Can U.S. Banks and Insurers Achieve Benefits Promised by Financial Integration?

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The Gramm-Leach-Bliley Act of 1999 essentially removed the barriers that enforced the separation between commercial banks, investment banks, and insurance companies in the U.S. We construct a unique data set, which links the U.S. banking and insurance regulatory data sets. We investigate efficiency effects from possible economies of scope across the two formally separate sectors by estimating multiproduct cost, revenue, and profit functions. The empirical evidence suggests that there are significant cost scope diseconomies, revenue scope economies, and weak profit scope economies. The scope economies vary among firms, and certain firm characteristics are the determinants of scope economies.

INTRODUCTION AND MOTIVATION

In 1999, when Congress passed the landmark financial services reform legislation called the Financial Services Modernization Act (also referred to as the Gramm-Leach-Bliley Act),[1] it was viewed as the culmination of years of effort to reform the U.S. financial services industry. The Gramm-Leach-Bliley Act (GLB) repealed the 66-year old Glass-Steagall Act of 1933,[2] as it eliminated the restrictions on affiliations between commercial banks and investment banks. GLB also substantially modified the 43-year old Bank Holding Company Act of 1956,[3] as it removed barriers that enforced the separation between commercial banks and insurance companies.

GLB had the potential of having a profound impact on financial services providers because under its regulations the 600+ companies that were operating as financial holding companies (FHCs) at the end of 2003 represented 78 percent of the total assets of all bank holding companies (BHCs) in the United States. In addition, by 2003, more than 1,300 FHCs/BHCs were engaged in insurance agency or underwriting activities, and over 2,500 insurance companies through agents or risk-bearing underwriters were affiliated with banking institutions.[4] Today, U.S. consumers can choose from a broadening array of financial tools and from companies that can serve their multiple needs or those that specialize in one or two types of financial products.

The early results of GLB suggested that the U.S. financial industry was headed towards greater and greater consolidation both within and across sectors. However, practitioners and researchers alike still debate both the motives and benefits of financial integration. In addition, a number of organizations that initially took advantage of the new rules under GLB have returned over time to their core businesses and given up on their integration strategies.[5]

One of the arguments in the debate about offering financial products via an integrated financial services provider is whether any productive efficiency benefits exist for a single firm that manufactures disparate products. This argument is a bit surprising since substantial research has been devoted to measuring the productive efficiency of financial institutions over the past twenty years, particularly in commercial banks where analysts have conducted literally hundreds of studies that estimate various measures of the efficiency of financial institutions located in more than two dozen countries.[6] That said, there is little research on the efficiency effects of integrating providers of different categories of financial services into universal type organizations. In addition, the scant evidence that does appear in the literature has been extrapolated from scope efficiency studies within one sector of the financial industry,[7] or it comes from simulations of investigating the benefits of risk diversification in the absence of synergistic gains (Boyd, Graham, and Hewitt, 1993; Allen and Jagtiani, 2000).

Thus, the purpose of this paper is to remedy a deficiency in the literature—the absence of data on the efficiency effects of integrating providers of different categories of financial services into universal type organizations—and to provide the first evidence regarding the productive efficiency effects of integrating two formally separated financial services sectors, that is, banking and insurance. To do so, we estimate the economies of scope of post-GLB U.S. banking and insurance industries across cost, revenue, and profit measures.[8]

A likely reason for the scarce empirical research on the integration of the banking and insurance sectors is because the regulatory data sets available are product specific and there is no convenient way to identify companies affiliated with one another across sectors. Yeager, Yeager, and Harshman (2007) is the closest paper to our own as the authors investigate evidence of cost reductions or profit enhancements by comparing the performance of BHCs/FHCs before and after passage of GLB. However, our paper is different in at least two significant ways. First, Yeager, Yeager, and Harshman investigate univariate measures of performance and operating efficiency, such as return on equity, return on assets, operating income per employee, and so on. Our investigation of operating performance using estimates based on modern production theory is substantially different and arguably a more robust way to approach the problem (Brown, Caves, and Christensen 1979). Second, Yeagar, Yeager, and Harshman are not able to investigate insurance operations at the level of the individual lines of business given the source of their data, which is FR-Y-9C. As discussed later, we link individual sector-specific regulatory databases from the banking and insurance industries which allows us to investigate any possible economies of scope at the level of individual lines of business.

Therefore, the first effort in our study is to construct a unique data set that links the insurance and the bank regulatory data sets. The combined data set exists for financial conglomerates, specialist banks, and specialist insurers operating in the U.S. banking and insurance industry during 2003, 2004, and 2005.

We utilize a standard two-stage econometric method to investigate economies of scope. In the first stage, we estimate multiproduct cost, revenue, and profit functions, and we estimate separate functions for the banking (commercial banks vs. thrifts) and insurance (life-health insurance vs. property-liability insurance) subsidiaries of joint producers and of specialist firms in each industry. We then use the estimated functions to calculate scope economy scores for all financial institutions in our database. In the second stage, we use the scope economy scores to investigate various hypotheses on whether scope economies are associated with firms jointly producing financial products across multiple sectors, and we explain the variation of scope economy estimations.

This paper is organized as follows. Section 2 discusses the concept of scope economies and reviews the literature. Section 3 describes the data set construction. In Section 4, we develop testable hypotheses. Section 5 explains the estimation methodology that we employ. Section 6 discusses the scope economies estimation results and regression results. We offer our conclusions in Section 7.

SCOPE ECONOMIES IN FINANCIAL SERVICES: A SURVEY OF THE EVIDENCE

Cost Scope Economies

Cost scope economies refer to the reduction of average total production costs through the production of a wider variety of goods or services. For cross-sector integration, cost scope economies may be realized from the sharing of physical inputs, reusing managerial expertise and experience, raising external capital at lower costs because of reduced risks, employing common service functions such as advertisement or investment, cross-selling, and using information at a lower cost. However, cost scope diseconomies may also arise because of higher coordination and administrative costs and organizational diseconomies when producing a broad range of products.

The prior literature that estimates the cost scope efficiencies of providing multiple products within a single financial institution tend to evaluate possible economies of within-sector products (e.g., commercial loans and consumer loans) rather than cross-sector products (e.g., commercial loans and life insurance policies). Within the U.S. banking sector, the evidence has been mixed, as most studies have not found substantial evidence of cost scope economies in commercial banks or savings and loans institutions (e.g., Mester, 1993; Pulley and Humphrey, 1993; and Rogers, 1998). However, two papers did report evidence of cost scope diseconomies arising from coordination and administrative costs (Cebenoyan, 1990; Winton, 1999). In the insurance sector, Grace and Timme (1992) report no significant cost scope economies across lines of business with the life insurance industry for the largest 423 U.S. life insurance companies.

Berger et al. (2000) is an exception to this general conclusion as they report that there are weak economies of scope in the joint production of financial services and positive cost scope economies for insurers jointly offering life and property-liability insurance over the years 1988–1992. However, in a more recent paper, the authors' find no evidence of cost scope efficiencies for property-liability insurers but some evidence of cost scope economies for life insurers during the period 1993–2006 (Cummins, Weiss, Xie, and Zi, 2010).

Although studies have investigated scope economies across lines of business within the same sector in the U.S. financial industry, there is no evidence on whether scope economies exist for offering a wider variety of products across different financial sectors.

Revenue Scope Economies

Revenue scope economies refer to the increase of total revenue resulting from the production of different categories of services or products. Revenue scope economies may occur because of consumption complementarities (otherwise known as demand superadditivity). By offering the convenience of "one-stop shopping," financial conglomerates may reduce consumer search and transactions costs, and some customers may be willing to pay more for the convenience of "supermarket" shopping for their banking and insurance needs. Demand-side scope efficiency gains may arise by cross-selling a broad range of financial products or by integrating distribution systems. Reputation recognition can also lead to revenue scope economies when the integration associates itself with a strong brand name that customers recognize and prefer. By diversifying across products, financial conglomerates may be lower risk if net cash flows across business lines are less than perfectly correlated. In this sense, conglomerates may realize revenue scope economies by charging higher prices because of lower expected financial distress costs.

However, the possibility of revenue scope diseconomies cannot be dismissed, especially if the integration creates or enhances conflicts of interest within the organization. Various papers suggest that the internal capital markets associated with the conglomerate form weaken management's investment incentives and may allow inefficient cross subsidies to occur that generate increasing costs (e.g., Shin and Stulz, 1998; Scharfstein and Stein, 2000). Revenue scope diseconomies also may arise if specialists from different types of financial services are knowledgeable in their areas of expertise and can provide products better tailored to the specific needs of clients. In this case, the specialists may be better able to command a higher premium for the product than joint producers.

Little research exists on the effects of financial integration on revenue scope efficiency. The few studies that do exist are based on within-sector data, and the results are inconclusive. Berger, Humphrey, and Pulley (1996) find little or no evidence of revenue scope efficiency for providing deposits and loans. Berger et al. (2000) find revenue scope diseconomies for insurers providing both life and property-liability insurance products. Using a more sophisticated estimation technique, Cummins, Weiss, Xie, and Zi (2010) report evidence of revenue scope diseconomies in the U.S. insurance industry.

Profit Scope Economies

Profit scope economies generally refer to the increased profits from producing a broader range of products or services. Profit scope economies simultaneously consider both costs and revenues and, therefore, reflect differences in the product or service quality that may not be captured by considering cost or revenue scope efficiencies in isolation. For example, customers may prefer "one-stop shopping" and therefore be willing to pay for the consumption convenience leading to revenue scope economies. However, financial conglomerates may incur additional expenses due to joint production that leads to cost scope diseconomies. Thus, revenue scope economies or cost scope diseconomies alone cannot explain the net scope efficiency gain/loss from integrating different categories of financial products. In this sense, profit scope economy measures dominate the more commonly used concept of cost or revenue scope economies.

Studies of profit scope efficiencies generally do not find consistent benefits for joint production or specialization within the banking or insurance industry. However, studies typically find that joint production is more efficient for some firms and specialization is more efficient for others within the U.S. banking or insurance sector (Berger, Hancock, and Humphrey, 1993; Berger et al., 2000; Cummins et at., 2010). Few studies find meaningful profit scope economies among traditional deposit and loan outputs (Humphrey and Pulley, 1997; Rogers, 1998).

CONSTRUCTION OF THE BANKING/INSURANCE DATABASE

The regulatory data sets in the U.S. covering financial services firms are product specific and there is no convenient way to identify affiliations among companies across different product lines. In this study, we construct a linking variable that allows us to match the unique company identifiers between insurance and bank regulatory data sets. The variable that we develop links the unique company identifiers in the National Association of Insurance Commissioners (NAIC) insurance data sets together with the identifiers in the Bank Holding Company Financial Report (BHCFR) (part of the Federal Reserve's FR-Y-9C report), the Commercial Bank Call Report (CALL), and the Thrift Financial Report (TFR).

The unit of observation that we use to approximate the cost to estimate the cost, revenue, and profit functions in this study is the specialist firms and the subsidiary firms that operate as part of a financial conglomerate. Thus, instead of using the consolidated financial data reported in the FR-Y-9C, we use the subsidiary level data (CALL, TFR, and NAIC) to separately aggregate each group's life, property-liability, commercial bank, and thrift subsidiaries to obtain divisional totals. We use the subsidiary data because banking subsidiaries must be parallel to insurance subsidiaries in the conglomerate structure since GLB does not allow individual banks to own insurance subsidiaries or to directly engage in insurance underwriting activities. Insurance underwriting is only permitted by a separate legal entity that must be held in a holding company structure. Therefore, using the sector-specific regulatory data sets allows us to accurately measure the input prices and output quantities at the divisional level. Thus, we treat a firm as a single producer with up to four business divisions.

We eliminate firms in our data with nonpositive total assets, liabilities, or net worth. Following the literature (e.g., Berger and Mester, 2003), we exclude specialist banks with less than $1 billion in assets and specialist insurers with less than $600 million in assets. The final data sample consists of 260 observations of multiproduct firms that jointly produce banking and insurance products, 613 insurance specialist observations, and 1,450 bank specialist observations over the period 2003–2005.

TABLE 1
DATA SAMPLE STATISTICS

This table lists the total assets of firms contained in the data sample by sectors and product lines. Firms under common ownership are aggregated to the group level. The number of firms is given in the parentheses. Joint firms are those producing both banking and insurance products. Assurbanks are insurers owning banking subsidiaries; Bancassurers are banks owning insurance subsidiaries. Insurance and banking specialists are firms producing only insurance or banking products, respectively. The data sample accounts for 98 percent life insurance industry assets, 94 percent property-liability insurance assets, 88 percent commercial banks assets, and 81 percent thrift saving banks assets.

	2003	2004	2005
Joint Firms			
- Assurbanks	$2,652b	$2,940b	$3,354b
	(44)	(41)	(42)
- Bancassurers	$4,606b	$5,299b	$5,501b
	(44)	(44)	(45)
Total	**$7,258b**	**$8,239b**	**$8,855b**
	(88)	**(85)**	**(87)**
Insurance Specialists			
- Life Insurers	$1,343b	$1,420b	$1,515b
	(110)	(104)	(102)
- PC Insurers	$753b	$854b	$917b
	(144)	(149)	(151)
Total	**$2,096b**	**$2,274b**	**$2,432b**
	(204)	**(208)**	**(209)**
Banking Specialists			
- Commercial Banks	$2,859b	$3,090b	$3,349b
	(389)	(402)	(439)
- Thrift Saving Banks	$732b	$818b	$859b
	(132)	(132)	(146)
Total	**$3,591b**	**$3,908b**	**$4,208b**
	(461)	**(470)**	**(509)**

Table 1 shows the summary statistics of the firms in our data set displayed separately for joint producers versus specialist firms. We further segregate the joint producers into two categories: bancassurers versus assurbanks. We define a *bancassurer* to be a financial conglomerate selling insurance products through either its own distribution channels or outside agents manufactured by insurance subsidiaries owned and controlled by the bank. Similarly, we define an *assurbank* as an insurance company selling banking products manufactured by banking subsidiaries owned and controlled by the insurance institution. Although joint producers represent the smallest category in terms of numbers, bancassurers and assurbanks are the largest category in terms of total assets under management followed by banking specialists and then insurance specialists. The firms included in the data set account for 98 percent of life insurance industry assets, 94 percent of property-liability insurance industry assets, 88 percent of commercial bank industry assets, and 81 percent of savings-thrift industry assets.

Table 2 shows statistics demonstrating the extent to which joint producers have entered into new business lines. For example, on average, 93.5 percent of an assurbank's total revenue comes from its traditional business of insurance with the remaining 6.5 percent coming from its new banking subsidiaries. Similarly, 69.6 percent of revenue for an average bancassurer comes from its traditional

banking subsidiaries with the remaining 30.4 percent coming from its new insurance division. Table 2 suggests that traditional commercial banks more aggressively entered the insurance business than insurance companies entered the banking business during the time period of this study.

TABLE 2
SUMMARY STATISTICS OF ASSET BASE AND REVENUE FOR JOINT FIRMS

This table displays statistics of the percentage of assets Bancassurers and Assurbanks held in banking subsidiaries versus insurance subsidiaries. The same statistics are also shown for the percentage of revenues produced by the banking versus insurance subsidiaries. The statistics were calculated across all three years of data.

	% Assets in Banking Subsidiaries			% Assets in Insurance Subsidiaries		
Type of Joint Firm	Mean	Median	75th Percentile	Mean	Median	75th Percentile
Assurbanks	9.51%	1.19%	9.27%	90.49%	98.81%	99.84%
Bancassurers	75.84%	96.74%	99.77%	24.16%	3.26%	40.55%
	% Revenue in Banking Subsidiaries			**% Revenue in Insurance Subsidiaries**		
Type of Joint Firm	Mean	Median	75th Percentile	Mean	Median	75th Percentile
Assurbanks	6.46%	0.56%	1.65%	93.54%	99.44%	99.93%
Bancassurers	69.63%	92.25%	99.66%	30.37%	7.75%	72.34%

HYPOTHESES

Although passage of GLB eliminated most of the barriers and restrictions on affiliations across financial sectors, it does not necessarily follow that financial "supermarkets" will become dominant. Furthermore, we observe the coexistence of conglomeration and specialization business strategies by U.S. banks and insurers. Whether scope efficiency benefits exist for joint production remains an open question for cross-sector financial conglomeration. This suggests the first two general hypotheses regarding the existence of scope economies (stated in null form).

Hypothesis 1: Neither scope economies nor diseconomies exist in the post-GLB integrated banking and insurance industries.

Hypothesis 2: Economies of scope are invariant among financial conglomerates jointly producing banking and insurance products.

Economies of scope can arise from a variety of cost and/or revenue complementarities. Firm-specific characteristics (e.g., firm size, product mix, distribution network, and regulatory regime) may affect these complementarities and thus contribute to assorted scope economies or diseconomies. Therefore, some banks or insurers could be in a better position to benefit from diversified manufacturing.

There is a general consensus in the literature that firm size may be associated with greater or lesser scope economies with large banks and insurance companies better positioned to exploit scope economies (Milbourn, Boot, and Thakor, 1999; Berger et al., 2000; Cummins, Weiss, Xie, and Zi, 2010). In addition, the results of event studies tend to suggest that the market consensus is that large banks would benefit more from the passage of GLB than small banks (see, e.g., Akhigbe and Whyte, 2001). Large financial conglomerates may also gain a competitive advantage through implicit "too big to fail" government guarantees if consumers perceive that these guarantees may reduce potential losses in bankruptcy. Thus,

the large conglomerates may gain a reputational advantage that allows them to borrow funds at lower cost (Kane, 1999; Carow, 2001). It is possible that cost scope economies may exist on a small scale from sharing inputs or fixed resources and that these gains may be offset by coordination or management diseconomies in larger organizations. Nevertheless, significant scale may be needed to generate revenue scope economies from consumption complementarities because of the need to maintain a large distribution network. Given this discussion, our third hypothesis is as follows:

Hypothesis 3: Larger financial conglomerates are associated with higher economies of scope in jointly producing banking and insurance products.

There are numerous reasons for hypothesizing how business opportunities offered by GLB may benefit some lines of business more than others. For example, Carow (2001) reports that life insurance companies benefited more from the passage of GLB than did property-liability insurers. A General Accounting Office (1990) study concluded that potential synergistic gains were greater for the combination of banks and life insurers than for the combination of banks and property-casualty insurers. Given that there were regulations that precluded banks from manufacturing insurance before GLB, U.S. banks have a long history of entering into distribution alliances with insurers and have been engaging in the insurance business through the selling of annuities and credit-related insurance. Since life insurance products are similar in some respects to banking products and function as complementarities to banking products, banks may be more interested in cross-sell life insurance products than property-liability products (Johnston and Madura, 2000). Finally, on a univariate basis, our data sample supports this inference as bank-owned insurers accounted for 7.3 percent of life insurance industry assets but only 3 percent of property-liability industry assets. For all these reasons, banks are expected to achieve greater scope economies when combining with life insurers than with property-liability insurers. The fourth null hypothesis is stated as follows:

Hypothesis 4: Higher economies of scope are associated with firms jointly producing life and banking products rather than firms jointly producing property-liability and banking products.

Economies that arise from marketing, distribution, administration, and other functions could be more prevalent in retail product lines than in commercial lines. The primary argument in favor of this position is that marketing, distribution, administration, and other functions tend to be more homogeneous in retail markets and more heterogeneous in commercial lines. On the sell side, retail customers may be willing to pay more for one-stop shopping convenience, while commercial customers face relatively trivial search or transaction costs and prefer tailored products. These arguments suggest the null hypothesis in relation to the product portfolio:

Hypothesis 5: Higher economies of scope are associated with retail financial product lines than commercial product lines.

Although a consolidated bank and insurer is able to lower its total costs or to increase its expected revenue by cross-selling, scope economies may vary because of the distribution systems that insurers employ. The distribution systems used by U.S. insurance companies can roughly be thought of as vertically integrated versus horizontal or partnership models. Insurers using exclusive agents, direct marketing, or mass marketing to distribute their products can be thought of as employing vertical distribution mechanisms. Insurers using horizontally integrated distribution systems distribute through brokers or independent agents who typically represent multiple insurers.

It is reasonable to suppose that a bank belonging to a financial conglomerate is expected to sell its insurance affiliates' products through its branches or offices. Thus, one hypothesis is that banks affiliated with vertically integrated insurers can reuse the insurers' relatively large investment in advertising and marketing, which may lead to cost scope economies. On the other hand, scope economies between banks and vertically integrated insurers may be negative if such affiliations increase competition and create conflicts within the group. This issue may be particularly serious when bank-sold insurance products are similar to insurance products, especially annuities, offered by insurer affiliates. In this sense, insurers using horizontal distribution systems may be in a better position to gain revenue scope economies. Berger, Cummins, and Weiss (1997) report that vertically integrated distributors are more likely to realize both cost and revenue scope economies in the life insurance industry. However, Cummins, Weiss, Xie,

and Zi (2010) do not find evidence that scope economies are more likely for insurers using vertically integrated distributions than those using horizontal distribution systems. From these arguments we have our next hypothesis:

Hypothesis 6: Higher economies of scope are associated with combinations of banks and insurers using vertically integrated distributions rather than with combinations of banks and insurers using horizontally integrated distributions.

The productivity literature defines X-efficiency as an individual firm's deviation from the best technology efficient frontier. X-efficiency can be thought of as the effectiveness with which a given set of inputs is used to produce outputs. Given the resources used and the best technology available, a firm is said to be X-efficient if it is producing a quantity of output at the lowest possible cost (Leibenstein, 1966). In this study, we calculate cost, revenue, and profit X-efficiency as $e^{[MIN(\varepsilon_i)-\varepsilon_i]}$, where ε_i is the error term from the first-stage cost, revenue and profit function regressions for firm *i*. respectively Firms closer to or further from the frontier are more and less efficient, respectively, at producing the same level of output as firms on the frontier. We hypothesize that more X-efficient managers, who are already outperforming their competitors, can use and extend their managerial talent, experience, and expertise into the conglomerate and thus can better realize economies of scope. The last hypothesis is as follows:

Hypothesis 7: X-efficient firms are associated with higher economies of scope in the joint production of banking and insurance products.

METHODOLOGY AND DATA

Econometric Approach

We use the composite production function first proposed by Pulley and Braunstein (1992) to estimate cost, revenue, and profit functions used in this study. The Pulley-Braunstein composite function is ideal for our setting because it not only allows zero output for some products, but it also allows for negative values for the dependent variable. Thus, this functional form is attractive for scope economies analysis, especially for estimating profit scope efficiencies.[9]

Function form

The composite Pulley-Braunstein model combines a quadratic structure for outputs and a log-quadratic specification for input prices. It is given by:

$$C = \left[\alpha_0 + \sum \alpha_i q_i + \frac{1}{2}\sum\sum \alpha_{ij} q_i q_j + \sum\sum \delta_{ik} q_i \ln r_k\right] \times \exp\left[\beta_0 + \sum \beta_k \ln r_k + \frac{1}{2}\sum\sum \beta_{kl} \ln r_k \ln r_l + \sum\sum \mu_{ik} q_i \ln r_k\right] + \varepsilon \quad (1)$$

where C is total costs; q_i is the ith output, i=1,…,n; r_k is the kth input price, k=1,…,m; α, β, δ, and μ are coefficient vectors to be estimated; and ε denotes a random error term. The theoretical requirement that the cost function be homogeneous of degree one in input prices is met by imposing the following restrictions (Brown, Caves, and Christensen, 1979):

$$\sum\nolimits_k \beta_k = 1 \text{ and } \sum\nolimits_l \beta_{kl} = \sum\nolimits_k \beta_{lk} = 0 \ (k, l = 1,\ldots,m)$$

$$\sum\nolimits_k \delta_{ik} = 0 \ (k = 1,\ldots,m)$$

The symmetry restrictions imply $\alpha_{ij} = \alpha_{ji}$ and $\beta_{kl} = \beta_{lk}$. The constant term and the interaction terms $\sum\sum \mu_{ik} q_i \ln r_k$ are omitted because of the technical difficulty in estimating both constant interaction terms simultaneously (Pulley and Braunstein, 1992; McKillop, Glass, and Morikawa, 1996; Berger et al., 2000). Hence, the Pulley-Braunstein composite model used is specified as:

$$C = \left[\alpha_0 + \sum \alpha_i q_i + \frac{1}{2}\sum\sum \alpha_{ij} q_i q_j + \sum\sum \delta_{ik} q_i \ln r_k\right] \times \exp\left[\sum \beta_k \ln r_k + \frac{1}{2}\sum\sum \beta_{kl} \ln r_k \ln r_l\right] + \varepsilon \quad (2)$$

Consistent with the literature, we adopt a modified version of the composite cost function form by normalizing the dependent variable and the output and input variables as follows:

$$\frac{C}{r_m} = \left[\theta_0 + \sum \theta_i y_i + \frac{1}{2}\sum\sum \theta_{ij} y_i y_j + \sum\sum \gamma_{ik} y_i \ln s_k\right] \quad (3)$$
$$\times \exp\left[\sum \epsilon_k \ln s_k + \frac{1}{2}\sum\sum \epsilon_{kl} \ln s_k \ln s_l\right] + \varepsilon$$

where the dependent variable is normalized by the price of the last input (r_m). Output terms are scaled by the sample mean ($y_i = q_i$ /mean(q_i)) and input prices are normalized by the last input price ($s_k = r_k / r_m$). The revenue and profit functions estimated in our study are identical to the composite cost function (3) except that the dependent variable cost is replaced by revenue and profit respectively.[10] Thus, the revenue (R) and profit functions (P) are:

$$\frac{R}{r_m} = \left[\pi_0 + \sum \pi_i y_i + \frac{1}{2}\sum\sum \pi_{ij} y_i y_j + \sum\sum \sigma_{ik} y_i \ln s_k\right] \quad (4)$$
$$\times \exp\left[\sum \rho_k \ln s_k + \frac{1}{2}\sum\sum \rho_{kl} \ln s_k \ln s_l\right] + \varepsilon$$

$$\frac{P}{r_m} = \left[\varphi_0 + \sum \varphi_i y_i + \frac{1}{2}\sum\sum \varphi_{ij} y_i y_j + \sum\sum \tau_{ik} y_i \ln s_k\right] \quad (5)$$
$$\times \exp\left[\sum \omega_k \ln s_k + \frac{1}{2}\sum\sum \omega_{kl} \ln s_k \ln s_l\right] + \varepsilon$$

The modified composite cost, revenue, and profit functions are estimated using nonlinear least squares.[11]

Measurement of scope economies

Cost economies of scope (*CSCOPE*) are defined as the percentage of costs that firms could save by producing multiple products jointly instead of producing each product separately in specialist firms (Panzar and Willig, 1975, 1981). The measure of *CSCOPE* in the case of a firm producing n product categories, $Q_1, \ldots, Q_n$, is given by:

$$CSCOPE = \frac{\sum_{i=1}^{n} C_{Si}(Q_i; r_1,\ldots,r_m) - C_J(Q_1,\ldots,Q_n; r_1,\ldots,r_m)}{C_J(Q_1,\ldots,Q_n; r_1,\ldots,r_m)} \quad (6)$$

where $C_{Si}(Q_i; r_1, \ldots r_m)$ is the cost function for specialist firm S_i producing Q_i given input price vector $(r_1, \ldots r_m)$, and $C_J(Q_1,\ldots, Q_n; r_1, \ldots r_m)$ is the cost function for a jointly producing firm producing an output vector $(Q_1,\ldots,Q_n)$. Cost scope economies are believed to be present if *CSCOPE* > 0, and diseconomies are present if *CSCOPE* < 0.

Revenue and profit scope economies are generally measured as the percentage increase in revenue or profit when different categories of products are provided jointly instead of being provided separately. The revenue scope economies score (*RSCOPE*) is given by:

$$RSCOPE = \frac{\sum_{i=1}^{n} R_{Si}(Q_i; r_1,\ldots,r_m) - R_J(Q_1,\ldots,Q_n; r_1,\ldots,r_m)}{R_J(Q_1,\ldots,Q_n; r_1,\ldots,r_m)} \quad (7)$$

and the profit scope economies score (*PSCOPE*) is:

$$PSCOPE = \frac{\sum_{i=1}^{n} P_{Si}(Q_i; r_1,\ldots,r_m) - P_J(Q_1,\ldots,Q_n; r_1,\ldots,r_m)}{P_J(Q_1,\ldots,Q_n; r_1,\ldots,r_m)} \quad (8)$$

where $R_{Si}(\ .\ )$ and $P_{Si}(\ .\ )$ are revenue and profit functions for specialist firm S_i; $R_J(\ .\ )$ and $P_J(\ .\ )$ are revenue and profit functions for the conglomerate J. Similarly, revenue or profit scope economies are believed to be present if *RSCOPE* > 0 or *PSCOPE* > 0, and scope diseconomies are present if *RSCOPE* < 0 or *PSCOPE* < 0.

Following best practice in the literature, we estimate the cost, revenue, and profit functions separately for the specialists and for the jointly producing firms using nonlinear least squares (Berger et al., 2000). The primary advantage of adopting this approach is that we do not artificially impose the restriction that specialist and jointly producing firms use the same technology to produce similar goods. Using this approach requires us to estimate twenty-four cost, revenue, and profit functions. That is, we estimate eight functions for each measure (cost, revenue, and profit): four functions (life insurance, property-liability insurance, commercial banking, and thrifts) for specialist firms that only produce the specific product and

four functions, one for each product type, for the divisions of conglomerate firms that jointly produce financial services.

Defining Outputs, Inputs, and Prices

Like other service industries, it is difficult to define what financial institutions produce and how they price their services. The literature has evolved over time and three alternative methods have been used to measure outputs in the financial services industry: the asset (financial intermediation) approach (Sealey and Lindley, 1977), the user-cost approach (Donovan, 1978), and the value-added (production) approach (Berger and Humphrey, 1992). This section briefly discusses the measurement of outputs, inputs, and prices for insurers and banks used in this study.

Insurance Outputs

Consistent with the literature on insurance efficiency, we measure insurance outputs using the value-added approach (Cummins and Weiss, 2001). We identify three principal services provided by insurance companies: risk pooling and risk bearing, real financial services, and financial intermediation. The actuarial, underwriting, claim settlement, and associated expenses incurred in operating risk pools are the main components of value added related to risk pooling and risk bearing. Real financial services include personal financial planning, commercial benefit plan administration, coverage program design, and services related to insured losses. For financial intermediation, interest credited to life insurance policies and premium discounts applied to property-liability insurance policies represent the value added of the insurers' intermediation function.[12]

Property-Liability Insurance: For property-liability insurers, the present value of real losses incurred, $PV(L)$, is used as a proxy for the quantity of risk pooling provided by insurers. Losses incurred are generally defined as total losses that are expected to be paid arising from business written in previous years; specifically, they are calculated as the sum of losses paid plus the net change in loss reserves. We discount the future expected loss payments to reflect claim settlement lags that are prevalent among certain product lines for which losses are often not paid and typically are settled many years after they occur (most notably the liability lines of insurance). The quantity of the insurer's intermediation function is measured by the amount of real invested assets averaged over the course of the year. Because of limitations due to sample size, we use three aggregate insurance outputs for property-liability insurers: (1) personal lines combining personal property and liability products, (2) commercial lines combining commercial property and liability products, and (3) the intermediary output (invested assets).

Life Insurance: Unfortunately, due to limitations in the information reported by life insurers, the present value of benefits incurred for life insurers is not available. Thus, following accepted practice (e.g., Yuengert, 1993; Berger et al., 2000; Cummins, Weiss, Xie, and Zi, 2010), we use incurred benefits (payments received by policyholders in a year) plus additions to reserves as a proxy for life insurance outputs. We define five business lines: personal life insurance, personal annuities, group life insurance, group annuities, and accident and health insurance. We use three aggregate outputs for life insurers: life insurance including personal and group life insurance, annuities including personal and group annuities, and accident and health insurance.

Banking Outputs

Consistent with the majority of the literature on bank efficiency, we assume that the services provided by banks are traditional financial services, new financial services, and off-balance sheet activities (Berger, Cummins, and Weiss, 1997). Traditional financial services include deposits (demand, time, and savings) and loans (real estate, commercial, and installment), which continue to represent the majority of bank revenue. Fee-based services and off-balance sheet activities are recognized as a growing category of bank assets, and they now account for a substantial portion of bank revenues (Stiroh, 2000). New financial services include portfolio management, mutual or pension fund distribution, and safekeeping services. The major off-balance sheet activities are loan commitments, credit derivatives, letters of credit, and loan originations, sales, and servicing.[13]

Following the literature, we identify three categories of outputs: consumer loans, business loans, and other assets.[14] Consumer loans involve intermediation and loan services, and they are calculated as the sum of the dollar value of residential loans, credit card loans, and other installment loans. Business loans include the dollar value of real estate loans, commercial and industrial loans, farm loans, and other loans and leases. Other assets include the banks' new financial services and off-balance sheet business, and they are defined as the sum of the dollar values of securities and trading assets held and risk-weighted (based on Basle Accord risk weights) off-balance sheet activities.

Insurance Inputs and Prices

Unlike output definitions, there is general agreement in the literature regarding the measurement of inputs in the financial services industry. Usually, inputs to insurance fall into four principal categories: home office administrative labor, agent labor, material and physical capital, and financial equity and debt capital.

Since insurers are not required to report detailed information about the number of employees and quantity of materials used in their businesses, the price of home office labor is obtained from average weekly wage rates for life insurers (NAICS 524113) and property-liability insurers (NAICS 524126) in their state of domicile, which is available from the U.S. Department of Labor. Similarly, the price of agent labor is defined as the premium-weighted average weekly wage rates for insurance agents (NAICS 524210) in states where insurers operate. The price of materials and business services is defined as the U.S. Department of Labor average weekly wage rates for business services (NAICS 5614).

We include two proxies for financial capital: equity capital and debt capital. Financial equity capital plays an important role in reducing insolvency risks, and it is viewed in the literature as an important input (Berger, Cummins, and Weiss, 1997; Hughes, Mester, and Moon, 2001). An insurer's financial equity capital is defined as the average of the beginning-of-year and end-of-year equity capital as reported on statutory balance sheets. The price for financial equity capital that we use is the estimated cost of equity capital as determined using the Fama-French Three Factor asset pricing model with industry specific beta information and expected risk premia, which can be obtained from Ibbotson Associates *Cost of Capital Yearbook*.[15] Debt capital is defined as funds borrowed from policyholders proxied by the amount held in loss and unearned premiums reserves. The price of debt capital is calculated as total expected investment income minus expected investment income attributed to equity capital divided by average debt capital (Berger, Cummins, and Weiss, 1997; Cummins and Weiss, 2001).

Banking Inputs and Prices

The four inputs for banks (commercial banks and thrift institutions) are widely recognized as deposits, labor, physical capital, and purchased funds.[16] Deposits include demand deposits, and time and saving deposits. The price of deposits is calculated as total interest expense on deposits divided by the dollar value of deposits. The price of labor is calculated as salary, wages, and welfare per employee. The price of physical capital is obtained from occupancy and fixed asset expenditures divided by the dollar value of net premises and fixed assets available in the banks' regulatory reports. Purchased funds include federal funds purchased, large CDs, foreign deposits, demand notes, and other liabilities for borrowed money. The price of purchased funds is calculated as interest paid on these funds divided by the total dollar value of these funds.

Costs, Revenues and Profits

Similar to input and input price definitions, there is general consensus in the literature how to define costs, revenues and profits for insurers and banks. For insurers, costs are defined as the sum of underwriting expenses, investment expenses, general and administration expenses, and agent commissions. For banks, costs are the sum of interest expenses, noninterest expenses, and loan provisions. Profit for both types of firms is defined net income before taxes and revenues are the sum of costs and profits.

EMPIRICAL RESULTS

Scope Economy Estimates

We calculate the variables used to estimate cost, revenue, and profit functions separately for banks, thrift, life insurers, and for property-liability insurers. The descriptive statistics are not presented but available from the author. The subsidiaries of conglomerate organizations are larger, on average, than the specialist firms operating in the same industry. It is also interesting to note that the input price for labor tends to be higher for the subsidiaries of joint firms than for specialist firms, which is consistent with the hypothesis that greater managerial expertise is needed to successfully operate a conglomerate.

We estimate scope economy scores using the coefficients estimated from the composite functions. Scope economy estimates are presented in several ways. First, estimates of cost, revenue, and profit scope economies are evaluated for all firms in the sample and the scope economy scores are shown at the 25th (Q1), 50th (median), and 75th (Q3) percentile of the data based upon total output. We then present the same results estimated using data on joint producers only.[17]

The results in Table 3 Panel A suggest that negative cost scope economies exist regardless of the evaluation point. There are significant cost scope diseconomies when jointly producing banking and insurance products. For example, at the median level of output and input prices, the data show that costs increase by 19.9 percent for all firms (valuation points are based on all firms, i.e., joint firms and specialist firms, producing each product) and only 1.6 percent for actual joint producers (valuation points are based on joint firms only). The estimates at the other evaluation points for cost scope economies are also negative and statistically significant. Panel A also shows an inverse relationship between firm size and cost scope diseconomies.

Table 3 Panel B shows our estimates of revenue scope economies. The positive and significant scores for revenue scope economies indicate that revenue scope economies exist in joint production environments. This is consistent with the hypothesis that firms offering both banking and insurance products are associated with higher sales revenue than specialist firms producing the same products. Consistent with Hypothesis 3, we see that small firms are less associated with the benefits of joint production providing evidence consistent with the hypothesis that only firms of considerable size are associated with revenue scope economies.

Table 3 Panel C summarizes the scores for profit scope economies. Although the data generally show statistically significant scores, the economic significance of joint production is much lower except for the largest firms in the sample. At the sample median, our analysis suggests that the benefit of joint production only amounted to a 2.0 percent increase in net income. Similar to revenue scope economies, large firms show higher profit scope economies when producing both banking and insurance products.

TABLE 3
COST, REVENUE, AND PROFIT SCOPE ECONOMY ESTIMATES

The scope economy scores are evaluated at the 25th (first quartile), 50th (median), and 75th (third quartile) of the sample. The valuation points for the life insurance variables are based on joint firms w riting life insurance, and all firms w riting life insurance (joint firms and life specialists). The valuation points for the property-liability variables are based on joint firms w riting property-liability insurance, and all firms w riting property-liability insurance (joint firms and property-liability specialists). The banking product variables are based on joint firms producing banking products, and all firms offering banking products (joint firms and banking specialists). Scope economy is present if the scope economy score is greater than zero. Scope diseconomy is present if the scope economy score is less than zero. Neither scope economy nor diseconomy is present if the scope economy score equals zero.

Panel A: Cost Scope Economies

	Cost Scope Economies		
	1st Quartile	Median	3rd Quartile
Joint Firms	-4.7% *	-1.6% *	-22.0% ***
All	-24.6% **	-19.9% **	-61.6% ***

Panel B: Revenue Scope Economies

	Revenue Scope Economies		
	1st Quartile	Median	3rd Quartile
Joint Firms	19.0% *	16.2% **	22.1% ***
All	33.2% **	33.3% **	56.8% ***

Panel C: Profit Scope Economies

	Profit Scope Economies		
	1st Quartile	Median	3rd Quartile
Joint Firms	0.9%	2.0% *	5.7% **
All	4.2% *	8.7% *	17.8% **

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

The findings in Table 3 reject Hypothesis 1 and suggest that significant cost scope diseconomies, significant revenue scope economies, and weak profit scope economies exist in the post-GLB integrated banking and insurance industries. The evidence of cost scope diseconomies cannot support production complementarities and indicates that cost savings from sharing resources do not offset the extra costs incurred by joint production and conglomeration. The findings of revenue scope economies support consumption complementarities and may suggest demand side scope efficiency gains by cross-selling. The findings of profit scope economies indicate that revenue scope economies slightly dominate cost scope diseconomies on joint productions, which leads to the final net profit scope economies, which, however, are small.

We conducted two adjustments to check for the robustness the results shown in Table 3. First, we re-estimated the scope economy scores where we adjusted the amount of output produced across the quartiles but held input prices fixed at the median level. The results are similar to what we report above. For example, the scores for profit scope economies for all firms range from 2.67 percent at the 25th percentile, 3.98 percent at the 50th percentile, and 7.67 percent at the 75th percentile of output. For the joint producers, the same scope economy scores were –0.34 percent, 2.12 percent, and 11.8 percent, respectively.

The second robustness test that we conducted was to follow the suggestion of Pulley and Humphrey (1993) and estimate "quasi-scope economy scores," which allow for quasi-specialized production where each firm is assumed to produce small amounts of the non-specialized output rather than make the assumption that the firm produces zero output in its nontraditional line of business (see Pulley and Humphrey, 1993). The results shown in Table 3 are also robust to this alternative measure of scope economy.

Regression Analysis

We next run regressions using the cost, revenue, and profit scope economy scores as the dependent variables on a set of firm characteristic variables to investigate types of firms more likely to benefit from integration. We estimate the models using censored regression techniques after eliminating observations with extreme scores (greater than +1 or less than –1). All regressions are estimated using robust standard errors clustering at the firm level. The final data sample contains 232 joint producer observations.

TABLE 4
DSCRIPTIVE STATISTICS OF REGRESSION VARIABLES

This table provides summary statistics of regression variables for financial groups jointly producing banking and insurance products. Observations with extreme scope economy scores, for example, scope economy scores >1 or <-1, are excluded from the sample. The final sample used in the regression contains 232 joint firms.

Definition	Mean	Std. Dev.	Min	Max
Cost scope economy score	-0.4114	0.4462	-1.0000	0.9820
Revenue scope economy score	0.4430	0.3950	-0.7809	1.0000
Profit scope economy score	0.1766	0.2849	-0.7502	1.0000
Total group assets ($billion)	96.20	208.25	0.2039	1171.03
Total retail products business share (%)	0.6521	0.2144	0.0079	0.9991
Insurance retail products share (%)	0.5367	0.3551	0.0000	1.0000
Banking retail products share (%)	0.6162	0.2771	0.0000	0.9997
Dummy - Bancassurer	0.5345	0.4999	0.0000	1.0000
Dummy - Assurbank	0.4655	0.4999	0.0000	1.0000
Dummy - Bancassurer doing life insurance only	0.2457	0.4314	0.0000	1.0000
Dummy - Bancassurer doing property-liab. insurance only	0.0776	0.2681	0.0000	1.0000
Dummy - Bancassurer doing both life & property-liab. insurance	0.2112	0.4090	0.0000	1.0000
Dummy - Assurbank doing commercial banking only	0.0560	0.2305	0.0000	1.0000
Dummy - Assurbank doing thrift saving only	0.3922	0.4893	0.0000	1.0000
Dummy - Assurbank doing both commercial banking & thrift saving	0.0172	0.1305	0.0000	1.0000
Dummy - Securities firm affiliation	0.4569	0.4992	0.0000	1.0000
Insurance product mix HHI	0.5073	0.2747	0.0000	1.0000
Banking product mix HHI	0.4031	0.2500	0.0000	1.0000
Insurance geographic business HHI	0.2706	0.3492	0.0000	1.0000
Number of bank branches and offices	278	858	1.0000	5957
Insurance horizontal distribution dummy	0.4698	0.5002	0.0000	1.0000
Insurance vertical distribution dummy	0.1724	0.3786	0.0000	1.0000
Insurance vertical & horizontal distribution dummy	0.3578	0.4804	0.0000	1.0000
Capital to assets ratio	0.1635	0.1171	0.0311	0.5738
Cost X-efficiency - Life insurance	0.7261	0.1100	0.5785	1.0000
Cost X-efficiency - Property-Liability insurance	0.7629	0.0864	0.6063	1.0000
Cost X-efficiency - Banking	0.7204	0.1263	0.5414	1.0000
Revenue X-efficiency - Life insurance	0.7197	0.1166	0.5885	1.0000
Revenue X-efficiency - Property-Liability insurance	0.7418	0.0822	0.6144	1.0000
Revenue X-efficiency - Banking	0.6953	0.1313	0.5206	1.0000
Profit X-efficiency - Life insurance	0.7785	0.0975	0.5787	1.0000
Profit X-efficiency - Property-Liability insurance	0.9099	0.0323	0.8536	1.0000
Profit X-efficiency - Banking	0.4272	0.2083	0.1697	1.0000

Table 4 shows that the average conglomerate firm has negative cost scope economies, positive revenue scope economies, and slightly positive profit scope economies although not statistically different from zero. Table 4 also displays summary statistics of a set of indicator variables that we created and that are designed to capture broad differences in the business strategies employed by firms in our sample. We first segmented all joint producers to be either bancassurers or assurbanks depending upon the lead institution of the firm. We then further segregated the bancassurers by the range of insurance businesses in which they engage: life insurance only, property-liability insurance only, or both life and property-liability insurance. We segregated the assurbanks in a similar fashion by using the range of banking business in which they engage: owning commercial banks only, owning thrifts only, or owning both commercial banks and thrifts. According to this segmentation, the most popular conglomeration strategy among U.S. financial institutions over this time period was insurance companies moving into the banking business using thrift organizations (40 percent of our observations). An indicator variable was also added to capture whether the joint producer owns securities firms.

Table 5 displays two sets of regressions where the only difference between the models is the variables used to capture a firm's business portfolio and product mix. Models 1, 2, and 3 use the total personal business share and overall firm categories, while models 4, 5, and 6 use more refined measures of the percentage of banking and insurance business in retail markets and the overall firm strategy.

We use the natural log of total assets as a proxy for size to test Hypothesis 3—firm size is related to scope economies. The coefficient is negative in the cost regression and positive in both the revenue and profit regressions. All of the estimated coefficients are statistically significant, and the results are consistent with the univariate findings reported in Table 3 that larger firms are associated with positive synergies when jointly producing banking and insurance products.

We tested Hypotheses 4 and 5 by using firms' business portfolios and product mix variables. We used the aggregated firm-type indicators and a single variable to capture the percentage of a firm's revenue coming from retail markets in Models 1, 2, and 3. In Models 4, 5, and 6, we employed more granular versions of these same variables. The personal product share variables all have negative coefficients in the cost scope regression and positive coefficients in the revenue and profit scope regression. The results suggest that conglomerate firms that emphasize their retail business are associated with lower cost savings but higher revenue and profits increases. Thus, profit scope economies are positively related to personal product lines as opposed to commercial lines consistent with the hypothesis that retail banking and insurance products are more homogeneous and joint producers appear to have modest success cross-selling. The result is also consistent with the hypothesis that commercial products are more heterogeneous and commercial customers may prefer expertise and tailored products to meet their banking and/or insurance needs. The estimated coefficients for the business strategy indicator variables generally indicate that, controlling for all other factors, insurers moving into both commercial and thrift banking were associated with lower economies of scope as the estimated coefficients in the profit scope regressions for the "Assurbanks in owning both commercial banks and thrifts" indicator variables are negative and significant (note, the omitted category is "Bancassurer owning a property-liability insurer").

We included two variables to control for product diversification: an insurance product Herfindahl-Hirschman Index (HHI) and a banking product HHI. The maximum possible value for either index is 1.0, which indicates that the firm offers only a single product. As such, higher index values indicate a decrease in product diversification. The regression results suggest that firms offering a more narrow set of products from their insurance division were associated with lower cost scope economies but higher revenue and profit scope economies. Product diversification in the banking division does not appear to have a significant impact on joint production. Thus, it appears that joint producers with more focused insurance operations was the dominate strategy at this time.

We used two variables to control for the geographic spread of conglomerates' banking and insurance divisions. On the insurance side, we include a geographic business HHI, while on the banking side we include the number of domestic bank branches. Higher values of the insurance geographic HHI or a lower number of bank branches are consistent with less geographically diversified insurers or banks,

respectively. The estimated coefficients in the regressions suggest a consistent story—joint firms with more geographically diversified insurance or banking businesses appear to be associated with higher profit scope economies. The results further suggest that the success with a conglomeration strategy required firms to operate at a national level (or at least a super-regional level) in order to enjoy the positive net effects on profitability.

TABLE 5
SCOPE ECONOMIES REGRESSION ANALYSIS – JOINT FIRMS

This table provides the regression results for financial conglomerates joint producing banking and insurance products. A truncated Tobit model is used. The dependent variable for the regression <1> and <4> is cost scope economy score; the dependent variable for the regression <2> and <5> is revenue scope economy score; the dependent variable for the regression <3> and <6> is profit scope economy score.

	Cost Scope Economies <1>		Revenue Scope Economies <2>		Profit Scope Economies <3>		Cost Scope Economies <4>		Revenue Scope Economies <5>		Profit Scope Economies <6>	
Independed Variables	Coefficient	*t* stat.	Coefficient	*t* stat.	Coefficient	*t* stat.	Coefficient	*t* stat.	Coefficient	*t* stat.	Coefficient	*t* stat.
Intercept	7.0681	5.06 ***	-5.1171	-5.62 ***	-3.8479	-8.81 ***	7.6823	5.56 ***	-5.7272	-6.34 ***	-4.0894	-9.28 ***
Firm size variables												
Log (Total group assets)	-0.2140	-5.34 ***	0.1767	6.71 ***	0.0554	6.04 ***	-0.2190	-5.78 ***	0.1848	7.34 ***	0.0593	6.49 ***
Business and product mix variables												
Total retail products business share (%)	-0.4330	-1.97 **	0.1193	0.76	0.0907	1.44						
Insurance retail products share (%)							-0.3896	-2.54 ***	0.1767	1.66 *	0.0185	0.43
Banking retail products share (%)							-0.4715	-2.45 **	0.2872	2.05 **	0.1276	2.48 **
Dummy - Assurbank	-0.0412	-0.31	0.0463	0.49	0.0004	0.01						
Dummy - Bancassurer doing life insurance only							0.1528	0.69	-0.2280	-1.46	-0.0007	-0.01
Dummy - Bancassurer doing both life & property-liab. insurance							0.2183	0.97	-0.2011	-1.27	0.0191	0.33
Dummy - Assurbank doing commercial banking only							0.1680	0.63	-0.1621	-0.86	-0.0682	-0.94
Dummy - Assurbank doing thrift saving only							0.1597	0.81	-0.1114	-0.81	0.0181	0.32
Dummy - Assurbank doing both commercial banking & thrift saving							0.8109	1.82 *	-1.0993	-3.88 ***	-0.2731	-2.37 **
Dummy - Securities firm affiliation	-0.0558	-0.45	0.0273	0.31	0.0157	0.45	-0.0944	-0.78	0.0722	0.84	0.0340	0.94
Business diversification variables												
Insurance product mix HHI	-0.3400	-1.73 *	0.1355	1.00	0.0911	1.77 *	-0.1904	-1.03	0.1122	0.86	0.0857	1.71 *
Banking product mix HHI	-0.2939	-1.49	0.1001	0.70	0.0783	1.44	-0.2911	-1.59	0.0706	0.53	0.0805	1.49
Insurance geographic business HHI	0.1543	0.94	-0.1269	-1.10	-0.1289	-2.93 ***	0.2580	1.52	-0.2309	-1.93 **	-0.1293	-2.72 ***
Log (number of bank branches and offices)	-0.1176	-3.13 ***	0.0591	2.41 **	0.0490	5.79 ***	-0.1200	-3.22 ***	0.0652	2.63 ***	0.0479	5.58 ***
Insurance distribution system variables												
Insurance vertical & horizontal distribution dummy	0.2407	1.96 **	-0.2270	-2.59 ***	-0.0211	-0.66	0.1834	1.53	-0.1714	-1.93 ***	-0.0301	-0.92
Insurance vertical distribution dummy	-0.0855	-0.55	0.0356	0.32	0.0620	1.53	-0.1648	-1.09	0.1303	1.21	0.0882	2.15 **
Leverage variable												
Capital to assets ratio	-1.2562	-2.46 **	0.6900	1.95 **	0.1369	1.00	-1.3673	-2.77 ***	0.8589	2.49 **	0.1547	1.13
X-efficiency variables												
Cost X-efficiency - Life insurance	0.1028	0.22					-0.1487	-0.32				
Cost X-efficiency - Property-Liability insurance	-2.3858	-3.51 ***					-2.3606	-3.58 ***				
Cost X-efficiency - Banking	0.1081	0.25					-0.3126	-0.66				
Revenue X-efficiency - Life insurance			0.1968	0.62					0.3870	1.17		
Revenue X-efficiency - Property-Liability insurance			1.4312	3.04 ***					1.6298	3.56 ***		
Revenue X-efficiency - Banking			-0.1068	-0.35					0.0075	0.02		
Profit X-efficiency - Life insurance					0.4003	2.94 ***					0.4463	3.27 ***
Profit X-efficiency - Property-Liability insurance					2.2945	5.61 ***					2.3096	5.63 ***
Profit X-efficiency - Banking					0.1992	2.98 ***					0.2279	3.28 ***
Year dummy variables												
Year 2003	-0.3174	-2.73 ***	0.2252	2.78 ***	0.1043	3.35 ***	-0.3242	-2.98 ***	0.2287	3.02 ***	0.1062	3.48 ***
Year 2004	-0.1694	-1.51	0.1465	1.83 *	0.0657	2.06 **	-0.1713	-1.64 *	0.1449	1.94 *	0.0647	2.07 **
Average value of dependent variable	-0.4114		0.4430		0.1766		-0.4114		0.4430		0.1766	
Adjusted R^2	32.89%		36.42%		56.59%		36.52%		40.33%		58.71%	
Number of observations	232		232		232		232		232		232	

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

We included another set of variables to test our hypotheses as to whether the type of distribution system used by the insurance subsidiaries was related to scope economies. We defined three variables based on the distribution strategies of the firms. The first indicator was set equal to one for firms that exclusively employed independent agents and brokers to distribute their product (i.e., horizontal insurance distribution where there are horizontally integrated distribution channels such as independent agents, brokers, general agents, career agents, and banks). The second indicator was set equal to one for firms that used employees or some direct channel mechanism to distribute their products (i.e., the vertical insurance distribution indicator equals one for insurers that use exclusive/captive agents, direct response, Internet, affinity group marketing, worksite marketing). Finally, we defined a third category for insurers that used both systems. To avoid perfect colinearity in the regressions, we eliminated the horizontal distribution variable to estimate the regressions. The results shown in Table 5 suggest that the vertical distribution strategy employed by insurers was related to higher scope economies.

The remaining variables shown in Table 5 are included as controls for various influences the previous literature suggests are important determinants of scope economies. The coefficients on the capital-to-asset ratio suggest that better capitalized firms are less cost scope efficient but more revenue and profit efficient. The results are consistent with low-risk firms attracting more potential customers; however, holding additional equity capital can be costly.

The final set of variables in the regressions was used to test the hypothesis that more productive companies enjoy scope economies. The evidence shown in Table 5 is consistent with this hypothesis as there is a positive relationship between firms that are more X-efficient and the presence of positive scope economies. This finding suggests that an important determinant for conglomeration success may be the employment of managers who are already outperforming their specialized competitors.

SUMMARY AND CONCLUSIONS

This paper contributes new evidence on scope efficiencies from the joint production of insurance and banking products in the post Gramm-Leach-Bliley era. Constructing a unique variable that links regulatory data sets of the U.S. banking and insurance industries enables us to identify domestic assurbanks, bancassurers, and all unique subsidiaries for all financial services companies licensed as a commercial bank, thrift, or insurance company in the U.S.

We utilize a two-stage econometric procedure. In the first stage, we estimate composite cost, revenue, and profit functions and then use the estimated functions to calculate cost, revenue, and profit scope economy scores for each firm in our data set. We find significant cost scope diseconomies, revenue scope economies, and weak profit scope economies for firms that jointly manufacture banking and insurance products. The evidence suggests that the cost savings from sharing inputs generally do not offset the extra costs possibly incurred in joint production and conglomeration. The findings of revenue scope economies suggest that consumption complementarities may exist, which implies efficiency gains do arise by cross-selling and offering one-stop shopping. The findings of profit scope economies indicate that revenue scope efficiency gains dominate and offset cost scope efficiency losses in joint productions, although they do contribute to net profit scope efficiency gains—albeit in a very small way.

In the second stage, we use regression analyses to investigate several hypotheses regarding the characteristics of joint production that are associated with higher/lower scope economies. Our analysis suggests that large firms are associated with higher cost scope diseconomies and higher revenue or profit scope economies than small firms. Large firms also are associated with higher benefits from increased revenue as opposed to cost savings when jointly producing banking and insurance products. Higher economies of scope are found to be associated with retail product lines rather than commercial lines, which is consistent with the hypothesis that retail banking and retail insurance products are more homogeneous and can be efficiently distributed through cross-selling. This result also suggests that commercial customers prefer the expertise and tailored solutions of specialized firms. Traditional insurers are found to be less revenue and profit scope efficient when conducting commercial banking and thrift saving business simultaneously. Joint producers that are more geographically diversified are associated with higher profit scope economies suggesting that national operations are necessary to enjoy the net effects of scope efficiencies. We find evidence that insurers with vertically integrated distribution systems have higher scope economies. Finally, firms with a high capital-to-assets ratio present lower cost scope economies but higher revenue scope economies, and more X-efficient firms are related to higher profit scope economies.

Following the passage of GLB, a number of academics and market observers predicted that we would witness a wave of cross-sector conglomeration across the U.S. banking and insurance industries. The pundits were wrong as banks and insurers have largely shown restraint and have not taken, on a grand scale, advantage of the new freedom granted to them by GLB to merge their operations. Although we find statistically significant evidence of efficiency gains due to conglomeration, the economic significance appears to be small. The cost scope economies on the supply side are often negative, and the magnitude of the revenue scope economies on the demand side is just barely large enough to offset the cost increases. Furthermore, our analysis strongly suggests that only the most well-run organizations would be able to achieve the benefits promised by proponents of conglomeration. Thus, the allure of a universal bank still exists—it is just not that easy to achieve.

ENDNOTES

1. Pub. L. 106-102, 113 Stat. 1338 (1999).
2. Pub. L. 66, 48 Stat. 162 (1933).
3. Ch. 240, 70 Stat. 133 (1956).
4. BHC Statutory Financial Report (multiple years); Federal Reserve Report to Congress, 2003.
5. The most notable example of this trend was Citigroup. Citigroup was formed in the late 1990s through the merger of Citibank, at the time the largest commercial bank in the United States, and The Travelers, which was one of the largest multiline insurance companies in the United States. However, beginning in 2002, Citigroup began to disband. In 2003, it sold its property-liability insurance companies to rival non-life insurer St. Paul Companies, and it subsequently sold the subsidiaries that underwrote life insurance to MetLife in 2005. A more recent example is the financial conglomerate ING who, under pressure from various stakeholders including the European Commission following ING's acceptance of state aid from the Dutch Government during the financial crisis of 2008, has decided to sell its insurance subsidiaries in a strategy the company referred to as its "Back to Basics" strategy (see ING, 2009).
6. Berger and Humphrey (1997) critically reviewed more than 130 studies and summarized the empirical efficiency estimates of financial institutions in 21 countries.
7. For commercial banking, see Berger, Hancock, and Humphrey (1993) and Berger, Humphrey, and Pulley (1996). For the insurance industry, see Grace and Timme (1992) and Berger et al. (2000).
8. The focus of this paper is on the possible cross synergies between banking and insurance. We do not include securities firms in our analysis because the data needed to determine the outputs and inputs necessary to estimate production functions for securities firms are not available to us. As discussed later, we control for the presence of securities firms in the financial conglomerates in our regression methodology.
9. The Pulley-Braunstein model has been used to estimate economies of scope in banking (e.g., Pulley and Humphrey, 1993; McKillop, Glass, and Morikawa, 1996; Berger, Humphrey, and Pulley, 1996; Humphrey and Pulley, 1997) and in insurance (e.g., Berger et al., 2000; Hirao and Inoue, 2004).
10. Following Berger et al. (2000), we adopt the alternative profit efficiency concept which uses the same form and independent variables for the cost, revenue, and profit functions in order to avoid the impact of specification differences on the cost, revenue, and profit scope economies estimations (see also Berger and Mester, 1997, 2003).
11. As is standard in the efficiency literature, we make no effort to separate demand- and supply-side effects on revenues or profits. Instead we estimate reduced form equations in order to understand the interrelationship (partial correlation) between the dependent and explanatory variables. Thus, we are unable to say much about the direction of the causality should we find any.
12. See Berger, Cummins, and Weiss (1997) and Cummins and Weiss (2001) for details on insurance outputs and measurement.
13. See Pulley and Humphrey (1993), Berger, Cummins, and Weiss (1997), and Kashyap, Rajan, and Stein (2002) for details.
14. It would be ideal if the bank outputs were disaggregated into more categories. However, there is a trade-off between the degree of aggregation and the number of degrees of freedom in our data set. Thus, we are only able to use three categories of output.
15. Cummins and Weiss (2001) proposed a book-value approach, which assumed that insurers held equity portfolios with a market beta coefficient of 1.0; therefore, they use a constant cost of equity across all insurers in the industry.
16. See Berger and Humphrey (1992), Berger and Mester (2003), and Berger et al. (2007) for details.
17. An approach common in the literature is to evaluate scope economies at a single point - for example at the mean of the data. Nevertheless, this estimation method has been criticized for its weak representation as it may not provide a good approximation for the whole sample (Hirao and Inoue, 2004; Berger et al., 2000).

REFERENCES

Akhigbe, A. & Whyte, A.M. (2001). The market's assessment of Financial Services Modernization Act of 1999. *The Financial Review*, 36, 119–138.

Allen, L. & Jagtiani, J. (2000). The risk effects of combining banking, securities, and insurance activities. *Journal of Economics and Business*, 52, 485–497.

Berger, A.N., Cummins, D.J. & Weiss, M.A. (1997). The coexistence of multiple distribution systems for financial services: the case of property-liability insurance. *Journal of Business*, 70, (4), 515–546.

Berger, A.N., Cummins, D.J. & Weiss, M.A., Zi, H. (2000). Conglomeration vs. strategic focus: evidence from the insurance industry. *Journal of Financial Intermediation*, 9, 323–362.

Berger, A.N., Dick, A.A., Goldberg, L.G. & White, L.J. (2007). Competition from large, multimarket firms and the performance of small, single-market firms: evidence from the banking industry. *Journal of Money, Credit, and Banking*, 39, 331–368.

Berger, A.N., Hancock, D. & Humphrey, D.B. (1993). Bank efficiency derived from the profit function. *Journal of Banking and Finance*, 17, 317–347.

Berger, A.N. & Humphrey, D.B. (1992). *Measurement and efficiency issues in commercial banking*, in: Griliches, Z. (Ed.), Output Measurement in the Service Sectors, NBER, Studies in Income and Wealth, 56. University of Chicago Press.

Berger, A.N., Humphrey, D.B. & Pulley, L.B. (1996). Do consumers pay for one-Stop banking? evidence from alternative revenue function. *Journal of Banking and Finance*, 20, 1601–1621.

Berger, A.N. & Mester, L.J. (1997). Inside the black box: what explains differences in the efficiencies of financial institutions? *Journal of Banking and Finance*, 21, 895–947.

Berger, A.N. & Mester, L.J. (2003). Explaining the dramatic changes in performance of US banks: technological change, deregulation, and dynamic changes in competition. *Journal of Financial Intermediation*, 12, 57–95.

Boyd, J.H., Graham, S.L. & Hewitt, R.S. (1993). Bank holding company mergers with non-bank financial firm: effects on the risk of failure. *Journal of Banking and Finance*, 17, 43–63.

Brown, R.S., Caves, D.W. & Christensen, L.R. (1979). Modeling the structure of cost and production for multiproduct firms. *Southern Economic Journal*, 46, 256–273.

Carow, K.A. (2001). Citicorp-Travelers group merger: challenging barriers between banking and insurance. *Journal of Banking and Finance*, 25.

Cebenoyan, A.S. (1990). Scope economies in banking: the hybrid Box-Cox function. *The Financial Review*, 25, 115–125.

Cummins, D.J. & Weiss, M.A. (2001). *Analyzing firm performance in the insurance industry using frontier efficiency and productivity models*, in: Dionne, G. (Ed.), Handbook of Insurance, Chapter 24. Kluwer Academic Publishers: Boston.

Cummins, D.J., Weiss, M.A., Xie, X. & Zi, H. (2010). Economies of scope in financial services: a DEA efficiency analysis of the US insurance industry. *Journal of Banking & Finance*, 34, (7), 1525-1539.

Donovan, D.J. (1978). Modeling the demand for liquid assets: An application to Canada. *International monetary fund staff papers*, 5, 676–704.

Grace, M. & Timme, S.G. (1992). An examination of cost economies in the United States life insurance industry. *Journal of Risk and Insurance*, 59, 72–103.

Hirao, Y. & Inoue, T. (2004). On the cost structure of the Japanese property-casualty insurance industry. *Journal of Risk and Insurance*, 71, 501–530.

Hughes, J.P., Mester, L.J. & Moon, C.G. (2001). Are scale economies in banking elusive or illusive? evidence obtained by incorporating capital structure and risk-taking into models of bank production. *Journal of Banking and Finance*, 25, 2169–2208.

Humphrey, D. & Pulley, L. (1997). Bank's responses to deregulation: profits, technology and efficiency. *Journal of Money, Credit and Banking*, 29, 73-93.

Johnston, J. & Madura, J. (2000). Valuing the potential transformation of banks into financial service conglomerates: evidence from the Citigroup merger. *The Financial Review*, 35,17–36.
Kane, E.J. (1999). Implications of superhero metaphors for the issue of banking powers. *Journal of Banking and Finance*, 23, 663-673.
Kashyap, A.K., Rajan, R. & Stein, J.C. (2002). Banks as liquidity provider: an explanation for the coexistence of lending and deposit-taking. *Journal of Finance*, 57, 33–73.
Leibenstein, H. (1966). Allocative efficiency vs. X-efficiency. *American Economic Review*, 56, (3), 392–415.
McKillop, D.G., Glass, J.C. & Morikawa, Y. (1996). The composite cost function and efficiency in giant Japanese banks. *Journal of Banking and Finance*, 20, 1651–1671.
Milbourn, T.T., Boot, A.W.A. & Thakor, A.V. (1999). Megamergers and expanded scope: theories of bank size and activity diversity. *Journal of Banking and Finance*, 23, 195–214.
National Association of Insurance Commissioners (2003), *Annual Statement, Property and Casualty Companies – Association Edition*, Kansas City, MO: National Association of Insurance Commissioners.
Noulas, A.G., Miller, S.M. & Ray, S.C. (1993). Regularity conditions and scope estimates: the case of large-sized U.S. banks. *Journal of Financial Services Research*, 7, 235–48.
Panzar, J. & Willig, R. (1975). Economies of scale and economies of scope in multioutput production. *Economic Discussion Paper* No. 33. Bell Laboratories.
Panzar, J. & Willig, R. (1981). Economies of scope. *American Economic Review*, 71, 268–272.
Pulley, L. & Braunstein, Y.M. (1992). A composite cost function for multiproduct firms with an application to economies of scope in banking. *Review of Economics and Statistics*, 74, 221–230.
Rogers, K.E. (1998). Nontraditional activities and the efficiency of U.S. commercial banks. *Journal of Banking and Finance*, 22, 467–82.
Scharfstein, D.S. & Stein J.C. (2000). The dark side of internal capital markets: divisional rent-seeking and inefficient investment. *Journal of Finance*, 55, 2537–2564.
Sealey, C.W. Jr. & Lindley, J.T. (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. *Journal of Finance*, 32, 1251–1266.
Shin, H. & Stulz, R.M. (1998). Are internal capital markets efficient? *The Quarterly Journal of Economics*, 113, 531–552.
Stiroh, K. J. (2000). How did bank holding companies prosper in the 1990s? *Journal of Banking and Finance*, 24, 1703–1745.
United States General Accounting Office (1990). *Bank Powers: Issues Relating to Banks Selling Insurance*. GAO/GDC, 90–113, Washington, DC.
Winton, A. (1999). Don't put all your eggs in one basket? Diversification and specialization in lending. Working paper, available at SSRN: http://ssrn.com/abstract=173615.
Yeager, T.J., Yeager, F.C. & Harshman, E. (2007). The financial services modernization act: evolution or revolution? *Journal of Economics and Business*, 59, 313–339.
Yuengert, A. (1993). The measurement of efficiency in life insurance: estimates of a mixed Normal-Gamma error model. *Journal of Banking and Finance*, 17, 483–496.

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