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The impact of bancassurance on efficiency and profitability of banks: Evidence from the banking industry in Taiwan☆

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ABSTRACT

We set out in this study to investigate whether bancassurance business leads to improvements in the efficiency and profitability of banks. We examine the positive impacts on the system using actual data provided by a unique database on banks engaging in bancassurance business in Taiwan between 2004 and 2012. Our results reveal that banks with greater involvement in bancassurance business generally tend to experience improvements in their efficiency, and thus also accrue greater profits. Our empirical results provide evidence to support that bancassurance business offers substantial benefits for banks, ultimately leading to an increase in shareholder value. Finally, our results also reveal that the adoption of a diversification strategy in bancassurance can impact bank performance.

1. Introduction

The use of banks by insurance companies as an additional distribution channel for their products is known as 'bancassurance' . Under the bancassurance model, the bank acts as an intermediary, helping an insurance company to reach its target customers with the aim of increasing its market share, an arrangement which seems to have mutual benefits for both the banks and the insurance companies. The benefit for the banks is that they can use their existing staff to earn fee income (commission) by delivering insurance services in addition to their existing tasks (Gonulal et al., 2012), while the insurers can gain access to new customers through this new distribution channel, thereby increasing the income accrued from premiums.

Bancassurance business has played an increasingly important role in banking operations in recent decades, with the banks now generating considerable commission income from such business; and indeed, bancassurance has become the most successful distribution channel within the insurance markets of many countries. Although the development of the financial markets has stimulated keen competition and encouraged aggressive banking practices, ultimately narrowing the interest spread and reducing the profit margins of all banks (Hsiao et al., 2010), the commission generated by bancassurance business now provides the banks with an important boost to their finances. Taking Taiwan as an example, whilst the ratio of bancassurance commission to total non-interest income was just 2.3% in 2004, by the end of 2012, it had risen sharply to 20.8%. The changes over the years in the share of commission income arising from bancassurance business in Taiwan are illustrated in Fig. 1.

As shown in Table 1, within the insurance markets of France, Spain and Italy, the proportion of life insurance premiums arising from bancassurance channels in 2012 was in excess of 60%, especially the proportion in Brazil which reached 77%, representing the highest in the world during reported period.[1] The market share of life insurance premiums attributable to bancassurance is close to 50–60% in Asian countries such as China, South Korea and Hong Kong, with the figure for Taiwan having reached 55% in 2012. Hence, it is expected that bancassurance business will continue to play an important role in the future (Gonulal et al., 2012).

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[1] The bancassurance market shares for various countries are obtained from the Finaccord Bancassurance database.

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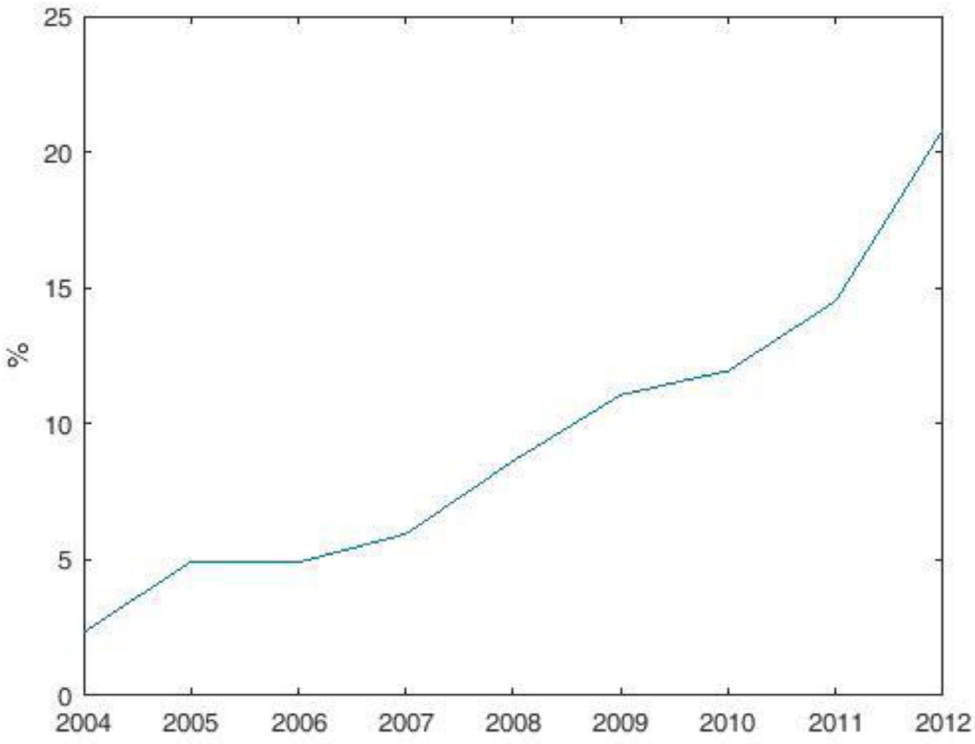

Fig. 1. Insurance commission as a percentage of non-interest income of banks over 2004–2012 in Taiwan.

Table 1
Bancassurance market shares across countries.

Country[a]	Market share (%)[b]	Country	Market share (%)[b]
Brazil	77	Poland	43
Spain	65	Indonesia	40
France	60	Chile	35
Italy	60	Malaysia	32
Morocco	60	Thailand	31
South Korea	59	Mexico	28
Taiwan	55	Hungary	20
Hong Kong	50	India	10
China	48		

Notes:

[a] The bancassurance market shares are calculated in terms of the premiums coming from all channels within the life insurance industry.

[b] 2010 data for France, Hong Kong, Indonesia, Italy, Mexico, South Korea and Spain are obtained from the World Bank Policy Research Working Paper; 2012 data for Brazil, Chile, China, Hungary, India, Malaysia, Morocco, Poland and Thailand are obtained from the Finaccord Global Bancassurance Database; and 2012 data for Taiwan were collected from the Taiwan Insurance Institute.

A number of related studies have investigated the impact of 'merger and acquisition' (M&A) transactions between banks and insurance firms (Fields et al., 2007; Chen and Tan, 2011; Dontis-Charitos et al., 2011, and Slijkerman et al., 2013), and have examined other forms including strategic alliances and joint ventures between banks and other firms (Amici et al., 2013), with the primary focus being on whether banks involved in such activities succeed in increasing value for their shareholders. In many respects, banks provide an ideal channel for the sale of insurance products, particularly in banking markets with stagnant interest income (Bergendahl, 1995). However, although insurers are found to benefit from the distribution of insurance products through banking channels, empirical evidence on the impact of bancassurance business on the overall performance of banks remains rather ambiguous.

Our primary aim in this study is to examine the impacts of bancassurance on banks' performance. Using data on actual commission accrued from insurance sales in the banking sector in Taiwan, we directly test whether the involvement by banks in bancassurance business enhances their efficiency and profitability levels. We further examine whether diversification strategies in bancassurance can provide greater benefits for the banks, with regard to their subsequent performance.

We find that as a result of their participation in bancassurance activities, both the efficiency and profitability of banks have been improved; indeed, the higher the involvement of the banks in bancassurance, the higher their overall performance improvements. We also find that such performance can be further improved by a diversification strategy, which implies that banks tend to perform better when their commission comes from more diversified sources.

We make several contributions to the extant literature. First, by using actual revenue data on bancassurance business, we can precisely examine the direct impacts of bancassurance business on the efficiency and profitability of the banks. Prior studies have primarily relied upon mergers with insurance companies as the proxy for involvement in bancassurance activity. Based upon a unique dataset, which includes the premiums and commission earned from bancassurance business for each bank, we are able to provide more precise evidence to demonstrate the effects of bancassurance, in terms of overall enhancements to bank performance.

Secondly, to the best of our knowledge, our study is the first to consider the effects of bancassurance strategies between banks and insurers. Due to data limitations, prior studies have been unable to examine whether a bancassurance strategy by a bank can improve its performance. In this study, based upon our access to a unique

database, we intend to fill this gap and contribute to the extant literature by providing new evidence on the impacts on bank performance.

Finally, as a result of regulatory changes to the financial industry in Taiwan, the banking sector provides an intriguing environment for an examination of the ways in which involvement in bancassurance can affect banking efficiency and profitability. Although the bancassurance trend is already at a mature stage in many developed countries, banks in Taiwan did not get involved in bancassurance business until 2001, when the Taiwanese government deregulated financial integration between the banking and insurance sectors.[2] This deregulation led to a rapid acceleration in the growth of bancassurance business in Taiwan over a very short period of time. On the insurance side, the ratio of bancassurance premiums to total life insurance premiums was less than 27% in 2004, but it increased to 55% in 2012. On the banking side, the commission revenue from bancassurance business increased from about 200 million US dollars in 2004 to more than 1.2 billion US dollars in 2012. The numbers of banks involved in bancassurance business also increased from 14 to 31 between 2004 and 2012. As mentioned above in Fig. 1, the ratio of bancassurance commission income to the total non-interest income of banks had also risen sharply during the period.

The remainder of this paper is organized as follows. A review of the extant related literature is provided in Section 2, followed by a description of the data, methodology and variables adopted in our study in Section 3. Regression analyses are subsequently performed in Section 4, leading to the presentation of our empirical results and a discussion of their impact. Finally, the conclusions drawn from this study are presented in Section 5.

2. Literature review and hypotheses

The previous literature has shown conflicting predictions regarding the impact of a greater diversification of activities on the performance or value of banks. On the one hand, Altunbas and Molyneux (1996) argued that banks engaging in a variety of non-banking activities can enjoy economies of scope, ultimately boosting both their performance and market value. On the other hand, however, diversification could lead to the intensification of any agency problems existing between corporate insiders and small shareholders, which would ultimately destroy the value of the firm within the market (Jensen, 1986; Aggarwal and Samwick, 2003). Based upon a US dataset, Schmid and Walter (2009) argued that it was the diversification in financial services that decreased the banks' value in the US market. However, van Lelyveld and Knot (2009) did not find the same result in the EU market.

Regulatory change also plays an important role in the diversification activities and performance of the banks. In the United States, the 1999 Gramm–Leach–Bliley Act (GLBA) allows financial holding companies (FHCs) to integrate banking, securities and insurance business[3] and results in a welfare gain in the banking industry (Mamun et al., 2005). Filson and Olfati (2014) suggested that diversification into investment banking, securities brokerage and insurance under the GLBA creates value for the banks. Drucker and Puri (2005) showed that efficiency gains arise due to the economies of scope from combining lending and investment banking activities under financial conglomerates following the GLBA.

In Europe, universal banks are allowed to form financial conglomerates.[4] The structure of universal banks might lead to substantial gains from economies of scale, economies of scope, or improved profit and cost efficiency from a diversified financial institution. Lang and Welzel (1996) found evidence of economies of scope which supports the notion of universal banking. Vander Vennet (2002) found that conglomerates are more efficient than their specialized competitors and that the degree of both cost and profit efficiency is higher in universal banks than in non-universal banks. Rime and Stiroh (2003) found evidence of economies of scale for small and medium-sized Swiss banks that arise from universal banking. However, Ferreira and Matos (2012) suggested that there exist possible conflicts of interest in universal banks, but firms could also benefit from governance links to banks.

The impact of involvement by banks in insurance activities has attracted the attention of many researchers[5]; for example, based upon a cost-benefit analysis, Bergendahl (1995) noted that the benefits of bancassurance may be attributable to customers demonstrating greater faith in the banks, essentially as a result of the provision of products satisfying their individual needs. Singhal and Singh (2010) further argued that bancassurance could increase scale economies by utilizing the existing networks of the banks to offer greater ranges of products, whilst also increasing the efficiency and skills of bank employees as they face the new challenges. These prior studies have, however, consistently failed to provide any empirical evidence in support of their arguments. Amici et al. (2013) investigated the impact by examining strategic alliances and joint ventures between banks and insurance companies, whilst Slijkerman et al. (2013) suggested that systemic risk could be lowered through financial conglomeration between banks and insurance companies.

The empirical studies on bancassurance have tended to focus on the potential wealth or risk effects of mergers between banks and insurance companies; for example, from an examination of the merger between Citicorp and Travelers, Carow (2001) identified increases in the stock prices of both banks and life insurance companies, whilst Fields et al. (2007) provided evidence on the potential for bidder wealth gains in bancassurance mergers through an examination of such mergers in the US and other countries. Based upon a further examination of merger deals, Chen and Tan (2011) examined the effects on risk and wealth for a total of 72 M&As between banks in Europe; however, after considering risk effects and changes in risk with respect to market indices, they were unable to identify any wealth effects.

It is argued in some related studies that banks can benefit from bancassurance activities through synergy and economies of scope; that is, as compared to traditional channels, bancassurance provides banks with the advantage of lower costs (Benoist, 2002). Fiordelisi and Ricci (2011) carried out an examination of the efficiency performance of banks involved in bancassurance activities using ownership links as a proxy for bancassurance activities to test the effects on the banks' efficiency; however, they could not find any evidence in support of the involvement of banks in life insurance business. In contrast to these prior studies, we aim to fill the gap in the literature by examining whether banks selling insurance policies gain any diversification value from their bancassurance activities. By using data on actual commission from insurance sales, we can directly test whether involvement in bancassurance enhances the efficiency and performance of the banks.

[2] The Financial Holding Companies Act was promulgated in 2001 in Taiwan.

[3] Under the framework of Financial Holding Companies (FHCs), FHCs may engage in insurance underwriting, insurance agency activities and banking.

[4] The Second Banking Directive in 1989 removed the existing barriers between different sectors of the financial services industry, so that a credit institution can become a distribution channel of financial and insurance services (Starita, 2012).

[5] Examples include Bergendahl (1995), Genetay, Molyneux and McGuire (1998), Fields et al. (2007) and Singhal and Singh (2010).

Our main research question is whether the performance of the banks is affected by their involvement in bancassurance business. When considering economies of both scope and scale, we would expect to find involvement in bancassurance business leading to increased efficiency (Singhal and Singh, 2010). Furthermore, bancassurance can provide additional commission profit for the banks through the use of existing staff and infrastructure (Bergendahl, 1995; Genetay et al., 1998). As a result, bancassurance business may also increase profitability, such as by increasing the returns on assets and risk-adjusted returns. We therefore propose the following 'enhanced-performance hypothesis':

Hypothesis 1. *Involvement in bancassurance business will have positive effects on bank performance through improved efficiency and profitability.*

As already noted, prior studies have failed to provide any evidence related to the bancassurance strategies of banks that involve more insurers and their resultant performance. The most common bancassurance models adopted around the world include partnerships, joint ventures and captives.[6] The social factors and regulatory environment affect the choice of market (Swiss Re, 2007). Because of the regulatory flexibility in choosing cooperative insurance companies, the partnership model is the major bancassurance model in Taiwan. Under this model, an insurance company distributes its products through one or several banks by contracts, and banks are remunerated with selling commissions paid by their insurer partners.

In this study, we further examine whether bank performance can be affected by a strategy that involves a higher or lower concentration in bancassurance business. A low concentration business model allows banks to provide diversified insurance products, harness more bargaining power and obtain more information from insurers. As a result, banks can select better products from different insurers to meet the needs of their customers. Since a low concentration or diversification strategy may improve both the efficiency and profitability of the banks, we propose the following 'diversified-strategy hypothesis':

Hypothesis 2. *A diversification strategy that involves a lower concentration of insurers in the bancassurance business model will have positive effects on bank performance.*

3. Data and methodology

This section begins with a description of our primary data sources and details on the construction of the database. We then go on to define the methodology and variables for our subsequent analysis, along with the descriptive statistics.

3.1. Data

The Financial Holding Company Act of 2001 provided the general rules to allow financial integration between the banking and insurance sectors. This act opened the window of bancassurance business, but firms in Taiwan did not get fully involved in bancassurance business until the regulatory changes in 2003, when further detailed regulations concerning the partnership relationship between banks and insurers were introduced. The cross-selling of insurance products by banks thus quickly became the most important distribution channel for insurance companies.

We construct a 2004–2012 annual panel dataset to facilitate our empirical analysis of the relationship between bancassurance and bank performance in Taiwan.[7] We use the comprehensive bancassurance database compiled by the Taiwan Insurance Institute (TII) as our primary source of information, since this database provides information on all the banks, including the premiums and commission earned from all of their insurer partners annually. The availability of such information enables us to examine the cooperation between our sample banks and their insurer partners. The financial information on our sample banks is obtained from the Taiwan Economic Journal (TEJ) database, which provides information on factors such as balance sheets and income statements.

We examine the banks' activities in Taiwan from 2004 to 2012. This market had been through a period of entry and exit as well as consolidation, causing the number of banks to fall from 37 in 2004 to 34 in 2008 and to subsequently increase to 36 in 2012. The total number of observations available in our dataset is 320 over the nine-year time span. We excluded 16 observations for banks with negative equity that were later taken over by the authorities during the sample period.[8] Another 9 observations were excluded because of missing values in the calculation of DEA efficiency scores. This has left us with a total of 295 observations[9] and 60 of these observations reveal no involvement in bancassurance activity.

3.2. Methodology

In this section, we explain our empirical model and predict our main variables in Section 3.2.1. We then provide the details of our dependent and control variables in Sections 3.2.2 and 3.2.3, respectively.

3.2.1. Empirical model

The empirical specifications for our regression models are:

$$Performance_{it} = \beta_0 + \alpha_i + \theta_t + \beta_1 Banc_{it} + \gamma X_{it} + \varepsilon_{it} \quad (1)$$

$$Performance_{it} = \beta_0 + \alpha_i + \theta_t + \beta_1 Banc_{it} + \beta_2 Str_{HHIit} + \gamma X_{it} + \varepsilon_{it} \quad (2)$$

where *Performance* refers to the performance measure of the banks, which includes both their efficiency and profitability. *Banc* is a proxy measuring the extent of a bank's involvement in bancassurance business and Str_{HHI} in Eq. (2) serves as a proxy for the level of concentration of a bank's strategy in bancassurance business. Both variables are further explained as follows. ε is the error term; the α are the individual specific effects; the θ are the year effects; and X is a vector of other control variables for bank i at time t.

We measure the extent of bancassurance involvement (*Banc*) using the ratio of the commission from insurance sales to interest and non-interest income. The non-interest income of the banks includes fiduciary income, fees and service charges, trading revenue and any other sources of non-interest income. *Banc* is therefore

[6] The insurance company distributes its products through banking channels on the basis of selling agreements under the partnership model. Under the joint venture model, an insurance company distributes it policies through an affiliated banking network. In the captive structure, an insurance company provides its policies through the distribution channels of a banking parent. Details are provided in Caratelli (2012: 71-81).

[7] In Taiwan, the official data on bancassurance business has been available since 2004. Thus, our data cover the period from 2004 to 2012.

[8] There are 5 banks that withdrew from the market due to insolvency during 2004-2008.

[9] There are four banks that exited the market via mergers & acquisitions, while another five new banks entered the banking market. The data for most banks in the sample cover the 9-year period with the exception of the data for 2 banks covering an 8-year period, the data for 2 banks covering a 7-year period, the data for 2 banks covering a 2-year period, and the data for 3 banks covering a 1-year period.

measured as:

$$Banc = \frac{\text{Commission Earned from Insurance Sales}}{\text{Interest and Non} - \text{interest Income of the Bank}}$$

We also use the ratio of the commission earned from insurance sales to the non-interest income of banks (*Bancnon*) as an alternative measure. A higher *Banc* or *Bancnon* value indicates that the bank is involved in more bancassurance business with insurance companies.

We use the Herfindahl Index on the commission of the different partner insurers (Str^{HHI}) as the proxy for our measure of bancassurance strategies, since it accounts for variations in the breakdown of commission paid by different insurance company partners. Thus, our primary measure of the commission diversification of a bank is:

$$Str_{HHI} = \Sigma_i Sh^2_{COM_i},$$

where Str_{HHI} measures the level of concentration; thus, a higher value of Str_{HHI} indicates that the bank adopts a more concentrated strategy with its insurance partners, whereas a lower value indicates that commission comes from more diversified sources; that is, $Str_{HHI} = 1$ indicates that all of the bank's commission comes from a single insurance company (complete concentration). Sh_{COMi} is the share of bancassurance commission to total bancassurance commission from insurance company *i*.

Separate estimations are carried out for Eqs. (1) and (2), with the estimates on the effects of bancassurance business being denoted by β_1 and the effects of the adoption of a bancassurance strategy being denoted by β_2. Eq. (1) is the regression model facilitating the analysis of the enhanced-performance hypothesis for the full sample of banks. If the coefficient for bancassurance involvement (β_1) is found to be significantly positive, this then provides support for the enhanced-performance hypothesis.

Eq. (2) is designed to facilitate an investigation into our diversified-strategy hypothesis which is restricted to only those banks involved in bancassurance business; thus, any banks with no involvement in bancassurance activities were excluded from the sample prior to carrying out the analysis of Eq. (2). If the coefficient β_2 is found to be significantly negative, then this would provide clear evidence in support of our diversified-strategy hypothesis.

In order to control for unobserved variables or variables that can change over time, we use panel data analysis to avoid any biased estimations resulting from individual heterogeneity; this method controls for unobserved firm differences and aggregate shocks over different years through the inclusion of firm and year effects. We adopt either a fixed or random effects model, depending on the correlation between the explanatory variables and the error term based on the results of the Hausman test.[10]

For our measure of efficiency performance, given that the estimated efficiency is truncated at 1,[11] we follow several prior related studies to use a Tobit regression model;[12] the main advantage of using a Tobit model is that it can avoid inconsistent estimators. Furthermore, in data-censoring applications, a random effects model is used to solve the problem of unobserved heterogeneity; we therefore apply the Tobit random effects model, essentially because unconditional fixed-effect estimates are biased and do not provide a sufficient statistic to allow the fixed effects to be conditioned out of the likelihood.[13]

For the robustness check of our results, we further correct for the potential endogeneity problem of bancassurance involvement and performance. We adopt the instrumental variable (IV) method, which provides a general solution to the problem of an endogenous explanatory variable. Following Campa and Kedia (2002) and Liebenberg and Sommer (2008), we choose the lagged value of our main independent variable *Banc* and the number of cooperating insurance companies as our two instrumental variables.[14] We then carry out the estimation using the instrumental variables approach.

We also use Heckman's two-stage procedure to provide a more accurate assessment of the impacts of bancassurance on banks' performance for the robustness check. It is important to control for potential selection bias based on systematic differences in the types of banks that are involved in bancassurance business versus those that are not. Heckman's two-stage estimation procedure (Heckman, 1976) can isolate effects in terms of the decision to sell insurance and the proportion of bancassurance business. In the first stage, we estimate the selection model using Probit regression for the probability of engaging in bancassurance business. In the second stage, we correct for selection bias by incorporating the inverse Mills ratio, a transformation of these predicted individual probabilities, as an additional explanatory variable.

In order to reduce the bias that may arise from systematic differences across banks with different degrees of involvement in bancassurance business, we also engage in Generalized Propensity Score matching analysis[15] to check our results for robustness. The analysis is proposed by Hirano and Imbens (2004) and is designed for settings with a continuous treatment, such as the amount of involvement in bancassurance business.[16] The results of the change in the bank efficiency for a unit change in the bancassurance obtained by the generalized propensity score analysis will be discussed in Section 4.3 which focuses on the robustness check.

3.2.2. Dependent variables-performance

3.2.2.1. Efficiency measures. The efficiency measures are based on the input-output frontier methodologies. The two major efficiency methods are the econometric and mathematical programming approaches. In this study, we adopt the latter approach for our evaluation of bank efficiency – specifically, the Data Envelopment Analysis (DEA) approach.[17] Of the total of five measures of DEA efficiency performance used in our analysis, we begin by examining

[10] We run a Hausman test to identify whether the preferred model is a random or fixed effects model. If the Hausman test is rejected, then we will select the fixed effects model. We also carry out a Wald test to further confirm whether the dummies for all years or for all entities are equal to 0, which requires time or entity fixed effects. If the Hausman test is not rejected, then we will select the random effects model. We then undertake a Breusch-Pagan Lagrange Multiplier test (LM test) to further confirm the significant differences across both years and entities.

[11] The numbers of firms with efficiency scores of 1 for 'pure technical efficiency', 'technical efficiency', 'cost efficiency', 'scale efficiency' and 'allocative efficiency' are 92, 38, 12, 41 and 12, respectively.

[12] See Casu and Molyneux (2003), Havrylchyk (2006) and Hsiao et al. (2010).

[13] Details are provided in Wooldridge (2002: 538-42).

[14] These instrumental variables are chosen by satisfying two key assumptions, the non-zero coefficient on the bancassurance involvement measures and non-correlation with the error term. To check whether our instrumental variables satisfy the two conditions mentioned above, we first perform the Stock-Yogo Weak Identification Test and Anderson Canonical Correlation Test to check the non-zero coefficient of our instrumental variable for the bancassurance involvement measures. We then perform the Sargan–Hansen test (or so-called Sargan's J test) for overidentifying restrictions. The results show that the lagged value $Banc_{t-1}$ and *Co_Number* fulfill the above two requirements for the instrumental variables.

[15] We greatly appreciate the reviewer's valuable suggestion for using this analysis.

[16] We match each firm with its counterpart for a different level of bancassurance involvement based on selected firm characteristics, including bank size, the BIS capital adequacy ratio, the equity ratio and a dummy indicating whether the bank is government-owned. We then estimate the treatment-effect function along with its 95% or 90% confidence interval that is obtained from 500 bootstrap replications.

[17] We adopt a mathematical programming approach (with DEA being one of the most popular such approaches) for at least two reasons. First, the DEA approach avoids the possibility of specification errors that are frequently encountered when using an econometric approach; and secondly, the DEA approach is found to perform well with only a small number of observations. Details are provided in Cummins and Weiss (2013: 784-85).

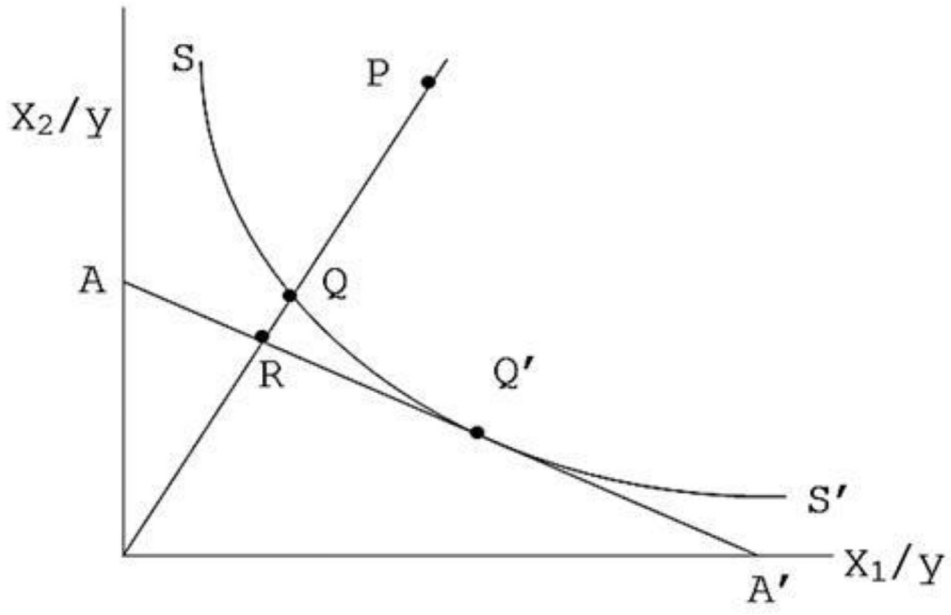

Fig. 2. Illustration of technical efficiency.

'technical efficiency' (*TE*), 'allocative efficiency' (*AE*) and 'cost efficiency' (*CE*) as follows.

Technical efficiency reflects the ability of a firm to obtain the maximum output from a given set of inputs, whilst allocative efficiency reflects the ability of a firm to utilize inputs in optimal proportions, given the prices of the inputs. *TE* and *AE* are then combined to provide a measure of cost efficiency (Coelli et al., 2005). These three efficiency measures vary between 0 and 1, with an efficiency score of 1 representing total efficiency.

The efficiency measures are further illustrated in Fig. 2. Using a simple example involving a firm using two inputs (x_1 and x_2) to produce a single output (y), isoquant-SS′ in Fig. 2 represents the various combinations of the two inputs required to produce a fixed amount of output. Firms using the best available technology are located on the isoquant, with these firms being considered to be technically efficient.

The value of the *TE* of a firm ranges from 0 to 1, with a value of 1 representing total technical efficiency. If the input-output combination of a firm is located at point P, then its *TE* is defined as the ratio QP/0P, which represents the amount by which the firm could reduce its inputs by adopting the best technology. *TE* is therefore represented in this study by the ratio $TE = 0Q/0P$, which is equal to 1−QP/0P Point Q is technically efficient, since it lies on the efficient isoquant.

The isocost line AA′ in Fig. 2 represents the ratio of input prices; the *AE* of a firm operating at point P is defined as the ratio $AE = 0R/0Q$, with the distance between points R and Q representing the reduction in costs that would occur if the firm operated at the allocatively efficient point Q′, as opposed to point Q. Total cost efficiency, *CE*, is defined in this study as the ratio 0R/0P, which is the product of *TE* and *AE*:[18]

$$TE * AE = CE \text{ or } (0Q/0P) * (0R/0Q) = 0R/0P \quad (3)$$

Finally, we can further decompose the *TE* measure into 'scale efficiency' (*SE*) and 'pure technical efficiency' (*PTE*), where *SE* is a measure of the extent to which the scale of a firm deviates from its optimal level (considering the relationship between outputs and inputs under constant returns to scale), and *PTE* explains the technical efficiency that cannot be attributed to deviations from the optimal scale level. Both measures can be further solved using other linear programming problems.

To decide the input/output variables used in our analysis, we follow the majority of prior studies using the intermediation approach[19] and include three inputs (X_i) and three outputs (Y_i) within our model. The three inputs are X_1 (total deposits), X_2 (number of employees) and X_3 (total fixed assets), whilst the three outputs are Y_1 (total loans), Y_2 (other investment assets) and Y_3 (other non-interest income).

The prices of the inputs (P_i) are measured in this study as P_1 (interest expenses/total deposits), P_2 (salary expenses divided by the number of employees) and P_3 (operating expenses minus salary expenses, divided by fixed assets), with all of the money-related figures being deflated using the 2011 'consumer price index' (CPI).

3.2.2.2. Profitability measures. Our profitability measures comprise the 'return on equity' (*ROE*, defined as net income divided by equity) and the 'return on assets' (*ROA*, defined as net income divided by total assets). Following Stiroh and Rumble (2006), we also use the 'risk-adjusted return on equity' (RA_{ROE}) and the 'risk-adjusted return on assets' (RA_{ROA}) as our primary measures. The standard deviations for both *ROE* and *ROA* are calculated using data for the last twelve quarters, which represents the total volatility of profits. These risk-adjusted return ratios are considered to be the accounting returns per unit of risk. The definitions of the two risk-adjusted returns are as follows:

$$RA_{ROE} = \frac{\text{Return on Equity}}{\text{Standard Deviation of Return on Equity}}$$

$$RA_{ROA} = \frac{\text{Return on Assets}}{\text{Standard Deviation of Return on Assets}}$$

[18] Under the DEA approach, efficiency scores are estimated by solving linear programming problems; for space-saving purposes, we do not provide the detailed problem solving methodologies here. Interested readers should refer to the studies of Cummins and Zi (1998), Coelli et al. (2005), Jeng and Lai (2005) and Cummins and Weiss (2013).

[19] For the details of the intermediation approach, see Berger, Hanweck and Humphrey (1987), Casu and Molyneux (2003), Havrylchyk (2006) and Hsiao et al. (2010). Kao and Liu (2004) and Hsiao et al. (2010) also adopt the intermediation approach to examine the efficiency performance of the banks in Taiwan.

Table 2
Descriptive summary statistics.

Variables[a]	Mean	S.D.	Min.	Max.	Median	No. of[b] Obs.
CE	0.605	0.171	0.242	1.000	0.590	295
AE	0.823	0.107	0.461	1.000	0.841	295
TE	0.735	0.178	0.281	1.000	0.742	295
PTE	0.841	0.169	0.300	1.000	0.891	295
SE	0.878	0.131	0.374	1.000	0.918	295
ROA (%)	0.009	1.207	−7.417	1.874	0.266	283
ROE (%)	0.687	43.202	−371.383	540.881	4.714	283
RA_{ROA} (%)	1.143	2.045	−3.575	4.170	1.260	283
RA_{ROE} (%)	1.148	2.022	−3.649	4.064	1.254	283
Banc	0.018	0.024	0.000	0.241	0.012	295
$Banc_{non}$	0.079	0.094	0.000	0.881	0.053	295
Str_{HHI}	0.417	0.271	0.089	1.000	0.309	235
ln-Asset	20.060	1.062	17.523	22.123	19.890	295
Div	0.231	0.108	0.054	0.653	0.207	295
Div2	0.591	0.172	0.113	0.897	0.626	295
BIS (%)	11.254	2.614	−2.120	29.830	11.160	295
Equity/Assets	0.061	0.020	−0.014	0.218	0.059	295
Gov-Own	0.210	0.408	0.000	1.000	0.000	295
Listing	0.305	0.461	0.000	1.000	0.000	295

Notes:

[a] The $Banc_{non}$ variable, which is an alternative proxy for the *Banc* variable, is defined as the ratio of bancassurance commission earned from insurance to the non-interest income of banks.

[b] The total sample comprised 295 observations, but only 235 observations were included in the bancassurance strategy measure. As regards the profitability measure, a total of 283 observations were included (the other 12 observations were excluded as they lacked quarterly data, which is a prerequisite for the calculation of risk-adjusted returns).

3.2.3. Control variables

Following the literature, various control variables are adopted in this study to account for the differences between the sample banks, since such differences could ultimately influence their performance. These firm-specific variables include: (i) a dummy variable, *Listing*, which indicates whether or not a bank is publicly-listed on the Taiwan Stock Exchange; this is equal to 1 for listed banks, otherwise 0; (ii) a dummy variable, *Gov-Own*, which indicates whether or not a bank is owned by the government; this is equal to 1 for banks controlled by the government, otherwise 0; (iii) ln-*Assets* which represents the scale effects and is defined as the natural logarithm of total assets;[20] (iv) *BIS* which refers to the *BIS* capital adequacy ratio[21] of the banks; (v) *Equity/Assets*, the equity ratio, which is defined as the ratio of the equity to the total assets of the bank; and (vi) *Div*, the diversification effect, which is defined as the ratio of the non-interest income to the total net income including non-interest income and interest income. Following Stiroh and Rumble (2006), we also use an alternative measure of the diversification effect (*Div2*) for the robustness check.[22]

The descriptive summary statistics for all of the sample banks are presented in Table 2, which reports the sample mean, standard deviation, minimum, maximum and median (50th percentile). As we can see from the table, during the 2004–2012 sample period, the ratio of the mean value of bancassurance commission to the total income of the banks was 1.8%, whilst the mean value of such commission to the non-interest income of the banks was 7.9%, with a standard deviation of 9.4%. It is therefore clear that, over time, the banks have become increasingly dependent on income from insurance sales.

4. Empirical results

Our analysis begins with an examination of the enhanced-performance hypothesis in an attempt to provide a better understanding of the ways in which involvement in bancassurance business affects the efficiency and profitability of banks. As opposed to a simple dummy variable, we use *Banc* as the measure of bancassurance involvement, since it provides additional information on the commission revenue arising from bancassurance business.

We then go on to examine the diversified-strategy hypothesis to determine whether a bancassurance strategy between banks and insurers affects their performance. Str_{HHI}, which measures the degree of concentration between banks and insurers in bancassurance business, is used as the proxy. A higher value of Str_{HHI} implies that the bank adopts a more concentrated strategy.

4.1. Bancassurance and efficiency

We adopt a Tobit random-effects regression model for our efficiency performance analysis, essentially because the efficiency measures are truncated and our sample is comprised of panel data.[23] The results of the Tobit random-effects regressions for all banks are presented in Table 3, which shows that the coefficients of bancassurance involvement (β_1) in the *CE, TE* and *PTE* regressions are all found to be significantly positive at the 1% level, thereby implying that greater involvement in bancassurance improves the cost efficiency, technical efficiency and pure technical efficiency of the banks. In addition, the coefficients of *Div* in the

[20] We also consider market share (*Mkt_share*), which is defined as the market share of total deposits, as an alternative proxy for the scale effect.

[21] *BIS* stands for 'Bank for International Settlements'. The Bank for International Settlements' Basel committee has used this *BIS* capital adequacy ratio as the global standard for bank capital adequacy. It measures the financial strength of a bank, expressed as a ratio of its capital to its assets. The *BIS* ratio collected in this paper is sourced from the reports of the Central Bank of Taiwan.

[22] We define the diversification measure (*Div2*) as: $1\text{-}HHI_{INCOME} = 1\text{-}$ [(Interest income)^2 + (Non-interest income)]^2 /(Non-interest Income + Interest income)^2. A higher value of *Div2* indicates that the bank adopts a more diversified strategy, and *Div2* = 0 implies that all of the bank's income comes from interest income. Our results are still robust when using alternative diversification measures.

[23] Since the use of unconditional fixed-effects estimates here would be biased, we apply the random-effects model, whilst also using the OLS method as a check for the robustness of our results. As expected, the estimated coefficients are found to have the same sign under the traditional random-effects model estimated by the OLS method with a Tobit random-effects model.

Table 3
Tobit random-effects regression results for bancassurance and bank efficiency.

Variables	*CE*		*AE*		*TE*		*PTE*		*SE*	
	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.
Constant	−4.188***	0.745	0.255	0.255	−2.656***	0.686	−2.119***	0.593	0.172	0.442
Banc	0.960***	0.348	0.174	0.320	1.291***	0.423	1.157***	0.442	0.598	0.378
ln-Asset	0.233***	0.037	0.027**	0.013	0.163***	0.034	0.148***	0.030	0.030	0.022
Div	0.401***	0.085	0.194***	0.075	0.326***	0.105	0.522***	0.112	−0.026	0.093
BIS	0.005	0.004	0.001	0.004	0.007	0.005	0.001	0.006	0.009*	0.005
Equity/Assets	−0.571	0.675	−0.366	0.557	−0.869	0.796	−1.709**	0.846	0.274	0.701
Gov-Own	−0.184*	0.099	0.000	0.031	−0.060	0.090	0.046	0.086	−0.026	0.060
Listing	0.111	0.076	0.008	0.024	0.079	0.069	−0.025	0.066	0.060	0.047
Log Likelihood	204.729		235.314		129.452		85.104		159.247	

Note: Total observations = 295.
*** denotes significance at the 1% level.
** denotes significance at the 5% level.
* denotes significance at the 10% level.

Table 4
Tobit random-effects regression results for efficiency, taking a strategy of bancassuranceinto consideration.

Variables	*CE*		*AE*		*TE*		*PTE*		*SE*	
	Coeff	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.
Constant	−5.678***	0.879	0.254	0.258	−3.784***	0.958	−2.252***	0.632	0.067	0.542
Banc	0.650	0.412	0.192	0.360	1.164**	0.485	1.375***	0.473	0.445	0.422
Str_{HHI}	−0.020	0.046	0.033	0.033	−0.087	0.055	−0.019	0.050	−0.089*	0.046
ln-Asset	0.307***	0.043	0.025*	0.013	0.225***	0.047	0.162***	0.032	0.035	0.027
Div	0.436***	0.098	0.243***	0.079	0.340***	0.117	0.502***	0.111	−0.001	0.100
BIS	0.001	0.006	0.001	0.005	0.000	0.007	−0.006	0.007	0.009	0.006
Equity/Assets	0.177	0.944	−0.434	0.641	−0.543	1.078	−2.665***	0.908	0.878	0.850
Gov-Own	−0.24**	0.117	0.031	0.028	−0.134	0.109	−0.015	0.071	−0.016	0.061
Listing	0.161	0.101	0.006	0.023	0.092	0.090	−0.013	0.057	0.051	0.051
Log Likelihood	161.865		193.929		108.580		85.479		138.437	

Note: Total observations = 235.
*** denotes significance at the 1% level.
** denotes significance at the 5% level.
* denotes significance at the 10% level.

CE, AE, TE and *PTE* regressions are all found to be significantly positive at the 1% level, implying that the efficiency is higher when the banks' non-interest income constitutes a higher fraction of their total income.

Our empirical results are consistent with the findings of Bergendahl (1995) that by engaging in the sale of insurance products, banks increase their overall productivity levels. In specific terms, our results from the *PTE* and *TE* regression imply that for a given level of inputs, banks may experience improvements in their ability to produce more outputs. Furthermore, involvement in bancassurance business may enhance the skills of bank employees, ultimately leading to increases in both cost efficiency and technical efficiency (Singhal and Singh, 2010). Our empirical results therefore provide strong evidence in support of our proposed enhanced-performance hypothesis.

We go on to examine the effects of our diversified-strategy hypothesis purely for those banks involved in bancassurance business, with the regression results of the Tobit random-effects model being reported in Table 4. The focus in prior studies has tended to be placed on banks with highly concentrated strategies, whilst also being largely based on M&A data or the use of ownership links as the proxy for insurance firms. However, prior studies have been unable to draw any clear conclusions on the involvement of banks in bancassurance business (Dontis-Charitos et al., 2011; Fiordelisi and Ricci, 2011). Thus, the results of this study provide new evidence in this field.

Similar to the results reported in Table 3, *Banc* is found to be significantly positive in the *TE* and *PTE* regressions. We then examine the coefficient for Str_{HHI} to see how becoming involved in a diversified bancassurance strategy can affect the performance of the banks. In Table 4, Str_{HHI} is found to have a significant negative coefficient in the *SE* regression at the 10% level. A robustness check based on using the alternative measure of the diversification effect (*Div2*) further suggests that the coefficients of Str_{HHI} for both the *TE* and *SE* regressions are significantly negative at the 10% level.[24] In other words, our results indicate that if a bank chooses to earn commission from more diversified sources (a diversification strategy), this can lead to higher scale as well as higher technical efficiencies. Our empirical results therefore provide weak support for our diversified-strategy hypothesis, and suggest that a lower concentration of insurers in the bancassurance business model may be an appropriate strategy for improving the efficiency of the banks.

4.2. Bancassurance and profitability

In order to determine whether bancassurance has a positive impact on the profitability of banks, we carry out further regression analyses that examine the relationship between the involvement of banks in bancassurance business and their subsequent profitability levels. Since the Hausman test rejects the null hypothesis, we use the fixed effects model for *ROE, ROA,* RA_{ROE} and RA_{ROA}, and the regression results are presented in Table 5.[25]

The results reveal that the coefficients on bancassurance involvement (β_1) in the *ROE,* RA_{ROE} and RA_{ROA} regressions are all

[24] Due to the space limitation, the results using alternative measure (*Div2*) are upon request.

[25] The Hausman test rejects the null hypothesis of the differences in the coefficients not being systematic, essentially because the unique errors are found to be correlated with the regressors.

Table 5
Fixed effects regression results for bancassurance and bank profitability.

Variables	RA_{ROE}		RA_{ROA}		*ROE*		*ROA*	
	Coeff.	Std.err.	Coeff.	Std.err.	Coeff.	Std.err.	Coeff.	Std.err.
Constant	−0.259**	0.121	−0.300**	0.119	4.743	3.17	−0.125	0.077
Banc	0.357***	0.071	0.352***	0.070	4.974***	1.867	0.050	0.045
ln-Asset	0.012*	0.006	0.014**	0.006	−0.220	0.158	0.005	0.004
Div	0.073***	0.016	0.072***	0.016	0.960**	0.423	0.048***	0.010
BIS	−0.002*	0.001	−0.002*	0.001	−0.070***	0.024	−0.001	0.001
Equity/Assets	0.506***	0.131	0.534***	0.128	2.705	3.429	0.295***	0.083
Gov-Own	–	–	–	–	–	–	–	–
Listing	–	–	–	–	–	–	–	–
R^2	0.312		0.335		0.082		0.201	
Hausman test	31.44***		32.08***		11.68**		12.04**	
Model	Fixed		Fixed		Fixed		Fixed	

Note: Total observations = 283 (12 observations were excluded as they lacked quarterly data, which is a prerequisite for the calculation of risk-adjusted returns).
*** denotes significance at the 1% level.
** denotes significance at the 5% level.
* denotes significance at the 10% level.

Table 6
Fixed effects regression results for profitability, taking a strategy of bancassurance into consideration.

Variables	RA_{ROE}		RA_{ROA}		*ROE*		*ROA*	
	Coeff.	Std.err.	Coeff.	Std.err.	Coeff.	Std.err.	Coeff.	Std.err.
Constant	−0.452***	0.148	−0.421***	0.147	−0.759	1.316	0.016	0.082
Banc	0.331***	0.082	0.356***	0.081	1.668**	0.728	0.116**	0.045
Str_{HHI}	−0.009	0.008	−0.011	0.008	−0.113	0.075	−0.007	0.005
ln-Asset	0.021***	0.007	0.019***	0.007	0.016	0.065	−0.001	0.004
Div	0.057***	0.019	0.058***	0.019	0.677***	0.169	0.043***	0.011
BIS	−0.001	0.001	−0.001	0.001	−0.009	0.010	−0.001	0.001
Equity/Assets	0.656***	0.165	0.632***	0.163	6.713***	1.462	0.225**	0.091
Gov-Own	–	–	–	–	–	–	–	–
Listing	–	–	–	–	–	–	–	–
R^2	0.379		0.386		0.296		0.213	
Hausman test	50.80***		48.31***		37.04***		11.16*	
Model	Fixed		Fixed		Fixed		Fixed	

Note: Total observations = 228 (12 observations were excluded as they lacked quarterly data, which is a prerequisite for the calculation of risk-adjusted returns).
*** denotes significance at the 1% level.
** denotes significance at the 5% level.
* denotes significance at the 10% level.

found to be significantly positive at the 1% level, thereby clearly indicating that banks with greater involvement in bancassurance business are likely to be more profitable than other banks. Further support is therefore provided for the enhanced-performance hypothesis when using the measures of profitability *ROE*, RA_{ROE} and RA_{ROA}. In addition, the coefficients of *Div* in the *ROE*, *ROA*, RA_{ROE} and RA_{ROA} regressions are all found to be significantly positive at the 1% and 5% levels, implying that the probability is higher when the banks' non-interest income constitutes a higher fraction of their total income.

We further examine the effects of the diversified-strategy hypothesis purely for those banks involved in bancassurance business. As shown in Table 6, although the results regarding the measure of involvement in bancassurance business (*Banc*) are still found to hold, the regression results exhibit no significant relationship between the bancassurance strategy (Str_{HHI}) and profitability. Therefore, no support is provided for the diversified-strategy hypothesis when using the profitability measures.

4.3. Tests for robustness

We carry out the robustness checks on the regression results in an attempt to control for any potential endogeneity problem. We use the method of instrumental variables with two-stage estimation to deal with the problem of endogeneity, and the results are reported in Tables 7 and 8.[26] We use the lagged value of *Banc* and the number of cooperating insurance companies as the instrumental variables for *Banc*. The fixed and random effects models are also adapted to control for unobserved firm and year effects under the instrumental variables method. We begin by examining the effects of the enhanced-performance hypothesis for all of the banks. As we can see from Tables 7 and 8, the results are found to be consistent with those reported in Tables 3 and 5, showing that significant relationships still exist between involvement in bancassurance business and both the profitability and efficiency measures.

We then go on to carry out further checks on the effects of potential selection bias regarding banks' decisions as to whether to engage in bancassurance or not. To correct for potential selection bias, we use Heckman's two-stage procedure purely for those banks involved in bancassurance business. The regression results of the first-stage selection model using Probit regression are reported in Table 9.[27] Our result implies that a bank with larger assets size,

[26] As an additional check for robustness, we also estimate the model using the 'generalized method of moments' (GMM) and find that the results are consistent with the estimation results.

[27] The control variables in the first stage include a new control variable *FHC*, which indicates whether or not a bank is owned by a financial holding company; this is equal to 1 for banks controlled by a financial holding company, otherwise it is 0. In order to avoid the problem of identification and severe collinearity, the con-

Table 7
Results of instrumental variables methods for bancassurance and bank efficiency.

Variables[a]	*CE*		*AE*		*TE*		*PTE*		*SE*	
	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.
Constant	−2.125***	0.607	0.314	0.273	−1.264**	0.554	−0.946*	0.553	0.375	0.466
Banc_hat	2.435***	0.504	−0.326	0.481	3.510***	0.588	3.629***	0.699	1.708***	0.544
ln-Asset	0.126***	0.031	0.023*	0.014	0.090***	0.028	0.087***	0.028	0.018	0.024
Div	0.269***	0.099	0.251***	0.094	0.101	0.117	0.187	0.124	−0.057	0.108
BIS	0.010*	0.006	0.006	0.005	0.006	0.006	−0.003	0.007	0.007	0.006
Equity/Assets	−0.421	0.777	−1.165	0.717	0.671	0.896	0.305	0.918	0.927	0.838
Gov-Own	−0.012	0.073	−0.002	0.033	0.071	0.077	0.122	0.079	0.020	0.063
Listing	0.068	0.055	0.006	0.025	0.045	0.06	−0.068	0.061	0.058	0.050
Log Likelihood	191.904		194.694		133.046		91.853		146.918	

Notes:
[a] Total observations = 255. Please refer to Table 3 for the correction for the endogeneity of the bancassurance involvement variable (*Banc*), where the instrumental variables are $Banc_{t-1}$ and *Co-Number*. The results are estimated under a random effects Tobit regression model in the second stage of the IV estimation procedure.
*** denotes significance at the 1% level.
** denotes significance at the 5% level.
* denotes significance at the 10% level.

Table 8
Regression results of instrumental variable methods for bancassurance and bank profitability.

Variables[a]	RA_{ROE}		RA_{ROA}		ROE		ROA	
	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.
Constant	−0.275*	0.142	−0.310**	0.140	1.462	1.695	−0.062**	0.031
Banc_hat	0.587***	0.087	0.567***	0.086	5.411**	2.152	0.127***	0.048
ln-Asset	0.013*	0.007	0.014**	0.007	−0.066	0.086	0.002	0.002
Div	0.053***	0.017	0.054***	0.017	0.853*	0.455	0.030***	0.010
BIS	−0.002	0.001	−0.001	0.001	−0.055**	0.025	0.001	0.001
Equity/Assets	0.413***	0.137	0.441***	0.135	2.244	3.447	0.096	0.077
Gov-Own	–	–	–	–	0.236	0.226	0.005	0.004
Listing	–	–	–	–	−0.026	0.178	−0.000	0.003
R^2	0.415		0.431		0.085		0.220	
Hausman test	61.43 ***		57.83 ***		8.24		8.46	
Model	Fixed		Fixed		Random		Random	

Notes:
[a] Total observations = 246. Please refer to Table 5 for the correction of the endogeneity of the bancassurance involvement variable (*Banc*), where the instrumental variables are $Banc_{t-1}$ and *Co-Number*. The results are estimated under the fixed effects or random effects regression models in the second stage of the IV estimation procedure.
*** denotes significance at the 1% level.
** denotes significance at the 5% level.
* denotes significance at the 10% level.

Table 9
Results of first-stage equation of Heckman selection model.

Variables	*Bancd*	
	Coeff.	Std. err.
Constant	−5.530**	2.555
ln-Asset	0.283**	0.136
Div	0.753	1.028
BIS	0.163**	0.066
Equity/Assets	−24.915***	8.461
Gov-Own	−0.463	0.300
Listing	0.434**	0.218
FHC	0.939***	0.273
Log Likelihood		−117.268

Note:
[a] Total observations = 295. *** denotes significance at the 1% level; ** denotes significance at the 5% level; and * denotes significance at the 10% level.
[b] *Bancd* indicates whether or not a bank involves in bancassurance business; this is equal to 1 for banks involves in bancassurance business, otherwise 0.

higher *BIS* capital ratio, lower equity ratio is more likely to engage in bancassurance business. In addition, a bank which is owned by a financial holding company (FHC) or is a publicly-listed company also tend to involve in bancassurance business. Once again, as we can see from the results of Tables 10 and 11, the Heckman two-stage regression results are found to be consistent with those reported in Tables 4 and 6.

In particular, the coefficients (β_2) for Str_{HHI} in the *SE* regressions in Table 10 are found to be significantly negative for *SE* at the 10% level, thereby indicating that when banks choose to adopt a more concentrated strategy with their insurance partners, this can lead to higher scale efficiency. Thus, the results in Tables 4 and 10 provide weak support for the diversified-strategy hypothesis.

For more robustness, we also adopt the Generalized Propensity Score methodology for settings with a continuous treatment (Hirano and Imbens, 2004; Bia and Mattei, 2008). Figs. 3 and 4 show the results of the change in the outcome variable (bank efficiency and profitability) for a unit change in the treatment variable

trol variables in the first and second stages do not need to be identical. The overlapping control variables will still create problems for identification in some cases, but we can estimate β_1 with much precision under the sample selection model. Details are provided in Wooldridge (2002: 564).

Table 10
Results of Heckman two-stage regression on efficiency, taking a strategy of bancassurance into consideration.

Variables	*CE*		*AE*		*TE*		*PTE*		*SE*	
	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.
Constant	−5.645***	0.887	−0.442***	0.395	−3.618***	0.994	−2.879***	0.737	0.139***	0.66
Banc	0.654	0.412	0.111	0.358	1.192**	0.485	1.299***	0.477	0.454	0.424
Str_{HHI}	−0.020	0.046	0.039	0.033	−0.085	0.054	−0.025	0.049	−0.089*	0.046
ln-Asset	0.306***	0.043	0.057***	0.019	0.218***	0.049	0.190***	0.036	0.032	0.032
Div	0.430***	0.102	0.265***	0.079	0.317***	0.121	0.541***	0.113	−0.005	0.102
BIS	−0.000	0.009	0.009	0.006	−0.005	0.011	0.003	0.009	0.008	0.008
Equity/Assets	0.439	1.580	−1.813**	0.842	0.441	1.787	−4.302***	1.379	1.057	1.260
Gov-Own	−0.238**	0.119	-0.012	0.033	−0.123	0.115	−0.052	0.073	−0.012	0.066
Listing	0.162	0.102	0.010	0.023	0.096	0.095	−0.013	0.054	0.051	0.051
Lambda	−0.028	0.137	0.172**	0.071	−0.109	0.157	0.195	0.125	−0.022	0.113
Log Likelihood	161.886		197.043		108.824		86.691		138.455	

Notes:
[a] Total observations = 235. Please refer to Table 4 for the correction of selection bias of the bancassurance involvement decision. The results are estimated under a random effects Tobit regression model in the second stage of the Heckman two-stage estimation procedure.
*** denotes significance at the 1% level.
** denotes significance at the 5% level.
* denotes significance at the 10% level.

Table 11
Results of Heckman two-stage regression for bancassurance and bank profitability, taking a strategy of cooperation into consideration.

Variables	RA_{ROE}		RA_{ROA}		*ROE*		*ROA*	
	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.	Coeff.	Std. err.
Constant	−0.464***	0.151	−0.425***	0.150	−0.341	1.338	0.051	0.083
Banc	0.333***	0.082	0.356***	0.082	1.588**	0.727	0.109**	0.045
Str_{HHI}	−0.010	0.008	−0.011	0.008	−0.107	0.075	−0.007	0.005
ln-Asset	0.021***	0.007	0.019***	0.007	0.001	0.066	−0.003	0.004
Div	0.058***	0.019	0.059***	0.019	0.647***	0.169	0.040***	0.010
BIS	−0.000	0.002	−0.001	0.002	−0.025*	0.014	−0.002**	0.001
Equity/Assets	0.576**	0.263	0.607**	0.261	9.58***	2.326	0.469***	0.144
Gov-Own	–	–	–	–	–	–	–	–
Listing	–	–	–	–	–	–	–	–
Lambda	0.009	0.023	0.003	0.023	−0.326	0.206	-0.028**	0.013
R^2	0.379		0.386		0.305		0.232	
Hausman test	49.01***		46.68***		44.87***		18.17**	
Model	Fixed		Fixed		Fixed		Fixed	

Notes:
[a]Total observations = 228. Please refer to Table 6 for the correction of selection bias in the bancassurance involvement decision. The results are estimated under the fixed effects model in the second stage of the Heckman two−stage estimation procedure.
*** denotes significance at the 1% level.
** denotes significance at the 5% level.
* denotes significance at the 10% level.

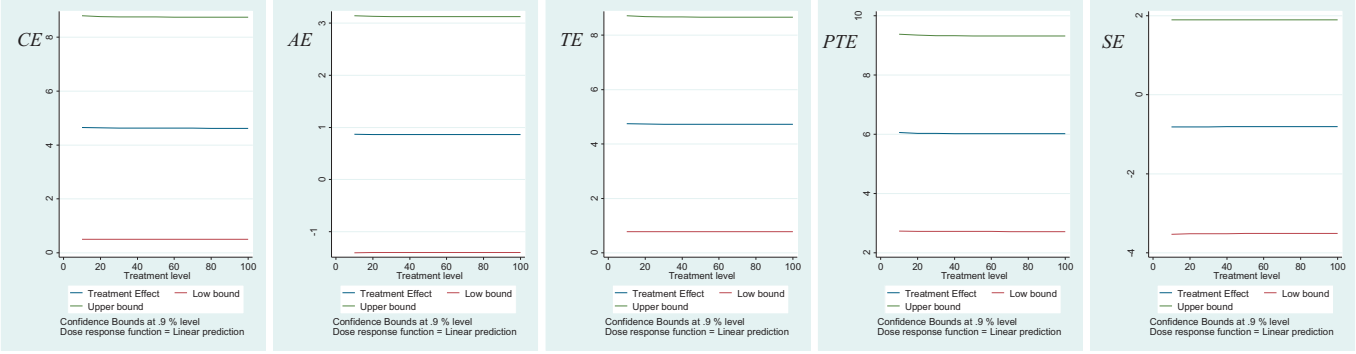

Fig. 3. Results of generalized propensity score with continuous treatment for bancassurance and bank efficiency.
Notes: Total observations = 295. The horizontal axis shows different levels of the treatment variable, whereas the vertical axis shows the change in the conditional expectation of the outcome variable including different efficiency measures (*CE, AE, TE, PTE* and *SE*), given the treatment and generalized propensity score for a unit change in the treatment variable. The middle line of the graph indicates the change in performance measures for a one-unit increase in Log(*Banc*), and the low bound and upper bound plot the 90 confidence interval generated with bootstrapped standard errors from 500 bootstrap replications.

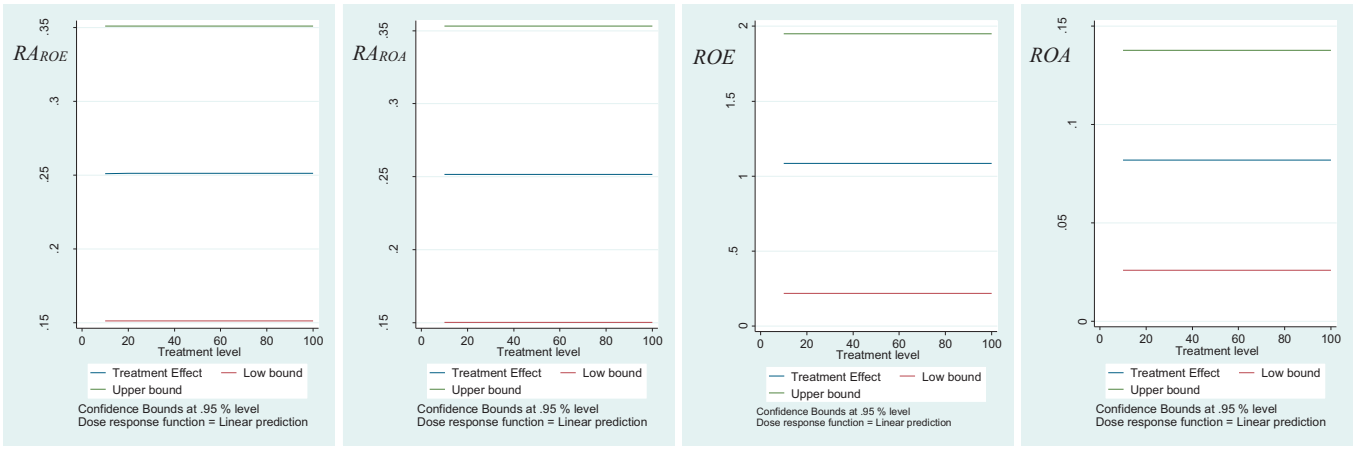

Fig. 4. Results of generalized propensity score with continuous treatment for bancassurance and bank profitability.
Notes: Total observations = 283 (12 observations were excluded as they lacked quarterly data, which is a prerequisite for the calculation of risk-adjusted returns). The horizontal axis shows different levels of the treatment variable, whereas the vertical axis shows the change in the conditional expectation of the outcome variable including different efficiency measures (RA_{ROE}, RA_{ROA}, *ROE* and *ROA*), given the treatment and generalized propensity score for a unit change in the treatment variable. The middle line of the graph indicates the change in performance measures for a one-unit increase in Log(*Banc*), and the low bound and upper bound plot the 95% confidence interval generated with bootstrapped standard errors from 500 bootstrap replications.

(bancassurance use) using the Generalized Propensity Score analysis. The treatment variable (t) is Log (*Banc*) and the outcome variables are efficiency measures and profitability measures. Our results in Figs. 3 and 4 suggest that the positive treatment effects are statistically significant in the results for *CE, TE, PTE,* RA_{ROE}, RA_{ROA}, *ROE*, and *ROA*. In other words, our results are still found to support the enhanced-performance hypothesis after employing the matching method.

5. Conclusions

This paper investigates whether bancassurance improves the profitability and efficiency of banks. The Financial Holding Companies Act in Taiwan opened the door for banks to enter the bancassurance market in 2001. This deregulation led to a rapid acceleration in the growth of bancassurance revenue in the banking sector over a very short period of time and provided an intriguing environment to examine how bancassurance can affect banks' efficiency and profitability. The previous literature indicates that bancassurance may improve bank efficiency, not only through an increase in commission income, but also through non-monetary benefits. However, these studies have failed to provide sufficient empirical evidence to clearly identify the overall effects of bancassurance business on the banks. By using a unique database on the premiums and commission from bancassurance business for each bank in Taiwan, we provide more precise evidence in support of the enhanced bank performance attributable to bancassurance. In addition, due to data limitations, prior studies have been unable to examine whether a bancassurance strategy can improve bank performance. Our results provide new evidence on the impact that a bancassurance strategy can have on bank performance.

Our evidence provides support for the enhanced-performance hypothesis proposed in this study, which posits that involvement in bancassurance business does lead to improvements in the overall performance of banks. The results suggest that bancassurance provides banks with real benefits, whilst also increasing value for bank shareholders. Our analysis also sheds further light on the growing financial consolidation between banks and insurance companies.

The bancassurance advantages are identified from two sets of results on the efficiency and profitability of the banks. First, the evidence shows considerable improvements in efficiency amongst banks engaging in more bancassurance business. The Tobit random-effects regression results reveal enhancements in cost efficiency, technical efficiency and pure technical efficiency. These results imply that banks may be better able to utilize their networks and other fixed costs, thereby raising their overall cost efficiency, with the resultant improvements in the skill sets of their employees ultimately raising their technical efficiency.

Secondly, involvement in bancassurance business has significantly positive effects on profitability performance, as measured by both accounting returns and risk-adjusted returns. The results show that the bancassurance business has positive correlations with *ROE,* RA_{ROE} and RA_{ROA}, which indicates that banks with greater involvement in bancassurance business have greater profitability than other banks.

We also propose a diversified-strategy hypothesis in this study on the effects of different bancassurance strategies between banks and insurers. Interestingly, we find that banks with a diversified strategy can enjoy positive impacts on their efficiency. The regression results reveal that a diversified strategy leads to enhance technical efficiency and scale efficiency. Our evidence therefore provides weak support for our diversified-strategy hypothesis; indeed, the results indicate that a diversification strategy is better for the banks than a concentration strategy. However, we find no evidence of a diversified-strategy increasing the profitability of the banks.

We suggest that our study contributes to the extant literature by providing new evidence in support of involvement by banks in bancassurance business. The empirical evidence demonstrates that the regulatory change from the government can have a significant influence on the rapid financial integration between the banking and insurance sectors. Our results indicate that the advantages of bancassurance persist even after adjusting for risk and efficiency levels. Overall, our empirical results suggest that bancassurance business can provide banks with higher profits and efficiency improvements. In addition, banks' efficiency levels can be improved by more diversified sources of bancassurance commission. We therefore conclude with the suggestion that banks should consider a diversification strategy that involves a lower concentration of insurers in the bancassurance business model.

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