



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Consolidation and Efficiency in the major European Insurance Markets

Klumpes, Paul John Marcel

Publication date:
2022

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Klumpes, P. J. M. (2022). *Consolidation and Efficiency in the major European Insurance Markets.*

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

Consolidation and Efficiency in the Major European Insurance Markets

Abstract

The survivorship principle posits that likelihood of firms surviving over time is associated with their degree of business diversification. This paper examines this issue in the context of the long-term regulatory efforts to harmonise fragmented European regulatory environments, and examines the determinants of technical efficiency of acquiring insurance firms both in the pre- and post- financial crisis periods. Technical efficiencies are estimated over a period of significant consolidation and harmonisation of monetary and insurance regulation rules using data envelopment analysis modelling (DEA). We predict and find that the probability of being an acquirer is consistent with both technical efficiency and with the survivorship principle.

JEL Classifications: G2, G22, G34, L11

Keywords: Efficiency, Insurance, Mergers and Acquisitions, Data Envelopment Analysis

1. Introduction

On 1st of the January 1993, the European Union sought to promote the freedom of services, goods and labour by developing a number of Directives in an effort to harmonise and integrate various financial services markets. The deregulation of European insurance markets occurred primarily through the EU's Third Generation Insurance Directives, implemented in July 1994. The Third Directives effectively deregulated the EU insurance markets, with the exception of solvency regulation, which is still carried out by the insurer's home country.

Although the primary stated objective of the Third Directives was to promote the efficiency and competitiveness of the entire European insurance market, there is relatively little empirical research evidence that has evaluated their economic impact in the subsequent two decades. Understanding the link between consolidation trends and the efficiency of financial services firms is particularly important in environments where a combination of market integration, information technology, stability of economic conditions and market deregulation occur simultaneously. Most of the existing literature analyses United States insurance markets, which has common legal structures, culture and monetary policy. Prior research by Cummins and Xie (2008) find that M&As in US property-liability insurance were primarily associated with financial vulnerability and the desire for earnings diversification. However these linkages are also becoming more pertinent to the more mature and dense European general insurance markets, which until recently have been heavily regulated and fragmented.

Cummins and Weiss (2004) examine the stock price impact of M&A transactions on target and acquiring firms operating across the entire European insurance market. They find European M&As created small negative cumulative average returns for acquirers, but were value creating for targets. Cummins, Weiss and Klumpes (2016) subsequently find similar findings for the period 1997-2001.

However there are a number of reasons for further clarifying these findings. First, prior analysis was limited to the decade prior to when the Third directives were fully implemented by various member states. In fact, most of the initial wave of M&A transactions post-harmonisation occurred during a fairly narrow 1999 to 2000 window. Second, most M&A activity took place in the relatively deregulated and equity market oriented UK market. Third, the subsequent post-crisis consolidation of the insurance industry, resulting in an average of 60% decline in the total number of registered insurers in major European markets , raises important issues concerning the competitiveness of the relevant markets in which they were implemented.

This paper extends prior research in this area in a number of ways.¹ First, our paper is the first to address the consolidation effects of M&A in insurance markets outside the US.² Second, we explicitly incorporate the impact of a fragmented regulatory and monetary environment into the Data Envelopment Analysis (DEA) model used to estimate the technical efficiency of insurance firms competing in the major EU markets. We therefore argue that many components of pure technical and scale efficiency European insurance firm may be subject to non-discretionary influences, such as regulatory corruption and market penetration. Third, we provide a longer-term analysis of the relevance of the survivorship principle in explaining significant industry consolidation, in the two decades since the EU harmonisation rules were first implemented. Finally, our tests of the survivorship principle are based on the largest European insurance markets (France, Germany, Italy, Netherlands, Switzerland and

¹ France, Germany, and the United Kingdom are the three largest European insurance markets for general insurance markets; Switzerland has the highest insurance density of all European markets. The United Kingdom and Switzerland have the highest global insurance penetration levels (Klumpes et al., 2006).

² For example, Cummins et al. (2004) investigated efficiency of Spanish insurers but their focus was to understand the difference in performance due to the organizational form. Hardwick (2004) estimated cost, technical and allocative efficiencies for 50 UK life insurers over the period 1989-93. Hussels and Ward (2007) used written premiums and additions to reserves as outputs for measuring efficiency of 31 UK and 47 German life insurers through 1991-2002. Other studies of small EU markets include Barros (2005); Barros et al (2008); Nektarios and Barros (2010) Europe wide studies of efficiency include Fenn et al. (2008) and Diacon et al. (2002) but they use premiums as output, and not claims paid.

the UK), where both the degree of M&A activity and diversification of industry participation is highest during this period.³

The paper proceeds as follows. Section 2 discusses the institutional background. Section 3 develops the hypotheses. Section 4 outlines the research methodology, while Section 5 outlines the DEA model used to estimate insurance inputs and outputs. Section 6 presents our estimates of technical efficiency and scale economies. Section 7 concludes.

2. Institutional Background

This section briefly overviews the major features of the major European insurance markets and explains the institutional background underlying the motives for M&A activity. The European insurance industry was historically subject to stringent national regulation affecting pricing, contractual provisions, the establishment of branches, solvency standards, etc. National bespoke regulations existed European country, and cross-border transactions were rare, except for reinsurance and some commercial coverage. Competitive intensity was generally low, with minimal price and product competition and stable profit margins (Swiss Re, 2000).

The implementation of the EU's Third Generation Directives, effective in 1995, represented a major step forward in harmonising the regulation of insurers based in the UK resembling those in single deregulated national markets such as the US and Australia. The 'Third Generation Directives' comprised (1) the establishment of a single EU license, whereby an insurer is required to obtain only one license to operate in the EU rather than being licensed in each member nation; (2) the principle of home country supervision, whereby an insurer is regulated only by the nation which issued its license and not by each host country where it

³ Klumpes et al. (2007) find that, by contrast, there is a significant extent of market concentration in many smaller European insurance markets, where larger more established firms tend to dominate the market over time.

operates; and (3) the abolition of ‘substantive insurance supervision’, meaning that regulation is limited to solvency control and pricing, contracting and other insurer operations are effectively deregulated. Thus, insurers were encouraged to compete freely in a range products and services. The Directives also encouraged the entry of foreign insurance firms into the domestic European markets, thus making it more difficult for small firms to survive.

During the past two decades, the major European insurance and banking markets have experienced an unprecedented wave of mergers and acquisitions. Competition was also reinforced by more aggressive strategies from insurers willing to gain market share. These changes in the industry started to affect insurers financial position which forced them to look for other options to increase efficiency. Diagram 1 summarises the key trends for the two decades to 2017. In aggregate, the total major European insurance markets experienced, on average, over a 50% decline in the number of listed insurers. However the extent of decline differed significantly across the markets - they ranged from 14% in Switzerland, to a two-thirds decline in the total number of insurers registered in both the Netherlands and UK insurance markets.

INSERT DIAGRAM 1 ABOUT HERE

3. Development of Hypotheses

M&A activity may be motivated for a number of reasons. The most commonly argued reason is to increase shareholder value by exploiting opportunities to improve firm operating performance, e.g. by enhancing a firm’s efficiency by adopting the best practice technology (technical efficiency). Furthermore, operating costs can be significantly reduced by scale economies. Sources for risk facing insurance firms include investment risk, operational risk, underwriting risk and credit receivables default risk. By increasing the breadth of the

policyholder pool, losses become more predictable and earnings volatility due to underwriting income is reduced. This gives the general insurer an opportunity to take on more risky, higher yielding investments, thus increasing revenues for a given level of overall risk. This provides another rationale for our first hypothesis that acquired firms should show greater efficiency gains than non-M&A firms. This diversification motive is consistent with a desire for entry into other EU countries, especially those where insurance penetration is relatively low or regulatory quality is poor.

The predominant organisational model in the insurance industry is the holding company or consolidated insurance group, consisting of several insurers under common ownership. M&A activity involving the formation of a single consolidated insurance group develops a business model that is consistent with Williamson's (1985) M-form organisational form. A number of the largest insurance enterprises in Europe, such as Allianz, Axa and Aviva, involve the creation of a single holding company that undertakes low-frequency strategic business activities, such as planning, budgeting and treasury, while high-frequency operational activities concerning operational are devolved to the subsidiary level. Consequently, while subsidiary units operate relatively independently in terms of marketing, a number of important operations such as information systems, investments, and policyholder services usually are conducted centrally. Spreading the fixed costs of financing these operations over a broader base has the potential to improve financial capital allocation and thus enhance technical scale efficiency. This implies that the creation or development of an M-form organisation will result in relatively greater technical efficiency, since consolidation facilitates cross-selling, improves customer satisfaction, and otherwise enhances the firm's ability to extract technical scale efficiency (Klumpes, 2005).

The quest for scale economies is often given as another operating synergy rationale for mergers and acquisitions. Under this motive, firms operating with non-decreasing (constant or

increasing) returns to scale (NDRS) will be attractive acquisition targets because they are currently operating in the optimal size range or have the opportunity to become more efficient through growth. Firms operating with decreasing returns to scale are likely to be viewed as unattractive acquisition targets because they are already ‘too large’ in terms of scale economies.

These considerations about potential motives for insurance M&A lead to competing predictions regarding the patterns and effects of merger activity in the European insurance industry. The first hypothesis is that acquisitions are driven solely by desired technical scale efficiency improvements for the acquired firm, since consolidation appears to be driven by pressures to compete more effectively. Because rapid improvements are needed under vigorous competition, more efficient firms will more likely be acquired than inefficient firms.

This leads to our first hypothesis:

H1: Incentives for M&A in the European insurance industry in the pre-financial crisis consolidation period (1997-2007) are primarily associated with the desire for technical efficiency improvements.

Our second ‘survivorship hypothesis’ is based on the insights provided by Lien and Klein (2012) concerning the whether inter-industry relatedness can predict insurance firm’s survival probability in the longer-term, post consolidation period. We therefore predict that:

H2: Surviving European insurance firms in the subsequent, post financial crisis consolidation period (2008-2016) are more likely to be those which engage in M&A activity, have similar or different business lines from their competitors, or engage in cross-border activity.

4. Methodology

This section outlines the sample selection procedures and data sources used to test the hypotheses outlined above. We then summarise the DEA estimation methodology.

4.1. Sample selection procedures and data sources

Table 1 summarizes our sample of European insurance firms by country. German firms comprised 22% of the sample. Overall, the proportion of firms during the pre-crisis period participating in M&A ranged between 32% (UK) and 13% (Italy). UK firms participated 24% of firms included in the surviving firm sample, and comprised 10 acquirers, 17 targets and 18 neither that were classified as belonging to a “control group”.

INSERT TABLE 1 ABOUT HERE

Our data comes from the Standards & Poor’s Eurothesys database of annual account information relating to specialist life, composite and non-life insurance firms licensed in the seven major European markets. Because of the complexity and diversity of consolidation rules in different European states, only company level information was extracted from the database. Following the sampling procedure used in Diacon et al. (2002, 448), companies are excluded from the sample if their results were consolidated into another insurer in the same country unless they appeared to be trading as a separate unit. Firms were also excluded if they had non-positive values for total assets, total technical reserves, total capital, total operating expenses, total investment income, and premium income. Only general insurance business specialists are included in the sample. Non specialists, such as captive insurance firms or specialist reinsurance firms are excluded.

Further selection criteria were applied to those firms participating in M&A transactions. The analysis focuses specifically on firms which either did or did not engage in M&A transactions occurring during the initial pre-crisis consolidation study period 1997-2007. To be eligible for

further analysis, and using the standard approach used in prior M&A research, firms were included only if they had continuous data available at least 3 years prior to and after the consolidation period. Firms were excluded if they did not meet these criteria, or otherwise either exited or entered the industry during the period. Firms were only classified as being M&A active firms if they were registered in one of the seven major insurance markets being analysed, and could be clearly identified as being either acquirer or target firms involved in (a) pre-crisis M&A transactions that occurred in the two decades between 1997 and 2007, and (b) post-crisis M&A transactions that occurred in the subsequent decade between 2008-2016. Consistent with the equivalent sample selection procedures described in Cummins and Xie (2008) and Cummins et al. (1999a), M&A deals were excluded if they did not involve a change in the ownership of a firm, or were pending, terminated, non-binding or involved acquisition of a minority interest only. In all cases, only acquirers whose targets are fully operating general insurance firms in the relevant markets over the relevant time period are included for analysis. Firms with unusual or extreme financial ratios were also excluded from further analysis. The final M&A pre-crisis sample (of complete acquisitions and acquisitions of a majority interest) comprises 2,266 insurance firm yearly observations, based on 453 firms.

Prior US based research also employs standardised annual statements filed with the National Association of Insurance Commission (NAIC). They are compiled at both company level and group level. This data enables researchers to measure whether acquiring entity groups as well as individual unaffiliated companies benefit from efficiency and productivity gains due to M&A transactions. However, due to diversity in consolidation and firm ownership rules across European countries, it is not feasible to separate group and unaffiliated acquiring firms. Consequently only company level analysis is performed for measuring changes and efficiency and productivity for both acquirers and targets.

In order to examine the survivorship hypothesis, we identified the sub-sample of firms that survived during the subsequent post-crisis period from 2008 to 2016. To qualify for inclusion in the survivorship firms had to be in continuous existence and were not subject to major restructuring or business model changes. This resulted in a final sample of 252 ‘surviving’ firm observations.

4.2. Estimation methodology

Consistent with prior research in this area, ‘best practice’ production frontiers for each year of the sample period, are estimated using data envelopment analysis (DEA), a non-parametric technique (Cooper et al., 2006). A production frontier gives the minimum inputs, required to produce any given output vector. Efficiency, which is measured for each firm in the sample in each year, ranges from 0 to 1, with firms operating on the frontier measured as fully efficient (efficiency of 1), and firms not operating on the frontier measured as inefficient (efficiency less than 1). Cummins et al. (1999a) and Cummins and Weiss (2000) provide the rationale for the suitability of this approach in measuring and assessing the performance of the insurance sector along various dimensions.

The analysis focuses on the change in efficiency for firms that are acquirers or acquisition targets between the period prior to and the period after the acquisition. However prior related literature is inconsistent in the selection of study windows for this analysis. Cummins et al. (1999a) measure technical efficiency change and technical change two years prior to acquisition and two years after the acquisition for US life insurance firms. By contrast, Cummins and Xie (2008) instead use one year prior to acquisition and two years after acquisition.

Both these prior studies also involve examining a sequence of overlapping blocks of data centred on multiple acquisition years. By contrast, the pre-crisis M&A analysis in this paper is based on a specified period of takeover activities, while the firms included in the final sample had to be in continuous existence at least during the two years prior to and subsequent to the M&A deal. Accordingly this study estimates the change in the two years prior to acquisition, to two years after the acquisition period. Focusing on target and acquisition firms that continue to operate over the same period both pre and post acquisition provides a relatively more robust analysis and a more homogeneous sample consisting of the most common type of M&A transaction.

4.3. Measurement of inputs and outputs

This section briefly overviews the data sources, the measurement of outputs and inputs and the estimation methodology used in the analysis.

4.3.1. Outputs

Following the value added approach in Cummins and Weiss (2000), we specify three main services or outputs produced by European insurance firms:

1. Risk-pooling and risk-bearing: Insurance provides a mechanism through which individuals and businesses exposed to losses can engage in risk reduction through pooling. The actuarial, underwriting and related expenses involved in risk pooling constitute a main element of value added in insurance.
2. Real financial services relating to insured losses: Insurers provide a variety of real services such as financial planning and counselling, risk surveys, loss prevention services etc.
3. Intermediation: Insurers issue debt contracts and invest the funds until they are withdrawn by policyholders or used in claim settlements. The net interest margin between the rate of

return earned on invested assets and the rate credited to policyholders reflect the value added from the intermediation function.

Insurance firms thus create value by providing risk-pooling and risk-bearing, and providing 'real financial services for policyholders and intermediation. The outputs can be identified by identifying the sources of operating costs. If an industry is competitive, operating costs represent the amounts that consumers are willing to pay for these services. Operating costs of insurance firms typically comprise commissions paid to agents, personnel costs for functions other than investments and sales, and investment expenses.

This study uses three output and price measures to capture the different services provided by European insurance firms. The first insurance output is the total value of incurred insurer losses) and the second output is present value of insurance policy claims. Consistent with prior research, we use the present value of losses incurred insurers and real financial services relating to insured losses, approximated by the incurred benefits plus additions to reserves (e.g. Cummins and Weiss, 2000). Losses incurred measures the total amount of losses expected to be distributed by the insurers as a result of their providing insurance coverage for a given year, so it is a good proxy for the amount of risk pooling conducted. This measure is also used as a proxy for the provision of real services by prior US researchers, and, because major lines of insurance business differ in types of contingent events that are covered and differ in terms of the relative importance of risk pooling, risk bearing, intermediation and real services, U.S. studies tend to use a combination of output variables by line of business. For example, Cummins et al. (1999a) and Cummins and Xie (2008) define multiple output variables, reflecting each of the major lines of business offered by life insurers.

A second output variable approximates the real financial services relating to incurred losses. Financial planning and administration costs European insurance firms are heavily regulated at

the product distribution level. However, except for the UK (e.g. Klumpes, 2004), no product line measure of this value added output is readily available.⁴

A third output, the quantity of intermediation services, is measured as the average of a firm's beginning and end of year invested assets. All output quantities are deflated to real values using the CPI.

5.3.2. Inputs

Following prior US based literature, this study defines and uses three sets of inputs: business services, labour, and equity capital. Relevant quantities are obtained by obtaining total operating expenses to proxy the inputs of sales, administrative and managerial staff, using the procedure described in Diacon et al. (2002, 449).

5. Empirical Tests

This section first presents summary statistics on the characteristics of the firms in the sample and the results of the DEA analysis. Next the results of a panel regression analysis are presented. The analysis of the relationship between M&A and acquiring and target firms is then conducted based on multinomial logit regressions for the sample of European general insurance firms.

5.1. Descriptive statistics

Table 2 reports the main statistical difference between acquirers and non-acquirers for the extended pre-crisis two decade period 1997-2007 (i.e. to analyse change in efficiency for the 3 years prior to and after the intense consolidation period) as well as the post-crisis decade period 2008-2016.

⁴ An alternative procedure, but not reported, and consistent with Diacon et al. (2002, 449) this study also uses net earned life premiums to proxy for output, i.e. as the quantity of real services. While it is recognised that this measure is problematic for long-tail non-life and pensions business lines where there is substantial delay between the collection of premiums and provision of services, it is used here since most of the real services are heavily regulated and hence are usually provided 'upfront'. The overall results are not significantly different from those based on the losses incurred approach.

The univariate t-test efficiency scores provide preliminary evidence (i.e. without controlling for the effect of other factors) which suggest that acquiring firms do (not) have significantly higher technical efficiency and pure efficiency than non-acquiring firms in the post (pre) financial crisis periods. The evidence (does not) support the second (first) hypothesis that insurance M&A transactions generally involve acquirers buying technically inefficient firms.

INSERT TABLE 2 ABOUT HERE

5.2. Regression Analysis of Efficiency

To analyze both total and pure technical efficiency while controlling for other differences between acquiring firms, and the control groups of non-M&A firms, regressions are estimated with efficiency changes as dependent variables and firm characteristics as independent variables. The independent variables include size (log of assets), and organizational form (a dummy variable equal to 1 for general insurance and zero for life insurance firms). To determine whether acquisitions improve firm efficiency, we include a dummy variable equal to 1 if the firm was not acquired during the period and zero otherwise.

The two sample periods for the regressions is firstly for the pre-financial crisis period fixed decade year block 1997-2007; and for the post-financial period the fixed nine year block 2008-2016. This compares with the moving five year blocks used by Cummins et al. (1999) and Cummins and Xie (2007). Relative to a five year moving block, a fixed twenty year pre and ten year post block permits a more directly comparable measurement of the change in efficiency over a period encompassing both the beginning from EU harmonisation and monetary convergence rules coming into effect and up to three years prior to the acquisition year (t-3) and ending three years after the acquisition year (t+3). Table 3 reports the OLS regression results.

INSERT TABLE 3 ABOUT HERE

The control variables in both sets of regressions reveal that larger firms experienced significantly higher efficiency changes than smaller firms. The differences in technical change could provide further evidence that these insurance firms operate in less complex and less risky lines of business that may provide fewer opportunities for technological gains.

An important finding in the regressions is that acquiring continental European firms experienced significantly higher changes in technical efficiency than did UK firms during the pre-financial crisis period. By contrast, the UK dummy is positive and statistically significant for the post-crisis period, while acquirers experienced significantly more positive benefits in terms of the change over time. A possible explanation for this finding is that technological advances in data transmission and communications may provide more opportunities for improving efficiency for non-UK firms that are relatively less diversified geographically than UK firms. An alternative explanation is that the implementation of the EU regulations had a less detrimental impact on the existing strategic business models of UK firms, relative to non-UK firms.

5.3. Logistic regression analysis of the probability of acquisition

The logistic regression analysis of the probability that a firm becomes an acquiring firm is presented in Table 4. Consistent with Cummins and Xie (2005) and Cummins et al. (1999, 354), we use a dummy dependent variable set at 0 for non-acquiring firms and equal to 1 for acquiring firms. Acquiring firms are included in the logistic regression analysis only in the year of their acquisition. Non-M&A firms are included for all sample years (1997-2007 - pre-crisis; and 2008-2016 – post crisis).

INSERT TABLE 4 ABOUT HERE

The regression models include several explanatory variables to test the hypotheses discussed in Section 2 along with control variables. To test the hypothesis that efficient firms are acquirers or attractive acquisition targets, we include only one type of efficiency ratio in each equation. Positive coefficients on one or more of the efficiency variables would support our hypothesis.

Following the equivalent analysis in Cummins and Xie (2005), several variables are included in the equations to test the hypothesis that financially vulnerable firms are more likely to be acquisition targets. The ratio of equity capital to assets is used to measure the adequacy of the firm's capitalization. The ratio of net operating cash flow to assets as a measure of the adequacy of funds to invest in new projects is also included. As a liquidity ratio, a ratio of cash and invested assets to liabilities is used. Additionally, the tables report as control variables the loss reserve as a proportion of premiums, net income as a percentage of premiums, and the percentage of equity investments. Consistent with Cummins et al. (1999, 355), all of these variables are expected to be positively related to being an acquirer and inversely related to the probability of being an acquisition.

A dummy variable equal to 1 is included for firms based in each of the seven major European insurance markets and zero otherwise to test for country based effects. As control variables, consistent with prior research, the log of assets is used to capture size effects.

The logistic regression results (see Table 4) provide statistically significant support for the first hypothesis that more technically efficient insurance firms in the pre-crisis period. The survivor dummy variable is also positive and statistically significant, suggesting that survivors are more likely to be acquirers in the pre-crisis period. Further, both technical and pure technical efficiency variables are positively related to the probability of acquisition in both the pre and post crisis periods. This result supports the second hypothesis, and is consistent with those reported by Cummins et al. (1999, 354) and Cummins and Xie (2007).

The log of assets, the life insurance dummy, the percentage of equity investments and the UK dummy is also positively related to the probability of being an acquirer in both pre and post-crisis periods. This supports the view that acquiring firms tend to be relatively large, life insurers, engage in risky investments and are UK firms.

6. Conclusion

This paper evaluates whether the European Union's efforts to develop more uniform solvency, financial reporting and cross-registration rules in the mid-1990s improved the technical efficiency of firms engaging in M&A in the UK and other major European insurance markets. We further examine technical and pure technical efficiency scores for both the pre-crisis and post-crisis periods. Supporting the predictions of the first hypothesis, technical efficiency gains are significantly higher than for non-acquiring firms in the pre-crisis period.

These results are also consistent with the predictions of the second hypothesis concerning the survivorship principle, i.e. similar factors explain the probability of being an acquirer in the post-crisis period. Additionally, for both the pre-crisis and post-crisis periods, we find that larger firms, life insurers, UK firms and firms engaging in risky investments, to become acquisition firms, acquiring life and non-life firms tend to be relatively large. Moreover, our empirical results support the impact of M&A activities for firms operating in the major European markets in order to exploit the technical efficiency benefits allegedly arising from harmonisation and deregulation associated with the monetary and insurance regulation benefits of EU integration.

We therefore conclude that mergers and acquisitions in the major European insurance markets during a period of monetary convergence and harmonisation in regulation appears to be driven for the most part by diversification objectives. Further, we find that acquiring firms are

more likely to benefit from technical efficiency gains associated with takeover activity post the financial crisis.

The scope of our analysis and their implications is restricted to the period of regulatory harmonisation and concurrent M&A activities following the implementation of the Single European market, and subsequently the post-crisis period for surviving firms. Further harmonisation resulting from the eventual implementation of Solvency II may lead to a further period of industry consolidation, and the competitive landscape would change even more profoundly if the EU treaty was revised to prevent certain jurisdictions from offering tax-free products relative to other countries. Due to restrictions of our original aims and objectives, we have also not considered the impact of newly developed solvency requirements and the reduction in information asymmetry that may arise from greater transparency and harmonisation in risk-based solvency and accounting requirements. Finally, due to the evolution of insurance accounting rules over the extended study period (e.g. IFRS 4 – Insurance Contracts, which allowed insurers to use a wide variety of accounting practices for insurance contracts), we have not been able to extend the analysis to address further motivations for M&A related to microeconomic theory which posits that acquiring firms are profit maximizers by minimizing costs and maximizing revenues (Cummins and Weiss, 2013). Therefore, it is plausible that many acquiring firms in the industry have been successful in exploiting their technical gains effectively in order to create value for shareholders and policyholders, thereby providing a further motivation for continued consolidation. Further research is needed to examine these issues.

List of References

- Banker, R. D., Morey, V. 1986. The use of categorical variables in Data Envelopment Analysis, *Management Science* 32 (10), 1613-1627
- Banker, R. D., Natarajan, R. 2001. Evaluating contextual variables affecting productivity using Data Envelopment Analysis”, *Working Paper UT at Dallas*.
- Banker, R. D., Natarajan, R. 2004. Statistical tests based on DEA efficiency scores. In W. W. Cooper, L. M. Seiford and J. Zhu (Eds.), *Handbook on Data Envelopment Analysis*, Kluwer Academic Publishers, Boston, 299-321.
- Barros, C.P., Barroso, N., Borges, M.R., 2005. Evaluating the efficiency and productivity of insurance companies with a Malmquist index: A case study for Portugal. *Geneva Papers on Risk and Insurance* 30, 244-267.
- Barros, C., Nektarios, M. and Assaf, A., 2008. Efficiency in the Greek insurance industry. *European Journal of Operations Research* 205, 431-436.
- Baum, C. 2006. *An Introduction to Modern Econometrics using STATA*, Texas, Stata Press
- Berger, A.N., Humphrey, D.B., 1997. Efficiency of financial institutions: International survey and directions for future research. *European Journal of Operational Research* 98, 175–212
- Campbell, C.J., Goldberg,L., Rai,A., 2003. The Impact of the European Union Insurance Directives on insurance company stocks, *Journal of Risk and Insurance*, 70 (1): 125-167.
- Cooper, W.W., Seiford L.M. Tone, K. 2006. *Introduction to Data Envelopment Analysis and its Uses*, Springer Science, New York.
- Cummins, J.D., Weiss, M. 2000. Analyzing firm performance in the insurance industry using frontier efficiency and productivity methods. In Dionne,G. (Ed) *Handbook of Insurance* , Kluwer Academic Publishers, Boston.
- Cummins, J.D., Weiss, M. and Klumpes, P.J.M. 2015. Mergers and acquisitions in the Global Insurance Industry: Information Asymmetry and Valuation Effects.*Geneva Papers on Risk and Insurance: Issues and Practices* 40(3): 444-473.
- Cummins, J.D, 1999. Efficiency in the US life insurance industry: Are insurers minimizing costs and maximizing revenues? In Cummins, J.D, Santomero A.M. (Eds) *Changes in the life insurance industry: efficiency, technology, and risk management* pp. 75-115, .Kluwer Academic Publishers, Norwell, Massachusetts.
- Cummins, J. D, Weiss, M.A., Zi,H.1999a. Organizational form and efficiency: The coexistence of stock and mutual property-liability insurers, *Management Science*, 45, 9, 1254-1269.

Cummins, J.D., Rubio-Misas, M. 2003. Deregulation, consolidation and efficiency: Evidence from the Spanish insurance industry. Brookings Papers.

Cummins, J.D., Tennyson, S., Weiss, M.A.. 1999b. Consolidation and efficiency in the US life insurance industry. *Journal of Banking and Finance* 23: 325-357.

Cummins, J. David, Mary A. Weiss, 2000. Analyzing firm performance in the insurance industry using frontier efficiency and productivity methods, in *Handbook of Insurance*, ed by Georges Dionne, Kluwer, Massachusetts.

Cummins, J. David and Mary A. Weiss, 2004, "Consolidation in the European Insurance Industry: Do Mergers and Acquisitions Create Value for Shareholders," *Brookings-Wharton Papers on Financial Services* (2004 edition).

Cummins, J.D., Rubio-Misas, M., Zi, H., 2004. The effect of organizational structure on efficiency: Evidence from the Spanish insurance industry. *Journal of Banking and Finance* 28, 3113–3150.

Cummins, J.D. and Xie, X. 2008. Mergers and acquisitions in the US property-liability insurance industry: Productivity and efficiency effects, *Journal of Banking and Finance* 32: 30-55.

Cummins, J.D. and B. Venard. 2008. *Handbook of International Insurance: Between Global Dynamics and Local Contingencies*. Springer: New York.

Cummins, J.D., M. Weiss and P.J.M. Klumpes. 2015. M&A in the global insurance industry: information asymmetry and valuation effects. *Papers on Risk and Insurance: Issues and Practices* 40(3): 444-473

Cummins, J.D. and M.A. Weiss. 2013. Analyzing firm performance in the insurance industry using frontier efficiency and productivity methods. In G. Dionne, ed. *Handbook of Insurance* New York: Springer.

Diacon, S.R., Starkey, K, O'Brien, C. 2002. Size and efficiency in European long-term insurance companies: An international comparison, *The Geneva Papers on Risk and Insurance*, 27(3), 444-466.

Diacon, S.R., K., Starkey, C. O'Brien, Odindo, C. 2005. Strategies, size and success in UK long-term insurance. *Insurance Research & Practice*, 20 (1), 5-15.

Eling, M. And M. Luhn. 2010. Frontier efficiency methodologies to measure performance in the insurance industry: overview, systematization and recent developments. *Geneva Papers on Risk and Insurance: Issue and Practice*, 35(2): 217-265.

Fenn, P., D. Vencappa, Diacon, S.R, Klumpes, P., O'Brien, C. 2008. Market structure and the efficiency of European insurance companies: A Stochastic Frontier Analysis. *Journal of Banking and Finance*, 32, 86-100.

- Hardwick, P., 1997. Measuring cost inefficiency in the UK life insurance industry. *Applied Financial Economics* 7, 37–44.
- Hussels, S., Ward, D.R., 2007. The impact of deregulation on the German and UK life insurance markets: An analysis of efficiency and productivity between 1991–2002, Cranfield University Management Research Paper Series, No. 4.
- Kaufmann, D., Kraay A., Mastruzzie, M. 2006. Governance matters V: aggregate and individual governance indicators for 1996-2005, www.govindicators.org.
- Keynes, J. M. 1936. *The General Theory of Employment Interest and Money*, London, Macmillan.
- Klumpes, P. 2004. Performance benchmarking in financial services: Evidence from the UK life insurance industry, *Journal of Business*, 77, 2, pp. 257-274.
- Klumpes, P. 2005. Managerial use of discounted cash-flow or accounting performance measures, *Geneva Papers on Risk and Insurance* 30(1).
- Klumpes, P., D. Cummins and M. Weiss. 2012. M&A in the global insurance industry: information asymmetry and valuation effects. Mimeo.
- Klumpes, P., Diacon, S., Fenn P., O'Brien, C. 2006. European Insurance Markets: Recent Trends and Future Regulatory Developments, in D. Cummins and V. Bernard, *Insurance Markets*, Kluwer.
- Lensink, R. Meesters, A. 2007. Institutions and bank performance: A stochastic frontier analysis, Working Paper. Center for International Banking, Insurance and Finance (CIBIF), University of Groningen. <http://ssrn.com/abstract=965825>
- Lien, L.B. and P.G. Klein. 2012. Can the survivorship principle survive diversification? *Organization Science*....
- Rhoades, S.A. 1998. The efficiency effects of bank mergers. An overview of case studies of nine mergers. *Journal of Banking and Finance*, 22 (3) , 273-291.
- Nektarios, M. And C.P. Barros. 2010. A malmquist index for the Greek insurance industry. *Geneva Papers on Risk and Insurance: Issues and Practice* 35(2): 309-324.
- Sheffrin, S. 1996. *Rational Expectations* (2nd Ed.) Cambridge University Press, UK.
- Swiss RE, 2000. 'World Insurance in 1999: Soaring Life Insurance Business.', *Sigma*, No. 9
- Williamson. O. 1985. *The Economic Institutions of Capitalism: Firms, Markets and Relational Contracting*, New York: The Free Press.

Table 1
Sample of Insurance Firms by Country and M&A Status

	France	Germany	Italy	Netherlands	Spain	Switzerland	UK	Total
<i>Panel A: Pre-crisis 1997-2007</i>								
Acquirers	17	16	14	14	15	4	13	93
Non-acquirers	62	93	29	33	35	34	93	379
Total	79	109	45	47	50	38	106	472
<i>Panel B: Post-crisis survivors 2008-2016</i>								
Acquirers	2	1	1	1	0	1	3	9
Non-acquirers	3	3	2	1	1	3	6	19
Total	5	4	3	2	1	4	9	28

Table 2
Summary Statistics for Surviving and Non-Surviving firms, 1997-2016

Panel A: Pre Financial Crisis 1997-2007 (n = 2360)

	Non-surviing firms (2108)		Surviving firms (252)		T-test statistic
	Mean	Std. dev	Mean	Std dev.	
% equity/total invested assets	20.42	23.04	21.73	21.82	-1.24
Total assets (Euro million)	8542.45	11496.02	13181.97	17600.72	5.56***
Capital/total assets	0.15	0.15	0.16	0.14	-2.33**
Loss reserves /premium earned	2.62	14.14	2.00	3.52	2.23*
%Equity invested/total nvested assets	20.42	23.04	21.73	21.82	-1.24
Technical efficiency	0.24	0.21	0.24	0.21	-0.07
Pure Technical efficiency	0.33	0.29	0.32	0.24	0.25

Panel B: Post Financial Crisis Survivors 2008-2016 (n=252)

	Non-acquiring firms (180)		Acquiring firms (72)		T-test statistic
	Mean	Std. dev	Mean	Std dev.	
% equity/total invested assets	78.73	14.33	85.51	7.52	-3.81***
Total assets (Euro million)	8542.45	11496.02	13181.97	17600.72	5.56***
Capital/total assets	0.09	0.08	0.08	0.07	0.59
Loss reserves /premium earned	10.11	15.01	11.65	9.41	-0.81
%Equity invested/total nvested assets	78.73	14.33	85.51	7.52	-3.81***
Technical efficiency	0.36	0.10	0.52	0.32	-4.55***
Pure Technical efficiency	0.19	0.29	0.23	0.16	-2.43**

Table 3
Regression Models of Efficiency for Survivors and Non-Survivors

	Pre-Crisis		Post-Crisis	
	TE	PTE	TE	PTE
Survivor (pre only)	-0.026 (0.007)***	-0.043 (0.010)***		
Acquirer	-0.028 (0.007)***	-0.036 (0.011)***		
Ln(assets)	0.010 (0.002)***	0.010 (0.003)***	0.011 (0.009)	0.061 (0.010)***
Equity PCT	-0.001 (0.001)**	-0.001 (0.002)***	0.005 (0.001)***	0.008 (0.002)***
Capital TA	-0.546 (0.025)***	-0.708 (0.036)***	-0.016 (0.002)***	-0.010 (0.002)***
Premium/surplus ratio	0.005 (0.004)***	0.005 (0.005)***	0.003 (0.001)**	0.003 (0.014)**
UK dummy	-0.056 (0.009)***	-0.045 (0.012)***	0.149 (0.028)***	0.075 (0.031)**
Life business dummy	-0.199 (0.008)***	-0.248 (0.012)***	-0.246 (0.026)***	-0.172 (0.030)***
Constant	0.311 (0.021)***	0.355 (0.029)**	0.136 (0.114)	0.270 (0.131)**
No.of obs.	2360	2360	252	252
Adjusted R-square	0.317	0.254	0.602	0.621

Note: The dependent variable in the equations is TEM = Technical efficiency change, Tech = Technical change. TFP = total factor productivity change,

Standard errors are presented below the estimated coefficients.***Significant at 1% level** Significant at 5% level* Significant at 10% level

Table 4
Logistic Regressions of the Probability of Being an Acquirer in year t

	Pre-Crisis		Post-Crisis	
	TE	PTE	TE	PTE
Survivor dummy (pre only)	0.320 (0.04)***	0.36 (0.05)***		
Life dummy	0.442 (0.10)***	-0.49 (0.11)***	0.30 (0.22)*	0.19 (0.12)***
Efficiency _{t-1}	0.129 (0.08)***	0.28 (0.11)***	0.13 (0.16)**	0.14 (0.18)***
Capital _{t-1} /assets _{t-1}	0.411 (0.26)	0.73 (0.46)	1.17 (0.06)***	1.19 (0.06)***
Ln(assets)	1.269 (0.059)***	1.30 (0.07)***	0.60 (0.14)**	0.40 (0.10)***
Loss reserve/premium ratio _{t-1}	1.001 (0.01)	1.00 (0.02)	1.01 (0.02)	1.01 (0.02)
Pct Investment in stock	0.996 (0.023)**	0.99 (0.01)**	1.16 (0.05)***	1.14 (0.05)***
UK dummy	0.182 (0.052)***	0.17 (0.05)***	0.13 (0.09)***	0.16 (0.11)***
Intercept	0.261 (0.11)***	-5.21 (0.74)***	0.01 (0.01)**	-0.01 (0.01)***
No. of observations	2052	1420	252	252
Log-likelihood	179.86	235.12	146.67	160.36

Note: Standard errors are presented below the estimated coefficients

***Significant at the 1% level

** Significant at the 5% level

*Significant at the 10% level

Figure 1
Trends in Number of Registered Insurance Companies Europe 1998-2017

