

## Financial Integration and Scope Efficiency in U.S. Financial Services Post Gramm-Leach-Bliley

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### Abstract

The Gramm-Leach-Bliley (GLB) Act of 1999 largely removed the barriers that forced separation between commercial banks, investment banks, and insurance companies in the U.S. and promised the most fundamental reform of U.S. financial services regulation in more than half a century. In this study we construct a unique dataset that links the U.S. banking and insurance regulatory datasets. Doing so allows us to identify newly formed domestic “assurbanks” (insurers owning banks), “bancassurers” (banks owning insurers), and all the unique subsidiaries licensed either as commercial banks, thrifts, or insurance companies. We use this data set to investigate efficiency effects from possible economies of scope across the two formally separate sectors by estimating multi-product costs, revenue, and profit functions. The empirical evidence suggests that a significant number of cost scope diseconomies, revenue scope economies, and weak profit scope economies exist in the post-GLB U.S. integrated banking and insurance sectors. The scope economies are variant among firms, and certain firm characteristics are the determinants of scope economies.

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## **Abstract**

### **Financial Integration and Scope Efficiency in U.S. Financial Services Post Gramm-Leach-Bliley**

The Gramm-Leach-Bliley (GLB) Act of 1999 largely removed the barriers that forced separation between commercial banks, investment banks, and insurance companies in the U.S. and promised the most fundamental reform of U.S. financial services regulation in more than half a century. In this study we construct a unique dataset that links the U.S. banking and insurance regulatory datasets. Doing so allows us to identify newly formed domestic “assurbanks” (insurers owning banks), “bancassurers” (banks owning insurers), and all the unique subsidiaries licensed either as commercial banks, thrifts, or insurance companies. We use this data set to investigate efficiency effects from possible economies of scope across the two formally separate sectors by estimating multi-product costs, revenue, and profit functions. The empirical evidence suggests that a significant number of cost scope diseconomies, revenue scope economies, and weak profit scope economies exist in the post-GLB U.S. integrated banking and insurance sectors. The scope economies are variant among firms, and certain firm characteristics are the determinants of scope economies.

## 1. Introduction and motivation

When the landmark financial service reform legislation, the Financial Service Modernization Act<sup>1</sup> (known as the Gramm-Leach-Bliley Act), was passed in 1999, it was viewed as the culmination of years of effort to reform the U.S. financial service industry. The Gramm-Leach-Bliley Act (GLB) repealed the 66-year old Glass-Steagall Act (GSA) of 1933<sup>2</sup> and eliminated the restrictions on affiliation between commercial banks and investment banks. GLB also substantially modified the 43-year old Bank Holding Company Act (BHCA) of 1956<sup>3</sup> and removed barriers which forced separation between commercial banks and insurance companies.

The potential for GLB to have a profound impact on financial services providers are great and, under the new regulations, the 600+ companies that were operating as Financial Holding Companies (FHC) by the end of 2003 represented 78 percent of the total assets of all Bank Holding Companies (BHC) in the United States. In addition, by 2003 more than 1,300 FHCs/BHCs were engaged in insurance agency or underwriting activities under the Act, and more than 2,500 insurance companies (either through agents or through risk bearing underwriters) were affiliated with banking institutions.<sup>4</sup> Today, consumers can choose from a broadening array of financial tools and from companies either aiming to serve their multiple needs or companies specializing in one or two types of financial products.

Taken at face value, the early results of GLB suggest the U.S. financial industry was headed towards greater and greater consolidation both within sector and across sectors. However, debate exists amongst practitioners and researchers alike regarding both the motives and benefits for financial integration. In addition, a number of organizations that initially took advantage of

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<sup>1</sup> Pub. L. 106-102, 113 Stat. 1338 (1999).

<sup>2</sup> Pub. L. 66, 48 Stat. 162 (1933).

<sup>3</sup> Ch. 240, 70 Stat. 133 (1956).

<sup>4</sup> BHC Statutory Financial Report (multiple years); Federal Reserve Report to Congress, 2003

the new rules under GLB have, over time, returned to their core businesses and given up on the integration strategies.<sup>5</sup>

One of the important elements in the debate regarding the benefits of offering financial products via an integrated financial service provider is whether any productivity benefits exist for a single firm to manufacture disparate products. This 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 literally hundreds of studies have been conducted to estimate various measures of efficiency of financial institutions located in more than two-dozen countries.<sup>6</sup> That said, there is little research on the efficiency effects of integrating providers of different categories of financial services into universal-type organizations. The scant evidence that does appear in the literature is extrapolated either from scope efficiency within one sector of the financial industry, e.g., commercial banking (Berger, *et al.* 1993; Berger, *et al.* 1996) or insurance industry (Grace and Timme, 1992; Berger, *et al.* 2000), or from simulations of risk diversification benefits in the absence of synergistic gains (Boyd, *et al.* 1993; Allen and Jagtiani, 2000).<sup>7</sup>

The purpose of this paper is to remedy this deficiency in the literature and provide the first set of evidence regarding the productive efficiency effects of forming an integrated financial service company. To do so we estimate economies of scope of the post-GLB U.S. financial services industry across costs, revenue and profit measures. The most commonly quoted source of potential gains from cross-sector integration is the exploitation of scope economies. Scope

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<sup>5</sup> The most notable example of this trend was Citigroup which was formed in the late 1990's through the merger of the largest commercial bank in the United States, Citibank, and The Travelers – one of the largest multi-line insurance companies in the United States. However, beginning in 2002, Citigroup began to disband and sold the property-liability insurance companies to a rival non-life insurer, St. Paul, in 2003 and subsequently sold the subsidiaries underwriting life insurance to MetLife in 2005.

<sup>6</sup> Berger and Humphrey (1997) critically reviewed more than 130 studies and summarized empirical efficiency estimates of financial institutions in 21 countries.

<sup>7</sup> There are a few exceptions to this broad-based statement that are discussed later in the paper.

efficiency gains can be created by sharing such physical inputs as distribution systems, reusing managerial expertise, and providing consumption complementarities. However, scope diseconomies may also arise at the same time because of higher administration and coordination expenses, organizational diseconomies, cross-subsidization in internal capital markets, or the loss of specialized expertise for customers needing tailored products.

A likely reason for the scarce empirical research on the integration of 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. Thus, the first effort in our study is to construct a unique dataset which links the insurance and the bank regulatory data sets. The combined data set exists for financial conglomerates, specialist banks, and specialist insurers in the U.S. banking and insurance industry during 2003, 2004, and 2005.

We utilize a two-stage econometric method to investigate economies of scope. We first estimate multi-product cost, revenue, and profit production functions. We estimate separate functions for banking (commercial banks and saving and loans thrifts) and insurance (life-health insurance vs. property-liability insurance) subsidiaries, of specialists firms and joint producers which are firms jointly producing both banking and life insurance, banking and property-liability insurance, and firms participating in all three sectors. We then use the estimated functions to calculate scope economy scores for all financial institutions in our database. In the second stage, the scope economy scores are regressed upon a set of variables describing firm characteristics. The second stage regressions allows us to test various hypotheses whether scope economies exist for firms jointly producing financial products across multiple sectors and to 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 dataset construction. In Section 4, we develop the testable hypotheses. Section 5 explains the estimation methodologies. Section 6 discusses the scope economies estimation results and the regression results. Section 7 offers conclusions.

## **2. Scope economies in financial services: A survey of the evidence**

### *2.1. Cost scope economies*

Cost scope economies refer to the reduction of the 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 products; 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.

Some studies exist estimating the cost scope efficiencies of providing multiple products within a single financial institution. These studies evaluate cost scope 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 and most studies found no substantial evidence of cost scope economies in commercial banks or in savings and loans (e.g., Mester, 1987, 1993; Berger and Humphrey, 1991; Pulley and Humphrey, 1993; and Rogers, 1998). Two papers found evidence of cost scope diseconomies arising from the coordination and administrative costs (Cebenoyan, 1990; Winton, 1999).

Within the insurance sector, Grace and Timme (1992) report no significant cost scope economies for the largest 423 U.S. life insurance companies. Berger, *et al.* (2000) instead found cost scope economies for insurers jointly offered life and property-liability insurance during 1988-1992. However, a more recent paper by Cummins, *et al.* (2003) extended Berger *et al.* (2000) and found no evidence of cost scope efficiencies for insurance groups during the period 1993-1997.

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

## 2.2. *Revenue scope economies*

Scope economies in revenue refer to the increases of total revenue resulting from the production of different categories of services or products. Revenue scope economies may occur because of consumption complementarities, otherwise called the demand super-additivity. By offering “one-stop shopping” convenience, financial conglomerates can reduce consumers’ search and transactions costs. 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 integrating distribution systems. Reputation recognition can also lead to revenue scope economies when the integration or consolidation associates itself with a strong brand name, which customers recognize and prefer. By diversifying across products, financial conglomerates may lower their risk if net cash flows are negatively correlated. In this sense, conglomerates may realize revenue scope economies by charging higher prices because of lower bankruptcy and financial distress costs.

However, the existence of revenue scope diseconomies cannot be dismissed, especially if the integration creates or enhances conflicts of interest. The conglomerate form of organization can create internal capital markets, which may somehow worsen inefficient cross-subsidies and investment inefficiencies arising from managerial agency problems (e.g., Shin and Stulz, 1998; Scharfstein and Stein, 2000). Mester (1992) argued that the market would view problems in one subsidiary as signaling problems in other subsidiaries and emphasized that BHCs have tended to rescue their failing affiliates. In a financial conglomerate, catastrophic losses of one business line (e.g., property-liability insurance) could be subsidized by other business lines (e.g., commercial banking). Thus, commercial banking customers would worry about their savings and change to unaffiliated banks. In this sense, revenue scope diseconomies are more likely to occur. Revenue scope diseconomies may also arise if specialists from different types of financial services have better knowledge and expertise in their areas and can provide better-tailored products, and, thereby, charge higher prices than joint producers.

There exists little research on revenue scope efficiency effects of financial integration. The studies that do exist, again, are based on within-sector data, and the results are inconclusive. Berger, *et al.* (1996) and Noulas, *et al.* (1993) found little or no evidence of revenue scope efficiency for providing deposits and loans. In addition, both studies showed non-increasing revenue for charging customers for joint consumption benefits. Berger, *et al.* (2000) found revenue scope diseconomies from providing life and property-liability insurance products by integrated insurers. However, using a more sophisticated estimation technique, Cummins, *et al.* (2003) found weak evidence of revenue scope economies in the U.S. insurance industry.

### 2.3. *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 product or service quality, which may not be measurable by considering cost or revenue scope efficiency in isolation. For example, customers show their preference for “one-stop shopping” by paying more for such consumption convenience, which leads to revenue scope economies. However, financial conglomerates may incur additional expenses in joint production that leads to cost scope diseconomies. So, 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 economies dominate the more commonly used concept of cost and revenue scope economies.

Studies of profit scope efficiencies generally do not find consistent benefits of either joint production or specialization within either the banking or the insurance industry. Studies typically find that joint production was more efficient for some firms and specialization was more efficient for others within either U.S. banking or insurance sector (Berger, *et al.* 1993; Berger, *et al.* 2000; Cummins, *et al.* 2003). Few studies have found meaningful profit scope economies among traditional deposit and loan outputs (Humphrey and Pulley, 1997; Rogers, 1998).

### **3. Construction of the banking/insurance database**

The regulatory data sets in the U.S. covering financial service 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 the insurance and bank regulatory data sets. The variable 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), the Commercial Banks Call Report (CALL), and the Thrift Financial Report (TFR). These four data sets contain financial and domicile information for almost all insurers, BHCs, FHCs, commercial banks, and thrifts operating in the U.S. for our research period over 2003 – 2005.

The procedure we followed to develop the linking variable was as follows. First, We identify the list of insurers affiliated with banks, if any, by using key word search on the Federal Reserve Structure Report (FEDSR) and the Thrift Holding Company Structure Report (THCFR), and by using self-reported answers to queries posed by insurance regulators as part of the annual oversight process as reported on the annual regulatory statements. Supplementary information from the National Information Center Hierarchy Report (NICHR) allows us to then tie the BHCFR, TFR and CALL data to FEDSR and THCFR by the core linkage code assigned by the FRB. In the final step, we match the banking data to the insurance regulatory data manually using company name, location and other domicile information required to perform the merge.

Firms under common ownership are aggregated to the group level. We separately aggregate the data of each group's life, property-liability, commercial bank, and thrift subsidiaries to obtain divisional totals. A firm is treated as a single producer with up to four business divisions. Inactive firms with non-positive total assets, liabilities, or net worth are eliminated. Since almost all joint producers in our data are large, we then focus on large financial institutions licensed as insurers or banks in the U.S. Following the literature (e.g., Berger and Mester, 1997, 2003), we further exclude specialist banks with less than \$1 billion assets, and specialist insurers with less than \$600 million assets. The final data sample consists of 260 observations of diversified firms jointly producing banking and insurance products, 613 insurance specialist observations and 1,450 bank specialist observations over the period 2003 – 2005. Table 1 shows the statistics of

the data sample. The firms included account for 98 percent life insurance industry assets, 94 percent property-liability insurance assets, 88 percent commercial banks assets, and 81 percent thrifts assets.

#### **4. Hypotheses development**

Although GLB largely eliminates 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. These suggest 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 variety cost complementarities and/or revenue complementarities. Firm-specific characteristics, e.g., firm size, product mix, distribution network, and regulatory regime, may affect those 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 consensus that firm size may be associated with greater or lesser scope economies, and it is typically found that large banks or insurance companies are better positioned to exploit higher scope economies (Berger, *et al.* 1996; Milbourn, *et al.* 1999; Berger, *et al.*, 2000; Cummins, *et al.* 2003) and large banks benefited more from the passage of GLB than small banks (Akhigbe and Whyte, 2001). Financial conglomerates may gain a competitive

advantage through implicit government guarantee “too big to fail.” If consumers perceive that the implicit guarantees reduce potential losses, the conglomerates may gain a reputational advantage that allow them to borrow funds at lower costs (Kane, 1999; Carow, 2001). Cost scope economies may exist on a small scale, from sharing some inputs or fixed resources, but for larger conglomerates these cost scope economy gains could be exhausted or offset by coordination or management diseconomies. Nevertheless, large 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 more likely to exploit economies of scope in jointly producing banking and insurance products.

The business opportunities offered by GLB may benefit some lines of insurance business more than others. Carow (2001) found that life insurance companies benefited more from the passage of GLB than did property-liability insurers. A GAO (1990) study concluded that synergistic gains are greater for the combination of banks and life insurers than for the combination of banks and property-casualty insurers. Given regulations precluding banks from manufacturing insurance, U.S. banks have long entered distribution alliances with insurers and have been engaging in the insurance business through the selling of annuities and the credit related insurance. Since life insurance products have more similarities with banking products and function as complementarities to banking products, banks may be more interested to cross-sell life insurance products than property-liability products (Johnston and Madura, 2000). On a univariate basis, our data sample supports this inference as bank-owned insurers accounted for 7.3 percent life insurance industry assets but only 3 percent property-liability industry assets.

A 1996 Life Office Management Association survey of banks and thrifts involved in insurance distribution showed that banks were most likely to sell annuities followed by term life

and whole life, and were least likely to distribute property-liability products. As a result, many banks and thrift institutions have accumulated significant experience distributing life insurance. Hence, banks could gain greater scope economies when combining with life insurers than with property-liability insurers. The fourth null hypothesis is stated as follows:

Hypothesis 4: Economies of scope are more likely to occur in jointly producing life and banking products than in 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 the retail lines and more heterogeneous in the commercial lines. Retail customers may be willing to pay more for such one-stop shopping convenience; however, 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: Economies of scope are more likely to occur in the retail financial product lines than in the commercial lines.

Although a consolidated bank and insurer may lower total costs or increase expected revenue by cross-selling, scope economies may vary with distribution systems. Insurers using vertically integrated distribution systems distribute their products through exclusive agents, direct marketing, or mass marketing. Insurers using horizontally integrated distribution systems distribute through brokers or independent agents who sell the products of multiple insurers.

Banks are expected to sell their insurance affiliates' products through their branches or offices. Banks affiliated with vertically integrated insurers can reuse insurers' relatively large investments in advertising and marketing, which more likely create cost scope economies. However, revenue scope economies may be less likely because such affiliations may increase

competition and conflicts within the group, which is especially serious when bank-sold insurance products are similar to the insurance products offered by their insurer affiliates, especially annuities. In this sense, insurers using horizontal distribution systems may be in a better position to gain revenue scope economies. Berger, *et al.* (1997) report that vertically integrated distributors are more likely to realize both cost and revenue scope economies in the life insurance industry. However, Cummins, *et al.* (2003) did not find evidence that scope economies were more likely for insurers using vertically integrated distributions than those using horizontal distribution systems. These arguments inform the next hypothesis:

Hypothesis 6: Economies of scope are more likely to be present for the combination of banks and insurers using vertically integrated distributions than for the combination of banks and insurers using horizontally integrated distributions.

X-efficiencies capture individual firm's deviations from the efficiency frontier. Since efficient managers are already outperforming their competitors, with the ability to achieve high levels of X-efficiency, they can use and extend their managerial talent, experience, and expertise into the conglomerate. Thus, they can better realize economies of scope, yielding a positive relationship between efficiency and scope economies. The last hypothesis is as follows:

Hypothesis 7: X-efficient firms are more likely to enjoy economies of scope in the joint production of banking and insurance products.

## **5. Methodology and data**

### *5.1. Econometric approach*

We use the composite production function first proposed by Pulley and Braunstein (1992) to estimate the cost, revenue and profit functions used in this study. The PB composite function is ideal for our setting as 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 the scope economies analysis, especially for estimating profit scope efficiencies.<sup>8</sup>

It is well recognized that specialist firms and diversified firms may operate at different production frontiers due to different business strategies and technologies (Berger et al. 2000). Thus, we estimate cost, revenue, and profit composite functions for specialist and diversified firms, respectively, using non-linear least squares. A total of 24 functions are estimated: two types of firms (specialists and diversified) across four sectors (life insurance, property-liability insurance, commercial banking, and thrifts) by three types of functions (cost, revenue, and profit).

### 5.1.1. Function form

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

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

where  $C$  is total costs;  $q_i$  is the  $i$ th output,  $i=1, \dots, n$ ;  $r_k$  is the  $k$ th input price,  $k=1, \dots, m$ ;  $\alpha$ ,  $\beta$ ,  $\delta$ ,  $\mu$  are coefficient vectors to be estimated;  $\varepsilon$  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):

$$\sum_k \beta_k = 1 \text{ and } \sum_l \beta_{kl} = \sum_k \beta_{lk} = 0 \quad (k, l = 1, \dots, m)$$

$$\sum_k \delta_{ik} = 0 \quad (k = 1, \dots, m)$$

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<sup>8</sup> P-B 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).

The symmetry restrictions imply  $\alpha_{ij} = \alpha_{ji}$  and  $\beta_{kl} = \beta_{lk}$ . The constant terms  $\beta_0$  and the interaction term  $\sum \sum \mu_{ik} q_i \ln r_k$  are omitted because of the technical difficulty in estimating both constant terms and both interaction terms simultaneously (Pulley and Braunstein, 1992; McKillop, *et al.*, 1996; and Berger, *et al.*, 2000). Hence, the P-B composite model used is specified as

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

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:

$$\frac{C}{r_m} = [\alpha_0 + \sum \alpha_i y_i + (1/2) \sum \sum \alpha_{ij} y_i y_j + \sum \sum \delta_{ik} y_i \ln s_k] \cdot \exp[\sum \beta_k \ln s_k + (1/2) \sum \sum \beta_{kl} \ln s_k \ln s_l] + \varepsilon \quad (3)$$

where the dependent variable is normalized by the price of the last input ( $r_m$ ). Output terms are scaled by the sample mean ( $y_i = q_i / \text{mean}(q_i)$ ) 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.<sup>9</sup> Thus, revenue ( $R$ ) and profit functions ( $P$ ) are

$$\frac{R}{r_m} = [\alpha_0 + \sum \alpha_i y_i + (1/2) \sum \sum \alpha_{ij} y_i y_j + \sum \sum \delta_{ik} y_i \ln s_k] \cdot \exp[\sum \beta_k \ln s_k + (1/2) \sum \sum \beta_{kl} \ln s_k \ln s_l] + \varepsilon \quad (4)$$

$$\frac{P}{r_m} = [\alpha_0 + \sum \alpha_i y_i + (1/2) \sum \sum \alpha_{ij} y_i y_j + \sum \sum \delta_{ik} y_i \ln s_k] \cdot \exp[\sum \beta_k \ln s_k + (1/2) \sum \sum \beta_{kl} \ln s_k \ln s_l] + \varepsilon \quad (5)$$

The modified composite cost, revenue, profit functions are estimated by non-linear least squares.

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<sup>9</sup> Following Berger *et al.* (2000), we adopt the alternative profit efficiency concept, which use the same form and independent variables for the cost, revenue, and profit functions to avoid the impact of specification differences on the cost, revenue, and profit scope economies estimations (Berger and Mester, 1997, 2003).

### 5.1.2. Measurement of scope economies

Cost economies of scope (*CSCOPE*) are measured 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  $m$  product categories,  $Q_1, \dots, Q_m$ , is given by

$$CSCOPE = \frac{\sum_{i=1}^m C_{S_i}(q_i; r_i) - \sum_{i=1}^m C_{J_i}(q_i; r_i)}{\sum_{i=1}^m C_{J_i}(q_i; r_i)} \quad (6)$$

where  $C_{S_i}(q_i; r_i)$  is the cost function for the specialist firm  $S_i$  producing  $Q_i$ ; and  $C_{J_i}(q_i; r_i)$  is the cost function for the division  $J_i$  (producing  $Q_i$  only) of conglomerates. 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

$$RSCOPE = \frac{\sum_{i=1}^m R_{J_i}(q_i; r_i) - \sum_{i=1}^m R_{S_i}(q_i; r_i)}{\sum_{i=1}^m R_{J_i}(q_i; r_i)} \quad (7)$$

and profit scope economies score (*PSCOPE*) is

$$PSCOPE = \frac{\sum_{i=1}^m P_{J_i}(q_i; r_i) - \sum_{i=1}^m P_{S_i}(q_i; r_i)}{\sum_{i=1}^m P_{J_i}(q_i; r_i)} \quad (8)$$

where  $R_{S_i}(\cdot)$  and  $P_{S_i}(\cdot)$  are revenue and profit functions for specialist firms  $S_i$ ;  $R_{J_i}(\cdot)$  and  $P_{J_i}(\cdot)$  are revenue and profit functions for divisions  $J_i$  of conglomerates. 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  $PSCOPE < 0$ .

## 5.2. *Defining outputs, inputs, and prices*

Like other service industries, it is difficult to define what financial institutions produce and how the services are priced. 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, respectively.

### 5.2.1. *Insurance outputs*

Consistent with the recent 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.<sup>10</sup>

**Property-Liability Insurance.** For property-liability insurers, the present value of real losses incurred ( $PV(L)$ ) is used as a output proxy. Losses incurred are generally defined as the 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 expected loss payments to reflect claim settlement lags that may have a significant

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<sup>10</sup> 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. See Berger, et al. (1997), and Cummins and Weiss (2001) for details on insurance outputs and the measurement

impact on certain product lines (most notably the liability lines of insurance). Four output lines of business are defined: personal property, personal liability, commercial property, and commercial liability products. The output for the intermediation function is measured by the annual average real invested assets. 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; (3) intermediary output (invested assets).

**Life Insurance.** Unfortunately limitations in 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, *et al.* 2003) we use incurred benefits (payments received by policyholders in a year) plus additions to reserves as a proxy of 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: (1) life insurance including personal and group life insurance; (2) annuities including personal and group annuities; (3) accident and health insurance.

### 5.2.2. *Banking outputs*

Consistent with the majority of the literature on bank efficiency, we assume the services provided by banks are traditional financial services, new financial services, and off-balance sheet (OBS) activities (see Berger, *et al.* 1997). The traditional financial services include deposits (demand, time and savings) and loans (real estate, commercial, installment), which continue to represent the majority of bank revenue. Fee-based services and OBS activities have been recognized as a growing category of bank assets and now account for a substantial portion of bank revenues (Stiroh, 2000). New financial services include portfolio management, mutual or

pension fund distributions, and safekeeping services. The major OBS activities are loan commitments, credit derivatives, letters of credit, and loan originations, sales, and servicing.<sup>11</sup>

Following the literature, we identify three categories of outputs – consumer loans, business loans, and other assets.<sup>12</sup> Consumer loans involve intermediation and loan services and 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 a bank's new financial services and OBS business, and are defined as the sum dollar value of securities and trading assets held and risk-weighted (based on Basle Accord risk weights) OBS activities.

### *5.2.3. Insurance inputs and prices*

Unlike output definitions, there is a general agreement in the literature regarding the measurement of inputs in the financial service industry. Generally, the 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 business, the price of the home office labor is obtained from average weekly wage rates for life insurers (NAICS categories 524113) and property-liability insurers (NAICS 524126) in their domicile state 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 the insurer operates. The price of the materials and business services is defined as the U.S. Department of Labor average weekly wage rates for business services (NAICS 5614).

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<sup>11</sup> See Pulley and Humphrey (1993), Berger et al. (1997) and Kashyap, Rajan, and Stein (2002) for details.

<sup>12</sup> It would be ideal if the bank outputs were disaggregated into more categories. However, because of the trade-off between the degree of aggregation and the degree of freedom, our data cannot afford losing the degree of freedom.

We include two proxies for the financial capital: equity capital and debt capital. Financial equity capital plays an important role in reducing the insolvency risk and is viewed as one of the important inputs as conveyed in the literature (Berger, *et al.*, 1997; Hughes, *et al.* 2001). An insurer's financial equity capital is defined as the statutory policyholders surplus measured as the average of beginning and end-of-year equity capital. To measure the price of financial equity capital, we use the estimated cost of equity capital using 3-Factor Fama-French CAPM with industry specific beta obtained from Ibbotson Associates Cost of Capital Yearbook.<sup>13</sup> The debt capital is defined as the funds borrowed from policyholders, which are comprised of loss reserves 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, *et al.*, 1997; Cummins and Weiss, 2001).

#### 5.2.4. 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<sup>14</sup>. Deposits include demand deposits, time and saving deposits. The price of deposits is calculated as total interest expense on the deposits divided by the dollar value of deposits. The price of labor is calculated as the salary, wage and welfare per employee. The price of physical capital is obtained as occupancy and fixed asset expenditures divided by the dollar value of net premises and fixed assets available in the banks' regulatory report. 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.

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<sup>13</sup> 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.

<sup>14</sup> See Berger and Humphrey (1992), Berger and Mester (2003), Berger, *et al.* (2005) for details.

## 6. Empirical results

### 6.1. Summary Statistics and Scope Economy Estimates

Tables 2, 3, 4 and 5 show the descriptive statistics of the variables used to estimate the cost, revenue and profit functions separately for banks, thrift, life insurers and for property-liability insurers. A review of the tables suggests the subsidiaries of conglomerate organizations are, on average, larger than the specialist firms operating in the same industry. It is also interesting to note the input price for labor tends to be higher for the subsidiaries of diversified firms than for specialist firms consistent with the hypothesis greater managerial expertise is needed to successfully operate a conglomerate organization.

After estimating the twenty-four composite cost, revenue and profit functions (available from the authors), we estimate the scope economy scores using the coefficients estimated from the composite functions. The scope economy estimations are presented in several different ways. First, the cost, revenue, and profit scope economies are evaluated for all the firms in the sample and for the actual joint producers only. The scope economy scores, then, are evaluated at the 25<sup>th</sup> (Q1), 50<sup>th</sup> (median), and 75<sup>th</sup> (Q3) percentile of the data.<sup>15, 16</sup>

Table 6 summarizes the estimates of costs, revenue, and profit scope economy scores. Panel A shows consistent negative cost scope economy estimates regardless of evaluation points. The evidence indicates significant cost scope diseconomies on jointly producing banking and insurance products. For example, at median level of outputs and input prices, the data show that

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<sup>15</sup> One common approach in inferring scope economies is to evaluate at a single point, e.g., the mean or median of the data. Nevertheless, this point 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).

<sup>16</sup> To check for robustness, we also estimated scope economy scores where we adjusted the amount of output produced across the quantiles but held input prices fixed at the median level. The results are similar to what we report in the paper. For example, the profit scope economy scores for all firms ranges from 2.67 percent at the 25<sup>th</sup> percentile of output, 3.98 percent at the 50<sup>th</sup> percentile of output, and 7.67 percent at the 75<sup>th</sup> percentile. For the joint producers the same scope economy scores were -0.34 percent 2.12 percent 11.8 percent, respectively

costs increase by 11.4 percent for all the firms and 24.1 percent for actual joint producers. The estimates at Q1 and Q3 suggest the same conclusion, and the cost scope diseconomies are statistically significant. Panel A also shows an inverse relationship between firm size and cost scope diseconomies. As discussed earlier, cost scope economies may exist on a small scale from sharing inputs or sharing fixed resources, but such gains could be exhausted in larger scale.

Panel B of Table 6 lists the revenue scope economies estimates. The positive and significant revenue scope economy scores indicate revenue scope economies in joint production, suggesting that offering both banking and insurance products can generate higher sales revenue than producing the products separately in specialists firms. Consistent with Hypothesis 3, we see that small size firms are less capable of benefiting from such joint production strategy. As discussed earlier, large scale operations may be needed to generate revenue scope economies from consumption complementarities because of the need to maintain a large distribution network. This finding further suggests that large firms are more efficient in utilizing cross-selling and exploiting benefits from offering one-stop shopping convenience.

Panel C of Table 6 provides the summary of profit scope economy score estimations. The data generally show significant profit scope economies. However, profit scope economies are small and less significant than cost and revenue scope economies. For example, at sample median, joint producers could benefit from joint production by increasing 2 percent net income. Similar to the revenue scope economies, large firms show higher profit scope economies when producing both banking and insurance products.

The findings 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 possibly incurred in joint production and conglomeration. The findings of revenue scope economies support consumption complementarities, which show the 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.

## 6.2. *Regression analysis*

We next investigate the types of firms are more likely to benefit from conglomeration. To do so we regress the cost, revenue, and profit scope economy scores on a set of firm characteristic variables, respectively. We estimate the models using Tobit methodology after eliminating observations with extreme scores, e.g., greater than 1 or less than -1. The final data sample contains 214 joint producer observations. Table 7 summarizes descriptive statistics of regression variables. Table 8 shows the regression results.

In Table 7 we see the average conglomerate firm had negative cost scope economies, positive revenue scope economies, and slightly positive profit scope economies although not statistically different from zero. Table 7 also displays summary statistics of a set of indicator variables we created designed to capture broad differences in the business strategies employed by the firms in our sample. Financial institutions with more than 75 percent of group assets in banking division are defined as bancassurers; firms are categorized as assurbanks if banking division assets account for less than 25 percent of group assets; and the remaining firms are conglomerates. We further segmented the bancassurers and conglomerates by the range of insurance business in which they engage: in life insurance only, in property-liability insurance only, and in both life and property-liability insurance. Assurbanks were also segregated by the

range of banking business in which they engage: owning commercial banks only, owning thrifts only, and 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 the thrift organizations (over 40 percent of our observations). The second most popular strategy was banks moving into insurance through the purchase of life insurance subsidiaries.

Table 8 displays two sets of regressions where the only difference between the models is variables used to capture 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> further segregate personal business share and firm categories.

To test Hypothesis 3 that firm size is related to scope economies, we use the natural log of gross total assets as a proxy for size. The coefficient is negative in the cost regression and positive in both revenue and profit regressions. All of the estimated coefficients are statistically significant and the results are consistent with the univariate finding reported in Table 6 that small firms are more likely to benefit from cost saving by sharing important or costly resources in conglomeration, while large firms are more likely to benefit from revenue and profit increases when jointly producing banking and insurance products.

Hypotheses 4 and 5 are investigated using the firm's business portfolio and product mix variables. In Models 1 through 3, we use the aggregated firm-type indicators discussed earlier and a variable equal to the percentage of the firm's revenue coming from retail markets. In Model 4 through 6, we use the more granular versions of these same variables. As shown in Table 8, 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 emphasizing retail business are less likely to realize cost savings but more likely to benefit from increases in revenue and profits. Thus, profit scope economies are more likely to occur in personal product lines than in 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 on business portfolio indicator variables indicates that banks appear more profit scope efficient when participating in both life and property-liability insurance business (i.e., bancassurers), that assurbanks are profit scope inefficient when participating in both commercial and thrift banking business, and that conglomerate firms with balanced banking and insurance businesses are more scope efficient when offering property-liability insurance products.

We include two variables to control for the product diversification: the insurance product Herfindahl index (HHI) and banking product HHI. The maximum possible value for the Herfindahl index is 1.0 and indicates the firm only offers a single product. As such, higher index values indicate a decrease in product diversification. The results suggest firms offering a more narrow set of products from their insurance division were less likely to exploit cost scope economies but the more likely to exploit revenue and profit scope economies. Product diversification in the banking division does not appear to have a significant impact in joint production. Thus, joint producers with more focused insurance operations appears to be have been the dominate strategy at this time.

Two variables are used to control for the geographic diversification and the strategies of national or local operation: the geographic business HHI in insurance division and the number of domestic bank branches.<sup>17</sup> Firms are less geographically diversified with higher values of the insurance geographic HHI and with a lower number of bank branches. Both measures present a consistent impact. Joint firms with more geographically diversified insurance or banking businesses appear more likely to realize profit scope economies. The results suggest that conglomerate firms had to operate at the national level (or at least super-regional level) level in order to enjoy the positive net effects on profitability.

The next set of variables were included to test our hypotheses whether the type of distribution system used by the insurance subsidiaries are related to scope economies. We defined three variable based upon the distribution strategies of the firm. 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). The second indicator was set equal to one for firms that use employees or some direct channel mechanism to distribute their products (i.e., vertical insurance distribution). Finally, we defined a third category for insurers that use both systems.<sup>18</sup> To avoid perfect colinearity in the regressions, we eliminated the horizontal distribution variable to estimate the regressions. The results shown in Table 8 suggest the type of distribution strategy employed by the insurer had no significant impact on scope economies.

The remaining variables shown in Table 8 were included as controls for various influences the previous literature suggests are important determinants of scope economies. The significant

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<sup>17</sup> HHI for a firm producing  $n$  types of products is measured as  $(X_1^2 + X_2^2 + \dots + X_n^2)/(X_1 + X_2 + \dots + X_n)^2$ , where  $X_i$  is the  $i$ th product output. HHI for insurers operating in  $m$  states is measured as  $(Y_1^2 + Y_2^2 + \dots + Y_m^2)/(Y_1 + Y_2 + \dots + Y_m)^2$ , where  $Y_i$  is the direct premium written in the  $i$ th state.

<sup>18</sup> Vertically integrated distribution channels include exclusive/captive agents, direct response, internet, affinity group marketing, worksite marketing. Horizontally integrated distribution channels include independent agents, brokers, general agents, career agents, and banks.

coefficients on capital-to-asset ratio suggest that better capitalized firms are less cost scope efficient but enjoy more revenue and profit scope economies. 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 we include in the regressions test the hypothesis that more productive companies will enjoy scope economies. The evidence shown in Table 8 is consistent with this hypothesis as firms more profit X-efficient in the individual subsidiaries are also shown to be overall more profit scope efficient. The finding suggests firms that employ more efficient managers who are already outperforming their competitors with the ability to achieve high levels of X-efficiency can reuse and extend this managerial talent, experience, and expertise in a conglomeration strategy. Thus, they can be better able to realize economies of scope, yielding a positive relationship between efficiency and scope economies.

## **7. 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 the U.S. banking and insurance regulatory data sets enables us to identify domestic assurbanks, bancassurers, and all the unique subsidiaries of all financial service companies in the U.S. licensed as a commercial bank, thrift, or insurance company. We use this data set to examine the existence of scope economies in financial conglomerations.

We conduct our analysis utilizing a two-stage procedure econometric procedure. In the first stage we estimate composite cost, revenue, and profit functions and then use those function 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 integrating the manufacture of banking and insurance products. The evidence shows

that cost savings from sharing inputs cannot offset the extra costs possibly incurred in joint production and conglomeration. The findings of revenue scope economies support consumption complementarities suggesting demand side scope efficiency gains arise by cross-selling and by offering one-stop shopping convenience. The findings of profit scope economies indicate that revenue scope efficiency gains dominate and offset cost scope efficiency losses in joint productions, and contribute to net profit scope efficiency gains.

In the second stage, we use regression analysis to address investigate several hypothesis about the types and characteristics of joint producing that are more or less likely to enjoy scope economies. Our analysis suggests large firms are associated with higher cost scope diseconomies and higher revenue or profit scope economies than small firms. Large firms are also more likely to benefit from increased revenue than cost savings when jointly producing banking and insurance products. Economies of scope are found to be more likely to occur in retail product lines than in 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 and that commercial customers may prefer expertise and tailored products. Traditional banking firms are found to be more profit scope efficient when conducting life and property-liability insurance business simultaneously, while traditional insurers that enter the banking market appear profit scope inefficient. Furthermore, we find that conglomerate firms with insurance subsidiaries offering a wide range of insurance products are more likely to exploit cost scope economies but the less likely to exploit revenue and profit scope economies. Joint producers that are more geographically diversified are more likely to realize profit scope economies suggesting that national operations are necessary to enjoy the net effects on scope efficiencies. Contrary to our hypotheses, we do not find any evidence the type of distribution

system employed by the insurer is related to scope economies. Finally, firms with high capital-to-assets ratio present high profit scope economies and more X-efficient firms are more likely to enjoy profit scope economies.

Following the passage of GLB, a number of academics and market observers predicted 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, on a grand scale, taken 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 small. The cost scope economies on the supply side are not pervasive and sometime negative and the magnitude of the revenue scope economies on the demand side are just barely large enough to offset the cost increases. Furthermore, our analysis strongly suggest that only the most well run organizations will be able to achieve the benefits promised by proponents of conglomeration. Thus, the allure of universal bank still exists – it is just not easy to achieve.

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**Table 1. Sample of Conglomerate and Specialist Financial Institutions: 2003-2005**

This table displays the total assets and number of firms represented in the combined banking and insurance regulatory data set by sectors and product lines from 2003-2005. The statistics for firms under common ownership are aggregated to the group level. The number of group or unaffiliated institutions is given in the parentheses. Joint firms are those with both banking and insurance operating subsidiaries. Insurance and banking specialists are firms that only have insurance or banking subsidiaries, respectively. We eliminate all banking or joint producers with less than \$1billion in assets and all insurance groups with less than \$600million. The final sample of firms 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
<b>Joint Firms</b>			
- Bank & LH	\$1,732b (38)	\$2,034b (37)	\$2,072b (36)
- Bank & PC	\$185b (14)	\$229b (15)	\$269b (15)
- Bank & LH, PC	\$5,341b (36)	\$5,976b (33)	\$6,514b (26)
<b>Total</b>	<b>\$7,258b (88)</b>	<b>\$8,239b (85)</b>	<b>\$8,855b (87)</b>
<b>Insurance Specialists</b>			
- Life Insurers	\$1,343b (110)	\$1,420b (104)	\$1,515b (102)
- PC Insurers	\$753b (144)	\$854b (149)	\$917b (151)
<b>Total</b>	<b>\$2,096b (204)</b>	<b>\$2,274b (208)</b>	<b>\$2,432b (209)</b>
<b>Banking Specialists</b>			
- Commercial Banks	\$2,859b (389)	\$3,090b (402)	\$3,349b (439)
- Thrift Saving Banks	\$732b (132)	\$818b (132)	\$859b (146)
<b>Total</b>	<b>\$3,591b (461)</b>	<b>\$3,908b (470)</b>	<b>\$4,208b (509)</b>

Note: LH is the abbreviation for life insurance. PC is the abbreviation for property-liability insurance. "Bank & LH" refers to the affiliation between banks and life insurance companies, "Bank & PC" refers to the affiliation between banks and property-liability insurance companies, and "Bank & LH, PC" refers to the affiliation between banks, life insurance and property-liability insurance.

**Table 2. Descriptive Statistics of Variables in Composite Function Estimation - Commercial Banks**

This table provides summary statistics of variables used in the composite function estimation. Cost, Revenue, Profit, and output quantities are in thousands.

***Panel A: Descriptive statistics for diversified commercial banks (N= 111)***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	3,821,298	8,868,608	4,035	51,172,912
Revenue	5,020,367	11,661,406	4,949	67,617,667
Profit	1,199,069	2,816,317	-18,449	16,444,755
Output quantity - Consumer loans	33,050,750	73,816,765	0	358,827,325
Output quantity - Business loans	20,434,609	48,476,928	0	268,248,721
Output quantity - Other assets	150,522,991	479,974,730	74,302	3,117,297,782
Input price - Labor	78.5325	45.3557	35.8438	347.2667
Input price - Net premiums and fixed assets	1.6137	5.7786	0.0000	52.2632
Input price - Deposits	0.0169	0.0147	0.0009	0.0969
Input price - Purchased Fund	0.0250	0.0241	0.0000	0.2176

***Panel B: Descriptive statistics for specialist commercial banks (N= 1,238)***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	288,041	644,243	20,013	5,518,470
Revenue	368,159	822,725	18,563	7,105,638
Profit	80,118	186,667	-59,209	1,738,170
Output quantity - Consumer loans	1,741,006	4,120,055	0	35,748,992
Output quantity - Business loans	2,261,665	5,119,329	0	46,505,825
Output quantity - Other assets	4,183,472	12,178,919	139,659	129,215,588
Input price - Labor	59.8007	22.7612	20.1755	276.4737
Input price - Net premiums and fixed assets	0.3977	0.6602	0.0000	14.1736
Input price - Deposits	0.0149	0.0056	0.0020	0.0596
Input price - Purchased Fund	0.0290	0.0247	0.0000	0.6769

***Panel C: Descriptive statistics for all commercial banks (N= 1,349)***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	578,768	2,782,530	4,035	51,172,912
Revenue	750,957	3,654,265	4,949	67,617,667
Profit	172,189	879,677	-59,209	16,444,755
Output quantity - Consumer loans	4,317,271	23,114,961	0	358,827,325
Output quantity - Business loans	3,756,992	15,516,865	0	268,248,721
Output quantity - Other assets	16,224,752	143,365,414	74,302	3,117,297,782
Input price - Labor	61.3420	25.8804	20.1755	347.2667
Input price - Net premiums and fixed assets	0.4977	1.7991	0.0000	52.2632
Input price - Deposits	0.0151	0.0069	0.0009	0.0969
Input price - Purchased Fund	0.0287	0.0246	0.0000	0.6769

**Table 3. Descriptive Statistics of Variables in Composite Function Estimation - Thrift Saving Banks**

This table provides summary statistics of variables used in the composite function estimation. Cost, Revenue, Profit, and output quantities are in thousands.

***Panel A: Descriptive statistics for diversified thrift saving banks ( N= 68 )***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	219,562	512,449	5,416	3,177,384
Revenue	251,198	596,823	6,025	3,670,408
Profit	31,636	87,580	-20,548	493,024
Output quantity - Consumer loans	1,529,552	3,048,094	0	12,826,927
Output quantity - Business loans	283,622	1,129,100	0	7,047,061
Output quantity - Other assets	3,337,837	9,804,086	7,400	50,942,408
Input price - Labor	72.6990	28.7693	38.7872	251.0833
Input price - Net premiums and fixed assets	5.1889	12.3835	0.0000	61.9318
Input price - Deposits	0.0212	0.0067	0.0060	0.0361
Input price - Purchased Fund	0.0287	0.0284	0.0000	0.1990

***Panel B: Descriptive statistics for specialist thrift saving banks ( N= 202 )***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	258,653	336,869	32,583	2,526,626
Revenue	328,918	434,286	47,141	3,253,980
Profit	70,265	111,019	-19,880	727,354
Output quantity - Consumer loans	3,405,588	4,586,445	895	27,655,552
Output quantity - Business loans	924,846	1,767,719	0	16,150,809
Output quantity - Other assets	2,734,887	4,311,897	114,652	28,828,965
Input price - Labor	63.2470	24.1848	29.1730	295.5603
Input price - Net premiums and fixed assets	0.5389	0.4275	0.0000	2.9332
Input price - Deposits	0.0185	0.0057	0.0059	0.0422
Input price - Purchased Fund	0.0385	0.0390	0.0000	0.5253

***Panel C: Descriptive statistics for all thrift saving banks ( N= 270 )***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	248,808	387,931	5,416	3,177,384
Revenue	309,344	480,404	6,025	3,670,408
Profit	60,536	106,781	-20,548	727,354
Output quantity - Consumer loans	2,933,105	4,324,080	0	27,655,552
Output quantity - Business loans	763,352	1,652,333	0	16,150,809
Output quantity - Other assets	2,886,741	6,156,456	7,400	50,942,408
Input price - Labor	65.6275	25.6923	29.1730	295.5603
Input price - Net premiums and fixed assets	1.7100	6.5131	0.0000	61.9318
Input price - Deposits	0.0191	0.0060	0.0059	0.0422
Input price - Purchased Fund	0.0360	0.0368	0.0000	0.5253

**Table 4. Descriptive Statistics of Variables in Composite Function Estimation - Life Insurers**

This table provides summary statistics of variables used in the composite function estimation. Cost, Revenue, Profit, and output quantities are in thousands.

***Panel A: Descriptive statistics for diversified life insurance companies ( N= 133 )***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	831,038	1,033,719	535	4,145,507
Revenue	1,125,697	1,400,670	3,545	6,489,245
Profit	294,659	434,943	-38,546	2,343,738
Output quantity - Life Insurance	957,672	1,636,354	8	7,719,653
Output quantity - Annuities	1,435,005	2,609,786	0	12,558,310
Output quantity - Accident & Health Insurance	284,276	535,468	0	2,669,184
Input price - Administration and management labor	1265.34	228.10	807.00	1882.00
Input price - Agent labor	1024.27	98.11	796.52	1457.71
Input price - Materials and physical capital	706.63	145.73	435.05	1019.43
Input price - Equity capital	0.1200	0.0061	0.1132	0.1280
Input price - Debt capital	0.0445	0.0140	0.0102	0.0823

***Panel B: Descriptive statistics for specialist life insurance companies ( N= 315 )***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	237,061	311,482	79	1,833,309
Revenue	311,534	422,973	255	2,373,229
Profit	74,474	139,820	-66,198	1,005,259
Output quantity - Life Insurance	217,125	364,395	0	2,955,663
Output quantity - Annuities	251,982	437,434	0	2,867,009
Output quantity - Accident & Health Insurance	252,897	587,877	0	3,382,254
Input price - Administration and management labor	1241.30	219.13	760.00	1923.00
Input price - Agent labor	999.39	99.63	760.01	1412.22
Input price - Materials and physical capital	714.76	177.99	353.01	1473.32
Input price - Equity capital	0.1200	0.0061	0.1132	0.1280
Input price - Debt capital	0.0466	0.0173	0.0102	0.1192

***Panel C: Descriptive statistics for all life insurance companies ( N= 448 )***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	413,398	676,399	79	4,145,507
Revenue	553,239	918,529	255	6,489,245
Profit	139,841	282,382	-66,198	2,343,738
Output quantity - Life Insurance	436,975	999,362	0	7,719,653
Output quantity - Annuities	603,192	1,561,572	0	12,558,310
Output quantity - Accident & Health Insurance	262,213	572,405	0	3,382,254
Input price - Administration and management labor	1248.44	221.85	760.00	1923.00
Input price - Agent labor	1006.78	99.72	760.01	1457.71
Input price - Materials and physical capital	712.35	168.94	353.01	1473.32
Input price - Equity capital	0.1200	0.0061	0.1132	0.1280
Input price - Debt capital	0.0460	0.0164	0.0102	0.1192

**Table 5. Descriptive Statistics of Variables in Composite Function Estimation - Property-Liability Insurers**

This table provides summary statistics of variables used in the composite function estimation. Cost, Revenue, Profit, and output quantities are in thousands.

***Panel A: Descriptive statistics for diversified property-liability insurance companies ( N= 114 )***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	535,078	1,077,620	52	6,792,995
Revenue	662,600	1,247,356	73	7,258,835
Profit	127,522	218,534	-24,344	1,123,429
Output quantity - Personal property-liability insurance	485,816	1,130,523	0	5,597,831
Output quantity - Commercial property-liability insurance	312,227	690,986	0	3,923,788
Output quantity - Invested assets	3,128,234	5,587,308	2,570	29,081,332
Input price - Administration and management labor	1145.71	130.96	792.00	1408.00
Input price - Agent labor	1007.18	125.09	665.00	1438.53
Input price - Materials and physical capital	679.10	203.02	432.33	1655.83
Input price - Equity capital	0.0811	0.0015	0.0798	0.0832
Input price - Debt capital	0.0287	0.0267	0.0102	0.1889

***Panel B: Descriptive statistics for specialist property-liability insurance companies ( N= 443 )***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	331,560	458,874	323	4,402,666
Revenue	421,052	592,411	233	5,921,569
Profit	89,492	182,961	-385,183	1,518,902
Output quantity - Personal property-liability insurance	167,852	315,397	0	1,961,435
Output quantity - Commercial property-liability insurance	284,816	451,168	0	3,970,428
Output quantity - Invested assets	2,339,506	3,114,810	5,791	26,166,168
Input price - Administration and management labor	1171.83	152.04	664.00	1707.00
Input price - Agent labor	1046.39	130.13	714.00	1444.00
Input price - Materials and physical capital	706.07	158.86	296.82	1154.76
Input price - Equity capital	0.0811	0.0015	0.0798	0.0832
Input price - Debt capital	0.0315	0.0281	0.0102	0.3449

***Panel C: Descriptive statistics for all property-liability insurance companies ( N= 557 )***

<b>Variable Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost	373,214	640,437	52	6,792,995
Revenue	470,490	777,640	73	7,258,835
Profit	97,275	191,188	-385,183	1,518,902
Output quantity - Personal property-liability insurance	232,929	596,087	0	5,597,831
Output quantity - Commercial property-liability insurance	290,426	508,898	0	3,970,428
Output quantity - Invested assets	2,500,934	3,762,829	2,570	29,081,332
Input price - Administration and management labor	1166.48	148.23	664.00	1707.00
Input price - Agent labor	1038.37	129.97	665.00	1444.00
Input price - Materials and physical capital	700.55	168.99	296.82	1655.83
Input price - Equity capital	0.0811	0.0015	0.0798	0.0832
Input price - Debt capital	0.0309	0.0278	0.0102	0.3449

**Table 6. Cost, Revenue, and Profit Scope Economy Estimates*****Panel A: Cost Scope Economies***

	Cost Scope Economies		
	1st Quartile	Median	3rd Quartile
All	-19.9% **	-11.4% **	-36.0% ***
Joint Firms	-0.1%	-24.1% ***	-70.8% ***

***Panel B: Revenue Scope Economies***

	Revenue Scope Economies		
	1st Quartile	Median	3rd Quartile
All	29.2% ***	25.6% ***	49.6% ***
Joint Firms	15.7% **	32.1% ***	74.3% ***

***Panel C: Profit Scope Economies***

	Profit Scope Economies		
	1st Quartile	Median	3rd Quartile
All	2.6% *	3.9% *	7.6% ***
Joint Firms	-0.4%	2.0% *	16.9% ***

Notes: The data sample used to evaluate scope economies contains 260 actual joint firms and 298,185 hypothetical joint firms, which is created by merging every insurance specialist with every bank specialist. Scope economies are estimated to be present if the scope economy score is greater than zero; scope diseconomies are estimated to exist if the scope economy score is less than zero; Neither scope economies nor diseconomies are estimated to be present if the score equals zero.

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

**Table 7. Descriptive Statistics of Variables Used in Scope Economies Regressions (N = 214 )**

This table provides summary statistics of regression variables for financial groups joint producing banking and insurance products. Observations with extreme scope economy scores, e.g., scope economy scores >1 or <-1, are excluded from the sample. The final sample used in the regression contains 214 actual joint producers.

<b>Definition</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Cost scope economy score	-0.4231	0.4233	-1.0000	0.8984
Revenue scope economy score	0.4482	0.3748	-0.7694	1.0000
Profit scope economy score	0.1772	0.2430	-0.4029	1.0000
Total group assets (\$billion)	85.703	206.851	0.2039	1171.034
Total retail products business share (%)	0.6485	0.2184	0.0079	0.9886
Insurance retail products share (%)	0.5731	0.3408	0.0000	1.0000
Banking retail products share (%)	0.6090	0.2812	0.0000	0.9997
Dummy - Bancassurer	0.3832	0.4873	0.0000	1.0000
Dummy - Assurbank	0.5093	0.5011	0.0000	1.0000
Dummy - Conglomerate	0.1075	0.3104	0.0000	1.0000
Dummy - Bancassurer doing life insurance only	0.1776	0.3830	0.0000	1.0000
Dummy - Bancassurer doing property-liab. insurance only	0.0561	0.2306	0.0000	1.0000
Dummy - Bancassurer doing both life & property-liab. insurance	0.1495	0.3574	0.0000	1.0000
Dummy - Assurbank doing commercial banking only	0.0841	0.2782	0.0000	1.0000
Dummy - Assurbank doing thrift saving only	0.4112	0.4932	0.0000	1.0000
Dummy - Assurbank doing both commercial banking & thrift saving	0.0140	0.1178	0.0000	1.0000
Dummy - Conglomerate doing life insurance only	0.0140	0.1178	0.0000	1.0000
Dummy - Conglomerate doing property-liab. insurance only	0.0327	0.1783	0.0000	1.0000
Dummy - Conglomerate doing both life & property-liab. insurance	0.0607	0.2394	0.0000	1.0000
Insurance product mix HHI	0.5424	0.2469	0.1650	1.0000
Banking product mix HHI	0.4097	0.2590	0.0000	1.0000
Insurance geographic business HHI	0.2889	0.3518	0.0000	1.0000
Number of bank branches and offices	227.561	805.104	1.0000	5957
Insurance horizontal distribution dummy	0.4907	0.5011	0.0000	1.0000
Insurance vertical distribution dummy	0.1869	0.3908	0.0000	1.0000
Insurance vertical & horizontal distribution dummy	0.3224	0.4685	0.0000	1.0000
Capital to assets ratio	0.1610	0.1132	0.0311	0.5314
Cost X-efficiency - Life insurance	0.0846	0.2196	0.0007	1.0000
Cost X-efficiency - Property-Liability insurance	0.1364	0.2546	0.0034	1.0000
Cost X-efficiency - Banking	0.1549	0.2882	0.0020	1.0000
Revenue X-efficiency - Life insurance	0.0882	0.2198	0.0017	1.0000
Revenue X-efficiency - Property-Liability insurance	0.1210	0.2484	0.0044	1.0000
Revenue X-efficiency - Banking	0.1358	0.2781	0.0013	1.0000
Profit X-efficiency - Life insurance	0.7392	0.1123	0.4943	1.0000
Profit X-efficiency - Property-Liability insurance	0.9419	0.0209	0.9068	1.0000
Profit X-efficiency - Banking	0.4157	0.1985	0.1676	1.0000

**Table 8. Scope Economies Regression Analysis - Joint firms (N=214)**

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.

Independed Variables	Cost Scope Economies < 1 >		Revenue Scope Economies < 2 >		Profit Scope Economies < 3 >		Cost Scope Economies < 4 >		Revenue Scope Economies < 5 >		Profit Scope Economies < 6 >	
	Coefficient	t stat.	Coefficient	t stat.	Coefficient	t stat.	Coefficient	t stat.	Coefficient	t stat.	Coefficient	t stat.
Intercept	5.1084	6.01 ***	-3.7137	-6.38 ***	-3.9326	-7.36 ***	5.2593	6.64 ***	-4.0351	-7.06 ***	-4.3238	-8.35 ***
<i>Firm size variables</i>												
Log ( Total group assets)	-0.1940	-5.71 ***	0.1506	6.33 ***	0.0693	9.25 ***	-0.1967	-6.29 ***	0.1562	6.88 ***	0.0717	10.04 ***
<i>Business and product mix variables</i>												
Total retail products business share (%)	-0.8422	-3.96 ***	0.4321	2.74 ***	0.0954	1.77 *						
Insurance retail products share (%)							-0.6826	-4.52 ***	0.2618	2.39 **	0.0779	2.17 **
Banking retail products share (%)							-0.1349	-0.84	0.1210	0.91	0.0971	2.26 **
Dummy - Bancassurer	-0.1420	-0.81	0.2235	1.69 *	0.0135	0.30						
Dummy - Assurbank	0.2330	1.52	-0.1033	-0.91	-0.0596	-1.48						
Dummy - Bancassurer doing life insurance only							-0.1468	-0.69	0.3293	2.15 **	-0.0164	-0.30
Dummy - Bancassurer doing property-liab. insurance only							-0.6623	-2.31 **	0.7024	3.33 ***	0.0333	0.49
Dummy - Bancassurer doing both life & property-liab. insurance							-0.3106	-1.41	0.4867	2.90 ***	0.1199	2.25 **
Dummy - Assurbank doing commercial banking only							-0.0599	-0.28	0.1730	1.10	-0.0741	-1.32
Dummy - Assurbank doing thrift saving only							0.0825	0.44	0.1802	1.34	0.0221	0.47
Dummy - Assurbank doing both commercial banking & thrift saving							0.5763	1.66 *	-0.4800	-1.81 *	-0.1919	-1.92 *
Dummy - Conglomerate doing life insurance only							-0.5877	-1.72 *	0.5222	1.98 **	0.1362	1.33
Dummy - Conglomerate doing property-liab. insurance only							-0.5175	-1.94 **	0.6693	3.24 ***	0.1316	1.85 *
<i>Business diversification variables</i>												
Insurance product mix HHI	-0.3979	-2.01 **	0.2160	1.49	0.1373	2.83 ***	-0.2691	-1.35	0.0893	0.60	0.1651	3.33 ***
Banking product mix HHI	-0.0698	-0.41	0.0415	0.32	-0.0255	-0.56	-0.0679	-0.44	0.0270	0.22	-0.0133	-0.31
Insurance geographic business HHI	0.2422	1.50	-0.3447	-2.89 ***	-0.1004	-2.55 **	0.3720	2.31 **	-0.4286	-3.51 ***	-0.0898	-2.29 **
Log ( number of bank branches and offices )	-0.0104	-0.31	-0.0031	-0.12	0.0159	2.08 **	-0.0409	-1.25	0.0222	0.88	0.0179	2.37 **
<i>Insurance distribution system variables</i>												
Insurance vertical & horizontal distribution dummy	0.0102	0.10	-0.0537	-0.70	0.0200	0.77	-0.0488	-0.48	0.0198	0.25	0.0213	0.82
Insurance vertical distribution dummy	0.1131	0.88	-0.0464	-0.47	0.0374	1.14	0.1012	0.82	-0.0394	-0.41	0.0251	0.78
<i>Leverage variable</i>												
Capital to assets ratio	-2.0945	-4.23 ***	1.6671	4.54 ***	0.2432	1.96 **	-2.1070	-4.61 ***	1.6650	4.80 ***	0.1850	1.57
<i>X-efficiency variables</i>												
Cost X-efficiency - Life insurance	-0.6069	-2.23 **					-0.7758	-2.90 ***				
Cost X-efficiency - Property-Liability insurance	-0.5800	-2.81 ***					-0.3641	-1.82 *				
Cost X-efficiency - Banking	-0.1290	-0.77					-0.1249	-0.73				
Revenue X-efficiency - Life insurance			0.4271	2.32 **					0.6218	3.22 ***		
Revenue X-efficiency - Property-Liability insurance			0.3495	2.31 **					0.2595	1.65 *		
Revenue X-efficiency - Banking			0.0755	0.59					0.0922	0.67		
Profit X-efficiency - Life insurance					0.5299	5.18 ***					0.5832	5.92 ***
Profit X-efficiency - Property-Liability insurance					1.9393	3.51 ***					2.1479	4.08 ***
Profit X-efficiency - Banking					0.2079	3.33 ***					0.1919	2.97 ***
<i>Year dummy variables</i>												
Year 2003	-0.2440	-2.34 **	0.2325	2.97 ***	0.0737	2.77 ***	-0.2755	-2.87 ***	0.2461	3.37 ***	0.0725	2.90 ***
Year 2004	-0.1316	-1.32	0.1570	2.07 **	0.0561	2.05 **	-0.1412	-1.55	0.1557	2.21 **	0.0551	2.15 **
Average value of dependent variable	-0.4231		0.4482		0.1772		-0.4231		0.4482		0.1772	
Adjusted R <sup>2</sup>	34.00%		34.37%		59.47%		37.99%		38.55%		65.07%	
Number of observations	214		214		214		214		214		214	

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