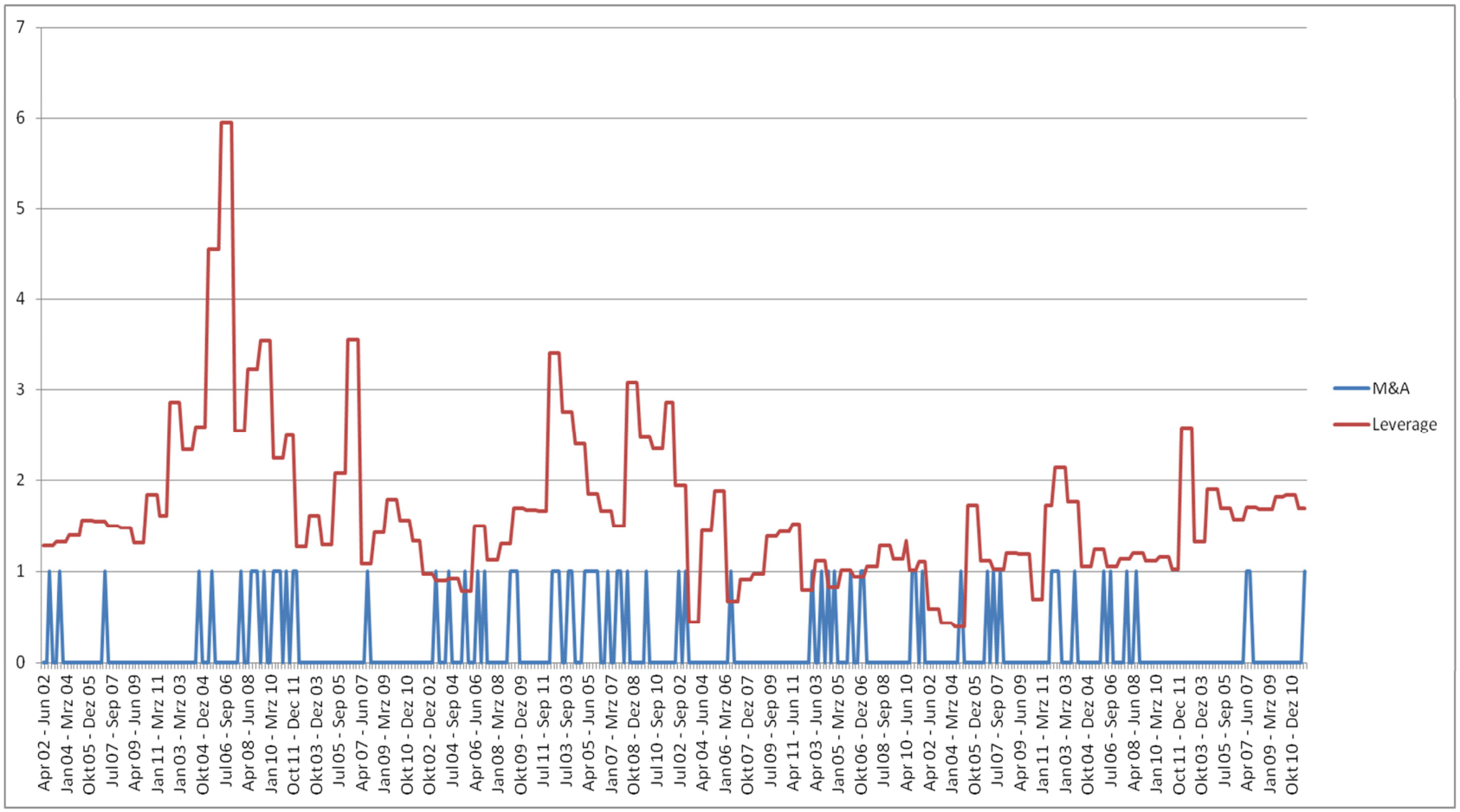
Appendix VI: Relationship company size - M&A likelihood (Latin American cluster)



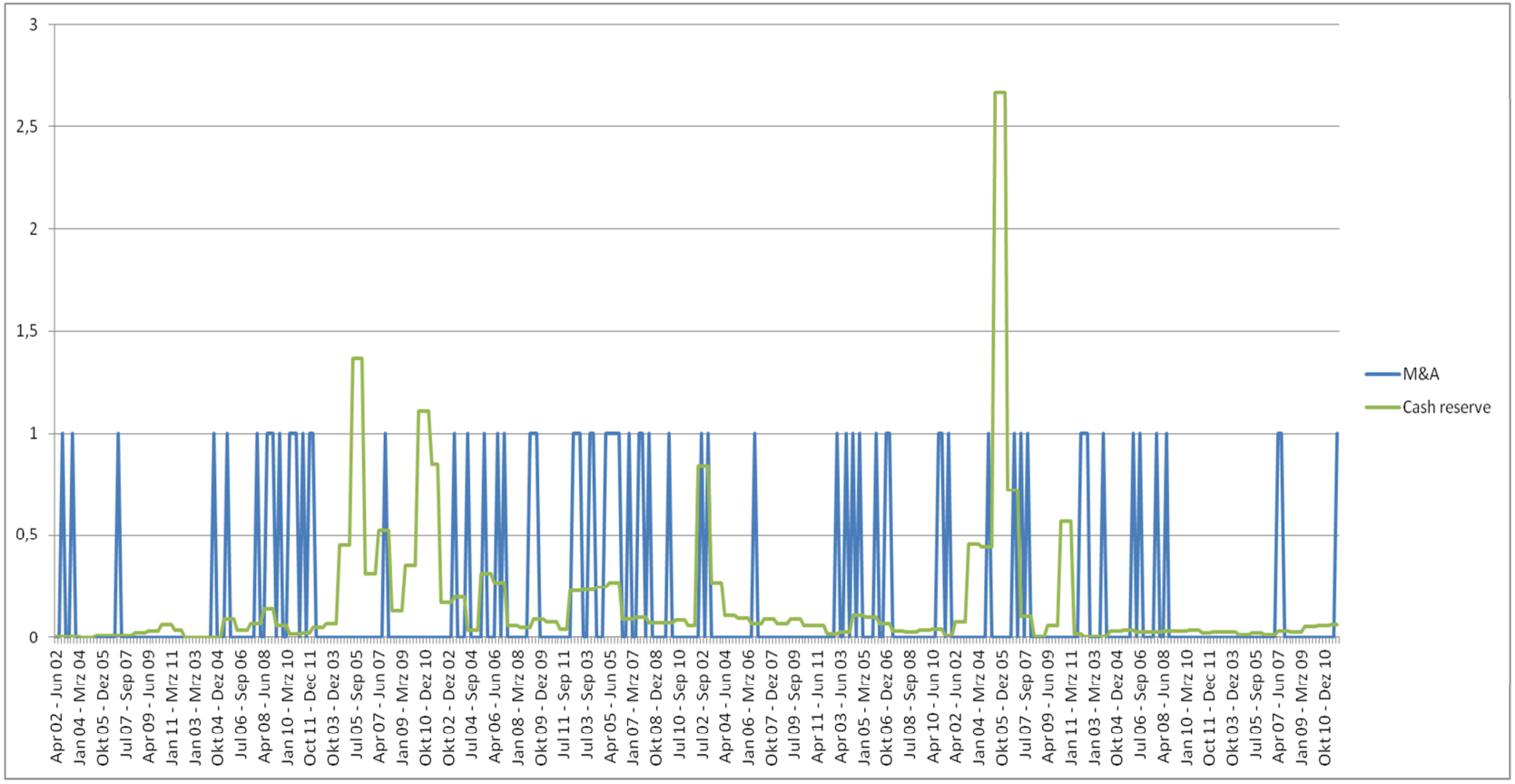
Appendix VII: Relationship commodity prices - M&A likelihood (Latin American cluster)



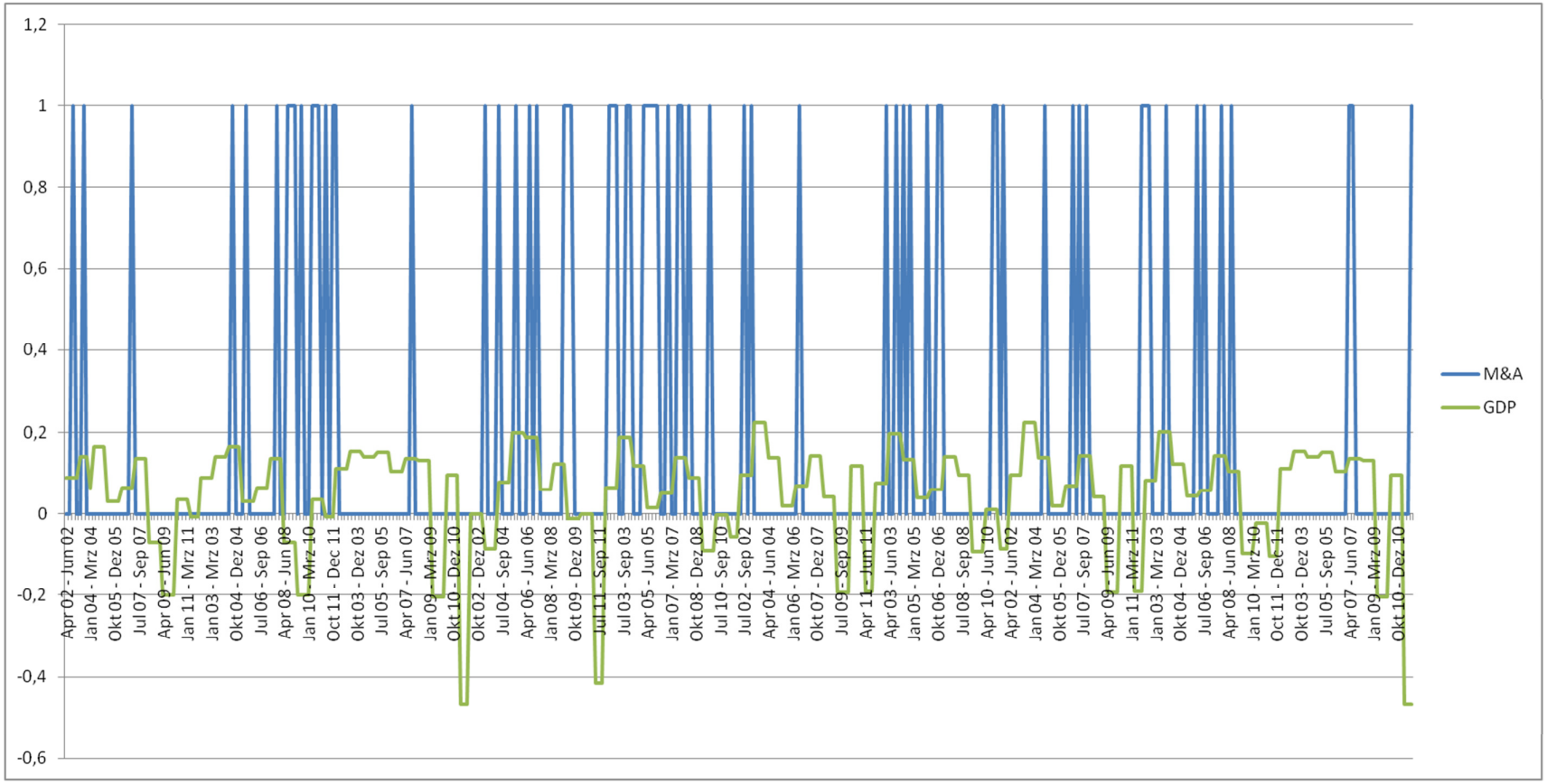
Appendix VIII: Relationship leverage - M&A likelihood (European cluster)



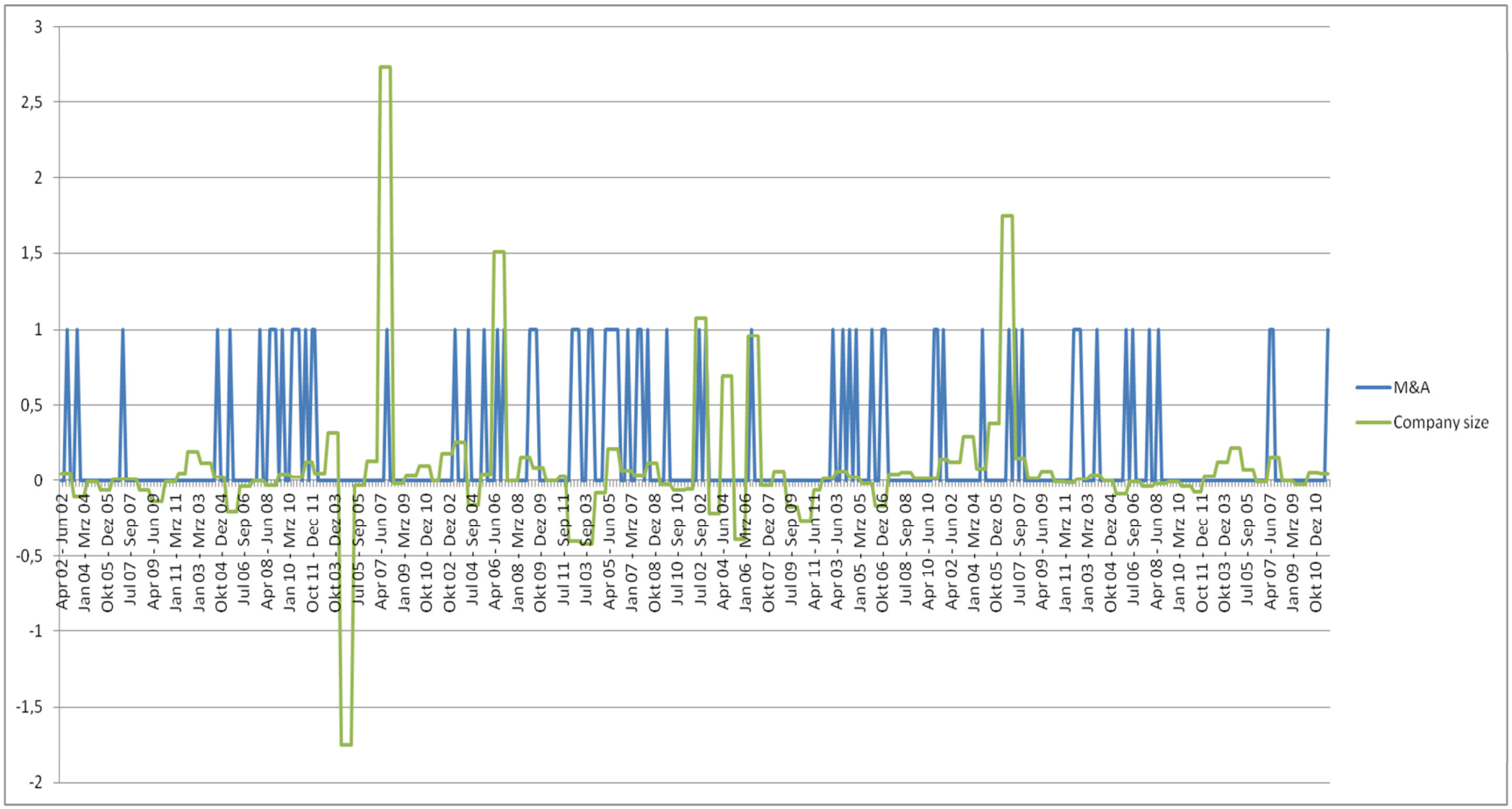
Appendix IX: Relationship Cash reserve - M&A likelihood (European cluster)



Appendix X: Relationship GDP - M&A likelihood (European cluster)

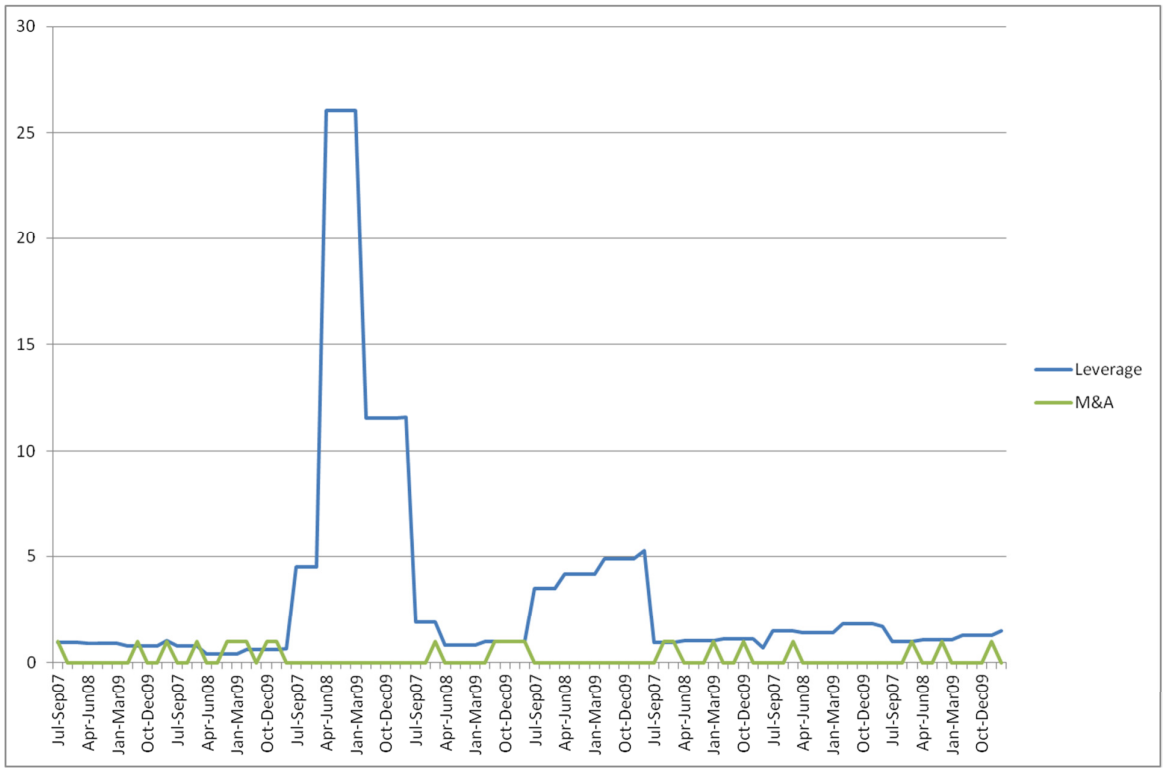


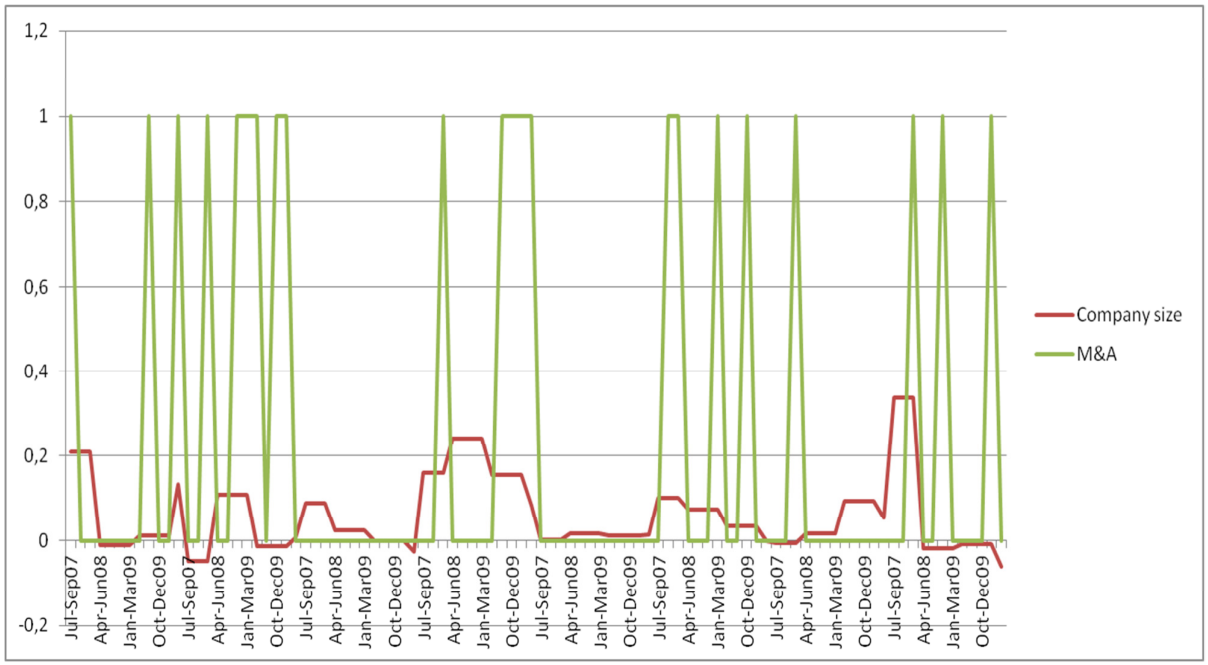
Appendix XI: Relationship company size - M&A likelihood (European cluster)



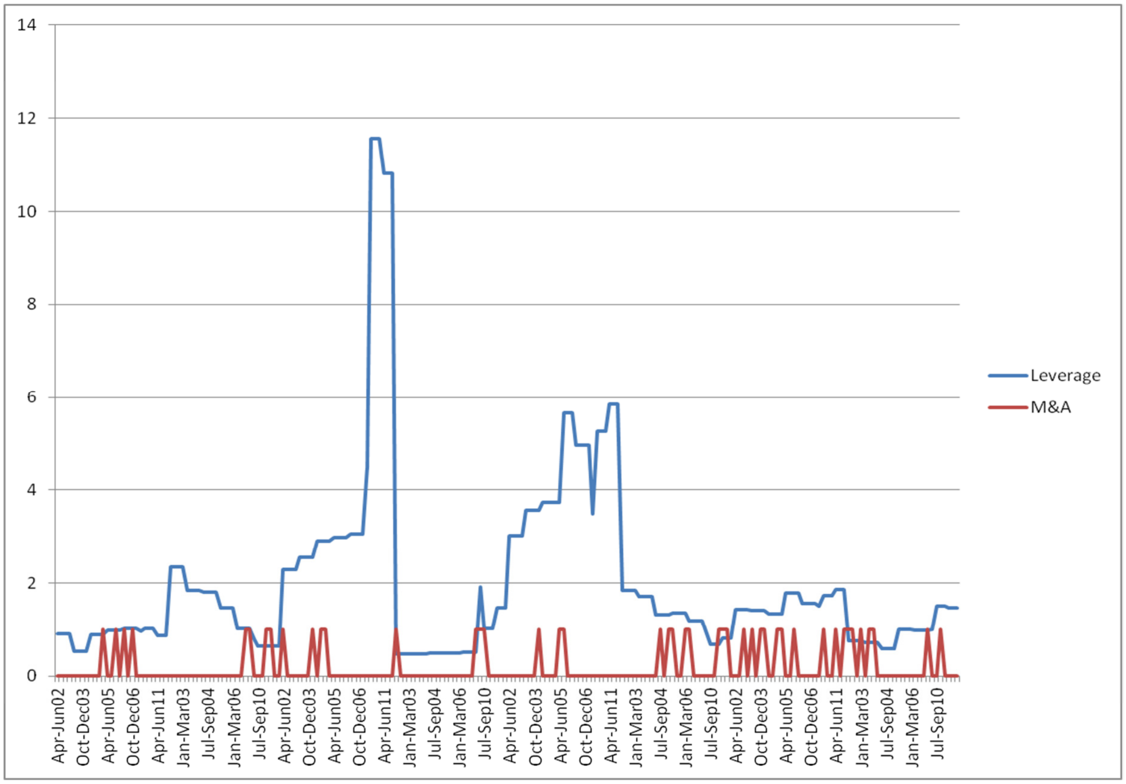
Appendix XII: Additional graphs Latin American cluster

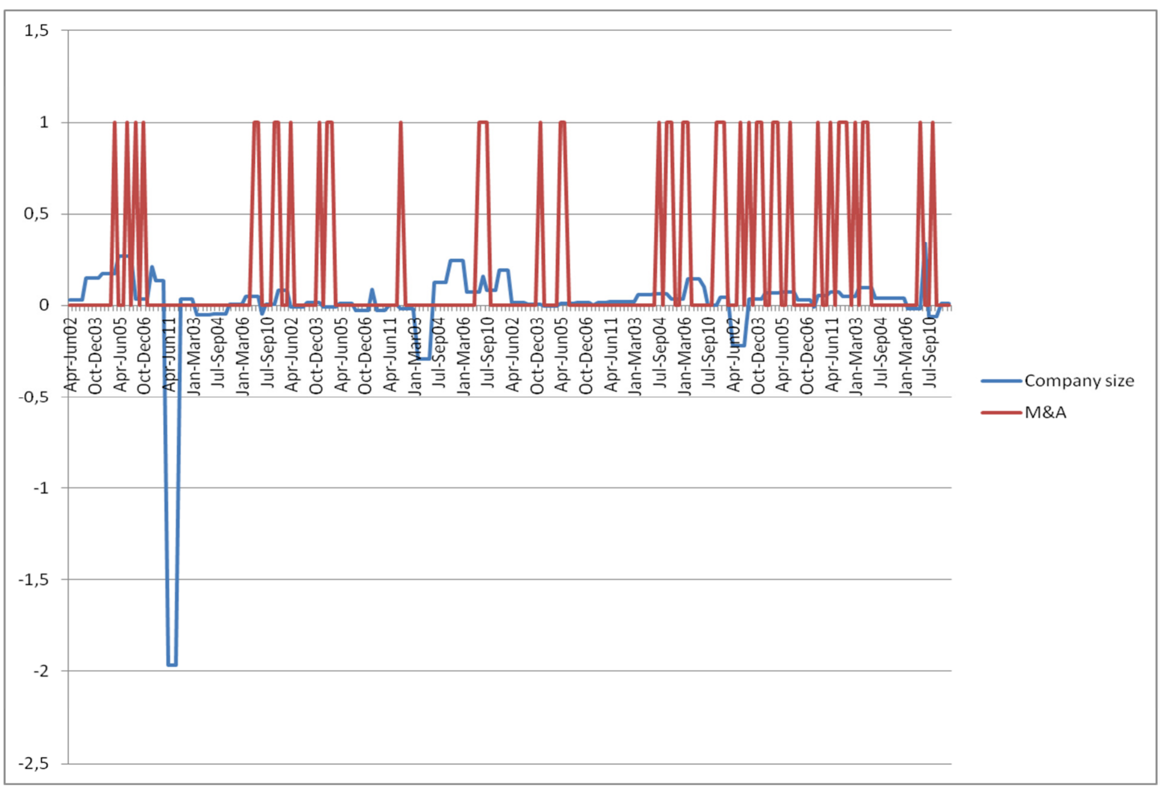
Latin American cluster during the financial crisis





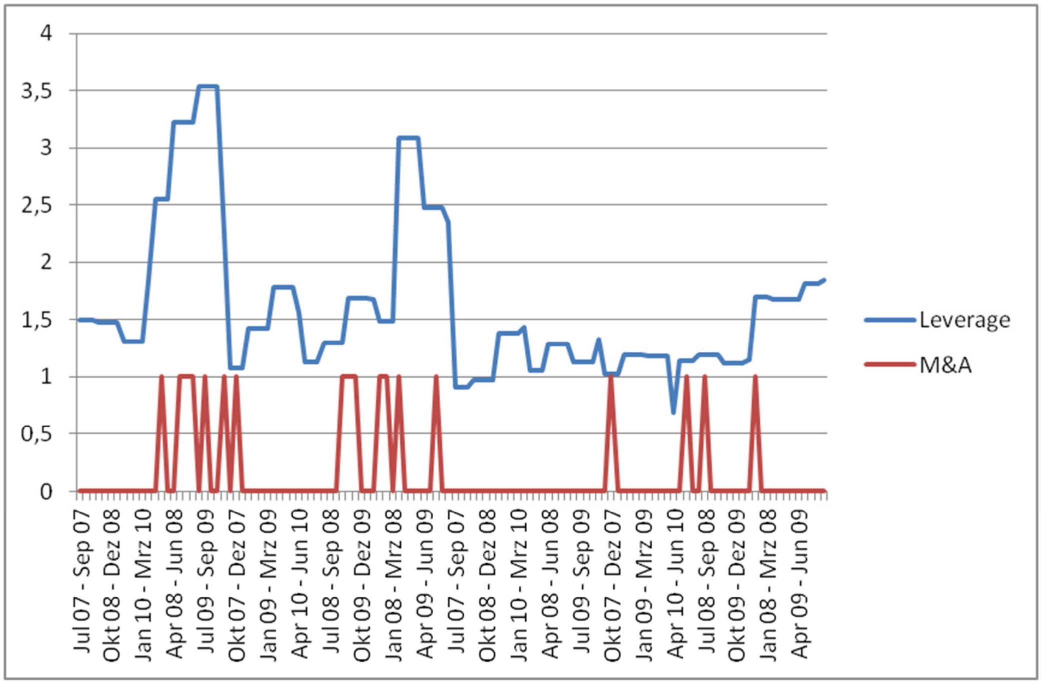
Latin American cluster excluding the financial crisis





Appendix XIII: Additional graphs European cluster

European cluster during the financial crisis



European cluster excluding the financial crisis