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Management Practices in Korean Manufacturers: A Striking Level Difference between Production and Incentive Management*

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This study investigates the management practices of 926 manufacturing plants in South Korea using the quantitative method by Bloom et al. (2019). The original management and organizational practices survey (MOPS) in the U.S. is revised to reflect the Korea-specific environment and merged with the Mining and Manufacturing Survey of Statistics Korea. We determine that the measured management scores vary substantially across the plants, while they change little over time. When the overall management is categorized into production and incentive management, the median score of the latter is about 56% of the former, much lower than the corresponding score ratio in the U.S. which is 92%. The structured management turns out to have a strong and positive relationship with any measure of productivity. The plants at the 90th percentile of management scores in the sample are 30.3% higher in total factor productivity than those at the 10th percentile.

JEL Classification: D22, D24, L25, L60, M11, M52
Keywords: management practices, MOPS, incentive management, productivity

I. Introduction

Although managerial input has been regarded as an important source of productivity differences across firms, it has not been actively studied in economics field in large part because it is difficult to be observed in the data. A seminal paper

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by Bloom and Van Reenen (2007) gained much attention by overcoming the limitation and quantitatively measuring management practices, a key managerial input. They have developed the standards for best practices in four aspects of management (production process, performance monitoring, target setting, and personnel/incentives) that can be applied to any manufacturers. These standards turned into 18 open-ended questions for a large-scale survey from which the overall management score is measured for 732 firms in multiple countries. The score explains a significant portion of productivity differences among those firms.

A couple of follow-up studies have attempted to transform the open-ended questions into equivalent multiple-choice questions, wherein the survey can be scaled up after the success of the survey measurement approach. Bloom *et al*. (2019) is an output of the attempt: they successfully show that the previous findings on the relationship between management practices and organizational performances are well preserved in the new survey data with more than 35,000 manufacturing plants. They prove that the relationship is causal: better management practices or what they call the "structured management" do enhance productivity.

This study takes the survey approach of Bloom *et al.* (2019) and evaluates the management practices of 926 Korean manufacturing plants in 2014 and 2017. The population is divided into 10 major sectors and five size groups and the sample is randomly chosen within each stratum. We design our own survey consistent with the original U.S. Management and Organizational Practice Survey (MOPS) used in Bloom *et al.* (2019), but slightly adjust the questionnaire to reflect the Korea-specific environment. Thus, our survey data can generate not only the management score completely comparable to the one in the U.S., but also alternative scores of management practices that may be more appropriate in the Korean context.

Our findings are consistent with Bloom *et al.* (2019) or other related studies. The measured management scores are widely heterogenous among the sample plants, although the overall variance is smaller than in the U.S. case. The heterogeneity is equally observed across plants within the same firms. Larger plants and exporters tend to have a more structured management, but older plants do not necessarily possess better management skills. The latter finding is in line with that the plant-level management scores change little over 2014 and 2017.

The structured management turns out a main driver of productivity differences among Korean manufacturers. The 90-10 spread in the management scores accounts for around 21% of the same spread in the revenue-based total factor productivity (TFP) after partialling out the five-digit industry and year fixed effects. The estimate is comparable to the result of the U.S. case where the corresponding estimate is 18%. To obtain a practical sense about the spread, our preferred estimate indicates that the plants at the 90^{th} percentile exhibited 30.3% higher TFP than the plants at the 10^{th} percentile. The relationship between management and productivity is robust to alternative scoring methods for management practices and alternative measures of productivity.[1]

The most striking and crucial result in our study is arguably the substantial score difference between production and incentive management within the same plants. The incentive management score tend to be much lower than the production management score in most plants, wherein the median of the former is only around56% of the median of the latter (62% for the average score ratio). In the U.S., the corresponding median score ratio is 92%. Korea and the U.S. are roughly at the same levels in both median and average production management scores, indicating that the overall management score difference between the two countries is solely driven by the incentive management.

This paper contributes to the academic literature and policy dialogue in several ways. First, our study provides the quantitative status of management practices of Korean manufacturers in a consistent manner with the U.S. case. This naturally allows us to evaluate the management in Korea relative to the benchmark country and identify a potential source of manufacturing productivity difference between the two countries.[2] Given that the survey has been or plans to be conducted in other countries, more comparisons will be possible with other countries.

Second, poor incentive management found among Korean manufacturers is alarming to the economy, wherein it could work as a deep obstacle to future productivity growth. The literature robustly documents that incentive management is complementary to the utilization of new technology, a main source of productivity enhancement (Bloom *et al.*, 2012a; Atkin *et al.*, 2017). Poorly-managed worker incentives—which is quite persistent—can deter firms from adopting and utilizing new technologies, ultimately hampering the firm's competency. The result also raises a fundamental question of why and calls for more researches on that issue.

Third, our study provides implications for the direction of Korea's innovation policy. South Korea is one of the most innovative countries in the world if innovative activities only consider technological inputs and outputs. For example, Korea's R&D expenditure share of the GDP is the world's number one with 4.81% in 2018. However, the technological inputs and outputs comprise only a part of innovation. The other equally important part is managerial inputs and outputs, such as marketing and organizational practices. (OECD, 2005; OECD/Eurostat, 2018). Innovation policies often miss these managerial activities because they are hardly measurable, unlike the technology-related activities. We guide what policymakers need to take into account in their policy design by emphasizing the

[1] Although we do not directly show the causal effect of the structured management, the literature consistently supports the causal relationship. The next section introduces the literature.

[2] According to Korea Productivity Center (2019), the manufacturing productivity in Korea, measured by the PPP-based real value added per worker, is about 90% of the one in the U.S. as of 2015. If nominal exchange rate is applied instead of PPP, the number goes down to 66%.

role of management practices with visible statistics.

This paper is organized as follows. The next section introduces the literature on management practices with a particular focus on the methods for quantitative measurement. Section 3 introduces how we implement the Korea MOPS and construct the final sample for our study. Our findings are reported in Sections 4 and 5. We show the cross-sectional distribution of the plant-level management scores in the sample, as well as their change over time in Section 4. Section 5 then relates the score with other plant characteristics including productivity. Section 6 concludes the study.

II. Related Literature

Economists typically do not trust a respondent's evaluation-based survey because it may contain serious measurement errors. The tendency had prevented the economics field from investigating the role of management in the economy despite its importance (Syverson, 2011). The previous literature that had assessed the role of management mostly conducted case studies on one or a few companies.[3]

The value of Bloom and Van Reenen (2007) hinges on the validity of their measure of management practices. They applied several innovative techniques to secure the validity. For example, the interviews were conducted over the phone by trained students in MBA or similar majors. Two interviewers interviewed two different managers in the same company to reduce the bias from the phone survey. Based on the rigorous measures, they determined several interesting results, including the large heterogeneity in management practices among firms across countries and the strong association between management practices and firm performances.

Numerous subsequent studies have emerged since then. One strand extends the research topic to several service sectors such as schools (Bloom *et al.*, 2015a) and hospitals (Bloom *et al.*, 2015b).[4] Another branch looks at how management practices are related with other business activities including the degree of utilization of information technology (Bloom *et al.*, 2012a), the decentralization of authority (Bloom *et al.*, 2012b), and the internationalization of firms (Bloom *et al.* 2018). Management practices have a significant and positive relationship with each activity.

Bloom *et al.* (2013) conducted a randomized controlled trial that provides free consulting to firms in India. The quality of management practices has improved for

[3] Studies in the business literature typically take this approach. Within the literature of economics, for example, see Ichniowski *et al.* (1997), Lazear (2000), and Bartel *et al.* (2007).

[4] In particular, Bloom *et al.* (2015b) use instrumental variables to show that the correlation between management and productivity is causal.

consulted firms, which has led to increased productivity (Bruhn *et al*., 2018) for a similar experiment). Bloom *et al.* (2020) examine how long the effect of the consulting in the previous experiment lasts, finding that about half of the consulted firms maintained relatively a high management quality and worker productivity after about eight to nine years. The persistent effect of management consulting on productivity is also found in a natural experiment setting by Giorcelli (2019).

Bloom *et al.* (2016), replace the open-ended questions with closed-ended ones to circumvent some major limitations of Bloom and Van Reenen (2007). The open-ended, subjective questions can generate too much various answers. The interpretation of similar answers may also vary by the characteristics of interviewers. To induce the categorizable answers and make consistent interpretations of the answers, the cost of training is bound to be high. The response rate to the survey is also relatively low because the survey takes a long time. The MOPS is designed for the purpose. It maintains the questions about the core management practices selected from previous studies almost identical but converts them into multiple-choice questions to draw standardized answers. The MOPS was conducted in collaboration with the U.S. Census Bureau as a panel survey over 2010 and 2015. Because the survey requires a response by law, not only did it dramatically improve the response rate, but it also reduced the cost per survey. See Buffington *et al.* (2016) for a formal introduction to the U.S. MOPS including the survey questionnaire.

A potential drawback of the MOPS is the measurement error caused by respondent's different interpretations or careless answers to the survey questions. As the U.S. survey asks about the management practices six years ago along with the previous year (five-year difference), the measure may reflect the wrong memory (recall error). Thus, the success of the MOPS depends on whether the findings in prior studies are still preserved. Bloom *et al.* (2019) has shown that the relationships between management practices and organizational performances found in the previous studies were consistently observed through the MOPS data.

The successful transition to the survey method, which is relatively easy to be replicated, has allowed several national statistical agencies to conduct the survey in their own language.[5] This study benchmarks the U.S. MOPS and quantitatively measures the level of management practices in Korean manufacturing establishments.

A closely related paper to ours is Lee *et al.* (2016), who benchmark the early version of the survey in Bloom and Van Reenen (2007) to investigate management practices of 350 Korean firms (and 570 Japanese firms). They determine that

[5] As of the end of 2019, countries who have conducted a version of the MOPS (including pilots) include the U.K., Germany, Japan, Australia, Canada, Mexico, and Pakistan. Bloom and Van Reenen, with their co-authors, are currently hosting the MOPS Conference in December every year to share and disseminate researches related to the survey. Statistics Korea also participated in the conference in 2019 and conducted a pilot survey in 2020 which we discuss briefly at the end of the paper.

incentive management is significantly associated with productivity, which is consistent with ours.[6] Our study not only provides stronger evidence on the association, but also reports some new findings on management practices in Korea, including its distribution and the relationship to other plant characteristics.

III. Data Description

The data for this study originates from two sources. We collected information on management practices at the establishment-level from our own survey, which we refer to as Korea MOPS. It is combined with the Mining and Manufacturing Survey data from Statistics Korea. The dataset provides a unique chance to investigate how management practices are related to several plant characteristics. This section briefly introduces the structure of the Korea MOPS, sampling method, and survey implementation strategy. The difference between the Korea MOPS and the U.S. MOPS is also discussed. The main part of the survey questionnaire is provided in the Appendix, while the full questionnaire written in Korean may be found in Chung (2018).

3.1. Structure of the Korea MOPS

The basic structure of our survey questionnaire is similar to the U.S. MOPS, which is nicely introduced in Buffington *et al.* (2016). We refer to the paper for more details on the MOPS. Because there are some noticeable differences in detail questions, we briefly introduce the Korea MOPS with the emphases on the differences.

Section A of the Korea MOPS, equivalent to Section A and B combined in the U.S. MOPS, asks management and organizational practices through 18 and six questions, respectively. The questions on management practices comprise how to (i) set targets, (ii) monitor production processes, and (iii) incentivize employees, as shown in Bloom *et al.* (2016, 2019). However, the 18 questions in our study are broadly categorized into two types: production management (corresponding to questions A1 through A7 in the questionnaire in the Appendix) and incentive management (questions A8 through A13). The other 6 questions on organizational practices are to measure the degree to which the plant's decision-making is independent of its separate headquarter.

Note that Section A adds new questions, A10 and A11, that do not appear in the

[6] Their measure of management practices do not include production management, as their sample also covers service firms. Instead, they include "organizational management" which intend to capture organizational vision and reforms.

U.S. MOPS. They are added because the pay systems in Korea and the U.S. are notably different. The definition of a job task in the U.S. is relatively well described, wherein job-based pay has long been practiced, whereas the traditional wage scheme in Korea is seniority-based pay. The most common form of salary adds performance-based bonuses on top of the basic seniority-based pay. To capture this unique feature in Korea, A10 asks the type of pay system in the establishment, and A11 measures the degree to which the plant provides incentives to employees by asking the percentage of the bonuses in the total salary.

Section B involves questions about technology investment and relevant practices particularly focusing on the share and use of data generated from various production activities (Brynjolfsson and McElheran, 2016, 2019). While the equivalent section (Section C) in the U.S. MOPS surveys some organizational practices regarding the data, we added a question (B1) to obtain information on the adoption status of new technologies. The specific question asks: *"In what year has each of the following seven technologies been adopted? (will be adopted by 2020, if not yet adopted?)"* The seven technologies are Internet of Things, Cloud Computing, Machine Learning, Big Data Processing and Analysis, Intelligent Robot, Blockchain, and Augmented/Virtual Reality. These technologies are often introduced as the key technologies for digital transformation and a potential source of productivity gain (See Chung and Kim (2021) and references therein).

Section C is about uncertainty with regard to the plant's future performance and decision-making. The section is the same as the U.S. MOPS (Section D).

Section D of the Korea MOPS consists of the questions about the plant's general characteristics and financial information. We added a question (D8) on ownership types of the headquarter firm as follows: "*Of the following, which one is the closest to the relationship between ownership and management in the headquarter firm to which your establishment belongs?*". Four choices are provided for an answer: (1) The owner has most of the decision-making authority and directly supervises the management; (2) Managed by a professional manager, but lacks transfer of authority; (3) Although the management has been transferred significantly to a professional manager, the decision-making authority on key management issues remains with the owner; and (4) Ownership and management are completely separate and independent. According to Bloom and Van Reenen (2007, 2010), the owner's strong controls on management are negatively associated with management quality.

3.2. Sampling and Implementation Strategy

The target population of the survey is all establishments with 10 or more employees and three years or older as of 2017 in 10 two-digit manufacturing industries based on the 10th revision of the Korean Standard Industrial

Classification (KSIC10).[7] There are around 32,000 registered establishments in the population of which the list is obtained from the Korea Industrial Complex Corporation (KICOX). The final sample is limited to 1,000 establishments due to the cost required to conduct the in-person survey. Considering that the sample size is insufficient to cover all industries in manufacturing, we restrict the population to the 10 two-digit industries.[8]

It is difficult to test the hypotheses of our interest by randomly sampling a thousand observations out of the 32,000 population. For example, to check whether plant-level management practices is heterogeneous within a firm, multiple plants of the same firm should be sufficient in the sample, but the probability of choosing them is not high from a random sampling. We divided the population into three groups to deal with the problem. Group I comprised the firms with a single manufacturing plant. Group II comprised the firms with multiple plants, and Group III comprised the firms belonging to a foreign investor. Multi-plant firms of Group II can be identified through the registered establishment list of the KICOX. The affiliation of Group III (foreign-invested firms) is identified using the list of foreign direct investment firms by the Ministry of Trade, Industry and Energy.[9] Group II compares the management practices of several plants within the same firm, and Group III compares between establishments in foreign-invested firms and in domestic ones.

The size of the establishment is divided into five categories: (i) 10∼19 employees, (ii) 20∼49, (iii) 50∼99, (iv) 100∼299, and (v) 300 or more employees. Thus, a population matrix is formed for each of the 10 industries and the five size categories. After dividing the population by group-industry-size, the target sample observations in each cell are set based on two conditions. First, the industry distribution in the sample should follow the distribution in the population. Second, the size distribution within each industry is set to roughly weigh 15%, 30%, 25%, 20%, and 10% for the size categories (i) to (v), respectively. The assigned weights are intentionally different from the population. The number of plants with 10 to 19 employees accounts for more than half of the population, whereas the ones with 300 or more only accounts for around 1%. However, our study aims to grasp how the management practices vary across plants of various sizes rather than to represent the

[7] The selected industries are manufacturers of food products (two-digit code=10); wearing apparel, clothing accessories and fur articles (14); chemicals and chemical products (20); pharmaceuticals, medicinal chemical and botanical products (21); fabricated metal products (25); electronic components, computer; visual, sounding and communication equipment (26); medical, precision and optical instruments, watches and clocks (27); electrical equipment (28); other machinery and equipment (29); motor vehicles, trailers and semitrailers (30).

[8] There are no objective criteria for the selection. Our primary criterion is the size of the industry (measured by employment) but we make sure that some light industries are also included.

[9] If the multi-plant firm is a foreign-invested firm, it is classified into Group II. Classifying them into Group III does not change our findings qualitatively.

population.

Before conducting the main survey, we conducted a pilot survey with a sample size of 30 to confirm that the questionnaire is properly designed. The pilot survey revealed that some of the answers are extremely concentrated on one choice. We re-adjusted the number of choices in such cases.[10] The survey questions are mainly for the 2017 status but the status in 2014 is also asked in management-related questions to track changes over time. The time interval is set to three years to reduce the recall error mentioned before, contrary to the five-year interval in the U.S. MOPS, although doing so does not suffice to circumvent the problem.

Plants are randomly contacted within each cell and surveyed if permitted. The process repeated until the target sample size is obtained. The final response rate was 37.7%. Survey respondent was limited to the one who has worked as the plant's manager or CEO and understands its management practices well. We hired around 50 interviewers and instructed them on the survey structure, specific meaning of each question, and rules to watch out for, among others, while going through the survey together. The interviewers were requested to lead the interview and record all answers by themselves throughout the interview. The face-to-face survey was conducted almost two months from August to October 2018. The finished surveys were cross-checked by other interviewers who asked the survey respondents whether the interview was properly conducted at the site.

[Table 1] Sample by Industry and Size

Industry (KSIC10 2-digit Code)	Size (Number of Employees in 2017)					Total
	10∼19	20∼49	50∼99	100∼299	≥300	
Food Products (10)	15	42	36	42	9	144
Wearing Apparel & Fur Articles (14)	6	9	5	5	1	26
Chemicals & Chemical Products (20)	11	28	24	25	8	96
Pharmaceuticals (21)	3	10	3	11	3	30
Fabricated Metal Products (25)	17	59	16	14	2	108
Electronic Comp. & Comm. Equip. (26)	20	40	24	25	11	120
Medical, Precision, Optical Inst. (27)	16	27	6	10	2	61
Electrical Equipment (28)	19	25	14	5	6	69
Other Machinery & Equipment (29)	30	42	40	30	5	147
Motor Vehicles & Trailers (30)	6	41	25	34	19	125
Total	143	323	193	201	66	926

Notes: The observations are for 2017, among which Group I, II, and III have 583, 129, and 214 observations, respectively.

[10] For example, question A2 has the four choices in the U.S. MOPS: (i) No key performance indicators (KPIs), (ii) 1∼2 KPIs, (iii) 3∼9 KPIs, and (iv) more than 10 KPIs. However, most answers to the question in our pilot survey were 3∼9 KPIs. Thus, we divided it into two choices, (iii) 3∼5 KPIs and (iv) 6∼9 KPIs, as shown in the Appendix. Questions A9 and A13 are also such cases.

Among 1,019 plants surveyed through this process, 926 have left in the final sample, as shown in Table 1, after dropping disqualified observations in terms of industry-size-age criteria or data quality. The target number is not exactly fulfilled in some cells because the number of plants in the population itself was extremely small. Plants in adjacent cells were surveyed instead. The number of sample plants by the group is 583 in Group I, 129 in Group II, and 214 in Group III, allowing a meaningful comparison between groups. The distribution of plants by industry and size is close to our initial target.

IV. Descriptive Statistics of Management Practices

The scoring method of management practices follows Bloom *et al.* (2019) as much as possible to maintain the comparability.[11] The score assigned to each choice of the question is indicated in parentheses in the Appendix (red colored). The overall management score is the simple average of all 16 management questions, eight from production and the other eight from incentive management. We maintain observations only if the plant has reported 10 or more non-missing answers out of the 16 questions, following the U.S. case.

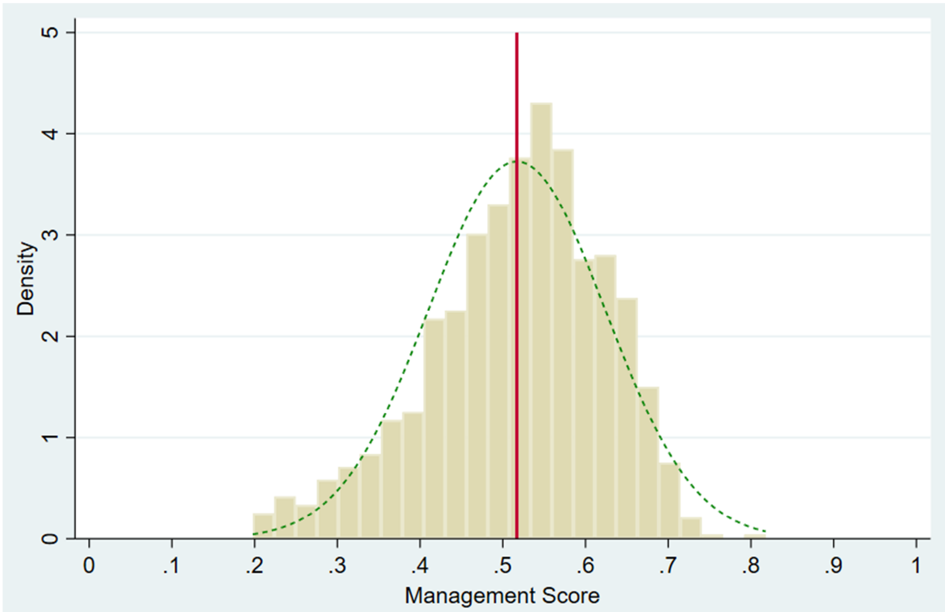
4.1. Sample Distribution of Management Scores

Figure 1 presents the cross-sectional distribution of the calculated management scores in 2017 as a histogram, while further detailed summary statistics are provided in Table 2. The overall density looks close to a normal distribution (the dashed green curve) but slightly skewed to the left as the average is 0.517 and the median is 0.531. The score at the 10th percentile (10pct) is 0.370, while the 90th percentile (90pct) score is 0.651. The score gap of 0.281 indicates a considerable heterogeneity in management practices among Korean manufacturers (standard deviation = 0.107).

The heterogeneity in management practices is widely present even among plants within the same firms. Group II comprises 129 establishments of 46 multi-plant firms where each firm has two to six plants in the sample. Table 2 compares the standard deviations of management scores among overall plants, between firms, and plants within the firms. As they belong to multi-plant firms, their management is more structured on average (0.573). However, the score variation is not so small

[11] We apply the same management scoring method as Bloom et al. (2019) to the choice-adjusted questions, too. See Chung (2018) for the scoring results that fully exploit the adjusted choices. While the overall management scores tend to fall, the findings in Chung (2018) are not qualitatively different from this study.

[Figure 1] Distribution of Management Score



Notes: The distribution is based on 926 observations in 2017. Mean=0.517 (vertical red line); Std. dev.=0.107; 10pct=0.370; 50pct=0.531; 90pct=0.651. The dashed green curve indicates a normal distribution.

[Table 2] Summary Statistics for Management Score

Variables	Obs.	Mean	Std.Dev.	10pct	25pct	50pct	75pct	90pct
Panel A: Management Score in Korea (as of 2017)								
Overall	926	0.517	0.107	0.370	0.448	0.531	0.594	0.651
Group I	583	0.504	0.110	0.354	0.432	0.516	0.583	0.641
Group II	129	0.573	0.086	0.469	0.531	0.578	0.635	0.667
Between	46	0.565	0.062	0.492	0.539	0.575	0.604	0.634
Within	--	--	0.063	--	--	--	--	--
Group III	214	0.526	0.092	0.412	0.469	0.532	0.578	0.646
Production	926	0.637	0.148	0.375	0.583	0.667	0.739	0.792
Incentive		0.396	0.151	0.208	0.292	0.375	0.500	0.615
Alt. Incentive		0.349	0.137	0.167	0.250	0.354	0.438	0.542
Panel B: Management Score in the U.S. (2010 and 2015 combined)								
Overall	About 70,000	0.615	0.172	0.379	0.521	0.648	0.742	0.806
Production		0.643	0.199	0.365	0.521	0.677	0.792	0.865
Incentive		0.583	0.215	0.300	0.474	0.623	0.739	0.819

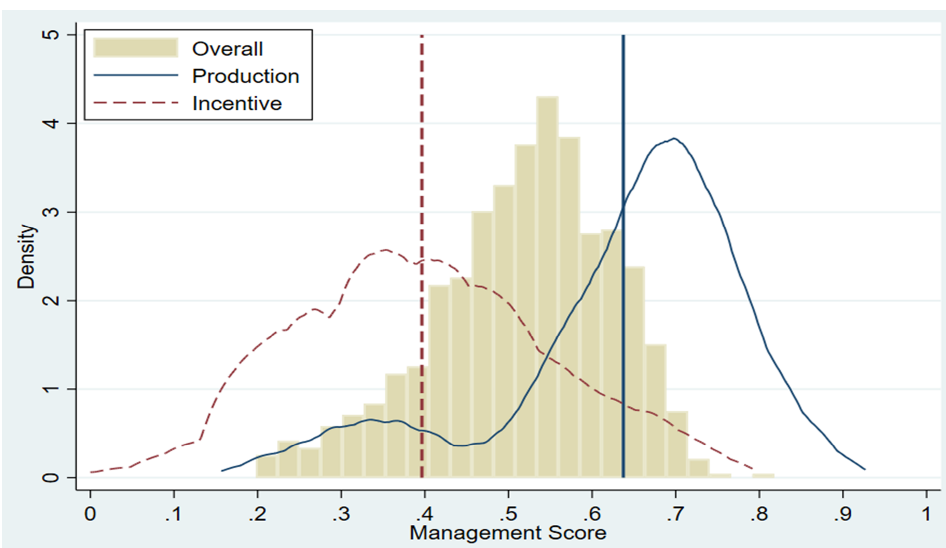
Notes: All statistics in Panel A are based on 2017 values (Including 2014 values barely change the statistics). The number of plants within firms ranges from two to six in Group II. Panel B is drawn from Bloom *et al*. (2019, Table A4) where the sample includes 2010 and 2015 values. The exact sample size is not reported.

(0.086) compared to the variation in the entire sample. The within variation (0.063) is also as large as the between variation (0.062). This result has an implication for the multi-plant firms: If structured management is an important factor of business performance, they can improve the firm-level performance by consistently transplanting the best practices into their plants.

Another crucial and striking result is revealed when the overall management is divided into production management and incentive management. Figure 2 shows that the distributions of the two management scores are radically apart from each other. The average scores are 0.637 for production management and 0.396 for incentive management, generating a 0.241-point gap. The gap becomes even greater when the median scores are compared (0.667 vs. 0.375), wherein the incentive management score accounts for only 56% of the production management score. Figure 2 also indicates that the two score distributions are dispersed at a similar level.

How are these findings compared with the U.S. benchmark case? The direct comparison needs caution. One obvious reason is that the sample composition differs. For example, the median plant size measured by the number of employees is 86 in the U.S., whereas we have 49 in Korea. Provided that larger plants tend to be more structured in management, the management scores in the U.S. can be higher in general. We briefly compare the first and second moments of the two sample distributions. Relevant statistics for the U.S. sample is provided in Bloom *et al.*

[Figure 2] Distribution of Management Score: Production vs. Incentive



Notes: The distribution is based on 926 observations in 2017. Average production management score is 0.637 and average incentive management score is 0.396, which are also indicated by the vertical lines.

(2019, Table A4) where the sample includes entire observations from their 2010 and 2015 surveys.[12]

For the first moments, the mean and median management scores of the U.S. manufacturing establishments are 0.615 and 0.648, respectively. Both of them are higher than ours by about 0.1 points. The differences are statistically significant: The t-statistic for the mean difference is 27.4. The higher scores in the U.S. by themselves is unsurprising as one may expect, but the sample composition is not the main reason. When in fact we weight our sample to match the employment distribution of corresponding industries in the U.S. (as of 2015), the mean and median management scores barely change.[13] Another weighting scheme that matches our sample to the U.S. MOPS in terms of establishment size raises mean score by 0.009 and median score by 0.006, but the increments fall short of explaining the large score gap between Korea and the U.S.[14]

What primarily drives the score gap in the overall management score is the much lower score of incentive management in Korea compared to that in the U.S. The mean and median scores of production management are roughly the same between the two countries as the scores in the U.S. are 0.643 and 0.677, respectively. However, the scores of incentive management in the U.S. are 0.583 for the mean and 0.623 for the median. The difference between Korea and the U.S. reaches to almost a quarter in the median case.

Turning to the second moment, the standard deviation of the overall management scores in the U.S. is 0.172, indicating that they are much more dispersed than those in Korea. The 90-10 spread in the U.S. is 0.363 (=0.742-0.379), which is larger than ours. Wider variances of the management scores in the U.S. are also true for both production and incentive management. The reason why the management scores in the U.S. are more dispersed is not as clear. Aside from the sample composition issue discussed earlier, one possible explanation is the cultural differences between Korea and the U.S. The literature documents that Asians tend to choose less extremes than Westerners in multiple-choice surveys (Dolnicar and Grün, 2007).

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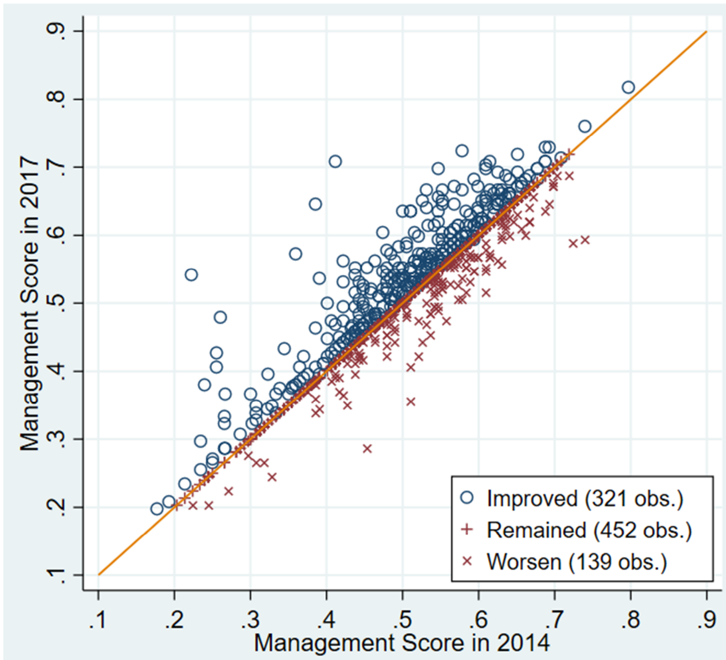
[12] We can also combine 2014 and 2017 data for the comparability with the U.S. data but doing so barely changes the summary statistics in Table 3.

[13] Table A3 readily provides a hint for this result. The table compares average management scores by industry showing no substantial differences, except food product (10) and medical, precision, optical instrument (27). Given that the two are not major industries in both countries, it is evident that weighting our sample in accordance with the U.S. industry composition can hardly change the distribution of management scores. The detailed procedure to obtain the exact weights and the following result are omitted to save space.

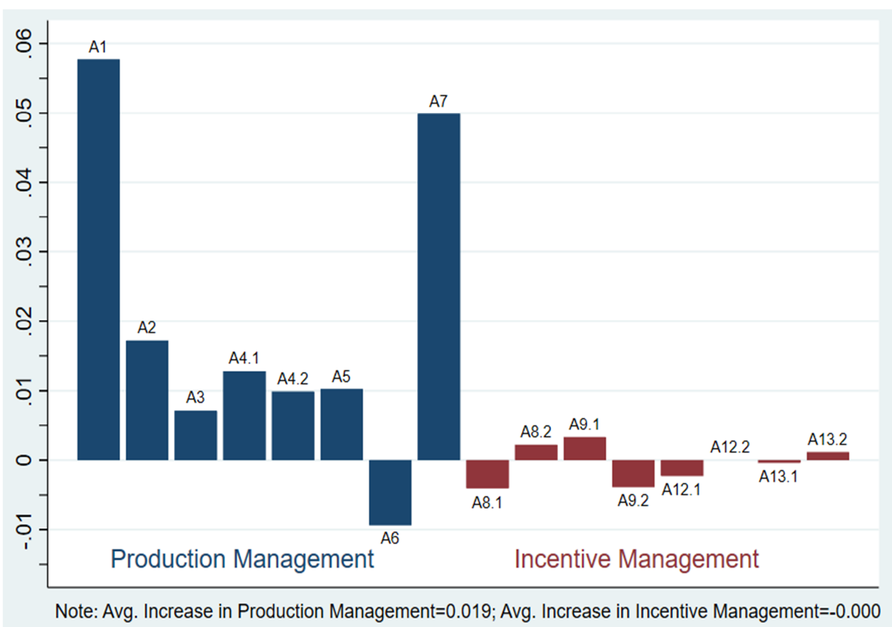
[14] We weight each observation by log of its own employment to match the U.S. MOPS sample. The resulting weighted sample mean and median of employment are 171.9 and 75, respectively, while the corresponding statistics are 177.2 and 86 in the U.S. MOPS.

[Figure 3] Management Score over Time

(a) Management Score in 2014 vs. 2017



(b) Improvement of Management Score by Question



Notes: The name at each bar indicates the actual question number in the survey.

4.2. Change in Management Scores

Figure 3-(a) shows the changes in management scores between 2014 and 2017 as a scatter plot. Of the 912 plants whose management scores are observed in both years, almost half (452 plants) reported that their overall management has not changed at all. Although 321 plants reported score improvements and the rest (139 plants) experienced a decline in the scores, their changes are not large just as we see that most observations in the figure are not far from the 45-degree line. The management score in 2017 compared with 2014 has improved by 0.009 points. This is a consistent result with the previous literature according to which management practices evolve slowly over time (Bloom and Van Reenen, 2010; Dessein and Prat, 2019). There may be some persistent impediments that make it difficult to improve even in the long run.

Despite the rigidness of management practices, it can be still informative to determine where the marginal chances mainly stem from. Figure 3-(b) presents the average score change of management practices by question as a bar graph. The name at each bar indicates the actual question number in the survey. The figure indicates that the marginal improvement in management practices over three years is entirely driven by the change in production management. The management score in production management (A1∼A7) increases by 0.019 points on average, but 0 points in incentive management (A8.1∼A13.2). No single noticeable increase or decrease can be found in the questions of incentive management. This result, combined with its low level found above, raises a serious question on why incentive management performs so poorly in Korea. One may presumably attribute the reason to the rigidity of the Korean labor market but, to our knowledge, no formal studies in the economics literature have addressed this issue.

V. Management Practices and Plant Characteristics

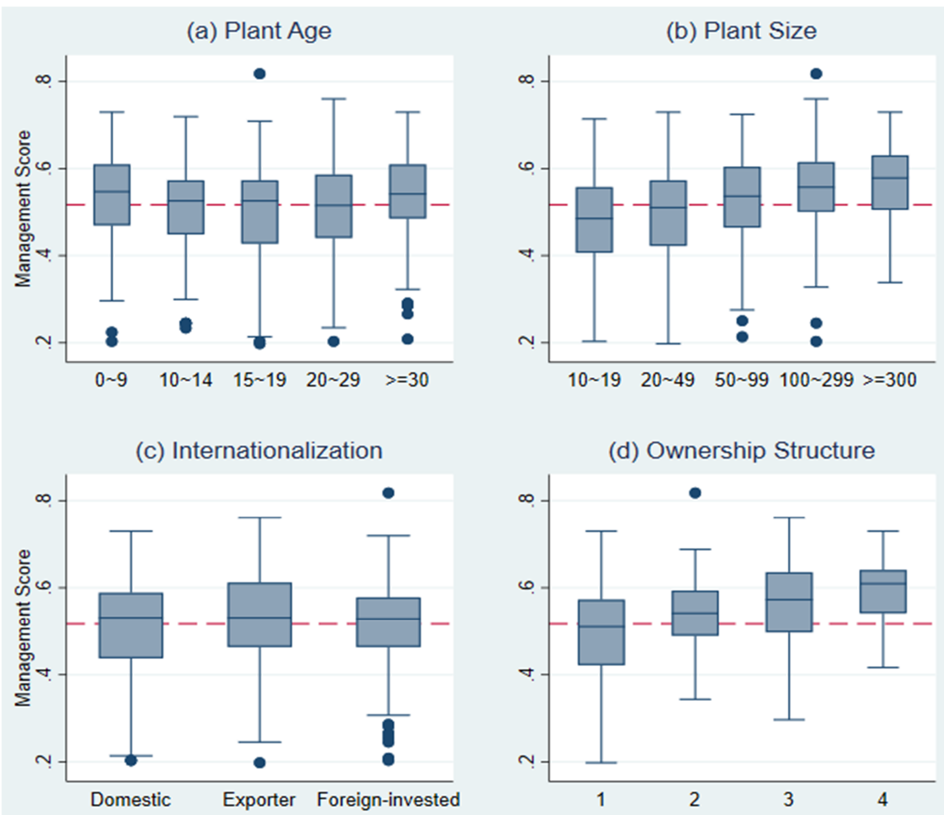
We examine how management practices relate to other plant characteristics, which include productivity. The qualitative relationships are first shown graphically using appropriate plots. For the plant productivity, we further use formal empirical models to check the robustness of the qualitative relationships and provide their quantitative meaning.

5.1. Management Practices and Plant Characteristics

Figure 4 presents the relationships between the management score and basic plant characteristics via box plots. The plant characteristics we consider comprise (a) age, (b) size, (c) internationalization, and (d) the degree to which the plant ownership and management are separated, among others. For effective presentation of the relationships, each characteristic is grouped into a few categories and the distributions of management score are compared across the categories.

In Panel (a) in the figure, no clear distributional differences exist in management score among the five age categories. The medians (horizontal line in each box) are insignificantly different from the overall mean (dotted line in red color), either. This result is contrary to the intuition that plants would keep improving their management practices by accumulating experience or know-how as they become older. The result reinforces the finding shown in Figure 3: The little change in the management practices is not merely because the time interval is too short.

[Figure 4] Management Score by Plant Characteristics



Notes: The dashed red line in each panel shows the average management score (0.517). In panel (d), 1=The owner has most of the decision-making authority and directly supervises the management; 2=Managed by a professional manager, but lacks transfer of authority; 3=Although the management has been transferred significantly to a professional manager, the decision-making authority on key management issues remains with the owner; 4=Ownership and management are completely separate and independent.

Unlike in plant age, the interquartile range of the management scores moves up as the plant size increases in panel (b). The difference between the minimum and maximum values (excluding outliers) gradually decreases, indicating that the overall distribution is converging. Thus, Panels (a) and (b) jointly indicate that large plants tend to practice more structured management in general regardless of its age, which is consistent with the high management scores among Group II of multi-plant firms (as they tend to be large).

Panel (c) relates the management practices to internationalization. It shows that exporters tend to be managed better than domestic plants, which is consistent with the literature (Görg and Hanley, 2017; Bloom *et al*., 2018). The literature also documents that foreign-invested firms can employ advanced management practices from their headquarters, especially when the headquarters are located in advanced countries (Bloom *et al*., 2012a). We do not find a significant score difference from the foreign-invested plants at least in our sample, although their management scores are slightly higher than domestic plants in general (see Table 2 for more details).

Panel (d) compares the management scores of four groups by the degree to which management is independent from ownership of the firm to which the plant belongs to. Bloom and Van Reenen (2007) states that firms where the owner directly controls management and management is inherited to the first son tend to have an extremely low management score. We determine a consistent pattern in our sample. The first group with owner's strongest controls are managed badly and the overall management improves as its independence increases.

5.2. Management Practices and Productivity

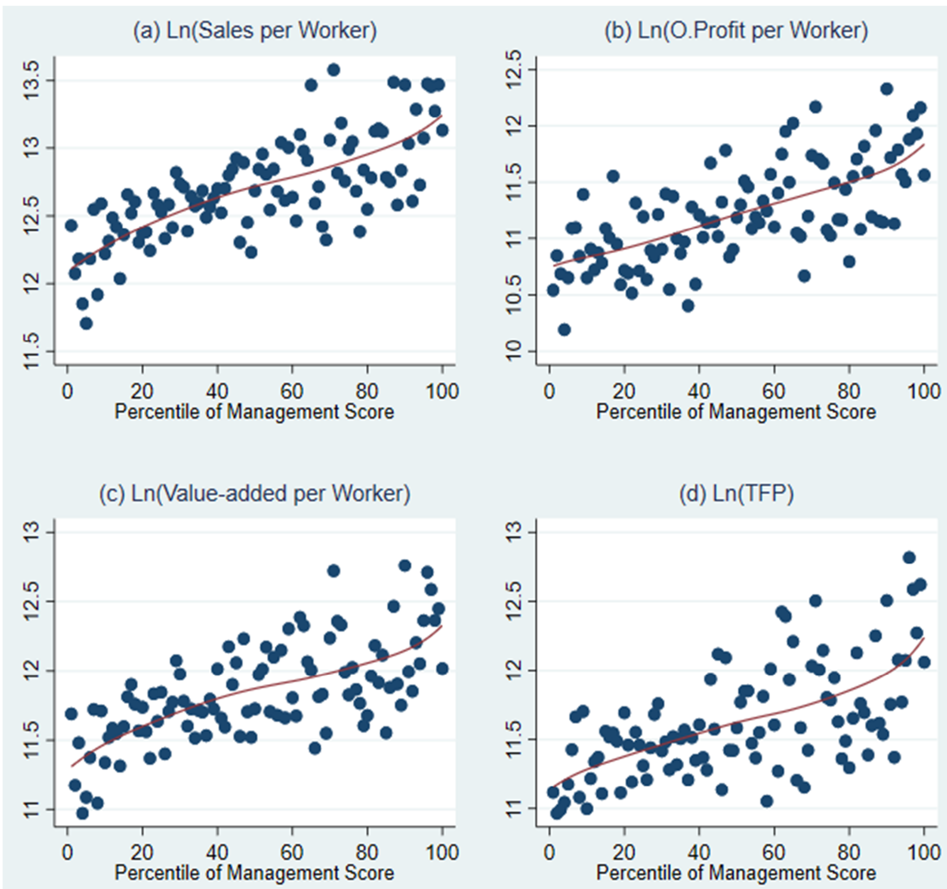
Figure 5 presents binscatter plots between the percentiles of management score and four measures of plant productivity: (a) sales per worker, (b) operating profits per worker, (c) value-added per worker, and (d) revenue-based total factor productivity (TFP for short), all of which are log-transformed. We use the entire sample (i.e., both 2014 and 2017 data) throughout the figure after converting all nominal values to 2015 real values.[15] To obtain the plant-level TFPs in (d), we estimate production functions of value-added using the population data in the Mining and Manufacturing Survey ranging from 2008 to 2018. The method by Wooldridge (2009) is applied to each three-digit manufacturing for the estimation of production function. The TFPs are backed out from these estimated production

[15] All deflators come from the OECD STAN database (available from http://oe.cd/stan). Among the STAN variables in ISIC Rev.4 SNA08 with 2015 benchmark revisions, we applied PRDP to sales and operating profits, VALP to value-added, INTP to intermediate inputs, and GFCP to net investment in physical capitals, respectively.

functions.[16]

Every plot in Figure 5 clearly presents a strong, positive correlation between the two variables. The relationship is close to be linear: The locally weighted scatterplot smoothing (lowess) curves are provided in all plots to capture any potential non-linear relationship. Although some minor deviations are observed at the very top and the bottom percentiles of management score, the linearity is preserved in most part of the domains.

[Figure 5] Management Score and Productivity



Notes: The red curve in each panel is the locally weighted scatterplot smoothing (lowess).

Given the strong association between the management practices and plant productivities, we conducted formal regressions controlling for many potential

[16] Wooldridge (2009) proposes a generalized method of moment (GMM) estimation for estimating productivity functions that also deals with the potential lack of identification problem in Levinsohn and Petrin (2003). See Ackerberg *et al.* (2015) for a formal discussion about the problem.

confounders as follows:

$$\ln(TFP_{ijt}) = \alpha + \beta M_{ijt} + \boldsymbol{X}_{ijt}\gamma + \lambda_j + \mu_t + \varepsilon_{ijt} \tag{1}$$

where $\ln(TFP_{ijt})$ is log of the total factor productivity of plant i belonging to industry j at year t.[17] M_{ijt} on the right-hand side is our measure of management score. Figure 5 indicates β to be positive. Our estimation controls for several plant characteristics in $\boldsymbol{X}_{ijt}$ including ages, export status, and plant-specific wage premium compared to the industry average about which we will discuss more shortly. We are not able to control for the plant-level fixed effect because the within variation of management scores is too small to identify β as shown in Figure 3. We comprise five-digit industry dummies (λ_j) that control for unobserved time-invariant factors at the industry level, such as industry-specific regulations. There are more than 200 five-digit industries in our sample. Because we utilize all available data in both years for our estimation, a year dummy (μ_t) is also included. The estimation result using only 2017 data is reported as a robustness check.

The estimation results are presented in Table 3. Estimations in all columns include the industry and year dummies if applicable. As a consequence, R^2 is greater than 0.5 at the minimum. Column (1) is estimated with no controls in $\boldsymbol{X}_{ijt}$ to observe how much the management score alone can explain the variation of the TFP. To obtain an estimate, the 90-10 spread of management score (0.281) is multiplied by the estimated coefficient (1.797) and divided by the 90-10 spread of the log of TFP (2.401). The estimate indicates that it accounts for around 21.0% of the 90-10 spread of the TFP. This number is comparable to the corresponding estimate in Bloom *et al.* (2019) which is 18.1%.

Column (2) allows the differential effects of production management and incentive management. Their magnitudes are not different from each other as indicated at the bottom of the column (F-statistic=2.51). However, the fact that incentive management plays a role at least as important as (or possibly greater role than) production management in explaining the TFP variation has a meaningful implication, provided that it is relatively poor in Korea. Column (3) estimates the same model as column (2), but use the alternative measure of the incentive management mentioned in the previous Section. The result does not change qualitatively.

Column (4) in Table 3 includes the following controls in $\boldsymbol{X}_{ijt}$: indicator of any of the seven digital technologies having been adopted (DT adopted), plant age, dummies for Groups II and III, respectively, and exporter dummy, all of which can

[17] Eq. (1) is also estimated for the other three measures of productivity appeared in Figure 5. The results do not change qualitatively.

potentially affect TFP.[18] Adopting new digital technologies can be essential for digital transformation through which firms seek to secure a competitive advantage. We determine that the adoption of the digital technologies is significantly associated with TFP from the regression of the TFP on the indicator variable alone. However, the significance disappears once the management score is also added in the regression. One way to interpret the result is that better managed plants enhance their productivity through exploiting new technologies. This interpretation is consistent with Bloom *et al*. (2012a) in which U.S. firms with stronger *incentive* management may achieve higher productivity than European firms through exploiting information technology better. Their conclusion only underlines our result of the poor incentive management in Korea.

Column (5) comprises one more important control variable, wage premium. Bender *et al.* (2018) argued that having a good management system may be a mere proxy of having good managers, which in turn is determined by the competitiveness of the wages. Once these confounders are controlled for, they find that the original association between management practices and productivity is mitigated by 30∼50%. To address the problem, we take the average over the plant-level average wages at the five-digit industry level. Our measure of the wage premium is the gap between the plant's average wages and the industry average. Consistent with the literature, the wage premium has a strong association with the TFP, while reducing the magnitude of $\hat{\beta}$ by around 27%.[19] The management score does not lose its economic and statistical significance.

Column (6) has the same model as Column (5), but uses only 2017 observations because one may be concerned about the recall error on the management practices in 2014. The industry-specific unobserved heterogeneity is still controlled for by λ_j whether it is time-varying or not (e.g., the degree of market concentration). The benefit comes only at the cost of the smaller sample size. We do not find any difference between Columns (5) and (6).

Columns (7) and (8) divided the overall score into the production and incentive management scores as in Columns (2) and (3), but with the full controls. The results do not change qualitatively.

[18] An important plant-specific characteristic not observable in our data is subcontract transactions: If subcontractors exhibit different productivities from non-subcontractors and management practices are systematically correlated with subcontracting, our estimates in Table 3 may be biased. According to the literature, however, the relationship between subcontracting and productivity is not well-established (See, e.g., Park *et al*., 2010; Pyo and Lee, 2018; Hong and Lee, 2020). We do not have a clear prior on how management practices interact with subcontracting, either.

[19] Bender *et al*. (2018) use the two distinct measures of managers' skill and wage premium, while we only observe the latter in the data. We expect the wage premium at least partially capture the effect of manager's skill on the productivity if it is omitted from the estimation.

[Table 3] Management Practices and Productivity

Y = *Ln*(*TFP*)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Overall Score	1.797***			1.469***	1.079***	0.939***		
	(0.327)			(0.323)	(0.294)	(0.330)		
Production		0.632***	0.595***				0.395**	0.392**
		(0.213)	(0.215)				(0.195)	(0.194)
Incentive		1.135***					0.674***	
		(0.241)					(0.200)	
Adj.Incentive			0.938***					0.546**
			(0.259)					(0.215)
DT Adopted				0.080	0.010	-0.043	0.018	0.002
				(0.092)	(0.077)	(0.084)	(0.079)	(0.077)
Ln(age)				0.233***	0.155***	0.130**	0.154***	0.154***
				(0.061)	(0.051)	(0.056)	(0.051)	(0.052)
Group II				0.592***	0.408***	0.406***	0.397***	0.440***
				(0.139)	(0.128)	(0.147)	(0.128)	(0.130)
Group III				0.124	0.043	-0.025	0.055	0.040
				(0.077)	(0.065)	(0.080)	(0.066)	(0.066)
Exporter				0.063	0.048	0.054	0.044	0.057
				(0.067)	(0.060)	(0.076)	(0.060)	(0.060)
Wage Premium					0.917***	1.239***	0.917***	0.922***
					(0.205)	(0.128)	(0.205)	(0.206)
Observations	1,507	1,507	1,507	1,507	1,503	769	1,503	1,503
R-squared	0.533	0.534	0.526	0.569	0.660	0.711	0.660	0.658
F-statistic		2.510	1.012				1.103	0.363

Notes: All columns use both 2014 and 2017 values, except Column (6), which uses 2017 values only. All columns include industry (KSIC10-5digit) and year fixed effects (only industry FE in column (6)). Standard errors in parentheses are clustered at the industry level. The bottom row shows the test statistics for the difference between the coefficients of production and incentive management scores. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Figure 5 and Table 3 indicate that the structured management has a strong, positive relationship with the plant productivity. We conclude specifically that, from our preferred estimation in Column (5) of Table 3, a one-point increase in the overall management score is associated with a 1.079%p increase in the TFP. The plants at the 90 percentile perform 30.3% (=1.079×0.281) better in TFP than the plants at the 10 percentile. We also conclude from column (7) that the economic significance of incentive management may be potentially greater than production management.

One caveat follows. The findings on the management-productivity relationship in this study cannot be directly interpreted as causal, such as that an improvement in management practices necessarily induces higher productivity. Regarding the causal linkage, we have to rely on the previous literature showing that better managed firms or plants do enhance their productivity (Bloom *et al*., 2013, 2019; Bloom, Propper, *et al*., 2015) and the effect is quite persistent (Giorcelli, 2019; Bloom *et al*., 2020).

VI. Concluding Remarks

Management practices of 926 Korean manufacturers have been studied from a unique survey that is consistent with the U.S. survey (and potentially the ones in other countries). The Korean plants, even within the same firms, are widely heterogeneous in their management practices and this heterogeneity can account for a significant portion of productivity differences among the plants. Although we did not show the causality directly, the literature consistently documents that the causal effect is large and persistent. Despite the importance, improving management practices appears difficult, as our findings indicate. Managerial improvement barely occurs among the plants, especially in incentive management, and aged plants do not necessarily practice more structured management. The score of incentive management is substantially low relative to that of production management or to the same measure in the U.S., which drags down the overall management score.

Our study is only an early step toward a better understanding of management practices or more generally managerial inputs in Korea. Further studies on this topic are warranted in the future. The underlying reasons behind the relatively poor incentive management need to be further scrutinized, although the literature provides some clues, such as labor market regulations and lack of product market competitions (Bloom and Van Reenen, 2007, 2011). Identifying them would not only help to explain the Korean economy, but also provide a meaningful implication for innovation policies. Fortunately, Statistics Korea has been interested in this topic and conducted a pilot survey in 2020 for about a thousand manufacturing plants under our guidance. Although the results of the survey are confidential, we confirmed that they are remarkably similar to our study. A larger scale survey is under planning as of the end of 2020. We hope that the data can contribute to the advancement in studies and policies on the topic.

Appendix: Korea MOPS Questionnaire

Section A of the Korea MOPS are presented below in English, while the original questionnaire written in Korean is fully available in Chung (2018). The management score assigned to each choice of all questions is shown in parentheses (red colored).

Section A. Management and Organizational Practices

※ For each question, please select the one that best describes the general situation in 2014 and 2017.

A1. What best describes what happens at your establishment when a problem in the production process arises?
(Examples: Finding a quality defect in a service, product, or a piece of equipment breaks down.)

① No action was taken (0)
② We fixed it, but did not take further action (1/3)
③ We fixed it and took action to make sure that it did not happen again (2/3)
④ We fixed it and took action to make sure that it did not happen again, and had a continuous improvement process to anticipate problems like these in advance (1)

2014	2017

A2. How many key performance indicators (KPIs) are monitored in your establishment?
(Examples: Metrics on service quality, customer satisfaction, production, cost, waste, quality, inventory, and absenteeism.)

① No KPIs (if no KPIs in both years, skip to A5) (0)
② 1~2 KPIs (1/3)
③ 3~5 KPIs (2/3)
④ 6~9 KPIs (2/3)
⑤10 or more KPIs (1)

2014	2017

A3. Where are display boards showing service quality, output and other key performance indicators located in your establishment?

① We did not have any display boards (0)
② All display boards were located in one place (1/2)
(e.g., in the store back office or at the end of the production line)
③ Display boards were located in multiple places (1)
(e.g., at multiple places in the store or establishment)

2014	2017

A4. In 2014 and 2017, how frequently are the key performance indicators reviewed by mangers or non-managers at this establishment?

① Hourly or more frequently (1)
② Daily (5/6)
③ Weekly (4/6)
④ Monthly (3/6)
⑤ Quarterly (2/6)
⑥ Yearly (1/6)
⑦ Never (0)

1. Manager	
2014	2017
2. Non-Managers	
2014	2017

* *manger and non-manager*

A manager is someone who has employees directly reporting to them, with whom they meet on a regular basis, and whose pay and promotion they may be involved with, e.g., Plant Manager, Human Resource Manager, Quality Manager.
Non-managers are all employees at the establishment who are not managers

A5. In 2014 and 2017, what best describes the time frame of production targets at this establishment?
(Examples of production targets are: production, quality, efficiency, wastes, on-time delivery.)

① Main focus was on short-term (less than one year) (1/3)
② Main focus was on long-term (more than one year) (2/3)
③ Combination of short-term and long-term production targets (1)
④ No production targets (if no production targets in both years, skip to A13) (0)

2014	2017

A6. In 2014 and 2017, how easy or difficult was it for this establishment to achieve its production targets? (Leave blank for the year you answered 4 in A5.)

① Impossible to achieve (.)
② Possible to achieve without much effort (0)
③ Possible to achieve with some effort (2/4)
④ Possible to achieve with normal amount of effort (3/4)
⑤ Possible to achieve with more than normal effort (4/4)
⑥ Only possible to achieve with extraordinary effort (1/4)

2014	2017

A7. In 2014 and 2017, who was aware of the production targets? (Leave blank for the year you answered 4 in A5.)

① Only senior managers (0)
② Most managers and some production workers (1/3)
③ Most managers and most production workers (2/3)
④ All managers and most production workers (1)

2014	2017

A8. In 2014 and 2017, what is primary way managers and non-mangers are promoted?

① Promotions were based solely on performance and ability (1)
② Promotions were based partly on performance and ability, and partly on other factors (e.g., tenure or family connections) (2/3)
③ Promotions were based mainly on factors other than performance and ability (for example, tenure or family connections (1/3)
④ Normally not promoted (0)

1. Manager	
2014	2017
2. Non-Managers	
2014	2017

A9. In 2014 and 2017, when was an under-performing manager and non-manager reassigned or dismissed?

① Within six months (1)
② Six months to one year (1/2)
③ After one year (0)
④ Never (0)

1. Manager	
2014	2017
2. Non-Managers	
2014	2017

A10. In 2014 and 2017, what pay system was mainly applied to the salary of manager and non-manager (including bonuses)?

① Seniority-based pay (seniority-linked wages)
② Job-based pay (pay for job)
③ Skill-based (capability-based) pay
④ Others (______________________________)

1. Manager	
2014	2017
2. Non-Managers	
2014	2017

A11. In 2014 and 2017, what was the percentage of bonuses (incentives or other monetary benefits) in the total wages of managers and non-managers?

① 0% (0)
② 1∼10% (1/4)
③ 11∼33% (2/4)
④ 34%∼49% (3/4)
⑤ More than 50% (1)

1. Manager	
2014	2017
2. Non-Managers	
2014	2017

A12. In 2014 and 2017, what were the managers' and non-managers' performance bonuses usually based on at this establishment?

① Their own performance as measured by production targets (1)
② Their team or shift performance as measured by production targets (3/4)
③ Their department's performance as measured by production targets (3/4)
④ Their establishment's performance as measured by production targets (2/4)
⑤ Their company's performance as measured by production targets (1/4)
⑥ No performance bonuses (0)

1. Manager	
2014	2017
2. Non-Managers	
2014	2017

A13. When production targets were fulfilled in 2014 and 2017, which percent of managers and non-managers at this establishment received performance bonuses?

① 0% (1/5)
② 1~25% (2/5)
③ 26~49% (3/5)
④ 50%~99% (4/5)
⑤ 100% (1)
⑥ Production targets not met (0)

1. Manager	
2014	2017
2. Non-Managers	
2014	2017

A14. In the last three years (2015-2017), through what channels did the manager of your establishment learn about management practices? Please select two in order of importance.

① Headquarters
② Other establishments in the same company (except headquarters)
③ Adjacent establishments in other companies
④ Suppliers or customers
⑤ Competitors in the same industry
⑥ Educational program (school, conferences, etc.)
⑦ New managers
⑧ Consultants
⑨ Other channels (personal network, etc.)
⑩ Did not learn at all

2014	2017

A15. Was the headquarters for this company at the same location as this establishment?

① Yes ☞ **B1**

② No ☞ **A15-1**

A15-1. In 2014 and 2017, where were the following decisions made for this establishment?

① Only at this establishment (1)

② Only at headquarters (0)

③ Both at this establishment and at headquarters (1/2)

Type of Decision	2014	2017
(a) Hiring permanent full-time employees		
(b) Give an employee a pay increase of at least 10%		
(c) New product introductions		
(d) Product pricing		
(e) Advertising		

A15-2. In 2014 and 2017, what was the dollar amount that could be used to purchase a fixed/capital asset for this establishment without prior authorization from headquarters?

2014	2017
Mil. Won	Mil. Won

[Table A1] Summary Statistics for Plant Characteristics

Variables	Obs.	Mean	Std.Dev.	10pct	25pct	50pct	75pct	90pct
Age	926	20.8	12.3	7	12	18	28	38
# Employees	926	106.9	196.0	15	25	49	115	230
Sales	905	67,775	208,531	2,290	2,290	14,862	47,375	153,776
Operating Profits	826	13,645	44,767	300	300	2,503	8,872	29,843
Value-added	857	24,607	68,900	1,094	1,094	6,877	20,294	55,009
Material Costs	864	38,408	133,475	774	774	7,299	25,660	88,600
Wages	897	6,255	16,012	580	580	2,315	5,400	13,392
Capital Stock	813	39,394	265,598	198	198	2,833	11,349	40,576
Ln(TFP)	772	11.639	1.060	10.509	11.019	11.595	12.196	12.910
Exporter	926	0.328	0.470	0	0	0	1	1
# DT Adopted	926	0.409	0.952	0	0	0	0	2

Notes: All statistics are based on 2017 values. Monetary values are in million Korean Won.

[Table A2] Average Management Score by Question

Question Number in the Survey		2014	2017	Diff. (2017-2014)
Production Management	A1	0.805	0.862	0.058
	A2	0.524	0.541	0.017
	A3	0.654	0.661	0.007
	A4-1	0.493	0.505	0.012
	A4-2	0.437	0.446	0.009
	A5	0.856	0.865	0.009
	A6	0.691	0.681	-0.009
	A7	0.496	0.545	0.049
Incentive Management	A8-1	0.657	0.652	-0.005
	A8-2	0.588	0.591	0.002
	A9-1	0.266	0.268	0.001
	A9-2	0.246	0.242	-0.004
	A12-1	0.279	0.278	-0.001
	A12-2	0.267	0.268	0.000
	A13-1	0.448	0.446	-0.002
	A13-2	0.432	0.432	0.000
Alternative Questions to A13	A11-1	0.259	0.257	-0.002
	A11-2	0.235	0.235	-0.001

[Table A3] Average Management Score by Industry

Industry (KSIC10 2-digit Code)	Management Score			
	Overall	Production	Incentive	Adj.Incentive
Food Products (10)	0.532	0.618	0.447	0.369
Wearing Apparel & Fur Articles (14)	0.509	0.700	0.319	0.283
Chemicals & Chemical Products (20)	0.528	0.680	0.375	0.333
Pharmaceuticals (21)	0.528	0.655	0.401	0.382
Fabricated Metal Products (25)	0.502	0.601	0.402	0.343
Electronic Comp. & Comm. Equip. (26)	0.526	0.657	0.385	0.356
Medical, Precision, Optical Inst. (27)	0.454	0.535	0.371	0.344
Electrical Equipment (28)	0.518	0.641	0.394	0.344
Other Machinery & Equipment (29)	0.517	0.623	0.411	0.356
Motor Vehicles & Trailers (30)	0.526	0.678	0.373	0.336

Notes: All statistics are based on 2017 values.

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한국 제조업의 경영관리: 생산관리와 인센티브관리 수준 간의 현격한 차이*

정 성 훈**

초 록 본 연구는 Bloom *et al.*(2019)이 제안한 정량적 방법론을 사용하여 국내 926개 제조 공장의 경영관리 수준을 분석하였다. 미국의 management and organizational practices survey(MOPS)를 한국 특유의 환경을 반영하여 개정하였고 통계청의 광업제조업 조사와 결합하여 분석 자료를 구축하였다. 측정된 관리 점수는 공장 간 차이가 큰 반면 시간에 따른 공장 내 변화는 미미하였다. 전체 경영관리를 생산관리와 인센티브관리로 구분했을 때 후자의 중간값은 전자의 중간값에 약 56%로 미국의 92%보다 훨씬 낮은 것으로 나타났다. 아울러 경영관리 수준은 다양한 생산성 지표들과 강한 양의 상관관계를 맺고 있었다. 구체적으로 표본에서 경영관리 수준 90%에 해당하는 공장은 10%에 해당하는 공장보다 총요소 생산성이 30.3% 가량 높았다.

핵심 주제어: 경영방식, MOPS, 인센티브 관리, 생산성

경제학문헌목록 주제분류: D22, D24, L25, L60, M11, M52

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