Do M&As in the EU banking industry lead to an increase in performance?

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Abstract

This paper investigates whether M&A operations influence the performance of banks. Using a sample of 714 deals involving EU acquirers and targets located throughout the world over the period 1991-2005, we investigate whether M&A operations are associated with improved performance (measured using both standard accounting ratios and cost and alternative profit X-efficiency measures). Despite the extensive and ongoing consolidation process in the banking industry, we find that M&A operations are associated with a slight deterioration in return on equity, cash flow return and profit efficiency and with a marked improvement in cost efficiency. Hence, the improvements in cost efficiency appear to be transferred to bank clients. These changes in performance are directly attributable to the M&A operations, and would not have occurred in their absence. Moreover, these changes exhibit a particularly negative trend for cross-border deals to testify the importance of geographical relatedness in order to achieve better post-M&A performance. The environmental and bank-characteristics that make a deal successful or unsuccessful are finally identified.

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1 Introduction

This paper investigates the effect of mergers and acquisitions on the performance of banks and explores the sources of any merger-induced changes in performance. It is motivated by the relative dearth of empirical evidence on the impact of mergers and acquisitions involving European banks. Overall the handful of studies on merger and acquisition (M&A) activities in the EU banking industry provides mixed results. For instance, Altunbas and Ibanez (2004) report that bank mergers taking place in the EU banking industry between 1992 and 2001 do lead on average to improved accounting profitability. Altunbas, Molyneux, and Thornton (1997) provide empirical evidence suggestive of limited opportunities for cost savings from large mergers in the banking industry. Vander Vennet (2002) reports a limited improvement in profit efficiency but not in cost efficiency with reference to cross-border deals only.

This inconclusive evidence appears counterintuitive given that an intensive process of M&A operations transformed the banking industry in the US over the last decades (DeLong and DeYoung, 2007), and that the pursuit of a further integration trough cross-border M&A operations in retail banking is one of the main objectives pursued by the European Central Bank in the EU (Trichet, 2007). The main aim of our paper is to use a comprehensive approach, involving cost efficiency, profit efficiency, and accounting ratios, in order to test directly whether M&As involving European banks did lead to improvements in performance between 1991 and 2005.

To our knowledge, this is the first study involving a large sample of EU acquiring banks in deals with target banks located throughout the world (including, among the others, US and EU banks). None of the previous studies compare the evidence from all the performance measures (accounting ratios, cost efficiency and profit efficiency). None of the existing studies disentangle the total change in performance into the part due to the M&A operation itself and the part that would have occurred anyway. Our paper therefore aims to investigate the impact of M&A operations on accounting

1

profitability measures and on (cost and alternative profit) X-efficiency for a large sample of 714 deals with EU acquirers and targets located in any country of the world over the period 1991-2005. In particular, it extends and integrates the existing literature by enlarging the geographical coverage of the sample, by contemporaneously testing several performance measures, and by distinguishing the part of the change in performance due to the M&A itself.

In spite of the extensive and ongoing consolidation process in the banking industry, we find that M&A operations are associated with a slight deterioration in return on equity, cash-flow returns, and profit efficiency and a pronounced improvement in cost efficiency in a period of 5 to 6 years following the deals. Hence, the improvements in cost efficiency appear to be transferred to bank clients rather than to bank shareholders. Interestingly, these changes in performance are directly attributable to the M&A operations and would not have occurred in the absence of any M&A operation. Moreover, these changes exhibit a particularly negative trend for cross-border deals: in domestic deals, cost efficiency improves more markedly than in cross-border deals whilst returns on equity and profit efficiency remain unchanged instead of diminishing. This highlights the importance of geographical relatedness in order to achieve better post-M&A performance. Finally, in the years before the M&A operation, target banks exhibit weaker performance than acquirers in terms of profit efficiency, cash-flow returns, returns on equity, personnel expenses and operating costs. Besides, banks involved in M&A operations (both acquirers and targets) are more efficient and profitable than their peers not involved in M&A operations.

Furthermore, an important set of institutional, regulatory, bank-specific and deal-specific variables has a significant influence on changes in cost and profit efficiency. The management of acquiring banks should tend to direct investments to those countries that guarantee better regulatory quality together with higher freedom from government. Moreover, to achieve positive changes in efficiency in the medium-term, transactions should be paid in equity (not in cash) and result in a combined bank with a higher focus on traditional banking activities.

Finally, a number of bank and environmental characteristics make a deal successful or unsuccessful. A higher likelihood of an unsuccessful M&A (in terms of profit efficiency) is associated with larger size and equity capital of the acquirer, a higher risk (of both the acquirer and the target), a larger diversification of the target, a higher freedom from government and regulatory quality in the country of the acquirer, and a lower regulatory quality in the country of the target. A higher likelihood of an unsuccessful M&A (measured in terms of cost efficiency) is associated with smaller size of the acquirer, a

smaller equity capital of the acquirer, and a higher loan loss provision (of both the acquirer and the target).

The paper is organised as follows. Section 2 provides a literature review and notes the motivation for our study. Section 3 outlines the methodological approach, and illustrates the sample and data. Finally section 4 describes the empirical results, and section 5 concludes.

2 Literature and motivations

Surprisingly, the available empirical evidence suggests that M&A operations in the US banking industry have not had a positive influence on performance (DeLong and Deyoung, 2007; Amel, *et al.*, 2004; Berger, Demsetz, and Strahan, 1999). Overall these studies provide mixed evidence and many fail to show a clear relationship between M&As and performance. Some of the previous literature has examined the impact of M&A operation on cost efficiency as measured by simple accounting cost ratios (Rhoades, 1990, 1993; Pilloff, 1996; DeLong and DeYoung, 2007), the impact on cost X-efficiency (Berger and Humphrey, 1992; DeYoung, 1997; Peristiani, 1997; Berger, 1998; Rhoades, 1998), the impact on profitability ratios such as ROE and ROA (Berger and Humphrey, 1992; Pilloff, 1996; Knapp *et al.*, 2006; DeLong and DeYoung, 2007), and the impact on profit X-efficiency (Akhavein *et al.*, 1997; Berger, 1998). Neither the earlier studies nor more recent analysis find evidence of clear positive effects of M&A operations on the performance of US banks.

Most of the empirical evidence on the impact of M&A operation on X-efficiency relates to the US banking sector and to the estimation of cost efficiency only. The evidence shows that very minor or absent improvements in cost X-efficiency were achieved by M&A operations during the '80s (De Young, 1997; Peristiani, 1997). By using a thick frontier approach on a sample of 348 deals, DeYoung (1997) finds that 58% of the banks in the sample generated cost efficiency. Interestingly, mergers in which the acquiring bank had recent experience with acquisitions were more likely to generate post-merger cost efficiency gains. As regard to 4,900 transactions occurred between 1980 and 1990, Peristiani (1997) suggests that acquirers failed to improve X-efficiency after the merger, but acquiring banks experienced moderate gains in scale efficiency relative to a control sample. As regard to the '90s, there is mixed empirical evidence (Rhoades, 1998; Berger, 1998). For nine deals involving relatively large banks during the early 1990s, Rhoades (1998) finds that four of the nine mergers were clearly successful in improving cost X-efficiency but five were not, although all nine of the mergers resulted

in significant cost cutting. For deals involving both large and small banks from 1990 to 1995, Berger (1998) instead finds very small improvements in cost X-efficiency.

Although most of the studies focus on cost efficiency, few attempts have been done to estimate the effects on profit efficiency for US banks (Akhavein *et al.*, 1997; Berger, 1998). By investigating US "megamergers" (i.e. both partners with more than $1 billion in assets) over the period 1980-1990, Akhavein *et al.* (1997) find improvements in profit efficiency (+16% in comparison with other big banks). Most of the improvement comes from a better risk diversification and increased revenues, including a change in the output composition from securities in the bank portfolio to loans. The highest improvement is recorded for the banks with the lowest efficiencies prior to the merger, which therefore had the greatest capacity for improvements. Berger (1998) finds similar results in a study that includes all US bank mergers, both large and small, from 1990 to 1995.

The handful of studies on the M&A activities in the EU banking industry also seem to conclude that performance improvements are seldom realised. These studies have examined the impact of M&A operation on cost X-efficiency (Vander Vennet, 1996, 2002; Altunbas, Molyneux and Thornton, 1997), the impact on profitability ratios such as ROE and ROA (Vander Vennet, 1996; Altunbas and Ibáñez, 2004), and the impact on profit X-efficiency (Huizinga *et al.*, 2001, Vander Vennet 2002). Altunbas, Molyneux and Thornton (1997) estimate a hybrid translog cost function for a pooled sample of French, German, Italian and Spanish banks for 1988 only. Their results suggest only limited opportunities for cost savings from big-bank mergers, and instead an increase in total costs appears more likely. With regard to a sample of 492 M&A operations related to EU banks over the period 1988-1993, Vander Vennet (1996) shows that domestic mergers among equal-sized partners significantly increase the accounting profitability of the merged banks, whereas improvements in cost efficiency are observed only for cross-border acquisitions (and not for domestic operations). Domestic takeovers are found to be influenced predominantly by defensive and managerial motives such as size maximization. For a small sample of 52 bank mergers over the period 1992-1998, Huizinga *et al.* (2001) find that the cost efficiency of merging banks is positively affected by the deal, while the relative degree of profit efficiency improves only marginally. In a specific focus on cross-border deals among EU banks, Vander Vennet (2002) refers to a sample of 62 operations executed by banks headquartered in the EU, Norway and Switzerland between 1990 and 2001. In the short period after the deal, he finds a limited improvement in profit efficiency, but no improvement in cost efficiency. His analysis also reveals large differences in the cost and profit effi-

4

ciency of the acquirer and target pre-deal. Altunbas and Ibáñez (2004) with regard to 262 deals taking place in the EU banking sector between 1992 and 2001 find that, on average, bank mergers resulted in improved accounting profitability (ROE).

Several explanations for this puzzling evidence have been provided: absence of best-practices guidelines for planning and executing increasingly large and complex acquisitions (DeLong and DeYoung, 2007), failure in considering the mean-reversion behaviour in industry-adjusted performance (Knapp *et al.*, 2006); longer time (up to five years) needed to realise efficiency gains, mergers and acquisitions leading to more favourable prices for consumers (Focarelli and Panetta, 2003), difficulties in integrating broadly dissimilar institutions (Altunbas and Ibáñez 2004; Vander Vennet, 2002), increased costs associated with changes in post-merger risk profiles and business strategies (Demsetz and Strahan, 1997; Hughes *et al.*, 1999).

Nevertheless all the above studies just refer to the overall change in performance by comparing in a dynamic analysis (according to the definition by Berger, 1998 and 1999) the post-M&A performance with the pre-M&A performance. However, some of this difference could be due to a continuation of firm-specific performance before the merger or to economy wide and industry factors, as stated by Healy *et al.* (1992). Healy *et al.* (1992) however do not specifically investigate the banking industry and just refer to the impact on operating cash flow returns of the 50 largest US mergers over the period 1979 and 1984.

In short, none of the above studies consider a large sample of EU acquiring banks involved in deals with target banks located throughout the world; none compare the evidence from all the performance measures; and none disentangle the total change in performance into the part due to the M&A operation itself and the part that would have occurred anyway. Our paper therefore aims to extend and integrate the existing literature by enlarging the geographical coverage of the sample, by contemporaneously testing several performance measures, and by distinguishing the part of the change in performance due to the M&A itself. These elements constitute the main novelties of this analysis.

3 Methodology

Our study uses a variety of ways to investigate the relationship between bank performance measure in the pre- and post- deal period. The initial approach to test this relationship follows the traditional banking literature on M&A and performance measures (reviewed above). By conducting ANOVA tests,

we thus compare:

1. Performance measures for target and acquirer in the pre-M&A period;

2. Performance measures for banks involved in M&A operations and banks not involved in any M&A operations.;

3. Performance values post-merger for combined banks resulting from the M&A deal and weighted averages of the performance measures of the targets and acquirers prior to the M&A deals (with total assets as weights).

In order to take into account the fact that any performance measure can be affected by both bank-specific influences and industry-wide trends, we introduce industry-adjusted measures. This industry-adjusted performance measure, also referred to as abnormal performance, is derived as the difference between the performance measure for each M&A bank minus the (average) performance of the industry control sample (all other banks never involved in any M&A operations, matched on the basis of the country of the M&A bank and the year under investigation).

Performance measures used in this paper refer either to accounting profitability measures (estimated by annual ROE and cash flow returns) or to global measures of operational efficiency (estimated by both cost and alternative profit X-efficiency). The statistical significance of the industry-adjusted figures is based on t-statistics, and on the non-parametric Wilcoxon test to assess the significance in the case of non-normality. To ensure that industry-adjusted figures are not driven by outliers, the portion of positive cases is also reported. The dynamic analysis covers a medium-long term period either starting six years before and ending six years after a deal (6B-6A) or starting three years before and ending three years after (3B,3A). For each of the years surrounding the deal, we calculate the mean value of the relevant ratios for the banks involved. For accounting ratios we also calculate median values, as they are more susceptible to outliers. The year of the deal itself is left out of the analysis as it can be considered as a transition period strongly affected the accounting practices regarding M&As.

The measure of the change in performance – as described here above - provides some informative (but not conclusive) evidence about the impact of M&A operations on performance. The difference in the performance prior- and after- the deal, could also be due to economy-wide and industry factors, or the continuation of firm-specific performance before the operation (Healy *et al.*, 1992). Accounting measures typically move to the industry mean in a process known as mean reversion (Fama and French, 2000; Knapp *et al.*,

2006). To further investigate the relationship between pre- and post- deal industry-adjusted performance, we hence split the overall change into its several determinants by using the following cross-sectional regression:

$$AdjPer_{M\&A,post} = \alpha + \beta AdjPer_{M\&A,pre} + \varepsilon \qquad (1)$$

where $AdjPer$ is the average annual industry-adjusted performance for each M&A (as previously noted, performance measures are both accounting values and X-efficiency estimation). $AdjPer_{M\&A,post}$ refers to the post-M&A period (i.e. to each of the 6 years after the deal), whereas $AdjPer_{M\&A,pre}$ refers to pre-M&A period, known as base period, which represents the weighted average of the performance measure of the target and acquirer in the 3 years (or alternatively in the 6 years) prior to the M&A.

Following the interpretation of Healy *et al.* (1992), the slope coefficient β captures any correlation in performance between the pre- and post- M&A years so that $\beta AdjPer_{pre,M\&A}$ measures the effect of the pre-M&A performance on the post-M&A performance. The intercept α is therefore independent of pre-M&A performance and hence measures the impact of the M&A operation on performance.

Note that in order to investigate the size effect on the variation in performance determined by the M&A, we use the following OLS regressions:

$$AdjPer_{M\&A,post} = \alpha + \beta AdjPer_{M\&A,pre} + \gamma Size_{A,pre} + \delta Size_{T,pre} + \varepsilon \quad (2)$$

Furthermore, to control for the determinants of the change in performance, several regulatory, bank-specific and deal-specific variables are used as control variables. The estimated regression equation is:

$$AdjPer_{M\&A,pre\,vs\,post} = \alpha + \lambda \left(CV_{A,pre}, \; CV_{T,pre}, \; CV_{C,post} \right) + \varepsilon \qquad (3)$$

where CV are the control variables:

1. deal-specific: dummy for the year of the deal announcement (either before or after year 2000), dummy for cross-country and domestic deals, dummy for the method of payment (cash vs. equity);

2. bank-specific: size (where size is measured as the natural logarithm of total assets) of acquirer (A), target (T), and combined bank resulting from the deal (C); risk of the business (where risk is measured by the standard deviation of ROE) of acquirer, target, and combined bank;

proportion of traditional banking (measured by loans/total assets) for acquirer, target and combined entity[1];

3. regulatory and institutional (of the countries of the acquirer and target): freedom from government (defined to include all government transfers and state-owned enterprises), regulatory quality (the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development), concentration index of the banking industry (total value of assets of the five biggest banks).

Finally, to compare deals that work and those that do not work, we divide deals into successful and unsuccessful deals. Successful (unsuccessful) deals are deals in which the change in efficiency (measured as adjusted efficiency after the deal minus adjusted efficiency before the deal) is comprised in the first (fifth) quintile. The differentiation of successful and unsuccessful deals is based on the following characteristics of the acquirer and target: a) size (proxied by natural logarithm of total assets); b) capital (proxied by the normalised value of equity); c) risk (proxied by standard deviation of ROE); d) diversification (proxied by off-balance sheet / total assets); e) quality of loan portfolio (proxied by the normalised value of loan loss provision); f) freedom from government; g) regulatory quality; h) year of the deal announcement (before vs. after 2000).

3.1   Data set and sample

The data set is obtained by combining three sources: Thomson One Banker M&A for data on the M&A operations; Thomson Financial Datastream for prices of listed banks, benchmark, and economic indexes; Bankscope for balance sheet and profit and loss data of the banks involved in M&A operations (M&A sample) and of banks not involved (control sample).

The sample is limited to credit institutions as defined in the Second Banking Directive (excluded are deals involving securities firms, insurance companies, investment banks or finance companies). It comprises M&A deals announced between 1/1/1991 and 31/12/2005 in which the acquirer is a EU bank and the target is a bank operating in any country of the world. The initial M&A sample refers to 970 observations, but the final one contains 714

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[1]We also tested for other variables on bank-level characteristics: quality of loan portfolio (proxied either by total problematic loans or by loan loss provision) and equity capital. However these bank-level variables are not proven to be statistical significant either for cost or for profit efficiency changes.

deals (394 domestic and 320 cross-border transactions) for which full financial information about the participating banks is available. It is a unique sample, bigger than any other sample used for the analysis of M&A operations in the EU banking industry. Table 1 shows the total number of deals constituting the sample in each country and year, and the total panel under observation. Table 2 highlights the home country of target and acquirer in cross-border deals over the years under observation.

In any given year, the control sample consists of all banks – never engaged in any merger or acquisition over the life span of this study - that match the nationalities of the acquirers and targets during a specific year. As shown in Table 3, the control sample consists of 7,963 observations over the period 1991-2005. For any M&A deal, there is a control for both the acquirer and the target. By default, in the X efficiency studies, the control for any performance measure related to an acquirer (target) is the mean performance of all the banks in the same country than the acquirer (target), and same year. Accounting ratios however do exhibit significant skewness. In accounting studies, by default, the control for any performance measure related to an acquirer (target) is hence the median performance of all the banks in the same sector of activity than the acquirer (target), in the same country, and same year.

3.2   Accounting ratios as performance measure

This paper introduces two main accounting-based ratios in order to assess performance as far as shareholders are concerned: return on equity (ROE) and cash-flow return (CFR). A firm's ROE is defined by default as the ratio of net income over the book value of equity obtaining at the beginning of the financial year. This ratio relies on the properties of accrual accounting in order to assess performance. Whilst widely used, this ratio is however affected by the method of accounting for the acquisition or merger, by the method used to finance the M&A (cash vs shares) and by other discretionary accounting choices made by managers. Hence we also assess performance through cash-flow returns. A firm's cash-flow return is defined by default as the ratio of operating cash-flow over the market value of equity obtaining at the beginning of the financial year. The operating cash-flow is furthermore derived as net revenue (interest revenue, commission income, and trading income) less cost of generating revenues (interest expense, commission expense, and trading expense), less personnel expenses, and other administrative expenses. The cash-flow return performance measure, unlike return on equity, is unaffected by depreciation and goodwill. This market-based performance measure is however affected by changes in expectations about future cash-

flows. Because the market values used in the cash flow returns are affected by the M&A, we subtract the market premium from the market value of equity in order to measure performance following the M&A deal. Regardless of the performance measure used, we do exclude the year in which the acquisition or merger is taking place because of differences between the acquisition and merger methods in timing the consolidation of the acquirer with the target.

3.3   Operating efficiency as performance measure

In addition to traditional accounting ratios, we introduced a more advanced measure of operational productivity at the global level, the so-called X-efficiency (Leibenstein, 1966). It is generally accepted in the empirical banking literature that frontier analysis provides an overall, objectively determined, numerical efficiency value (known as X-efficiency) and ranking of firms that is not otherwise available (Berger and Humphrey, 1997). This attribute makes frontier analysis particularly valuable in assessing and informing government policy regarding financial institutions, particularly in the context of mergers and acquisitions.

X-inefficiency is a measure of managerial best practice, and represents the distance of the position of equilibrium of each bank from the optimal operative frontier. X-efficiency can be framed as:

1. Cost efficiency, which provides a measure of how close a bank is to the cost sustained by the best practice bank to produce a given mix of outputs (assuming that the banks are operating under the same conditions). A bank is said to be cost minimising when it consumes a lower quantity of inputs for the production of a given amount of outputs or, in other words, produces the same amount of outputs using less inputs and, in this way, enjoys a cost advantage;

2. Profit efficiency, which provides a measure of how close a bank is to the realisation of the maximum level of profit given its level of outputs (generally known as alternative profit X-inefficiencies). A bank is said to be profit maximising when it produces a greater quantity of outputs given the amount of inputs employed. It indicates that the bank produces more outputs (or outputs of a higher quality) using the same amount of inputs and, thus, is able to apply a price premium.

Following Berger and Mester (1997), we prefer to choose a parametric approach – as opposed to a non-parametric approach – as it is particularly effective in representing the concepts of cost and profit efficiency. We employ the standard Stochastic Frontier Approach (SFA) to generate estimates of

cost and alternative profit efficiencies for each bank over the years 1991-2005 along the lines first suggested by Aigner *et al.* (1977). Specifically, we employ the Battese and Coelli (1995) model of a stochastic frontier function for panel data with firm effects which are assumed to be distributed as truncated normal random variables ($\mu \neq 0$) and are also permitted to vary systematically with time (see for more details on the SFA methodology Coelli *et al.*, 1998).

The functional form for the frontier is a Fourier flexible (FF) form, which is a global approximation that dominates the conventional translog form. The characteristic of global approximation is particularly important in the case of the study of the effects of M&As on banks around the world, because the scale of banks, the diversification of their products and services and the levels of their inefficiency are often heterogeneous (see, for example, Gallant 1981; McAllister and McManus 1993; Mitchell and Onvural, 1996). It combines the stability of the translog specification around the average of the sample and the flexibility of the Fourier specification for the observations that are far from the average. The FF functional form, including a standard translog and all first- and second-order trigonometric terms, as well as a two-component error structure is estimated using a maximum likelihood procedure. This is specified as follows:

$$
\begin{aligned}
\ln TC = {} & \alpha_0 + \sum_{i=1}^{3} \alpha_i \ln Q_i + \sum_{j=1}^{3} \beta_j \ln P_j + \tau_1 T \; + \; \lambda_1 \ln E + \\
& + \tfrac{1}{2}\left[\sum_{i=1}^{3}\sum_{j=1}^{3} \delta_{ij} \ln Q_i \ln Q_j + \sum_{i=1}^{3}\sum_{j=1}^{3} \gamma_{ij} \ln P_i \ln P_j \; + \; \phi_{11} \ln E \ln E \right] + \\
& + \sum_{i=1}^{3}\sum_{j=1}^{3} \rho_{ij} \ln Q_i \ln P_j + \sum_{j=1}^{3} \kappa_{j1} \ln P_j \ln E \; + \; \sum_{i=1}^{3} \varsigma_{i1} \ln Q_i \ln E + \\
& + \sum_{i=1}^{3} \left[a_i \cos(z_i) \; + \; b_i \sin(z_i) \right] + \\
& + \sum_{i=1}^{3}\sum_{j=1}^{3} \left[a_{ij} \cos(z_i + z_j) \; + \; b_{ij} \sin(z_i + z_j) \right] \; + \varepsilon
\end{aligned}
\tag{4}
$$

where: TC is a measure of the total cost of production (including labour costs, depreciation, other operating and administrative costs and interests paid on deposits); Qi represent bank outputs (with 1.0 added to avoid taking the log of zero): Q1 = total loans, Q2 = securities, Q3 = off balance sheet business; Pi are bank input prices for labour (= personnel expenses/total assets), price for loanable funds (= interest expenses/total deposits) and price for physical capital (depreciation and other capital expenses/fixed assets).

11

Equity capital (E) is included to control for differences in bank risk preferences (Mester, 1996). z_i are the adjusted values of the log output $\ln Q_i$ such that they span the interval $[0.1 \cdot 2.\pi, 0.9 \cdot 2.\pi]$ to reduce approximation problems near the endpoints.[2] ε is the two-component stochastic error term. $\alpha, \beta, \delta, \gamma, \tau, \lambda, \phi, \rho, \kappa, \varsigma$ are parameters to be estimated.

While there continues to be debate about the definition of input and output used in the function, we follow the traditional intermediation approach of Sealey and Lindley (1977), in which inputs (labour, physical capital and deposits) are used to produce earning assets. Two of our outputs (loans and securities) are earnings assets, and we also include off balance sheet items as a third output.[3]

The alternative profit function has the same specification as the above, the only difference being that the dependent variable is replaced with ln profits $(\pi + \theta)$, as specified in Berger and Mester (1997). π is a measure of operating profits (interest revenues + commission income + trading income – total costs). To exclude negative values, $\pi + \theta = \pi + \left|\pi^{\min}\right| + 1$, where $\left|\pi^{\min}\right|$ is the absolute value of the minimum value of profits in the sample.

Being aware of the problems associated with international comparisons of banking efficiency (Berger, 2007)[4], in this paper, we adopt a common cross-country frontier for banking industries across the world with the inclusion of environmental variables (along the lines of Dietsch and Lozano-Vivas, 2000; Kwan, 2003). This choice to use a common frontier with environmen-

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[2]$z_i = \mu_i (\ln Q_i + w_i)$, where μ_i and w_i are scaling factors, limiting the periodic sine and cosine trigonometric functions within one period length 2π (see for a discussion: Gallant, 1981; for an application: Mitchell and Onvural, 1996).

[3]Although off balance sheet items are not earning assets, they do represent an increasing source of income for all types of banks and are therefore included in order to avoid understating total output (Jagtiani and Khanthavit, 1996).

[4]Berger (2007) crystallizes the three types of cross-country efficiency comparisons used in the banking literature: 1) based on nation-specific frontiers, 2) based on a common frontier, 3) based on foreign-owed versus domestically owned banks in the same nation using a nation-specific frontier. Berger (2007) highlights the following. The first category – nation-specific frontiers - cannot be used to draw any conclusion as to whether banks in one country are more efficient than banks in other countries because they are measured against different frontiers. The second category – common frontier (Dietsch and Lozano-Vivas, 2000; Kwan, 2003) - may be problematic because it may be virtually impossible to control for all the environmental variables of different countries. Moreover, even if all of the environmental differences do not exist or are well controlled for, the efficiency of institutions within their own country can differ from their efficiency as foreign entities in other countries. The third category (Berger et al., 2000) generally resolves the main issue of the first two categories by analysing separately foreign and domestic banks competing in the economic environment of the same country. Nevertheless even this category is not free of measurement difficulties (i.e. sample selection issues and impossibility to measure the cross-subsidies received by foreign banks from home-nation banks).

tal variables draws from the empirical evidence provided in Beccalli (2004), which suggests that the common frontier with environmental variables delivers consistent X-efficiency estimates with the Berger et al. (2000) method[5]. Real growth in GDP is used here as a country-specific control variable in the panel[6]. This model controls for environmental differences across countries and investigates the effects of these variables on measured efficiency. This methodology essentially allows for a firm-specific and time-varying intercept shift in the distribution of the inefficiency term, and this intercept shift is itself a function of the exogenous environmental variables that vary across countries (Battese and Coelli 1995).

This study applies Fourier terms (both for the cost frontier and the alternative profit frontier) only for the outputs, leaving the input price effects to be defined entirely be the translog terms (see Berger, Leusner, and Mingo, 1997; Mitchell and Onvural, 1996; Gallant, 1982). Moreover, the usual input price homogeneity restrictions are imposed on logarithmic price terms only, and not on the trigonometric terms (as in Altunbas, Gardener, Molyneux, Moore, 2001). Accordingly, TC, P_1 and P_2 are normalised by the price of physical capital, P_3. Finally, all the values are expressed in real terms (GDP deflator for each country with 1991 as a base year).

4 Empirical results

We first examine unadjusted performance (cost efficiency, profit efficiency, accounting profitability and their determinants) for acquirers and targets in each of the six years before the deal. The values highlighted in Table 4

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[5]Beccalli (2004) compares and reconciles the three methods for cross-country comparisons of the cost efficiency with reference to the UK and Italian investment firms. In particular, Beccalli (2004) both controls for environmental differences across countries by integrating environmental variables into the definition of the common frontier, and compares the X-efficiency of foreign versus domestic institutions operating within the borders of different home countries to examine the extent to which financial institutions are able to monitor and control their subsidiaries operating in other nations. The two methods produce consistent results. In contrast, the traditional method for efficiency comparison based on nation-specific frontiers produces different results.

[6]We have also tested for a larger set of control variables (real growth in GDP, population and concentration ratio). Between these frontiers (including either one control variable or the set of control variables), we found large, positive, and significant rank order correlation. This correlation suggests that the efficiency ordering generated by the common frontier with one environmental variable is consistent with the efficiency ordering generated by the common frontier with several environmental variables. Thus we have chosen to minimise the number of control variables and have kept the specification with a country dummy only.

show that the level of profit efficiency is higher for acquirers in comparison with targets in each of the 6 years before the deal (and the difference is statistically significant): the higher values for the acquirers range between 1.3% (one year before the deal) and 3.2% (six years before the deal). The level of cost efficiency tends to be higher for acquirers than for targets in most of the years before the deal but not statistically significant. Interestingly, instead, the determinants of cost efficiency (labour costs and operating costs) show a clearly better performance for acquirers in comparison with targets: these costs are always lower for the acquirer in comparison to the target. In particular, personnel costs of the acquiring banks are on average 3.7% to 4.7% lower than the personnel costs of the acquired banks. In the remaining part of this section, we will control for the performance of acquirers' and targets' peers. (Note that we will present the evidence on the accounting measures first and then move to the results on efficiency).

To investigate performance as far as shareholders are concerned, we use the return on equity (ROE), where equity is measured at the beginning of the financial year. As shown in Table 5 (Panel A), acquirers do outperform their peers in each of the five years prior to the mergers and acquisitions by 2 to 3%. There is also some evidence reported in Table 5 (Panel B) suggesting that targets do outperform their peers in the two years prior to the mergers and acquisitions[7]. Acquirers furthermore outperform targets in a period starting five years prior to the mergers and ending three years prior to the mergers [Table 5 (Panel C)]. As shown in Table 5 (Panel D), there is not much evidence that firms engaging in M&A do outperform their peer post-merger (first year only). There is furthermore evidence suggesting that firms engaging in mergers and acquisitions experience a decrease in their performance post-merger. As shown in Table 5 (Panel E), in the five years following the mergers, the median industry-adjusted ROE is about 1%. This compares with a median weighted average of the acquirer's industry-adjusted ROE and target's industry-adjusted ROE of about 2% in the five years prior to the merger.

The study's main findings so far, superior bottom-line performance by acquirers pre-merger and lack of evidence of any increase in bottom-line performance post-merger, are robust to alternative specifications of return on equity and peer performance. For example, these findings still obtain if return on equity is derived on an average basis (that is, if equity is measured as the average of the beginning of the financial year and end of the financial year values) or if peer performance is derived as the average (as opposed to the median) return on equity of all banks in the same year, sector of activity,

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[7]The latter result is however not robust to alternative specifications of ROE.

and country[8].

Any decrease in post-merger industry-adjusted ROE may however not be due to the merger or acquisition. In order to control for the effect of pre-merger performance on post-merger performance, we regress post-merger industry-adjusted ROE on pre-merger industry-adjusted ROE, the regression intercept capturing the direct effect of the merger on performance. As shown in Table 6, the regression intercept is negative and statistically significant in the second, third, and fourth year following the merger. The empirical evidence hence suggests that the M&A operation has a negative impact on returns on equity.

We then distinguish between domestic and cross-border mergers and acquisitions. Acquirers are shown to outperform targets prior to domestic mergers and acquisitions [Table 7 (Panel A)]. In contrast, there is no evidence suggesting that acquirers outperform targets prior to cross-border mergers and acquisitions [Table 7 (Panel A)]. Banks engaging in cross-borders mergers and acquisitions however experience a decrease in their performance from the second to the fifth year following the mergers and acquisitions [Table 7 (Panel B)]. In contrast, there is no statistically significant evidence suggesting that banks engaging in domestic mergers and acquisitions experience a decrease in their performance post-merger following the mergers and acquisitions [Table 7 (Panel B)].

The superior returns on equity experienced by acquirers pre-merger are driven by superior net margins as opposed to superior asset turnover [Table 8 (Panel A)]. In contrast, compared with their peers, targets suffer from lower asset turnover in each of the four years prior to the mergers and lower net margins in the two years prior to the mergers [Table 8 (Panel B)]. There is no evidence of any statistically significant improvement in industry-adjusted asset turnover or net margin post-merger [Table 8 (Panel C)].

Compared with their peers, acquirers have a lower personnel expense as a function of revenue in each of the five years prior to the mergers and acquisitions [Table 9 (Panel A)]. This is also true for targets in some of the earlier years prior to their acquisitions [Table 9 (Panel B)]. The ratio of personnel expense over revenue is however increasing post-merger [Table 9 (Panel C)]. The same picture arises when analysing the ratio of other administrative expenses over revenue.

In order to control for the effect of pre-merger performance on post-merger performance, we again regress post-merger industry-adjusted performance on pre-merger industry-adjusted performance, the regression intercept capturing the direct effect of the merger on performance. In regressions involving

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[8]Empirical evidence on robustness is available from the authors on request.

either net margin or asset turnover, the regression intercepts are negative and statistically significant regardless of the length of the post-merger interval selected [Table 10 (Panels A and B)]. In regressions involving the ratio of personnel expense over revenue, the regression intercept is negative and statistically significant when post-merger performance is measured over a period of three years selected [Table 10 (Panel C)]. In regressions involving the ratio of other administrative expenses over revenue, the regression intercept is positive and statistically significant when post-merger performance is measured over a period of two years but becomes negative and statistically significant when post-merger performance is measured over a period of five years [Table 10 (Panel D)]. The empirical evidence hence suggests that the M&A operation has a negative impact on asset turnover and net margins but may have a positive effect on personnel and other administrative expenses.

We then turn our attention to cash-flow returns. As shown in Table 11 (Panel A), acquirers do outperform their peers in each of the five years prior to the mergers and acquisitions. There is however no evidence suggesting that targets do outperform their peers in any of the five years prior to the mergers and acquisitions [Table 11 (Panel B)]. Acquirers furthermore outperform targets in the two years prior to the mergers and acquisitions [Table 11 (Panel C)]. There is furthermore strong evidence suggesting that firms engaging in mergers and acquisitions experience a decrease in their performance post-merger [Table 11 (Panel D)].

In order to control for the effect of pre-merger performance on post-merger performance, we regress post-merger cash-flow returns on pre-merger cash-flow returns. Regression intercepts are negative and statistically significant over many post-merger periods, especially when the market value of equity is measured as the average of the beginning and end of year values [Table 10 (Panels E and F)]. The empirical evidence hence suggests that that the M&A operation has a negative impact on cash-flow returns.

In all the empirical tests so far, the performance of any bank involved in an M&A has been adjusted for country, year and sector of activity. In order to make sure that our results are not driven by failing to adjust for size, we investigate the correlation between accounting performance and size as measured by total assets in the population of banks not involved in mergers and acquisitions. Correlation is shown to be very low. For instance, when performance is measured by returns on equity, the Pearson correlation coefficient is equal to 2.4% whilst the Spearman correlation coefficient is equal to 13.7%.

In order to investigate the effect of size on the variation in performance determined by the merger or acquisition, we regress post-merger industry-adjusted performance on pre-merger industry performance, the industry-

adjusted size of the acquirer, and the industry-adjusted size of the target (as outlined in equation 2). When performance is measured by returns on equity or cash-flow returns, the coefficient γ is found to be negative and statistically significant in most regressions [Table 12]. The empirical evidence hence suggests that performance attributable to a merger or acquisition is decreasing in the size of the acquirer.

We now focus our attention on efficiency measures. We first compare the industry-adjusted performance of acquirers and targets [Table 13]. Both acquirers and targets are more efficient (both in profit and cost terms) than non-M&A banks[9], and the higher performance is statistically significant (in line with the findings on ROE and CFR). However, adjusted-values do not provide confirmation of the better performance of acquirers in comparison with targets when performance is measured by profit efficiency. This result may be due to the higher standard deviation induced by the use of the control sample.

The comparison of the efficiency values of the combined bank emerging from the deal with the pre-values of the merging banks interestingly outlines improvements in cost efficiency in the post-deal period, regardless of whether the base year prior to the deal refers to 3 or 6 years [Table 14 (Panel A)]. In each of the six years after the deal, cost efficiency is higher than the cost efficiency before the deal, and this happens in up to 80% of the cases (six years after the deal). Moreover, it emerges that improvements in cost efficiency become more evident the longer the time after the deal, with a trend strictly monotonic (from +3.01% in year one after the deal to 5.10% in year six after the deal). By disentangling the sample into domestic and cross-border deals [Table 14 (Panel B and C)], the analysis suggests that the higher improvements in cost efficiency are associated to domestic deals.

The picture on the profit efficiency side is however different. Profit efficiency decreases in the post deal period in comparison with the pre-deal period [Table 14 (Panel A)][10], and the decrease becomes more evident the

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[9]The industry-adjusted values show that banks involved in M&A operations are more (cost and profit) efficient than banks not involved in M&A (control sample) on average in any year (1991-2005) and in most of the countries under investigation. Further details can be found in a version of the paper available at http://www.fdic.gov/bank/analytical/cfr/Beccalli_Frantz.pdf.

[10]In order to make sure that our results are not driven by failure to control for size, we test the correlation between the (profit and cost) efficiency and the (profit and cost) efficiency measure normalised by equity. We find large, positive, and significant rank order correlation for each year before and after the deal. This correlation suggests that the efficiency ordering generated by the unadjusted estimates is consistent with the efficiency ordering generated by the normalised estimates. However the magnitude of the correlation coefficient for profit efficiency (about 0.75 significant at 1% level) is lower than the

longer the number of years after the deal (as previously documented by the accounting profitability measure). The average decrease in profit efficiency varies between –1.17% (one year after the deal) and –5.33% (six years after the deal) when profit efficiency post merger is compared with the weighted average of profit efficiency for the target and acquirer in the six years prior to the deal. Interestingly, by distinguishing between domestic and cross-border operations [Table 14 (Panel B and C)], the decrease in profit efficiency is particularly evident for cross-border operations; instead it does not emerge for domestic operations (as found for ROE). Note that with reference to cross-border M&As, the change in (cost and profit) efficiency in the pre- vs. post-deal period is not affected by the location of the target either in a developed or in a developing country[11]: the difference in the change in performance for developed and developing countries is not statistically different from zero. Thus the location of the target in a developed vs. developing country does not have any impact on the change in performance.

The previous findings suggest that the impact of M&A operations on banks' performance is negative on the profit efficiency side and positive on the cost efficiency side: M&A operations are associated with lower profit efficiency and higher cost efficiency. This could be due to the skimping on the resources devoted to underwriting and monitoring loans (Berger and DeYoung, 1997), which makes banks appear to be cost efficient in the short run because fewer operating expenses can support the same quality of loans[12]. In addition, this seems to suggest that the improvements in cost efficiency are transferred outside the bank, as bank revenues suffer a decrease after the operation. It could be argued that cost benefits are transferred to bank clients (and not to bank shareholders), especially in cross-border operations. The need to enter into new markets forces banks not to apply a price premium at least in the medium-term.

To better investigate the above preliminary evidence, we disentangle the overall change in (cost and profit) efficiency in order to isolate the variation specifically determined by the M&A operation, by using the OLS regressions

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magnitude of the correlation coefficient for cost efficiency (about 0.90 significant at 1% level). Therefore we further investigate any scale bias effect on (profit and cost) efficiency by testing the correlation between efficiency and size (proxied by ln total assets) for the control sample. The magnitude of this correlation is very low (about 5% significant at 1% level), which suggests that there is no failure to adjust for size the (profit and cost) efficiency estimates.

[11]As in much of the literature (Berger, 2007), the terms "developed" and "developing" countries are based on International Monetary Fund (IMF) classifications: developed countries are "high-income" countries, developing countries are "middle income" or "low income" countries.

[12]The authors would like to thank Allen Berger for suggesting such an interpretation.

previously outlined in equation (1). Several interesting results emerges for the overall sample of deals [Table 15 (Panel A)]. First, the explanatory power of the relationship is particularly high: by comparing the average of (both cost and profit) efficiency in the 6 years after the deal with the average efficiency in the 3 year before the deal, the R^2 is much above 50%, a much higher value than the one traditionally found (e.g. as regard to cash flow return the R^2 is 10% in Healy *et al.*, 1992). Moreover, the decreasing trend over time in the values of the coefficient β suggests that there is a strong mean reversion trend in the industry-adjusted (cost and profit) efficiency measures. This provides clear evidence of the highly competitive nature of the banking industry. Finally, the value of the intercept α (a measure of the impact of the M&A operation itself) is positive and statistically significant for cost efficiency with respect to the overall sample both when the reference is to the 3 and 6 years prior to the deal. However, the value of the intercept α in the regression involving profit efficiency is not significantly different from zero (Panel A). This would suggest that the M&A operation itself does have a positive impact on cost efficiency, but does not have any (either positive or negative) impact on profit efficiency. Furthermore, in order to investigate the size effect on the variation in performance determined by the M&A, we use the OLS regressions outlined in equation (2). The value of the intercept α becomes positive and statistically significant at 1% level, but the coefficient γ is found to be negative and statistically significant. This suggests that the larger the size of the acquirer, the lower the profit efficiency associated with the M&A (Panel A).

This surprising evidence leads us to further investigate the impact of the M&A operation itself by focusing on the level of geographical relatedness of the acquirer and target bank. To this aim, by distinguishing between domestic and cross-border operations, the analysis reveals that when the dependent variable is profit efficiency, the value of the intercept α is positive for domestic operations (Panel B) and negative for cross-border deals (Panel C). This implies that cross-border M&As have a negative impact on profit efficiency, whereas domestic M&As have a positive impact on profit efficiency. When the dependent variable is cost efficiency, the value of the intercept α is higher for domestic operations in comparison to cross-border operations. Overall, this suggests that for domestic deals the improvements in cost efficiency and in profit efficiency are due to the M&A operation itself, and not to the behaviour in X-efficiency that would have occurred in absence of any M&A operation. For cross-border deals, instead, decreases in profit efficiency occur because of the M&A operation itself, while the improvements in cost efficiency are lower than those observed for domestic deals. Consequently, this evidence emphasizes the importance of geographical similarities in order

to achieve better post-M&A performance: geographical relatedness creates value.

The potential determinants of the changes in cost and profit efficiency due to M&A operations are proxied here by institutional/regulatory, bank-specific and deal-specific variables. Table 16 sets out their definitions and statistics. The first category comprises freedom from government (an index measuring the incidence of all government expenditures and state-owned enterprises in the economy), regulatory quality (a measure of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development) and banking concentration (total value of assets of the five biggest banks). The second category includes the period in which the deal takes place (before and after year 2000), the method of payment used to regulate the operation (cash vs. equity), and the geographical nature of the operation (domestic vs. cross-border). The third category refers to the size of the banks involved in the operation (big, medium, and small measured on the basis of total assets), the focus of the banks involved in the so-called traditional banking (proxied by the amount of loans over total assets), and the degree of riskiness of the bank business (measured by the standard deviation of ROE).

In order to identify the impact of these determinants on the changes in the efficiency levels due to the M&A operation, we test equation (3) [Table 17]. With respect to the regulatory and institutional variables, the change in profit efficiency (post vs. pre deal) is positively associated to the levels of freedom from government and regulatory quality characterising the home country of the target, whereas it is negatively associated to the same indexes qualifying the home country of the acquirer. Deals better able to create profit efficiency are those in which acquiring banks direct their investments in countries with a better ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development and with lower government expenditures and state-owned enterprises. Instead, a higher concentration in the banking industry of the country of the acquirer has a negative impact on profit efficiency. As regard to deal-specific conditions, cash payment has a negative impact on (profit and cost) efficiency. The realisation of the M&A deal in the years 1994-1999 has a negative impact on (profit and cost) efficiency, whereas when the deal occurs in the period 2000-2005 there is a negative effect on cost efficiency only. With regard to structural bank-specific variables, a size qualified as "medium" (comprising all the banks in the 2nd tertile in terms of the natural logarithm of total assets) for the target in the pre-deal period results in a negative impact on profit efficiency. Also a "big" size for the acquirer has a negative impact on profit efficiency. A higher concentration of the acquirer

in the pre-deal period on traditional banking activities over the total bank activities (proxied by the proportion of loans over total assets) has a negative impact on both cost and profit efficiency; whereas the impact is positive when the combined bank resulting from the operation has a higher concentration on traditional banking. Finally, the level of riskiness (proxied by the standard deviation of the ROE) of the activity of both the acquirer, the target, and the combined entity resulting form the M&A is always positively associated with the changes in profit and cost efficiency.

Finally, the evidence suggests that successful and unsuccessful deals differ with regard to several environmental and bank-characteristics [Table 18][13]. A higher likelihood of an unsuccessful M&A (measured in terms of profit efficiency) is associated with a larger size of the acquirer, a larger equity of the acquirer and a higher risk (of both the acquirer and the target). Instead a larger diversification of the target is associated with a higher likelihood of an unsuccessful deal. Higher freedom from government and regulatory quality in the country of the acquirer are associated with a higher likelihood of an unsuccessful deal, whereas a higher regulatory quality in the country of the target is associated with a higher likelihood of a successful deal. A higher likelihood of an unsuccessful M&A (measured in terms of cost efficiency) is associated with smaller size of the acquirer, a smaller capital of the acquirer, and a higher loan loss provision (of both the acquirer and the target).

5   Conclusions

This paper investigates whether M&A operations influence the performance of banks. Using a sample of 714 deals involving EU acquirers and targets located throughout the world over the period 1991-2005, we investigate whether M&A operations are associated with improved performance (measured using both standard accounting ratios and cost and alternative profit X-efficiency). Despite the extensive and ongoing consolidation process in the banking industry, we find that M&A operations are associated with a slight deterioration in profit efficiency, return on equity and cash flow returns, and a pronounced improvement in cost efficiency in the 6 years after the deal (in comparison to the 3/6 years prior to the deal). Hence, the improvements in cost efficiency appear to be transferred to bank clients rather than to bank shareholders.

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[13]Note that the difference between successful and unsuccessful deals with regard to diversification and risk are not statistically different from zero for targets, whereas the quality of the loan portfolio is not statistically different from zero for acquirers. Similarly the method of payment, the cross-border nature of a deal, the location of the target in developing/developed country do not differ between successful and unsuccessful deals.

Interestingly, these changes in performance are directly attributable to the M&A operations and would not have occurred in their absence. Moreover, these changes exhibit a particularly negative trend for cross-border deals: in domestic deals, cost efficiency improves more markedly than in cross-border deals, and profit efficiency remains unchanged instead of diminishing. This highlights the importance of geographical relatedness in order to achieve better post-M&A performance. Finally, in the years before the M&A operation, target banks exhibit worse performance than acquiring banks in terms of profit efficiency, profitability accounting ratios, personnel expenses and operating costs. Besides, banks involved in M&A operations (both acquirers and targets) are more efficient and profitable than their peers not involved in M&A operations.

Furthermore, an important set of institutional, regulatory, bank-specific and deal-specific variables has a significant influence on the changes in cost and profit efficiency. The management of acquiring banks should tend to direct investments to those countries that guarantee better regulatory quality together with higher freedom from government. Moreover, to achieve positive changes in efficiency in the medium-term, transactions should be paid in equity (not in cash) and result in a combined bank with a higher focus on traditional banking activities. Finally, negative changes in profit efficiency are associated with deals announced before year 2000, whereas more recent deals do not seem to determine any change in profit efficiency.

Finally, several environmental and bank-characteristics make a deal successful or unsuccessful. Successful M&As with respect to profit efficiency are associated with a smaller size and equity of the acquirer, a lower risk (of both the acquirer and the target), a lower diversification of the target, a lower freedom from government and regulatory quality in the country of the acquirer, and a higher regulatory quality in the country of the target. Successful M&As with respect to cost efficiency are associated with a larger size of the acquirer, a larger capital of the acquirer, and a lower loan loss provision (of both the acquirer and the target).

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Table 1: Number of M&A deals (by country and by year); 1991 -2005

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Austria				1	2	1	4	2	5	1				1		17
Belgium							4	4	2	1	4	2	1	2		20
Denmark	1		1	2		1	2	2	2	3		2		2		18
Finland			1	1												2
France	11	7	9	17	8	9	7	6	5	4	9	3	4	10		109
Germany	2	5	3	10	7	5	15	8	9	11	2	1		2		80
Greece								2	6	3	1	2	2			16
Hungary											1		1	3		5
Iceland													2	4		6
Ireland					2											2
Italy	1		3	16	22	8	14	12	22	28	20	16	11	5		178
Luxembourg							1	2		1	1		1	2		8
Netherlands			2	1	2	3	1	3	3	3		2	1		1	22
Norway				2	1	3	2						1	3		12
Poland							2	1	6	2	4		1	1		17
Portugal		2	2	1	2	2	1	2	3	11			1			27
Spain	6	6	3	3	4	9	8	11	11	12	6	6	5	3		93
Sweden								2	8	2	3	1	1	2		19
Switzerland		4	4	6	1	2	5	1	1	1		1	2			28
Turkey															1	1
UK	1	3	1	3	3	5	5	2	4	2	1	1	1	2		34
Total	22	27	29	63	54	48	71	60	87	85	52	37	35	42	2	714

Table 2: Number of cross-border M&A deals (by country); 1991-2005

Home country target	AU	BE	DE	FR	GE	GR	HU	IS	IR	IT	LU	NE	PL	PO	SP	SE	CH	TR	UK	Total
Argentina				1						1		1			12					15
Australia																	1		2	3
Austria		1		1	4			1					1				1			9
Belgium		1		1	1						1									4
Brazil				2								4		1	5				1	13
Bulgaria				2		1	1													4
Canada				1						1										2
Chile					1										5					6
Colombia															6				1	7
Croatia					1		1			1										3
Czech Republic	2			1	3					2										8
Denmark					1			1								6				8
Estonia																3				3
Finland																1				1
France		2		4	4					2	2	2		1	1		4		3	25
Germany				5						3		2			2	1				13
Greece				3	2															5
Hungary	3				4		1			2		1	1		1					13
India		1																		1
Ireland			1																2	3
Italy	1			5	5							4			4				1	20
Lebanon				1																1
Luxembourg		2	1	2																5
Mexico															13					13
Morocco				2	1															3
Netherlands					1						1									2
Norway			1					3								2				6
Poland	1	5	2	1	13							1	4	3		3				33
Portugal				1								1			7					9
Romania				3		3	1			1										8
Slovak Rep		1					1			4										6
Slovenia				1																1
South Africa				1	1									1					1	4
South Korea				1	3															4
Spain				3	3	1				2	4				3				4	20
Sweden			2																	2
Switzerland				1	1					2							1			5
Thailand												1								1
Turkey				1															1	2
United Kingdom		1	1	1	2					1					3			1	1	11
United States				2								4		1	4		1		3	15
Venezuela															3					3
Total	7	14	8	47	51	5	5	4	1	22	8	21	6	10	66	16	8	1	20	320

AU: Austria; BE : Belgium; DE: Denmark; FR: France; GE: Germany; GR: Greece; HU: Hungary; IS: Iceland; IR: Ireland; IT: Italy; LU: Luxembourg; NE: Netherlands; PL: Poland; PO: Portugal; SP: Spain; SE: Sweden; CH: Switzerland; TR: Turkey; UK: United Kingdom

Table 3: Number of banks in the control sample (by country and by year)

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Argentina		1	1	2	3	3	5	5	5	5	5	5	6	6	6	58
Australia	8	8	9	10	10	10	10	10	10	11	12	14	14	14	12	162
Austria			1	1	6	7	8	9	8	7	6	6	6	6	1	72
Belgium					1	1	5	5	4	5	5	5	5	5		41
Brazil	4	5	6	6	8	10	9	10	9	10	14	16	16	16	15	154
Canada	3	3	4	10	10	11	11	12	12	12	14	16	15	16	15	164
Chile				1	4	4	5	7	6	7	7	7	7	7	7	69
Colombia								1	1	2	2	3	4	4	3	20
Denmark	6	7	8	11	14	14	14	14	14	14	14	14	15	15	3	177
Finland	2	2	3	3	3	3	3	3	3	4	4	4	4	4		45
France	9	12	15	16	17	17	17	17	25	29	31	31	31	31	4	302
Germany	4	4	5	6	6	6	6	4	5	7	8	8	8	6	1	84
Greece		1	2	5	5	6	8	8	10	10	10	11	11	11	1	99
Hungary	1	1	1	2	2	2	1	1	2	3	3	3	3	3	1	29
India											13	19	16	17	18	83
Ireland	2	3	3	3	3	3	3	4	4	4	4	5	5	4	1	51
Italy	3	3	10	11	15	16	18	20	21	25	27	28	29	29	1	256
Lebanon		1	1	2	2	2	2	2	2	2	2	2	2	1	1	22
Luxembourg		1	1	1	1	2	3	3	3	3	2	2	2	2		26
Mexico	1	1	1	1	1	1	2	2	3	3	5	5	6	5	5	42
Morocco	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	27
Netherlands	3	3	3	3	3	5	5	5	5	5	5	5	6	6		62
Norway	2	3	4	5	6	7	7	8	8	10	11	12	14	14		111
Poland						2	5	5	6	7	8	8	9	9		59
Portugal	2	4	4	4	4	4	5	5	5	5	5	5	5	5		62
Romania										1	1	1				3
Slovenia				1	1	1	1	1	1	1	1	1	1	1		10
South Africa	5	5	6	6	7	7	10	12	13	13	13	13	12	12	4	138
South Korea		1	3	4	4	4	5	5	4	5	7	8	9	9	8	76
Spain	8	8	7	8	8	8	9	9	9	9	9	9	9	9	1	120
Sweden	3	3	3	4	4	4	4	4	5	6	7	9	9	9		74
Switzerland	4	5	8	10	11	13	13	13	14	18	16	16	17	14	11	183
Thailand			1	1	2	2	4	7	10	13	20	20	20	22	18	140
Turkey	1	1	1	1	1	1	1	1	1	1	2	6	9	9	7	43
United Kingdom	9	9	9	10	13	16	18	20	23	25	27	29	31	31	10	280
United States	21	23	214	223	237	248	262	303	344	359	391	468	488	498	484	4563*
Venezuela	1	1	1	1	1	2	3	3	3	5	7	7	7	7	7	56
Total	103	119	336	371	414	443	483	539	599	649	721	824	854	860	648	7963

*When estimating efficiency, in order to avoid the bias induced by a disproportionate presence of US banks in the frontier of the control sample, we have randomly selected and included only a sub-sample of 45 US banks.

Table 4: Comparison of unadjusted values of efficiency and return on equity for acquirer and target prior to the M&A deal

Panel A. Acquirers. Unadjusted values for cost efficiency, profit efficiency and returns on equity

	N	Cost efficiency		Profit efficiency		ROE		NTB		NM		TOER		PER	
		Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
B1	721	0.8042	0.1019	0.7963	0.0780	0.1278	0.0772	0.6404	3.0359	0.0733	0.0640	0.0228	0.0092	0.0125	0.0050
B2	674	0.8038	0.0935	0.7997	0.0764	0.1209	0.0644	0.5741	1.0761	0.0660	0.0485	0.0225	0.0089	0.0124	0.0051
B3	612	0.7953	0.1002	0.7999	0.0758	0.1204	0.0631	0.7479	1.4417	0.0589	0.0565	0.0221	0.0086	0.0123	0.0049
B4	529	0.7940	0.1012	0.8018	0.0688	0.1138	0.0656	0.8394	1.2418	0.0556	0.0637	0.0223	0.0086	0.0123	0.0045
B5	464	0.7879	0.1021	0.8016	0.0665	0.1164	0.0760	1.1760	1.8698	0.0555	0.0549	0.0233	0.0088	0.0127	0.0048
B6	410	0.7809	0.1039	0.8106	0.0614			1.1755	1.4886	0.0585	0.0501	0.0225	0.0081	0.0123	0.0047

Panel B. Targets. Unadjusted values for cost efficiency, profit efficiency and determinants

	N	Cost efficiency		Profit efficiency		ROE		NTB		NM		TOER		PER	
		Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
B1	222	0.7928	0.1177	0.7705	0.1318	0.1039	0.1396	0.3494	0.9433	0.0631	0.1260	0.0268	0.0190	0.0158	0.0115
B2	212	0.7910	0.1165	0.7700	0.1281	0.1109	0.1101	0.3474	0.4488	0.0599	0.0746	0.0264	0.0151	0.0155	0.0105
B3	187	0.7896	0.1198	0.7821	0.1267	0.1281	0.1136	0.4241	0.5923	0.0648	0.0677	0.0257	0.0137	0.0148	0.0095
B4	155	0.7849	0.1076	0.7835	0.1161	0.1197	0.1415	0.3936	0.5513	0.0560	0.0781	0.0264	0.0136	0.0148	0.0101
B5	137	0.7796	0.1127	0.7765	0.1287	0.1120	0.1455	0.4810	0.7428	0.0404	0.0752	0.0278	0.0153	0.0150	0.0093
B6	120	0.7734	0.1214	0.7867	0.1212			0.4291	0.3298	0.0315	0.1075	0.0275	0.0138	0.0159	0.0110

Panel C. Acquirers versus targets. Unadjusted values for cost efficiency, profit efficiency and determinants

	N	Cost efficiency		Profit efficiency		ROE		NTB		NM		TOER		PER	
		Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
B1	209	0.0091	0.1376	0.0132*	0.1392	0.0505***	0.2217	0.1032**	0.5620	0.0226*	0.13126	-0.0065***	0.0207	-0.0046***	0.0123
B2	194	0.0129	0.1390	0.0244**	0.1325	0.0236***	0.0987	0.1030*	0.5616	0.0114	0.0827	-0.0050***	0.0147	-0.0044***	0.0109
B3	168	0.0094	0.1345	0.0190*	0.1395	0.0118	0.1101	0.0888	0.9359	-0.0048	0.0622	-0.0047***	0.0137	-0.0037***	0.0097
B4	130	0.0084	0.1369	0.0161	0.1242	0.0132	0.1383	0.3355	1.1665	0.0033	0.0776	-0.0056***	0.0131	-0.0040***	0.0112
B5	106	0.0056	0.1328	0.0312**	0.1322	0.0238**	0.1228	0.5244	2.0823	0.0123	0.0700	-0.0060***	0.0165	-0.0040***	0.0105
B6	95	-0.0021	0.1480	0.0322**	0.1284	0.0661***	0.2381	0.0498	0.1307	0.0209*	0.0711	-0.0056***	0.0152	-0.0047***	0.0128

Return on Equity (ROE) = Net income/Total Equity (end of the year); Non Traditional Banking (NTB) = OBS/Total assets; Net margin (NM) = Net income/Revenues (= Interest income + Commission income + Trading income); Total Operating Expense Ratio (TOER) = Total non-interest operating expense/Total assets; Personnel expense ratio (PER) = Personnel costs/Total assets. ***, **, * T-test respectively statistically significant at 1%, 5% and 10%. N: number of observations.

Table 5: Comparison of return on equity before and after the deal

Panel A. Acquirer. Industry-adjusted values for ROE(BY) before the deal (adjustment: by year, country and type of activity)						
Year	Acquirer		Acquirer Industry-Adjusted			
	Median ROE (%)	N	Median ROE (%)	N	% +	Z Score
B1	12.2	691	2.07	618	63.1	8.82***
B2	11.6	641	2.25	566	69.3	10.21***
B3	11.9	553	2.49	501	72.9	11.04***
B4	11.1	485	2.28	442	74.4	10.60***
B5	10.6	426	2.57	396	73.5	10.60***

Panel B. Target. Industry-adjusted values for ROE(BY) before the deal (adjustment: by year, country and type of activity)						
Year	Target		Target Industry-Adjusted			
	Median ROE (%)	N	Median ROE (%)	N	% +	Wilcoxon Test Z Score
B1	11.0	272	1.56	224	60.3	2.21**
B2	10.1	254	1.22	206	57.8	1.96**
B3	10.0	215	0.54	169	55.0	1.99*
B4	9.7	177	1.96	135	60.7	1.87*
B5	9.1	151	1.11	116	57.8	1.75*

Panel C. Acquirer – Target. Industry-adjusted values for ROE(BY) before the deal (adjustment: by year, country and type of activity)						
Year	Industry-Adjusted ROE (%)			Wilcoxon Test		
	Acquirer	Target	Difference	N	% +	Z Score
B1	2.07	1.56	0.02	169	50.3	1.10
B2	2.25	1.22	0.00	157	48.4	1.08
B3	2.49	0.54	0.57	119	52.9	1.73*
B4	2.28	1.96	1.14	91	53.8	2.12**
B5	2.57	1.11	2.41	78	59.0	2.96***

Panel D. Post values for the combined bank. Adjusted values for ROE(BY) (adjustment: by year, country and type of activity)						
Year	Combined bank		Combined bank Industry-Adjusted			
	Median ROE (%)	N	Median ROE (%)	N	%+	Z Score
A1	12.4	675	2.09	111	65.8	3.03***
A2	11.6	663	0.80	94	58.5	1.60
A3	11.5	629	0.83	83	59.0	1.27
A4	11.6	565	-0.34	68	48.5	0.99
A5	12.4	493	0.21	51	51.0	0.35

Panel E. Post values for the combined bank vs. Pre values of the merging banks. Adjusted values for ROE(BY) (adjustment: by year, country and type of activity)								
	Pre-Merger			Post-Merger			Post versus Pre Wilcoxon Test	
Years	Median ROE(%)	N	Years	Median ROE(%)	N	Change (N)	%+	Z Score
B2B1	2.09	186	A1A2	1.80	117	0.00 (102)	45.1	0.02
B3B1	2.00	189	A1A3	1.33	118	-1.00 (104)	39.4	2.00**
B5B1	1.94	191	A1A5	0.99	119	-2.50 (104)	31.7	3.26***

ROE = Net income / Total Equity (beginning of the year). N: number of observations. % of positive cases under the Wilcoxon test. ***, **, * statistical significance at 1%, 5% and 10%.

Table 6: Regression of post-merger on pre-merger industry adjusted mean ROE

Panel A. Regression of Annual Post-Merger Industry-Adjusted ROE on Average Pre-Merger Industry-Adjusted ROE						
	A	β	R	R^2	Adj.R^2	N
A1, B3B1	-0.014 (0.010)	0.614*** (0.226)	0.331	0.109	0.095	62
A2, B3B1	-0.034** (0.013)	1.108*** (0.292)	0.477	0.227	0.212	51
A3, B3B1	-0.032*** (0.012)	0.214 (0.292)	0.118	0.014	-0.012	40
A4, B3B1	-0.025** (0.010)	0.354 (0.302)	0.216	0.047	0.013	30
A5, B3B1	-0.035*** (0.010)	-1.242*** (0.311)	0.676	0.456	0.428	21
Panel B: Regression of Average Post-Merger Industry-Adjusted ROE on Average Pre-Merger Industry-Adjusted ROE						
A1A2, B3B1	-0.024** (0.011)	1.055*** (0.242)	0.529	0.280	0.265	51
A1A3, B3B1	-0.026** (0.010)	0.508 (0.244)**	0.320	0.103	0.079	40

AdjROE$_{Ai}$ denotes the industry-adjusted ROE of the combined firm in the ith year following the acquisition. AdjROE$_{A1Ai}$ denotes the average industry-adjusted ROE of the combined firm from the first to the ith year following the acquisition. AdjROE$_{B1B3}$ denotes the average industry-adjusted ROE of the combined firm from the third to the first year prior to the acquisition.

Table 7: Domestic versus cross-border M&A deals

Panel A. Domestic vs. cross-border deals. Acquirer – Target. Industry-adjusted values for ROE(BY) before the deal

	Domestic M&A Deals					Cross-Border M&A Deals				
	Mean ROE		Wilcoxon Test			Mean ROE		Wilcoxon Test		
N. of years	Acquirer	Target	Acquirer vs Target			Acquirer	Target	Acquirer vs Target		
before the deal	%	%	N	%+	Z	%	%	N	%+	Z
B1	2.63	-0.66	84	54.8	2.71***	-0.01	1.14	85	44.7	1.26
B2	1.51	-0.48	71	52.6	2.11**	0.85	2.62	79	37.2	1.71*
B3	1.32	0.18	56	60.7	2.59***	2.33	4.03	63	47.6	0.49
B4	1.57	-1.95	41	56.1	3.55***	1.83	4.49	50	56.0	0.44
B5	2.50	1.69	37	70.3	3.55***	2.45	0.76	41	48.8	0.32

Panel B. Domestic vs. cross-border deals. Post values for the combined bank vs. Pre values of the merging banks. Adjusted values for ROE(BY)

	Domestic M&A Deals					Cross-Border M&A Deals				
N. of years	Mean ROE		Wilcoxon Test			Mean ROE		Wilcoxon Test		
before the deal	N	ROE (%)	N	Change in ROE (%)	%+ (Z)	N	%	N	Change in ROE (%)	%+ (Z)
B3B1	53	0.31				99	0.52			
A1	50	-1.61	27	-2.19	44.4 (1.18)	273	-0.77	69	0.06	0.79
A2	38	-1.04	22	-2.21	54.5. (0.47)	281	-1.84	64	-2.27	26.6 2.88***
A3	36	-0.27	19	-1.42	52.6 (0.44)	265	-1.28	56	-1.82	32.1 2.87***
A4	31	-1.37	14	-2.29	42.9 (0.22)	231	-1.06	45	-1.43	26.7 2.53**
A5	25	5.36	11	1.29	54.5 (0.62)	206	-2.10	34	-3.83	20.6 3.22***
A1A2	88	-0.60	22	-2.47	40.9 (1.45)	302	-1.05	72	-0.98	37.5 1.90*
A1A3	74	-0.59	19	-1.19	57.9 (0.73)	314	-1.07	73	-1.14	38.4 1.90*
A1A5	45	+0.05	21	1.15	72.7 (1.16)	336	-1.35	73	-1.86	28.8 3.00***

In this table, in the interest of concision, ROE refers to mean industry-adjusted Return on Equity, where equity is measured at the beginning of the year. In the same spirit, Change in ROE refers to the difference between the mean industry-adjusted Return on Equity in some year following the acquisition and the mean industry-adjusted Return on Equity in the 3 years before the acquisition.

Table 8: Comparison of net margin and asset turnover before and after the deal

Panel A. Acquirer. Industry-adjusted values for NBM and BAT before the deal (adjustment: by year, country and type of activity)

	NBM							BAT						
N. of years	NBM		Adjusted NBM		Wilcoxon Test			BAT		Adjusted BAT		Wilcoxon Test		
before the deal	Median (%)	N	Median (%)	N	%+	%-	Z	Median (%)	N	Median (%)	N	%+	%-	Z
B1	18.0	746	0.00	667	46.3	41.4	3.15***	2.27	642	0.15	533	55.5	44.5	0.02
B2	17.2	720	0.00	645	48.7	41.1	3.28***	2.20	592	0.12	505	56.4	43.6	0.41
B3	17.0	649	0.00	578	45.8	42.4	2.40**	2.17	521	0.04	461	53.4	46.6	1.43
B4	15.9	557	0.00	504	49.0	38.3	3.15***	2.17	452	0.02	407	50.4	49.6	1.00
B5	15.1	493	0.00	453	47.2	40.4	2.01**	2.18	404	0.04	375	51.7	48.3	0.18

Panel B. Target. Industry-adjusted values for NBM and BAT before the deal (adjustment: by year, country and type of activity)

	NBM							BAT						
N. of years	NBM		Adjusted NBM		Wilcoxon Test			BAT		Adjusted BAT		Wilcoxon Test		
before the deal	Median (%)	N	Median (%)	N	%+	%-	Z	Median (%)	N	Median (%)	N	%+	%-	Z
B1	18.5	300	0.77	251	40.2	54.2	2.40**	2.07	235	-0.12	180	47.2	52.8	2.65***
B2	17.2	286	0.00	236	41.1	51.3	1.75*	2.06	217	-0.19	168	45.2	54.8	3.22***
B3	16.9	256	-0.57	206	39.3	53.9	1.35	2.13	183	-0.15	140	43.6	56.4	2.75***
B4	16.0	212	-0.30	164	42.7	50.0	1.58	1.97	160	-0.05	119	45.4	54.6	2.09**
B5	14.9	177	-1.96	134	39.6	56.7	2.50**	2.02	134	-0.11	97	47.4	52.6	1.18

Panel C. Post values for the combined bank vs. Pre values of the merging banks. Adjusted values for NBM and BAT (adjustment: by year, country and type of activity)

	Pre-Merger				Post-Merger					Post versus Pre Wilcoxon Tesrs				
Year	NBM Median (%)	N	BAT Median (%)	N	Year	NBM Median (%)	N	BAT Median (%)	N	NBM %+ (%-)	NBM Z	BAT %+ (%-)	BAT Z	N NBM N BAT
B2B1	-0.05	189	0.01	149	A1A2	-0.11	119	-0.04	97	53.3 (40.0)	0.69	34.1 (39.0)	0.94	105 82
B3B1	-0.36	194	0.01	147	A1A3	0.00	120	-0.02	97	50.9 (39.6)	0.07	31.3 (46.3)	1.48	106 80
B5B1	-0.36	194	0.04	141	A1A5	-0.08	121	-0.09	89	50.0 (43.4)	0.03	21.9 (38.4)	1.83*	106 73

NBM = Net Income / Net Revenue. BAT = Net Revenue / [Total Assets + Off Balance Sheet Assets (beginning of the year)]. % +: % of positive cases under the Wilcoxon test. % -: % of negative cases under the Wilcoxon test. ***, **, * statistical significance at 1%, 5% and 10%.

Table 9: Comparison of ratios of personnel and other administrative expenses over revenue before and after the deal

Panel A. Acquirer. Industry-adjusted values for PEX and AOE before the deal (adjustment: by year, country and type of activity)

N. of years before the deal	PEX								OAE						
	PEX		Adjusted PEX		Wilcoxon Test			OAE		Adjusted OAE		Wilcoxon Test		
	Median (%)	N	Median (%)	N	%+	%-	Z	Median (%)	N	Median (%)	N	%+	%-	Z
B1	15.9	730	-1.18	651	24.1	60.8	10.2***	9.63	694	-0.20	620	30.0	54.8	6.47***
B2	15.6	704	-1.26	630	25.9	61.9	10.2***	9.32	674	-0.21	603	31.5	52.9	6.30***
B3	14.8	638	-1.46	567	23.3	63.3	10.1***	8.60	610	-0.31	542	27.7	55.4	6.69***
B4	14.6	549	-1.31	497	23.3	63.0	9.36***	8.48	526	-0.36	476	28.6	56.3	6.26***
B5	14.1	485	-1.47	444	25.9	63.3	8.97***	8.36	465	-0.25	426	30.0	56.1	6.37***

Panel B. Target. Industry-adjusted values for PEX and OAE before the deal (adjustment: by year, country and type of activity)

N. of years before the deal	PEX								OAE						
	PEX		Adjusted PEX		Wilcoxon Test			OAE		Adjusted OAE		Wilcoxon Test		
	Median (%)	N	Median (%)	N	%+	%-	Z	Median (%)	N	Median (%)	N	%+	%-	Z
B1	16.4	292	-0.34	243	36.6	52.3	0.93	10.50	217	0.00	185	45.9	49.2	0.46
B2	15.9	275	-0.47	225	37.8	53.8	1.54	9.90	215	0.00	181	43.1	50.3	0.72
B3	15.4	241	-0.49	193	34.7	54.9	2.28**	9.60	195	-0.07	162	42.0	50.6	1.30
B4	15.6	202	-0.49	155	34.8	56.1	1.81*	9.85	167	0.00	133	47.4	46.6	0.61
B5	14.7	173	-0.90	130	36.2	57.7	2.74***	8.75	147	-0.05	114	40.4	51.8	1.86*

Panel C. Post values for the combined bank vs. Pre values of the merging banks. Adjusted values for PEX and OAE (adjustment: by year, country and type of activity)

	Pre-Merger				Post-Merger					Post versus Pre Wilcoxon Tesrs				
N. of years before the deal	PEX Median (%)	N	OAE Median (%)	N	Years	PEX Median (%)	N	OAE Median (%)	N	PEX %+ (%-)	PEX Z	OAE %+ (%-)	OAE Z	N PEX N OAE
B2B1	-1.68	176	-0.39	145	A1A2	-1.15	110	-0.07	89	54.7 (45.3)	1.86*	58.2 (41.8)	2.00**	95 79
B3B1	-1.69	180	-0.51	148	A1A3	-1.07	111	-0.01	90	57.3 (40.6)	2.40**	61.3 (37.5)	2.18**	96 80
B5B1	-1.92	183	-0.70	150	A1A5	-1.28	112	0.00	91	62.5. (36.5)	2.96***	62.5. (36.3)	2.70***	96 80

PEX = Personnel Expense / Revenue. OAE = Other Administrative Expense / Revenue. % +: % of positive cases under the Wilcoxon test. % -: % of negative cases under the Wilcoxon test. ***, **, * statistical significance at 1%, 5% and 10%.

Table 10: Regressions of industry-adjusted post-merger accounting performance on industry-adjusted pre-merger accounting performance

$$AdjPer_{M\&A,post} = \alpha + \beta AdjPer_{M\&A,pre} + \varepsilon$$

Post, Pre	α	β	R^2	$AdjR^2$	N	Post, Pre	α	β	R^2	$AdjR^2$	N
Panel A: Net Margins (NBM)						**Panel B: Asset Turnover (BAT)**					
A1A2, B3B1	-0.070*** (0.023)	-1.499*** (0.187)	0.389	0.383	103	A1A2, B3B1	-0.008*** (0.002)	0.264*** (0.045)	0.314	0.305	78
A1A3, B3B1	-0.061*** (0.020)	-1.444*** (0.170)	0.415	0.410	104	A1A3, B3B1	-0.009*** (0.002)	0.233*** (0.045)	0.259	0.249	79
A1A4, B3B1	-0.080*** (0.018)	-1.733*** (0.150)	0.566	0.561	104	A1A4, B3B1	-0.009*** (0.002)	0.215*** (0.045)	0.229	0.219	79
A1A5, B3B1	-0.084*** (0.018)	-1.719*** (0.150)	0.562	0.557	104	A1A5, B3B1	-0.009*** (0.002)	0.203*** (0.044)	0.215	0.205	79
Panel C: Personnel Expense over Revenue (PEX)						**Panel D: Other Administrative Expenses over Revenue (OAE)**					
A1A2, B3B1	0.008 (0.011)	1.394*** (0.108)	0.648	0.644	93	A1A2, B3B1	0.019** (0.010)	1.574*** (0.090)	0.801	0.799	77
A1A3, B3B1	-0.019** (0.009)	0.394*** (0.128)	0.095	0.085	92	A1A3, B3B1	0.004 (0.008)	1.138*** (0.078)	0.735	0.731	78
A1A4, B3B1	-0.007 (0.012)	1.316*** (0.126)	0.544	0.539	94	A1A4, B3B1	-0.008 (0.009)	0.919*** (0.081)	0.627	0.622	78
A1A5, B3B1	-0.018 (0.014)	1.243*** (0.146)	0.439	0.433	94	A1A5, B3B1	-0.018* (0.010)	0.787*** (0.091)	0.496	0.490	78
Panel E: Cash Flow Returns CFR (BY)						**Panel F: Cash-Flow Returns CFR(AVG)**					
A1A2, B3B1	-0.113 (0.070)	0.507* (0.300)	0.062	0.040	45	A1A2, B3B1	-0.401*** (0.046)	0.848** (0.420)	0.087	0.066	45
A1A3, B3B1	-0.116* (0.063)	0.514* (0.269)	0.078	0.057	45	A1A3, B3B1	-0.378*** (0.040)	0.985*** (0.364)	0.141	0.125	45
A1A4, B3B1	-0.132** (0.062)	0.493* (0.268)	0.073	0.052	45	A1A4, B3B1	-0.372*** (0.039)	1.008*** (0.359)	0.155	0.135	45
A1A5, B3B1	-0.136** (0.060)	0.478* (0.259)	0.073	0.052	45	A1A5, B3B1	-0.372*** (0.039)	0.992*** (0.361)	0.149	0.129	45

Adj Per$_{A1Ai}$ denotes the average industry-adjusted performance of the combined bank from the first to the ith year following the acquisition. Adj PER$_{B1B3}$ denotes the average industry-adjusted performance of the combined bank from the third to the first year prior to the acquisition. CFR (BY) = (Net Revenue – Personnel Expense – Other Administrative Expense)/Market Value (Beginning of the year). CFR (AVG) = (Net Revenue – Personnel Expense – Other Administrative Expense)/Market Value (Average over the year).

Table 11: Comparison of cash-flow returns before and after the deal

Panel A. Industry-adjusted values for CFR before the deal (adjustment: by year, country and type of activity)

N. of years before the deal	Acquirer Mean CFR (%)	N	Acquirer Industry-Adjusted Mean CFR (%)	N	% +	% -	Z Score
B1	21.2	513	1.46	467	53.3	45.4	2.04**
B2	23.1	484	4.27	433	60.7	37.4	4.89***
B3	23.5	418	4.84	382	63.6	35.9	5.62***
B4	24.7	360	6.13	332	67.8	30.4	6.90***
B5	27.1	316	4.83	292	69.2	29.5	7.28***
B2B1	22.7	540	3.29	494	55.8	43.8	3.85***
B3B1	24.2	551	4.98	507	62.8	37.2	4.73***
B5B1	26.8	561	6.86	517	64.3	35.7	6.70***

Panel B. Target. Industry-adjusted values for CFR before the deal (adjustment: by year, country and type of activity)

N. of years before the deal	Target Mean CFR (%)	N	Target Industry-Adjusted Mean CFR (%)	N	% +	% -	Z Score
B1	18.6	113	-1.43	100	53.0	47.0	0.32
B2	20.1	112	-1.10	98	45.9	53.1	0.20
B3	24.5	92	0.41	77	50.6	45.5	0.48
B4	25.8	79	-2.99	65	63.1	36.9	1.08
B5	27.3	63	-2.56	52	55.8	44.2	0.62
B2B1	18.2	101	-3.47	86	46.5	53.5	1.32
B3B1	18.6	84	-3.36	68	47.1	52.9	1.23
B5B1	21.6	57	-5.14	45	53.3	46.7	0.80

Panel C. Acquirer – Target. Industry-adjusted values for CFR before the deal (adjustment: by year, country and type of activity)

N. of years before the deal	Mean Industry Adjusted CFR (%) Acquirer	Target	Acquirer versus Target (Wilcoxon Test) N	%+	%-	Z Score
B1	1.46	-1.43	72	48.6	29.2	2.37**
B2	4.27	-1.10	73	47.9	34.2	2.53**
B3	4.84	0.41	49	42.9	34.7	1.05
B4	6.13	-2.99	38	44.7	28.9	1.64
B5	4.83	-2.56	30	30.0	46.7	0.09
B2B1	3.29	-0.58	85	50.0	30.5	2.35**
B3B1	4.98	0.30	85	45.9	36.5	1.55
B5B1	6.86	0.36	85	43.5	38.8	1.61

Panel D. Post values for the combined bank vs. Pre values of the merging banks

N. of years after the deal	Mean Industry Adjusted CFR N	(%)	Change in Mean-Industry Adjusted CFR N	(%)	Wilcoxon Test %+	%-	Z Score
B3B1	82	2.7					
A1	82	-16.5	56	-15.1	28.6	71.4	3.30***
A2	68	-6.1	44	-5.9	27.3	72.7	2.42**
A3	58	-4.4	38	-10.5	23.7	76.3	3.75***
A4	50	-13.3	34	-20.9	20.6	79.4	4.35***
A5	39	-10.2	24	-20.1	8.3	91.7	3.91***
A1A2	85	-14.1	57	-14.8	24.6	75.4	3.77***
A1A3	85	-13.1	57	-14.2	22.8	77.2	4.43***
A1A5	85	-13.2	57	-15.7	19.3	80.7	4.58***

% +: % of positive cases under the Wilcoxon test. % -: % of negative cases under the Wilcoxon test. ***, **, * statistical significance at 1%, 5% and 10%.

Table 12: Regression of industry-adjusted post-merger accounting performance on industry-adjusted pre-merger accounting performance and industry adjusted acquirer and target size

$$AdjPer_{M\&A,post} = \alpha + \beta\, AdjPer_{M\&A,pre} + \gamma\, Size_{A,pre} + \delta\, Size_{T,pre} + \varepsilon$$

Post, Pre	Panel A: Return on Equity ROE (BY) α	β	γ_1	γ_2	AdJ.R^2	N	Panel B: Return on Equity ROE (AVG) A	β	γ_1	γ_2	Adj.R^2	N
A1,B1	0.004 (0.010)	0.275*** (0.091)	-0.013** (0.006)	0.001 (0.004)	0.064	123	0.008* (0.005)	0.165*** (0.044)	-0.007** (0.003)	-0.002 (0.002)	0.099	124
A1A2, B3B1	0.004 (0.007)	0.204*** (0.068)	-0.011** (0.004)	0.005 (0.003)	0.074	132	0.009** (0.004)	0.266*** (0.058)	-0.006** (0.003)	0.001 (0.002)	0.132	132
A1A3, B3B1	0.000 (0.007)	0.208*** (0.061)	-0.010*** (0.004)	0.003 (0.003)	0.086	133	0.009** (0.004)	0.260*** (0.053)	-0.005** (0.003)	0.001 (0.002)	0.159	133
A1A4, B3B1	-0.003 (0.006)	0.209*** (0.060)	-0.010** (0.004)	0.002 (0.003)	0.085	133	0.008** (0.003)	0.237*** (0.050)	-0.004* (0.002)	0.000 (0.002)	0.137	133
A1A5, B3B1	-0.008 (0.006)	0.201*** (0.057)	-0.005 (0.004)	0.003 (0.003)	0.079	133	0.005 (0.004)	0.196*** (0.050)	-0.001 (0.002)	0.001 (0.002)	0.098	133

Post, Pre	Panel C: Cash Flow Returns CFR (BY) α	β	γ_1	γ_2	AdJ.R^2	N	Panel D: Cash Flow Returns CFR (AVG)	β	γ_1	γ_2	Adj.R^2	N
A1,B1	-0.167 (0.144)	1.096*** (0.327)	-0.033 (0.067)	0.030 (0.055)	0.144	54	-0.436*** (0.094)	1.520*** (0.264)	-0.073 (0.055)	0.028 (0.045)	0.376	54
A1A2, B3B1	-0.100 (0.065)	0.859*** (0.166)	-0.059 (0.039)	0.028 (0.033)	0.333	56	-0.446*** (0.093)	1.477*** (0.268)	-0.081 (0.055)	0.035 (0.046)	0.351	56
A1A3, B3B1	-0.091* (0.052)	0.878*** (0.131)	-0.063** (0.031)	0.028 (0.026)	0.466	56	-0.411*** (0.078)	1.489*** (0.224)	-0.087* (0.046)	0.036 (0.038)	0.450	56
A1A4, B3B1	-0.104** (0.052)	0.883** (0.132)	-0.060* (0.031)	0.024 (0.026)	0.460	56	-0.389*** (0.069)	1.500*** (0.199)	-0.091** (0.041)	0.038 (0.034)	0.520	56
A1A5, B3B1	-0.109** (0.050)	0.879*** (0.126)	-0.059* (0.030)	0.021 (0.025)	0.480	56	-0.382*** (0.064)	1.506*** (0.185)	-0.093** (0.038)	0.038 (0.031)	0.560	56

Adj Per$_{Ai}$ denotes the industry-adjusted performance of the combined firm in the ith year following the acquisition. Adj Per$_{A1Ai}$ denotes the average industry-adjusted performance of the combined firm from the first to the ith year following the acquisition. Adj Per$_{B1B3}$ denotes the average industry-adjusted performance of the combined firm from the third to the first year prior to the acquisition. Size$_A$ denotes the industry-adjusted size of the acquirer and is measured at the end of the first year prior to the acquisition. Size$_T$ denotes the industry-adjusted size of the target and is measured at the end of the first year prior to the acquisition. ***, **, * statistical significance at 1%, 5% and 10%.

Table 13: Comparison of adjusted values of efficiency prior to the M&A deal

Panel A. Acquirer. Industry-adjusted values for cost efficiency and profit efficiency before the deal (adjustment: mean by year and country)

N. of years before the deal	N	Cost efficiency		Profit efficiency	
		Mean (Std. Dev)	% +ve cases (Z-test)	Mean (Std. Dev)	% +ve cases (Z-test)
B1	694	.0145 (.1200)	57%- (-4.25)°°°	.0739 (.1062)	83% (-17.38)°°°
B2	661	.0214 (.1218)	59% (-5.16)°°°	.0722 (.1061)	85% (-16.68)°°°
B3	586	.0285 (.1422)	58% (-4.58)°°°	.0761 (.1117)	85% (-16.03)°°°
B4	510	.0264 (.1355)	58% (-4.51)°°°	.0794 (.1104)	88% (-15.88)°°°
B5	435	.0203 (.1343)	53% (-3.27)°°°	.0724 (.1053)	85% (-13.96)°°°
B6	378	.0229 (.1341)	56% (-3.16)°°°	.0822 (.0933)	91% (-14.78)°°°

Panel B. Target. Industry-adjusted values for cost efficiency and profit efficiency before the deal (adjustment: mean by year and country)

N. of years before the deal	N	Cost efficiency		Profit efficiency	
		Mean (Std. Dev)	% +ve cases (Z-test)	Mean (Std. Dev)	% +ve cases (Z-test)
B1	264	.0026 (.1313)	56% (-1.949)°°	.0535 (.1208)	76% (-7.746)°°°
B2	251	-.0014 (.1374)	57% (-1.764)°	.0596 (.1160)	78% (-8.220)°°°
B3	211	.0113 (.1458)	59% (-2.737)°°°	.0658 (.1177)	81% (-8190)°°°
B4	181	.0119 (.1416)	59% (-2.289)°°	.0727 (.1338)	78% (-7.669)°°°
B5	160	.0195 (.1565)	67% (-3.169)°°°	.0708 (.1439)	79% (-6.854)°°°
B6	130	.0212 (.1285)	64% (-2.594)°°°	.0657 (.1327)	83% (-6.422)°°°

Panel C. Acquirer versus Target. Industry-adjusted values for cost efficiency and profit efficiency before the deal (adjustment: mean by year and country)

N. of years before the deal	N	Cost efficiency		Profit efficiency	
		Mean (Std. Dev)	% +ve cases (Z-test)	Mean (Std. Dev)	% +ve cases (Z-test)
B1	196	.0093 (.1625)	45% (-.561)	.0019 (.1443)	47% (.647)
B2	188	.0179 (.1710)	45% (-1.052)	.0038 (.1436)	44% (-.652)
B3	157	.0088 (.1798)	43% (-.132)	.0049 (.1538)	42% (-.629)
B4	123	.0122 (.1807)	45% (-.494)	-.0019 (.1667)	45% (-.303)
B5	100	.0080 (.1839)	42% (-.283)	.0036 (.1562)	42% (-.175)
B6	89	-.0025 (.1717)	48% (-.290)	.0133 (.1452)	41% (-.040)

% of positive cases under the Wilcoxon test. °°°, °°, ° Z-test respectively statistically significant at 1%, 5% and 10%. Total number of deals: 647. Number of domestic deals: 345. Number of cross-border deals: 302.

Table 14: Comparison of X-efficiency before and after the deal

Panel A. Post values of the combined bank vs. Pre values of the merging banks. Adjusted for cost and profit efficiency (adjustment: mean by year and country)

No of years after the deal	Cost efficiency Base year: B6B1		Cost efficiency Base year: B3B1		Profit efficiency Base year: B6B1		Profit efficiency Base year: B3B1	
	Mean (Std. Dev)	% negative cases (Z-test)	Mean (Std. Dev)	% negative cases (Z-test)	Mean (Std. Dev)	% positive cases (Z-test)	Mean (Std. Dev)	% positive cases (Z-test)
A1	0.0308***	60%	0.0302***	64%	-0.0117*	53%	-0.0057	52%
n. deals: 160	(0.082)	(-4.177)°°°	(0.079)	(-4.519)°°°	(0.084)	(-1.603)°	(0.081)	(-0.829)
A2	0.0366***	71%	0.0358***	72%	-0.0187**	52%	-0.0127*	46%
n. deals: 136	(0.074)	(-5.467)°°°	(0.073)	(-5.629)°°°	(0.087)	(-1.616)°	(0.082)	(0.419)
A3	0.0375***	65%	0.0364***	69%	-0.0155**	52%	-0.0092*	44%
n. deals: 121	(0.079)	(-5.053)°°°	(0.077)	(-5.308)°°°	(0.085)	(-1.380)	(0.079)	(-0.317)
A4	0.0397***	73%	0.0387***	74%	-0.0225**	54%	-0.0155*	46%
n. deals: 104	(0.083)	(-4.887)°°°	(0.080)	(-5.034)°°°	(0.088)	(-2.276)°°	(0.082)	(-1.211)
A5	0.0407***	65%	0.0386***	72%	-0.0424**	65%	-0.0340**	61%
n. deals: 77	(0.093)	(-3.465)°°°	(0.091)	(-3.614)°°°	(0.124)	(-3.064)°°°	(0.121)	(-2.459)°°
A6	0.0510***	80%	0.0436***	75%	-0.0533***	73%	-0.0444***	73%
n. deals: 49	(0.104)	(-3.576)°°°	(0.106)	(-3.057)°°°	(0.094)	(-3.566)°°°	(0.087)	(-3.344)°°°
Mean (A1A3)			0.0380	0.0734			-0.0073	0.0805
Mean (A1A6)	0.0400	0.0746			-0.0170	0.0861		

Panel B. Domestic M&A. Post values of the combined bank vs. Pre values of the merging banks. Adjusted for cost and profit efficiency (adjustment: mean by year and country)

No of years After the deal	Cost efficiency Base year: B6B1		Cost efficiency Base year: B3B1		Profit efficiency Base year: B6B1		Profit efficiency Base year: B3B1	
	Mean (Std. Dev)	%negative cases (Z-test)	Mean (Std. Dev)	% negative cases (Z-test)	Mean (Std. Dev)	% positive cases (Z-test)	Mean (Std. Dev)	% positive cases (Z-test)
A1	0.0384***	57%	0.0387***	62%	-0.0055	54%	-0.0022	50%
n. deals: 87	(0.094)	(-2.963)°°°	(0.090)	(-3.318)°°°	(0.081)	(-0.601)	(0.081)	(-0.76)
A2	0.0450***	70%	0.0441***	70%	-0.0068	44%	-0.0048	37%
n. deals: 70	(0.076)	(-4.322)°°°	(0.073)	(-4.427)°°°	(0.077)	(-0.243)	(0.074)	(-0.688)
A3	0.0461***	70%	0.0444***	73%	-0.0017	44%	0.0001	38%
n. deals: 64	(0.073)	(-4.588)°°°	(0.070)	(-4.628)°°°	(0.072)	(-0.187)	(0.068)	(-0.983)
A4	0.0460***	76%	0.0432***	75%	-0.0137	49%	-0.0106	42%
n. deals: 55	(0.078)	(-4.223)°°°	(0.075)	(-4.198)°°°	(0.075)	(-1.089)	(0.068)	(-0.369)
A5	0.0449***	76%	0.0397***	76%	-0.0397*	59%	-0.0333	59%
n. deals: 41	(0.088)	(-3.285)°°°	(0.085)	(-3.065)°°°	(0.148)	(-1.432)	(0.145)	(-1.160)
A6	0.0544**	86%	0.0463**	82%	-0.0521***	68%	-0.0452***	68%
n. deals: 28	(0.106)	(-3.006)°°°	(0.104)	(-2.983)°°°	(0.084)	(-2.788)°°°	(0.075)	(-2.801)°°°

Panel C. Cross-border M&A. Post values of the combined bank vs. Pre values of the merging banks. Adjusted for cost and profit efficiency (adjustment: mean by year and country)

Number of years After the deal	Cost efficiency Base year: B6B1		Cost efficiency Base year: B3B1		Profit efficiency Base year: B6B1		Profit efficiency Base year: B3B1	
	Mean (Std. Dev)	% negative cases (Z-test)	Mean (Std. Dev)	% negative cases (Z-test)	Mean (Std. Dev)	% positive cases (Z-test)	Mean (Std. Dev)	% positive cases (Z-test)
A1	0.0217***	64%	0.0199***	65%	-0.0190*	52%	-0.0099	54%
n. deals: 73	(0.065)	(-2.966)°°°	(0.063)	(-3.143)°°°	(0.088)	(-1.685)°	(0.081)	(-1.038)
A2	0.0276***	71%	0.0269***	74%	-0.0313***	59%	-0.0213*	55%
n. deals: 66	(0.072)	(-3.440)°°°	(0.072)	(-3.683)°°°	(0.095)	(-2.399)°°	(0.089)	(-1.650)°
A3	0.0278**	58%	0.0273**	64%	-0.0311**	61%	-0.0199*	52%
n. deals: 57	(0.085)	(-2.411)°°	(0.083)	-2.847)°°°	(0.096)	(-2.054)°°	(0.089)	(-1.224)
A4	0.0327**	69%	0.0336***	73%	-0.0323**	59%	-0.0212	50%
n. deals: 49	(0.089)	(2.591)°	(0.087)	(-2.903)°°°	(0.101)	(-2.084)°°	(0.095)	(-1.272)
A5	0.0359**	53%	0.0374**	69%	-0.0455***	72%	-0.0349**	63%
n. deals: 36	(0.100)	(-1.650)°	(0.099)	(-2.047)°°	(0.090)	(-2.765)°°°	(0.086)	(-2.260)°°
A6	0.0465*	71%	0.0397	65%	-0.0549**	81%	-0.0433*	80%
n. deals: 21	(0.104)	(-1.929)°°	(0.110)	(-1.456)	(0.108)	(-2.416)°°	(0.103)	(-2.016)°°

Base year are weighted averages of the performance measure in the years prior to the M&A of the target and acquiring banks. ***, **, * T-test respectively statistically significant at 1%, 5% and 10%. °°°, °°, ° Z-test respectively statistically significant at 1%, 5% and 10%. Total number of deals: 647. Number of domestic deals: 345. Number of cross-border deals: 302.

Table 15: X-efficiency before and after the deal: M&A impact and trend

Panel A: M&A sample (post vs. 3 years pre- deal)						Panel B: M&A sample (post vs. 6 years pre- deal)					
Post, Pre	α	β	R	R²	AdjR²	Post, Pre	α	β	R	R²	AdjR²
Cost efficiency $AdjPer_{M\&A,post} = \alpha + \beta AdjPer_{M\&A,pre} + \varepsilon$											
A1, B3B1	0.029*** (0.006)	0.796*** (0.062)	0.715	0.512	0.509	A1, B6B1	0.029*** (0.006)	0.761*** (0.063)	0.691	0.478	0.474
A2, B3B1	0.033*** (0.006)	0.689*** (0.057)	0.726	0.527	0.523	A2, B6B1	0.033*** (0.006)	0.670*** (0.056)	0.715	0.512	0.508
A3, B3B1	0.031*** (0.006)	0.558*** (0.063)	0.630	0.397	0.392	A3, B6B1	0.032*** (0.006)	0.527*** (0.063)	0.608	0.370	0.365
A4, B3B1	0.031*** (0.007)	0.554*** (0.071)	0.616	0.389	0.373	A4, B6B1	0.031*** (0.007)	0.528*** (0.071)	0.595	0.354	0.347
A5, B3B1	0.027*** (0.008)	0.462*** (0.075)	0.583	0.340	0.331	A5, B6B1	0.027*** (0.008)	0.440*** (0.075)	0.561	0.314	0.305
A6, B3B1	0.020* (0.012)	0.349*** (0.099)	0.463	0.214	0.197	A6, B6B1	0.023** (0.012)	0.354*** (0.097)	0.471	0.222	0.205
A1A3, B3B1	0.036*** (0.006)	0.777*** (0.057)	0.735	0.541	0.538	A1A6, B6B1	0.038*** (0.006)	0.746*** (0.056)	0.724	0.524	0.521
Profit efficiency $AdjPer_{M\&A,post} = \alpha + \beta AdjPer_{M\&A,pre} + \varepsilon$											
A1, B3B1	0.001 (0..8)	0.887*** (0.067)	0.729	0.531	0.528	A1, B6B1	-0.001 (0.008)	0.855*** (0.069)	0.701	0.492	0.488
A2, B3B1	-0.003 (0.009)	0.874*** (0.074)	0.716	0.512	0.508	A2, B6B1	-0.004 (0.010)	0.813*** (0.077)	0.673	0.453	0.448
A3, B3B1	0.005 (0.009)	0.818*** (0.083)	0.674	0.454	0.449	A3, B6B1	0.007 (0.010)	0.725*** (0.082)	0.628	0.395	0.390
A4, B3B1	-0.012 (0.011)	0.952*** (0.952)	0.696	0.484	0.479	A4, B6B1	-0.008 (0.012)	0.826*** (0.098)	0.641	0.411	0.406
A5, B3B1	-0.012 (0.019)	0.743*** (0.160)	0.475	0.226	0.215	A5, B6B1	-0.010 (0.020)	0.662*** (0.151)	0.450	0.203	0.192
A6, B3B1	-0.024 (0.030)	0.751*** (0.190)	0.504	0.254	0.238	A6, B6B1	-0.014 (0.020)	0.571*** (0.164)	0.453	0.206	0.189
A1A3, B3B1	0.007 (0.007)	0.774*** (0.064)	0.691	0.477	0.474	A1A6, B6B1	0.004 (0.008)	0.693*** (0.067)	0.633	0.401	0.397

Profit efficiency and size $AdjPer_{M\&A,post} = \alpha + \beta AdjPer_{M\&A,pre} + \gamma Size_{A,pre} + \delta Size_{T,pre} + \varepsilon$											
	α	β	γ	δ	AdjR²		α	β	γ	δ	AdjR²
A1, B3B1	0.214** (0.087)	0.907*** (0.066)	-0.008* (0.005)	-0.005 (0.004)	0.540	A1, B6B1	0.270*** (0.090)	0.892*** (0.069)	-0.009* (0.005)	-0.006* (0.004)	0.512
A2, B3B1	0.297*** (0.092)	0.900*** (0.072)	-0.017*** (0.005)	0.000 (0.004)	0.543	A2, B6B1	0.352*** (0.097)	0.855*** (0.075)	-0.018*** (0.005)	-0.002 (0.004)	0.495
A3, B3B1	0.85*** (0.092)	0.866*** (0.080)	-0.018*** (0.005)	0.003 (0.004)	0.496	A3, B6B1	0.330*** (0.097)	0.784*** (0.080)	-0.019*** (0.005)	0.001 (0.004)	0.443
A4, B3B1	0.299*** (0.108)	1.012*** (0.096)	-1.018*** (0.006)	0.000 (0.004)	0.515	A4, B6B1	0.347*** (0.115)	0.897*** (0.097)	-0.018*** (0.007)	-0.003 (0.005)	0.448
A5, B3B1	0.529*** (0.180)	0.903*** (0.160)	-0.031*** (0.010)	0.001 (0.007)	0.294	A5, B6B1	0.575*** (0.183)	0.834*** (0.153)	-0.031*** (0.010)	-0.003 (0.007)	0.277
A6, B3B1	0.621*** (0.173)	1.171*** (0.207)	-0.032*** (0.009)	-0.007 (0.006)	0.399	A6, B6B1	0.583*** (0.184)	0.906*** (0.188)	-0.027*** (0.009)	-0.008 (0.007)	0.315

Panel C: Domestic M&A sample (post vs. 6 years pre- deal)						Panel D: Cross-border M&A sample (post vs. 6 years pre- deal)					
Cost efficiency											
	α	β	R	R²	AdjR²		α	β	R	R²	AdjR²
A1, B3B1	0.033*** (0.010)	0.780*** (0.107)	0.622	0.386	0.379	A1, B6B1	0.024*** (0.007)	0.757*** (0.070)	0.791	0.626	0.620
A2, B3B1	0.032*** (0.009)	0.600*** (0.089)	0.633	0.400	0.392	A2, B6B1	0.032*** (0.008)	0.727*** (0.077)	0.763	0.582	0.576
A3, B3B1	0.034*** (0.008)	0.542*** (0.090)	0.607	0.368	0.358	A3, B6B1	0.030*** (0.009)	0.521*** (0.093)	0.604	0.365	0.354
A4, B3B1	0.025*** (0.009)	0.458*** (0.099)	0.538	0.289	0.276	A4, B6B1	0.034*** (0.011)	0.566*** (0.107)	0.610	0.372	0.359
A5, B3B1	0.011 (0.012)	0.359*** (0.114)	0.450	0.203	0.182	A5, B6B1	0.042*** (0.013)	0.431*** (0.108)	0.563	0.317	0.297
A6, B3B1	0.005 (0.018)	0.267* (0.150)	0.329	0.109	0.074	A6, B6B1	0.039** (0.016)	0.369** (0.130)	0.545	0.297	0.259
Profit efficiency											
A1, B3B1	0.026*** (0.009)	0.427*** (0.097)	0.431	0.186	0.176	A1, B6B1	-0.029** (0.013)	1.107*** (0.092)	0.819	0.670	0.666
A2, B3B1	0.036*** (0.011)	0.358*** (0.110)	0.367	0.135	0.122	A2, B6B1	-0.032** (0.015)	1.008*** (0.103)	0.774	0.600	0.594
A3, B3B1	0.035*** (0.011)	0.436*** (0.113)	0.441	0.194	0.181	A3, B6B1	-0.020 (0.018)	0.891*** (0.11)	0.709	0.503	0.494
A4, B3B1	0.024** (0.012)	0.454*** (0.121)	0.459	0.211	0.196	A4, B6B1	-0.040** (0.021)	1.071*** (0.147)	0.729	0.531	0.521
A5, B3B1	-0.007 (0.032)	0.544** (0.304)	0.275	0.076	0.052	A5, B6B1	-0.011 (0.022)	0.712*** (0.143)	0.648	0.420	0.403
A6, B3B1	-0.009 (0.021)	0.485 (0.184	0.459	0.211	0.180	A6, B6B1	-0.021 (0.039)	0.676** (0.307)	0.450	0.203	0.161

Post values of the combined bank vs. Pre values of the merging banks. Adjusted values for cost and profit efficiency (adjustment: mean by year and country).

Table 16: Descriptive statistics of institutional, deal- specific and bank-specific determinants of the change in X-efficiency

	N. obs.	Minimum	Maximum	Mean	Std. Deviation
T_Freedom from Government	312	.00	0.90	.3901	.1841
T_Regulatory quality	291	-.65	1.94	.9469	.4243
T_Concentration index	367	.00	0.80	.2607	.1987
A_Freedom from Government	703	.01	0.94	.3927	.1388
A_ Regulatory quality	631	.02	1.94	1.0737	.3191
A_Concentration index	558	.00	0.80	.2553	.2064
Payment method (=1 if Cash only)	970	.00	1.00	.5515	.4976
Deal Period: 2000-2005	970	.00	1.00	.4701	.4994
Deal Period: 1994-1999	970	.00	1.00	.5299	.4994
Deal Period: 1991-1993	970	.00	1.00	.1309	.3375
Cross border dummy (=1 if cross border)	970	.00	1.00	.8557	.3516
C_big	708	.00	1.00	.3319	.4712
C_medium	708	.00	1.00	.3362	.4727
A_big	786	.00	1.00	.3282	.4699
A_medium	786	.00	1.00	.3384	.4735
T_medium	303	.00	1.00	.3333	.4722
T_small	271	.00	1.00	.2435	.4300
C_ Traditional banking	708	.06	.90	.5269	.1322
A_Traditional banking	786	.02	.89	.5132	.1252
T_ Traditional banking	303	.06	.96	.5461	.1743
C_ Risk	636	.00	3.41	.0591	.1729
A_Risk	717	.00	3.41	.0569	.1965
T_Risk	266	.00	1.05	.0899	.1444

Freedom from government (http://www.heritage.org/research/features/index/) is defined to include all government expenditures - including consumption and transfers - and state-owned enterprises. Regulatory quality (www.worldbank.org), the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Concentration index = Total value of assets of the five biggest banks (CR5). Traditional banking = Loans/Total assets; Risk = Stand. Dev ROE; Big = Fist tertile (ln (Total assets)); Medium = Second tertile (ln (Total assets)); Small = Third tertile (ln (Total assets)).

Table 17: Determinants of changes in X-efficiency prior and after M&A

$AdjPer_{M\&A, prevs\,post} = \alpha + \lambda \left(CV_{A,pre}, CV_{T,pre}, CV_{C,post}\right)$	Change in Profit efficiency		Change in Cost efficiency	
Independent Variables (λ) and intercept (α):	Par	T-stat	Par	T-stat
Intercept	0.141**	0.064	0.159***	0.045
T_Freedom from Government	0.204**	0.096	0.365***	0.079
T_Regulatory quality	0.057*	0.035	0.105	0.029
T_Concentration index	0.023	0.049	-0.030	0.044
A_Freedom from Government	-0.337***	0.087	-0.317***	0.073
A_ Regulatory quality	-0.072**	0.034	0.065**	0.028
A_Concentration index	-0.142***	0.054	-0.009	0.045
Payment method dummy (=1 if Cash only)	-0.024*	0.014	-0.022*	0.012
Deal Period: 2000-2005	-0.12	0.023	-0.083***	0.020
Deal Period: 1994-1999	-0.049***	0.016	-0.026**	0.011
Cross border dummy (=1 if cross border)	0.023	0.017	0.006	0.692
C_big	0.005	0.036	-0.004	0.905
C_medium	-0.020	0.024	0.010	0.020
A_big	-0.076**	0.030	-0.002	0.026
A_medium	-0.030	0.024	-0.010	0.020
T_medium	-0.034*	0.018	-0.019	0.015
T_small	-0.002	0.020	-0.005	0.017
C_Traditional banking	0.352***	0.101	0.000	0.001
A_Traditional banking	-0.408***	0.101	-0.002**	0.001
T_ Traditional banking	0.040	0.055	0.001	0.001
C_Risk	1.096***	0.248	0.661**	0.269
A_Risk	0.431***	0.129	0.314***	0.105
T_Risk	0.230**	0.104	0.017	0.094
N. of obs.	96		96	
R²	0.793		0.665	

Table 18: Characteristics of successful vs. unsuccessful deals

Characteristics	Profit efficiency					
	Acquirer			Target		
	Successful	Unsuccessful	Difference in means	Successful	Unsuccessful	Difference in means
Size	17.810	18.779	-0.969***	16.142	16.399	-0.257
	(1.567)	(0.863)	[-2.968]	(1.726)	(1.995)	[-0.533]
Capital	0.209	0.279	-0.070*	0.156	0.193	-0.036
	(0.177)	(0.118)	[-1.812]	(0.213)	(0.252)	[-0.606]
Risk	0.055	0.024	0.031**	0.1729	0.070	0.103**
	(0.079)	(0.023)	[1.965]	(0.201)	(0.079)	[2.449]
Diversification	1.218	0.634	0.584	0.276	0.549	-0.273*
	(2.013)	(0.612)	[1.517]	(0.517)	(0.599)	[-1.640]
Freedom from government	0.397	0.445	-0.048*	0.441	0.437	0.005
	(0.081)	(0.116)	[-1.660]	(0.243)	(0.224)	[0.066]
Regulatory quality	1.022	1.190	-0.168**	0.994	0.713	0.280**
	(0.276)	(0.293)	[-1.995]	(0.407)	(0.387)	[2.391]
	Cost efficiency					
	Acquirer			Target		
Characteristics	Successful	Unsuccessful	Difference in means	Successful	Unsuccessful	Difference in means
Size	18.143	17.309	0.833**	16.751	16.194	0.557
	(1.272)	(1.729)	[2.127]	(2.272)	(1.947)	[1.020]
Capital	0.197	0.136	0.060*	0.273	0.180	0.093
	(0.148)	(0.117)	[1.746]	(0.302)	(0.240)	[1.327]
Loan loss provision	0.295	0.165	0.131**	0.242	0.128	0.114*
	(0.310)	(0.160)	[2.053]	(0.308)	(0.170)	[1.776]
Deal period: 1994-1999	0.533	0.833	-0.300***	0.533	0.833	-0.300***
	(0.507)	(0.379)	[-2.594]	(0.507)	(0.379)	[-2.594]

Size = ln (Total assets). Capital = (Equity$_i$ – Equity$_{min}$)/Equity$_{max}$. Diversification = Off-balance sheet /total assets. Loan loss provision (llp) = (llp$_i$ – llp$_{min}$)/llp$_{max}$. Standard deviations in ( ). T-values in [ ]. ***, **, * T-test respectively statistically significant at 1%, 5% and 10%.