Economies of Scope in Financial Conglomerates: Analysis of a Revenue Side*

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Abstract

This paper looks into the economies of scope in revenue associated with financial conglomeration. In the first part, we presented a theoretical model of revenue enhancement brought about by the establishment of brand image and one-stop shopping. In the second part, we first studied the revenue enhancement effects due to the synergies between divisions that are engaged in different types of businesses, using the financial data of subsidiaries of three major financial conglomerates in Europe (ING Group, Allianz Group, and Credit Suisse Group) from 1998 to 2003. We then verified the existence of synergies between banking and insurance divisions of financial conglomerates, using the financial data of the respective banking and insurance divisions of fourteen European financial conglomerates. From among them, we collected the data of the respective banking divisions of twelve financial conglomerates, separately for personal banking and corporate banking, and determined the existence of synergies among the personal banking division, corporate banking division and insurance division of the financial conglomerates. As a result, we confirmed the existence of revenue synergies between banking operations and insurance operations, while no cost synergies have been observed in preceding studies.

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1. Introduction

There is a growing trend to provide various financial services under the umbrella of one financial group. In Japan, there is an ongoing debate on the issue of allowing banks to deal in securities and insurance products, while especially in developed countries, financial conglomerates simultaneously engaged in banking, securities and insurance operations are being formed. The reason behind such financial conglomeration is claimed to be the synergies brought about by the integration of different business units. The synergies can broadly be divided into two types: *cost reduction* and *revenue*[1] *enhancement.* Yet, preceding analyses of the merits of conglomeration have been limited to identifying the merits in the context of cost reduction and risk diversification effects due to the consolidation of branches, etc. There have been no sufficient analyses on synergies due to the enhancement of revenue. In this paper, we analyze the *revenue enhancement* effects due to conglomeration in light of the so-called "economies of consumer costs". Firstly, we present a theoretical model of revenue enhancement brought about by the establishment of brand image and one-stop shopping. Based on this, we present a revenue model of producers (financial institutions). We then conduct an empirical analysis of the revenue enhancement effects due to conglomeration, with reference to major financial conglomerates in Europe.

Relationship with Preceding Studies

One of the reasons behind financial conglomeration is to demonstrate synergies by running multiple types of businesses at the same time. There are many preceding studies on the synergies in financial conglomerates, which have normally been shown by the existence of economies of scope in the context of cost effects.[2]

On the other hand, one school of thought argues that such synergies can be studied on two different levels, namely, the cost effects and the revenue effects. Herring and Santomero (1990) stressed the importance of revenue synergies, by pointing out that synergies exist not only on the financial institution side but also on the consumer side when financial services are traded, and that the amount paid by the consumer per product increases in such cases. Further, Hirota and Tsutsui (1992) highlighted the three financial intermediary operations of Japanese banks (i.e., lending, investment in securities, and deposit-taking) and examined whether or not economies of scope exist among them. They pointed out that the benefits of conglomeration can take the form of cost savings as well as revenue enhancement, and stated that "(this Chapter) is significant for having analyzed economies of scope in both cost and income (revenue)". The basic approach taken by this paper rests on the two aforementioned studies. We focus on the banking and insurance operations of financial conglomerates, and analyze the economies of scope between them.

The following is a summary of the preceding studies on the economies of scope in revenue.

Many general discussions have been held regarding the merits of providing multiple financial services simultaneously. Among them, Berger, Hanweck and Humphrey (1987)[3] clearly pointed out the merits by focusing on four areas. The first effect is (1) the sharing of fixed costs. Branches, data processing systems, personnel and other such (fixed) cost items can be used for producing and selling other products. Costs of the entire bank (group) can be slashed by sharing them. The second effect is (2) the use of customer information for multiple purposes. If a bank provides both deposit-taking services and lending services, customer information obtained from either service can be recycled to the other. Information on deposit behavior is actually used to assess bankruptcy and default risks[4]. The third effect is (3) the risk reduction effect. Differences in revenue between operations can be dispersed by operating multiple, different divisions simultaneously. And the last effect is (4) the economies of consumer costs. Some banking service expenses paid by the consumer can be saved by using multiple services at the same time. For example, if a bank offers demand deposit, savings account and lending services simultaneously over the counter, etc., the merit to the consumer takes the form of traveling expenses saved. Banks engaged in such operations simultaneously may incur greater costs as a result of conglomeration, but will increase their revenue from banking operations as a

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[1] Revenue is sometimes confused with profit. In the strict sense, profit is a "net" concept in that profit equals revenue minus costs (a negative profit indicates a loss), whereas revenue is a "gross" concept. Revenue also differs from income, which denotes cash flow. Income is a cash concept whereas revenue is a PL (profit or loss) concept. The term "revenue" is used throughout this paper as it is focused on PL analysis. The exception is "gross premium written", which is used to comply with the terminology used by Japanese life insurance companies and non-life insurance companies.

[2] Refer to Maeda and Nagata (2003).

[3] Refer to the Group of Ten (2001) survey.

[4] Having said that, diversion of customer information needs to be handled with special care in terms of information management. In particular, the diversion of information to other divisions in financial conglomerates is generally restricted, for the purpose of protecting personal information and in view of conflict of interest.

whole, through the increase in commissions paid by consumers, the increase in deposits and loans outstanding, the expansion of market share, and so on.

Economies of scope brought about by the integration of different business units are generally identified in the context of cost complementarities in a cost function. In contrast, Berger, Hanweck and Humphrey (1987) conducted a study on revenue using the data of American banks on the grounds that among the characteristics defined by them, (1) sharing of fixed costs and (2) use of customer information for multiple purposes are identifiable, but (3) risk reduction effect and (4) economies of consumer costs cannot be reflected. As a result, they empirically showed the existence of economies of scope in revenue[5].

Further, Panzar and Willig (1981) attempted to discuss cost complementarities of lending operations and deposit-taking operations of American banks. In a paper released in the following year, Baumol, Panzar and Willig (1982) conducted additional analyses on costs and revenues simultaneously, on the grounds that revenue effects are just as important. In the said paper, they measured economies of scope by using cost functions, presented the concept of economies of product mix, and argued that revenue in the banking industry improves by supplying multiple products (i.e., they showed the existence of economies of product mix).

In addition to this, Pulley, Berger and Humphrey (1994) revealed that economies of scope in revenue do not exist between deposit-taking and lending, while noting that synergies generated by providing multiple financial services may take the form of cost reduction effects due to joint production (economies of scope in costs) and revenue enhancement effects due to joint consumption (economies of scope in revenue). Due to the lack of data, there are few empirical analyses on the synergies experienced by financial conglomerates that are concurrently engaged in banking, securities and insurance operations. Lang and Welzel (1998) analyzed the synergies in universal banks in Europe, but could not confirm the existence of revenue synergies.

Overview of This Paper

This paper analyzes the revenue enhancement effects, based on the aforementioned discussions relating to *economies of scope in revenue.* It is distinctive for conducting the analysis in light of economies of consumer costs. The aforementioned Herring and Santomero (1990) argued that business expansion referred to as "one-stop shopping" by financial institutions leads to revenue enhancement provided that consumers actually find value in this, based on the view that *for revenue synergies, users of financial services place much value on being able to receive several different products from one company in the form of a financial services package.* In Chapter 2 of this paper, we present a theoretical model of revenue enhancement brought about by the establishment of brand image and one-stop shopping, drawing upon Herring and Santomero (1990).

In Chapter 3, we then apply the dataset used by Maeda and Nagata (2003) to examine the revenue enhancement effects in financial conglomerates. Maeda and Nagata (2003) analyzed the cost reduction effects by using the financial data of subsidiaries of three major financial conglomerates in Europe (ING Group, Allianz Group and Credit Suisse Group) from 1998 to 2003. The conclusion of their analysis was that no economies of scope were observed. In Chapter 3, Section 1 of this paper, we examine the revenue enhancement effects due to the synergies between divisions that are engaged in different types of businesses, by estimating the Cobb-Douglas revenue function using the same data. In Chapter 3, Section 2, we estimate the translog revenue function using the financial data of fourteen European financial conglomerates (separate data for banking divisions and insurance divisions), and examine the existence of synergies between the respective banking divisions and insurance divisions of financial conglomerates. In Chapter 3, Section 3, we then collect the data of the respective banking divisions of twelve financial conglomerates from among those fourteen conglomerates, broken down into personal banking and corporate banking, estimate the translog revenue function, and determine the existence of synergies among the personal banking division, corporate banking division and insurance division of the financial conglomerates. In Chapter 4, we provide a summary of the aforementioned analyses, and describe the implications in conclusion.

[5] Economies of scope in this context are expressed as "economies of product mix" based on Panzar and Willig (1981), which is mentioned later.

2. Theoretical Model

2.1 Basic Model

Here, consider a simple two-commodity model. Firstly, build a model of the consumer side. There are two commodities in this economy, Commodity 1 and Commodity 2, and consumers derive utility from the consumption of each commodity. Let c_1 and c_2 denote the consumption of Commodity 1 and Commodity 2, respectively, and formulate a utility function based on $u(c_1)+\beta u(c_2)$[6]. Let y denote consumer income, and c_1 and c_2 represent the price of Commodity 1 and Commodity 2, respectively. Assume that cost t is incurred per unit when purchasing a commodity. Suppose that such cost includes the expenses involved in collecting commodity-related information for the purpose of purchasing a commodity, traveling expenses incurred for visiting a branch, opportunity costs associated with it, and so on.

The consumer's optimization problem in this economy can be expressed by

$$\max u(c_1) + \beta u(c_2)$$
subject to
$$p_1c_1 + p_2c_2 + tc_1 + tc_2 \le y$$

The first-order condition of this problem is

$$c_1 : u'(c_1) = \lambda(p_1 + t)$$
$$c_2 : \beta u'(c_2) = \lambda(p_2 + t)$$

From this, delete λ to obtain

$$\frac{u'(c_1)}{\beta u'(c_2)} = \frac{p_1 + t}{p_2 + t} \tag{1}$$

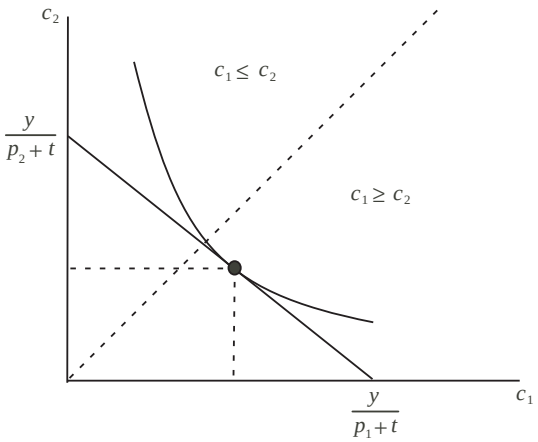

Figure 1: Choice of Consumption

Figure 1 illustrates the consumer's choice. The inclination of the budget line (its absolute value) in this Figure is $\frac{p_1 + t}{p_2 + t}$. The inclination of the indifference curve (its absolute value) on the 45-degree line is

$$\frac{u'(c)}{\beta u'(c)} = \frac{1}{\beta}$$

The following holds in the case depicted in Figure 1.

$$\frac{p_1 + t}{p_2 + t} < \frac{1}{\beta}$$

In this case, $c_1>c_2$ holds when the consumption combination generates maximum consumer utility.

$$\frac{p_1 + t}{p_2 + t} > \frac{1}{\beta}$$

[6] Even if the utility function is generalized as $u(c_1, c_2)$, the analysis results in this paper basically remain unchanged. This formula was adopted for the purpose of simplifying the analysis.

Conversely, in the following case, $c_1<c_2$ holds when the consumption combination generates maximum consumer utility.
This boils down to the following proposition (refer to Figure 2).

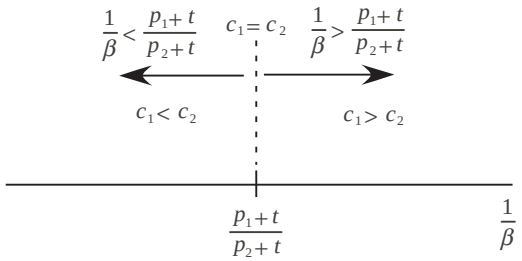

Figure 2: Choice of Consumption

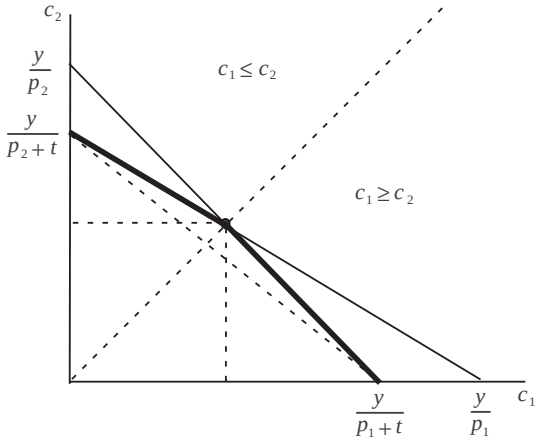

Figure 3: Budget Set

Proposition 1: Based on prices (p_1,p_2), suppose that the consumption combination chosen by the consumer is (c_1,c_2). When $\frac{p_1+t}{p_2+t} < \frac{1}{\beta}$, $c_1>c_2$. When $\frac{p_1+t}{p_2+t} > \frac{1}{\beta}$, $c_1<c_2$. When $\frac{p_1+t}{p_2+t} = \frac{1}{\beta}$, $c_1 = c_2$.

2.2 Synergy Model

In this Section, we analyze a model in which synergies in product sales exist. In the model shown in the previous Section, purchasing a commodity involved cost t per unit of purchase independently. Here, suppose that when a consumer purchases either commodity, he/she can save on commodity purchasing costs by purchasing the other commodity as well. For example, assume that both Commodities 1 and 2 are sold under the same brand name, and the consumer collects information on the brand and checks the brand's quality before purchasing Commodity 1. Once the brand image is established in the consumer's mind after the quality of Commodity 1 is examined at a cost, if the consumer wishes to purchase an alternative commodity marketed under the same brand (in this case, Commodity 2), he/she can guess its quality at a relatively low cost. In this Section, we analyze this in the context of synergies in sales. Another example is a case in which Commodities 1 and 2 are sold at the same branch; when the consumer purchases Commodity 1, he/she can save on traveling expenses and the time consumed in visiting the branch by purchasing Commodity 2 at the same time.

Purchasing Costs: Here, let $t\max\{c_1,c_2\}$denote the purchasing costs when the purchase volume of each commodity is (c_1,c_2). Suppose that the costs involved in purchasing either commodity is t per unit, as stated in the previous Section, but it costs nothing to purchase the other commodity provided that the purchase volume is less than that of the first commodity purchased.
Then, the consumer's utility maximization problem can be expressed by

$$\max u(c_1) + \beta u(c_2)$$
subject to
$$p_1c_1 + p_2c_2 + t\max\{c_1,c_2\} \le y$$

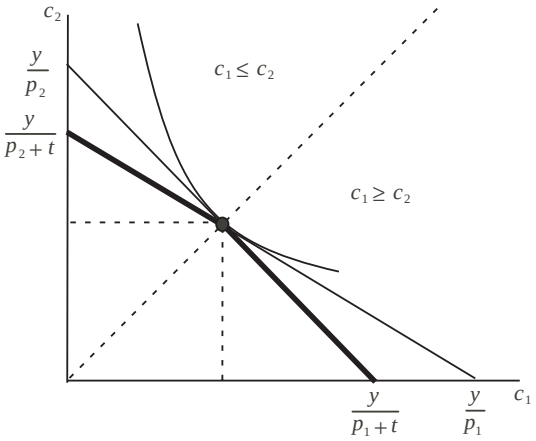

Figure 4: Choice of Consumption

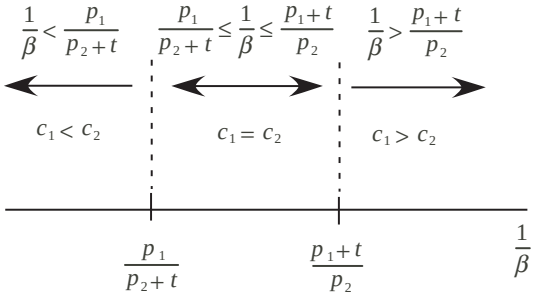

Figure 5: Choice of Consumption

The budget set in this problem is: when $c_1 \ge c_2$, $p_1c_1+p_2c_2+tc_1=y$, that is, $(p_1+t)c_1+p_2c_2 \le y$; and when $c_1 \le c_2$, $p_1c_1+p_2c_2+tc_2=y$, that is, $p_1c_1+(p_2+t)c_2=y$. Figure 3 illustrates this budget set. The inclination of the budget line (its absolute value) is $\frac{p_1+t}{p_2}$ when $c_1 \ge c_2$, or $\frac{p_1}{p_2+t}$ when $c_1 \le c_2$. Therefore, the budget set is a convex set curved along the 45-degree line as shown in Figure 3.

The consumption combination chosen by the consumer is given where the budget set touches the indifference curve, as shown in Figure 4.

The inclination of the indifference curve (its absolute value) on the 45-degree line is $\frac{u'(c)}{\beta u'(c)} = \frac{1}{\beta}$, so when

$$\frac{p_1}{p_2+t} \le \frac{1}{\beta} \le \frac{p_1+t}{p_2}$$

the solution is $c_1 = c_2$. Further, when

$$\frac{p_1}{p_2+t} > \frac{1}{\beta}$$

the solution is $c_1 < c_2$. When

$$\frac{p_1+t}{p_2} < \frac{1}{\beta}$$

the solution is $c_1 > c_2$.

In the following, we present a proposition summing up the observations above, and provide strict proof for the proposition (refer to Figure 5).

Proposition 2: Let (c_1,c_2) denote the choice made by the consumer faced with prices (p_1,p_2) and purchasing cost t. Here, the following holds.

$$\begin{aligned} \frac{p_1}{p_2+t} \le \frac{1}{\beta} \le \frac{p_1+t}{p_2} \quad &\Rightarrow c_1 = c_2, \\ \frac{p_1}{p_2+t} > \frac{1}{\beta} \quad &\Rightarrow c_1 < c_2, \\ \frac{p_1+t}{p_2} < \frac{1}{\beta} \quad &\Rightarrow c_1 > c_2. \end{aligned}$$

Proof: If consumption is chosen at a point other than where the budget line is curved, the indifference curve must touch the budget line at that point. The inclination of the indifference curve (its absolute value) when $c_1=c_2$ is $\frac{1}{\beta}$ so in the domain where $c_1<c_2$ (above the 45-degree line, hereinafter referred to as "upper domain"), the inclination of the indifference curve (its absolute value) is bigger than $\frac{1}{\beta}$. Conversely, in the domain where $c_1>c_2$ (below the 45-degree line, hereinafter referred to as "lower domain"), the inclination of the indifference curve (its absolute value) is smaller than $\frac{1}{\beta}$. The inclination of the budget line in the upper domain (its absolute value) is $\frac{p_1}{p_2+t}$, whereas the inclination of the budget line in the lower domain (its absolute value) is $\frac{p_1+t}{p_2}$. Also, $\frac{p_1}{p_2+t} < \frac{p_1+t}{p_2}$ holds. Therefore, when $\frac{p_1}{p_2+t} \le \frac{1}{\beta} \le \frac{p_1+t}{p_2}$ holds, consumption is chosen at the point where the budget line is curved, and $c_1= c_2$. Further, when $\frac{p_1}{p_2+t} > \frac{1}{\beta}$, $c_1<c_2$. When $\frac{p_1+t}{p_2} < \frac{1}{\beta}$, $c_1>c_2$.

(End of Proof)

2.3 Derivation of Synergies

In this Section, we attempt to derive synergies. Here, we conduct a partial equilibrium analysis on consumer behavior. Assume that the price of each commodity (p_1,p_2) is given. The inclination of the budget line (its absolute value) before conglomeration is $\frac{p_1+t}{p_2+t}$. The inclination of the budget line (its absolute value) after conglomeration depends on whether consumption is ultimately above or below the 45-degree line.

Let (c_1^0, c_2^0) and (c_1^1, c_2^1) denote consumption before and after conglomeration, respectively. Suppose $c_1^0 > c_2^0$ without loss of generality here. The following three cases can be considered with respect to consumption after conglomeration: (1) $c_1^1 > c_2^1$; (2) $c_1^1 = c_2^1$; and (3) $c_1^1 < c_2^1$. However, it is evident that $\frac{p_1+t}{p_2+t} < \frac{1}{\beta}$ holds based on Proposition 1. Thus, it is clear that Case (3) will not occur based on Proposition 2. This boils down to the following proposition.

Proposition 3: Suppose that the consumer faces prices (p_1,p_2) and purchasing cost t. Let (c_1^0, c_2^0) and (c_1^1, c_2^1) denote consumption before and after conglomeration, respectively. Assume that $\frac{p_1+t}{p_2} < \frac{1}{\beta}$ holds before conglomeration. In this case, the consumer's choice is $c_1^0 > c_2^0$. If (1) $\frac{p_1+t}{p_2} < \frac{1}{\beta}$ after conglomeration, $c_1^1 > c_2^1$, but if (2) $\frac{1}{\beta} \le \frac{p_1+t}{p_2}$, $c_1^1 = c_2^1$.

Case 1: In Case 1, the indifference curve touches the following budget line after conglomeration.

$$(p_1+t)c_1^1 + p_2c_2^1 = y$$

The inclination of this budget line (its absolute value) is $\frac{p_1+t}{p_2}$.

The synergies in this case can be calculated as follows. Let $q_1$denote the real price of Commodity i, including the purchasing cost. In other words, in Case 1, the real price changes from (p_1+t,p_2+t) before conglomeration to (p_1+t,p_2) after conglomeration.

The consumer's utility maximization problem is

$$\begin{aligned} &\max u(c_1) + \beta u(c_2) \\ &\text{subject to} \\ &q_1c_1 + q_2c_2 = y \end{aligned}$$

The first-order condition of this problem can be calculated by

$$\begin{aligned} &c1 : u'(c_1) - \lambda q_1 = 0 \\ &c2 : \beta u'(c_2) - \lambda q_2 = 0 \\ &\lambda : q_1 c_1 + q_2 c_2 = y \end{aligned}$$

The total differential of this condition is

$$\begin{aligned} &u''(c_1)dc_1 - q_1 d\lambda = \lambda dq_1 \\ &\beta u''(c_2)dc_2 - q_2 d\lambda = \lambda dq_2 \\ &- q_1 dc_1 - q_2 dc_2 = -dy + c_1 dq_1 + c_2 dq_2 \end{aligned}$$

This formula can be expressed in the form of a matrix as follows.

$$\begin{pmatrix} u''(c_1) & 0 & -q_1 \\ 0 & \beta u''(c_2) & -q_2 \\ -q_1 & -q_2 & 0 \end{pmatrix} \begin{pmatrix} dc_1 \\ dc_2 \\ d\lambda \end{pmatrix} = \begin{pmatrix} \lambda dq_1 \\ \lambda dq_2 \\ -dy + c_1 dq_1 + c_2 dq_2 \end{pmatrix}$$

Especially in Case 1, this formula becomes

$$\begin{pmatrix} u''(c_1) & 0 & -q_1 \\ 0 & \beta u''(c_2) & -q_2 \\ -q_1 & -q_2 & 0 \end{pmatrix} \begin{pmatrix} dc_1 \\ dc_2 \\ d\lambda \end{pmatrix} = \begin{pmatrix} 0 \\ \lambda dq_2 \\ c_2 dq_2 \end{pmatrix}$$

If $Ax = b$, then

$$|A| = -q_1^2 u''(c_1) - q_1^2 \beta u''(c_2) = -q_1^2 (u''(c_1) + \beta u''(c_2)) > 0$$

Let A_1 denote a matrix in which the first column of A is substituted with b. Then,

$$|A_1| = \begin{vmatrix} 0 & 0 & -q_1 \\ \lambda dq_2 & \beta u''(c_2) & -q_2 \\ c_2 dq_2 & -q_2 & 0 \end{vmatrix} = -q_1(\beta u''(c_2)c_2 + q_2\lambda)dq_2$$

Therefore,

$$dc_1 = \frac{|A_1|}{|A|} = \frac{(\beta u''(c_2)c_2 + q_2\lambda)}{q_1(u''(c_1) + \beta u''(c_2))} dq_2$$

From this, the following can be acquired.

$$\frac{dc_1}{dq_2} = \frac{|A_1|}{|A|} = \frac{(\beta u''(c_2)c_2 + q_2\lambda)}{q_1(u''(c_1) + \beta u''(c_2))} \tag{2}$$

Similarly, let A_2 denote a matrix in which the second column of A is substituted with b. Then,

$$|A_1| = \begin{vmatrix} u''(c_1) & 0 & -q_1 \\ 0 & \lambda dq_2 & -q_2 \\ -q_1 & c_2 dq_2 & 0 \end{vmatrix} = (q_1^2\lambda - q_2 u''(c_1)c_2)dq_2$$

Therefore,

$$dc_2 = \frac{|A_2|}{|A|} = \frac{(q_1^2\lambda - q_2 u''(c_1)c_2)}{-q_1^2(u''(c_1) + \beta u''(c_2))} dq_2$$

From this, the following can be acquired.

$$\frac{dc_2}{dq_2} = \frac{|A_2|}{|A|} = \frac{(q_1^2\lambda - q_2 u''(c_1)c_2)}{-q_1^2(u''(c_1) + \beta u''(c_2))} > 0 \tag{3}$$

Synergies: As the effective price of Commodity 2, denoted by q_2, falls from p_2+t to p_2 due to conglomeration, dq_2<0. Therefore, Formula (3) shows that dc_2>, meaning that the purchase volume of Commodity 2 increases. It is uncertain whether the purchase volume of Commodity 1 increases or decreases after conglomeration, because the sign in Formula (2) is undetermined.

Before conglomeration, purchasing cost t had to be borne independently upon purchasing Commodities 1 and 2. After conglomeration, however, although the purchasing cost has to be borne when buying a frequently-purchased commodity, it is possible to reduce the purchasing cost of a commodity that is bought at the same time as the frequently-purchased commodity. In the current case, Commodity 1 is the frequently-purchased commodity. Conglomeration brings about a reduction in the effective price of Commodity 2 purchased at the same time as Commodity 1. Accordingly, Commodity 2 is subject to a positive price effect and income effect simultaneously, resulting in an increase in purchase volume. However, Commodity 1 is subject to a negative price effect due to the increase in the relative effective price. Therefore, the relative magnitude of the negative price effect and the positive income effect determines whether the purchase volume ultimately increases or decreases.

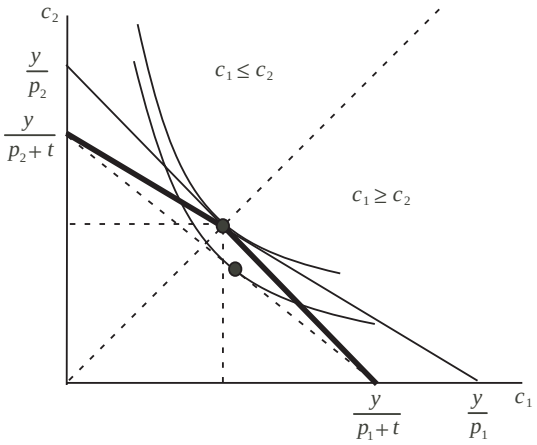

Figure 6: Synergies

Case (2): So far, we have looked at Case (1). Now, we analyze Case (2). Figure 6 illustrates a case in which the following holds.

$$\frac{p_1+t}{p_2+t} < \frac{1}{\beta} \le \frac{p_1+t}{p_2} \tag{4}$$

According to Formula (4),

$$\frac{p_1+t}{p_2+t} < \frac{1}{\beta}$$

Therefore, in cases where synergies do not exist, the consumer chooses consumption in the $c_1 > c_2$ domain. Also, based on Formula (4) again,

$$\frac{p_1}{p_2+t} \le \frac{1}{\beta} \le \frac{p_1+t}{p_2}$$

Thus, in cases where synergies do exist, the consumer chooses consumption in the $c_1 = c_2$ domain.

Synergies: In Case (2), $c_1 = c_2$. If $c_1 = c_2 = c$, then equilibrium consumption is

$$(p_1 + p_2 + t)c = y$$

This can be solved as follows.

$$c = \frac{y}{p_1 + p_2 + t}$$

As in Case 1, it shows that $c > c_2^0$, but it is uncertain whether or not consumption of Commodity 1 increases after conglomeration.

2.4 Model of Producer Side

In this Section, we build a model of producers (financial institutions) based on the analysis of consumer behavior conducted above. Our aim is to briefly describe producers by a model based on a simple markup principle.

Suppose that the producer of Commodity 1 and the producer of Commodity 2 each earn revenue μy from production (sales) y. Here, $\mu > 0$ is a constant. Assume that revenue after conglomeration is simply the sum of the revenues earned by the producers. Such simplification is made because this paper focuses on the changes in consumer behavior after conglomeration. As the volume of commodities purchased by the consumer increases due to conglomeration, the revenue of producers (financial institutions) will improve.

Summary: The following is a brief summary of the analysis based on the theoretical model. The volume of consumption (volume of sales) of each commodity before conglomeration (e.g., the amount borrowed from a bank, the amount of insurance purchased) was assumed to be $c_1^0 > c_2^0$. In other words, the volume of sales of Commodity 1 was assumed to be greater than that of Commodity 2. This means that Commodity 1 is the main commodity for this financial group in terms of sales volume. If a conglomerate is formed under these circumstances, consumers will purchase Commodity 2 at the same time as purchasing Commodity 1. As a result, the purchase volume of Commodity 2 will increase, leading to an increase in revenue at the division in charge of selling Commodity 2. However, the sales volume of Commodity 1 may decrease, because the purchase volume of Commodity 1 is subject to a negative income effect arising from the increased purchase of Commodity 1. If it does decrease, it may lead to a reduction in revenue at the division in charge of selling Commodity 1.

3. Empirical Analyses

The theoretical model introduced in Chapter 2 indicated the existence of revenue enhancement effects that arise when financial conglomerates deal in multiple financial products. In this Section, we conduct two types of empirical analyses on banking operations and insurance operations of financial conglomerates. The first type involves estimating the Cobb-Douglas revenue function based on the financial data of subsidiaries of financial conglomerates used by Maeda and Nagata (2003). The second type involves estimating the translog revenue function based on the divisional financial data of financial conglomerates. We estimate the translog revenue function for: two products (banking division and insurance division); and three products (personal banking division, corporate banking division, and insurance division)[7].

3.1 Estimation of Cobb-Douglas Revenue Function

Sample: We collected non-consolidated financial data of bank subsidiaries and insurance subsidiaries of each of the three financial conglomerates, namely, ING (Holland), Allianz (Germany) and Credit Suisse (Switzerland). As for the database, we used Bureau van Dijk's BankScope and ISIS for collecting data on bank subsidiaries and insurance subsidiaries, respectively. We recognized a company as a subsidiary of a financial group provided that the group as a whole had more than 50% ownership of the company. Specifically, we adopted affiliates in which the group had a total ownership[8] of more than 50% according to the databases. We broke down these subsidiaries into different types (bank, insurance and other) according to the attributes recorded in the database, and checked the attributes by referring to the annual reports and other documents published by each group. While we divided ING and Allianz into three types (banking, insurance and other), we collected data on Credit Suisse's securities subsidiaries separately, because its securities subsidiary Credit Suisse First Boston LLC and other affiliated securities subsidiaries could be independently categorized.

The sample consisted of 15 subsidiaries of the ING Group (7 banks and 8 insurance companies), 55 subsidiaries of the Allianz Group (8 banks and 47 insurance companies), and 28 subsidiaries of the Credit Suisse Group (4 banks, 20 insurance companies and 4 securities companies).

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[7] In general, it is extremely difficult to obtain divisional data of financial groups which cut across different types of businesses such as banking, securities and insurance, due to insufficient disclosure. Although there are some databases which have data on each type of business, there are no integrated databases which cut across different types of businesses.

[8] As financial conglomerates have complex internal shareholding structures, it is difficult to trace the movement of shares based on disclosed information only. For this reason, this paper applied "total ownership" provided by the Bureau van Dijk Ownership Database as the ownership criteria. Total ownership is the sum of the ratio of direct holdings and the ratio of indirect holdings in the subsidiary by the holding company of the financial group. The ratio of indirect holdings is calculated by Bureau van Dijk based on the annual reports of each company, information acquired through direct newsgathering, the U.S. Securities and Exchange Commission's database, data reported to security exchanges and various news reports.

Selection of Variables: The following variables were selected[9].

Revenue (R)

Revenue of bank subsidiaries: Net interest revenue + Commission revenue

Revenue of insurance subsidiaries: Gross premium written

Products: Earning assets (E)

Earning assets of bank subsidiaries

Total investments of insurance subsidiaries

Descriptive Statistics: The descriptive statistics of revenue and products have the following characteristics (Table 1).

		Average	Standard Deviation	Minimum	Maximum
ING Group					
Bank subsidiaries	Revenue	381	597	2	1,801
(7 companies)	Earning assets	22,375	26,748	243	101,055
Insurance subsidiaries	Revenue	360	546	43	1,449
(8 companies)	Earning assets	20,462	30,820	1,935	82,001
Allianz Group					
Bank subsidiaries	Revenue	709	1,579	12	4,880
(8 companies)	Earning assets	57,175	138,474	555	423,362
Insurance subsidiaries	Revenue	1,018	1,949	0	9,200
(47 companies)	Earning assets	6,139	18,434	4	106,653
Credit Suisse Group					
Bank subsidiaries	Revenue	1,667	2,512	46	6,013
(4 companies)	Earning assets	53,149	77,574	2,210	187,265
Insurance subsidiaries	Revenue	1,082	1,927	21	8,697
(20 companies)	Earning assets	6,133	13,548	30	60,199
Securities subsidiaries	Revenue	757	1,018	68	2,516
(4 companies)	Earning assets	50,589	84,998	7	197,802

Unit: million Euro (Excluding Credit Suisse Group; unit = million Swiss Franc)

Table 1: Descriptive Statistics (2003)

Estimation Equation: Estimate the Cobb-Douglas revenue function for each financial group, using the annual financial data from 1998 to 2003 which have been collected according to the criteria stated above, and conduct a quantitative analysis of the existence of revenue enhancement effects due to conglomeration. Use six years worth of data of each group as pooled data, and perform estimation by using the least-squares method for each type of business (banking, insurance) with respect to the following regression model.

$$R_{i,t} = a_0 + a_1 E_{i,t} + a_2 \overline{R}_{i,t} + u_{i,t} \qquad (5)$$

Here, assume that $R_{i,t}$ is the revenue of subsidiary i in period t, $E_{i,t}$ is the amount of earning assets of subsidiary i in period t, and $\overline{R}_{i,t}$ is the total revenue of subsidiaries engaged in other types of businesses from the viewpoint of subsidiary i in the financial group. Also, let $\overline{E}_{i,t}$ denote the total earning assets of subsidiaries engaged in other types of businesses from the viewpoint of subsidiary i in the financial group. (Depending on the way in which the variables are prepared, $\overline{R}_{i,t}$ and $\overline{E}_{i,t}$ will be a constant in each period.)

Coefficient a_2 of the term $\overline{R}_i$ is an indicator of the possibility of revenue enhancement effects existing due to conglomeration (if the value is negative, it represents revenue reduction effects). In other words, if a_2 equals zero, it means that most other types of financial businesses in the group will have no effect on the revenue of the subsidiary financial institution. If a_2 is a negative value, it means that the revenue of subsidiary financial institution i is decreasing in cases where other types of financial businesses in the group are active (the revenue of other types of businesses is increasing). If a_2 is a positive value, it means that the revenue of subsidiary financial institution i is increasing in cases where other types of financial businesses in the group are active (the revenue of other types of businesses is increasing).

[9] The revenue and earning assets of securities subsidiaries correspond to those of bank subsidiaries.

In addition to estimating Formula (5), estimate the following formula. Here, $\overline{E}_{i,t}$ is a variable introduced in place of $\overline{R}_{i,t}$ in Formula (5), as an indicator of the activity level of other types of financial businesses in the group.

$$R_{i,t} = a_0 + a_1 E_{i,t} + a_2 \overline{E}_{i,t} + u_{i,t} \quad (6)$$

	Sample	a_2:Formula (5)			a_2:Formula (6)		
		Estimate	*t*-value	$Adj.R^2$	Estimate	*t*-value	$Adj.R^2$
Bank subsidiaries							
ING Group	42	-.0035	-.6891	.9827	-.0009	-.4765	.9826
Allianz Group	48	-.0284	-2.3082 **	.9140	-.0039	-2.3747 **	.9146
Credit Swiss Group	24	.0145	.1562	.9728	.0022	.5395	.9731
Insurance subsidiaries							
ING Group	48	.0495	.1574	.7757	.0029	.5603	.7772
Allianz Group	282	-.0260	-.3232	.6616	.0006	.7725	.6622
Credit Swiss Group	120	-.0169	-.5080	.9385	-.0013	-.8666	.9388
Securities subsidiaries							
ING Group	-	-	-	-	-	-	-
Allianz Group	-	-	-	-	-	-	-
Credit Swiss Group	20	.1633	2.6393 **	.9620	.0031	1.3021	.9513

** and * are significant at 5% and 10%, respectively.

Table 2: Estimation Results of Cobb-Douglas Revenue Function

Estimation Results: The estimation results of the Cobb-Douglas revenue function with respect to a_2 in Formulae (5) and (6) are as shown below. (Table 2)

For the ING Group, the results show that the revenue of the insurance division benefits from the banking division's activities (i.e., synergies). It is evident that the insurance division's revenue enjoys (positive) synergies at a level of 5% from an increase in earning assets in banks and at a level of 10% from an increase in revenue in the banking division. For the Credit Suisse Group, it is clear that the securities division's revenue enjoys synergies arising from the activities of other divisions (banking and insurance divisions) at a level of 10% from revenue enhancement. These results indicate that there are certain revenue synergies when conglomerates run businesses in multiple sectors. They are in sharp contrast with the results obtained by Maeda and Nagata (2003), who measured economies of scope in costs by using the same dataset but failed to identify economies of scope in any of the divisions of these groups[10]. Economies of scope in costs at a level of 10% cannot be confirmed when the products are total assets (Formula (7)) or when the products are earning assets (Formula (8)).

[10] For reference, the estimation results of the cost function based on the pooled data used in this paper are shown in Table 3. The estimation equation of Table 3 is as follows.

For cost (*C*), suppose that the costs of bank subsidiaries consist of overheads and those of insurance subsidiaries consist of underwriting expenses.

$$\ln C_{i,t} = a_0 + a_1 \ln T_{i,t} + a_2 \ln \overline{T}_{i,t} + u_{i,t} \quad (7)$$

$$\ln C_{i,t} = a_0 + a_1 \ln E_{i,t} + a_2 \ln \overline{E}_{i,t} + u_{i,t} \quad (8)$$

The above assumes that the explanatory variables are total assets (*T*) and earning assets (*E*), and shows a_2 of Formulae (7) and (8) as the estimation results of the Cobb-Douglas cost function.

In Formula (7), $C_{i,t}$ denotes the cost of subsidiary *i* for period *t*, $T_{i,t}$ represents the amount of total assets of subsidiary *i* for period *t*, and $\overline{T}_{i,t}$ stands for the sum of total assets of subsidiaries engaged in other types of businesses from the viewpoint of subsidiary *i* in the group. (Depending on the way in which the variables are prepared, $\overline{T}_{i,t}$ will be a constant in each period.) Coefficient a_2 of the term $\overline{T}_i$ is an indicator of the possibility of economies of scope (or diseconomies of scope) being in existence. Put differently, if a_2 equals zero, it means that most other types of financial businesses in the group will have no effect on the costs of the subsidiary financial institution. If a_2 is a negative value, it means that the costs of subsidiary financial institution *i* are decreasing in cases where other types of financial businesses in the group are active (the revenue of other types of businesses is increasing). If a_2 is a positive value, it means that the costs of subsidiary financial institution *i* are increasing in cases where other types of financial businesses in the group are active (the revenue of other types of businesses is increasing).

Formula (8) is acquired by substituting *T* (total assets) in Formula (7) with *E* (earning assets).

Here, we further analyzed the securities division of the Credit Suisse Group, in which synergies were observed. As the results indicate that the securities division enjoys synergies from the activities of other divisions, we looked into whether the synergies are attributable to (1) the banking division (other-bank) or (2) the insurance division (other-insurance). The estimation equation is as follows.

$$R_{i,t} = a_0 + a_1 E_{i,t} + a_2 R_{other-bank\ i,t} + a_3 R_{other-insurance\ i,t} + u_{i,t}$$

Here, coefficient a_2 of the term $R_{other\text{-}bank\ i,t}$ is an indicator of the possibility of revenue enhancement effects existing in the securities division due to running a banking business as well (if the value is negative, it represents revenue reduction effects). Coefficient a_3 of the term $R_{other\text{-}insurance\ i,t}$ is an indicator of the possibility of revenue enhancement effects existing in the securities division due to running insurance business as well (if the value is negative, it represents revenue reduction effects).

	Sample	a_2:Formula (7)			a_2:Formula (8)		
		Estimate	*t*-value	$Adj.R^2$	Estimate	*t*-value	$Adj.R^2$
Bank subsidiaries							
ING Group	36	.4793	.3945	.8569	.5703	.4429	.8532
Allianz Group	40	.7442	.5657	.7624	.7120	.5195	.7622
Credit Swiss Group	20	.1433	.0758	.8757	.1706	.0977	.8734
Insurance subsidiaries							
ING Group	36	.4956	.5005	.7609	.5628	.5319	.7443
Allianz Group	232	.2920	.8525	.8590	.4316	1.1791	.8510
Credit Swiss Group	92	.1175	.1639	.8725	.1475	.1956	.8389
Securities subsidiaries							
ING Group	-	-	-	-	-	-	-
Allianz Group	-	-	-	-	-	-	-
Credit Swiss Group	12	.7498	.5016	.9638	2.4606	.5978	.7376

** and * are significant at 5% and 10%, respectively.

Table 3: Estimation Results of Cobb-Douglas Cost Function (Reference)

		a_2		a_3		
Securities Company	Sample	Estimate	*t*-value	Estimate	*t*-value	$Adj.R^2$
Credit Suisse Group	20	.1567	1.8414 *	.1756	1.4263	.9620

** and * are significant at 5% and 10%, respectively.

Table 4: Estimation Results of Cobb-Douglas Revenue Function (Credit Suisse Group)

In the Credit Suisse Group's securities division where synergies were observed, we revealed that the synergies originated from the banking division. On the other hand, synergies were hardly experienced by the insurance division.

3.2 Estimation of Translog Revenue Function (Two-product Model)

Next, we estimated a translog revenue function using the divisional data of financial conglomerates. This Section examines the economies of scope between the banking division and the insurance division by using data of these two divisions[11].

Sample: We selected the annual consolidated data of fourteen financial institutions from 2000 to 2003, from among financial institutions based in Euro-adopting nations with a total asset balance of at least $70 billion according to the BankScope database (73 financial institutions), and those with a total asset balance of at least $30 billion according to the ISIS database (32 financial institutions). The selected institutions each serve as the parent company of their respective financial groups, and data on net investment returns, gross premium written, deposit-taking (and short-term financing) and insurance reserves could all be confirmed in their annual reports.

[11] The basic approach to establishing the revenue functions in this Section complies with the method adopted by Hirota and Tsutsui (1992) mentioned earlier.

The following financial groups were selected.
Germany (2) Allianz, Deutsche Bank
Holland (4) ING, ABN AMRO, SNS Reaal, Eureko
France (5) Credit Agricole S.A., BNP Paribas, Caisse d'Epargne, Societe Generale, Banque Populaire
Belgium (3) Fortis, Dexia, Almanij

Selection of Variables: For products, define the respective stocks relating to two products, one produced by the banking division and the other by the insurance division. For revenue, adopt two variables.

Revenue (*R*)

R_1: Net investment returns (banking operations) + Gross premium written (insurance operations)

R_2: Net investment returns (banking operations) + Commission revenue (banking operations) + Gross premium written (insurance operations)

Products (*Y*)

Product of banking division (Y_B): Deposit-taking (and short-term financing)

Product of insurance division (Y_I): Insurance reserves

Descriptive Statistics: The descriptive statistics of revenue and products have the following characteristics (Table 5).

	Average	Standard Deviation	Minimum	Maximum
Net investment returns	5,589	3,945	200	16,125
Commission revenue	3,704	2,620	34	9,332
Gross premium written	11,848	16,722	112	55,978
Deposit-taking	295,289	154,878	6,974	503,556
Insurance reserves	66,255	93,482	482	343,931

Unit: million Euro

Table 5: Descriptive Statistics (2003, 14 Groups)

Formulation of Revenue Function: The revenue of financial conglomerates engaged in both banking operations and insurance operations is expressed as

$$R = r_B Y_B + r_I Y_I$$

provided that R is revenue, r_B is the rate of return of banking operations, Y_B is the product of banking operations, r_I is the rate of return of insurance operations, and Y_I is the product of insurance operations.
The rates of return are deemed to be dependent on the level of other products, rather than being constant for each operation. Accordingly, express r_B and r_I as a function of Y_B and Y_I as follows.

$$r_B = r_B(Y_B, Y_I), r_I = r_I(Y_B, Y_I)$$

This changes the formula above into

$$R = r_B(Y_B, Y_I), Y_B + r_I(Y_B, Y_I)Y_I$$

Apply Taylor approximation up to the second-order term of the log, and work out the translog revenue function. The result is

$$1nR = a_0 + a_B 1nY_B + \frac{1}{2} a_{BB}(1nY_B)^2 + a_I 1nY_I + \frac{1}{2} a_{II}(1nY_I)^2 + a_{BI} 1nY_B 1nY_I \quad (9)$$

In actual estimation, data on products (Y_B,Y_I) and revenue (R) were used by standardizing their respective average values to 1, in order to eliminate the effects of scale, etc.

Formulation of Economies of Scope in Revenue: Economies of scope in revenue refer to a situation in which the total revenue earned from multiple financial services is greater when produced collectively by one financial institution than when produced separately by different financial institutions. In other words, economies of scope in revenue exist when

$$R(Y_B, Y_I) > R(Y_B, 0) + R(0, Y_I)$$

The sufficient condition for economies of scope in revenue to exist between two products B and I is revenue complementarity. Put differently, the following must hold.

$$\frac{\partial^2 R}{\partial Y_B \partial Y_I} > 0$$

To be more specific,

$$\frac{\partial^2 R}{\partial Y_B \partial Y_I} = \frac{R}{Y_B Y_I}\left(\frac{\partial^2 1\mathrm{n}R}{\partial 1\mathrm{n}Y_B \partial 1\mathrm{n}Y_I} + \frac{\partial 1\mathrm{n}R}{\partial 1\mathrm{n}Y_B} \cdot \frac{\partial 1\mathrm{n}R}{\partial 1\mathrm{n}Y_I}\right) > 0$$

Further, as $\frac{R}{Y_B Y_I} > 0$, an indicator of revenue complementarity can be defined in concrete terms in the form of

$$\begin{aligned}
&\frac{\partial^2 1\mathrm{n}R}{\partial 1\mathrm{n}Y_B \partial 1\mathrm{n}Y_I} + \frac{\partial 1\mathrm{n}R}{\partial 1\mathrm{n}Y_B} \cdot \frac{\partial 1\mathrm{n}R}{\partial 1\mathrm{n}Y_I} \\
&= a_{BI} + (a_B + a_{BB} 1\mathrm{n}Y_B + a_{BI} 1\mathrm{n}Y_I) \cdot (a_I + a_{BI} 1\mathrm{n}Y_B + a_{II} 1\mathrm{n}Y_I) \\
&\equiv SCOPE(B, I) > 0
\end{aligned}$$

In actual validation, economies of scope are determined based on the average value of each dataset.
As $Y_B = 1$ and $Y_I = 1$, economies of scope in revenue exist if

$$SCOPE(B, I) = a_{BI} + a_B a_I > 0$$

On the other hand, economies of scale in revenue are determined on the basis of whether the increase in revenue is proportionately more or less than the increase in products when all products are multiplied by a certain figure. In a formula, economies of scale in revenue exist if the following exceeds 1.

$$\frac{\partial 1\mathrm{n}R}{\partial 1\mathrm{n}Y_B} + \frac{\partial 1\mathrm{n}R}{\partial 1\mathrm{n}Y_I}$$

To be more specific,

$$\begin{aligned}
&\frac{\partial 1\mathrm{n}R}{\partial 1\mathrm{n}Y_B} + \frac{\partial 1\mathrm{n}R}{\partial 1\mathrm{n}Y_I} - 1 \\
&= a_B + a_{BB} 1\mathrm{n}Y_B + a_{BI} 1\mathrm{n}Y_I + a_I + a_{BI} 1\mathrm{n}Y_B + a_{II} 1\mathrm{n}Y_I - 1 \\
&\equiv Scale(B, I) > 0
\end{aligned}$$

As in the case of economies of scope, in actual validation, economies of scale are determined based on the average value of each dataset. As $Y_B = 1$ and $Y_I = 1$, economies of scale in revenue exist if

$$Scale(B, I) = a_B + a_I - 1 > 0$$

Estimation Results: The estimation results of the translog revenue function are shown below (Table 6).
For both revenues R_1 (the sum of net investment returns and gross premium written) and R_2 (the sum of net investment returns, commission revenue and gross premium written), $SCOPE(B,I)$ was not significantly positive. Economies of scope could not be confirmed between banking operations and insurance operations[12].

[12] The data used in this study was pooled over a four-year period. In principle, the impact of the business cycle (price fluctuations) needs to be taken into account in this case. When making adjustments using a deflator, the problem is that the optimum deflator cannot be determined, because stock data (loans in the case of banks and insurance reserves in the case of insurance) is used for the products here, and also because of the lack of service price statistics in regard to flow data (net cash inflows and commission in the case of banks and gross premium written in the case of insurance). The estimation results are shown on the basis of the pooled data, having decided that commodity price adjustments are not necessary for the current analysis, as the European economy had faced low inflation on a global scale during this period. We performed an estimation using price-adjusted data based on the GDP deflator for the European region, but the conclusions turned out to be the same as those in this text, i.e., no revenue complementarity could be observed between banking operations and insurance operations. We also performed an estimation with dummy variables added to the model each year, and even a cross-sectional estimation each year, but the conclusions were again the same.

3.3 Estimation of Translog Revenue Function (Three-product Model)

In the previous Section, we could not confirm any economies of scope between banking operations and insurance operations. In this Section, we break down banking operations into personal banking and corporate banking, and then examine the economies of scope between banking operations and insurance operations. The theoretical model presented in Chapter 2 assumed the sale of bank products and insurance products to customers. Economies of scope between personal banking products and insurance products dealt with in this Section are deemed to be more appropriate for examining the theoretical model.

Revenue (R) Bank Product (Y_B) Insurance Product (Y_I)	R_1 Deposits Insurance Reserves	R_2 Deposits Insurance Reserves
Sample	56	56
$Adj.R^2$	.8969	.9195
a_0	-.0584	-.0109
a_B	.2477 **	.4580 ***
a_I	.6659 ***	.5381 ***
a_{BB}	.1562 ***	.2503 ***
a_{BI}	-.1372 ***	-.1772 ***
a_{II}	.1591 ***	.1255 ***
Scale	-.0864	-.0039
	(-.7157)	(-.0374)
SCOP E(B, I)	.0278	.0693
	(.3120)	(1.0363)

***, ** and * are significant at 1%, 5% and 10%, respectively.
R_1: Net investment returns + Gross premium written
R_2: Net investment returns + Commission revenue + Gross premium written
The figure in the parentheses of *Scale* and *SCOPE*(B,I) is t-value.

Table 6: Estimation Results of Translog Revenue Function

Formulation of Revenue Function: Based on Formula (9), break down the products of banking operations into personal loans (Y_1) and corporate loans (Y_2). Work out the translog revenue function of products (Y_1) and (Y_2) combined with insurance reserve (Y_3), which is an insurance product. The result is[13]

$$\ln R = a_0 + \sum_{i=1}^{3} a_i \ln Y_i + \frac{1}{2}\sum_{i=1}^{3}\sum_{j=1}^{3} a_{ij} \ln Y_i \ln Y_j \qquad (10)$$

Selection of Variables: The following variables were selected.

Revenue (R)

R_1: Net investment returns (banking operations) + Gross premium written (insurance operations)

R_2: Net investment returns (banking operations) + Commission revenue (banking operations) + Gross premium written (insurance operations)

Product (Y)

Product of banking division (Y_1): Personal loans

Product of banking division (Y_2): Corporate loans

Product of insurance division (Y_3): Insurance reserves

Descriptive Statistics: The descriptive statistics of revenue and products have the following characteristics.

Formulation of Economies of Scope: Economies of scope in revenue exist if the following holds with respect to two arbitrary divisions out of the three divisions (three combinations)[14].

$$SCOPE(i, j) = a_{ij} + a_i a_j > 0 \; (i, j = 1,2,3)$$

[13] Loans can be divided into personal loans and corporate loans in the following financial groups. The characteristics of the descriptive statistics of products and revenue are as shown in Table 7.

Germany (1) Deutsche Bank
Holland (4) ING, ABN AMRO, SNS Reaal, Eureko
France (5) Credit Agricole S.A., BNP Paribas, Caisse d'Epargne, Societe Generale, Banque Populaire
Belgium (2) Fortis, Almanij

[14] Economies of scale in revenue exist if $Scale = a_1 + a_2 + a_3 - 1 > 0$.

	Average	Standard Deviation	Minimum	Maximum
Net investment returns	4,918	2,817	200	9,723
Commission revenue	3,722	2,645	34	9,332
Gross premium written	8,974	12,162	112	45,519
Personal loans	57,625	37,246	14,362	148,551
Corporate loans	103,388	59,625	2,772	193,055
Insurance reserves	47,791	56,275	482	198,035

Unit: million Euro

Table 7: Descriptive Statistics (2003, 12 Groups)

Specifically, bearing in mind that personal loans (Y_1), corporate loans (Y_2), and insurance policy reserves (Y_3) are adopted as products of personal banking operations, corporate banking operations and insurance operations, respectively, economies of scope in revenue exist between the personal banking division and the corporate banking division if

$$SCOPE(1,2) = a_{12} + a_1 a_2 > 0$$

Economies of scope in revenue exist between the corporate banking division and the insurance division if

$$SCOPE(2,3) = a_{23} + a_2 a_3 > 0$$

Economies of scope in revenue exist between the personal banking division and the insurance division if

$$SCOPE(1,3) = a_{13} + a_1 a_3 > 0$$

Here, the synergies in financial services targeted at consumers must be analyzed in order to confirm the theoretical model presented in Chapter 2. This involves examining the economies of scope between the personal banking division and the insurance division, that is,

$$SCOPE(1,3) = a_{13} + a_1 a_3 > 0$$

Estimation Results: The estimation results of the translog revenue function are shown below (Table 8).
Economies of scope between the personal banking division and the insurance division were significant at a level of 1%, when the sign condition was satisfied in the following.

$$SCOPE(1,3) = a_{13} + a_1 a_3 > 0$$

The results indicating that revenue synergies exist between the personal banking division and the insurance division are consistent with the theoretical model presented in Chapter 2[15].
On the other hand, economies of scope between the corporate banking division and the insurance division, represented by the following, were significant at a level of 1%, but the sign condition was reversed.

$$SCOPE(2,3) = a_{23} + a_2 a_3 > 0$$

This indicates that diseconomies of scope exist between corporate loans and insurance. Such findings are difficult to determine and interpret, based on the analysis results of the current study alone. At least they showed the significance of analyzing the synergies between banking operations and insurance operations by clearly distinguishing between household services (retail) and corporate services (wholesale) for future studies, in addition to observing the aforementioned synergies between the personal banking division and the insurance division[16].

[15] Due to limited data, we distinguished between individual clients and corporate clients only for loans in this study. No deposit data which distinguishes between individual clients and corporate clients were available.

[16] As in the previous Section, the data used was pooled over a four-year period. The estimation results are shown on the basis of the pooled data, for the same reason as in the previous Section. We performed an estimation using price-adjusted data based on the GDP deflator for the European region, but the conclusions turned out to be the same as those in this text, i.e., no revenue complementarity could be observed between banking operations and insurance operations. We also performed an estimation with dummy variables added to the model each year, and even a cross-sectional estimation each year, but the conclusions were again the same.

Revenue(R) Bank product 1 (Y_1) Bank product 2 (Y_2) Insurance product (Y_3)	R_1 Personal loans Corporate loans Insurance reserves	R_2 Personal loans Corporate loans Insurance reserves
Sample	48	48
$Adj.R^2$	.9645	.9649
a_0	.0823	.1387 **
a_1	.4929 ***	.3342 ***
a_2	-.2078 **	.0360
a_3	.5879 ***	.4819 ***
a_{11}	-.1731	-.3715 **
a_{12}	.2417 **	.2377 **
a_{13}	.0459	.0573
a_{22}	-.1161	-.0313
a_{23}	-.2562 ***	-.2839 ***
a_{33}	.1840 ***	.1747 ***
Scale	-.1270 *	-.1479 *
	(-1.6804)	(-1.9590)
SCOP E (1, 2)	.1392	.2497 **
	(1.2421)	(2.3510)
SCOP E (1, 3)	.3356 ***	.2183 ***
	(6.0131)	(4.0472)
SCOP E (2, 3)	-.3784 ***	-.2665 **
	(-3.2420)	(-2.5373)

***, ** and * are significant at 1%, 5% and 10%, respectively.
R_1: Net investment returns + Gross premium written
R_2: Net investment returns + Commission revenue + Gross premium written
The figure in the parentheses of *Scale* and *SCOPE*(i,j) is t-value.

Table 8: Estimation Results of Translog Revenue Function (3 Products)

3.4 Consistency with Theoretical Model

The theoretical model presented in Chapter 2 implies that if a conglomerate is formed, the division with branches that are more frequently accessed by customers has revenue spillover effects into other divisions. In that sense, according to empirical analysis, the banking division can be regarded as the division with branches that are more frequently accessed by customers, for the purpose of withdrawing deposits, making transfer requests, opening accounts, and so on.

The estimation results of the Cobb-Douglas revenue function using subsidiary data in Chapter 3, Section 1 (Table 2) show that ING's insurance division and Credit Suisse's securities division have significant economies of scope in revenue. On the other hand, no economies of scope were detected in their banking divisions. The analysis results are consistent with the theoretical model, which implies that the economies-of-scope mechanism flows from the banking division to other divisions[17]. Spillover effects originating from the banking division in the form of economies of scope were also detected in the results of Table 4.

In the estimation of the translog revenue function using the divisional data of conglomerates in Chapter 3, Section 3, we analyzed the banking operations by breaking them down into personal banking and corporate banking. As shown in Table 8, economies of scope were detected between the personal banking division and the insurance division. The results are consistent with the theoretical model, which implies that there are revenue spillover effects from the division with branches that are more frequently accessed by customers into other divisions.

[17] No significant economies of scope in revenue could be confirmed other than in ING's insurance division and Credit Suisse's securities division. These results may be attributable to the following. Firstly, (1) A considerable amount of time might be required in order to realize economies of scope in revenue by conglomeration. ING became a financial conglomerate through the merger of Nationale Netherlanden (an insurance company) and NMB Postbank (a bank) in 1991. Credit Suisse acquired First Boston Securities in 1988. On the other hand, Credit Suisse acquired Winterthur (an insurance company) in 1997, while Allianz acquired Dresdner Bank in 2001—both are recent events.
As none of the groups disclose any figures on the cross-selling of bank products and insurance products, it is difficult to gain knowledge about their actual sales situation. Nonetheless, we obtained testimonies through interviews with sources close to the groups. According to them, it takes at least a few years to actually bring about the effects of conglomeration, based on the fact that it took five years (1992 to 1997) for the gross premium written by ING's bank branches to increase from 2.5% to 12% of the total amount of the insurance division (Nationale Netherlanden). More time may be needed for the effects of Allianz's acquisition of Dresdner Bank and Credit Suisse's acquisition of Winterthur to become noticeable.

4. Conclusion

One of the aims of forming a financial conglomerate is to demonstrate synergies by running multiple types of businesses at the same time. This paper took the position that synergies due to conglomeration can be identified on two levels, namely, cost effects and revenue effects, and examined the latter—the revenue enhancement effects brought about by conglomeration. In Chapter 2, we presented a theoretical model of revenue enhancement brought about by establishing the brand image and one-stop shopping in light of consumer costs. In Chapter 3, we measured the economies of scope in revenue experienced by European financial conglomerates. Consequently, we confirmed the existence of economies of scope in revenue between the personal banking division and the insurance division, in a manner consistent with the theoretical model.

The results of this study are significant when compared with cost synergies. Revenue synergies were confirmed between banking operations and insurance operations, whereas cost synergies were not observed in other preceding studies, including Maeda and Nagata (2003) who used the same dataset as in this study. It is worth noting that the results of this study were consistent with the responses from the top management of financial institutions to the questionnaire survey conducted by the Group of Ten (2000). Put differently, *revenue enhancement by product diversification (realization of one-stop shopping, etc.)* is the most important motivator for financial conglomeration; *cost reduction by product diversification* is only of secondary importance. The analysis in this study underpins the fact that the top management of financial institutions are motivated by revenue enhancement effects rather than cost reduction when going ahead with financial conglomeration.

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