

# **Comparing the Management Practices and Productive Efficiency of Korean and Japanese Firms: An Interview Survey Approach**

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In this study, we conduct interview surveys on management practices in Japanese and Korean firms following the study of Bloom, and Van Reenen (2007). The average management scores in Japanese firms are higher than those in Korean firms, and human

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resource management is positively associated with firm performance. When a Korean dummy is added as a shift term in regressions with the merged sample, its coefficient is negative, implying that Korean firms have low efficiency. However, when the cross terms of the Korean dummy are added with capital and labor, the significance of the shift term disappears. This observation entails that any efficiency difference between the two countries does not come from a technical efficiency (shift term) but from a factor efficiency (marginal productivity of labor and capital). One robust result of this study is that a high output elasticity of capital is observed in Korean firms, whereas a high output elasticity of labor is noted in Japanese firms despite the high capital–labor ratios in the former. One interpretation of this puzzle is that Japanese firms have pursued the optimization of labor uses and have been relying on labor-saving growth in the face of labor shortage and aging and that Korean firms have relied on capital for growth, continuously renovating and updating their capital, thereby recording a high capital productivity in contempt of aggressive labor.

*Keywords:* Factor efficiency, Intangible assets, Management practices

*JEL Classification:* D21, L23, M11, M12, M15, M51

## I. Introduction

In 1997, Japan and Korea both suffered from financial crises and successive deep recessions. However, the recovery processes adopted by these countries vary. The Japanese economy was stagnant for a long time because of large non-performing loans, but the Korean economy recovered rapidly. Korean firms correspondingly outperformed Japan firms in some competing industries, such as electric machinery and electric devices (Fukao *et al.*, 2008). Using the framework introduced by McGrattan, and Prescott (2005, 2010), Miyagawa, and Takizawa (2011) conducted growth accounting and determined that the labor productivity gap between Japan and Korea after the financial crises was caused by the difference in accumulation in intangible assets and in TFP growth. Chun *et al.* (2015) specified that all types of capital accumulation in Korea have overcome those in Japan.

Many studies have determined that at the firm level, Korean firms are rapidly catching up with Japanese firms in terms of productivity and market shares in several sectors. Jung, Lee, and Fukao (2008) noted that although the productivity of Korean firms was as low as half

of that of the Japanese firms in the mid-1980s, Korean firms were able to substantially catch-up on average within the 10% range in the late 1990s. Jung, and Lee (2010) asserted that sectoral- and firm-level factors (e.g., innovation capability and export orientation) are both responsible for the productivity convergence, with explicit knowledge-oriented sectors, such as IT, showing a faster catch-up than other sectors. Joo, and Lee (2010) compared Samsung and Sony in terms of the various indicators developed through patent data, including citations. These researchers concluded that Samsung caught up with Sony in the mid-2000s in terms of market capitalization and sales volume but its technological catch-up in terms of patent count, quality, mutual citations, and so on happened as early as the mid-1990s. Most extant studies only consider the tangible aspects of firms often reflected in standard financial statements or patent application data to explain the catching up between Korea and Japan although many diverse can be involved. Aoki (2010) emphasized that the organizational architecture of firms is a major driver of corporation systems in each country. The current study aims to expand the previous studies at the firm level, examining additional intangible aspects, including the management practices of firms in Japan and Korea.

Empirical studies conducted in the first half of the 2000s identified the role of intangible assets in economic performance. When the IT revolution started in the mid-1990s, many economists and policymakers assumed that the rapid development of the IT industry and IT investment accelerated the economic growth of the US. Therefore, many advanced countries supported the IT industry and encouraged IT investment in their own countries. However, the gaps in rates of economic or productivity growth between the US and other advanced countries have remained intact even in the early 2000s. Since then, many economists have focused on the complementary role of intangible assets in productivity growth and posited that without these assets, IT assets do not contribute to productivity growth at the firm and aggregate levels.<sup>1</sup>

Corrado, Hulten, and Sichel (referred to as “CHS” hereafter for brevity) (2005, 2009) estimated the investment in intangible assets at the aggregate US economy level and classified such assets into three categories, namely, computerized information, innovative property, and econ-

<sup>1</sup> The 2007 Economic Report of the President stated that “Only when they (businesses) made intangible investments to complement their IT investments did productivity growth really take off.” (p. 56)

omic competencies. Following the study of CHS (2009), many researchers in other advanced countries tried to estimate intangible investment.<sup>2</sup> Comparing the estimation results in Japan with those in the US and the UK, Fukao *et al.* (2009) and Pyo, Chun, and Rhee (2011) identified the characteristics of intangible investment in Japan and Korea. First, the investment in computerized information measured as a share of GDP in Japan and Korea is almost the same as those in the US and the UK. Second, because of the large R&D investment levels in Japan, the ratio of investment in innovative property to GDP in this country is greater than those in the US and the UK. Third, regarding the investments in economic competencies, the investment/GDP ratio in Japan and Korea is significantly smaller than those in the US and the UK. Chun *et al.* (2015) confirmed the accuracy of these features in the industry-level intangible investment data in Japan and Korea.

Investment in economic competencies includes investment in brand equity, firm-specific human capital, and organizational reform. Among these investments, the investment in firm-specific human capital and organizational reform in Japan is significantly smaller than those in the US and the UK. However, these investment amounts can hardly be estimated at the aggregate level and are difficult to compare with those in advanced countries.<sup>3</sup> In addition, these investments depend on management practices at the firm level. Therefore, recent studies on intangible investment have focused on the management practices on human resource management and organizational reform at the firm level using micro-data.

Bloom, and Van Reenen (2007) examined the effects of management practices on firm performance by conducting interview surveys among plant managers. The management practices were converted into scores based on the interview results, and these scores were then included as independent variables in the estimation of production function. The key finding presented by Bloom, and Van Reenen (2007) is the existence of a large difference in the management scores among the surveyed countries (*i.e.*, France, Germany, the UK, and the US). Of all countries, US firms obtained the highest score. The researchers claimed that the low score achieved by the continental European firms can be partly ex-

<sup>2</sup> See Marrano, Haskel, and Wallis (2009) for the UK, Corrado *et al.* (2014) for the EU countries, and Fukao *et al.* (2009) for Japan.

<sup>3</sup> For example, CHS (2009) does not account for the investment in firm specific human capital through on-the-job training although this type of investment is extremely important in Japanese and Korean firms.

plained by weak competition and the prevalence of several family-owned firms. The estimation results showed that the productivity differences corresponded to the differences in average management score.<sup>4</sup> In the present study, we conduct an interview survey similar to that of Bloom, and Van Reenen in Japan and Korea and use it to explain the performance gap between Japanese and Korean firms. In Japan, Kurokawa, and Minetaki (2006), Kanamori, and Motohashi (2006), and Shinozaki (2007) examined the effects of organizational reform resulting from IT investment on firm performance by using the *Basic Survey on Business Enterprise Activities* and *IT Workplace Survey*. These researchers suggested that the organizational reform resulting from IT investment is partially responsible for improving firm performance. Our work aims to expand the previous studies in Japan by comparing the performance of Japanese firms with that of Korean firms.

The remainder of the paper is organized into five sections. Following the Introduction, Section II describes our interview survey. Although our interview survey follows that of Bloom, and Van Reenen (2007), we incorporate some questions that were not included in that study to capture some unique features of Japanese and Korean firms, such as the role of informal meeting within a firm and on-the-job training (OJT). Section III presents the developed management score by quantifying the interview results and compares the management practices in Japanese and Korean firms. Section IV estimates a production function and examines the effects of management practices on firm performance using the management scores and financial statements of Japanese and Korean firms. Finally, Section V summarizes the study.

## II. Interview Surveys in Japan and Korea

In this study, we followed the interview survey conducted by Bloom, and Van Reenen (2007). However, we conducted the survey by meeting the managers of the planning departments of firms face-to-face, contrary to the telephone survey by Bloom, and Van Reenen (2007). Face-to-face interviews were performed because we were concerned about low response rates. We assumed that the qualitative features of firms can be obtained efficiently in Japan and Korea only through face-to-face communication.

<sup>4</sup>They extend their study to other developed countries. Management scores in 20 countries are shown in Bloom *et al.* (2014).

Bloom, and Van Reenen (2007) classified their 18 interview questions into 4 categories: product management, monitoring, the firm's target, and incentives for workers. While their survey was extended to only manufacturing plants, our survey was also extended to firms in the service sector. Thus, we excluded questions about product management because they would not apply to all firms. Instead, we asked questions about organizational change and OJT. As a result, our questions can be classified into two categories, namely, organizational management and human resource management.

The first category (organizational management) covers the first four questions (Questions A.1 to A.4). In this category, we intended to examine the managerial vision of the firms, organizational goals, internal communication, and organizational reform. The second category on human resource management (Questions A.5. to A.13.) includes the questions used by Bloom, and Van Reenen (2007) but we added a question about OJT because the effects of such training in Japanese and Korean firms are considered significant to firm performance. The detailed interview questions are shown in Appendix.

Three sub-questions were included in each question. The pointing system was structured in a manner that the respondents would obtain high points when they provide several positive answers to each sub-question, for instance, in human resource management. In each question with three sub-questions, 4 points were given for positive answers to all three sub-questions. Positive answers to the first two sub-questions only resulted in 2 points. In particular, the responses were quantified as follows: if the firm manager responded negatively to the first sub-question, then we gave the response 1 point out of a possible total of 4 points in the question and moved to the next question. If the manager responded positively to the first sub-question, then we continued to the second sub-question. If the manager responded negatively to the second sub-question, then we marked this response with a 2 and moved to the next question. If the manager responded positively to the second sub-question, then we moved to the last and third sub-questions. In the last sub-question, if the manager responded with a positive answer, then he/she was given 4 points for the all three sub-questions he/she answered positively, while a negative response was given 3 points for the two previous sub-questions he/she answered positively.

Our survey focused on four industries in the manufacturing sector (*i.e.*, electric machinery, information and communication equipment, motor vehicles, and precision machinery) and three industries in the

**TABLE 1**  
THE DISTRIBUTION OF FIRMS IN JAPAN AND KOREA (BY INDUSTRY)

Industry		Japan	Korea
Manufacturing	Electric machinery	44 (7.7%)	51 (14.6%)
	Information and communication machinery	73 (12.7%)	96 (27.4%)
	Motor vehicles	52 (9.1%)	140 (40.0%)
	Precision machinery	25 (4.4%)	10 (2.9%)
Non-manufacturing	Internet-based services	135 (23.6%)	15 (4.3%)
	Information service		11 (3.1%)
	Media activities	14 (2.4%)	9 (2.6%)
	Retail	230 (40.1%)	18 (5.1%)
Total		573	350

service sector (*i.e.*, internet-based services and information services, media activities, and retail service). In Japan, we obtained our data from 573 firms with a total sample of 1,086 firms and with a response rate of 52.8%. In Korea, we obtained the data from 350 of the sample 591 firms, with a response rate of 59.2%.<sup>5</sup>

### III. Management Scores in Japan and Korea

In this section, the management practices between Japanese and Korean firms are compared based on interview surveys.<sup>6</sup> Table 1 shows the distribution of firms in Japan and Korea by industry. The share of manufacturing firms in the total number of firms in Japan is 33.9%, whereas that in Korea is 84.9%. In particular, the firms in the motor vehicle industry in Korea account for 40.0% of the total number of firms. In Japan, the share of firms in the retail services is also 40.1%.

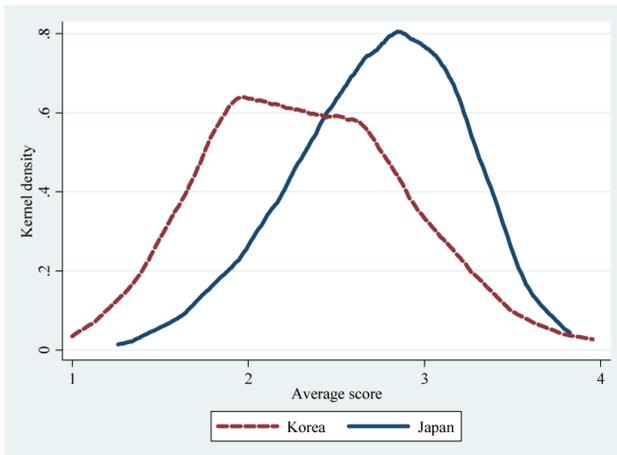
Table 2 shows the distribution of firms in Japan and Korea by size as measured by the number of employees. In the survey, the number of small- and medium-sized Japanese firms with fewer than 300 employees

<sup>5</sup>The Japanese survey was conducted from February 2008 to September 2008. The Korean survey was conducted from May 2008 to July 2008. In 2011-2012, we conducted a similar survey in Korea and Japan. The results in the second survey were published in Miyagawa *et al.* (2015).

<sup>6</sup>The results in the Korean interview surveys are based on Lee *et al.* (2009).

**TABLE 2**  
THE DISTRIBUTION OF FIRMS IN JAPAN AND KOREA  
(BY NUMBER OF EMPLOYEES)

Industry	Japan						Korea					
	50-99	100-299	300-499	500-999	1000-	Total	50-99	100-299	300-499	500-999	1000-	Total
Manufacturing	25	63	31	32	43	194	42	180	31	30	14	297
Information Related Services	43	59	13	17	17	149	5	22	3	0	5	35
Retail	43	80	42	40	25	230	0	11	1	0	6	18
Total	111	202	86	89	85	573	47	213	35	30	25	350



**FIGURE 1**  
DISTRIBUTION OF MANAGEMENT SCORES (ALL FIRMS)

is 313 of the total 573. In Korea, the number of firms with employees fewer than 300 is 260 out of 350. The share of small- and medium-sized firms in Korea is larger than that in Japan.

As explained in the previous section, we assigned scores to the management practices based on the interview surveys. Figure 1 shows the distribution of scores in all firms and all interview questions in Japan and Korea through kernel density estimation. Table 3 summarizes the statistics of management scores. The mean value of the distribution

**TABLE 3**  
SUMMARY OF MANAGEMENT SCORES

	Total		Japan		Korea	
	Mean	(Variance)	Mean	(Variance)	Mean	(Variance)
<b>All questions</b>						
All Samples	2.581	(0.303)	2.735	(0.229)	2.328	(0.321)
Manufacturing Firms	2.481	(0.315)	2.766	(0.215)	2.294	(0.294)
Service Firms	2.694	(0.264)	2.719	(0.236)	2.515	(0.438)
Large Firms	2.723	(0.275)	2.788	(0.224)	2.508	(0.387)
Small and Medium Sized Firms	2.454	(0.294)	2.661	(0.228)	2.255	(0.277)
<b>Organizational management</b>						
All Samples	2.703	(0.360)	2.845	(0.306)	2.471	(0.363)
Manufacturing Firms	2.633	(0.355)	2.911	(0.257)	2.450	(0.336)
Service Firms	2.784	(0.355)	2.811	(0.329)	2.586	(0.503)
Large Firms	2.818	(0.355)	2.885	(0.318)	2.595	(0.417)
Small and Medium Sized Firms	2.601	(0.343)	2.789	(0.285)	2.421	(0.333)
<b>Human resource Management</b>						
All Samples	2.390	(0.410)	2.564	(0.299)	2.105	(0.461)
Manufacturing Firms	2.244	(0.443)	2.540	(0.324)	2.052	(0.428)
Service Firms	2.555	(0.322)	2.576	(0.287)	2.405	(0.549)
Large Firms	2.575	(0.344)	2.636	(0.276)	2.374	(0.521)
Small and Medium Sized Firms	2.224	(0.411)	2.463	(0.316)	1.996	(0.397)

in the average score for all Japanese firms is 2.73 with a variance of 0.23. The average scores in most of these firms fall between 2.5 and 3.5. The mean value of the distribution for Korean firms is 2.33 with a variance of 0.32. Although Korea has lower mean and median values than Japan, it has a higher variance of scores. The average scores in most Korean firms range from 1.5 to 2.5. However, the differences in the mean and median values and the variance of scores between these countries are insignificant.

Given that several statistics of the two distributions are insignificantly different, these distributions were compared as a whole using the Kolmogorov-Smirnov test (K-S test). The cumulative distribution functions (*i.e.*,  $F(x)$  and  $G(x)$ ) were assumed, and the maximum differences between the two distributions ( $D_{mn}$ ) were defined from the sample distribution functions of  $F(x)$  and  $G(x)$ .

**TABLE 4**  
 KOLOMOGOLOV-SMILNOV TEST  
 (MANAGEMENT SCORES BY INDUSTRY AND BY SIZE)

	All Items		Organizational Managemnt		Human Resource Management	
	Distance	p-value	Distance	p-value	Distance	p-value
Japan < Korea <sup>1)</sup>	0.007	0.977	0.000	1	0.006	0.983
Japan > Korea <sup>1)</sup>	-0.328 ***	0	-0.298 ***	0	-0.342 ***	0
Combined test	0.328 ***	0	0.298 ***	0	0.342 ***	0

Note: 1) 'Japan < Korea' means that sample values in Japan are smaller than those in Korea, and vice versa.

2) \* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

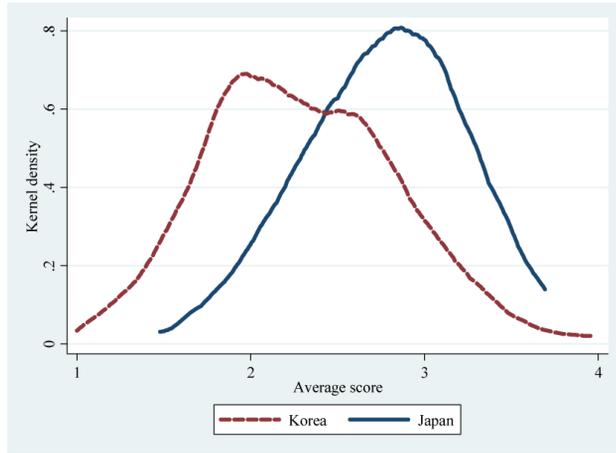
$$D_{mn} = \sup_{-\infty < x < \infty} |F_m(x) - G_n(x)|$$

In the K-S test, the null hypothesis states that the two distributions are the same ( $F(x)=G(x)$ ). If the test statistics  $(\frac{mn}{m+n})^{1/2}D_{mn} > c$  and  $c$  are appropriately constant, then the null hypothesis is rejected.

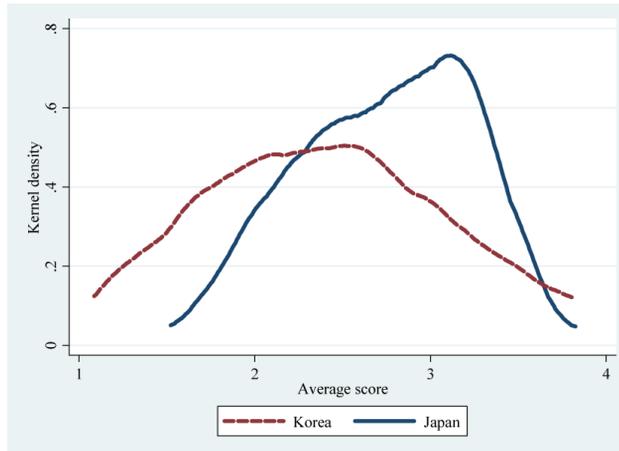
K-S test was applied to the distributions in the average management score in Japan and Korea. Table 4 shows the test results. In particular, the first row of the table displays the result in testing the hypothesis whether the sample values in Japan are significantly smaller than those in Korea. "Distance" in the second column shows the maximum distance in which the sample value in Japan is less than that in Korea. P value entails that the sample values in Japan are insignificantly smaller than those in Korea. The second row of the table illustrates the result in testing the opposite case. The K-S test indicates that the sample values in Japan are insignificantly larger than those in Korea. The last row of the table shows the combined results of the previous tests. The difference in the two distributions is significant.

The difference in the distribution of scores in Japan and Korea shown in Figure 1 may reflect the difference in the industry composition in the samples. Thus, we examined the distribution of scores by industry. Figures 2, 3, and 4 show the distribution of scores in the manufacturing sector, the information-related services sector, and the retail sector, respectively. The score distributions in these sectors are comparatively similar such that the scores of Japanese firms tend to be distributed in higher point areas than those of the Korean firms.<sup>7</sup>

Our interview questions were classified into two categories. The first



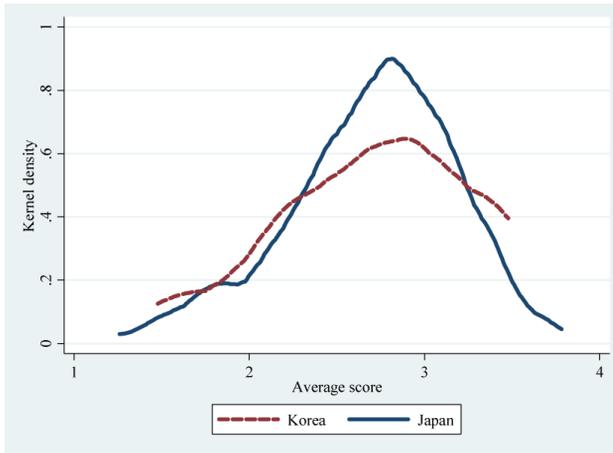
**FIGURE 2**  
DISTRIBUTION OF MANAGEMENT SCORES  
(MANUFACTURING FIRMS)



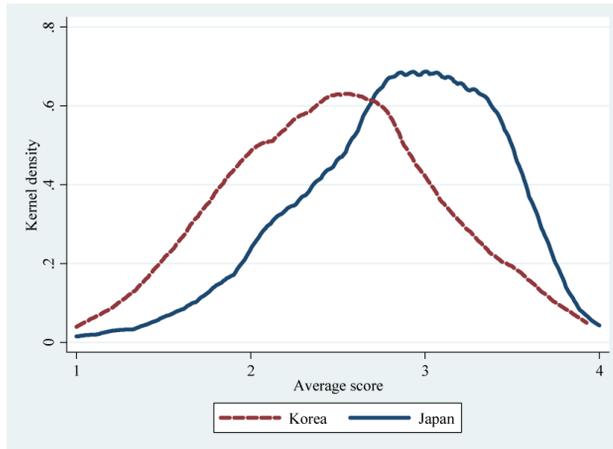
**FIGURE 3**  
DISTRIBUTION OF MANAGEMENT SCORES  
(INFORMATION-RELATED FIRMS)

category included questions on organizational management, whereas the

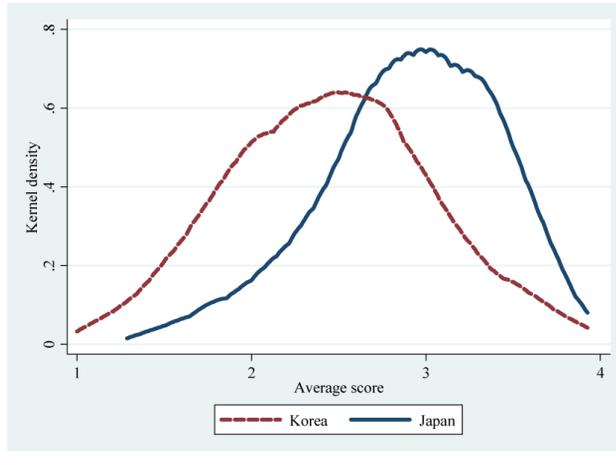
<sup>7</sup> The information-related services sector consists of internet-based and information services as well as media activities.

**FIGURE 4**

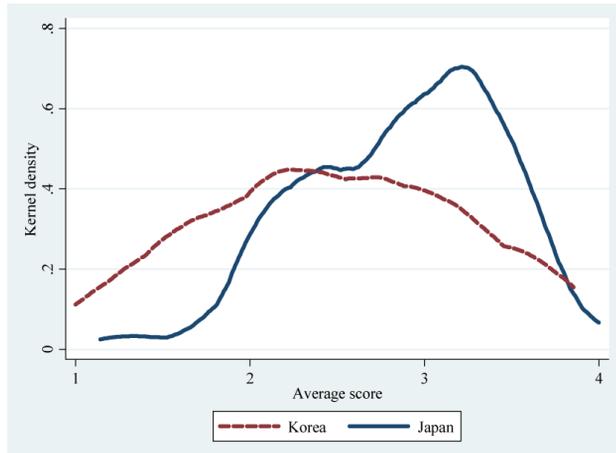
DISTRIBUTION OF MANAGEMENT SCORES (RETAIL FIRMS)

**FIGURE 5**DISTRIBUTION OF MANAGEMENT SCORES IN  
ORGANIZATIONAL CAPITAL (ALL FIRMS)

second category comprised questions on human resource management. Figures 5 to 8 demonstrate the distribution of scores in organizational capital. The mean value of the distribution in organizational management of both countries is higher than that of all questions combined. The

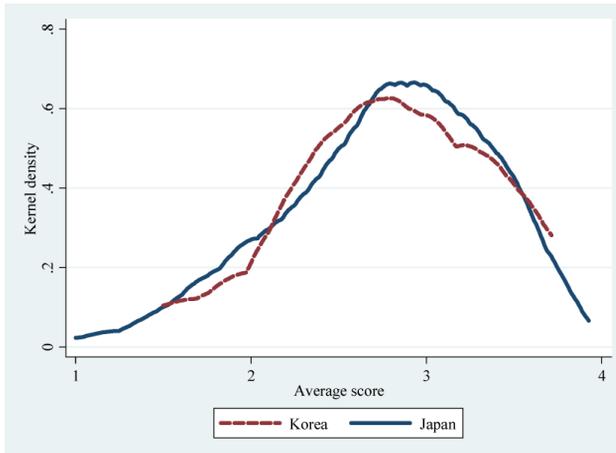


**FIGURE 6**  
DISTRIBUTION OF MANAGEMENT SCORES IN  
ORGANIZATIONAL CAPITAL (MANUFACTURING FIRMS)

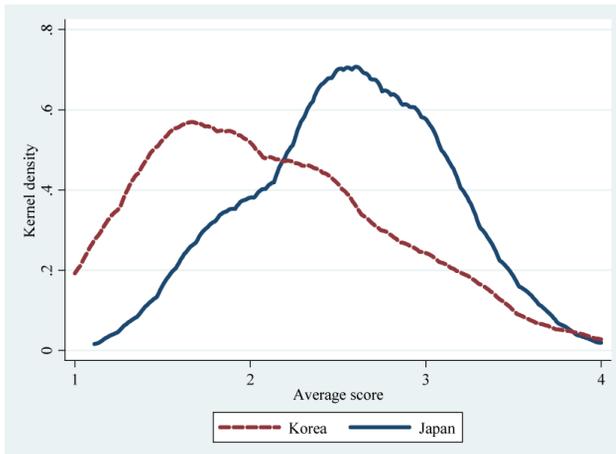


**FIGURE 7**  
DISTRIBUTION OF MANAGEMENT SCORES IN  
ORGANIZATIONAL CAPITAL (INFORMATION-RELATED FIRMS)

scores in Japan are higher than those in Korea. Given that high scores in organizational management indicate a great degree of transparency of organizational goals or aggressive organizational reform, the findings

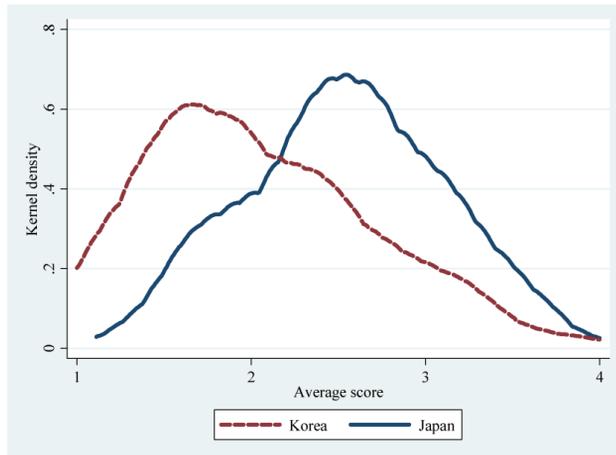
**FIGURE 8**

DISTRIBUTION OF MANAGEMENT SCORES IN ORGANIZATIONAL CAPITAL (RETAIL FIRMS)

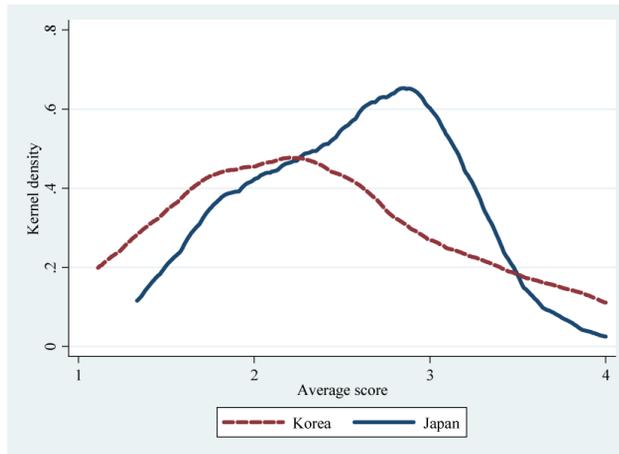
**FIGURE 9**

DISTRIBUTION OF MANAGEMENT SCORES IN HUMAN CAPITAL (ALL FIRMS)

imply that the organizational targets are generally perceived clearer by all employees in Japan than those in Korea, or Japanese firms improve their organizational structures more aggressively than Korean firms do.

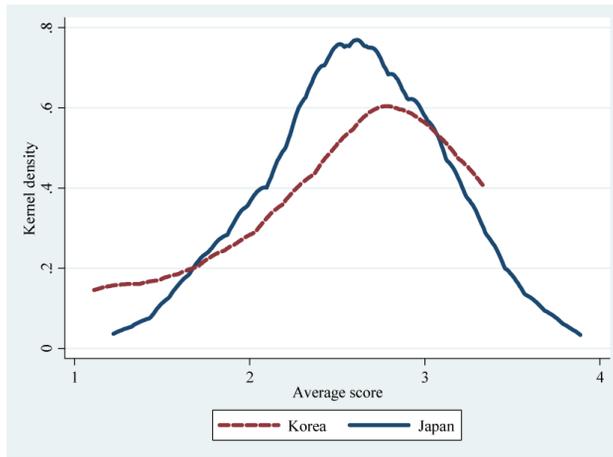


**FIGURE 10**  
DISTRIBUTION OF MANAGEMENT SCORES IN HUMAN CAPITAL (MANUFACTURING FIRMS)



**FIGURE 11**  
DISTRIBUTION OF MANAGEMENT SCORES IN HUMAN CAPITAL (INFORMATION-RELATED FIRMS)

Figures 9 to 12 show the distribution of scores in human resource management. The average scores in human resource management of both countries are lower than their scores in organizational management.

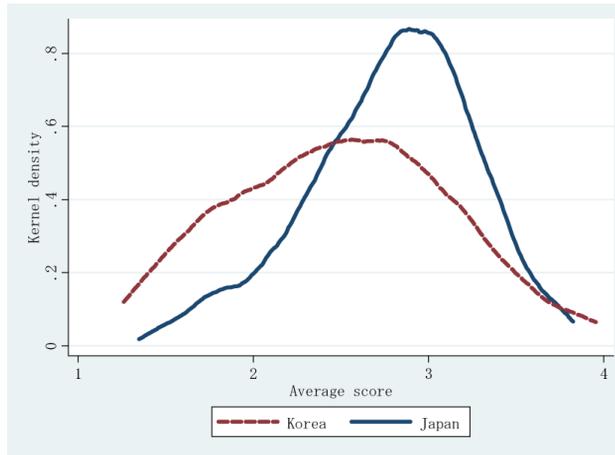


**FIGURE 12**  
DISTRIBUTION OF MANAGEMENT SCORES IN HUMAN  
CAPITAL (RETAIL FIRMS)

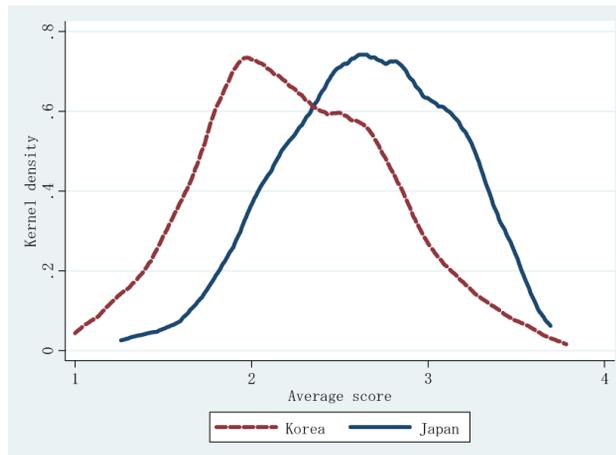
Nonetheless, in all sectors, the average scores in Japanese firms are higher than those in Korean firms. In Korea, the low score in the manufacturing sector pulls down the score in all firms. A high score in this category indicates flexibility in human resource management; hence, the results imply that Japanese firms are more flexible in their human capital management than Korean firms. The K-S test also showed that the two distributions significantly vary in terms of organizational management and human resource management (Table 3).

Table 2 indicates that the Korean sample involved more small- and medium-sized firms than the Japanese sample. Thus, the distribution of average score in both countries was examined by size in Figures 13 and 14. A gap in the mean value of the distributions in Japan (2.81) and Korea (2.57) was observed in Figure 13, which shows the distributions of the average scores in firms with more than 300 employees. The median value (2.87) in Japanese firms is higher than that (2.57) in Korean firms.

The peak of the distribution for Japanese firms with employees less than 300 is at a point higher than the 2.5 mark, whereas the peak for Korean firms is at approximately 2. The difference in the distribution leads to a wider gap in the average score in medium and small firms in both countries than that in large firms. Contrary to the relatively high mean in the distribution of Japanese firms (2.64), the mean in Korean



**FIGURE 13**  
DISTRIBUTION OF TOTAL SCORES OF FIRMS WITH 300 OR MORE EMPLOYEES (ALL FIRMS)



**FIGURE 14**  
DISTRIBUTION OF TOTAL SCORES OF FIRMS WITH FEWER THAN 300 EMPLOYEES (ALL FIRMS)

firms is 2.25. This gap in the mean can be explained by the difference in the distribution in the average score in human resource management, which is extremely low (2.00) in Korean firms, whereas the correspon-

ding mean in Japanese firms is 2.45. These results imply that human resource management practices in Korean small- and medium-sized firms are more conservative than those in Japan.<sup>8</sup>

In sum, the management scores in Japan tend to be higher than those in Korean firms. This conclusion is consistent with the common perception that Japanese firms are more advanced than Korean firms, which are catching up. The next question that should be addressed is how well these scores are reflected in firm performance or productivity.

#### IV. Are Management Practices Related to Firm Performance?

Using the scores that indicate the management practices explained in the previous section, we examined whether the improvement in firm performance is associated with enhanced management practices. Following the study of Bloom, and Van Reenen (2007), we estimated the following production functions:

$$\ln VA_i = \text{const.} + \alpha_1 MS_i + \alpha_2 \ln K_i + \alpha_3 \ln L_i + \alpha_4 X_i + \varepsilon_i \quad (1)$$

Equation (1) is a standard production function that includes the management score (*MS*). For *MS*, the average score in all interview questions was considered along with the management scores in organizational management and human resource management.

*VA* is the value added, *L* is labor input, and *K* is capital input. As a control variable (*X*), the ratio of college graduates to the total number of workers was considered. Bloom, and Van Reenen (2007) constructed pseudo-panel data by corresponding their management scores to other variables in production function in the past 10 years to examine the long-term relationship between management practices and firm performance. Following such work, we obtained the variables in Equation (1), except the management score, from firm-level data from 2006 to 2008.<sup>9</sup> Industry dummies were also included in both estimations.

Table 5 summarizes the statistics of all variables, except management scores, used in the estimation. Table 6 shows the calculation results for capital-labor ratios and the average productivity of labor. This table

<sup>8</sup> However, all differences in the mean values between Japanese and Korean firms are insignificant.

<sup>9</sup> In the regressions, we converted the value-added and capital data in Korean firms to those in terms of Japanese Yen using the current exchange rates.

**TABLE 5**  
SUMMARY OF STATISTICS

	Total		JAPAN		KOREA	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
<b>2006-2008</b>						
VA	8,924	41,383	9,997	42,497	6,683	38,886
K	12,251	60,153	11,208	48,634	14,357	78,420
L	797	2,875	905	3,301	572	1,647
College graduate	39%	26%	41%	26%	38%	25%
<b>2006</b>						
VA	9,664	45,485	10,557	45,810	7,817	44,838
K	12,188	57,824	11,090	46,222	14,384	75,945
L	779	2,814	888	3,248	557	1,583
College graduate	39%	26%	41%	26%	38%	25%

Note: Y, VA and K are gross output, value-added, and capital respectively, and are in million Yen. L is the number of regular workers.

**TABLE 6**  
CAPITAL/LABOR RATIOS AND AVERAGE PRODUCTIVITY (2006-2008)

Variable	Country	Obs.	Mean	S.D.	Min.	Median	Max.
K/L	Japan	1,604	10.2	15.8	0.0	7.0	283.2
	Korea	775	13.8	16.5	0.1	9.6	164.7
K/LH×100	Japan	956	0.9	4.5	0.0	0.4	79.4
	Korea	775	0.7	0.8	0.0	0.5	8.2
K/Wage	Japan	1,600	1.7	2.2	0.0	1.2	46.9
	Korea	794	6.5	13.7	0.0	2.9	155.4
VA/L	Japan	1,582	8.6	5.7	0.3	7.2	76.1
	Korea	743	7.5	8.6	0.1	6.1	131.1
VA/K	Japan	1,577	12.8	57.3	0.0	1.1	995.0
	Korea	758	1.4	5.1	0.0	0.6	104.4

Note: Y, VA and K are gross output, value-added, and capital respectively, and are in million Yen. L is the number of regular workers. LH is the number of regular workers times hours worked.

particularly implies that the capital-labor ratios are consistently higher in Korean firms than those in Japanese firms regardless of whether they are measured in medians or means using the number of workers, working hours, or the sum of wage payment as a measurement of labor, except

**TABLE 7**  
ESTIMATION RESULTS USING ALL SAMPLES (2006-2008)

lnVA	(1)	(2)	(3)	(4)	(5)	(6)
	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)
Average score	0.106 *** [3.912]	0.01 [0.270]	0.017 [0.421]			
Org. score				-0.026 [-0.926]	-0.075 ** [-2.103]	-0.097 ** [-2.164]
Human R.M score				0.142 *** [5.367]	0.1 *** [3.080]	0.12 *** [2.957]
lnL	0.836 *** [30.459]	0.836 *** [24.449]	0.735 *** [16.311]	0.829 *** [30.277]	0.83 *** [24.222]	0.719 *** [16.417]
lnK	0.171 *** [11.995]	0.157 *** [9.579]	0.28 *** [8.220]	0.172 *** [12.226]	0.157 *** [9.675]	0.284 *** [8.582]
College graduate	0.651 *** [9.544]	0.779 *** [9.999]	0.674 *** [4.902]	0.655 *** [9.575]	0.802 *** [9.948]	0.629 *** [4.669]
Observation	1,895	1,173	722	1,895	1,173	722
Adj. R-Squared	0.811	0.861	0.734	0.813	0.862	0.736
F-value	715	630	217	654	584	194
Model d. f.	10	10	10	11	11	11
RSS	552	269	243	547	267	240
Chow test	13.148			12.226		
p-value	0			0		

Note: 1. L=# employee ×hour worked. 2. Dummy variables for Industry are included in the estimations but not reported. 3. Robust t statistics in brackets. 4. \* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

the mean using working hours. By contrast, the average capital productivity in Japanese firms is higher than those in Korean firms. The average productivity of labor and capital in Japanese firms are also high in terms of value-added per labor. Although the table only shows the case of the whole sample, these observations still hold true for the sub-samples of manufacturing or services and for large or SMEs.

#### A. Basic Estimation Results

Regressions were run for each country data and for the merged data without a Korean dummy. Table 7 illustrates the results, which indicate that the average management score is positively and significantly related to firm performance in the whole sample of Korean and Japanese firms.

The average management score was then divided into an organizational management score and a human resource management score. The sig-

**TABLE 8**  
ESTIMATION RESULTS BY SECTOR (2006-2008)

InVA	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)
Average score	0.145 *** [3.930]	0.014 [0.192]	0.004 [0.100]				0.041 [1.110]	0.02 [0.502]	0.12 [1.171]			
Org. score				0.007 [0.168]	-0.077 [-1.054]	-0.085 * [-1.757]				-0.067 * [-1.807]	-0.069 * [-1.740]	-0.186 ** [-2.098]
Human				0.142 *** [3.841]	0.093 [1.607]	0.093 ** [2.150]				0.13 *** [3.379]	0.112 *** [2.772]	0.347 *** [3.451]
R.M score				0.74 *** [14.614]	0.695 *** [8.755]	0.709 *** [12.334]	0.876 *** [31.883]	0.878 *** [28.391]	0.716 *** [10.831]	0.871 *** [31.838]	0.874 *** [28.304]	0.687 *** [10.617]
lnL	0.272 *** [7.750]	0.29 *** [5.697]	0.291 *** [6.419]	0.274 *** [7.954]	0.291 *** [5.757]	0.295 *** [6.646]	0.13 *** [9.383]	0.127 *** [8.297]	0.246 *** [5.777]	0.13 *** [9.595]	0.127 *** [8.404]	0.272 *** [6.020]
College graduate	0.574 *** [4.863]	0.738 *** [5.234]	0.7 *** [4.395]	0.56 *** [4.788]	0.756 *** [5.352]	0.664 *** [4.258]	0.608 *** [7.775]	0.676 *** [7.732]	0.331 [1.616]	0.633 *** [7.819]	0.702 *** [7.713]	0.301 [1.548]
Observation	990	355	635	990	355	635	905	818	87	905	818	87
Adj.	0.778	0.874	0.708	0.779	0.875	0.710	0.854	0.856	0.853	0.856	0.858	0.869
R-Squared	433	406	209	381	361	181	747	653	158	655	574	163
F-value	7	7	7	8	8	8	6	6	6	7	7	7
Model d. f.	342	85	226	339	84	224	200	179	16	197	176	15
Chow test	11.961			10.781			3.093					
p-value	0			0			0.003					

Note: 1. L=# employee xhour worked. 2. Dummy variables for Industry are included in the estimations but not reported. 3. Robust t statistics in brackets. 4. \* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

**TABLE 9**  
ESTIMATION RESULTS BY SIZE (2006-2008)

InVA	(1)			(2)			(3)			(4)			(5)			(6)			(7)			(8)			(9)			(10)			(11)			(12)		
	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)	(Whole)	(Japan)	(Korea)						
Average score	0.117 *** [3.370]	0.032 [0.802]	0.049 [0.784]	-0.021 [-0.491]	0.153 *** [3.741]	0.127 *** [2.936]	-0.072 [-1.610]	-0.013 [-0.130]	0.057 [1.514]	-0.039 [-0.661]	0.002 [0.045]	0.057 [1.514]	-0.039 [-0.661]	0.002 [0.045]	0.057 [1.514]	-0.061 * [-1.704]	-0.123 ** [-2.401]	-0.12 ** [-2.356]	0.127 *** [3.776]	0.1 *** [1.973]	0.13 *** [2.896]	0.127 *** [3.776]	0.1 *** [1.973]	0.13 *** [2.896]	0.127 *** [3.776]	0.1 *** [1.973]	0.13 *** [2.896]	0.127 *** [3.776]	0.1 *** [1.973]	0.13 *** [2.896]						
Org. score	0.802 *** [18.390]	0.881 *** [17.742]	0.559 *** [5.704]	0.807 *** [18.834]	0.886 *** [18.308]	0.561 *** [5.676]	0.698 *** [12.949]	0.753 *** [12.117]	0.698 *** [12.949]	0.753 *** [12.117]	0.69 *** [8.990]	0.698 *** [12.949]	0.753 *** [12.117]	0.69 *** [8.990]	0.698 *** [12.949]	0.735 *** [11.723]	0.643 *** [8.128]	0.643 *** [8.128]	0.677 *** [12.524]	0.735 *** [11.723]	0.643 *** [8.128]	0.677 *** [12.524]	0.735 *** [11.723]	0.643 *** [8.128]	0.677 *** [12.524]	0.735 *** [11.723]	0.643 *** [8.128]	0.677 *** [12.524]	0.735 *** [11.723]	0.643 *** [8.128]						
Human R.M score	0.221 *** [9.624]	0.203 *** [8.371]	0.352 *** [4.995]	0.218 *** [9.739]	0.2 *** [8.483]	0.349 *** [4.876]	0.134 *** [8.673]	0.107 *** [6.151]	0.134 *** [8.673]	0.107 *** [6.151]	0.245 *** [6.184]	0.134 *** [8.673]	0.107 *** [6.151]	0.245 *** [6.184]	0.134 *** [8.673]	0.136 *** [8.902]	0.108 *** [6.175]	0.254 *** [6.675]	0.136 *** [8.902]	0.108 *** [6.175]	0.254 *** [6.675]	0.136 *** [8.902]	0.108 *** [6.175]	0.254 *** [6.675]	0.136 *** [8.902]	0.108 *** [6.175]	0.254 *** [6.675]	0.136 *** [8.902]	0.108 *** [6.175]	0.254 *** [6.675]						
College graduate	0.684 *** [7.324]	0.557 *** [5.421]	0.84 *** [3.301]	0.673 *** [7.139]	0.558 *** [5.367]	0.824 *** [3.250]	0.664 *** [6.885]	0.882 *** [7.634]	0.664 *** [6.885]	0.882 *** [7.634]	0.546 *** [3.026]	0.664 *** [6.885]	0.882 *** [7.634]	0.546 *** [3.026]	0.664 *** [6.885]	0.674 *** [6.945]	0.926 *** [7.529]	0.508 *** [2.885]	0.674 *** [6.945]	0.926 *** [7.529]	0.508 *** [2.885]	0.674 *** [6.945]	0.926 *** [7.529]	0.508 *** [2.885]	0.674 *** [6.945]	0.926 *** [7.529]	0.508 *** [2.885]	0.674 *** [6.945]	0.926 *** [7.529]	0.508 *** [2.885]						
Observation	740	539	201	740	539	201	1.155	634	1.155	634	521	1.155	634	1.155	634	634	521	1.155	634	521	1.155	634	521	1.155	634	521	1.155	634	521	1.155	634	521				
Adj. R-Squared	0.741	0.780	0.707	0.744	0.783	0.706	0.467	0.583	0.467	0.583	0.379	0.467	0.583	0.379	0.467	0.472	0.588	0.387	0.472	0.588	0.387	0.472	0.588	0.387	0.472	0.588	0.387	0.472	0.588	0.387	0.472	0.588	0.387			
F-value	181	196	62	168	181	56	71	62	71	62	29	71	62	29	71	72	62	28	72	62	28	72	62	28	72	62	28	72	62	28	72	62	28			
Model d. f.	10	10	9	11	11	10	10	10	10	10	10	10	10	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11			
RSS	179	106	57	177	105	57	343	145	343	145	179	343	145	179	339	143	177	339	143	177	339	143	177	339	143	177	339	143	177	339	143	177	339	143		
Chow test	6.282			5.667			5.875		5.875			5.875			5.875			5.782			5.782			5.782			5.782			5.782			5.782			
p-value	0			0			0		0			0			0			0			0			0			0			0			0			

Note: 1. L=# employee >hour worked. 2. Dummy variables for Industry are included in the estimations but not reported. 3. Robust t statistics in brackets. 4. \* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

nificance of the management scores is mostly due to the effect of the human resource management score in both countries and the combined sample regressions, whereas organizational management is insignificant or even negative at times.

The output elasticities of capital and labor were compared based on the coefficients of the estimated production functions. The output elasticity of labor is generally high in Japan, but the output elasticity of capital is high in Korea. Nevertheless, Table 6 shows that the average productivity of both labor and capital is higher in Japan than in Korea. These results remain the same whether regressions were run with gross output or value-added (Table 7) and are applicable to all other sub-samples of the manufacturing (Table 8) or services industry and to all samples divided by firm size such as large firms (Table 9).<sup>10</sup> These findings imply that Korean and Japanese firms use different production functions.

#### B. Estimation Results with a Korean Dummy

The over efficiency of Japanese and Korean firms was then compared with the merged regressions using a Korean dummy. In addition to the variables in Equation (1), we included cross terms with Korean dummy (KD) with respect to all explanatory variables in Equation (1). Equation (2) was estimated using the average score in all questions in the interview surveys.

$$\ln VA_i = \text{const.} + \beta_1 MS_i + \beta_2 MS_i * KD + \beta_3 K_i + \beta_4 \ln K_i * KD + \beta_5 \ln L_i + \beta_6 \ln L_i * KD + \beta_7 KD + \beta_8 X_i + \mu_i \quad (2)$$

Table 10 reports the results.<sup>11</sup> The estimation results for all samples (columns (1) and (2)) and all sectors, including manufacturing sector firms (columns (3) and (4)), service sector firms (columns (5) and (6)),

<sup>10</sup> Table 7 shows the estimation results when the value-added is a dependent variable. However, the estimation results are similar to those in Table 7 when we estimated a production function in which gross output is a dependent variable and intermediate inputs are included as another production factor.

<sup>11</sup> Although we estimated a production function with average management score and its cross term with Korean dummy, significant results of these coefficients were not observed in all estimations. The estimation results were determined when the management score was divided into two, namely, organizational management and human resource management.

large firms (columns (7) and (8)), and SMEs (columns (9) and (10)), are presented.

We first focused on the Korean dummy as a shift term, which was supposed to capture the overall difference in productivity of Japanese and Korean firms. Such differences are negative and significant in regression without the cross terms with capital and labor, implying that Korean firms have low efficiency. However, when the cross terms of the Korean dummy were added with capital and labor, the significance of the shift term disappeared. This pattern holds true in the regressions with all samples and different sub-samples of manufacturing, service, and SMEs. These findings imply that any efficiency difference between the two countries does not come from a technical efficiency (shift term) but from a factor efficiency (output elasticities of labor and capital). Most interestingly, in the result with large firm samples, the shift term dummy of Korean firms is positive and significant, indicating that Korean large firms are more efficient than Japanese firms even after the efficiency difference associated with output elasticities are controlled for.

Using different samples divided by sizes and sectors, all regression models confirmed the finding that Korean firms have high output elasticity of capital, whereas Japanese firms have high output elasticity of labor. This interesting pattern is consistent with other studies (Lee, and Jung 2009) and may be subject to diverse interpretations. One interpretation of such trend is that Japanese firms have been significantly economizing the use of labor, thereby showing a high output elasticity of labor, because of their high labor costs. This case also implies that labor is more binding in Japan than in Korea. By contrast, facing aggressive labor, Korean firms have relied on capital for growth, continuously renovating and updating their capital, thereby recording a high output elasticity.

Regarding management scores, the significance of the human resource management was observed in all regressions with Korean dummies although the Japan-Korea differences in the size of the human resource management effects varied by sub-samples. For instance, when this variable of human resource management was combined with Korean dummies, the interaction terms were generally insignificant, implying no difference in its effect between the Japanese and Korean firms. The share of college graduates in the total number of workers contributes to the improvement in firm performance.

**TABLE 10**  
ESTIMATION RESULTS WITH COUNTRY DUMMY VARIABLES (2006-2008)

InVA	All sample			Manufacturing			Service			Large firms			SMEs		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Org. score	-0.073 ** [-2.402]	-0.08 * [-1.924]	-0.087 ** [-2.092]	-0.112 [-1.488]	-0.066 [-1.494]	-0.069 [-1.402]	-0.028 [-0.600]	-0.061 [-1.169]	-0.104 *** [-2.631]	-0.107 * [-1.782]					
Org. score ×1(Korea)		-0.006 [-0.104]		0.026 [0.288]		-0.102 [-0.926]		0.081 [0.734]		-0.025 [-0.320]					
Human R.M score	0.1 *** [3.605]	0.077 ** [2.056]	0.085 ** [2.349]	0.061 [0.931]	0.122 *** [2.780]	0.104 ** [2.187]	0.106 ** [2.387]	0.104 ** [2.190]	0.098 *** [2.805]	0.065 [1.163]					
Human R.M ×1(Korea) score		0.043 [0.774]		0.032 [0.410]		0.163 [1.452]		-0.039 [-0.369]		0.067 [0.925]					
ln(Korea)	-0.369 *** [-10.198]	0.145 [0.296]	-0.447 *** [-10.211]	-0.127 [-0.178]	-0.15 ** [-2.422]	0.625 [1.019]	-0.333 *** [-6.017]	2.625 ** [2.459]	-0.295 *** [-5.770]	0.214 [0.197]					
lnK	0.198 *** [13.190]	0.168 *** [10.279]	0.288 *** [8.733]	0.265 *** [6.840]	0.145 *** [8.485]	0.14 *** [7.432]	0.247 *** [9.144]	0.209 *** [7.910]	0.16 *** [9.270]	0.125 *** [6.380]					
lnK ×1(Korea)		0.107 *** [3.454]		0.031 [0.545]		0.079 ** [2.245]		0.145 ** [2.327]		0.116 *** [3.210]					
lnL	0.807 *** [33.803]	0.84 *** [28.326]	0.726 *** [17.972]	0.76 *** [14.071]	0.851 *** [26.947]	0.856 *** [23.097]	0.781 *** [15.821]	0.899 *** [15.929]	0.708 *** [18.255]	0.737 *** [16.131]					
lnL ×1(Korea)		-0.107 ** [-2.181]		-0.051 [-0.655]		-0.097 * [-1.739]		-0.314 *** [-3.373]		-0.109 [-1.187]					
College graduate	0.747 *** [10.189]	0.745 *** [8.988]	0.689 *** [5.680]	0.764 *** [4.900]	0.701 *** [7.875]	0.753 *** [7.272]	0.754 *** [7.525]	0.619 *** [5.772]	0.75 *** [6.981]	0.75 *** [5.910]					
College ×1(Korea) graduate		-0.027 [-0.205]		-0.107 [-0.496]		-0.38 * [-1.745]		0.213 [0.864]		-0.053 [-0.309]					
Observation	1,609	1,609	903	903	706	706	608	608	1,001	1,001					
Adj. R-Squared	0.815	0.817	0.788	0.787	0.854	0.856	0.742	0.748	0.475	0.481					
F-value	592	423	377	293	448	334	127	109	82	65					

Note: 1. L=# regular workers ×hour worked. 2. Dummy variables for Industry are included in the estimations but not reported. 3. Robust t statistics in brackets. 4. \* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

*C. Results with Cross terms with Both a Korean Dummy and Management Practices*

The final experiments were conducted with the cross terms of labor and capitals interacting both with a Korean dummy and with management practice variables divided into organizational scores and human resources.

One of the questions addressed in this experiment was whether the Korea-Japan efficiency difference can be fully explained by the current variables that represent the management practices in these countries. In other words, we looked into whether the significance of a Korean dummy, either as a shift term or cross term with labor and capital, will disappear when the cross terms of labor and capital with the management practices are included in the regressions. To check the above alternative hypothesis, Equation (2) was revised as follows:

$$\begin{aligned} \ln VA_i = & \text{const.} + \beta_1 MS_i + \beta_2 MS_i * KD + \beta_3 K_i + \beta_4 \ln K_i * KD \\ & + \beta_5 \ln K_i * MS_i + \beta_6 \ln L_i + \beta_7 \ln L_i * KD + \beta_8 \ln L_i * MS_i \quad (3) \\ & + \beta_9 KD + \beta_{10} X_i + \beta_{11} X_i * MS_i + \mu_i \end{aligned}$$

Table 11 summarizes the results of the variable regressions. A pair of the results is shown for each different sample from the whole sample to the sub-samples of manufacturing, service, as well as large and small firms. As in Table 10, we divided the management score into organizational management and human resource management scores.

The first column in Table 11 is the result with labor and capital interacting only with the management practice variables, whereas the second column shows the results with labor and capital interacting both with the management practice variables and with a Korean dummy. In all the former results that only include interaction with management practices, the negative and significance of the Korean shift term reappears, opposing its disappearance in Table 10. In all the latter results with both kinds of interaction, the Korean dummies in the shift term lose their significance again or become positive and significant in the case of large firm samples. Even in these regressions, the sign and significance of the interaction terms between a Korean dummy and labor/capital are still similar to those in Table 10. In other words, the output elasticity of capital tends to be high in Korea as shown by the positive interaction terms but its output elasticity of labor is low as

TABLE 11  
ESTIMATION RESULTS WITH COUNTRY DUMMY VARIABLES AND MANAGEMENT SCORE VARIABLES (2006-2008)

InVA	All sample			Manufacturing			Service			Large firms			SMEs		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)					
Org. score	-1.411 *** [-2.732]	-1.487 *** [-2.812]	-1.131 [-1.307]	-1.051 [-1.135]	-1.437 ** [-2.129]	-1.404 ** [-2.064]	-3.658 *** [-2.761]	-3.671 *** [-2.675]	0.685 [0.853]	0.815 [1.000]					
Org. score ×1(Korea)	0.049 [0.796]	0.03 [0.485]	0.092 [0.961]	0.126 [1.284]	-0.034 [-0.260]	-0.081 [-0.650]	0.019 [0.181]	0.064 [0.608]	0.12 [1.470]	0.106 [1.309]					
Human RM score	0.206 [0.407]	0.311 [0.604]	0.875 [1.215]	1.07 [1.500]	-0.38 [-0.513]	-0.38 [-0.516]	3.01 *** [2.774]	3.411 *** [3.114]	-1.011 [-1.044]	-1.036 [-1.098]					
Human RM ×1(Korea) score	0.035 [0.599]	0.024 [0.408]	-0.014 [-0.174]	-0.008 [-0.092]	0.226 [1.521]	0.234 [1.521]	-0.026 [-0.439]	-0.044 [-0.482]	0.039 [0.482]	0.039 [0.464]					
1(Korea)	-0.587 *** [-3.883]	-0.145 [-0.292]	-0.689 *** [-3.013]	-0.333 [-0.403]	-0.638 ** [-2.237]	0.261 [0.423]	-0.305 [-1.371]	2.725 *** [2.756]	-0.703 *** [-3.423]	-0.203 [-0.188]					
lnK	0.382 *** [7.483]	0.293 *** [4.841]	0.317 *** [2.852]	0.255 [1.628]	0.31 *** [4.355]	0.264 *** [3.492]	0.306 *** [3.246]	0.247 *** [2.687]	0.429 *** [6.964]	0.349 *** [4.289]					
lnK ×1(Korea)	0.103 *** [3.055]	0.103 *** [3.055]	0.043 [0.641]	0.043 [0.641]	0.084 ** [2.449]	0.084 ** [2.449]	0.161 ** [2.536]	0.161 ** [2.536]	0.083 * [1.953]	0.083 * [1.953]					
lnK ×ORG. Score	-0.09 *** [-4.017]	-0.08 *** [-3.507]	0.028 [0.436]	0.032 [0.470]	-0.093 *** [-3.494]	-0.087 *** [-3.277]	-0.079 ** [-2.175]	-0.086 ** [-2.137]	-0.086 *** [-3.062]	-0.075 *** [-2.592]					
lnK ×HRM. Score	0.025 [1.110]	0.039 [1.596]	-0.034 [-0.561]	-0.024 [-0.378]	0.037 [1.285]	0.045 [1.548]	0.063 ** [2.090]	0.076 ** [2.466]	-0.016 [-0.542]	-0.004 [-0.117]					
lnL	0.435 *** [4.083]	0.49 *** [4.195]	0.615 *** [3.169]	0.706 *** [2.913]	0.345 ** [2.569]	0.385 *** [2.715]	0.538 * [1.842]	0.756 ** [2.467]	0.527 *** [2.581]	0.592 *** [2.741]					
lnL ×1(Korea)	-0.085 * [-1.690]	-0.085 * [-1.690]	-0.049 [-0.548]	-0.049 [-0.548]	-0.097 * [-1.735]	-0.097 * [-1.735]	-0.328 *** [-3.729]	-0.328 *** [-3.729]	-0.075 [-0.812]	-0.075 [-0.812]					
lnL ×ORG. Score	0.158 *** [3.350]	0.16 *** [3.308]	0.075 [0.858]	0.068 [0.736]	0.157 ** [2.517]	0.151 ** [2.417]	0.313 *** [3.146]	0.317 *** [3.000]	-0.015 [-0.215]	-0.029 [-0.407]					
lnL ×HRM. Score	-0.025 [-0.529]	-0.041 [-0.840]	-0.05 [-0.647]	-0.07 [-0.895]	0.025 [0.370]	0.019 [0.284]	0.291 *** [-3.048]	-0.291 *** [-3.503]	0.092 [1.152]	0.092 [1.118]					
College graduate	1.399 *** [3.970]	1.484 *** [3.729]	1.631 *** [3.046]	2.45 *** [3.601]	1.482 ** [2.426]	1.416 ** [2.265]	0.749 * [1.933]	0.296 [0.665]	1.803 *** [3.495]	2.113 *** [3.750]					
College ×1(Korea) graduate	-0.095 [-0.674]	-0.095 [-0.674]	-0.504 ** [-2.043]	-0.504 ** [-2.043]	-0.259 [-1.238]	-0.259 [-1.238]	0.927 [1.203]	0.927 [1.203]	-0.247 [-1.409]	-0.247 [-1.409]					
College ×ORG. Score	-0.276 ** [-2.221]	-0.325 ** [-2.508]	-0.738 *** [-3.339]	-0.904 *** [-3.922]	-0.084 [-0.436]	-0.1 [-0.516]	-0.168 [-0.991]	-0.179 [-1.045]	-0.337 ** [-2.085]	-0.433 *** [-2.685]					
College ×HRM. Score	0.041 [0.345]	0.075 [0.608]	0.421 ** [2.008]	0.49 * [1.933]	-0.224 [-1.058]	-0.167 [-0.791]	0.18 [1.031]	0.3 * [1.730]	-0.068 [-0.466]	-0.042 [-0.280]					
Observation	1.609	1.609	903	903	706	706	608	608	1.001	1.001					
Adj. R-Squared	0.818	0.819	0.79	0.791	0.86	0.862	0.747	0.755	0.484	0.488					
F-value	389	342	247	228	249	228	100	101	53	51					

Note: 1. L=# regular workers ×hour worked. 2. Dummy variables for industry are included in the estimations but not reported. 3. Robust t statistics in brackets, 4. \* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

shown by the negative interaction terms. These results clearly indicate that the current variables that represent the management practices (both organizational and human resource management) cannot fully explain the Korea-Japan differences in terms of both the overall efficiency and factor productivity.

The specific effects of management practices when they interact with either capital or labor were then examined. In the preceding results in Table 10, the effects of human resource management tend to survive better than those of organizational practices, which are often either insignificant or strangely negative when included as a shift term. When these effects are included as a cross term with labor or capital, the results vary. The interaction terms between labor and organizational practices tend to be positive and significant in several samples, such as in the entire sample, service firms, and large firms. However, the interaction of capital and organizational practices tends to show a negative and significant coefficient. In sum, the coefficients of the organizational variable as a shift term tend to remain negative or insignificant.

By contrast, the interaction terms of human resource management with labor or capital are insignificant in all cases except in large firms. The significance of the human resource management as a shift term previously observed tends to disappear in the results with the entire sample and services, but remains positive and significant in the results with manufacturing and large firms. These mixed results imply that the effects of human resource management exist although not always in a substantial extent and may be captured in diverse forms depending on the nature of firms.

#### *D. Robustness Checks*

Two alternative estimations were conducted to verify the robustness of the research findings. First, we included the “non-regular workers” in labor input in Japanese firms. “Non-regular workers” are workers without solid job security and fringe benefits. Second, we estimated Equation (2) through an instrumental variable method to consider the endogeneity between the value-added and management practices. TFP values were used as instruments in this estimation. Table 9 shows the estimation results of the first issue. The findings in this table are comparable to those in Table 10.

The sizes of the coefficient of the Korean dummy in its interaction term with labor are changed. Although the Korean dummy with labor is

**TABLE 12**  
ESTIMATION RESULTS INCLUDING NON-REGULAR WORKERS (2006-2008)

InVA	All sample			Manufacturing			Service			Large firms			SMEs		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Org. score	-0.072 ** [-2.365]	-0.085 ** [-2.053]	-0.096 ** [-2.271]	-0.128 [-1.636]	-0.04 [-0.922]	-0.068 [-1.428]	-0.032 [-0.679]	-0.066 [-1.391]	-0.094 ** [-2.410]	-0.089 [-1.485]					
Org. score ×1(korea)		0.012 [0.197]		0.04 [0.437]		-0.02 [-0.195]		0.108 [0.970]		-0.034 [-0.441]					
Human R.M score	0.123 *** [4.301]	0.081 ** [2.124]	0.1 *** [2.748]	0.12 * [1.831]	0.108 ** [2.378]	0.061 [1.273]	0.092 * [1.949]	0.067 [1.290]	0.128 *** [3.773]	0.093 * [1.829]					
Human R.M ×1(korea) score		0.053 [0.943]		-0.027 [-0.338]		0.318 *** [2.791]		0.003 [0.026]		0.05 [0.732]					
1(korea)	-0.241 *** [-6.013]	-0.495 [-1.039]	-0.365 *** [-7.849]	0.199 [0.264]	0.138 * [1.919]	0.414 [0.734]	-0.239 *** [-3.944]	-0.309 [-0.317]	-0.126 ** [-2.269]	-0.638 [-0.622]					
lnK	0.231 *** [15.733]	0.192 *** [12.244]	0.287 *** [8.527]	0.272 *** [6.357]	0.168 *** [10.230]	0.157 *** [8.944]	0.288 *** [11.145]	0.23 *** [9.995]	0.175 *** [10.102]	0.126 *** [6.349]					
lnK ×1(korea)		0.122 *** [3.802]		0.023 [0.386]		0.145 *** [3.911]		0.181 *** [2.738]		0.143 *** [3.859]					
lnL	0.735 *** [33.777]	0.768 *** [29.703]	0.733 *** [17.367]	0.77 *** [12.841]	0.763 *** [29.508]	0.778 *** [27.726]	0.601 *** [17.487]	0.66 *** [18.602]	0.641 *** [19.310]	0.665 *** [17.903]					
lnL ×1(korea)		-0.07 [-1.445]		-0.059 [-0.721]		-0.146 ** [-2.530]		-0.141 [-1.568]		-0.044 [-0.513]					
College graduate	0.501 *** [6.486]	0.375 *** [4.166]	0.663 *** [5.435]	0.666 *** [3.937]	0.179 * [1.875]	0.226 ** [2.093]	0.459 *** [4.338]	0.29 ** [2.476]	0.547 *** [4.894]	0.387 *** [2.815]					
College ×1(korea) graduate		0.253 * [1.832]		-0.007 [-0.029]		-0.308 [-1.464]		0.462 * [1.787]		0.222 [1.263]					
Observation	1611	1611	903	903	708	708	608	608	1003	1003					
Adj. R-Squared	0.809	0.812	0.786	0.785	0.853	0.86	0.729	0.737	0.477	0.477					
F-value	572	418	367	280	529	373	152	115	89	89					

Note: 1. L=# workers ×hour worked. 2. Dummy variables for industry are included in the estimations but not reported. 3. Robust t statistics in brackets.  
4. \* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

**TABLE 13**  
ESTIMATION RESULTS (IV REGRESSIONS, 2006-2008)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnVA	(Japan + Korea)	(Japan + Korea)	(Japan)	(Korea)	(Japan + Korea)	(Japan + Korea)	(Japan)	(Korea)
Average score	-0.024 [-0.368]	-0.064 [-0.978]	-0.042 [-0.468]	-0.094 [-0.930]				
Org. score					-0.961 ** [-2.553]	-1.275 ** [-2.091]	-0.856 ** [-1.983]	-1.307 * [-1.741]
Human R.M score					3.262 *** [2.673]	4.297 ** [2.099]	4.119 ** [2.273]	3.547 * [1.717]
1(Korea)		0.281 [0.655]			0.516 [1.452]	5.299 * [1.754]		
lnK		0.197 *** [15.206]	0.162 *** [11.230]	0.278 *** [10.195]	0.187 *** [4.288]	0.195 *** [2.952]	0.135 ** [2.124]	0.372 *** [3.379]
lnK × 1(Korea)		0.115 *** [4.347]				0.051 [0.424]		
lnL		0.821 *** [37.920]	0.856 *** [32.484]	0.742 *** [17.936]	0.437 *** [2.722]	0.371 [1.450]	0.404 * [1.798]	0.085 [0.211]
lnL × 1(Korea)		-0.117 *** [-2.764]				-0.318 [-1.534]		
College graduate		0.734 *** [11.201]	0.734 *** [8.859]	0.708 *** [6.199]	0.362 [1.389]	0.968 ** [2.562]	1.125 *** [2.969]	-0.974 [-0.930]
College graduate × 1(Korea)		0.005 [0.038]				-1.886 * [-1.828]		
Observation	1,479	1,479	840	639	1,479	1,479	840	639
Adj. R-Squared	0.83	0.832	0.868	0.761				
F-value	290	262	230	86	25	13	12	7

Note: 1. L=# regular workers ×hour worked. 2. Dummy variables for Industry are included in the estimations but not reported. 3. Robust t statistics in brackets. 4. \* p<0.10, \*\* p<0.05, and \*\*\* p<0.01. 5. Dummy variables for organizational reform, country dummy, and 3- and 4-period-lagged TFP values are used as instrument variables.

negative and significant in most estimation results in Table 10, its significance disappears in Table 12. This observation implies that the non-regular workers are not as efficient as the regular ones. In other words, while regular Japanese workers are more efficient than Korean workers, the efficiency of the average Japanese workers, including non-regular workers, is almost the same as that of regular Korean workers.

However, a more interesting finding than the one cited in the preceding paragraph is with regard to the coefficient of a Korean dummy inserted as a shift term. In Table 12, this Korean dummy is insignificant, but it is positive and significant in Table 10, indicating that large Korean firms have a high overall efficiency. These results imply that in Japan, hiring non-regular workers helps firms improve their overall productive efficiency relative to firms in other countries. This conclusion may imply that the productivity gap between regular and non-regular workers in Japan may be lower than their wage rate gap.

Table 13 demonstrates the estimation results on the second issue. The results shown in this table are similar to those in Table 10, verifying the robustness of our findings. The management practices in human resource management are positively and significantly associated with productivity in Korean and Japanese firms. The output elasticity of capital in Korean firms is higher than that in Japanese firms. By contrast, the output elasticity of labor in Japanese firms is higher than that in Korean firms.

## **V. Conclusions**

In the last 20 years, Korean firms have been catching up with Japanese firms; in fact, some of them have already overcome the performance of the competing Japanese firms. According to the growth accounting in Japan and Korea, the accumulation in intangible assets plays a key role in explaining the difference in economic performance in these countries. Among several kinds of intangibles, management skills and human capital are crucial to the improvement in firm performance. Bloom, and Van Reenen (2007) examined the effects of organizational and human resource management on firm performance by conducting interview surveys in France, Germany, the UK, and the US. Following the work of these researchers, we conducted an interview survey on organizational and human resource management in Japan and Korea.

We particularly developed the scores on management practices in each

firm based on the interview surveys. With regard to organizational management, the firms with clear organizational targets, efficient communication among employees, and active implementation of organizational reforms would receive a high score. With regard to human resource management, the firms that evaluate human resources flexibly and strive to keep their employees motivated would obtain high a score.

The distributions in the average management scores between Japanese and Korean firms were compared. The results showed that the mean value in Japan is higher than that in Korea. The K-S test confirmed that the distributions in the average score in Japan significantly vary from those in Korea. The results are similar to that in all firms although only the distribution in the average score in the manufacturing firms (which dominated the sample in the Korean survey) was analyzed.

Using these scores, we examined whether the improvement in firm performance is associated with enhanced management practices. The estimation results obtained using the combined sample of Japan and Korea showed that the measure indicating management practices in human resource management is positively and significantly related to the improvement in firm performance although it is positive and insignificant for the sample of each country. The significance of the management score in human resource management is the same even when a Korean dummy was added to the combined sample as a shift term.

The coefficient of the Korean dummy was negative and significant when the Korean dummy was added as a shift term. This condition implies that Korean firms have low efficiency. However, when we added the cross terms of the Korean dummy with capital and labor, these cross terms were significant and the significance of the shift term disappeared. This finding entails that any efficiency difference between the two countries does not come from a technical efficiency (shift term) but from a factor efficiency (marginal productivity of labor and capital). Even when we further added the cross terms of management practices with labor and capitals, the signs and significance of the cross terms of the Korean dummy with labor and capital remained the same. This result reconfirms our earlier interpretation that the differences in the management practice variables used in this survey cannot fully exhaust the Korea-Japan differences, which seem to involve several other dimensions.

The management practices were then divided into organizational and human resource management. Human resource management was determined to have more significant effects as a shift term than organizational management considering both the share of college graduates and

the labor force. However, the results changed when we added the cross terms of the organizational or labor management practices with labor or capital. For instance, the interaction terms between labor and organizational practices tend to be positive and significant in several samples. These mixed results imply that both human resource and organizational management yield effects but not always to a substantial extent and that such effects may be captured in diverse forms depending on the nature of firms.

Finally, we obtained an interesting finding that is robust in different models with or without the management practice variables interacting with labor and capital: Korean firms have a high output elasticity of capital, whereas Japanese firms have a high output elasticity of labor. This finding was confirmed by all regression models using different samples divided by sizes and sectors. We also determined that the capital-labor ratios in Korean firms are higher than those in Japanese firms whether they are measured using the number of workers, working hours, or the sum of wage payment as a measurement of labor. Using the estimated coefficients from the separate production function, we calculated the ratio of the marginal productivity of capital and labor ( $MPI/MPk$ ). Such ratio for the whole sample in Japan was determined as 5.4 and 4.8 in large Japanese firms. This ratio in Korea is significantly lower than that in Japan at 3.8 for the whole sample and 2.3 in large firms.

All these findings may constitute a puzzle because it implies that despite its low K/L ratio, Japanese labor is relatively more productive than that of Korean, whereas the Korean capital is relatively more productive than that of Japan despite its high K/L. One way to rationalize this puzzle would be that Japanese firms have pursued optimization of labor uses and have been relying on labor-saving growth in contempt of labor shortage and aging. Notwithstanding aggressive labor, Korean firms have relied on capital for growth, continuously renovating and updating their capital, thereby recording a high capital productivity. This reasoning is supported by actual data because the K/L ratio in Korea had increased four times from 1985 to 2005, whereas the K/L ratio in Japan had increased only two times over the same period not because of aggressive capital investment, but because of the decrease in labor inputs (Lee, and Jung 2009).

Although all the Korea-Japan efficiency differences captured in the shifting Korean dummy disappeared when additional variables were added, the dummy remained positive and significant in the sample of

large firms. This finding seems to be consistent with the phenomenal rise of large Korean businesses globally. However, such significance disappeared when we included both the regular and non-regular workers in Japan.

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## **Appendix**

### **A. Questionnaire: Quantitative Accompanying Information about the scoring**

#### *A.1. Permeation of management principles (vision)*

1. Does your company have management principles that it has upheld for many years?
2. What kind of schemes are in place to have those management principles shared by all employees? (For example, announcing them at the morning assembly, or making them portable by writing them on cards or such like.)
3. Are the management principles also supported by parties such as external partners or the shareholders?

#### *A.2. Implementation of organizational goals*

1. Are there specific numerical goals on multiple levels that go beyond being just a vision or a slogan, regardless of the level of the goals (such as company-wide or divisional or sectional goals)?
2. Are the goals of each division adjusted in each division to ensure consistency between divisions?
3. Is consistency maintained between these goals and the goals of the management principles or of the long-term company-wide goals?

##### *A.2.1. Implementation of organizational goals (setting target levels)*

1. For example, are the settings for the divisional or sectional target levels simply given to you from the division or section above you? Or are they given to you while considering the opinions of your division or section?
2. Are the target levels appropriately set as non-binding challenges?
3. Are target levels checked to ensure there is fairness between divisions or sections? Please give an example of how they are checked.

*A.2.2. Implementation of organizational goals (permeation of goals)*

1. Do all employees know about the goals?
2. If goals exist on various levels (such as company-wide, divisional and sectional goals), do all employees understand the level of priority of the goals?
3. Do all employees accept the target levels? Please give an example if possible.

*A.2.3. Implementation of organizational goals (degree to which goals are achieved, checks on performance)*

1. Are checks made to see how far goals have been achieved? Please give an example of how such checks are made.
2. Are such checks made on a periodic basis rather than being made as necessary? And how frequently are such checks made?
3. Are additional checks made that are decided by the section or department involved itself, rather than just being fixed checks?

*A.2.3.1. Implementation of organizational goals (permeation of degree to which goals are achieved, and results of checks on performance)*

1. Are the results of such checks made openly available within your division?
2. Are the results of such checks made openly available within not only your division but also between relevant divisions?
3. Are adjustments made to ensure that the degree to which goals have been achieved at different divisions is fairly compared? (for example, utilizing common scales such as overtime hours?)

*A.2.3.2. Implementation of organizational goals (results of checks - handling when goals have not been achieved)*

1. Is a meeting consisting of managerial staff and employees promptly held as soon as it is known that the goals were not achieved?
2. After investigations, are points to revise spread throughout the division, and are measures for handling the failure to achieve the goals promptly implemented? (In this case, exclude personnel matters.)
3. Are problematic issues and countermeasures made thoroughly known throughout the relevant division, and if necessary, other divisions? Please give an example if possible.

*A.2.3.3. Implementation of organizational goals (results of checks - handling when goals have been achieved)*

1. When goals are achieved are investigations made so that those goals renewed on a continuous basis or so that higher goals are set?
2. How long is it between the setting of higher goals and the operation / implementation of those goals?
3. Are these measures institutionalized on a company-wide level?

*A.3. Non-stylized communication within the organization*

1. Are measures and activities other than stylized meetings used to increase informal communication?  
(for example, informal meetings consisting only of key personnel)?  
Please give an example.
2. Are informal meetings held between divisions?
3. Are informal meetings held with persons of various ranks?

*A.4. Implementation of organizational reform*

1. Has your company undergone any organizational reforms in the last ten years? When did it occur?
2. Did your company use a consulting company at that time? How much did it cost?
3. Did you determine the results of the reform in a quantified manner? By what percentage did profits increase or by what percentage were costs reduced?

*A.4.1. Period of organizational reform or strategic change*

1. Did it take time to implement the organizational reform over one year? How many years were spent including preparation period?
2. Why was the organizational reform necessary? Was it to do with the leadership of the top management?
3. During the organizational reform, did the mid-level management also strive to achieve the reform, thereby giving a sense of unity in the company?

*A.4.2. Scope of the effects of organizational reform*

1. Were the effects of the reform shown in the divisions or sections? If they were, please give an example of the effects.
2. Were the effects of the reform shown between divisions, and not just within one division? If they were shown between divisions, please give an example of the effects.

3. Were the effects of the reform shown between the company and the business partners, and not just within the company? If they were, please give an example of the effects.

*A.4.3. Details of the organizational reform (delegation of authority)*

When a company undergoes organizational reform, sometimes the employees' decision-making authority is also revised. In case of your company,

1. Was decision-making authority given to those in a lower position as a result of the organizational reform?
2. Were posts simplified in conjunction with decision-making authority being given to those in a lower position?
3. As a result, was there a change in the details of the job or the way of doing the job? Please give an example.

*A.4.4. Details of the organizational reform (IT activities)*

1. Did the IT system make your company more streamlined, for example by reducing the amount of paper-based documentation?
2. In the last decade, did your company launch organizational reform, rather than raise business efficiency, by utilizing the IT system?
3. Did an opportunity to earn new profits arise as a result of the organizational reform by the organizational reform based on the IT system? Please give an example.

*A.5. Promotion system*

1. Does your company mainly have a performance-based promotion system?
2. If the promotion system is mainly a performance-based one, does your company have a management-by-objectives system? If it does, when did that system begin?
3. Did the performance of the employees improve as a result of using the management-by-objectives system and introducing a performance-based promotion system?

*A.6. Schemes to improve motivation*

1. Are there any schemes other than promotion-related or pay-related systems to increase the motivation of the employees? Please give an example.
2. Is that scheme used on an institutional basis throughout the company?

3. Do you monitor when the employees' motivation, retention rate or job performance increases as a result of such scheme?

*A.7. Handling employees that perform poorly*

1. Are they handled in some specific way other than by giving them oral warnings?
2. Does that handling include measures that are implemented faster than the average term of office?
3. Are the measures implemented as soon as a problem is confirmed (before a routine rotation)?

*A.8. Handling employees that perform well*

1. Is it made clear within the division that the employee's performance is good, for example by management praising employees at meetings?
2. Is there a system to connect good performance to things such as financial reward or promotion?
3. Was the motivation of the employees raised through introducing such system?

*A.9. Securing good manpower*

1. Can you identify the high performance and core employees, mentioned in the question A.9., in your company? Please give an example.
2. Such excellent employees are treated well compared with ordinary employees? If so, how they are treated?
3. Could you prevent the loss of such excellent employees?

*A.10. Evaluating the interpersonal skills of the managers*

1. Do the managers give clear criteria such as the degree to which persons of a lower position should be nurtured?
2. Is there an incentive system, such as a pay-related or promotion-related system, to reward managers that have nurtured excellent staff of a lower position?
3. Did the motivation of the managers increase as a result of introducing such system?

*A.11. Nurturing human resources through training*

1. Is there training on an occupational ability basis or an assignment basis, aiming to improve the work skills of the employees? Over the course of one year, on average how long is spent on training? (Training on an occupational ability basis means training in specialist capabilities that are required in each field, such as management,

business, research and development, and manufacturing. Assignment-based training means training in areas such as languages, OA, computing, and acquisition of official certifications.)

2. Do those training activities help to improve business results? Please give an example.
3. Are the effects of those training activities adaptable to other companies?

*A.12. Nurturing human resources through OJT*

1. Is OJT performed on a daily basis? What percentage of the supervisor's working time is spent on giving instructions to those in a lower position?
2. Does OJT contribute to business results? Please give an example.
3. Are the effects of OJT monitored? Please give an example of the methods used.

*A.13. Employees' expertise*

1. Are employees rotated in a fixed schedule, such as once every two or three years?
2. To improve the expertise of the employees, are they assigned to a set position for a long time?
3. Is there a systematic program in place to ensure the employees acquire some expertise?

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