

EC331 Research in Applied Economics

The effect of the business cycle on intra-industry merger activity

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Abstract

This paper presents an empirical study of horizontal mergers and acquisitions in the European Union over the period 1996 – 2012 and examines how well the macroeconomic model predicts both the volume and value of mergers in different industries. The results are consistent with the prediction that the business cycle affects mergers in different sectors in distinct ways: macroeconomic variables have strong explanatory power in the *High Technology sector* and a relatively weak influence on mergers in the *Retail* and *Energy & Power* sectors. Furthermore, the study supports the conjecture that mergers in certain industries occur in merger waves and clearly exhibit merger shocks in response to changes in the economic environment.

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1. Introduction

Historically there has been a continuing interest among economists in the study of mergers and acquisitions with the goal to identify the causes of merger activity. It has recently been acknowledged that industry-specific factors play a major role in determining merger behaviour, such as changes in the regulatory environment (deregulation) and industry concentration. *Industry shocks* seem to trigger merger waves (Mitchell and Mulherin 1996), implying a positive relationship between the number of mergers in an industry and the magnitude of the industry shocks immediately preceding mergers (Andrade and Stafford 2004; Harford 2005).

At the same time, mergers and acquisitions are perceived as an investment by firms, where the decisions to merge seem to be driven by the companies' aim to gain potential economies of scale (Lambrecht 2004). Since economies of scale tend to increase during periods of rising demand, mergers are directly related to the business cycle and are believed to be "pro-cyclical" – rise following expansionary periods of economic activity and fall following contractions in the economy.

The aim of this study is to analyze merger activity within each industry during the past 17 years (1996-2012) and draw a conclusion on how macroeconomic factors and the business cycle influence the volume and value of mergers and acquisitions. The area examined is the European Union (27 countries) since past research has mainly focused on US corporate mergers (Becketti 1986). The main contribution of my research is the alternative approach to evaluating mergers: in the past empirical analysis has been conducted on *aggregate mergers*, and only recently have Komlenovic et al. (2011) been the first to recognize and control for industry effects when modeling mergers. This has been achieved through splitting mergers by sector and conducting econometric analysis on panel data. My method involves running the macro-economic model introduced by Becketti (1986) on each industry separately, which will enable me to directly account for industry differences and conclude how the business cycle affects merger activity in each sector.

The paper is structured as follows. The next section provides an overview of past literature and how mergers and acquisitions have been modeled in different ways in order to conduct empirical analysis. Section three describes the data collected presenting some

preliminary statistics. Section four gives an outline of the methodology and model used. Section five presents the results and a discussion of the empirical findings. Section six concludes the paper, suggesting extensions for future research.

2.Literature Review

Past literature has focused on analyzing which factors have the most significant impact on *aggregate* mergers and acquisitions. Early empirical studies have looked at capital market and macroeconomic conditions - using the stock market price level as a proxy of the market's confidence about the future of the economy, and gross domestic product (GDP) and gross national product (GNP) as proxies of the business cycle - as the major determinants of aggregate mergers (Melicher et al 1983; Becketti 1986). Subsequently, research has examined mergers from an industry-level or firm-level perspective. Two main theories have been proposed to reflect the factors that affect industrial merger activity – the neo-classical theory and the behavioural theory.

i. Neo-classical Theory

This theory suggests that merger activity is triggered by industry-specific shocks that cause firms in an industry to restructure. Factors such as economic disturbances and technological change were the first ones to be identified to affect mergers (Gort 1969). Mitchell and Mulherin (1996) suggest that financing innovations (measured by R&D/sales) as well as regulation are negatively and significantly related to merger activity. Furthermore, Andrade and Stafford (2002) find that variables such as industry concentration, free cash flow and capacity utilization are important in determining merger waves in certain industries. Harford (2005) summarized the industry-related (economic) shocks in his work: cash flow margin on sale (net income on sale), asset turnover, research and development, capital expenditure, employee growth, return on asset (ROA) and sales growth are variables reflecting industry changes.

ii. Behavioural Theory

This theory suggests that mergers are driven by stock market misvaluation and that overvalued firms, taking advantage of mispricing, will tend to buy (acquire) assets or stocks of less overvalued or even undervalued firms during periods of high market valuation. Rhodes-Kropf and Viswanthan (2004) argue that acquirers overestimate the targets' value (and synergy) in times

when the market generally is overvalued and underestimate it when the market is undervalued. The book-to-market (B/M) ratio of all firms in an industry can be used as a proxy to test the behavioural theory.

The **business cycle effect** on corporate merger activity has been discussed by Becketti (1986), Lambrecht (2004) and Komlenovic et al. (2011) who argue that mergers are pro-cyclical, implying that they increase following economic “booms” and decrease in response to recessions. My research will look at the business cycle effect from an industry-level perspective since merger activity is influenced by industry-specific characteristics outlined in the neo-classical theory. Therefore, macroeconomic effects should vary across industries depending on their sensitivity to the business cycle.

It’s also worthwhile mentioning that whereas a number of theories have been proposed attempting to identify factors that influence fluctuations in mergers, empirical studies conducted in the past (mainly on US corporate mergers) have failed to develop one particular theory that predicts merger activity. Firstly, the dominance of factors affecting mergers depend on the period analyzed (Benzing 1991). Secondly, in empirical studies industry shocks are grouped into one variable to account for all industry-specific factors, and those prove to be significant in driving industry merger waves (Harford 2005). However, it’s still unclear which industry factors specifically explain mergers.

Finally, in my point of view, limitations arise from analyzing only aggregate mergers and not attempting to model mergers separately by sector. To expand on this, my analysis will provide useful insights into how the macroeconomic model explains intra-industry (related or horizontal) merger activity in each sector, and will enable to conclude which industry is most affected by capital market and economic conditions.

3.Data Analysis

Data

To analyze the impact of the business cycle on intra-industry merger activity, a dataset on mergers and acquisitions for the period 1996-2012 has been compiled using the *Thomson One Banker Database*. The data includes only *horizontal* (intra-industry) mergers meaning that the target and the acquiring firms are within the same macroeconomic sector. The above database uses a macro-level industry classification based on SIC¹, NAIC² and overall company business description. Below are the 12 macro-level industries:³

- Consumer Products and Services
- Consumer Staples
- High Technology
- Industrials
- Real Estate
- Retail
- Media and Entertainment
- Telecommunications
- Energy and Power
- Healthcare
- Financials
- Materials

The geographic area examined in the paper is the European Union, including 27 countries.⁴ It's also worth mentioning that only *completed* mergers and acquisitions are included in the analysis, sorted by their effective dates (dates when deals were declared complete). The time period investigated is 1996Q1 – 2012Q3, implying 67 consecutive quarters.

Other data sources include *Datastream* providing data on interest rates reported monthly by the *European Central Bank* (EMU Government Bond Yield – 10 Year), the Standard & Poors Europe 350 Stock (Equity) Index reported monthly and the Capacity Utilization Rate for the EU 27 countries reported quarterly. Finally, *Eurostat* provided Gross Domestic Product (GDP) Growth data for the EU 27 countries reported on a quarterly basis. Appendix 1 provides detailed descriptions of variables and macro-industries.

¹ Standard Industry Classification

² North American Industry Classification

³ The thirteenth sector (Government and Agencies) has been excluded from the analysis since only one merger occurred during the entire period.

⁴ EU 27 countries are Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Ireland, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Spain, Slovakia, Slovenia, Sweden and United Kingdom.

Preliminary Overview

This section presents some preliminary statistics. Table 1 provides summary statistics for each industry in terms of both the total number and aggregate value of mergers per quarter, showing that sectors do indeed vary in merger activity. On average, the *Telecommunications* and *Energy and Power* industries clearly have the highest total merger deal values per quarter with the highest variation⁵ from all sectors, whereas the *Healthcare* and *Consumer Goods and Services* industries have the lowest total merger deal values.

Table 1. Summary Statistics of Mergers⁶

| Variable | Mean | Std. Dev. | Min | Max |
|---|------------------|------------------|----------|------------|
| Total Merger Value | 38,990.83 | 36,280.02 | 9,811.52 | 259,612.70 |
| Industrials Merger Value | 4,135.20 | 4,365.01 | 321.49 | 23,596.20 |
| Consumer Products and Services Merger Value | 441.77 | 406.26 | 66.25 | 2,012.94 |
| Consumer Staples Merger Value | 1,085.34 | 689.60 | 16.28 | 3,369.14 |
| Energy and Power Merger Value | 11,983.10 | 17,329.98 | 358.41 | 96,424.69 |
| Financials Merger Value | 5,439.01 | 2,325.06 | 1,364.88 | 14,846.57 |
| Healthcare Merger Value | 440.27 | 403.63 | 4.27 | 1,588.84 |
| High Technology Merger Value | 607.99 | 626.77 | 53.36 | 3,288.80 |
| Media and Entertainment Merger Value | 1,336.30 | 997.05 | 185.92 | 4,288.79 |
| Materials Merger Value | 1,035.89 | 717.81 | 35.18 | 2,944.12 |
| Real Estate Merger Value | 1,610.21 | 1,233.71 | 68.78 | 7,500.72 |
| Retail Merger Value | 620.71 | 537.60 | 13.49 | 2,391.07 |
| Telecommunications Merger Value | 10,255.04 | 27,709.20 | 0.00 | 214,995.50 |
| Total Number of Mergers | 255.04 | 74.82 | 121 | 438 |
| Industrials Merger Number | 30.34 | 11.75 | 7 | 56 |
| Consumer Products and Services Merger Number | 20.00 | 7.46 | 8 | 38 |
| Consumer Staples Merger Number | 18.34 | 8.13 | 4 | 36 |
| Energy and Power Merger Number | 16.61 | 6.03 | 7 | 33 |
| Financials Merger Number | 50.43 | 13.00 | 24 | 93 |
| Healthcare Merger Number | 10.79 | 4.74 | 2 | 21 |
| High Technology Merger Number | 28.40 | 15.58 | 9 | 92 |
| Media and Entertainment Merger Number | 25.67 | 11.14 | 7 | 54 |
| Materials Merger Number | 15.84 | 7.73 | 3 | 38 |
| Real Estate Merger Number | 19.82 | 11.85 | 5 | 48 |
| Retail Merger Number | 12.22 | 5.74 | 2 | 30 |
| Telecommunications Merger Number | 6.57 | 3.61 | 0 | 17 |
| Average Merger Value | 150.70 | 102.42 | 43.80 | 594.08 |

Furthermore, the *Telecommunications* industry, while having the greatest deal values, has the lowest number of mergers (6.57 per quarter) with relatively high variation. The *Financials* sector has by far the highest number of mergers per quarter (50.43) while exhibiting the lowest

⁵To compare variation across sectors with different means, the *coefficient of variation* (Std. Dev./Mean) is used.

⁶Merger values (deal values) are reported in millions of dollars. There are 67 observations for each variable, since the time period consists of 67 consecutive quarters.

variation in both total merger value (coefficient of variation equal to 0.427) and total number of mergers (coefficient of variation is 0.258), implying stability in merger activity across time. The *Real Estate* sector exhibits the highest variation in the number of mergers (coefficient of variation is 0.598). Appendix 2 provides further summary statistics along with graphs of explanatory variables chosen to reflect capital market and market conditions in the EU, as well as the correlation matrices between independent variables and the two sets of dependant variables (*value and number of mergers*).

An initial overview of the link between economic growth and both the total number and aggregate value of mergers over the period 1996-2012 is presented in Figure 1. The EU Recession Periods indicate periods of negative GDP growth. The Global Recession reflects the crisis in the early 2000s, when the Dotcom bubble burst. In terms of mergers, there is indeed evidence that the number of mergers is pro-cyclical, since during each recession the number of mergers was clearly falling. As for the value of mergers, the relation to the business cycle seems unclear. Deal values appear to fluctuate a lot during such periods, with the first two recessions showing an initial increase in the value of mergers followed by a sharp fall. However, during the current recession the value of mergers is actually rising after a slight trough.

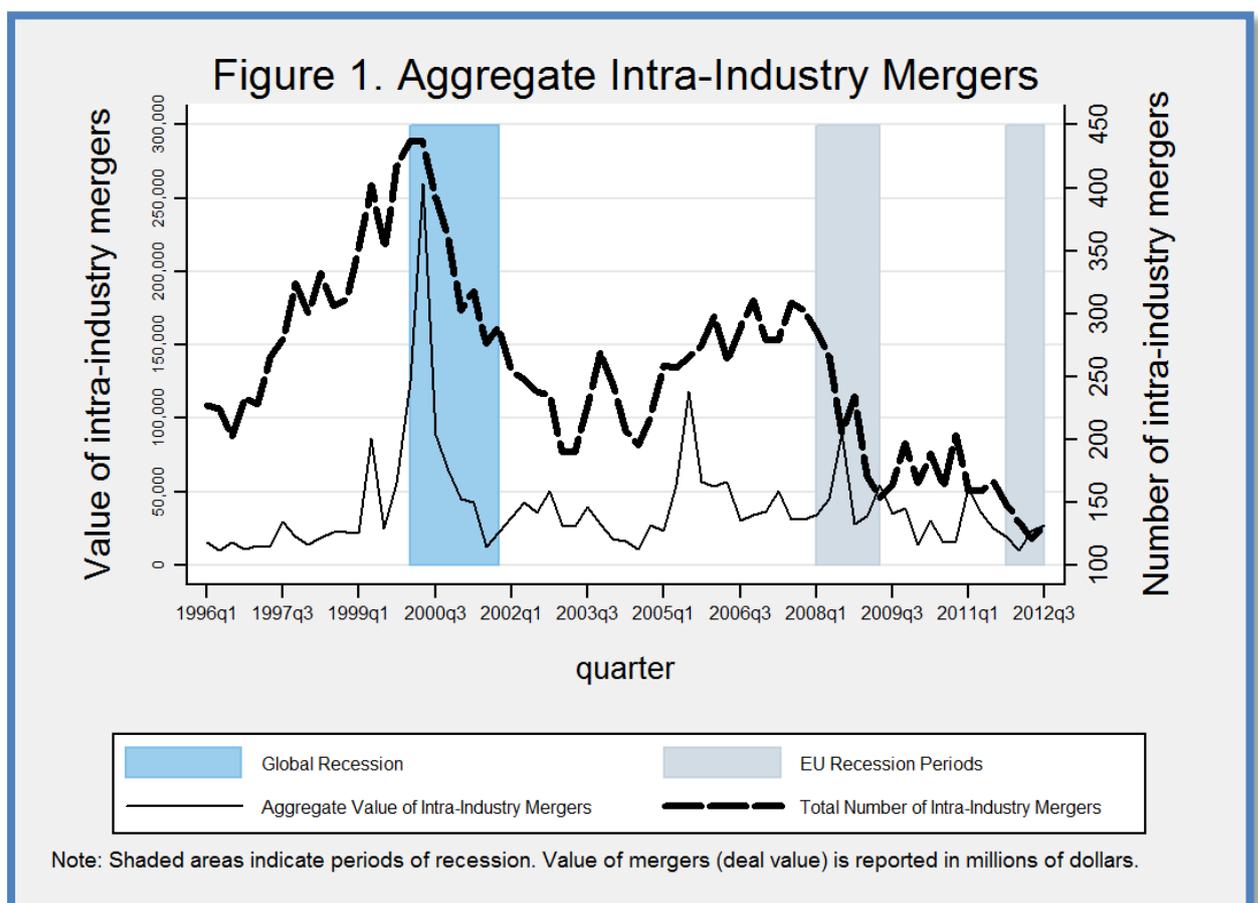
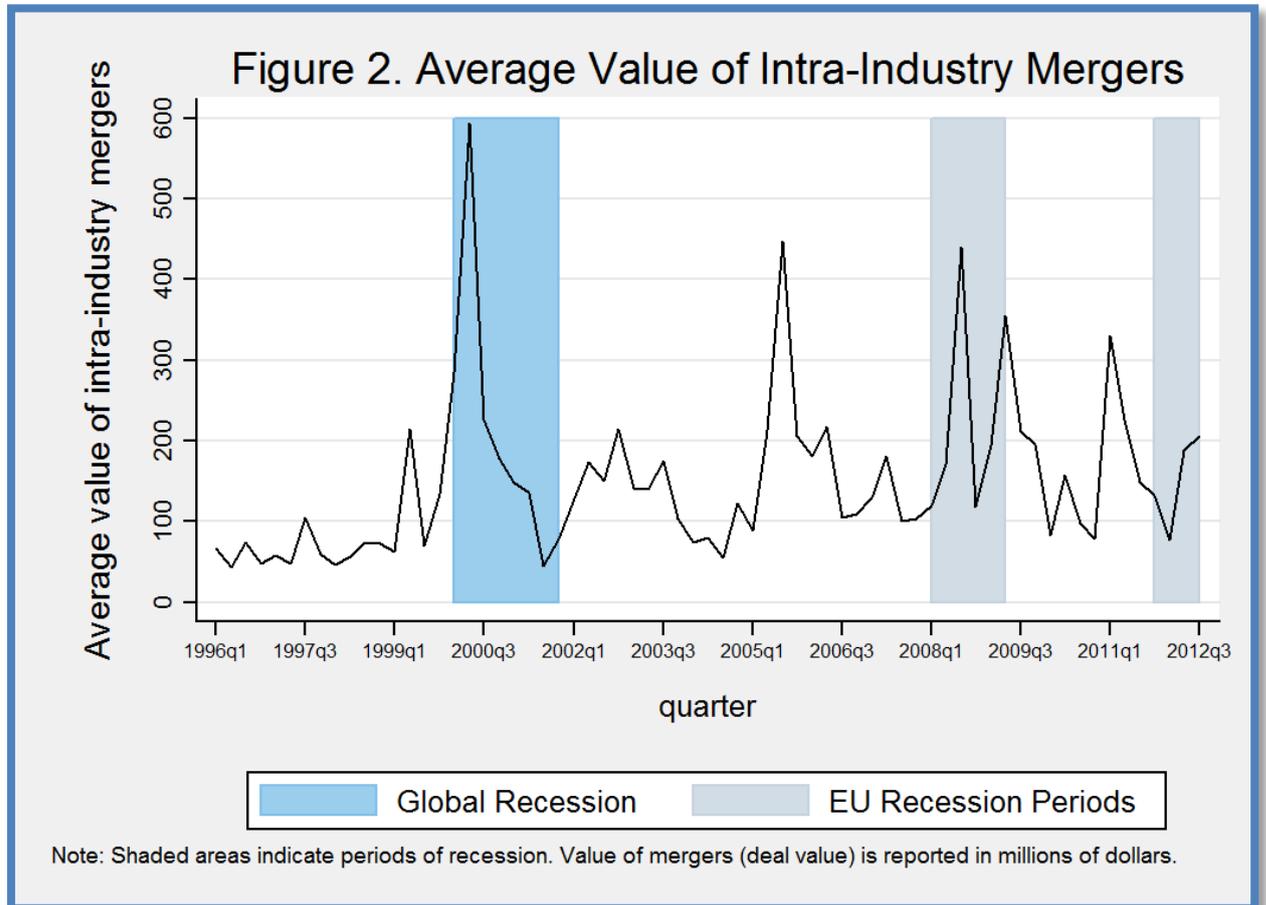


Figure 2 shows the relationship between the average value (per deal) of intra-industry mergers and the business cycle. Similar to total merger value, the macroeconomic effect on the average value of merger deals is ambiguous. There is more fluctuation in average deal value but the graph is quite similar to that of total value.



Appendix 3 presents graphs across each of the 12 industries examined showing the relationship between the business cycle and merger activity in each sector. This will be useful for reference when analyzing the results of modeling mergers individually by sector (see section five of the paper).

4. Methodology

Model

The motivation of this paper is to analyze how the macroeconomic model helps predict merger activity in each of the twelve sectors. Therefore, I follow the approach introduced by Becketti in his empirical analysis on mergers (*“Corporate mergers and the business cycle”* 1986). He models both the value and the number of mergers as a function of capital market and macroeconomic conditions, using an *Autoregressive Distributed Lag (time-series) Model* in his analysis. The model specification along with explanations is presented in Table 2.

Table 2. Model Specification

| Model: Linkages from real and financial activity to mergers⁷ |
|---|
| $N_t = \alpha + \beta_1(L)SPEuro_{t-1} + \beta_2(L)CAP_UT_{t-1} + \beta_3(L)IR_{t-1} + \beta_4(L)GDP27Growth_{t-1} + \varepsilon_t$ $V_t = \alpha + \beta_1(L)SPEuro_{t-1} + \beta_2(L)CAP_UT_{t-1} + \beta_3(L)IR_{t-1} + \beta_4(L)GDP27Growth_{t-1} + \varepsilon_t$ |
| <ul style="list-style-type: none"> ▪ Dependant variables: <p>N_t = Number of mergers</p> <p>V_t = Aggregate transaction value of related mergers (sum of <i>Ranking Values</i>⁸ of merger deals, including Net Debt of Target, in \$Million)</p> |
| <ul style="list-style-type: none"> ▪ Explanatory variables: <p>$SPEuro_t$ = Standard & Poors Europe 350 Stock (Equity) Index</p> <p>CAP_UT_t = Capacity Utilization Rate</p> <p>IR_t = Interest Rate (EMU Government Bond Yield – 10Year)</p> <p>$GDP27Growth_t$ = Real Growth in Gross Domestic Product (27 EU countries)</p> <p>$\beta_i(L)$ = Restricted polynomial in the lag operator L, applying a <i>general-to-specific approach</i> in eliminating insignificant lags (starting with 4 lags); α = Constant; ε_t = Error Term</p> |
| <p><u>Note:</u> Quarterly data and a semi-log specification are used. The capacity utilisation rate and the S&P Europe 350 Stock Index are in logarithm. GDP growth and the interest rate are in percentages. GDP Growth instead of GDP, a de-trended interest rate and de-trended capacity utilization rate are used in my analysis for stationarity purposes (see Appendix 2 for further explanation). Lagged dependent variables are included as explanatory variables in the specification if past merger activity is significant in predicting mergers.</p> |

⁷ Becketti also includes domestic nonfinancial debt and the stock of money as explanatory variables in his analysis. Stock of money was insignificant in determining mergers, and level of debt was significant and positively related to the value of mergers in the long-run. However, since data on EU debt levels is available only from year 2000 (doesn't cover the whole study period), I have excluded this variable from my analysis.

⁸ See Appendix 1 for the exact definition of Ranking Value

The goal of my research is to identify how current merger activity is associated with past values of macroeconomic variables. Therefore, the model includes only lagged explanatory variables. The difference between Becketti's approach and the analysis presented in this paper is that while Becketti analyzes *aggregate* mergers, my aim is to identify a link between macroeconomic variables and merger activity in each industry. Therefore, the model will be tested on each macroeconomic sector separately in order to directly account for industry differences. This will enable to conclude whether capital market and macroeconomic conditions are better predictors of merger activity in certain sectors, both in the short-run and long-run.

Predictions

Industries clearly differ in merger behaviour and since industry-specific factors are significant in predicting mergers, I expect to find that the business cycle affects merger activity in distinct sectors in different ways, so some industries will exhibit pro-cyclicality while other industries will be counter-cyclical in terms of merger activity, accounting for industry differences. This prediction is based on some industries being less consolidated (in earlier stages of maturity) or concentrated than others which would possibly lead to "contractionary" mergers whereby mergers facilitate a reduction or consolidation in the asset base. Therefore, one would expect a negative relationship between mergers and both the capacity utilization rate and economic growth, since mergers in this case would be an effective means for industries with excess capacity to rationalize and induce exit of least efficient firms following asset reallocation. Such industries would be more vulnerable to industry shocks which trigger industry consolidation (Andrade and Stafford 2004).

On the other hand, certain sectors would experience "expansionary" mergers whereby, similar to internal investment (Lambrecht 2004), mergers are a means for companies to increase their asset base and gain economies of scale, in response to good growth prospects. This would imply a positive relationship between mergers and both economic growth and the capacity utilization rate.

Furthermore, the significance of the macroeconomic variables will vary depending on the sector due to industry-specific features (changes in regulation, heavy spending on research and development and single-industry shocks) that affect mergers and which will be accounted for by testing the model on each industry individually.

5. Empirical Results and Analysis

The empirical results presented and analyzed in this section reflect on both the **short-run** and **long-run**⁹ effects of macroeconomic and capital market conditions on mergers and acquisitions. A significant short-run association between an explanatory variable and the variable being modeled means that a temporary deviation from the average value in the explanatory variable helps predict future temporary movements in the variable modeled. A significant long-run association means permanent shifts in explanatory variables predict permanent changes in the variable modeled. The regressions run to obtain those effects are presented in Appendix 4.

Aggregate Mergers

Firstly, I analyze *aggregate* EU mergers from 1996 to 2012. Tables 3 and 4 show that both in the short-run and long-run the model poorly predicts the total value of mergers, as no coefficients are significant at 10%. This is supported by the observation that both the average and total value of mergers follow an ambiguous relationship to the business cycle, presented in Figures 1 and 2 in section 3. Furthermore, the Dotcom bubble itself explains 29.29% of the variation in total merger value, implying that there was a shock to the economy at the stake of the two centuries (refer to Figure 3). Total merger value increased by \$82.24bn during that period (1999Q3 - 2000Q2).

Table 3. Short-run effects (F-statistics¹⁰)

| AGGREGATE Mergers | Δ Number | Value |
|---------------------------|-----------------|-------|
| Real GDP Growth EU27(%) | 4.23** | 2.15† |
| S&P Europe350 Index | 12.01*** | 1.35 |
| Interest rate(%) | 3.93* | 0.93 |
| Capacity Utilization Rate | 1.64 | 0.86 |

Notes: Statistical significance levels: ***1%,

**5%, *10%, †15%; capacity utilization rate and S&P Europe 350 Index are in logarithm.

Table 4. Long-run effects (actual)

| AGGREGATE Mergers | Δ Number | Value (in \$Mil) |
|---------------------------|-----------------|------------------|
| Real GDP Growth EU27(%) | 2.03 | 20214.25† |
| S&P Europe350 Index | -47.62** | 11892.1 |
| Interest rate(%) | -8.88** | -868.25 |
| Capacity Utilization Rate | 131.78 | -45823.96 |

⁹ Joint significance of the lag coefficients is regarded as a significant **short-run** association. The significance of the sum of the lag coefficients is regarded as a significant **long-run** association.

¹⁰ The figures in Table 3 are F-statistics for the tests of the hypotheses that each macroeconomic variable influences merger activity.

In the short-run the number of mergers is well predicted by the model with GDP growth, the S&P Europe 350 index and the interest rate being significant in determining merger activity. In the long run, however, the model is weaker in explaining mergers with GDP growth being insignificant. Also, mergers are actually negatively influenced by the S&P equity index possibly suggesting that despite low investor confidence, excess capacity in the EU economy drives industry consolidation through mergers in times when companies are performing relatively poorly in order to induce exit of less efficient firms. The capacity utilization rate, consistent with Beckett's (1986) findings, is insignificant in the long-run, implying that mergers and capital investment are regarded as substitutes by firms.

Industry Differences

Analyzing merger activity across different sectors in the EU, Table 5 presents the short-run and table 6 – the long-run effects of macroeconomic variables on mergers. Having a preliminary look at the results, it is convincing that the business cycle influences mergers in various sectors in different ways.

Analyzing the short-run effects, the only industry where our model yields no explanatory power is the *Energy & Power* sector. However, a significant amount of variation in volume is explained by past merger behaviour in the *Energy & Power* and *Financials* industries. Out of all explanatory variables, the S&P Europe 350 Index is most significant in the short-run in all sectors, except for *Retail* and *Telecommunications*. Whereas the capacity utilization rate is a weak measure in explaining economy-wide merger activity, it's significant in the *Materials* and *Healthcare* sectors, implying that mergers are perceived as an investment in production facilities. The other two explanatory variables reflecting macro-economic conditions are significant only in several industries.

Overall, it's clear that the macroeconomic model is relatively poor in explaining horizontal merger activity fluctuations in the short-term. However, GDP growth is significant at 10% in almost every industry, implying that in the short-run there exists a link between the state of the economy and companies' decisions to merge.

Table 5. Short-run effects (F-statistics)

| | Consumer Products & Services | | Consumer Staples | | Energy & Power | |
|---------------------------|------------------------------|---------------------|---------------------|---------|-----------------------|---------|
| | ΔNumber | Value | Number | Value | ΔNumber | Value |
| GDP Growth EU27(%) | 2.66* | 5.05** | 3.95* | 4.44** | 1.97 | 0.71 |
| S&P Europe350 Index | 3.37** | 1.19 | 15.54*** | 2.44* | 0.32 | 1.23 |
| Interest Rate(%) | 0.24 | 3.16* | 4.07** | 1.94 | 0.79 | 0.49 |
| Capacity Utilization Rate | 2.36 | 2.92* | 0.22 | 2.63* | 2.04 | 0.98 |
| | Financials | | Healthcare | | High Technology | |
| | ΔNumber | Value | Number | Value | ΔNumber | ΔValue |
| GDP Growth EU27(%) | 0.47 | 0.48 | 2.63* | 5.88*** | 2.89* | 1.46 |
| S&P Europe350 Index | 5.59*** | 21.97*** | 7.98*** | 4.13** | 16.16*** | 9.79*** |
| Interest Rate(%) | 2.50* | 0.71 | 2.36 | 1.31 | 3.85* | 6.28*** |
| Capacity Utilization Rate | 1.05 | 2.53* | 4.23** | 6.25** | 2.98* | 1.51 |
| | Industrials | | Materials | | Media & Entertainment | |
| | ΔNumber | Value | Number | Value | ΔNumber | Value |
| GDP Growth EU27(%) | 3.73** | 2.73* | 4.58** (3rd lag) | 1.50 | 2.83* | 3.38* |
| S&P Europe350 Index | 5.13** | 3.44** | 3.85** | 0.94 | 2.19 | 4.80** |
| Interest Rate(%) | 1.00 | 0.35 | 0.10 | 0.97 | 4.28** | 0.89 |
| Capacity Utilization Rate | 1.11 | 3.00* | 4.82** | 4.73** | 1.72 | 1.48 |
| | Real Estate | | Retail | | Tele-communications | |
| | Number | Value | Number | Value | Number | Value |
| GDP Growth EU27(%) | 3.27** | 2.38 | 4.37** | 2.53 | 4.31** | 2.59 |
| S&P Europe350 Index | 11.11*** | 4.98** | 1.99 | 0.50 | 2.15 | 1.82 |
| Interest Rate(%) | 1.04 | 6.49** (4th lag) | 4.70** (3rd lag) | 0.95 | 0.81 | 3.87** |
| Capacity Utilization Rate | 3.01* | 5.13*** | 2.36* | 3.03* | 2.44* | 0.91 |

Notes: Statistical significance levels: ***1%, **5%, *10%; capacity utilization rate and S&P Europe 350 Index are in logarithm

The long-run effects of macroeconomic and capital market conditions presented in Table 6 are slightly more interesting to analyze since there are clearly exceptions to the empirical findings on pro-cyclicality of mergers made in past literature. The volume of mergers in the *Healthcare and Materials* sectors is negatively related to the business cycle, implying there may be excess capacity in those industries which forces firms to restructure and drive the weakest companies out of industry. On the other hand, mergers in the *Consumer Products and Services, Consumer Staples, Industrials and Telecommunications* industries are clearly pro-cyclical (positively related to GDP growth). Therefore, mergers in those sectors are driven by positive growth prospects and the incentive to expand and gain potential economies of scale.

Table 6. Long-run effects

| | Consumer Products & Services | | Consumer Staples | | Energy & Power | |
|----------------------------------|------------------------------|--------------|------------------|-----------|-----------------------|------------|
| | ΔNumber | Value | Number | Value | ΔNumber | Value |
| GDP Growth EU27(%) | -0.56 | 282.14** | 1.81* | 672.49*** | -0.10 | -4991.606 |
| S&P Europe350 Index | -3.21 | -34.71 | 9.75*** | 355.38 | -0.92 | 15084.91 |
| Interest Rate(%) | 0.312 | -134.08* | -1.78** | -141.15 | -0.49 | -2659.16 |
| Capacity Utilization Rate | 25.08* | 1252.19 | 7.74 | -1261.76 | 18.63 | 66284.39 |
| | Financials | | Healthcare | | High Technology | |
| | ΔNumber | Value | Number | Value | ΔNumber | ΔValue |
| GDP Growth EU27(%) | 0.66 | 353.84 | -3.85** | -303.92* | -1.31 | -67.58 |
| S&P Europe350 Index | 0.27 | 6385.43*** | 7.29** | 44.70 | -13.59*** | -506.39*** |
| Interest Rate(%) | -2.64* | 174.13 | 1.47 | -54.71 | -2.03* | -95.64* |
| Capacity Utilization Rate | -8.45 | -23529.21*** | 53.88** | 5763.68** | 58.63** | 1235.48 |
| | Industrials | | Materials | | Media & Entertainment | |
| | ΔNumber | Value | Number | Value | ΔNumber | Value |
| GDP Growth EU27(%) | 1.71* | 5335.44** | -4.41** | -98.71 | 2.56* | 785.56* |
| S&P Europe350 Index | -5.57** | -1676.50 | 4.07 | -71.57 | -4.04 | 3137.36** |
| Interest Rate(%) | -0.82 | -566.81 | 0.46 | -63.10 | -2.01** | -240.48 |
| Capacity Utilization Rate | 14.91 | -35032.78 | 38.87 | 6644.84** | 13.93 | -979.98 |
| | Real Estate | | Retail | | Telecommunications | |
| | Number | Value | Number | Value | Number | Value |
| GDP Growth EU27(%) | -2.58 | 736.33 | 3.49* | 343.82 | 6.60** | 12315.55 |
| S&P Europe350 Index | -9.86*** | -749.59 | 4.97 | -102.66 | 2.12 | 11338.87 |
| Interest Rate(%) | -0.76 | -982.63** | -2.08** | 19.07 | -1.09 | 716.17 |
| Capacity Utilization Rate | 32.04 | -3316.95 | -64.14** | -5487.83 | -32.88 | -121353.6 |

Notes: Statistical significance levels: ***1%, **5%, *10%; capacity utilization rate and S&P Europe 350 Index are in logarithm

As predicted by the literature, the interest rate, which reflects the cost of financing mergers through borrowing funds, negatively affects merger activity in the long-run but is significant only in four industries. The negative sign suggests that mergers are better opportunities to utilize internal funds when the interest rate, or the opportunity cost of firms' internal funds (the return to lending cash instead of using it for acquisitions), is lower. Surprisingly, although being negative almost in each case, the long-run effect of the interest rate is insignificant in most industries suggesting that merger activity is not strongly related to financing costs in the long-term.

Another unexpected finding is the negative relationship between the stock price level and merger activity observed in the *High Technology*, *Industrials* and *Real Estate* sectors. Normally, one would expect merger activity to increase in response to better capital market conditions

when the market's optimism about future economic activities leads firms to expand during favourable market conditions. The three exceptions where merger activity negatively responds to the S&P Europe 350 possibly suggest either less market speculation in those industries, or could reflect the contractionary role of mergers in times of poor profitability when the weakest firms are driven out of industry through reallocation of the asset base. However, in *Financials* and *Consumer Staples* mergers are positively and significantly associated with the market price level reflecting that in those industries high investor confidence increases merger activity.

Finally, in the long run, the relationship between the aggregate capacity utilization rate, which reflects current demand conditions in the economy, and merger activity is unclear, being negatively or positively related to mergers in some cases while being insignificant in others. The sign of the long-run coefficients on this variable reflects how the industry behaves compared to the whole economy with the precise effect remaining uncertain. Because I don't consider industry-specific capacity utilization rates which have been discussed in past literature (Andrade and Stafford 2004), I cannot draw a precise conclusion on the effect. This is one of the limitations in my research outlined in the section below.

Furthermore, certain industries experienced economic shocks during the period examined. During the Dotcom boom the number of mergers in the *High Technology* industry increased by 41.05 mergers – being 3 times the average - with almost 40% of the variation in merger activity explained only by the boom. The *Consumer Products and Services* sector experienced a shock during the bubble preceding the global financial crisis in 2008 (which caused a recession in the EU) when the value of mergers increased by \$918 Million – being twice the average - with 29.07% of variation in the value of mergers explained by the bubble alone. Another shock was experienced by the *Telecommunications* industry during the Dotcom boom when the value of mergers increased by \$62.31bn – being 6 times the average, with around 30% of the variation explained by the boom itself (refer to Figure 3).

Figure 3. Economy and Industry Shocks

| VARIABLES | (1) Total Value of Mergers | (2) High Technology Number of Mergers | (3) Telecom- munications Value of Mergers | (4) Consumer Products & Services Value of Mergers |
|--|----------------------------------|---|---|--|
| Dot.com boom dummy | 82,243.99*** (15,851.62) | 41.05*** (6.30) | 62,312.11*** (12,146.70) | |
| Bubble preceding Financial Crisis 2008 dummy | | | | 917.61*** (177.77) |
| Constant | 34,080.74*** (3,873.17) | 25.95*** (1.54) | 6,534.91** (2,967.91) | 386.99*** (43.44) |
| Observations | 67 | 67 | 67 | 67 |
| R-squared | 0.293 | 0.395 | 0.288 | 0.291 |
| F | 26.92 | 42.50 | 26.32 | 26.64 |

Notes: Standard errors in parentheses; Significant at ***1%, **5%, *10%

Limitations

One of the limitations in my research is the restriction of data availability. Since I couldn't access data on industry-specific factors, such as the industry capacity utilization rate, concentration ratio and other variables proposed by the neo-classical model, I couldn't include them in my model as additional explanatory variables, developing further analysis on industry mergers.

Furthermore, the time period examined could ideally be extended to capture more booms and troughs in the economy. Also, because mergers frequently take up to a year to complete and vary in time frames between announcement and completion depending on legal issues and companies involved, an increase in sample size would improve my analysis since lagged explanatory variables reduce the number of observations in regression analysis.

6. Conclusion

This paper examined the relationship between merger activity and the business cycle – both aggregate and split by sector. The empirical results clearly support the prediction that the business cycle affects mergers in different sectors in various ways, with certain explanatory variables being better predictors of merger activity in distinct sectors while being insignificant in others. Contrary to other empirical studies, the aggregate volume of mergers is negatively related to the equity stock index implying that the economy could be operating at excess capacity with the need to consolidate operations, whereby mergers facilitate a restructuring of the industry in times when companies are experiencing difficulties.

Elaborating on industry differences, the prediction that some industries exhibit pro-cyclicality, while others – counter-cyclicality in merger activity is supported by the empirical findings: two industries are negatively related to GDP growth, four are positively related and six industries are not significantly influenced by changes in GDP. Overall, the model doesn't explicitly explain horizontal merger activity with some macroeconomic variables being significant and others not. The significance of explanatory variables varies from industry to industry, with the interest rate being the only independent variable having the predicted negative effect on merger activity in the long-run.

Another finding is that sectors clearly exhibit “merger wave” behaviour with current mergers predicting future merger activity. One cause of this tendency could be shocks to an industry's economic, technological or regulatory environment that initiate merger waves. Expanding on shocks, it's clear that certain sectors experienced abnormally high merger activity during the Dotcom bubble and the bubble preceding the 2008 global financial crisis.

The macroeconomic model explains around 37% of the variation in the total number of industry mergers and 50% - in total deal value. Across industries, the explanatory power of the model varies from 17% to 60%, with the lowest being in the *Energy & Power* and *Retail* industries and highest – in predicting the value of mergers in the *High Technology* sector. Furthermore, a lot of the variation in the volume of mergers is explained by past merger behavior, implying that possibly mergers could also be modeled as a univariate process.

Whereas macroeconomic conditions have been found to be significant in predicting mergers in certain sectors, future research could be devoted to the empirical study of industry-

specific factors which possibly yield better predictions of merger behaviour in certain industries in the EU, such as the industry capacity utilization rate, the concentration ratio and regulation changes, with the regulatory environment playing a major role in the EU (every merger decision is closely monitored by the European Commission). Since I had limited access to industry-specific variables, I could not include them in my model. However, it would be interesting to analyze how those affect mergers within each sector.

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Data Sources

Thomson One Banker Financial Database (M&A Deals)

Datastream Database

Eurostat Database

Standard & Poors Website www.spindices.com; SP Equity Indices; Factsheet on S&P Europe 350 Equity Index

8. Appendices

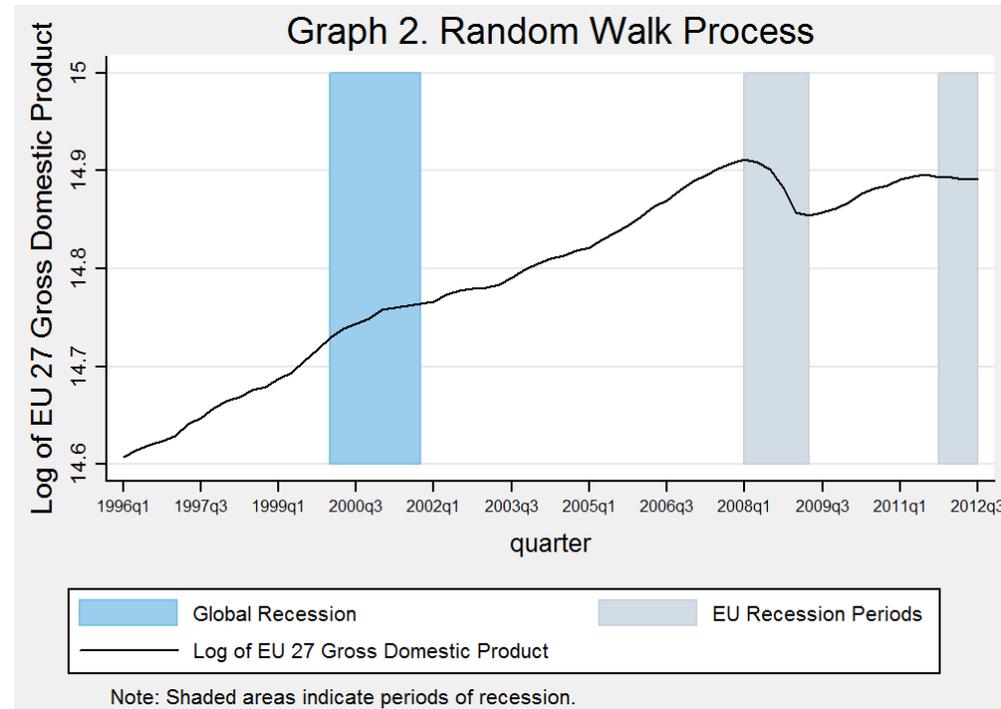
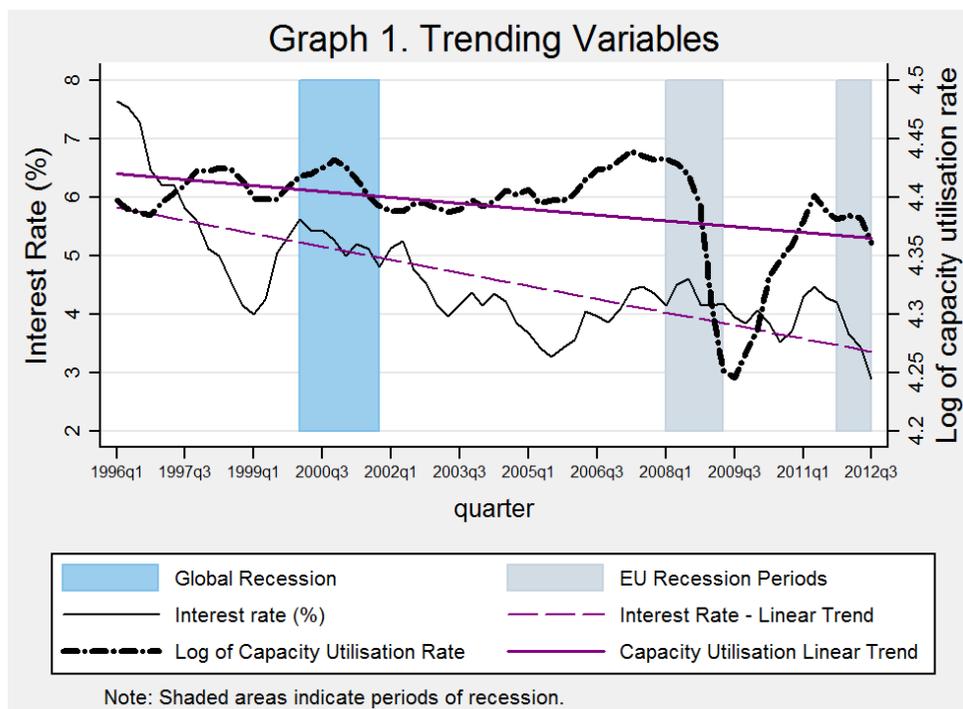
Appendix 1

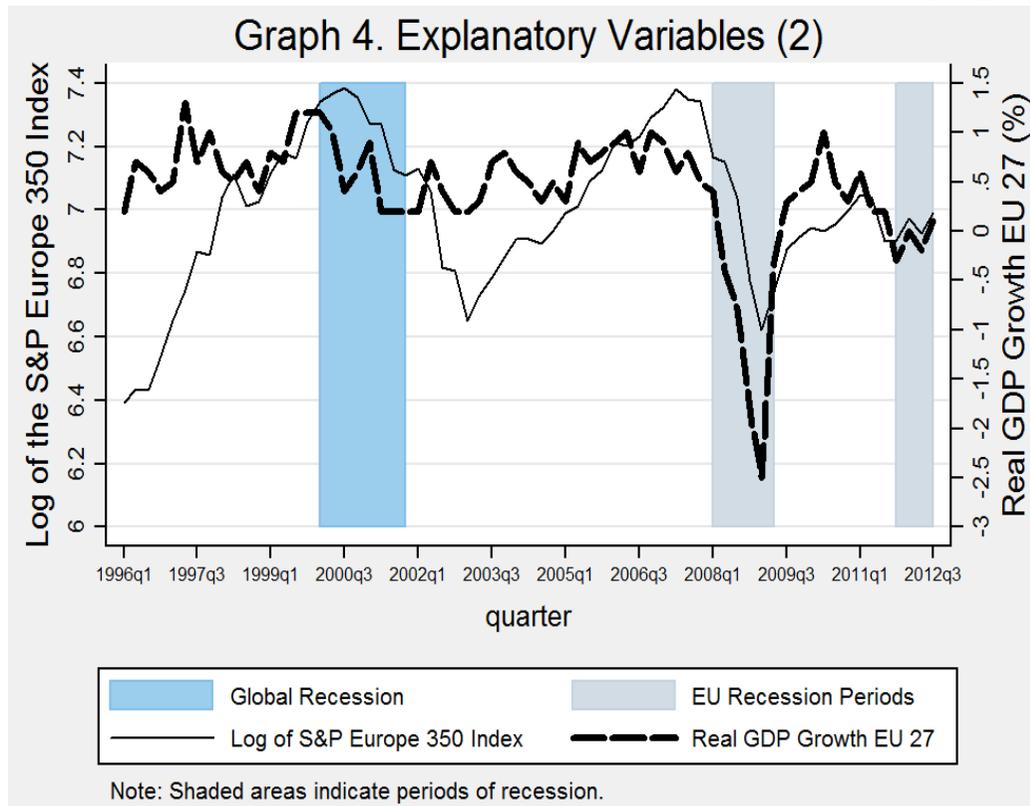
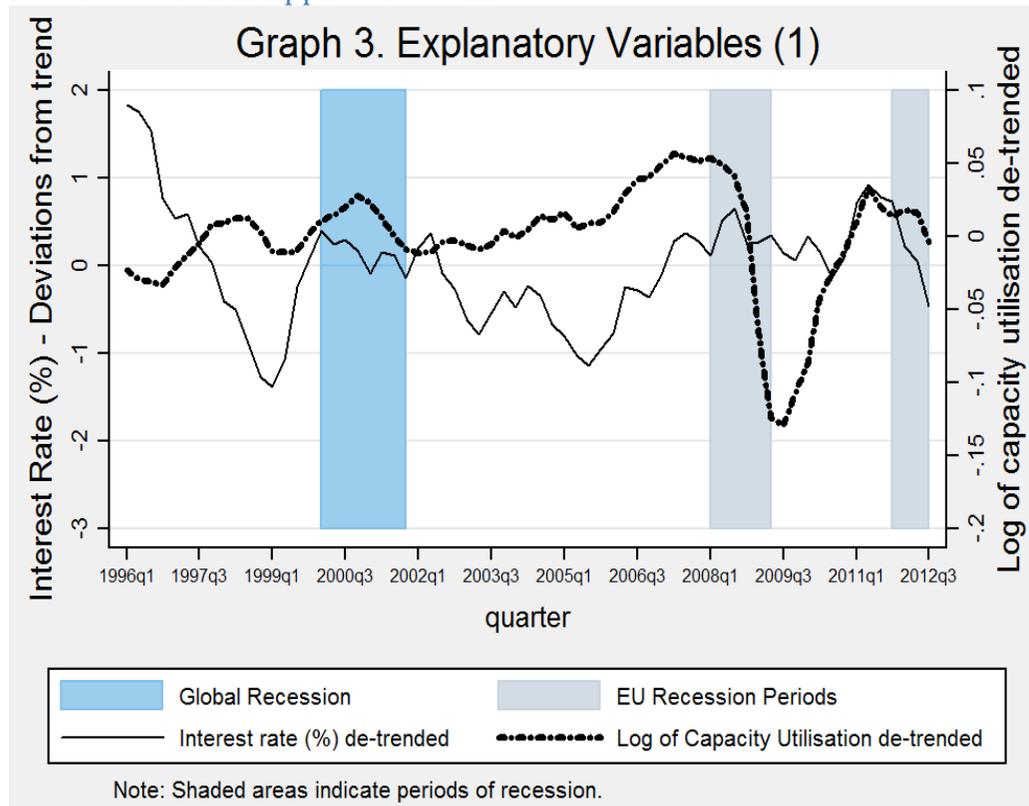
Table A. Variable list and Industry Descriptions

| Variable | Description |
|---|---|
| Ranking Value of Transaction (Merger Deal Value) | <u>Source: Thomson One Banker.</u> Rank value is calculated by subtracting the value of any liabilities assumed in a transaction from the transaction value and by adding the target's net debt (\$million). Net debt is Straight Debt plus Short-Term Debt plus Preferred Equity minus Cash and Marketable Securities as of the date of the most current financial information prior to the announcement of the transaction. If the target's net debt results in a negative Rank Value, Rank Value will be null. |
| EMU Government Bond Yield 10Year | Long-term interest rate, reported monthly by the ECB; converted into quarterly averages for testing the model; Market: Euro Area, Evolving Membership |
| Standard & Poors Europe 350 Equity Index | The equity (stock) index is drawn from 17 major European markets, covering approximately 70% of the region's market capitalization. It comprises of the S&P Euro, the S&P Euro Plus and the S&P United Kingdom. Like the S&P 500 (<i>used by Beckett in his analysis on US mergers</i>) and 5 other regional indices, the S&P Europe 350 is the European component of the S&P Global 1200; index reported on a monthly basis and converted into quarterly averages for testing the model |
| Capacity Utilization Rate | Overall capacity utilization rate based on Business Surveys (% quarterly), seasonally adjusted; <i>Capacity Utilization Rate</i> = The rate at which potential output levels are being met or used, referring to the extent to which an economy actually uses its installed productive capacity (the percentage of the economy's total plant and equipment that is currently in production). |
| Real GDP Growth | Real GDP Growth Rate (% quarterly), seasonally adjusted |
| Thomson Financial Macro Industry | Description (Business/ Activities within the sector) |
| Industrials | Aerospace & Defense, Automobiles & Components, Building/ Construction & Engineering, Industrial Conglomerates, Machinery, Transportation & Infrastructure and Other Industrials |
| Consumer Products and Services | Educational Services, Employment Services, Home Furnishings, Legal Services, Professional Services, Travel Services and Other Consumer Products & Services |
| Consumer Staples | Agriculture & Livestock, Food & Beverage, Household & Personal Products, Textiles & Apparel, Tobacco and Other Consumer Staples |
| Energy and Power | Alternative Energy Sources, Oil & Gas, Petrochemicals, Pipelines, Power, Water & Waste Management and Other Energy & Power |
| Financials | Asset Management, Banks, Brokerage, Credit Institutions, Diversified Financials, Government Sponsored Enterprises, Insurance and Other Financials |
| Healthcare | Biotechnology, Healthcare Equipment & Supplies, Healthcare Providers & Services, Hospitals, Pharmaceuticals and Other Healthcare |
| High Technology | Computers & Peripherals, E-commerce/ B2B, Electronics, Hardware, Internet Infrastructure, Internet Software & Services, IT Consulting & Services, Semiconductors, Software and Other High Technology |
| Media and Entertainment | Advertising & Marketing, Broadcasting, Cable, Casinos & Gaming, Hotels & Lodging, Motion Pictures/ Audio Visual, Publishing, Recreation & Leisure and Other Media & Entertainment |
| Materials | Chemicals, Construction Materials, Containers & Packaging, Metals & Mining, Paper & Forest Products and Other Materials |
| Real Estate | Non Residential, Real Estate Management & Development, Residential, Real estate investment trusts (REITs) and Other Real Estate |
| Retail | Apparel, Automotive, Computers & Electronics, Discount and Department Store, Food & Beverage, Home Improvement, Internet and Catalog and Other Retailing |
| Telecommunications | Space & Satellites, Telecommunications Equipment and Services, Wireless and Other Telecom |

Table B. Summary Statistics of explanatory variables

| Variable | Mean | Std. Dev. | Min | Max |
|---|--------------|------------|--------------|--------------|
| S&P Europe 350 Equity Index | 1127.11 | 258.86 | 597.48 | 1,610.67 |
| Log of S&P Europe 350 Equity Index | 7.00 | 0.24 | 6.39 | 7.38 |
| Interest Rate (%) | 4.59 | 0.97 | 2.90 | 7.64 |
| Interest Rate (Deviations from trend) – in % | 0 | 0.65 | -1.38 | 1.82 |
| Capacity Utilization Rate (%) | 80.89 | 3.16 | 69.80 | 84.70 |
| Log of Capacity Utilisation Rate | 4.39 | 0.04 | 4.25 | 4.44 |
| Log of Capacity Utilisation Rate De-trended | 0 | 0.04 | -0.13 | 0.06 |
| Gross Domestic Product EU 27 in Millions of Euro, chain-linked volumes (i.e. data at previous year's prices, linked over the years via appropriate growth rates), reference year 2005 (at 2005 exchange rates) | 2,672,761.00 | 240,812.70 | 2,207,738.00 | 2,994,173.00 |
| Log of GDP EU 27 | 14.79 | 0.09 | 14.61 | 14.91 |
| Real GDP Growth EU 27 (%) | 0.43 | 0.61 | -2.50 | 1.30 |





Graph 1 shows that for the period from 1996 to 2012 the interest rate and the EU capacity utilisation rate exhibit a downward trend. **Graph 2** shows that Gross Domestic Product (GDP) in the EU 27 countries has a clear upward trend from 1996 to 2012. In order to perform valid econometric analysis it is necessary to transform non-stationary series through either de-trending data (for trending variables), using the difference of the variable (for random walk processes with a drift) or in some cases using both transformations (for random walk processes with a deterministic trend), ensuring spurious regressions are avoided.

Graphs 3 and 4 present variables used in my analysis. **Graph 3** shows that 2 trending variables - interest rate and capacity utilisation rate - have been transformed (de-trended) to account for the trend, since they all contain a deterministic trend but they are not random walk processes. **Graph 4** shows that Real GDP Growth is used instead of GDP since GDP is a unit root process with a drift; furthermore, since the actual S&P Europe 350 Index is a stationary variable, it is used in my analysis (see [Appendix 4](#) for Augmented Dickey Fuller tests on stationarity/ existence of unit roots across the data).

Correlation Matrices

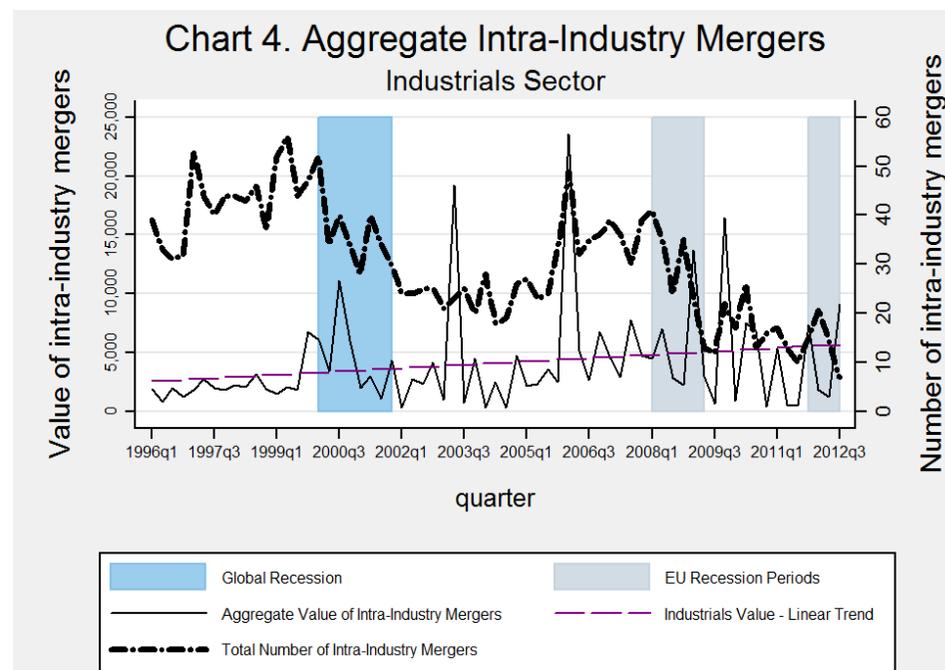
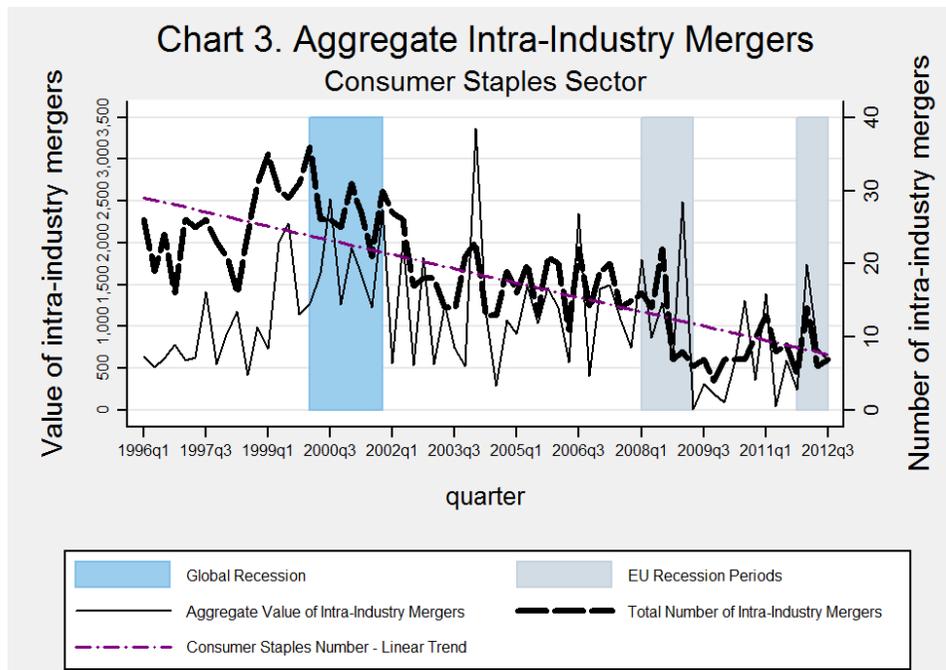
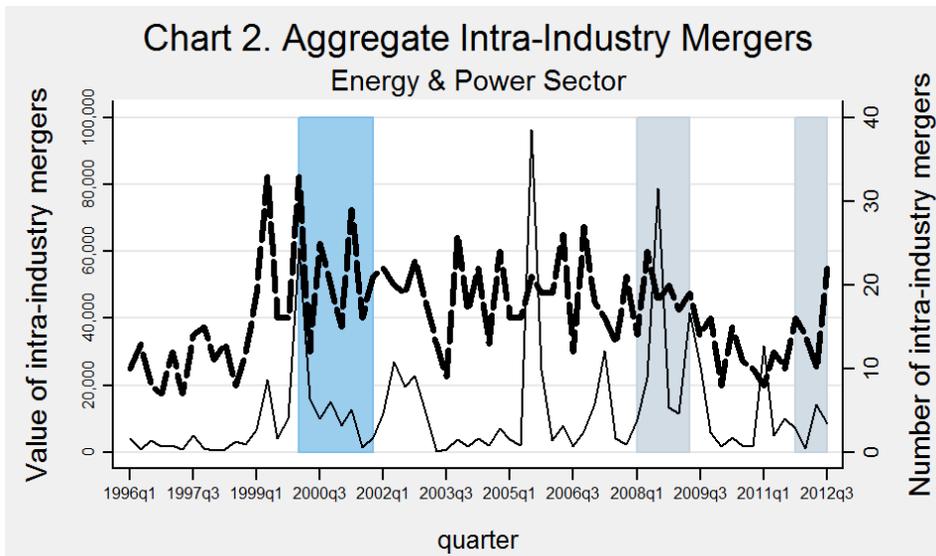
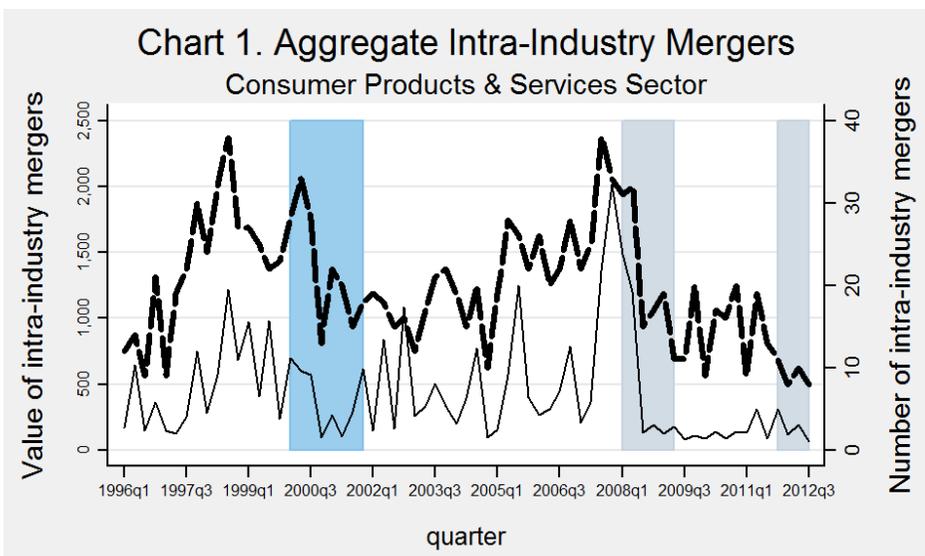
Table C. Number of mergers

| | Total Number | Industrials | CPS* | Consumer Staples | Energy & Power | Financials | Health-care | High Tech | Media & Entertainment | Materials | Real Estate | Retail | Tele-com | EU GDP Growth | Interest Rate | S&P Europe 350 | Cap Util** |
|----------------------------------|--------------|-------------|-------|------------------|----------------|------------|-------------|-----------|-----------------------|-----------|-------------|--------|----------|---------------|---------------|----------------|------------|
| Total Number | 1.00 | | | | | | | | | | | | | | | | |
| Industrials | 0.80 | 1.00 | | | | | | | | | | | | | | | |
| CPS* | 0.70 | 0.55 | 1.00 | | | | | | | | | | | | | | |
| Consumer Staples | 0.75 | 0.71 | 0.32 | 1.00 | | | | | | | | | | | | | |
| Energy & Power | 0.38 | 0.20 | 0.16 | 0.23 | 1.00 | | | | | | | | | | | | |
| Financials | 0.76 | 0.48 | 0.37 | 0.55 | 0.26 | 1.00 | | | | | | | | | | | |
| Healthcare | 0.22 | 0.18 | 0.36 | -0.03 | -0.07 | 0.07 | 1.00 | | | | | | | | | | |
| High Tech | 0.75 | 0.37 | 0.42 | 0.46 | 0.46 | 0.60 | 0.06 | 1.00 | | | | | | | | | |
| Media & Entertainment | 0.88 | 0.69 | 0.56 | 0.78 | 0.31 | 0.68 | 0.12 | 0.65 | 1.00 | | | | | | | | |
| Materials | 0.64 | 0.71 | 0.47 | 0.63 | -0.03 | 0.42 | 0.14 | 0.17 | 0.54 | 1.00 | | | | | | | |
| Real Estate | 0.71 | 0.57 | 0.67 | 0.32 | 0.15 | 0.34 | 0.21 | 0.47 | 0.47 | 0.45 | 1.00 | | | | | | |
| Retail | 0.69 | 0.54 | 0.47 | 0.57 | 0.08 | 0.54 | 0.05 | 0.36 | 0.56 | 0.54 | 0.52 | 1.00 | | | | | |
| Telecom | 0.57 | 0.27 | 0.42 | 0.33 | 0.33 | 0.44 | 0.11 | 0.64 | 0.49 | 0.08 | 0.36 | 0.34 | 1.00 | | | | |
| EU GDP Growth | 0.47 | 0.35 | 0.30 | 0.43 | -0.02 | 0.30 | 0.18 | 0.30 | 0.53 | 0.28 | 0.41 | 0.33 | 0.25 | 1.00 | | | |
| Interest Rate | -0.25 | -0.13 | -0.34 | -0.13 | -0.28 | -0.06 | 0.05 | -0.17 | -0.24 | 0.02 | -0.30 | -0.28 | -0.38 | -0.19 | 1.00 | | |
| S&P Europe 350 | 0.60 | 0.29 | 0.54 | 0.27 | 0.42 | 0.41 | 0.24 | 0.68 | 0.46 | 0.00 | 0.60 | 0.34 | 0.48 | 0.33 | -0.34 | 1.00 | |
| Cap Util** | 0.36 | 0.29 | 0.43 | 0.25 | 0.18 | 0.20 | 0.24 | 0.27 | 0.28 | 0.13 | 0.31 | 0.20 | 0.10 | 0.16 | -0.12 | 0.54 | 1.00 |

Table D. Value of mergers

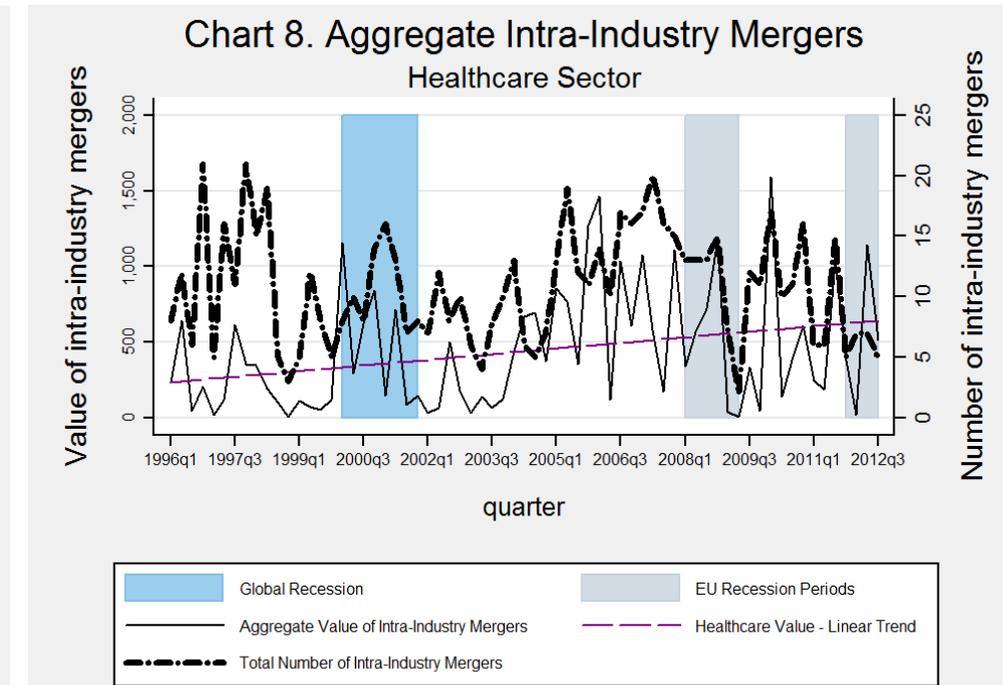
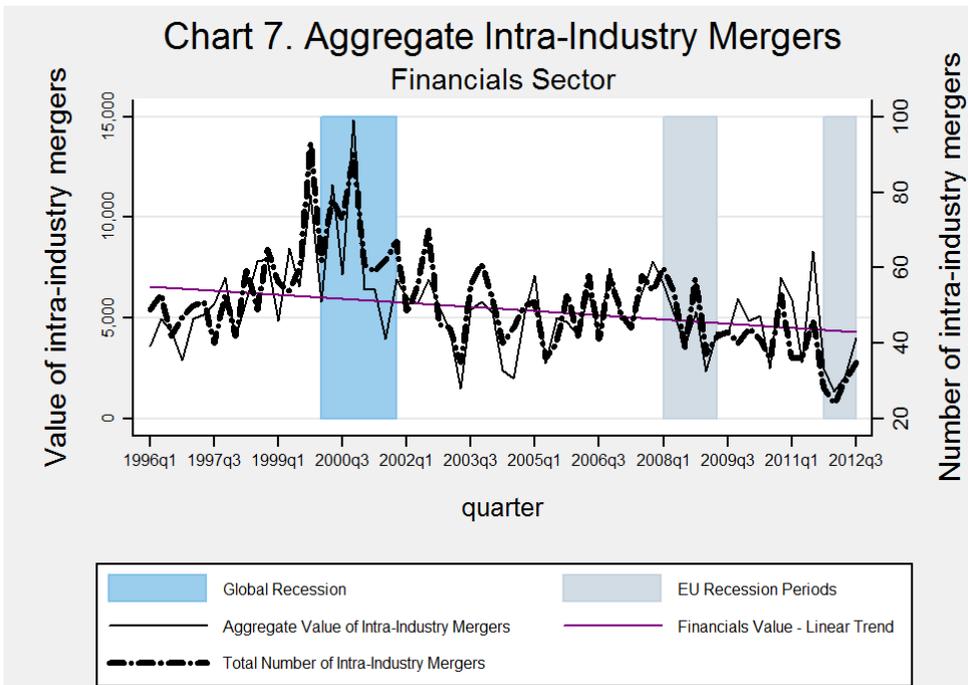
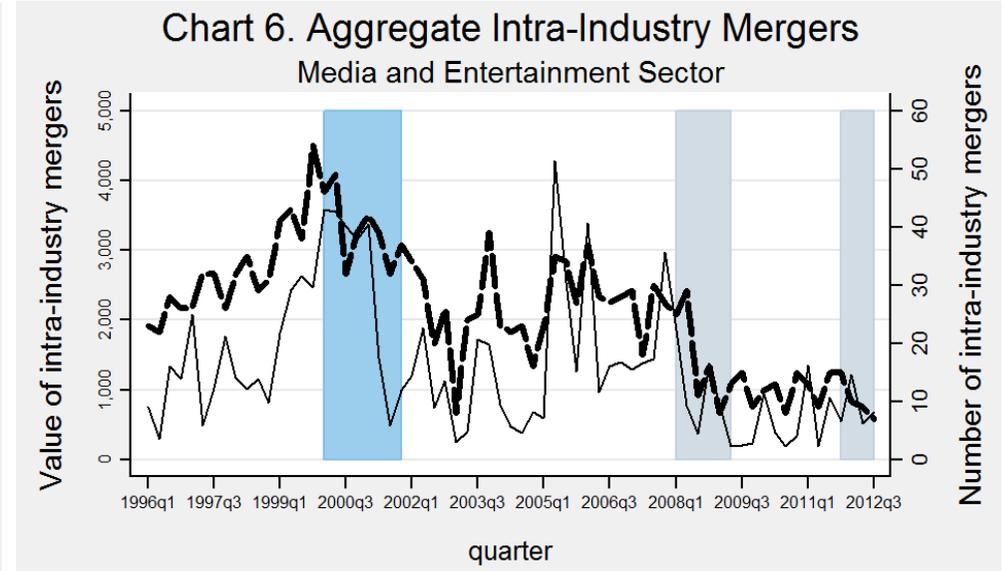
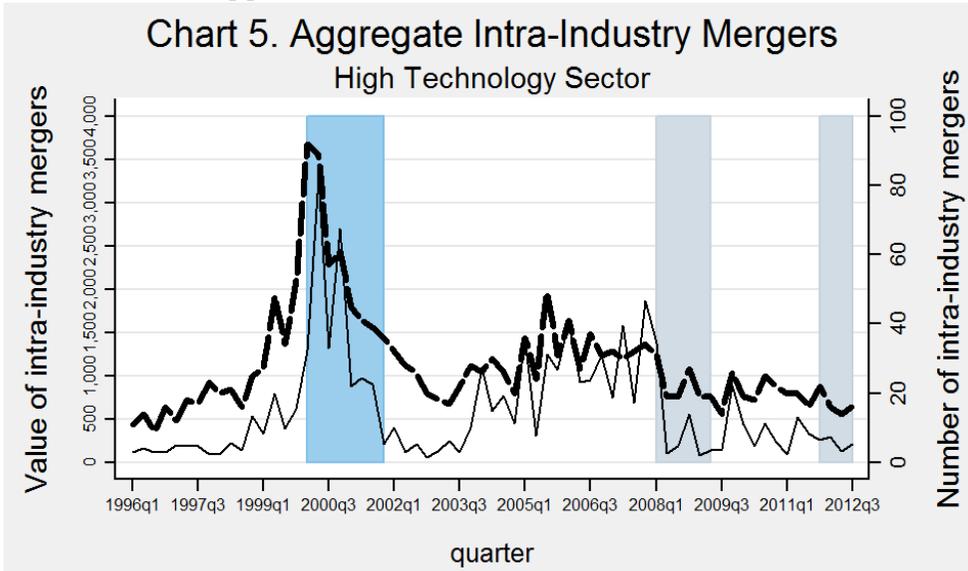
| | Total Value | Industrials | CPS* | Consumer Staples | Energy & Power | Financials | Health-care | High Tech | Media & Entertainment | Materials | Real Estate | Retail | Tele-com | EU GDP Growth | Interest Rate | S&P Europe 350 | Cap Util** |
|----------------------------------|-------------|-------------|-------|------------------|----------------|------------|-------------|-----------|-----------------------|-----------|-------------|--------|----------|---------------|---------------|----------------|------------|
| Total Value | 1.00 | | | | | | | | | | | | | | | | |
| Industrials | 0.13 | 1.00 | | | | | | | | | | | | | | | |
| CPS* | 0.14 | -0.01 | 1.00 | | | | | | | | | | | | | | |
| Consumer Staples | 0.23 | 0.11 | 0.11 | 1.00 | | | | | | | | | | | | | |
| Energy & Power | 0.54 | -0.02 | 0.11 | 0.06 | 1.00 | | | | | | | | | | | | |
| Financials | 0.42 | -0.05 | 0.18 | 0.10 | 0.03 | 1.00 | | | | | | | | | | | |
| Healthcare | 0.08 | 0.07 | -0.03 | -0.02 | 0.11 | 0.01 | 1.00 | | | | | | | | | | |
| High Tech | 0.63 | 0.19 | 0.20 | 0.25 | 0.12 | 0.54 | 0.34 | 1.00 | | | | | | | | | |
| Media & Entertainment | 0.54 | 0.14 | 0.34 | 0.38 | 0.14 | 0.45 | 0.18 | 0.54 | 1.00 | | | | | | | | |
| Materials | 0.18 | -0.08 | 0.17 | 0.26 | 0.12 | 0.18 | 0.04 | 0.19 | 0.26 | 1.00 | | | | | | | |
| Real Estate | 0.19 | 0.17 | 0.26 | 0.21 | 0.03 | 0.21 | 0.24 | 0.39 | 0.23 | 0.33 | 1.00 | | | | | | |
| Retail | 0.12 | 0.24 | 0.10 | 0.17 | -0.06 | 0.15 | -0.08 | 0.12 | 0.06 | 0.40 | 0.40 | 1.00 | | | | | |
| Telecom | 0.86 | 0.01 | 0.05 | 0.17 | 0.07 | 0.40 | -0.02 | 0.59 | 0.48 | 0.09 | 0.09 | 0.09 | 1.00 | | | | |
| EU GDP Growth | 0.15 | -0.09 | 0.20 | -0.01 | -0.12 | 0.34 | -0.04 | 0.25 | 0.37 | 0.16 | 0.32 | 0.05 | 0.21 | 1.00 | | | |
| Interest Rate | -0.07 | -0.12 | -0.18 | -0.20 | -0.01 | -0.07 | 0.00 | -0.14 | -0.18 | -0.03 | -0.26 | -0.06 | -0.03 | -0.19 | 1.00 | | |
| S&P Europe 350 | 0.45 | 0.15 | 0.32 | 0.34 | 0.19 | 0.47 | 0.26 | 0.63 | 0.52 | 0.13 | 0.60 | 0.12 | 0.32 | 0.33 | -0.34 | 1.00 | |
| Cap Util** | 0.14 | -0.04 | 0.38 | 0.26 | 0.03 | 0.19 | 0.26 | 0.36 | 0.32 | 0.20 | 0.33 | 0.06 | 0.10 | 0.16 | -0.12 | 0.54 | 1.00 |

*CPS = Consumer Products & Services; **Cap Util = Log of Capacity Utilisation Rate; Interest rate and Cap Util have been de-trended to avoid spurious results.



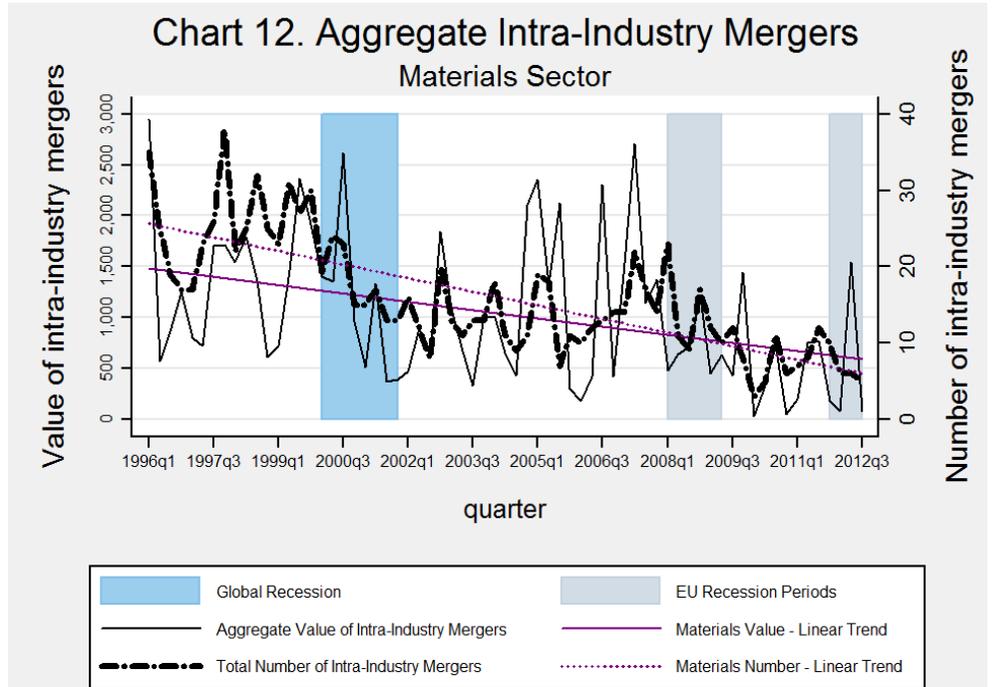
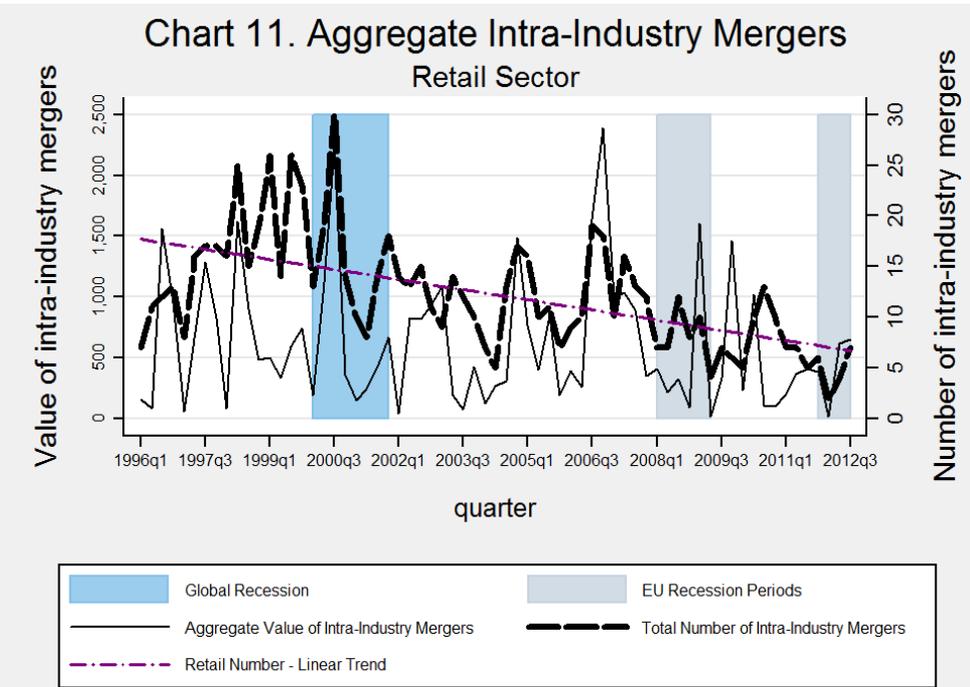
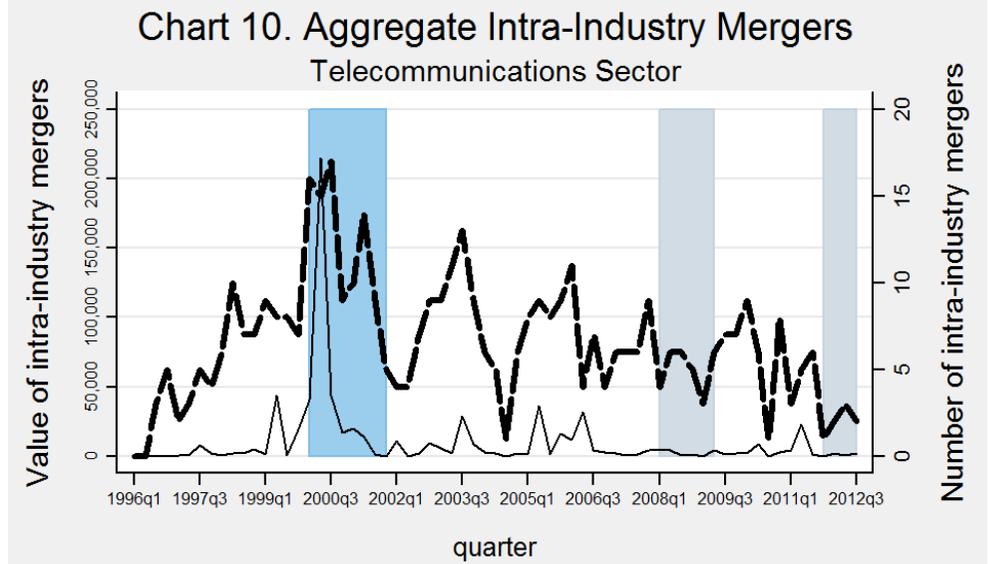
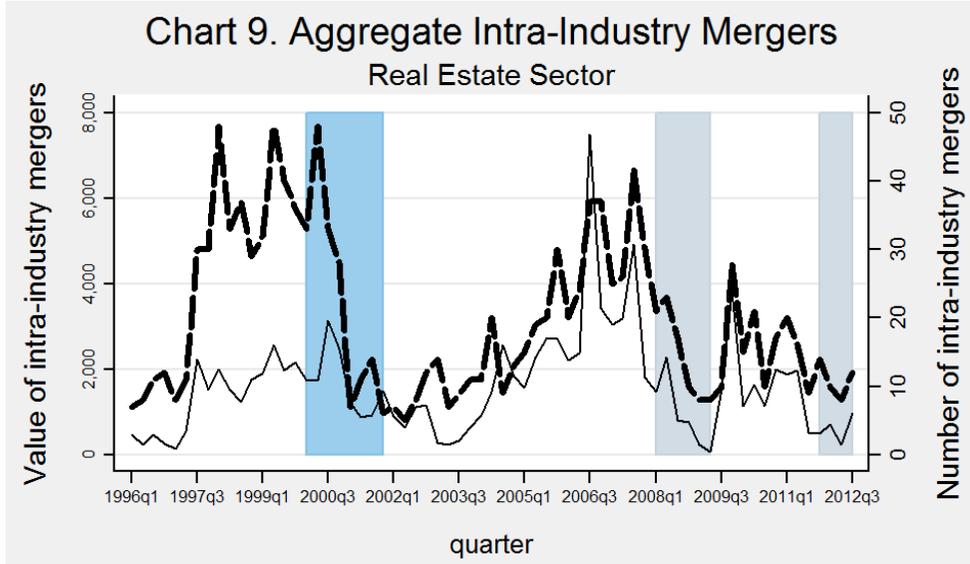
Note: Shaded areas indicate periods of recession. Value of mergers (deal value) is reported in millions of dollars.

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Appendix 4

Table E. Augmented Dickey Fuller Test for stationarity

| Variable | Augmented Dickey Fuller test Model | Test statistic | Critical Value (5%) | Stationary / Non-stationary | Order of integration |
|---|------------------------------------|----------------|---------------------|-----------------------------|---|
| Total Number of mergers | Constant, no trend | -1.282 | -2.916 | Non-stationary | I(1), as difference is stationary: I(0) |
| Total Value of mergers | Constant, no trend | -4.618 | -1.669 | Stationary | I(0) |
| Industrials Number | Constant, no trend, 2 lags | -0.941 | -2.916 | Non-stationary | I(1), as difference is stationary: I(0) |
| Consumer Products & Services Number | Constant, no trend, 1 lag | -2.526 | -2.916 | Non-stationary | I(1), as difference is stationary: I(0) |
| Consumer Staples Number de-trended | Constant, no trend, 1 lag | -3.511 | -2.916 | Stationary | I(0) |
| Energy & Power Number | Constant, no trend, 2 lags | -2.414 | -2.916 | Non-stationary | I(1), as difference is stationary: I(0) |
| Financials Number | Constant, no trend, 3 lags | -0.890 | -2.916 | Non-stationary | I(1), as difference is stationary: I(0) |
| Healthcare Number | Constant, no trend, 1 lag | -6.165 | -2.916 | Stationary | I(0) |
| High Technology Number | Constant, no trend, 1 lag | -2.254 | -2.916 | Non-stationary | I(1), as difference is stationary: I(0) |
| Media & Entertainment Number | Constant, no trend, 1 lag | -1.404 | -2.916 | Non-stationary | I(1), as difference is stationary: I(0) |
| Materials Number de-trended | Constant, no trend, 2 lags | -3.269 | -2.916 | Stationary | I(0) |
| Real Estate Number | Constant, no trend, 1 lag | -2.527 | -2.916 | Non-stationary | I(1), as difference is stationary: I(0) |
| Retail Number de-trended | Constant, no trend | -5.698 | -2.916 | Stationary | I(0) |
| Telecommunications Number | Constant, no trend | -3.863 | -2.916 | Stationary | I(0) |
| Industrials Value de-trended | Constant, no trend | -9.624 | -2.916 | Stationary | I(0) |
| Consumer Products & Services Value | Constant, no trend, 1 lag | -3.541 | -2.916 | Stationary | I(0) |
| Consumer Staples Value | Constant, no trend, 1 lag | -4.507 | -2.916 | Stationary | I(0) |
| Energy & Power Value | Constant, no trend | -6.810 | -2.916 | Stationary | I(0) |
| Financials Value de-trended | Constant, no trend, 1 lag | -3.638 | -2.916 | Stationary | I(0) |
| Healthcare Value de-trended | Constant, no trend, 2 lags | -3.466 | -2.916 | Stationary | I(0) |
| High Technology Value | Constant, no trend, 1 lag | -2.600 | -2.916 | Non-stationary | I(1), as difference is stationary: I(0) |
| Media & Entertainment Value | Constant, no trend | -4.365 | -2.916 | Stationary | I(0) |
| Materials Value de-trended | Constant, no trend | -7.127 | -2.916 | Stationary | I(0) |
| Real Estate Value | Constant, no trend | -4.490 | -2.916 | Stationary | I(0) |
| Retail Value | Constant, no trend | -7.102 | -2.916 | Stationary | I(0) |
| Telecommunications Value | Constant, no trend | -5.953 | -2.916 | Stationary | I(0) |
| Log of S&P Europe 350 Index | Constant, no trend, 1 lag | -2.959 | -2.918 | Stationary | I(0) |
| Interest rate de-trended | Constant, no trend | -3.535 | -2.916 | Stationary | I(0) |
| Log of Capacity Utilization de-trended | Constant, no trend, 1 lag | -4.323 | -2.918 | Stationary | I(0) |
| Real GDP Growth (%) | Constant, no trend | -3.230 | -2.916 | Stationary | I(0) |
| Log of GDP EU 27 | Constant, no trend, 1 lag | -1.893 | -2.918 | Non-stationary | I(1), as difference is stationary: I(0) |

Note: Number = number of mergers; Value = total value of mergers in the quarter; If a variable is a random walk process, i.e. **non-stationary** – I(1), its first difference which is stationary is modeled in order to avoid spurious regression results. If a series is trend-stationary - the variable is clearly trending but is not a random walk process (I(0)), the variable is de-trended to avoid spurious regression results. Finally, if a series is a random walk process – I(1) - with a drift and deterministic trend, then its first difference has to be de-trended to make it stationary and avoid spurious regression results, since the differenced series will contain a deterministic trend. Instead of GDP which is **non-stationary** I use GDP Growth in my model which is **stationary** and easy to interpret.

Table F. Autoregressive Distributed Lag Model Regression Results; *Dependant variable = number of mergers*

| Macro-economic Sector | (1) Total | (2) Consumer Products & services | (3) Media & Entertainment | (4) High Tech | (5) Financials | (6) Real Estate | (7) Energy & Power | (8) Industrials | (9) Consumer Staples | (10) Materials | (11) Telecommunications | (12) Health-care | (13) Retail |
|-------------------------------------|--|-------------------------------------|------------------------------|----------------------|---------------------|----------------------|-----------------------|--------------------|-------------------------|----------------------|----------------------------|---------------------|--------------------|
| Variable | Change in Number of Mergers (Δ Number) | | | | | | | | Number of Mergers | | | | |
| Dependant variable _{t-1} | -0.35*** (0.12) | -0.63*** (0.12) | -0.53*** (0.11) | -0.67*** (0.12) | -0.95*** (0.12) | -0.53*** (0.12) | -0.92*** (0.12) | -0.57*** (0.12) | | 0.30** (0.12) | 0.46*** (0.11) | | |
| Dependant variable _{t-2} | | -0.33*** (0.12) | | -0.27** (0.11) | -0.75*** (0.14) | -0.23* (0.12) | -0.45*** (0.12) | -0.44*** (0.12) | | | | | |
| Dependant variable _{t-3} | | | | | -0.51*** (0.12) | | | | | | | | |
| GDP Growth _{t-1} | 24.46*** (8.86) | 3.49* (1.95) | 3.93* (2.19) | 4.16* (2.22) | | 3.10 (2.58) | 3.27* (1.83) | | 1.81* (0.91) | | 2.01** (0.97) | | -1.68 (1.30) |
| GDP Growth _{t-2} | | | -6.21** (2.61) | | | 4.94 (3.04) | | 5.36*** (1.96) | | | | | |
| GDP Growth _{t-3} | -21.71** (10.62) | -4.58** (2.26) | | | 2.12 (3.08) | | -3.52 (2.28) | | | -3.10** (1.45) | | -1.48 (1.43) | |
| GDP Growth _{t-4} | | | | -6.71** (3.09) | | -6.29** (2.68) | | -1.92 (1.73) | | | 1.57 (1.19) | -2.37 (1.54) | 5.16*** (1.76) |
| S&P Europe 350 Index _{t-1} | | 9.33 (8.05) | | | 28.67*** (10.39) | | | | | 14.43*** (5.30) | | 16.57*** (4.22) | |
| S&P Europe 350 Index _{t-2} | | | | -26.34*** (6.55) | | | -2.18 (3.83) | -11.19** (4.94) | | | -6.10 (4.11) | | 10.76* (6.01) |
| S&P Europe 350 Index _{t-3} | -64.39*** (18.58) | -15.63** (7.16) | -6.19 (4.18) | | | -17.41*** (5.23) | | | 9.75*** (2.47) | -11.57** (4.72) | | | |
| S&P Europe 350 Index _{t-4} | | | | | -27.80*** (8.49) | | | | | | 7.25** (3.58) | -9.28*** (3.20) | -5.80 (5.26) |
| Interest Rate _{t-1} | | | -3.09** (1.49) | | | 3.35 (3.61) | -1.16 (1.31) | -1.65 (1.65) | | | | | |
| Interest Rate _{t-2} | | 0.61 (1.25) | | | 4.97 (4.60) | -4.70 (3.49) | | | -1.78** (0.88) | 0.33 (1.03) | | | |
| Interest Rate _{t-3} | -12.00* (6.05) | | | | -8.46* (4.54) | | | | | | -0.59 (0.66) | | -2.08** (0.96) |
| Interest Rate _{t-4} | | | | -3.94* (2.01) | | | | | | | | 1.47 (0.96) | |
| Capacity Utilization _{t-1} | -389.07 (356.02) | | | | -152.99 (106.04) | -154.40 (97.22) | -89.85 (78.23) | | | | -72.11* (37.82) | 53.88** (26.21) | -32.71 (32.69) |
| Capacity Utilization _{t-2} | 1,088.44* (597.62) | 150.78** (74.20) | 130.72* (71.00) | 205.00** (93.86) | 125.91 (94.32) | 210.98** (91.88) | 253.64* (129.69) | | | | 143.23** (60.16) | | |
| Capacity Utilization _{t-3} | -521.20 (345.49) | -101.49 (63.40) | -109.36 (68.13) | -91.38 (73.74) | | | -119.67 (74.77) | | 7.74 (16.67) | 150.08*** (49.56) | -179.30*** (63.21) | | -86.14 (69.18) |
| Capacity Utilization _{t-4} | | | | | | | | 29.96 (28.48) | | -122.74** (48.02) | 90.37** (36.76) | | 54.71 (51.49) |
| Dot.com bubble dummy | | | | 23.84*** (5.50) | | | | | | | | | |
| Constant | 448.29*** (130.33) | 44.37 (28.67) | 43.77 (29.25) | 184.63*** (45.88) | -8.47 (53.35) | 121.47*** (36.64) | 15.59 (26.77) | 76.33** (34.21) | -68.83*** (17.31) | -18.84 (23.77) | -5.82 (14.98) | -39.04 (24.55) | -36.19* (21.26) |
| Observations | 64 | 64 | 64 | 64 | 63 | 64 | 64 | 63 | 64 | 63 | 63 | 63 | 63 |
| R-squared | 0.378 | 0.411 | 0.357 | 0.465 | 0.597 | 0.379 | 0.580 | 0.369 | 0.411 | 0.302 | 0.503 | 0.274 | 0.325 |
| F | 4.176 | 4.194 | 4.436 | 5.205 | 7.693 | 3.228 | 8.299 | 4.598 | 10.28 | 3.394 | 5.271 | 3.530 | 3.247 |
| Prob > F | 0.001 | 0.000 | 0.001 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.004 | 0.000 | 0.005 | 0.004 |

Notes on Tables F and G: Standard errors are in parentheses; Significance levels: ***1%, **5%, *10%; the most insignificant lags of explanatory variables have been eliminated using the *general-to-specific* approach, starting from 4 lags. The number of observations lost is equal to the length of the longest lag.

Table G. Autoregressive Distributed Lag Model Regression Results; *Dependant variable = Value of mergers*

| <i>Macroeconomic Sector</i> | (1) Total | (2) Consumer Products & services | (3) Consumer Staples | (4) Media & Entertainment | (5) Materials | (6) Telecom- munications | (7) Financials | (8) Healthcare | (9) Real Estate | (10) Retail | (11) Energy & Power | (12) Industrials | (13) High Tech |
|--|-----------------------------|--|----------------------------|---------------------------------|--------------------------|--------------------------------|------------------------------|--------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|---------------------------|
| Variable | Value of mergers | | | | | | | | | | | | ΔValue |
| Dependant variable _{t-1} | 0.33*** (0.11) | | -0.35*** (0.12) | 0.30** (0.13) | | | -0.24* (0.13) | -0.23** (0.11) | | | | | -0.85*** (0.12) |
| Dependant variable _{t-2} | | | | | | | | | | | | | -0.25** (0.12) |
| Dependant variable _{t-3} | | | | | | | | 0.33*** (0.12) | | | | | |
| Dependant variable _{t-4} | | | | | | | | | 0.46*** (0.12) | | | | |
| GDP Growth _{t-1} | 13,488.44 (9,192.16) | | | | 232.04 (221.43) | | | | 398.48 (258.14) | | | | |
| GDP Growth _{t-2} | | 282.14** (125.61) | 549.16** (239.06) | | | | | | | | | 3,465.42** (1,708.74) | |
| GDP Growth _{t-3} | | | | 549.67* (299.15) | -330.75* (191.19) | 12,315.55 (7,658.72) | | 152.03 (112.36) | | | | | -141.58 (117.35) |
| GDP Growth _{t-4} | | | 357.22 (213.59) | | | | 399.59 (647.87) | -423.37*** (123.51) | | 343.82 (216.05) | -4,991.61 (5,923.75) | 1,870.02 (1,522.49) | |
| S&P Europe 350 Index _{t-1} | | -895.13 (579.65) | -1,640.55 (1,092.09) | 2,195.29** (1,002.32) | 1,013.09 (883.53) | 48,443.63* (27,311.19) | 9,156.23*** (2,364.87) | 741.02** (334.97) | | 462.36 (606.54) | 28,764.72 (29,644.39) | -22,549.93*** (7,702.11) | 1,078.60** (530.78) |
| S&P Europe 350 Index _{t-2} | | 1,586.24* (850.95) | 2,119.53** (1,026.98) | | | | | | 3,279.80** (1,301.06) | | -62,676.73 (46,047.64) | 37,570.14*** (11,111.01) | |
| S&P Europe 350 Index _{t-3} | -76,876.49 (57,151.98) | -725.82 (562.44) | | -1,562.34* (834.77) | -1,084.65 (791.52) | -112,431.21** (51,920.20) | -1,478.49 (2,123.44) | | | -565.02 (566.09) | 48,996.93 (31,090.35) | -29,561.80*** (10,995.70) | -2,139.47*** (517.55) |
| S&P Europe 350 Index _{t-4} | 84,811.77 (52,742.83) | | | | | 75,326.44* (40,032.07) | | -701.11*** (253.14) | -3,685.45*** (1,167.52) | | | 12,865.09 (7,992.27) | |
| Interest Rate _{t-1} | | -134.08* (75.39) | | | | | 693.69 (534.25) | | | | | | |
| Interest Rate _{t-2} | | | | | 360.04 (295.84) | | | 123.62 (106.40) | | 235.13 (177.45) | | | |
| Interest Rate _{t-3} | 19,372.26 (14,790.15) | | -190.24 (136.54) | | -423.14 (304.14) | 31,922.70*** (11,603.28) | | | | | -2,659.16 (3,782.23) | | 619.31*** (230.71) |
| Interest Rate _{t-4} | -19,951.62 (14,917.45) | | | -168.27 (178.02) | | -31,206.52** (11,947.56) | -451.78 (523.64) | -172.46 (106.70) | -531.77** (208.78) | -216.06 (174.51) | | -566.81 (963.83) | -819.67*** (238.67) |
| Capacity Utilization _{t-1} | -545,144.00 (383,492.64) | -4,143.83 (2,578.57) | -11,124.18* (5,553.54) | -9,088.92 (6,447.00) | | -121,353.63 (127,437.47) | -50,623.54** (24,168.79) | 5,145.88** (2,057.99) | | | -149,750.56 (180,385.22) | -76,193.21** (32,419.26) | |
| Capacity Utilization _{t-2} | 939,845.79 (594,689.55) | | | | 6,644.84** (3,054.65) | | 56,453.45 (38,492.71) | | -26,169.03*** (8,192.06) | 5,605.06 (6,288.69) | 216,034.95 (161,689.33) | | 2,588.30 (2,109.00) |
| Capacity Utilization _{t-3} | -425,278.92 (344,825.78) | 5,396.02** (2,278.48) | 9,423.59** (4,262.33) | 8,403.21* (4,915.84) | | | -33,168.75 (20,958.56) | | 24,373.99*** (8,296.09) | -22,265.08** (10,478.15) | | | |
| Capacity Utilization _{t-4} | | | | | | | | | | 16,777.25** (6,831.63) | | 41,160.43* (21,510.61) | |
| Pre-Financial Crisis 2008 bubble dummy | | 798.77*** (189.99) | | | | | | | | | | | |
| Dot.com bubble dummy | 60,224.82*** (17,031.13) | | | | | 47,736.20*** (14,020.03) | | | | | | | 599.62** (260.08) |
| Constant | -36,940.03 (155,835.73) | 514.39 (1,653.10) | -2,247.87 (3,385.41) | -3,750.06 (4,968.29) | 541.19 (3,415.28) | -76,689.95 (137,718.00) | -53,905.18*** (12,559.16) | -176.82 (1,973.79) | 3,551.16 (5,394.90) | 1,184.67 (3,172.74) | -90,709.59 (92,617.79) | 9,703.29 (24,979.17) | 7,458.29*** (2,616.49) |
| Observations | 63 | 64 | 64 | 64 | 64 | 63 | 64 | 63 | 63 | 63 | 64 | 63 | 64 |
| R-squared | 0.505 | 0.473 | 0.331 | 0.427 | 0.196 | 0.428 | 0.417 | 0.424 | 0.530 | 0.174 | 0.173 | 0.250 | 0.602 |
| F | 5.309 | 6.174 | 3.398 | 5.965 | 1.953 | 5.053 | 4.285 | 4.340 | 8.846 | 1.418 | 1.670 | 1.965 | 9.082 |
| Prob > F | 0.000 | 0.000 | 0.003 | 0.000 | 0.078 | 0.000 | 0.000 | 0.000 | 0.000 | 0.210 | 0.135 | 0.062 | 0.000 |