An Empirical Analysis of the Effect of Corporate Group Structure on Profitability

by Keisho Komoto
Economic Research Group
komoto@nli-research.co.jp

1. Introduction

Modern large companies rarely operate alone; most belong to a corporate group comprised of subsidiaries and affiliated companies. A typical example is Sony Corporation, which as of March 2002 boasted the largest number of consolidated subsidiaries at 1,068.

However, the number and size of subsidiaries held by a company vary widely depending on the company. While major electrical equipment manufacturers Sony and Matsushita Electric Industrial (MEI) have similar consolidated sales of ¥7.6 trillion and ¥6.9 trillion respectively, MEI has only 303 subsidiaries compared to 1,068 for Sony. In addition, Sony accounts for 34.9% of the group's consolidated sales, compared to 56.7% for MEI. Clearly, Sony is more active in creating subsidiaries than MEI.

Do differences in corporate group structure affect corporate performance? In general, business results are not necessarily the same for an internal business unit that operates within a company as for a subsidiary that operates independently. If outside capital is introduced to form a subsidiary, the new ownership structure clearly causes corporate behavior to change. Moreover, the business activities of a wholly-owned subsidiary tend to differ from that of an internal unit. This is because a subsidiary can produce positive effects by adopting self-supporting management, introducing employment and wage systems specific to a particular region, industry, or business category, and enjoying the merits of small-scale management (Endo, 1988). On the other hand, it can also produce negative effects by creating redundancy in back-office operations, obstructing information flows between parent and subsidiary or between subsidiaries, and diluting parent company control over rebellious subsidiaries that stray from group objectives. Depending on how these positive and negative effects come into play, subsidiaries can affect overall corporate performance in different ways.

In this paper, we present two indicators to quantify the composition of subsidiaries in the corporate group structure, and analyze how subsidiary strategies affect corporate performance. The research literature on subsidiaries includes Ito and Hayashida (1995), Ito and Hayashida (1997), Ito et al. (1997), and Ito et al. (2002). These, however, focus on the relationship between subsidiaries and delegation of authority, and between the governance

structure of subsidiaries and subsidiary performance, rather than between corporate group structure and group performance. Moreover, while advanced studies have been done mainly in the West on how corporate organization affects corporate performance, their aim is to empirically confirm Chandler's (1962) thesis that the multidivisional form of organization is superior to functional separation for diversified companies, and not to analyze the effect of corporate structure as it pertains to subsidiaries.[1] Thus to our knowledge, this paper is the first to empirically analyze the relationship between corporate group structure and corporate performance, taking advantage of Japan's unique accounting system, which makes available both unconsolidated and consolidated financial statements.

In Section 2, we present two methods for quantifying the subsidiary composition of the corporate group structure. Section 3 examines the relationship between corporate group structure and profitability, while Section 4 describes the data used and method of empirical analysis. Section 5 discusses the results of the empirical analysis, and Section 6 presents conclusions and raises issues for further study.

2. Two Methods for Quantifying Corporate Group Structure

The composition of subsidiaries in the corporate group structure can be quantified in two ways using available data. As explained below, both methods have advantages and drawbacks as indicators.

The first method, called the subsidiary count indicator, counts the number of consolidated subsidiaries in the corporate group.[2] Since the number of consolidated subsidiaries tends to increase with business size, the subsidiary count is standardized using consolidated revenue (in billion yen) as follows.

Subsidiary count indicator = No. of consolidated subsidiaries / Consolidated revenue

A drawback of this indicator is that it fails to reflect the size of subsidiaries.

The second method is the revenue indicator, and focuses on the size disparity between the parent company and overall group. In other words, it measures the size of business operations separated off from the parent company. Using sales revenue again to express

[1] Major studies include Armour and Teece (1978), Steer and Cable (1978), Teece (1981), and Thompson (1981).
[2] Unconsolidated subsidiaries and affiliated companies are excluded because data is unavailable for companies that do not file consolidated financial statements.

business size, the indicator is measured as follows.[3]

Revenue indicator = Unconsolidated revenue / Consolidated revenue

With the revenue indicator, if a company does not have any consolidated subsidiaries (does not file consolidated financial statements), the resulting indicator value is one. In addition, a pure holding company with zero or near zero revenue would also have an indicator value of zero or near zero. This method, however, has two drawbacks. First, it does not reflect the number of subsidiaries. The second problem is one of measurement. For example, consider a subsidiary that supplies components only to the parent company. Since the subsidiary's revenue is offset in the process of consolidating financial statements, unconsolidated and consolidated revenue are equivalent. Thus the indicator is equal to one, or exactly the same as for the case where there is no subsidiary.[4] Strictly speaking, the revenue indicator measures the extent to which subsidiaries generate revenue outside of the group.[5]

3. Relationship Between Corporate Group Structure and Profitability

3.1 Subsidiary Count Indicator and Profitability

The relationship between the subsidiary count indicator and profitability can be thought of as follows. Theoretically, it is possible to separate off internal operations at a very detailed level. To take an extreme case, each employee could be spun off as a separate company. However, there are costs associated with creating subsidiaries, such as the need to compile financial statements for each company. In addition, creating subsidiaries might produce almost no improvement in operating efficiency. Thus increasing the number of subsidiaries beyond a certain point would hurt profitability. However, in accommodating diversification or expansion, subsidiaries can improve operating efficiency by establishing a flexible structure suited to the characteristics of the particular locale and type of business. In this case, a single company performing all operations can improve profitability by separating off some of

[3] While business size can also be expressed by total assets, we prefer to use revenue for the following reason. Consider a pure holding company, the organizational form for which the subsidiary composition is most advanced. Since the shares of owned subsidiaries are included as assets on the parent company's (unconsolidated) balance sheet, the ratio of unconsolidated to consolidated total assets would not equal zero. Thus the subsidiary composition would appear more advanced for a business holding company than a pure holding company. On the other hand, since the unconsolidated revenue of a pure holding company is zero or near zero, the ratio of unconsolidated to consolidated revenue would also be near zero. Thus we can ensure the desired characteristic of the indicator—the more a company resembles a pure holding company, the smaller the indicator's value.

[4] In addition, unconsolidated revenue may even exceed consolidated revenue. For example, a subsidiary might only supply products to the parent company, and also purchase manufacturing equipment from the parent company.

[5] Since subsidiaries who only sell products to the parent company strongly resemble an internal division, they do not significantly affect the measurement of subsidiary composition.

its operations. Thus there must exist some optimal number of subsidiaries from the perspective of profitability.

Assuming there exists an optimal number of subsidiaries, the next issue is whether rationally behaving companies will constantly achieve the optimal number of subsidiaries. However, we know that companies do not always respond sensitively to changes in the business environment. While there are many reasons for this (Colombo and Delmastro, 2002), two reasons are most important. First, because uncertainties in society keep us from knowing beforehand when it is optimal to change the organization, managers tend to maintain the present organizational structure until poor business results necessitate change. This conforms to the real option approach, in which under uncertainty, decisions associated with sunk costs are deferred until uncertainty decreases. Second, when a company plans organizational reform, it can trigger unproductive activity (political activity within the company) among employees trying to protect their own interests. This risk can persuade managers to postpone organizational reform.

Because of such impediments to organizational change, companies may have more or less than the optimal number of subsidiaries.[6] Since companies with too many or too few subsidiaries are operating at less than optimal efficiency, their performance should also be less than optimal.

3.2 Revenue Indicator and Profitability

The relationship between the revenue indicator and profitability depends on how the corporate organization is being managed. For example, if operational efficiency is enhanced by a pure holding company that specializes in conducting corporate strategy, the indicator will correlate positively with profitability. However, if the pure holding company cannot adequately perform head office functions, efficiency will decline compared to other organizational forms. Thus before hypothesizing the relationship between the revenue indicator and profitability, we must first examine the data, and focus on how well head office functions are being performed for the corporate group.

[6] Setting up a new subsidiary is relatively easy because it expands operations and increases the number of posts. However, undoing an existing subsidiary can present problems due to opposition from the subsidiary's managers. Thus many companies have too many subsidiaries, a point often raised in the news media.

4. Data Analysis Method

4.1 The Dataset

We surveyed all publicly listed companies, excluding financial institutions, air transport, electric power, and gas companies. Financial institutions were excluded because their financial statements differ significantly from operating companies, while electric power, gas and air transport companies are excluded because they belong to highly regulated industries, and are also few in number. We collected financial statement data for fiscal years ending in March 31, 2000 to March 31, 2002, providing a maximum of three years of panel data. The start date was chosen because of the significant revision in consolidated accounting rules from this date.[7] Moreover, we excluded companies with a nonstandard fiscal year. As a result, a total of 9,195 companies were included in the analysis. All corporate financial data was obtained from Nikkei QUICK. We obtained composite results for all industries as well as for individual industries. Individual industries conform to the Nikkei industry classification.[8]

4.2 Descriptive Statistics

The distribution of ownership of consolidated subsidiaries is shown in Table 1. Approximately 20% of companies do not own any subsidiaries, while 75% have no more than ten subsidiaries, and over 90% have no more than 30. Thus Japan's publicly traded companies have fewer subsidiaries than is generally assumed.

[7] Two major revisions were made to accounting rules. First, the scope of inclusion for consolidated accounting was expanded from a majority control standard for subsidiaries (with over 50% ownership) to an influence standard that emphasizes actual control. Second, disclosure rules were also revised to target in on consolidated reporting.

[8] The Nikkei industry classification consists of 17 industries in manufacturing, and 19 industries in non-manufacturing.

Table 1　Distribution of Ownership of Consolidated Subsidiaries

Consolidated subsidiaries owned	No. of companies	Composition (%)	Cumulative composition (%)
0	686	19.9	19.9
1	338	9.8	29.6
2	315	9.1	38.8
3	261	7.6	46.3
4	237	6.9	53.2
5	201	5.8	59.0
6～10	556	16.1	75.1
11～20	387	11.2	86.3
21～30	180	5.2	91.5
31～50	125	3.6	95.1
51～100	88	2.5	97.7
101～300	65	1.9	99.6
301 +	15	0.4	100.0
Total	3,454	100.0	—

The distribution of the subsidiary count indicator is shown in Table 2. The most frequent range for this ratio is 0.1 to 0.2 subsidiaries per billion yen—that is, from one to two subsidiaries per ten billion yen in revenue—comprising approximately 20% of companies. Disparities between companies are rather large, with approximately half (47.3%) of companies having one or less subsidiary per billion yen in revenue, while approximately 20% have three or more subsidiaries.

Table 2　Distribution of Subsidiary Count Indicator

Indicator value	No. of companies	Composition (%)	Cumulative composition (%)
0	686	19.9	19.9
0 ＜ x ≤ 0.05	415	12.0	31.9
0.05 ＜ x ≤ 0.1	533	15.4	47.3
0.1 ＜ x ≤ 0.2	744	21.5	68.8
0.2 ＜ x ≤ 0.3	413	12.0	80.8
0.3 ＜ x ≤ 0.5	358	10.4	91.2
0.5 ＜ x ≤ 1.0	226	6.5	97.7
＞ 1.0	79	2.3	100.0
Total	3,454	100.0	—

Note: Indicator is the ratio of number of subsidiaries per billion yen in revenue.

Finally, the distribution of the revenue indicator is shown in Table 3. The most common ratio is between 0.95 up to 1(22.1% of companies), followed by exactly 1 (21.3%), meaning that

unconsolidated and consolidated revenue are equal. The ratio of unconsolidated revenue is less than 70% for 15.2% of companies, and less than 50% for only 4.2% of companies. Thus in terms of revenue composition, we find that not many companies are pursuing a more advanced subsidiary composition.

Table 3 Distribution of Revenue Indicator

Indicator value	No. of companies	Composition (%)	Cumulative composition (%)
0 ≤ x < 0.1	8	0.2	0.2
0.1 ≤ x < 0.5	137	4.0	4.2
0.5 ≤ x < 0.7	380	11.0	15.2
0.7 ≤ x < 0.8	374	10.8	26.0
0.8 ≤ x < 0.9	581	16.8	42.8
0.9 ≤ x < 0.95	435	12.6	55.4
0.95 ≤ x < 1.0	764	22.1	77.6
1.0	734	21.3	98.8
> 1.0	41	1.2	100.0
Total	3,454	100.0	—

4.3 Regression Analysis

To analyze how corporate group structure affects corporate performance, we performed a regression analysis of the panel data using corporate performance as the explained variable, and corporate group structure as the explanatory variable.

For the explained variable, corporate performance, we used return on assets (RIEKI), which is calculated using earnings before interests and taxes as follows:

Return on assets = EBIT / Total assets * 100

For the explanatory variables, we used the subsidiary count indicator (KOGAISHA), revenue indicator (RENTAN), and consolidated revenue (KIBO, in million yen, log value). We included both indicators of corporate group structure because to observe the effect of either indicator, it is necessary to eliminate the effect of the other. For reference purposes, we also analyzed the data using only one indicator at a time.

We also considered the possibility that corporate group structure and corporate performance do not have a simple linear relationship. As we saw in the relationship between the subsidiary count indicator and corporate performance, corporate performance can improve as the composition of subsidiaries grows from a low initial level, but declines when the composition exceeds a certain level. To capture this nonlinear effect, we conducted the

following transformation of KOGAISHA and RENTAN.[9]

For the KOGAISHA transformation, we set KLEVEL1 and KLEVEL2 at arbitrary values, and calculated KOGAISHA 1～3 as follows:

$$\begin{aligned}
\text{KOGAISHA1} &= \text{KOGAISHA} && (\text{if KOGAISHA} < \text{KLEVEL1})\\
&= \text{KLEVEL1} && (\text{if KOGAISHA} \geqq \text{KLEVEL1})\\
\text{KOGAISHA2} &= 0 && (\text{if KOGAISHA} < \text{KLEVEL1})\\
&= \text{KOGAISHA} - \text{KLEVEL1} && (\text{if KLEVEL1} < \text{KOGAISHA} \leqq \text{KLEVEL2})\\
&= \text{KLEVEL2} - \text{KLEVEL 1} && (\text{if KOGAISHA} \geqq \text{KLEVEL2})\\
\text{KOGAISHA3} &= 0 && (\text{if KOGAISHA} < \text{KLEVEL2})\\
&= \text{KOGAISHA} - \text{KLEVEL2} && (\text{if KOGAISHA} \geqq \text{KLEVEL2})
\end{aligned}$$

Thus for KOGAISHA1～3, the following relationship holds:

$$\text{KOGAISHA} = \text{KOGAISHA1} + \text{KOGAISHA2} + \text{KOGAISHA3}$$

KOGAISHA 1 measures the effect for a low-level subsidiary composition, while KOGAISHA 2 measures the effect for a mid-level subsidiary composition, and KOGAISHA 3 that of an advanced level.

Similarly, for RENTAN we set RLEVEL1 and RLEVEL2 at arbitrary values, and formulated variables RENTAN1, RENTAN2, and RENTAN3. We note here that an advanced subsidiary composition is denoted by large values for KOGAISHA1～3, but by small values for RENTAN1～3.

Regarding the value combinations for (KLEVEL1, KLEVEL2) and (RLEVEL1, RLEVEL2), we set the basic combination at (0.1, 0.3) and (0.8, 0.95) respectively, which are the values that divide the sample into three evenly sized groups. However, we also performed analyses using RLEVELs of (0.9, 0.95) and (0.95, 0.975). In Table 4, the analytical results for (0.8, 0.95) are denoted by “All industry 1,” (0.9, 0.95) by “All industry 2,” and (0.95, 0.975) by “All industry 3.” The results by industry are estimated using (0.8, 0.95).

5. Analytical Results

Based on the results shown in Table 4, below we examine the effect of the subsidiary count indicator and revenue indicator on corporate performance.

[9] This transformation conforms to Morck et al. (1988).

5.1 Subsidiary Count Indicator and Profitability

Looking at the All industry results (All industry 1～3), we find that coefficient values for KOGAISHA1 and KOGAISHA3 are positive but not statistically significant. However, the coefficients for KOGAISHA2 are negative and statistically significant. This result indicates that if company size and ratio of revenue generated by subsidiaries outside of the parent company are held constant, corporate performance is unaffected by an increase in subsidiaries for a subsidiary count of less than one subsidiary per billion yen in revenue, but deteriorates if there are one to three subsidiaries. For three or more subsidiaries, an increase in subsidiaries does not affect corporate performance. This result supports the hypothesis that of the subsidiary ratio exceeds a certain level, the number of subsidiaries is excessive, and profitability declines.

For the results by industry, many of the statistically significant coefficient values for KOGAISHA1～3 are negative. This indicates that in many industries, profitability declines if the subsidiary count exceeds a certain level. For instance, in industries such as chemicals, non-ferrous metals, machinery, mining, other land transport, and communications, the fewer the subsidiaries relative to company size (revenue), the better corporate performance is. Textiles and services are of particular interest because statistically significant positive values are observed for KOGAISHA3 for textiles, and KOGAISHA2～3 for services—in other words, having a larger number of subsidiaries increases corporate performance for textiles at the KOGAISHA3 level, and for services at the KOGAISHA2 level. This reflects how textile companies are withdrawing from the core textile business and improving profitability by diversifying and cost-cutting through subsidiaries, while labor-intensive service businesses are forming subsidiaries to optimize their organizational management.

5.2 Revenue Indicator and Profitability

For the All industry 1&2 results, where (RLEVEL1, RLEVEL2) is set at (0.8, 0.95) and (0.9, 0.95) respectively, statistically significant positive values are observed for RENTAN1～3. Unlike KOGAISHA values, RENTAN values decrease as subsidiary composition increases, and negative coefficients denote a positive effect. Thus the results indicate that the more operations are transferred to subsidiaries, the worse corporate performance becomes. However, for All industry 3, for which RLEVELs are set at (0.95, 0.975), RENTAN3 is positive but statistically insignificant, indicating that if the revenue indicator does not exceed 0.975, the negative effect of creating subsidiaries tends to disappear. RENTAN1 measures the effect of new subsidiaries when the subsidiary composition is already advanced, such as for a pure holding company where most parent company functions have been transferred to subsidiaries. RENTAN2 measures the effect of new subsidiaries at a less advanced stage of subsidiary composition. The results indicate that if the subsidiary

composition is excessive as measured by the revenue indicator, the effect of creating more subsidiaries is negative.

By industry, despite statistically significant values for RENTAN1 in real estate and RENTAN2 in mining, most industries share the same trend as the all industry results, with RENTAN1 having statistically significant positive values in 13 industries and RENTAN2 in 12 industries. As for RENTAN3, statistically significant results are fewer, while more of them tend to be negative. Thus companies in some industries have been able to improve profitability by transferring a small portion of business operations to subsidiaries.

One implication of our results is that while an advanced revenue indicator makes it all the more critical for parent companies to focus on conducting corporate strategy, we seldom see Japanese companies doing so when they add subsidiaries. As a result, creating subsidiaries often fails to produce the intended results.

6. Conclusion

We have attempted to quantify the composition of subsidiaries in the corporate group structure of Japan's publicly listed companies, and examine how it affects corporate performance. We proposed two methods for quantification—the subsidiary count indicator, in which the number of subsidiaries is standardized by consolidated revenue, and the revenue indicator, which compares unconsolidated revenue to consolidated revenue—and empirically measured both indicators using corporate data. Contrary to general perceptions, we found that most companies do not have a large number of subsidiaries in their corporate group structure.

Regarding the relationship between corporate group structure and group performance, starting from the theoretical and empirical result that companies do not always react sensitively to the business environment, and recognizing that corporate group structure affects corporate performance in different ways, we performed an empirical analysis of the panel data. We found that when the subsidiary count indicator exceeds a certain level, creating more subsidiaries tends to hurt corporate performance. However, for declining industries such as textiles, where diversification has proven to be an effective strategy, increasing the number of subsidiaries appears to improve corporate performance. Regarding the revenue indicator, we found that keeping the majority of functions inhouse while delegating only a portion of operations to subsidiaries tends to improve corporate performance. In pursuing a more advanced subsidiary composition as measured by the revenue indicator, corporate strategy becomes an increasingly critical function of the parent

company. However, our results show that Japanese companies aggressively create subsidiaries generally do not give adequate consideration to formulating and executing corporate strategy.

Finally, several issues are raised by our analysis. While we have assumed that corporate group structure determines corporate performance, the reverse causal relationship can also exist—corporate performance can determine the development of corporate group structure. For instance, in declining industries such as textiles, companies often attempt to cut costs by separating off weak divisions into subsidiaries. Our analysis does not consider this reverse causal relationship. Also, we have not considered the fact that subsidiaries are formed with objectives and methods, which can affect corporate performance in a variety of ways. These issues will need to be addressed in a future study.

Table 4　Analytical Results

Industry	Sample size	KOGAI-SHA1	KOGAI-SHA2	KOGAI-SHA3	RENTAN1	RENTAN2	RENTAN3	Revenue	CONST	Adj R2	Hausman test	Type
All industry 1	9,195	0.218	−13.61	0.298	10.742	23.097	14.81	10.043		0.665	<0.0001	Fixed
		(0.966)	(<0.001)	(0.462)	(<0.001)	(<0.001)	(0.027)	(<0.001)				
(Subsidiary count indicator only)	9,195	−9.288	−18.61	0.193				8.722		0.656	<0.0001	Fixed
		(0.068)	(<0.001)	(0.635)				(<0.001)				
(Revenue indicator only)	9,195				11.495	25.509	20.086	10.36		0.664	<0.0001	Fixed
					(<0.001)	(<0.001)	(0.002)	(<0.001)				
All industry 2	9,195	−0.036	−13.733	0.341	12.297	37.426	11.86	10.092		0.665	<0.0001	Fixed
		(0.994)	(<0.001)	(0.401)	(<0.001)	(<0.001)	(0.090)	(<0.001)				
All industry 3	9,195	0.016	−13.952	0.37	13.7	42.805	8.585	10.112		0.665	<0.0001	Fixed
		(0.997)	(<0.001)	(0.369)	(<0.001)	(0.004)	(0.356)	(<0.001)				
Foods	407	−27.755	14.398	−4.707	5.964	19.444	−79.663	5.227		0.744	0.0051	Fixed
		(0.227)	(0.206)	(0.236)	(0.118)	(0.060)	(0.053)	(0.001)				
Textiles & apparel	231	31.037	−9.082	2.957	8.094	4.584	−12.985	5.869		0.821	<0.0001	Fixed
		(0.164)	(0.271)	(0.002)	(0.163)	(0.741)	(0.716)	(0.001)				
Pulp & paper	98	39.263	−28.874	24.737	34.352	52.385	−52.586	25.721		0.76	<0.0001	Fixed
		(0.136)	(0.022)	(0.181)	(0.035)	(0.015)	(0.225)	(<0.001)				
Chemicals	591	−19.811	−2.585	−2.968	18.601	23.357	20.116	13.913		0.884	<0.0001	Fixed
		(0.011)	(0.544)	(0.236)	(<0.001)	(<0.001)	(0.273)	(<0.001)				
Pharmaceuticals	154	−6.908	−22.95	−5.28	8.817	−6.4	54.055	11.834		0.877	0.0002	Fixed
		(0.704)	(0.146)	(0.289)	(0.373)	(0.797)	(0.345)	(<0.001)				
Oil & coal products	30	−14.451	34.545	−17.747	−27.086	7.74	33.155	0.302	19.434	0.288	0.0638	Random
		(0.438)	(0.011)	(0.091)	(0.250)	(0.377)	(0.355)	(0.442)	(0.356)			
Rubber products	76	1.8	3.047	−5.201	14.028	28.65	−16.294	11.394		0.861	0.0001	Fixed
		(0.920)	(0.775)	(0.244)	(0.358)	(0.011)	(0.018)	(<0.001)				
Glass & ceramics	207	−9.134	0.436	3.052	12.752	12.08	30.741	20.884		0.752	<0.0001	Fixed
		(0.526)	(0.966)	(0.491)	(0.041)	(0.149)	(0.303)	(<0.001)				
Steel products	187	−17.26	−6.444	13.99	21.698	−7.375	71.516	12.654		0.52	<0.0001	Fixed
		(0.335)	(0.424)	(0.149)	(0.001)	(0.438)	(0.029)	(<0.001)				
Non-ferrous metals	415	−30.44	0.296	−6.214	11.823	−3.679	35.73	9.778		0.792	<0.0001	Fixed
		(0.018)	(0.959)	(0.003)	(0.001)	(0.572)	(0.036)	(<0.001)				
Machinery	722	−35.955	−12.005	−0.789	14.908	23.731	13.372	16.028		0.841	<0.0001	Fixed
		(0.013)	(0.026)	(0.678)	(<0.001)	(<0.001)	(0.453)	(<0.001)				
Electric machinery	850	−18.942	−38.376	0.521	35.673	32.047	2.457	12.39		0.814	<0.0001	Fixed
		(0.120)	(<0.001)	(0.394)	(<0.001)	(<0.001)	(0.897)	(<0.001)				
Shipbuilding	23	−13.87	8.853		−7.578	−16.97	115.487	−0.056	9.227	0.373	0.2736	Random
		(0.452)	(0.432)		(0.424)	(0.124)	(0.022)	(0.879)	(0.305)			
Automotive	254	−20.189	−9.555	13.416	13.372	−5.062	−4.098	4.561		0.794	0.0168	Fixed
		(0.199)	(0.222)	(0.178)	(0.013)	(0.518)	(0.803)	(<0.001)				
Other transport equipment	60	−32.221	0.424	−19.049	8.326	−18.173	−66.762	0.059	−0.176	0.223	0.1171	Random
		(0.206)	(0.970)	(0.001)	(0.269)	(0.135)	(0.226)	(0.943)	(0.987)			
Precision instruments	145	75.325	−35.168	−0.684	18.13	13.93	136.549	15.613		0.845	<0.0001	Fixed
		(0.002)	(0.002)	(0.897)	(0.030)	(0.328)	(0.001)	(<0.001)				
Other manufacturing	334	17.995	−23.879	−0.333	58.759	27.688	−1.906	13.213		0.715	<0.0001	Fixed
		(0.352)	(0.012)	(0.956)	(<0.001)	(0.029)	(0.951)	(<0.001)				
Fishery	31	−10.015	0.42	−10.04	−19.859	62.095	43.191	16.686		0.943	0.0116	Fixed
		(0.904)	(0.988)	(0.387)	(0.332)	(0.106)	(0.591)	(0.017)				
Mining	30	−1759	−59.837	−31.597	−15.525	−100.497	−3.813	−0.184		0.996	0.0004	Fixed
		(<0.001)	(0.003)	(0.263)	(0.113)	(0.046)	(0.847)	(0.946)				
Construction	705	27.299	−29.313	−3.276	39.007	−4.775	49.288	11.583		0.428	0.0023	Fixed
		(0.455)	(0.120)	(0.815)	(0.031)	(0.831)	(0.347)	(<0.001)				
Wholesale	1,100	−11.674	−1.348	−6.398	2.912	19.051	8.594	7.22		0.792	<0.0001	Fixed
		(0.225)	(0.798)	(0.021)	(0.301)	(<0.001)	(0.575)	(<0.001)				
Retail	596	−21.066	−25.372	−16.71	2.167	10.836	−18.917	1.557		0.856	0.0003	Fixed
		(0.164)	(0.002)	(0.079)	(0.607)	(0.207)	(0.325)	(0.163)				
Other financial	161	24.676	11.117	4.06	−12.196	4.759	25.238	1.422	−6.31	−0.007	0.6898	Random
		(0.605)	(0.741)	(0.694)	(0.529)	(0.902)	(0.823)	(0.169)	(0.746)			
Real estate	188	24.586	22.445	−28.113	−15.226	34.688	38.465	1.173	−1.715	0.207	0.4351	Random
		(0.295)	(0.074)	(<0.001)	(0.052)	(0.046)	(0.463)	(0.091)	(0.870)			
Railway / bus operators	105	−15.154	−2.186	−1.086	3.075	2.836	−18.07	0.255	−0.176	0.384	0.2936	Random
		(0.244)	(0.542)	(0.287)	(0.007)	(0.732)	(0.617)	(0.257)	(0.964)			
Other land transport	112	−27.471	−7.493	1.481	−1.894	9.066	−56.71	−0.146	9.969	0.104	0.0884	Random
		(0.069)	(0.142)	(0.463)	(0.615)	(0.131)	(0.080)	(0.688)	(0.069)			
Marine transport	61	5.517	−1.806	1.15	5.336	−0.707	−1.826	1.078	−12.571	0.211	0.0835	Random
		(0.845)	(0.879)	(0.383)	(0.339)	(0.936)	(0.818)	(0.004)	(0.037)			
Warehousing	119	−136.303	−4.795	3.651	22.938	26.02	−176.284	3.657		0.804	0.0063	Fixed
		(0.137)	(0.613)	(0.691)	(0.020)	(0.042)	(0.005)	(0.026)				
Communications	69	−156.824	49.926	−10.137	10.132	−14.435	−155.488	−0.22	11.017	0.128	0.1933	Random
		(0.001)	(0.086)	(0.269)	(0.191)	(0.631)	(0.081)	(0.822)	(0.486)			
Services	1,135	−23.186	15.251	1.44	1.704	50.336	19.519	14.166		0.759	<0.0001	Fixed
		(0.132)	(0.081)	(0.057)	(0.714)	(<0.001)	(0.250)	(<0.001)				

Notes: 1. Numbers in parentheses are p-values. Shaded areas indicate coefficients are statistically significant at 10% level.

2. For All industry 1 and individual industries, we set KLEVEL1 = 0.1, KLEVEL2 = 0.3, RLEVEL1= 0.8, RLEVEL2 = 0.95, and formulated KOGAISHA1～3 and RENTAN1～3. For All industry 2 and 3, KOGAISHA1～3 are the same as for All industry 1. However, RENTAN1～3 are set using RLEVEL = 0.90, RLEVEL2 = 0.95 for All industry2, and RLEVEL = 0.95 and RLEVEL2 = 0.975 for All industry 3.

References

Ito, H., and O. Hayashida, 1996, “Corporate Boundaries,” (in Japanese), in H. Ito, ed., *Japan's Company System*, University of Tokyo Press.

Ito, H., and O. Hayashida, 1997, “Corporate Group Structure and Delegation of Authority: The Incomplete Contract Approach,” (in Japanese), *JCER Review*, No. 34, 89-117.

Ito, H., T. Kikutani, O. Hayashida, 1997, “Corporate Group Structure Strategy and Delegation of Authority Among Japanese Companies: Analysis of Questionnaire Survey Results,” (in Japanese), MITI Research Review, No. 10, 24-59.

Ito, H., T. Kikutani, and O. Hayashida, 2002, “Subsidiary Governance Structure and Performance: Authority, Responsibility, and Monitoring,” (in Japanese), in H. Ito, ed., *Japanese Companies: Choices in a Period of Major Change*, Toyo Keizai Shinposha.

Endo, Y., 1988, *The Truth about Subsidiary Management*, (in Japanese), Nihon Keizai Shinbunsha.

Armour, H. O. and D. J. Teece, 1978, “Organizational Structure and Economic Performance: A Test of Multidivisional Hypothesis,” *Bell Journal of Economics,* 9, 106-122.

Chandler, A.D., 1962, *Strategy and Structure: Chapters in the History of the Industrial Enterprise*, MIT Press.

Colombo, M. G., and M. Delmastro, 2002, “The Determinants of Organizational Change and Structural Inertia: Technological and Organizational Factors,” *Journal of Economics & Management Strategy* 11, 595-635.

Morck, R., A. Shleifer, and R. Vishny, 1988, “Management Ownership and Market Valuation: An Empirical Analysis,” *Journal of Financial Economics,* 20, 293-315.

Steer, P. and J.Cable, 1978, “Internal Organization and Profit: An Empirical Analysis of Large U.K. Companies,” *Journal of Industrial Economics* 27, 13-30.

Teece, D, T., 1981, “Internal Organization and Economic Performance: An Empirical Analysis of the Profitability of Principal Firms,” *Journal of Industrial Economics*, 30, 173-199.

Thompson, R.S., 1981, “Internal Organization and Profit: A Note,” *Journal of Industrial Economics,* 30, 201-211.