

Agenda

Advancing economics in business

Who's cashing in on mergers? Measuring the benefits of consolidation

Globalisation of industry, technological advances, and the blurring of geographic and economic borders have, until recently, all contributed to an increase in mergers and acquisitions activity. Yet do these developments actually lead to any benefits? Focusing on the banking sector, Alan Horncastle, Oxera Principal, and Professor Subal Kumbhakar, Associate, consider how econometric techniques can be used to measure the impacts of consolidation

Mergers and acquisitions (M&A) can be motivated by numerous factors, such as a reduction in costs through synergies; an increase in revenue through product diversification; financial benefits through borrowing using the larger (combined) capital base; exploiting scale economies and creating economies of scale through new products and geographical expansion; gaining market power; more effective management; and increased innovation. Some of these factors decrease costs, while others increase revenue. Overall, it is argued that profitability will increase. However, it is not possible to predict whether this is something that will happen in reality for every merger, but is something that has to be addressed empirically. This article examines this evidence and considers some of the approaches that have been used in the literature to measuring the impact of consolidation in banking—a sector for which data is readily available, and which therefore lends itself to such a study.¹

In Europe, the single market programme (SMP) came into force at the end of 1992, and was aimed at reducing barriers to trade among Member States. This development was expected to increase competition and industrial restructuring, resulting in economic benefits from the following.

- **Allocative efficiency**—reducing producers' market power, where such producers tend to price above marginal costs, distorting consumption and keeping output below its socially optimal level.
- **Productive efficiency**—in competitive markets firms strive to produce at the lowest possible cost. In contrast, where competition is weak firms may operate inefficiently.
- **Dynamic efficiency**—competition also induces innovation, thereby shifting the technology frontier.

- **Diversification**—in terms of product offering and geographic markets, for example.

How to examine the issue

If the objective is to measure efficiency gains resulting from M&A, what analytical approaches can be used? The empirical literature relating to the banking sector follows two approaches: the event study approach, and pre- and post-merger performance comparison. Proponents of the event study approach argue that the benefit can be observed through higher share prices. That is, when a merger is announced, the stock market reacts in favour of the merger if it is believed that benefits will arise from it.

The second strand of research measures pre- and post-merger performance. This approach chiefly analyses changes in the post-merger performance of merged banks using accounting measurements, including return on assets (ROA) or return on equity (ROE), and cost and profit functions in various formats.

The approach discussed in this article is the econometric approach, whereby a number of factors are used to explain changes in efficiency indicators over time, such that the impact of the mergers themselves can be isolated. More specifically, if it is assumed implicitly that the efficiency gain takes place through improvements in managerial efficiency, this gain can be measured in two ways.

- **Efficiency gains can be examined from the cost side**—ie, the question of whether mergers improve cost efficiency can be analysed using stochastic cost frontier methodologies.
- **Efficiency gains can be measured through improvements in profitability**—ie, via the percentage ROA and percentage ROE.² Again, the

stochastic frontier analysis (SFA) approach can be used because if there is any gain in efficiency then ROA and ROE will improve.

These approaches are explained in more detail in the box below.

SFA is an econometric approach ideally suited to this problem. It was first developed in 1977 by Meeusen and van den Broeck, and Aigner, Lovell and Schmidt.³ It explicitly models efficiency and separately identifies modelling errors—or ‘noise’—by separating the model residual into a symmetric noise component and an asymmetric inefficiency component, rather than assuming that the entirety of the residual is due to inefficiency (as, for example, corrected ordinary least squares regression does).⁴

The results from the literature

Table 1 summarises the results of various studies from the 1980s and 1990s examining mergers in the banking industry (the articles focus largely on mergers in the USA). Most of the studies examined by Pilloff and

Santomero (1996) fail to find significant positive overall gains in the performance or stockholder wealth of banks as a result of a merger. Many studies attempt to identify reasons for these potentially counterintuitive results, and explanations posited for the lack of apparent improvements in performance include the following.

- Managerial behaviour/managerial hubris. Ex ante expectations of performance gains may systematically exceed ex post performance.
- Agency problems. There may be a lack of alignment between the interests of shareholders and managers and, while mergers are in the best interests of managers, they are not necessarily in the best interests of the shareholders. In addition, while there is limited evidence of significant overall gains, where there are gains, these tend to accrue to the target company at the expense of the acquirer, suggesting a winner’s curse (ie, that the acquiring firm bids up the price such that any gains flow to the target company).
- Performance gains are often unique to a specific merger and difficult to estimate on average. That is,

The technicalities applied to the banking sector

SFA

The standard cost function for SFA can be written as:

$$C = f(w, Y, Z) \exp(u + v) \quad (\text{Equation 1})$$

where C is the cost, Y is the set of output variables and Z is the set of contextual factors reflecting the environment of each bank; w is the vector of input prices. Finally v is the noise term and $u \geq 0$ is inefficiency.

The model estimates the parameters for w , Y and Z . Then $f(w, Y, Z) \exp(v)$ is the estimated efficient cost after noise ($\exp(v)$) is taken into account. $\exp(u)$ reflects the level of inefficiency of a bank. The noise term v is typically assumed to be normally distributed around zero, so it may take positive or negative values, while the inefficiency term u is typically assumed to follow some specific distributions that take only positive values.

To separate noise from inefficiency in the model (Equation 1), typically one of a number of possible distributional assumptions on u is made. The SFA approach enables the testing of whether the split between noise and inefficiency is statistically supported for each of the distributions.

Cost efficiency

In the cost function model, inputs and outputs are included, along with a time trend (for technical change), dummy variables to capture whether the technology is different depending on the nature of the merger, and country dummies to control for country-specific fixed effects such as culture and work habits. Determinants of inefficiency can be introduced through the mean and/or variance of the inefficiency component. It is the value of

these estimated coefficients that is of most interest. If the mean or variance is decreased due to mergers, these mergers result in a reduction in inefficiency.

A log linear cost function with inefficiency can be written as:

$$\ln C_{it} = \beta_0 + \sum \beta_j \ln w_{jit} + \sum \alpha_m \ln y_{mit} + \sum \lambda_q z_{qit} + v_{it} + u_{it} \quad (\text{Equation 2})$$

where C is total variable cost, w , y and z are input prices, output and other control variables (such as quasi-fixed inputs, time, merger characteristics, as well as country dummies), i denotes bank i , while t denotes the time period.

Profit efficiency

In the profit function model, a similar approach can be taken (the only difference is that the error term is now $v - u$) in which profit (or log profit) is regressed on a number of variables. An alternative to the standard profit function (which requires information on input and output prices, which are either not available or do not vary sufficiently to be used in econometric estimation) is to use accounting profitability measures such as ROA and ROE.

Return efficiency

The following model can be used to estimate the impact of mergers on ROA or ROE:

$$ROA_{it} = \beta_0 + \sum \lambda_q z_{qit} + v_{it} - u_{it} \quad (\text{Equation 3})$$

where the z variables include merger variables as well as certain others that explain ROA. The presence of inefficiency reduces ROA. The model for ROE is identical.

Table 1 The old ...

Study	Finding	Benefits?
Studies on efficiency		
Rhoades (1987)	Mergers did not affect income or non-interest expenses	×
Rhoades (1990)	Acquisitions involving large banks (\$1 billion in assets) had no effect on performance	×
Berger and Humphrey (1992)	Mergers of large banks in the 1980s did not lead to significant gains in cost efficiency	×
Chamberlain (1992)	Mergers did not result in gains in the full sample of 180 banks between 1981 and 1987 (unless mergers in Texas are excluded)	×
Linder and Crane (1992)	Mergers in New England between 1982 and 1987 did not result in improved operating income, measured by net interest and non-interest income to assets	×
Srinivasan (1992)	Mergers did not reduce non-interest expenses (similar to Srinivasan and Wall 1992)	×
Srinivasan and Wall (1992)	Mergers of commercial banks and bank holding companies between 1982 and 1986 did not reduce non-interest expenses	×
DeYoung (1993)	Overall, the 348 bank-level mergers between 1986 and 1987 led to no significant gains in cost efficiency. However, when both the acquirer and target were poor performers, mergers were found to result in significant gains in cost efficiency	×/✓
Rhoades (1993)	Horizontal mergers did not result in significant cost reductions or efficiency gains	×
Spindt and Tarhan (1993)	Commercial bank mergers in 1986 led to operating improvements. However, according to Pilloff and Santomero (1996), this may have been largely due to economies of scale at small institutions (less than \$100m in assets), and less relevant to large mergers	×/✓
Studies on shareholder value		
Hannan and Wolken (1989)	Shareholder value was not significantly affected by the announcement of merger deals	×
Cornett and Tehranian (1992)	Following 30 large bank holding company mergers, cash-flow returns on the market value of assets improved significantly, but net income to assets (a more traditional measure of bank profitability) did not	×/✓
Houston and Ryngaert (1994)	In 153 mergers studied between 1985 and 1991, acquirers experienced a loss in value and targets enjoyed a gain. However, there was no significant aggregate effect on the overall value of the two merging organisations	×/✓
Madura and Wiant (1994)	In 152 deals between 1982 and 1987, average cumulative abnormal returns of acquirers were negative during the three-year period following the merger announcement, possibly due to mergers achieving fewer benefits or the market revising downwards its expectation for mergers	×
Zhang (1995)	107 mergers in the USA between 1980 and 1990 led to a significant increase in overall value (with target shareholders benefiting more)	✓
Cybo-Ottone and Murgia (1996)	The combined value of the target and acquirer did not significantly change in the 26 mergers of European financial services firms between 1988 and 1995	×
Pilloff (1996)	Mergers were not associated with any significant change in performance, and the mean overall change in shareholder value was quite small	×
Akhavain, Berger and Humphrey (1997)	Mergers of large banks led to significant gains in profit efficiency, although analysis based on the more traditional measures, ROA and ROE, did not find significant improvements	×/✓
Source: Pilloff, S.J. and Santomero, A.M. (1996), 'The Value Effects of Bank Mergers and Acquisitions', Wharton School Paper, University of Pennsylvania, No. 97-07.		

some mergers are successful due to specific circumstances while others are not, such that, on average, the impact is not significant.

- Gains, while potentially sizeable, may not actually accrue (either in the short or longer term) for a number of reasons, such as:

- managers may not fully exploit the merger's potential for performance improvements;

- the fixed costs associated with the transition to a merged entity may continue for a significant period;
- efficiency gains do occur but are not subsequently passed on to consumers;
- prices fall only if there are substantially lower marginal costs after the merger.

While the above evidence from the older studies suggests a lack of benefits from bank mergers and

provides a long list of possible reasons for this lack, more recent (overall) academic evidence actually points towards apparent benefits from bank mergers (see Table 2).

This shift in results may be due to a number of factors. For example, it may simply be that more recent mergers have been more beneficial than earlier ones and that the later studies may, as a result, find positive gains. Alternatively, since it is rare to find two studies that use exactly the same model, or the exact same set of variables, it cannot necessarily be claimed that there is a learning process—ie, that managers in recent M&A have learned from mistakes in previous M&A. Instead, it may be that the insights gained from earlier studies, the issues that need to be addressed, and improvements in techniques to investigate these issues, have resulted in

uncovering the underlying gains. However, given the relatively small number of M&A (ie, with regard to the required complexity of the econometric modelling) and, as a result, the difficulty in fully testing the analysis, it is perhaps not surprising that the results from these studies are mixed.

Another potential problem is that none of the studies cited in Tables 1 and 2 analyse the channels through which efficiency improvement is supposed to work. That is, does a merger enhance labour productivity? Does it improve managerial efficiency? Does it result in the development or uptake of improved technology? For how long does the improvement continue? For a clearer understanding of the link between M&A and productivity, it would be informative to capture some of these issues formally in the econometric model.

Table 2 ... and the new

Studies on efficiency	Finding	Benefits?
Vennet (1996)	A study of 492 European takeovers between 1988 and 1992 showed that domestic mergers among equal-sized firms tended to have a positive impact on profitability, but domestic mergers did not deliver performance improvements	x/✓
Haynes and Thompson (1997)	There were significant productivity gains following acquisitions among 93 UK building societies over the period 1981–93	✓
Resti (1998)	In 67 Italian deals, merged banks appeared to have improved their efficiency in the post-merger period	✓
Lang and Welzel (1999)	There was no evidence of efficiency gains from mergers in German cooperative banks for 283 mergers from 1989 to 1997	x
Huizinga, Nelissen and Vander Vennet (2001)	52 bank mergers during 1994–98 resulted in improvements in cost efficiency for merging banks, but only marginal effects on profitability	✓
Abraham and Van Dijk (2002)	Among the 100 largest banks from 1995 to 2000, domestic M&A performed better than cross-border banks or those not actively acquiring other firms	x/✓
Amihud, Delong and Saunders (2002)	Subsequent to cross-border mergers, foreign-owned banks in developed markets tend to be less efficient than domestic banks	x
Cuesta and Orea (2002)	Among savings banks in Spain during 1985–98, non-merged banks were on average more efficient than merged banks	x
Focarelli, Panetta and Salleo (2002)	Significant improvements were found in Italian M&A activity over the period 1985–96	✓
Vennet (2002)	In cross-border mergers between 1990 and 2001, there was a partial profit improvement in the ex post performance, with no gains in terms of cost efficiency	x/✓
Altunbas and Ibanez (2004)	Bank mergers in Europe, particularly cross-border mergers, resulted in improved ROE over the period 1992–2001	✓
Díaz, García and Sanfilippo (2004)	Acquisitions between 1993 and 2000 in Europe led to an increase in the acquirers' long-term profitability	✓
Ashton and Pham (2007)	UK bank mergers enhance cost efficiency, but the effect on retail interest rates was mostly statistically insignificant	x/✓
Lozano-Vivas, Kumbhakar, Duygun-Fethi and Shaban (2008)	Cost efficiency was positively improved by within- and cross-border mergers	✓

Source: Lozano-Vivas, A., Kumbhakar, S.C., Duygun-Fethi, M. and Shaban, M. (2008), 'Consolidation in the European Banking Industry: How Effective is it?', unpublished manuscript, State University of New York, Binghamton; and Ashton, J. and Pham, K. (2007), 'Efficiency and Price Effects of Horizontal Bank Mergers', CCP Working Paper 07-9.

Conclusion

There is significant academic research into the effectiveness of bank mergers, with numerous studies discussing the potential for gains from mergers. However, no two studies use the same model and variables. Results differ according to the modelling approach (cost versus profit modelling) as well as estimation techniques employed (SFA versus data envelopment analysis). Some studies estimate both cost and profit efficiency and examine whether mergers

increase profit and reduce costs. The discussion of the effectiveness of mergers includes improvements in cost efficiency, and improvements in ROA and ROE using the parametric econometric approach (SFA).

However, the techniques discussed above are becoming more sophisticated and are increasingly used in contexts other than those involving M&A activity—eg, by regulators and competition authorities to assist in making ‘real-life’ decisions.⁵

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¹ This article draws on the following papers: Lozano-Vivas, A., Kumbhakar, S.C., Duygun-Fethi, M. and Shaban, M. (2008), ‘Consolidation in the European Banking Industry: How Effective is it?’, unpublished manuscript, State University of New York, Binghamton; and Pilloff, S.J. and Santomero, A.M. (1997), ‘The Value Effects of Bank Mergers and Acquisitions’, Wharton School Paper, University of Pennsylvania, No. 97-07.

² Other measures are also valid, but these two tend to be the most widely adopted in the academic literature, even if they are measures that have certain conceptual shortcomings when it comes to measuring economic profitability.

³ Meeusen, W. and van den Broeck, J. (1977), ‘Efficiency Estimation from Cobb–Douglas Production Functions with Composed Error’, *International Economic Review*, 18:2, June, pp. 435–44; and Aigner, D.J., Lovell, C.A.K. and Schmidt, P. (1977), ‘Formulation and Estimation of Stochastic Frontier Production Function Models’, *Journal of Econometrics*, 6:1, July, pp. 21–37.

⁴ See also Horncastle, A. (2006), ‘The Art of Noise: Recent Regulatory Developments in Measuring Efficiency’, *Agenda*, October. Available at www.oxera.com.

⁵ For example, Royal Mail’s most recent price control review. See Horncastle, A., Jevons, D., Dudley, P. and Thanassoulis, E. (2006), ‘Efficiency Analysis of Delivery Offices in the Postal Sector Using Stochastic Frontier and Data Envelopment Analyses’, chapter 10 in M.A. Crew and P.R. Kleindorfer (eds), *Liberalization of the Postal and Delivery Sector*, Cheltenham: Edward Elgar.

If you have any questions regarding the issues raised in this article, please contact the editor, Derek Holt: tel +44 (0) 1865 253 000 or email d_holt@oxera.com

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