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Management Practices Drive Productivity – But Not Without Human Capital

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Abstract

Data collected with the Finnish Management and Organizational Practices Survey (FMOP) is used to study the association between management practices and firm productivity, and to examine whether human capital intensity acts as a moderator variable for this relationship. A comparison of how well different models predict productivity from management practices and human capital reveals a linear two-way interaction between the education of managers and management practices. We find evidence that the marginal benefit of adopting more structured management practices is different for establishments with different levels of managerial human capital. Testing and accounting for this interaction is important for reliable estimation of the management-productivity relationship.

Accounting for the interaction, a 10 percent increase in the FMOP management score is found to be associated with an average of 7.1 percent higher labour productivity. Management practices can account for more than 24 percent of the observed productivity dispersion. This is close to as much as is accounted for by information and communication technologies and more than by research and development and human capital.

Tiivistelmä

Johtamiskäytännöt parantavat tuottavuutta – mutta eivät ilman inhimillistä pääomaa

Viimeaikaiset tutkimukset ovat osoittaneet, että johtamiskäytäntöjen tasoa kuvaavat mittarit korreloivat voimakkaasti yritystason kannattavuuden, tuottavuuden ja kasvun kanssa. Strategisen tutkimuksen neuvoston rahoittaman Taidot työhön -hankkeen osana toteutetulla Suomen johtamis- ja organisaatiokäytäntöjen kyselyllä (FMOP) on hankittu laajaa vertailutietoa Suomen teollisuuden toimipaikkojen johtamiskäytännöistä.

Yhdistämällä aineisto laadukkaisiin suomalaisiin rekisteriaineistoihin voidaan tutkia lattiatason johtamiskäytäntöjen ja yritysten tuottavuuden välistä yhteyttä sekä selvittää, toimiiko inhimillinen pääoma moderaattorimuuttujana tuottavuuden ja johtamisen välillä. Vertailemalla johtamiskäytännöistä ja inhimillisestä pääomasta tuottavuutta ennustavia tilastollisia malleja löydetään kaksisuuntainen lineaarinen interaktio johtajien koulutustason ja johtamiskäytäntöjen välillä. Toimipaikkojen käytössä olevien johtamiskäytäntöjen lisäämisen ja parantamisen rajahyöty siis riippuu johtajiin sitoutuneen inhimillisen pääoman määrästä. Kyseisen interaktion testaaminen ja huomioiminen on tärkeää johtamisen ja tuottavuuden välisen yhteyden luotettavalle estimoinnille.

Aineiston perusteella kymmenen prosenttia korkeampi johtamiskäytäntöpistemäärä on yhteydessä keskimäärin 7,1 prosenttia korkeampaan työn tuottavuuteen, kun interaktio-termi on otettu huomioon. Johtamiskäytännöt voivat selittää jopa 24 prosenttia havaitusta tuottavuusvaihtelusta, mikä on lähes yhtä suuri selitysosuus kuin tieto- ja viestintätekniikalla ja suurempi kuin tutkimus- ja kehittämistoiminnalla sekä inhimillisellä pääomalla.

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Keywords: Management practices, Management survey, FMOP, Productivity, Human capital, Education

Asiasanat: Johtamiskäytännöt, Johtamiskysely, FMOP, Tuottavuus, Inhimillinen pääoma, Koulutus

JEL: D22, J24, L25, L60, M11, M50

1 INTRODUCTION

The potential drivers of productivity are a central focus point of economic research. Such explanatory variables as research and development (R&D), information and communication technologies (ICT) spending and worker skills, just to name a few, have been under intensive empirical scrutiny by economists for as long as there have been data to base studies on. However, more recently, a new piece in the productivity puzzle has been uncovered: management practices. The idea of management as a driver of productivity is an old one (for example, Walker (1887)), but as Chad Syverson (2011, 336) puts it in his survey of productivity studies: "Perhaps no potential driver of productivity differences has seen a higher ratio of speculation to actual empirical study." The main reason for this has been the lack of adequate large-scale data on management.

With recent advances in the tools for collecting quantitative large-scale data on management practices, this potential driver of productivity has started to attract the attention of researchers and policy makers. This study aims to contribute to the literature by examining how human capital contributes to the management-productivity association. The Finnish Management and Organizational Practices survey (FMOP) provides high quality quantitative data on establishment-level management practices. The combined employer-employee data of Statistics Finland enables an especially useful partition of human capital intensity: we can separately examine the education levels of managers and non-managers. The partition provides a proxy for managerial ability and allows for separately assessing the need for (interactions with) managerial and non-managerial abilities as controls.

Using the multivariable fractional polynomials interaction (MFPI) approach (Royston & Sauerbrei 2008), a comparison of how well different models predict productivity from management practices and human capital in Finnish manufacturing establishments reveals a linear two-way interaction between the education of managers and management practices. Testing and accounting for this interaction is important for reliable estimation of the relationship between management practices and firm performance. MFPI combines the multivariable fractional polynomial (MFP) approach with a test for linear and nonlinear interactions between continuous regressors. No statistically significant interaction is found between management practices and the education of non-managers.

Accounting for the linear interaction between management and manager education, a 10 percent increase in the FMOP management score is found to be associated with an average of 7.1 percent higher labour productivity. The relationship between management and productivity is significant both statistically and in magnitude: increasing the adoption of structured management practices from the tenth percentile to the ninetieth can account for up to 24 percent of the corresponding 90–10 productivity gap. This is close to as much as is accounted for by information and communication technologies (ICT), a little more than human capital and more than 30 percent more than research and development (R&D). These measures of the 90–10 spreads are not very robust, since they are sensitive to, for example, scaling and measurement issues. However, they are not meant to accurately describe the absolute importance of the included factors in explaining productivity variation, but rather demonstrate the relative importance of accounting for management.

The paper is structured as follows. Section 2 is a short review of the relevant literature. Section 3 provides an overview of the data and methods used in the analysis. The results concerning the tests of interactions and non-linearity, the association between management and productivity and the comparison with other drivers of productivity are presented in section 4. At the end of section 4, some extensions are presented, and the robustness of the reported results is assessed. Section 5 concludes.

2 LITERATURE

The large-scale quantitative measurement of management practices started with the World Management Survey (WMS), a much-cited survey tool and research project developed by Nick Bloom and John Van Reenen (2007). The WMS research tool was developed in collaboration with market leaders in management consultancy and has been extensively tested to make sure it captures meaningful information about the management practices of firms and their establishments (Bloom & Van Reenen 2007). It is based on interviews with open-ended questions and uses a double-blind technique to minimize survey bias (Bloom, Lemos, Sadun, Scur & Van Reenen 2014).

Based on the same theoretical framework as the WMS, the United States Census Bureau, together with researchers Nick Bloom, Erik Brynjolfsson and John Van Reenen, developed the original Management and Organizational Practices Survey (MOPS). Studies utilizing these methods find large dispersion in the use of structural management practices across establishments, both between and within firms (Bloom et al. 2019). The survey tool has since been translated and adapted to collect data on the quality of management practices in Finnish manufacturing establishments. This paper uses said data, together with enterprises' financial statement data and the combined employer-employee data of Statistics Finland, to study the association between management practices and productivity and examine whether human capital intensity acts as a moderator variable for this relationship.

Following Dessein and Prat (2019), the different approaches to studying the role of management can be roughly divided into three perspectives: contingency theory (CT), the organization-centric empirical approach (OC) and the leadership-centric approach (LC). By merging the quantitative FMOP management practices data with data on manager skills, this paper aims to combine the OC and LC perspectives of management and draw from both approaches to produce empirical results concerning management and firm performance. In short, the findings suggest that the marginal benefit of adopting more structured management practices is different for establishments with different levels of managerial human capital.

Whereas OC looks at the connection between floor-level management practices and differences in firm performance, the leadership-centric empirical approach uses characteristics or skills of individual managers to explain said differences. Many LC studies focus on CEOs[1] and have found a link between CEO variables and firm performance. Lazear, Shaw and Stanton (2015) and Hoffman and Tadelis (2017) find similar evidence for middle managers instead of CEOs. It is plausible that the organization-centric empirical approach and the leadership-centric empirical approach are intrinsically linked, as suggested by Dessein and Prat (2019), since it is unlikely that the effects of management practices and the characteristics of individual managers on firm performance are orthogonal. The results presented in this paper support this proposition.

[1] Examples of this approach producing evidence for a link between CEO variables and firm performance include Johnson, Magee, Nagarajan and Newman (1985), Bertrand and Schoar (2003), Bennedsen, Nielsen, Perez-Gonzalez and Wolfenzon (2007), Kaplan, Klebanov and Sorensen (2012) and Bandiera, Hansen, Prat and Sadun (2020).

In CT, management is modelled as another production factor that profit-maximizing firms optimize[2]. Management can represent management practices or the skills of managers or both. If the production optimization problem has more than one solution, CT predicts that ex-ante identical firms can differ in the adoption of management practices and managerial ability without any correlation to differences in performance. This implication of the contingency theory is not supported by the results presented in this paper. However, if the optimization problem has a unique solution, similar management should be observed in similar firms.

Starting from the Ichniowski, Shaw and Prennushi (1997) study on the association between HR management practices and performance in steel finishing lines, the organization-centric empirical approach (OC) has been a key part of the economics of management. The management survey tools by Bloom and Van Reenen (2007) and subsequent studies are a continuation and extension of this approach. Studies utilizing these surveys have found significant variation in management practices within and between countries and industries (Bloom and Van Reenen 2007; Bloom et al. 2014).

In their comparison of management practices and other more commonly studied drivers of firm performance in US manufacturing, Bloom et al. (2019) find that increasing the adoption of structured management practices from the tenth to ninetieth percentile explained approximately 22% of the corresponding 90–10 productivity spread. As a contrast, R&D spending, ICT investment per worker and worker skills (share of all employees with a college degree) account for 21.6%, 12% and 15.9% of the productivity gap, respectively (Bloom et al. 2019). Since Bloom et al. (2019) use the education level of all employees as the measure of human capital, there is no way to distinguish how much of this quantity is driven by managers or non-managers. This likely leads to human capital mostly proxied by non-manager education, since most employees are not managers[3]. However, the results presented in this paper suggest that accounting for the part of human capital that can be attributed specifically to managers is more important for reliable estimation of the relationship between productivity and management practices.

The findings of this study and of Bloom et al. (2019) imply that ex-ante similar firms can and will adopt different management practices, and that these differences are correlated with differences in performance. This contradicts the predictions of contingency theory, unless the effects of adopting management practices for firms that are seemingly similar differ significantly in some unobservable ways. These results also imply that the impact of structured management practices on between-firm productivity dispersion might potentially be at least as significant as any of the variables that have traditionally been regarded as some of the most important drivers of said variation (see, for example, Syverson 2011). The association between management practices and firm performance remains statistically and economically significant when detailed employee characteristics (Bender, Bloom, Card, Van Reenen and Wolter 2018) and firm fixed effects (Bloom, Sadun and Van Reenen 2016; Bloom et al. 2019) are accounted for. Similar associational results have been found in other countries, such as Germany (Broszeit, Fritsch, Görg & Laible 2016) and Pakistan (Lemos, Choudhary, Van Reenen & Bloom 2016).

There is also evidence that the relationship between management practices and productivity is a causal one: Bloom, Eifert, Mahajan, McKenzie and Roberts (2013)

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[2] For example, Lucas (1978) outlined a model in which productive factors are optimally allocated over a distribution of managers with varying ability to maximize output.

[3] As shown in Table 1, approximately 4 percent of the employees in the FMOP sample are managers.

present experimental evidence concerning management practices and firm performance in large Indian textile firms. The randomized controlled trial involved 17 firms and their 28 establishments. On average, the use of the management practices the treated establishments were consulted to adopt increased from 25.6% to 63.4%, with the changes being persistent at least for the next year, whereas the control plants increased their usage of the same management practices by only 12 percentage points (Bloom et al. 2013).

The randomized management consulting raised plant output by an average of 9.4% ($p < 0.05$) and total factor productivity (TFP)[4] by 16.6% ($p < 0.1$). The increase in TFP resulted from rising output and the decrease of capital and mending labour, the latter of which was due to a decrease in quality defects (Bloom et al. 2013). The study provides relatively strong evidence for a causal effect of structured management practices on productivity, at least in the context of the manufacturing sector in developing countries.

[4] $TFP \equiv log(value\ added) - 0.42 * log(capital) - 0.58 * log(labour)$, where the factor weights are cost shares, capital is physical capital and labour is production hours.

3 DATA AND METHODS

3.1 Sample and Data

The 2016 Finnish Management and Organizational Practices Survey (FMOP) sample consists of 2509 Finnish manufacturing establishments with more than 3 employees. Only establishments belonging to firms that employ at least 50 employees were included in the sample (see Appendix C). The final number of responses is 731, with a response rate of approximately 31% after accounting for over-coverage. An additional 69 establishments are dropped from the data when using the 2015 US MOPS inclusion criterion: a valid response to questions 1, 2, 6, 13, 14, 15 and 16 is required for inclusion in the final data. Using the 2010 US MOPS criterion of at least 10 non-missing responses instead increases the number of valid respondents but does not have a qualitative effect on the estimated results.

The FMOP questionnaire[5] was translated and adapted for use in Finnish manufacturing establishments from the US MOPS methodology. The questionnaire consists of 35 questions, 16 of which are about management practices. 13 questions concern organizational practices and the remaining 6 are background questions. Most of the questions also have a recall component, where respondents are asked to give an answer regarding the circumstances five years earlier. The responses are normalized on a scale of 0 – 1 and the management score is calculated as the unweighted average of the normalized responses. The answer options corresponding with the management practices that are the most structured are assigned a value of 1 and the least structured practices are assigned a value of 0. Bloom et al. (2019) define more structured management practices as "those that are more specific, formal, frequent or explicit" (Bloom et al. 2019, 28).

Since the original management and organizational practices survey was designed for manufacturing establishments, which do not include mining and utilities, all analyses were conducted both with and without mining and utilities. Excluding these industries removes 391 establishments from the total FMOP sample and 80 establishments from the set of valid FMOP respondents. The exclusion of these industries had no discernible effects on the magnitude or significance of the results. The reported figures are from the analyses with all sample industries included.

Since very small establishments (in terms of employment) often tend to exhibit extreme labour productivity numbers, only establishments with at least 10 employees are included in the reported regressions. If instead all establishments with at least 5 employees are included, the number of observations in the FMOP data is increased by 57. This slightly increases some estimates and decreases others but does not affect statistical significance or any qualitative conclusions drawn from the regressions.

Furthermore, the FMOP respondents with at least 10 employees include one outlier with a labour productivity of over 20 000 000 euros. To ensure that the outlier is not driving the results, the analyses were performed with and without this establishment. Reported figures are with the outlier excluded. Inclusion of the establishment has no effect on the statistical significance of the results, but it amplifies the associations of interest.

[5] Further figures describing the data can be found in Appendix A and the FMOP questionnaire form in Appendix D.

Therefore, the reported coefficients, obtained without the outlier, are on the conservative side. See appended data description for more detailed information on the FMOP data and data collection.

Other variables used in the analysis, such as intermediate inputs, addition and depreciation of machinery and ICT spending are gathered from The Business Register database and enterprises' financial statement data maintained by Statistics Finland. Employee level variables like years of education, degree and position within the organization are from the Finnish Longitudinal Employer-Employee Data (FLEED), also compiled and maintained by Statistics Finland.

3.2 Descriptive statistics

The management score has a sample mean of 0.62 and is close to normally distributed, as seen from the histogram in Figure 1. Approximately 10 percent of establishments have a management score higher than 0.8, and establishments with a score of under 0.4 make up a little under 10 percent of the data. Furthermore, Figure 1 shows that the distribution is skewed slightly to the left; compared to normally distributed data with the same mean and standard deviation, a bit more of the mass is concentrated to values higher than the mean.

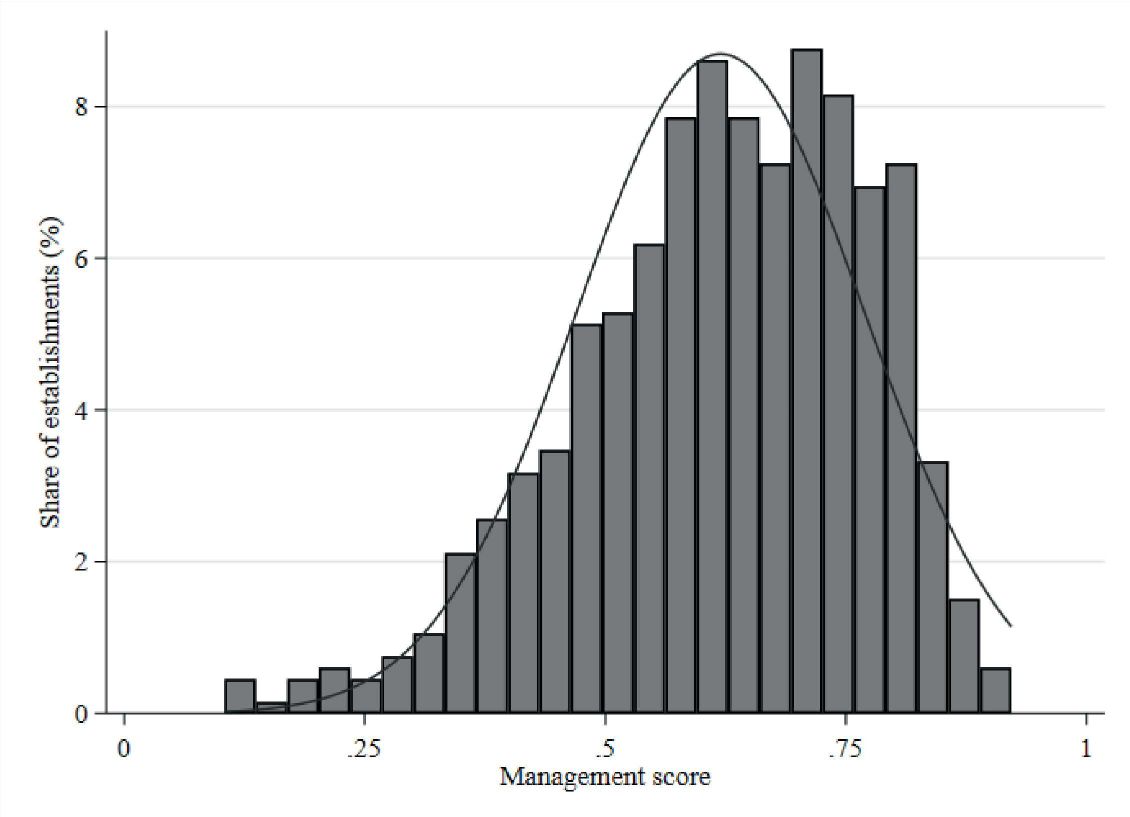

Figure 1 The distribution of the unweighted management score with an overlaid normal density with the same mean and standard deviation as the data.

Table 1 shows the mean of labour productivity, share of managers and non-managers with a higher education and the average years of education for the Finnish Management and Organizational practices survey sample, grouped by whether the establishment was a valid FMOP respondent or not. Managers and non-managers are defined as employees belonging and not belonging to the group "managers" in the Classification of Occupations 2010[6] (Statistics Finland 2021). Higher education is defined as having completed at least a bachelor's degree or equivalent, which averages to 15–16 years from the beginning of primary education.

On average, the respondents and the non-respondents of the FMOP sample are similar in their characteristics with regards to productivity, employee education and employment. The difference in labour productivity between the respondents and non-respondents of the FMOP sample is not statistically significant ($p = 0.51$). The same is true for the differences in the share of managers with higher education and the gross value of production (not shown in Table 1). There is a statistically significant but small difference in the share of non-managers with higher education: the share is 0.024 smaller among the 662 establishments that gave a valid response. The sample standard deviation of non-manager education is 0.217, so the difference is approximately 11 percent of a standard deviation. Likewise, a statistically significant difference that is small in magnitude is found in the number of employees (not included in the table): on average, the respondents have 24 or 15.8 percent of a standard deviation more employees than the non-respondents. The sample mean of the number of employees for the total sample, the respondents and the non-respondents is 81, 98 and 74, respectively.

Table 1 Average productivity and education for respondents and non-respondents.

Mean *(Std. Dev.)*	Number of establishments	Labour productivity (€)	Share of managers	Share of managers with higher education	Share of non-managers with higher education	Years of education (all employees)
FMOP respondents	662	508 177	0.04	0.71	0.20	12.8
		(1 611 872)	*(0.06)*	*(0.36)*	*(0.18)*	*(1.23)*
FMOP non-respondents	1847	453 383	0.04	0.71	0.22	12.9
		(2 405 861)	*(0.08)*	*(0.37)*	*(0.23)*	*(1.41)*
Total FMOP sample	2509	468 097	0.04	0.71	0.21	12.9
		(2 220 516)	*(0.08)*	*(0.36)*	*(0.22)*	*(1.37)*

Notes: Productivity is measured as the gross value of production/number of employees. Higher education is defined as having completed at least a bachelor's degree or equivalent (15–16 years from the beginning of primary education). Standard deviations in parentheses.

Figure 2 shows the number of employees, labour productivity and output growth of the FMOP establishments by management score deciles. The average number of employees and labour productivity both increase the higher the establishment's management score bin. The fourth figure shows labour productivity by employment deciles to demonstrate that, unlike with the management score deciles, productivity does not seem to increase with the number of employees.

[6] The Classification of Occupations 2010 is based on the International Standard Classification of Occupations ISCO-08, which is under the responsibility of the International Labour Organization (ILO) and confirmed by the United Nations.

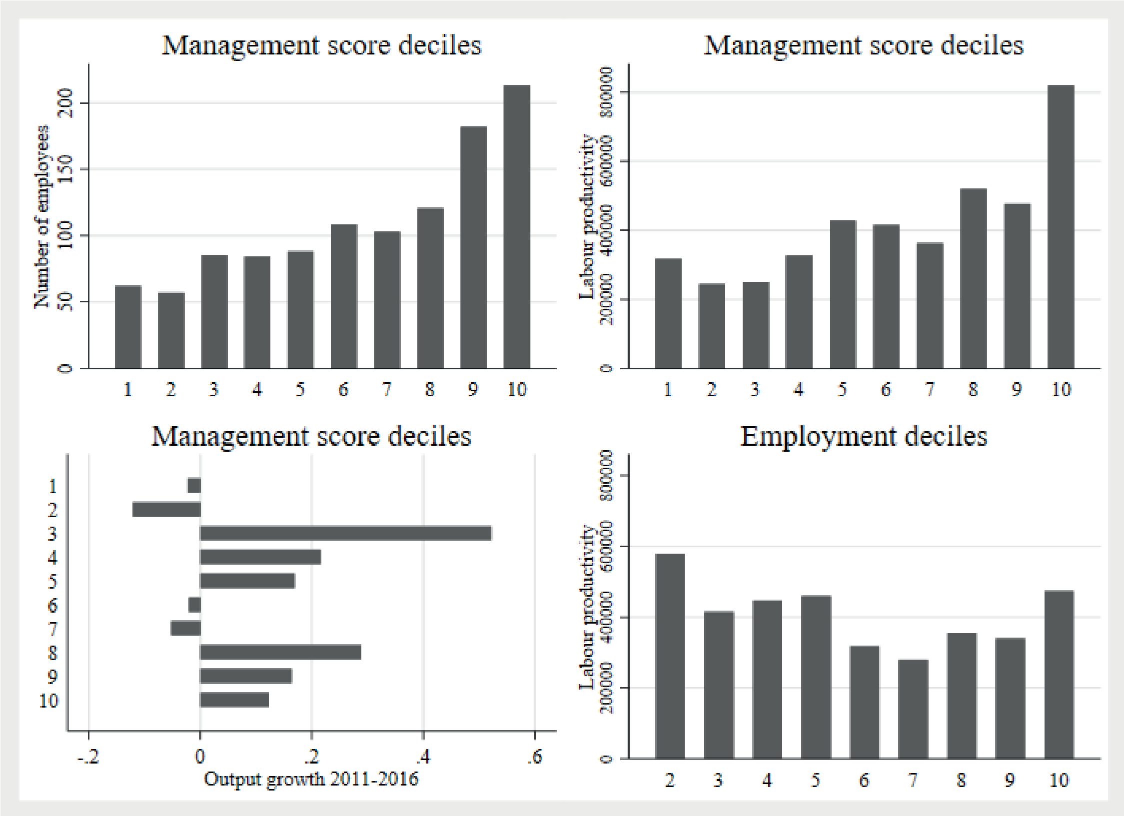

Figure 2 Comparisons of key variables by management score (and employment) deciles.

3.3 Methods

The multivariable fractional polynomial (MFP) approach provides a systematic, fully data-driven way of selecting the best-fitting functional form for a statistical model (Royston & Sauerbrei 2009). The approach uses backward elimination to select which variables are included in the model. It also combines this with a systematic fractional polynomial function selection procedure to determine a functional form for continuous predictors. Royston and Sauerbrei (2004) propose an extension of MFP called multivariable fractional polynomials interaction (MFPI), which provides a test of possible nonlinear interactions between a binary independent variable of interest and continuous regressors.

In the first step of the MFPI algorithm, the best-fitting fractional polynomial (FP) functions of the first and second degree are selected based on the Akaike's information criterion (AIC)[7]. In the second step, MFPI systematically examines whether FP functions of varying complexity describe the shape of the association between a regressor and the dependent variable better than a linear function. After the selection of the best-fitting functional form, a test for interactions between chosen regressors is performed:

For a binary regressor of interest x_i[8], the contribution of a control variable z on the estimated association between x_i and the dependent variable y can be written as $\hat{f}(z) =$

[7] $Model\ deviance - 2 * (maximized\ log\ likelihood\ for\ the\ interaction\ model)$.
[8] $x_i = i$ for $i \in \{0,1\}$.

$\hat{f}_1(z) - \hat{f}_0(z)$, where $\hat{f}_i(z)$ are the estimated functions for the association between z and y for each $x_i, i \in \{0,1\}$. The MFPI algorithm compares a model with different functions (and thus different coefficients) of z for x_1 and x_2 with a model that has the same function (and thus the same coefficient) for z in both x_i. This comparison acts as the test for an interaction term between z and x (Royston & Sauerbrei 2009).

Royston and Sauerbrei (2008) also describe an extension of MFPI, MFPIgen, that generalizes the approach to continuous-by-continuous interactions using the same fractional polynomial methodology. This paper utilizes said generalized version of MFPI to examine how human capital contributes to the management-productivity association. Consistent with the recommendations of Royston & Sauerbrei (2008), graphical checks are presented to support the MFPIgen method results.

The baseline linear model that is estimated on the data is

$$\begin{aligned} ln\left(\frac{Y_i}{L_i}\right) &= \alpha + \beta M_i + \gamma ln\left(\frac{I_i}{L_i}\right) + \mu ln\left(\frac{K_i}{L_i}\right) + (\gamma + \mu + \eta - 1)\, ln(L_i) + \delta H_i \\ &\quad + \phi X_i + f_i + \epsilon_i, \end{aligned} \tag{1}$$

where Y_i/L_i denotes the labour productivity of establishment i, M_i is the FMOP management score, I_i denotes intermediate inputs (minus energy), K_i is capital stock, L_i are labour inputs and H_i is human capital. The right-hand side also includes industry dummies f_i and a stochastic error term ε_i. The model is derived from a standard production function, where the management score, human capital and employee turnover are included in natural exponential function form.

Employee turnover is denoted by X_i. It is a labour market flow measure and is added as an additional control variable. The overall labour market flow activity of an establishment is a potential confounder since employee turnover can have knowledge spillover effects (Maliranta, Mohnen & Rouvinen 2009) that improve management practices. Employee turnover can also affect productivity if higher productivity workers tend to replace lower productivity employees. The model is estimated using OLS linear regression and, as a robustness check, generalized linear model (GLM) estimation to allow for a non-normal error distribution.

4 RESULTS

4.1 Tests of interactions

The generalized multivariable fractional polynomials interaction (MFPIgen) approach aims to identify linear and nonlinear interactions between continuous regressors. Applying this approach to a model of productivity as a function of the management score and the two education variables reveals a statistically significant linear interaction between the management score and the share of managers with a higher education[9].

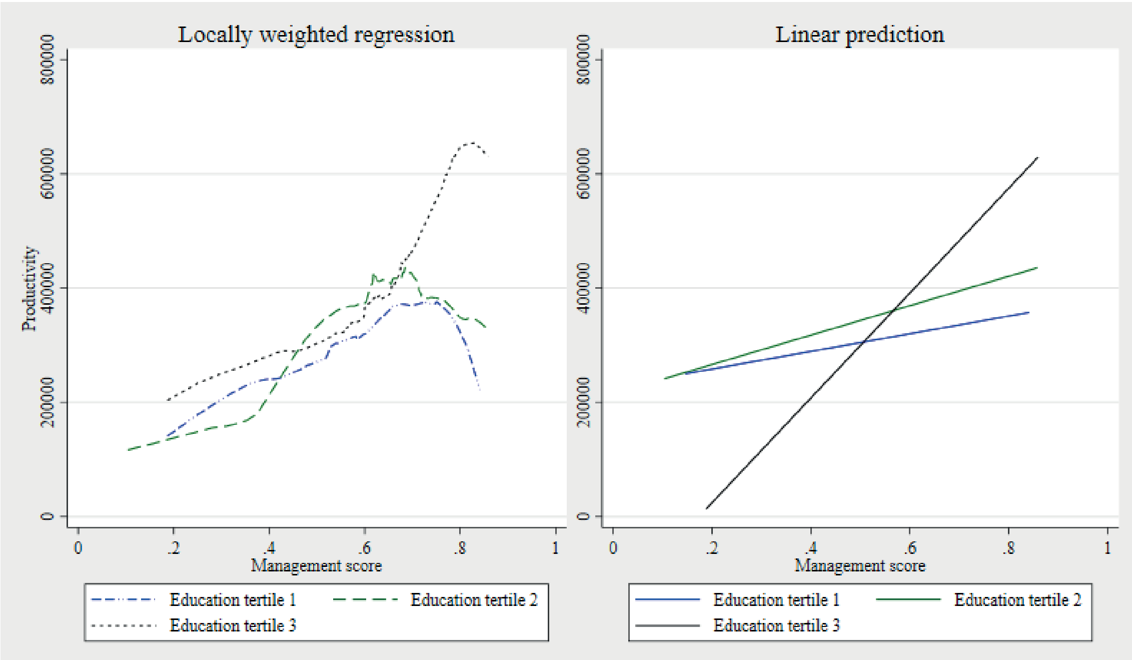

Figure 3 Manager education as a moderator variable. The education tertiles are tertiles of the share of managers with a higher education. Higher education is defined as having completed at least a bachelor's degree or equivalent (15–16 years from the beginning of primary education). The locally weighted regression on the left uses the tri-cube weight function.

Figure 3[10] shows graphically how the association between management practices and productivity varies with the average level of manager education. Both the locally weighted regressions and the linear predictions in tertiles 1 and 2 of the education level of managers are very similar, and the statistically significant difference in the slopes is mainly driven by tertile 3. For education tertile 3, the management-productivity association is monotonically increasing, except for at the very upper tail of the management score distribution. In the estimated regression models, both the management score and the

[9] $p = 0.007$ when productivity is in levels or $p = 0.014$ when productivity is in logs

[10] For ease of interpretation, the bottom and top 10 observations of the management score distribution have been cut from the figures. Including them has very little effect on the right-hand side linear prediction lines but improves the legibility of the locally weighted regression curves. Due to the low number of observations at the very tails of the distribution, the confidence intervals would also be very wide. No establishments have been cut from the regressions in Table 2. The figures with all establishments included are available upon request from the author.

education variable are modelled as continuous variables, as opposed to percentile bins, so the interaction term accounts for the whole continuous distribution of the education variable.

No interaction is found between management practices and the education of non-managers ($p = 0.52$). Figure 4 demonstrates this graphically. The slopes of the linear predictions by tertiles of non-manager education are relatively close to each other, and even the locally weighted regression curves have similar shapes.

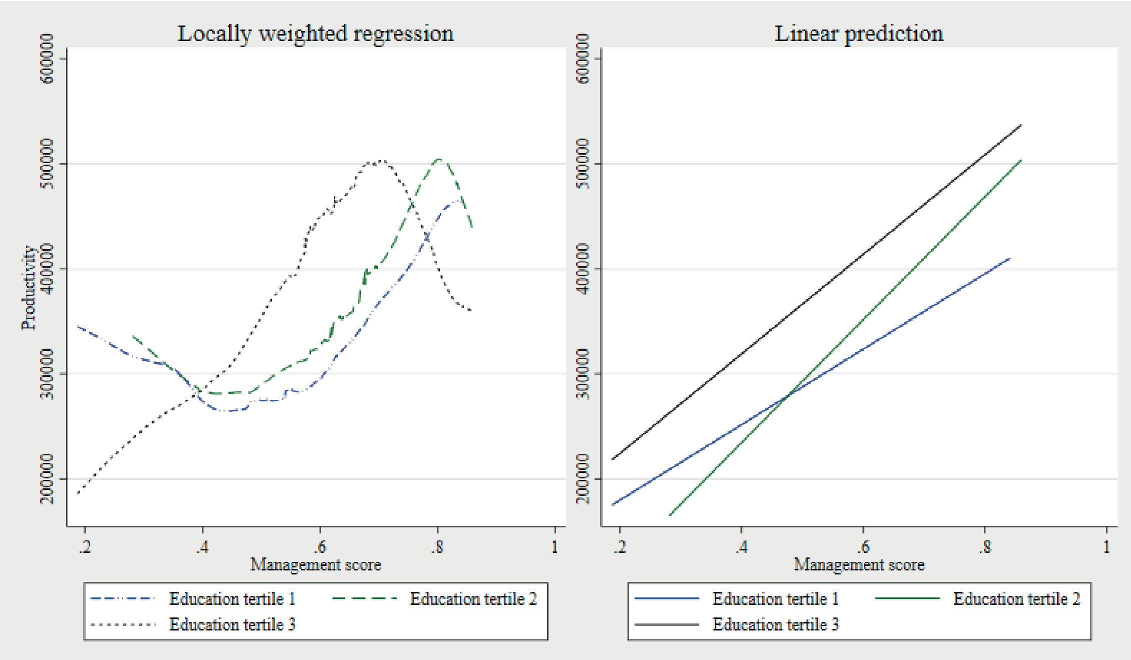

Figure 4 No statistically significant interaction is found with non-manager education. The education tertiles are tertiles of the share of non-managers with a higher education. Higher education is defined as having completed at least a bachelor's degree or equivalent (15–16 years from the beginning of primary education). The locally weighted regression on the left uses the tri-cube weight function.

The results of an OLS linear regression of (the log of) productivity on the management score by manager and non-manager education tertiles are reported in Table 2. The linear predictions in Figures 3 and 4 represent the estimates[11]. For reference, the coefficient of the management score in the simple baseline regression of the log of productivity on the management score in column 1 of Table 3 is 1.264. Table A 1 in Appendix B shows the same regressions as Table 2 but with non-manager education as a control when the regression is divided into manager tertiles and vice versa.

Like Figure 3, Table 2 further demonstrates the significant differences in the slope the management-productivity association for different values of manager education. This, together with the MFPIgen results, implies a need for an interaction term between the management score and manager education for a credible estimate of the correlation between management practices and productivity.

[11] In the figures, labour productivity is in levels. In the regressions, the dependent variable is the natural logarithm of labour productivity.

Table 2 Management-productivity association by education tertiles.

log(labour productivity) in	Manager education tertile			Non-manager education tertile		
	1	2	3	1	2	3
Management score	0.873**	0.902**	2.127***	1.004***	1.273***	1.348*
	(0.427)	(0.382)	(0.697)	(0.379)	(0.345)	(0.729)
Observations	129	97	204	175	207	185
Prob > F	0.043	0.020	0.003	0.009	0.000	0.066

Notes: Manager (and non-manager) education is calculated as the share of managers (and non-managers) with a higher education. Higher education is defined as having completed at least a bachelor's degree or equivalent (15–16 years from the beginning of primary education, including tertiary education).

4.2 Management practices and productivity

Start with the linear model

$$ln\left(\frac{Y_i}{L_i}\right) = \alpha + \beta M_i + \gamma ln\left(\frac{I_i}{L_i}\right) + \mu ln\left(\frac{K_i}{L_i}\right) + (\gamma + \mu + \eta - 1)\, ln(L_i) + \delta H_i + \phi X_i + f_i + \epsilon_i \tag{2}$$

where $y_i \equiv {Y_i}/{L_i}$ is the labour productivity of establishment i, M_i denotes the management score, K_i is capital stock, I_i is intermediate inputs (minus energy), H_i is human capital and X_i is relative employee turnover. Industry dummies are denoted by f_i and ε_i is a stochastic error term. Based on the MFPIgen results presented in subsection 3.1, we partition human capital H_i into manager and non-manager education, respectively denoted as H_i^m and H_i^n. The education variables are measured as the share of managers and non-managers with a higher (tertiary) education. An interaction term[12] for management practices and manager education is then added to equation (2) to get the following model:

$$ln(y_i) = \alpha + \beta M_i + \gamma ln(i_i) + \mu ln(k_i) + (\gamma + \mu + \eta - 1)\, ln(L_i) + \delta^m H_i^m + \xi M_i H_i^m + \delta^n H_i^n + \phi X_i + f_i + \epsilon_i. \tag{3}$$

The small letters denote variables divided by labour inputs L_i. Note that in this specification, the estimate for β, denoted $\hat{\beta}$, uniquely describes the association between management practices and productivity only when $H_i^m = 0$. This holds only for 63 establishments out of the 662 valid FMOP respondents. Otherwise, the association is described by $\hat{\beta} + \hat{\xi} H_i^m$[13]. The management score is never zero, so δ^{m} has no interpretation by itself.

[12] Adding manager education as a control in a linear regression would only account for the change in the intercept. An interaction term also corrects for the change in the slope of the regression line. The changes in the slope are demonstrated in Figure 3.

[13] $\ln(y_i) = \alpha + M_i(\beta + \mu H_i^m) + \gamma \ln(i_i) + \mu \ln(k_i) + (\gamma + \mu + \eta - 1)\ln(L_i) + \delta^m H_i^m + \delta^n H_i^n + \phi X_i + f_i + \epsilon_i$

Furthermore, since the null hypothesis of not including the individual education variables in the linear model cannot be rejected[14] in the MFP test of inclusion of covariates, H_i^m and H_i^n are only included as a robustness check in column 3 of Table 3, with no notable effects on the results. Excluding H_i^m and H_i^n results in the following specification:

$$\begin{aligned} \ln(y_i) = \alpha + \beta M_i + \gamma \ln(i_i) + \mu \ln(k_i) + (\gamma + \mu + \eta - 1)\ln(L_i) + \xi M_i H_i^m \\ + \phi X_i + f_i + \epsilon_i, \end{aligned} \tag{4}$$

which is estimated in column 5. The overall labour market flow activity ϕX_i can be measured either by the employee turnover or the relative employee turnover (turnover/employment) of establishments. Replacing the former as the control in the regressions of columns 5 and 7 has no qualitative effects on the standard errors. However, most of the regression coefficients are more conservative when using relative employee turnover, so those are reported in Table 3.

Table 3 Establishment management scores and labour productivity

log(labour productivity)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Management score	**1.264*** **	**0.823*** **	0.877***	**0.733*** **	**0.683*** **	0.690***	0.634***	0.866**	0.947***
	(0.292)	(0.200)	(0.220)	(0.239)	(0.236)	(0.206)	(0.206)	(0.426)	(0.332)
log(materials/worker)		0.250***	0.264***	0.253***	0.249***	0.253***	0.251***		
		(0.034)	(0.041)	(0.043)	(0.043)	(0.033)	(0.032)		
log(capital stock/worker)		0.102***	0.092***	0.093***	0.0917***	0.099***	0.101***		
		(0.019)	(0.023)	(0.023)	(0.023)	(0.019)	(0.019)		
log(employment)		-0.030	-0.061	-0.036	-0.043	-0.056	-0.064*		
		(0.032)	(0.045)	(0.043)	(0.043)	(0.034)	(0.034)		
Manager education			0.061						
			(0.088)						
Non-manager education			0.690***						
			(0.238)						
Management score x manager education				0.179	0.167			0.380**	
				(0.145)	(0.144)			(0.161)	
Management score x non-manager education						0.857**	0.884***		0.574*
						(0.340)	(0.336)		(0.318)
Relative employee turnover					-0.193*		-0.186**		
					(0.100)		(0.077)		
Observations	569	432	333	333	333	431	431	431	567
Industry dummies		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.186	0.469	0.460	0.446	0.450	0.475	0.513	0.191	0.191

Notes: OLS coefficients with Huber–White standard errors in parentheses. Labour productivity is measured as the gross value of production divided by the number of employees. Employee education is measured as the share of employees with a higher education. Higher education is defined as having

[14] The fractional polynomial fitting algorithm converges after 2 cycles with a p-value of 0.55 for manager and 0.65 for non-manager education. The average years of education of all employees is excluded from the model with a p-value of 0.98.

completed at least a bachelor's degree or equivalent (15–16 years from the beginning of primary education, including tertiary education). Employee turnover equals the sum of worker inflow and worker outflow during the year and is an establishment's aggregate labour market flow activity measure. Relative employee turnover is measured as employee turnover divided by the average number of employed. Materials are intermediate inputs without energy. Due to data restrictions, the sum of the addition and depreciation of machinery is used as a proxy for net capital stock. The industry dummies are at the 2-digit level of the Standard Industrial Classification; mining (05–09), manufacturing (10–33) and utilities (35) were divided into nine subindustries: 05–09, 10–15, 16–18, 19–23, 24–25, 26–27, 28–30, 31–33 and 35. Prob > F (the p-value of the F-test) is less than 0.001 in every column. $*\, p < 0.10$, $**\, p < 0.05$, $***\, p < 0.01$.

Running a baseline regression of labour productivity on the establishment management score without any controls or industry dummies, the highly statistically significant coefficient is 1.264 ($p < 0.001$). In this specification, a 0.1 (or 10 percentage point) increase in the management score is therefore associated with a 13.5%[15] increase in labour productivity. As seen from columns 2 and 4, with intermediate inputs, capital, labour and industry dummies included, adding the interaction term decreases the management score coefficient from 0.823 to 0.733. Including employee turnover further decreases the coefficient to 0.683.

This is reported in Column 5, which shows the estimation results for the full specification from equation (4), with intermediate inputs, capital, labour, relative employee turnover, industry dummies and the management-education interaction term. The management score coefficient of 0.683[16] implies that a 0.1 (or 10%) increase in the management score is associated with an average of 7.1% higher labour productivity. The standard deviation of the management score is 0.15 and its sample mean is 0.62. Therefore, a higher management score of one standard deviation implies an average increase of 10.8%[17] in labour productivity. Columns 6, 7 and 9 replace manager education with non-manager education in the interaction term for a comparison with columns 4, 5 and 8, respectively.

For further reference, a replication of the labour productivity estimations in Table 1 of Bloom et al. (2019) is presented in Table A 2 in Appendix B. For better comparability with the results of Bloom et al. (2019), who use the share of all employees with a college degree, the separate manager and non-manager education variables in Table 3 are replaced with the share of all employees (managers and non-managers) with a higher education in Table A 2. With the US data, the coefficient on management practices reduces from 1.351 to 0.209 when capital stock, materials, labour, employee education and industry dummies are added to the baseline regression of labour productivity on the management score (Bloom et al. 2019). In Table A 2, the corresponding change in the management coefficient is from 1.264 to 0.843.

As referenced in the introduction, there are strong empirical evidence and credible theoretical arguments that suggest management practices affect productivity. Nevertheless, the presented OLS management coefficients most likely do not describe a causal effect, since there are plenty of possible omitted factors, such as CEO effects, which could confound the relationship between management and productivity. However, the associational results are significant both statistically and in magnitude, and robust to different

[15] $e^{0.1264} - 1 \approx 0.1347$

[16] The association is described by $\hat{\beta} + \hat{\xi} H_i^m$, but since the coefficient of the interaction term, $\hat{\xi}$, is statistically indistinguishable from zero, we can simply look at $\hat{\beta} = 0.683$.

[17] $e^{0.683*0.15} \approx 1.108$

specifications, measurement choices and data restrictions. At the very least, the results show that the FMOP management score is a meaningful measure of firm characteristics. This is consistent with the findings of existing studies like Bloom et al. (2013) and Bloom et al. (2019), which show that management practices play a significant role in explaining productivity differences.

Next, the magnitude of the management-productivity association is compared to ICT, R&D and skills, all factors that have traditionally been regarded as some of the most important drivers of productivity variation (e.g., Syverson 2011).

4.3 Comparison with other drivers of productivity

To assess the magnitude of the association between management and productivity, Table 4 reports the OLS estimates from a regression of log(labour productivity) on four key drivers of productivity differences. Namely, the management score, research and development expenditures (R&D) per employee, information and communication technologies spending (ICT) per employee and human capital (measured as worker skills[18], proxied by the share of all employees with a higher education). The main question is: how large a share can the spread of these variables explain of the spread in productivity?

Akin to Bloom et al. (2019), the focus of the comparison is on the share of the 90–10 productivity spread explained by the different factors. The share of 90–10 spread explained by each variable is reported in the second row from the bottom and is calculated by multiplying each column's variable’s 90–10 percentile difference by its regression coefficient, then dividing by the 90–10 spread of labour productivity. The 90–10 percentile difference, or 90–10 spread, of a variable is calculated as the difference between the ninetieth percentile and the tenth percentile of the distribution.

[18] For robustness, two alternative measures of worker skills were used: the share of employees with a higher education and average years of education. The specifications in columns 4 and 6 use the former.

Table 4 Comparison of factors explaining productivity differences.

log(labour productivity)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Management score	1.208***					0.875***	0.907**
	(0.294)					(0.301)	(0.367)
ICT/worker		0.152***				0.072**	0.073*
		(0.016)				(0.032)	(0.039)
R&D			0.044***			0.051***	0.056***
			(0.006)			(0.010)	(0.012)
Skills (share of all employees with a higher education)				0.723***		0.071	
				(0.097)		(0.214)	
Share of managers with a higher education					0.287***		0.111
					(0.067)		(0.113)
Share of non-managers with a higher education					0.508***		-0.060
					(0.116)		(0.234)
Observations	556	1946	1946	1946	1384	556	422
Industry dummies						Yes	Yes
Share of 90–10 gap explained	0.240	0.257	0.178	0.209	0.288	0.523	0.571
$\sqrt{(R^2)}$	0.223	0.276	0.167	0.182	0.204	0.493	0.491

Notes: OLS coefficients with Huber–White standard errors in parentheses. Higher education is defined as having completed at least a bachelor's degree or equivalent (15–16 years from the beginning of primary education, including tertiary education). ICT is measured as the log of information and communications technology planning and programming expenditure per employee. Following Bloom et al. (2019), R&D is measured as $log(1 + R\&D\ intensity)$, where R&D intensity is total research and development expenditure per worker. Only observations with non-negative values of ICT and R&D expenditures are included. Missing values of right-hand side variables have been replaced by 2-digit level industry means. The share of 90–10 gap explained is measured as the regression coefficient on the column's variable times its 90–10 percentile difference, divided by the 90–10 difference of labour productivity. The 90–10 percentile difference, or the "90–10 spread", is calculated as the difference between the ninetieth percentile and the tenth percentile of each variable. In column 5, the reported number is the share of the 90–10 gap explained jointly by the education variables. The corresponding number for non-manager education is 0.142. $*\,p < 0.10$, $**\,p < 0.05$, $***\,p < 0.01$.

According to this measure, increasing the management score from the tenth percentile to the ninetieth can account for 24% of the corresponding productivity spread. This is consistent with the 22% found in the US manufacturing sector by Bloom et al. (2019). Compared to the 25.7%, 17.8% and 20.9% of ICT, R&D and skills, the conclusion is that management practices can account for as much of the 90–10 productivity gap as other important, more commonly studied drivers of productivity. Jointly[19], these factors can explain up to 52% of the 90–10 productivity gap, as shown in column 6 of Table 4. Columns 6 and 7 also demonstrate that even when other important factors are accounted for,

[19] Calculated by $\left(\sum_k^4 \widehat{\beta_k} X_k\right)/y_{90-10}$, where $\hat{\beta}_k$ is the coefficient of factor k in column 7, X_k is the relative 90–10 percentile ratio of factor k and y_{90-10} is the relative 90–10 ratio of labour productivity.

the management score retains a strong association with labour productivity. These results are supported by the measured contribution of each variable to the standard deviation of the log of labour productivity, represented in the table by the square root of the R^2 in each regression: 22.3% for management practices, 27.6% for ICT, 16.7% for R&D and 18.2% for skills.

Column 5 splits the skills variable into the share of managers and non-managers with a higher education. The partition suggests that about 28.8 percent of the 90–10 productivity gap can be explained jointly by the two education variables. Column 7 repeats the regression in column 6 with the partitioned education variables in the place of skills, with near-identical results. In both specifications with all variables included, the role of education practically disappears. This is driven by management practices, since the coefficients on both skills and the education variables become indistinguishable from zero when the management score is added to the regressions in columns 4 and 5, without adding any of the other factors. In all these instances, the role of management practices remains statistically significant and large.

Measuring R&D at the establishment-level can be problematic with multi-plant firms, but the share of the 90–10 productivity gap explained by the 90–10 R&D spread in Table 4 is consistent with the results of Bloom et al. (2019). In their firm-level analysis, they report 21.6% as both the share of the 90–10 productivity spread explained by R&D and the contribution of R&D to the standard deviation of log(labour productivity). This is also consistent with the 16.7% contribution of R&D to the standard deviation of labour productivity in the Finnish data, shown in the bottom row of Table 4.

Furthermore, compared to the 12 percent in Bloom et al. (2019), the 20.9 percent (or 28.8 percent jointly for the separate education variables) share of the 90–10 gap explained by skills is high but can still be considered commensurate. The difference could be relatively high because the US analysis is at the firm level[20], or due to differences in the measuring and scaling of variables. The 18.2 percent contribution of skills to the standard deviation of labour productivity in the Finnish data is relatively close to the firm level equivalent of 14.2 percent from US manufacturing. However, these measures are not meant to accurately describe the absolute importance of the included factors in explaining productivity variation, but rather demonstrate the relative importance of accounting for management.

4.4 Extensions and robustness checks

In addition to the reported estimates with normal unweighted average management scores, all regressions were run with employment weights to ensure that the qualitative conclusions hold for employment weighted (aggregate) management scores[21] as well. Employment weighted regressions mitigate the impact of smaller establishments with extreme labour productivity numbers. They also account for the workforce allocated into higher productivity establishments, making the employment weighted results more relevant in

[20] The US variables have been weighted up to the firm level from establishment-level data using establishment's total value of shipments (Bloom et al. 2019).

[21] Olley-Pakes decomposition (Olley & Pakes 1996) of the FMOP management score: Employment weighted (aggregate) management score = unweighted score + covariance term.

terms of competitiveness. Adding employment weights to the regressions does not change the statistical significance of or the conclusions drawn from the estimates. The coefficient of management practices in an employment weighted equivalent of the regression in column 7 of Table 3 is 0.604 ($p = 0.038$). The employment weighted regression is equivalent to fitting the model

$$\begin{aligned}\ln(y_i)\sqrt{L_i} = \alpha\sqrt{L_i} + \beta M_i\sqrt{L_i} + \gamma\ln(i_i)\sqrt{L_i} + \mu\ln(k_i)\sqrt{L_i} + \delta H_i\sqrt{L_i} \\ + \phi X_i\sqrt{L_i} + f_i\sqrt{L_i} + \epsilon_i\sqrt{L_i},\end{aligned} \tag{5}$$

where L_i is the number of employees in establishment i.

Furthermore, a generalized linear model (GLM) was fitted to allow for a non-normal error distribution. The gamma distribution was chosen for the estimation. The results from the main specifications of Table 3 are robust to the gamma GLM with both the identity link function ($X\beta = \mu$) and the canonical negative inverse link function ($X\beta = -\mu^{-1}$). In the full specification with materials, capital, labour, relative turnover, industry dummies and the interaction term, the GLM coefficients of the management score on log(productivity) are 0.652 ($p = 0.004$) and 0.815 ($p = 0.002$)[22], respectively for the two link functions. For reference, the corresponding coefficient of management in the main OLS regression in column 7 of Table 3 is 0.683.

The multivariable fractional polynomial (MFP) approach also tests for the inclusion and functional form of model variables. It combines backward elimination with an FP function selection procedure to select the MFP model that best fits the data / predicts the dependent variable from the regressors. Applying this approach to the full specification in equation (1), the management score, materials and capital are included in the model at the 99% confidence level ($p < 0.001$). Employee turnover is included at the 95% level ($p = 0.012$). Overall human capital, measured as the share of all employees with a higher education (human capital intensity) and alternatively as the average years of education of all employees, is not included in the model with the best fit ($p = 0.995$).

[22] The 0.815 is the result of calculating the average marginal (partial) linear prediction of the management score on labour productivity from the negative inverse link function GLM coefficient of -0.0045. This produces an estimate of the multiplier of M_i that is more comparable to the OLS coefficients in Table 3.

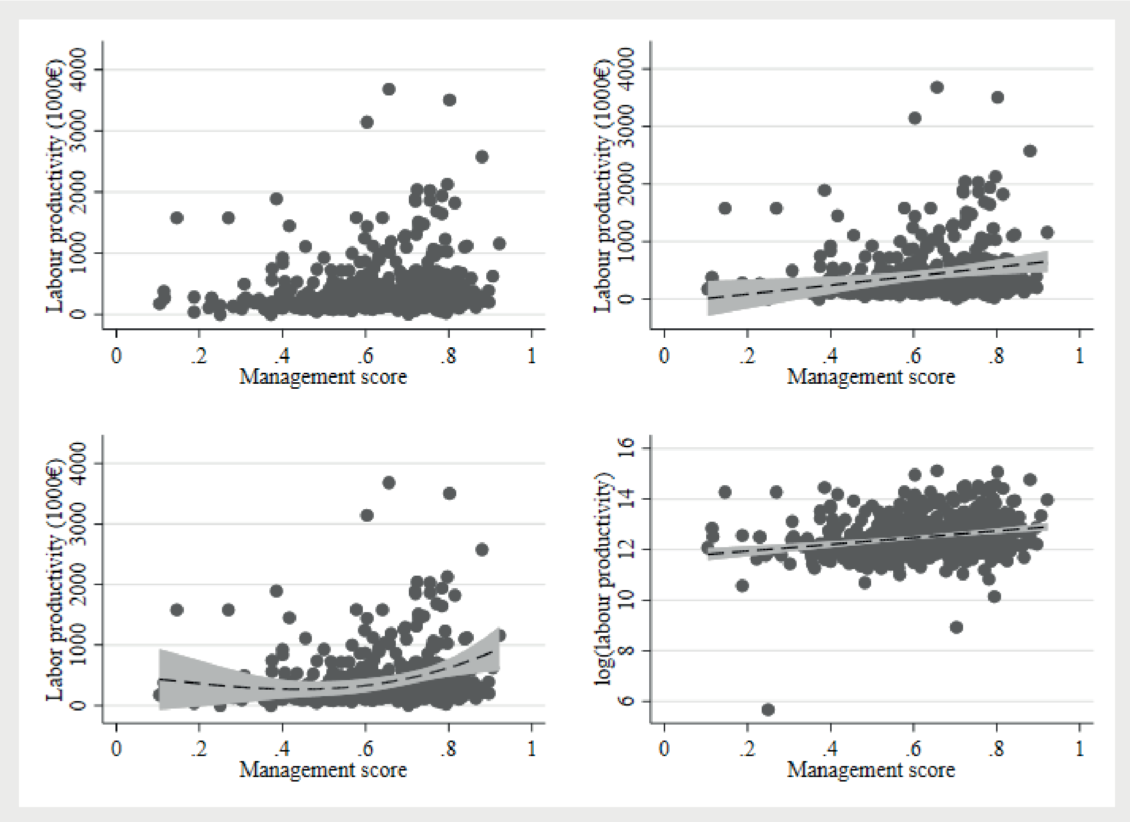

Figure 5 The linear prediction fits the data at least as well as the fractional polynomial fit in panel 3.

No statistically significant nonlinearity is found between the management practices and productivity, so a linear model was chosen for estimation. This is visualized in the scatter plots of Figure 5. The test for the functional forms of the other covariates concludes that the included variables fit the data best when kept linear[23]. The only exception is intermediate inputs, for which the best fit would be a fractional polynomial model with powers $(2, 2)$, denoted in vector notation as $\ln(i_i)^{(2,2)\prime}\boldsymbol{\gamma} = \gamma_0 + \gamma_1 \ln(i_i)^{(2)} + \gamma_2 \ln(i_i)^{(2)} \ln[\ln(i_i)]$, where $i_i \equiv I_i/L_i$. However, modelling inputs with the FP functional form does not change any conclusions drawn from the results.

When human capital is partitioned into the education levels of managers and non-managers (see equation 3), the results of the model selection procedure remain unchanged: all other variables are included and linear, intermediate inputs is included as a fractional polynomial with powers $(2,2)$ and the education variables are excluded from the model ($p = 0.55$ and $p = 0.65$ for manager and non-manager education). Regressions with employee education, both as years of education and as the share of employees with a higher education, were still run as a robustness check, with unchanged results. The estimation results of the full fractional polynomial model with mean-centered variables and nonlinear intermediate inputs are presented in the following.

Table 5 reports the results from estimating the full fractional polynomial (FP) model with non-linear intermediate inputs and mean centered variables, built by the MFP back-fitting model-selection algorithm. As is evident from comparing the coefficients in Table 5 to Table 3, the main results from estimating the linear model of equation 4 coincide

[23] Cannot reject the null of including management, capital and employee turnover as linear covariates at the 99% confidence level: $p = 0.29, p = 0.03$ and $p = 0.08$, respectively.

with the results from the estimation of the FP model. The regression coefficients of the management score in the full specification of the FP model without and with industry dummies are 0.812 and 0.611, respectively. When estimating the linear model of equation 4, the corresponding coefficients are 0.871 and 0.683.

All the other FP-transformed variables are only centered around the mean, but intermediate inputs is modelled as a fractional polynomial with powers $(2, 2)$, denoted in vector notation as

$$\ln\left(\frac{I_i}{L_i}\right)^{(2,2)\prime}\boldsymbol{\gamma} = \gamma_0 + \gamma_1 \ln\left(\frac{I_i}{L_i}\right)^{(2)} + \gamma_2 \ln\left(\frac{I_i}{L_i}\right)^{(2)} \ln\left[\ln\left(\frac{I_i}{L_i}\right)\right]. \tag{6}$$

Employment is automatically excluded as a covariate by the MFP hypothesis test of model fit. Including it does not significantly change the results. The interaction term included as a control in the estimation of the FP model in columns 3 and 4 uses the original variables, since the MFP approach does not allow interactions.

Table 5 Fractional polynomial model

log(labour productivity)	(1)	(2)	(3)	(4)
FP(management score)	0.800***	**0.682*****	0.812***	**0.611*****
	(0.170)	(0.169)	(0.227)	(0.210)
FP(materials/worker)	-0.190***	-0.188***	-0.207***	-0.213***
	(0.032)	(0.035)	(0.037)	(0.039)
FP_2(materials/worker)	0.074***	0.074***	0.081***	0.083***
	(0.012)	(0.013)	(0.013)	(0.014)
FP(capital stock/worker)	0.116***	0.093***	0.111***	0.080***
	(0.0191)	(0.0185)	(0.0226)	(0.0219)
FP(relative employee turnover)	-0.235***	-0.187**	-0.202**	-0.195**
	(0.076)	(0.072)	(0.097)	(0.095)
Management score			-0.009	0.128
# manager education			(0.149)	(0.134)
Observations	431	431	333	333
Industry dummies		Yes		Yes
R^2	0.436	0.531	0.529	0.530

Notes: $FP(management\ score) = M_i - 0.628$, $FP(materials/worker) = \ln(I_i/L_i)^2 - 90.137$, $FP_2(materials/worker) = \ln(I_i/L_i)^2 \ln[\ln(I_i/L_i)] - 202.868$. $FP(capital\ stock/worker) = \ln(K_i/L_i) - 8.268$ and $FP(relative\ employee\ turnover) = X_i - 0.336$. OLS coefficients with Huber–White standard errors in parentheses.

All regressions were also performed with and without one outlier with extremely high labour productivity. Including the outlier amplifies the management-productivity association but does not change the statistical significance of any estimates. The reported analysis excludes the outlier to avoid overstating any estimates.

According to Bloom et al. (2019), random measurement error in the management score accounts for approximately 51 percent of the observed variation in the adoption of management practices in the US data. Therefore, due to regression dilution bias, the reported regression slopes might be biased towards zero. This is because the measurement error is in a right-hand side variable and it is likely that there is not as much measurement error in the left-hand side variable of the regression equation (labour productivity), at least in the Finnish data.

Furthermore, in addition to the reported results, all analysis was performed with mining and utilities excluded. This was done because the original MOPS, on which the Finnish version is closely based on, was designed for use in "manufacturing" establishments, which does not include mining and utilities. However, the FMOP survey sample also contained these two industries. The results presented in this paper are robust to the exclusion of these industries. All relevant results are also robust to the use of the average years of education instead of the share of employees with a higher education as the measure of worker skills.

5 CONCLUSIONS

Advances in the tools for collecting quantitative large-scale data on management have made management practices as a potential driver of productivity an increasingly prominent target of research. This study complements the literature by examining how human capital contributes to the management-productivity association. Using the multivariable fractional polynomials interaction (MFPI) approach (Royston & Sauerbrei 2008), a linear two-way interaction between management practices and the education of managers is found. Testing and accounting for this interaction is important for reliable estimation of the relationship between management practices and firm performance.

In a regression with intermediate inputs, capital, labour inputs, and industry dummies, a 0.1 (or 10 percentage point) increase in the management score is associated with an average of 8.6 percent higher labour productivity. Adding the interaction term between management practices and manager education as a control decreases the association to 7.6 percent. The magnitude of the management-productivity relationship is large when compared to other commonly studied drivers of productivity. Increasing the management score from the tenth percentile to the ninetieth percentile can account for 24 percent of the corresponding productivity spread. This finding is consistent with the 22 percent reported for the US manufacturing sector by Bloom et al. (2019). Compared to the 25.7 percent, 17.8 percent and 20.9 percent of ICT, R&D and skills (12, 21.6 and 16 percent in the US), the conclusion is that management practices is a key variable in explaining productivity dispersion.

The analyses presented in this paper suggest that the marginal benefit of adopting more structured management practices is different for establishments with different characteristics. Namely, the part of human capital that can be attributed to managers is correlated with the rate of productivity improvements gained from better management practices. This is important since human capital is often measured through the education levels or other characteristics of the entire workforce. Therefore, since most employees are not managers[24], human capital ends up proxied by averages to which most of the weight comes from non-manager characteristics.

It is plausible that the set of establishments both with a high average level of manager education and a strong management-productivity association simply partakes in the type of manufacturing that highly benefits from or requires both. Another possibility is that human capital directly affects the relationship between management practices and productivity. Based on the available data alone, without making additional untestable assumptions, we cannot determine which is true.

Nevertheless, the results direct policymakers' attention to increasing the adoption of structured management practices, especially in establishments and industries with already high human capital intensity. This also encourages complementing managerial improvements with policies that promote human capital formation[25]. This study also demonstrates the importance and usefulness of comprehensive high quality census data that allows the formation of information-rich data sets by further partitioning variables. The Finnish data enables an even more rigorous dissection of manager and non-manager

[24] As shown in Table 1, approximately 4 percent of the employees in the FMOP sample are managers.

[25] See, for example, Heckman (2000) for an overview of sources of human capital formation with policy recommendations.

characteristics than what was utilized in this paper, with divisions by field of work and study, tenure and wage, for example. Studying these aspects of firms' employees more closely would provide insight into the relationships between management, workforce quality, firm performance and even employee well-being[26].

[26] See, for example, Böckerman, Ilmakunnas and Johansson (2011), Böckerman (2015) and Peutere, Saloniemi, Böckerman, Aho, Nätti and Nummi (2020).

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Johtamiskäytännöt parantavat tuottavuutta – mutta eivät ilman inhimillistä pääomaa

Laajennettu tiivistelmä:

Viimeaikaiset tutkimukset ovat osoittaneet, että johtamiskäytäntöjen tasoa kuvaavat mittarit korreloivat voimakkaasti yritystason kannattavuuden, tuottavuuden ja kasvun kanssa. Strategisen tutkimuksen neuvoston rahoittaman Taidot Työhön -hankkeen osana toteutetulla Suomen johtamis- ja organisaatiokäytäntöjen kyselyllä (FMOP) on hankittu laajaa vertailutietoa Suomen teollisuuden toimipaikkojen johtamiskäytännöistä. Kysely seuraa tarkasti Yhdysvalloissa toteutettua Management and Organizational Practices Survey (MOPS) -kyselyä ja se keskittyy lattiatason johtamiskäytäntöihin esimerkiksi ylimmän johdon strategisten päätösten sijaan.

Yhdistämällä FMOP aineisto laadukkaisiin suomalaisiin yhdistettyihin työntekijä-työnantaja-aineistoihin voidaan tutkia lattiatason johtamiskäytäntöjen ja yritysten tuottavuuden välistä yhteyttä sekä selvittää, toimiiko inhimillinen pääoma moderaattorimuuttujana tuottavuuden ja johtamisen välillä. Toisin kuin aiemmissa tutkimuksissa, suomalaisella aineistolla työntekijät on mahdollista jakaa johtajiin ja ei-johtajiin. Vertailemalla johtamiskäytännöistä ja inhimillisestä pääomasta tuottavuutta ennustavia tilastollisia malleja löydetään kaksisuuntainen lineaarinen interaktio johtajien koulutustason ja johtamiskäytäntöjen välillä. Toimipaikkojen käytössä olevien johtamiskäytäntöjen lisäämisen ja parantamisen rajahyöty siis riippuu johtajiin sitoutuneen inhimillisen pääoman määrästä. Kyseisen interaktion testaaminen ja huomioiminen on tärkeää johtamisen ja tuottavuuden välisen yhteyden luotettavalle estimoinnille.

Aineiston perusteella kymmenen prosenttia korkeampi johtamiskäytäntöpistemäärä on yhteydessä keskimäärin 7,1 prosenttia korkeampaan työn tuottavuuteen, kun interaktiotermi on otettu huomioon. Löydetty johtamiskäytäntöjen ja tuottavuuden välinen yhteys on suuruudeltaan merkittävä sekä tilastollisesti merkitsevä. Johtamiskäytäntöjen omaksumisen tason nostaminen ensimmäisestä desiilistä yhdeksänteen voi selittää jopa 24 prosenttia vastaavasta ”90–10” tuottavuuskuilusta. Johtamiskäytäntöjen osuus selitetystä tuottavuudesta on siis aineiston perusteella lähes yhtä suuri kuin tieto- ja viestintätekniikalla ja suurempi kuin tutkimus- ja kehittämistoiminnalla sekä inhimillisellä pääomalla. 24 prosenttia on johdonmukainen tulos Yhdysvaltalaisen tutkimuksen raportoiman 22 prosentin selitysosuuden kanssa.

Tämän tutkimuksen tulokset viittaavat siis siihen, että johtamiskäytäntöjen ja tuottavuuden välillä on voimakas yhteys, mutta johtamiskäytäntöjen omaksumisen rajahyöty on erisuuruinen toimipaikoille, joilla on erilaiset ominaisuudet. Tarkemmin sanottuna se osa inhimillisestä pääomasta, jonka voi laskea johtajien ansioksi, on yhteydessä johtamiskäytäntöjen ja tuottavuuden välisen yhteyden kulmakertoimeen. Havainto on tärkeä, sillä inhimillistä pääomaa mitataan usein koko henkilökunnan koulutustasolla. Tämän vuoksi inhimillisen pääoman mittarit ovat useimmiten erittäin vahvasti painotettuja ei-johtajien ominaisuuksilla, sillä suurin osa työntekijöistä ei ole johtajia. Työvoiman jakaminen johtajiin ja ei-johtajiin on siis tärkeää, kun halutaan mitata inhimillistä pääomaa johtamiseen liittyviä tekijöitä tutkiessa.

Tutkimuksen tulokset ohjaavat päättäjien huomiota yritysten johtamiskäytäntöjen parantamiseen tuottavuuden ja kilpailukyvyn edistämiseksi, erityisesti yrityksissä ja toimialoilla, joilla inhimillisen pääoman intensiteetti on jo valmiiksi korkea. Tulokset myös kannustavat täydentämään johtamiseen liittyviä parannuksia politiikkatoimenpiteillä – kuten koulutuspanostuksilla – jotka edistävät inhimillisen pääoman muodostumista.

6 APPENDIX A: FIGURES

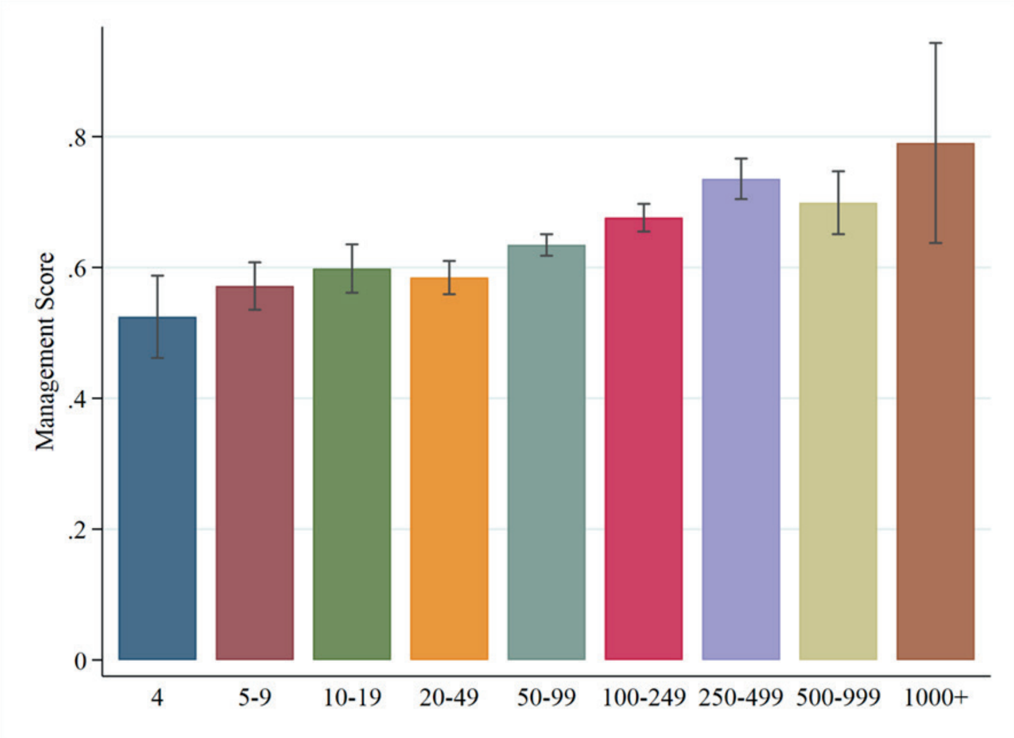

Figure A.6 Unweighted average management score by establishment size (number of employees) with confidence intervals.

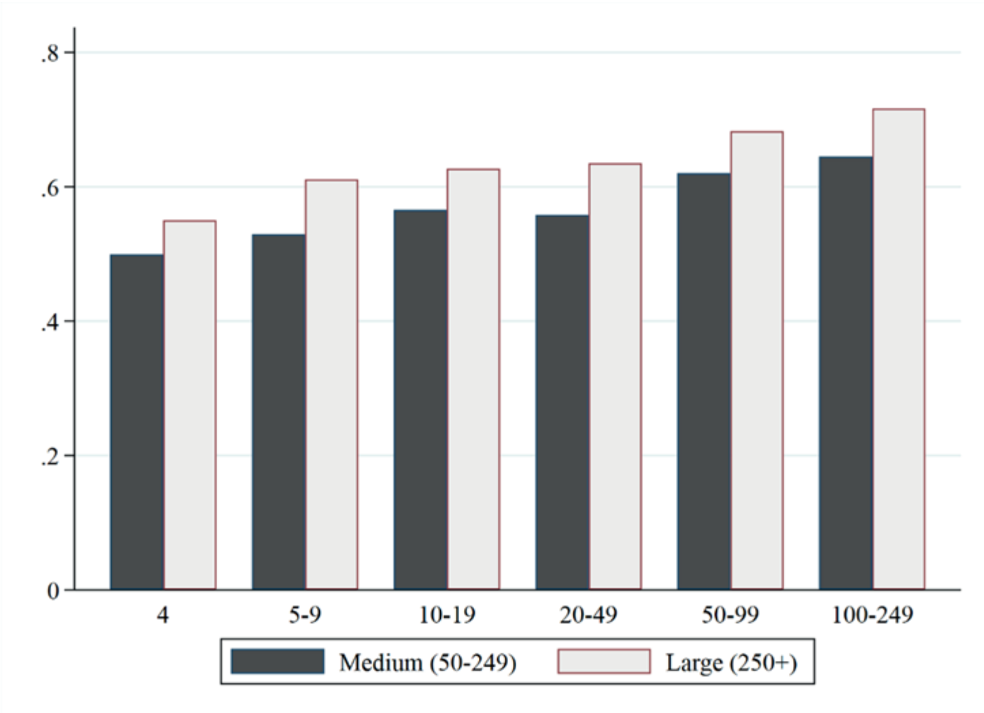

Figure A.7 Unweighted average management score by establishment size (number of employees) in medium and large enterprises.

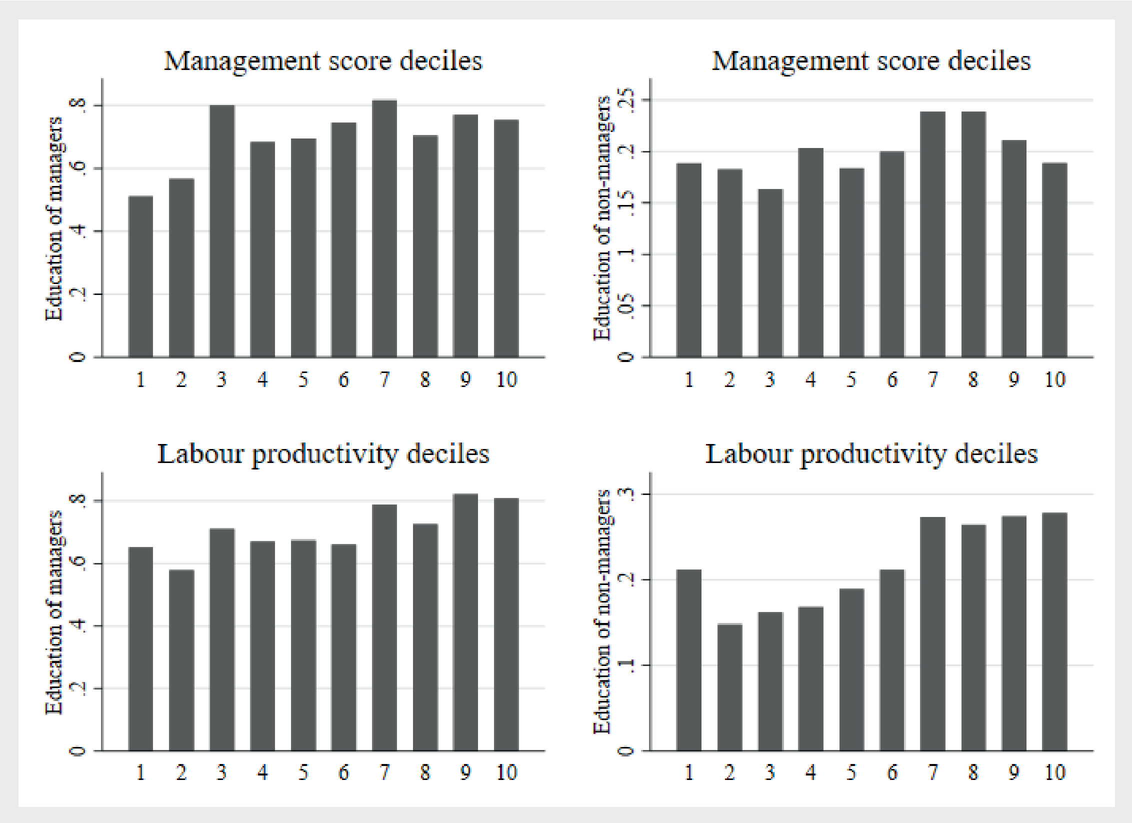

Figure A.8 Share of managers and non-managers with a higher education by management score and labour productivity deciles. Higher education is defined as having completed at least a bachelor's degree or equivalent (15–16 years from the beginning of primary education). Note that the scales of the y-axes are different for managers and non-managers.

7 APPENDIX B: TABLES

Table A 1 Management-productivity association by manager (non-manager) education tertiles with non-manager (manager) education as a control.

log(labour productivity) in	Manager education tertile			Non-manager education tertile		
	1	2	3	1	2	3
Management score	0.750*	0.910**	2.136***	1.462***	1.364***	1.229
	(0.433)	(0.393)	(0.699)	(0.487)	(0.328)	(0.781)
Non-manager education	1.183	0.059	0.128			
	(0.758)	(0.352)	(0.315)			
Manager education				0.082	0.271*	-0.184
				(0.162)	(0.155)	(0.300)
Observations	129	97	204	99	165	166
Prob > F	0.018	0.070	0.010	0.009	0.000	0.290

Notes: Manager (and non-manager) education is calculated as the share of managers (and non-managers) with a higher education. Higher education is defined as having completed at least a bachelor's degree or equivalent (15–16 years from the beginning of primary education, including tertiary education).

Table A 2 Establishment management scores and labour productivity: replication of the labour productivity section of Table 1 — Plant Management Scores and Performance in Bloom et al. (2019).

log(labour productivity)	(1)	(2)	(3)	(4)	(5)
Management score	**1.264*****	0.948***	**0.823*****	0.953***	**0.843*****
	(0.292)	(0.201)	(0.200)	(0.202)	(0.200)
log(materials/worker)		0.250***	0.250***	0.248***	0.253***
		(0.034)	(0.034)	(0.034)	(0.032)
log(capital stock/worker)		0.129***	0.102***	0.128***	0.099***
		(0.020)	(0.019)	(0.020)	(0.023)
log(employment)		-0.044	-0.030	-0.052	-0.058*
		(0.031)	(0.032)	(0.032)	(0.034)
Skills (share of employees with a higher education)				0.181	0.583***
				(0.192)	(0.215)
Observations	569	432	432	431	431
Industry dummies			Yes		Yes
R^2	0.186	0.357	0.469	0.355	0.477

Notes: OLS coefficients with Huber–White standard errors in parentheses. Labour productivity is measured as the gross value of production divided by the number of employees. “Skills” is measured as the share of employees with a higher education. Higher education is defined as having completed at least a bachelor's degree or equivalent (15–16 years from the beginning of primary education, including tertiary education). Employee turnover equals the sum of worker inflow and worker outflow during the year and is an establishment's aggregate labour market flow activity measure. Relative employee turnover is measured as employee turnover divided by the average number of employed. Materials are intermediate inputs without energy. Due to data restrictions, the sum of the addition and depreciation of machinery is used as a proxy for net capital stock. The industry dummies are at the 2-digit level of the Standard Industrial Classification; mining (05–09), manufacturing (10–33) and utilities (35) were divided into nine subindustries: 05–09, 10–15, 16–18, 19–23, 24–25, 26–27, 28–30, 31–33 and 35. Prob > F (the p-value of the F-test) is less than 0.001 in every column. $* p < 0.10$, $** p < 0.05$, $*** p < 0.01$.

8 APPENDIX C: DATA DESCRIPTION

Survey Design

Sampling frame

The enterprise-level sampling frame for the 2016 FMOP is based on the total sample of Statistics Finland's Financial statements inquiry for enterprises (TILKES). The TILKES concerns all enterprises that employ over 50 people, as well as enterprises whose turnover is more EUR 40 million or whose balance sheet exceeds EUR 300 million. The inquiry also includes 10-50 employee enterprises, which have been drawn by random sampling, some enterprises with less than 10 employees and all enterprises owned by municipalities. The inquiry includes approximately 6000 enterprises in total. The FMOP sampling frame consists mainly of the over 4-employee manufacturing establishments in over 50-employee enterprises included in the TILKES inquiry. (Statistics Finland 2017.)

Sample

The sample for the 2016 FMOP data collection consisted of 2509 manufacturing establishments with at least 4 employees that were extracted from the manufacturing and non-manufacturing enterprises included in the TILKES based sampling frame. Establishments were classified as manufacturing if they belong to industries 05-39 in the Standard Industrial Classification TOL 2008 (Statistics Finland 2017). A manufacturing establishment with at least 4 employees was picked from the sampling frame if it belonged to an enterprise with more than 50 employees, with an over EUR 40 million turnover or a balance sheet of more than EUR 300 million. The main rule in the sample selection was the number of personnel, but the sample includes 38 units that belong to enterprises with less than 50 employees, due to the other conditions. Because the establishments for the sample were chosen by nonprobability sampling, most of the results can only be generalised to the subset of manufacturing establishments which have at least 4 employees and are a part of an enterprise with at least one of the following qualities: more than 50 employees, a turnover of more than EUR 40 million or a balance sheet that exceeds EUR 300 million. (Statistics Finland 2017.)

Data collection

The first step of data collection was to find a respondent for each establishment in the sample. Telephone interviews were conducted to find plant managers to send the questionnaire to. 10% of the original sample was lost at this phase due to over-coverage and unwillingness to answer. The survey was conducted as an internet questionnaire, the description, instructions and link for which were sent out as an email to the target respondents. Responding was voluntary, and three follow-ups were sent to establishments that could not be reached or did not respond. Over-coverage and establishments that were explicitly unwilling to answer were dropped after each follow-up.

Questionnaire content

To ensure comparability between results, the FMOP questionnaire was replicated from the United States 2010 MOPS[27] as closely as possible. The questionnaire has a total of 35 questions, 16 of which concern management practices. In addition to the 16 management questions, the questionnaire has 13 questions on organizational practices and 6 background questions. The questionnaire concerns the past year (2016), but most of the questions also have a recall component, where respondents are asked to give an answer regarding the circumstances five years earlier (2011). The questions are in Finnish and have been translated to correspond with the questions of the US MOPS. The complete FMOP questionnaire can be found at the end of this document.

Data

The final number of responses was 731, with a response rate of approximately 31% after accounting for over-coverage. According to the feedback from the establishments, the voluntary nature of the survey was a major negative factor in the willingness to respond. This can also be seen when comparing the 31% response rate of the FMOP to the 78% response rate of the original 2010 MOPS in the United States, where the survey was mandatory. Technical issues also affected the response rate, as the survey was conducted solely through internet collection. Analysis of total non-response conducted by Statistics Finland showed that the distribution of respondents was skewed towards larger establishments, as measured by the number of personnel. Statistics Finland conducted a post-stratification to provide sample weights that correct for non-response bias. The over-coverage of 146 establishments was also taken into account when constructing the sample weights.

Restriction of data

The industries in the FMOP sample, 05-39 in the Standard Industrial Classification, include mining and utilities (in addition to manufacturing), which were not included in the United States MOPS sample. Therefore, the FMOP analysis is conducted with and without the two additional industries, and removing the industries restricts the data by 98 observations. Furthermore, in accordance with the United States 2015 MOPS, only establishments that gave a valid response to questions 1, 2, 6, 13, 14, 15 and 16 are included in the analysis. This means that an additional 69 establishments, or about 9.4% of the data, are dropped due to item non-response. Item non-response was more severe in the 2011 recall questions. However, the included establishments were chosen based solely on the responses for 2016. There are no establishments in the data that gave valid responses to the required questions for 2011 but failed to do so for 2016. Item non-response does not distort the management scores, which are calculated as the unweighted average of the responses, but it would cause bias in estimates regarding individual questions.

Scoring

The responses for each question are normalized on a scale of 0 – 1 and the establishment-level management score is calculated as the unweighted average of the normalized responses. The answer options corresponding with management practices that are considered the most structured are assigned a value of 1 and the least structured practices are assigned a value of 0. Bloom et al. (2019) define more structured management practices as “those that are more specific, formal, frequent or explicit” (Bloom et al. 2019, 28).

[27] Available at https://www.census.gov/programs-surveys/mops/technical-documentation/questionnaires.html.

The management questions can be divided into three sections: monitoring, targets and incentives. The monitoring section consists of questions 1 – 5 and they ask about the utilization and gathering of information and data in the monitoring of production. Questions 6 – 8 are about the setting of production targets and questions 9 – 16 ask about practices concerning bonuses and incentives, policies on recruitment and promotion as well as policies concerning the dismissal and reassignment of managers and non-managers.

9 APPENDIX D: FMOP QUESTIONNAIRE FORM

Osa A – Johtaminen

1 Mikä seuraavista kuvaa parhaiten toimipaikassa tehtyjä toimenpiteitä, kun tuotannossa havaittiin ongelma vuosina 2011 ja 2016?

Esimerkki: laadullisen vian löytäminen tuotteesta tai koneiston hajoaminen.

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Ongelma korjattiin, mutta muita toimenpiteitä ei tehty		
Ongelma korjattiin ja varmistettiin, ettei ongelmaa ilmene uudelleen		
Ongelma korjattiin ja varmistettiin, ettei ongelmaa ilmene uudelleen. Lisäksi meillä on jatkuvan kehittämisen prosessi tällaisten ongelmien ennakoimiseksi		
Mitään toimenpiteitä ei tehty		
Mitään ongelmaa ei havaittu		
Toimipaikan tietoja ei ole saatavilla vuodelta 2011		

2 Kuinka montaa suoritusmittaria toimipaikassa seurattiin vuosina 2011 ja 2016?

Esimerkiksi tuotannon, kustannusten, hävikin, laadun, varastojen, energian, poissaolojen ja toimitusaikojen mittarit.

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
1-2 mittaria		
3-9 mittaria		
10 tai useampaa mittaria		
Ei ollenkaan suorituskykymittareita		

Jos suoritusmittareita ei ollut kumpanakaan vuonna, lomake hyppää kysymykseen 6.

3 Kuinka usein toimipaikan **johtajat seurasivat** suoritusmittareita vuosina 2011 ja 2016?

Johtajaksi tässä tulkitaan henkilö, jolla on sellaisia suoria alaisia, joita hän tapaa säännöllisesti, joiden rekrytoimiseen, työehtojen sopimiseen ja ylennyksien tekemiseen hän on osallistunut (esimerkiksi laitoksen johtaja, henkilöstöjohtaja tai laatupäällikkö).

Merkitse kaikki sopivat vaihtoehdot *molempien vuosien sarakkeeseen.*

	2011	2016
Vuosittain		
Vuosineljänneksittäin		
Kuukausittain		
Viikoittain		
Päivittäin		
Tunneittain tai useammin		
Ei koskaan		

4 Kuinka usein **joku muu** kuin toimipaikan johtaja seurasi suoritusmittareita tässä toimipaikassa vuosina 2011 ja 2016?

Muilla kuin johtajilla viitataan tässä kaikkiin muihin toimipaikan työntekijöihin, joita ei voida määritellä johtajiksi edellisen kysymyksen määritelmän mukaisesti.

Merkitse kaikki sopivat vaihtoehdot *molempien vuosien sarakkeeseen.*

	2011	2016
Vuosittain		
Vuosineljänneksittäin		
Kuukausittain		
Viikoittain		
Päivittäin		
Tunneittain tai useammin		
Ei koskaan		

5	Mihin tuotannosta ja muista suoritusmittareista kertovat tiedot oli sijoitettu toimipaikassa vuosina 2011 ja 2016? *Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.*	2011	2016
	Kaikki tiedot olivat nähtävissä vain yhdessä ja samassa paikassa (esim. tuotantolinjan päässä)		
	Tietoja oli nähtävissä useassa paikassa (esim. useassa kohtaa pitkin tuotantolinjaa)		
	Toimipaikassa ei ollut nähtävillä kyseisiä tietoja		
6	Mikä seuraavista kuvaa parhaiten tuotantotavoitteiden aikajännettä toimipaikassa vuosina 2011 ja 2016? *Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.*	2011	2016
	Pääpaino oli lyhyen aikavälin tuotantotavoitteissa (alle yksi vuosi)		
	Pääpaino oli pitkän aikavälin tuotantotavoitteissa (yli yksi vuosi)		
	Sekä lyhyen että pitkän aikavälin tuotantotavoitteissa		
	Ei tuotantotavoitteita		
	Jos tuotantotavoitteita ei ollut kumpanakaan vuonna, lomake hyppää kysymykseen 13a.		
7	Kuinka helppoa tai vaikeaa tavoitteiden saavuttaminen oli vuosina 2011 ja 2016? *Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.*	2011	2016
	Mahdollista saavuttaa ilman suurempaa vaivannäköä		
	Mahdollista saavuttaa pienellä vaivannäöllä		
	Mahdollista saavuttaa normaalilla vaivannäöllä		
	Mahdollista saavuttaa normaalia suuremmalla vaivannäöllä		
	Mahdollista saavuttaa vain aivan poikkeuksellisella vaivannäöllä		
8	Ketkä tiesivät tämän toimipaikan tuotantotavoitteista vuosina 2011 ja 2016? *Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.*	2011	2016
	Vain ylimmät johtajat		
	Useimmat johtajat ja osa tuotantotyöntekijöistä		
	Useimmat johtajat ja useimmat tuotantotyöntekijät		
	Kaikki johtajat ja kaikki tuotantotyöntekijät		
9	Mihin **muiden kuin johtajien** tulospalkkiot perustuivat vuosina 2011 ja 2016? ***Merkitse kaikki sopivat vaihtoehdot** molempien vuosien sarakkeeseen.*	2011	2016
	Työntekijöiden omaan suoritukseen, jota mitattiin tuotantotavoitteiden avulla		
	Tiimien tai työvuorojen suoritukseen, jota mitattiin tuotantotavoitteiden avulla		
	Toimipaikan suoritukseen, jota mitattiin tuotantotavoitteiden avulla		
	Yrityksen suoritukseen, jota mitattiin tuotantotavoitteiden avulla		
	Ei ollut tulospalkkiota		
	Jos tulospalkkiota ei ollut kumpanakaan vuonna, lomake hyppää kysymykseen 11.		

10	Jos tuotantotavoitteet saavutettiin, mikä osa **muista kuin johtajista** sai tulospalkkion tässä toimipaikassa vuosina 2011 ja 2016? *Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.*		
		2011	2016
	0 %		
	1 - 33 %		
	34 - 66 %		
	67 - 99 %		
	100 %		
	Tuotantotavoitteita ei saavutettu		
11	Mihin **johtajien** tulospalkkiot yleensä perustuivat vuosina 2011 ja 2016? ***Merkitse kaikki sopivat vaihtoehdot** molempien vuosien sarakkeeseen.*		
		2011	2016
	Johtajien omaan suoritukseen, jota mitattiin tuotantotavoitteiden avulla		
	Tiimin tai työvuoron suoritukseen, jota mitattiin tuotantotavoitteiden avulla		
	Toimipaikan suoritukseen, jota mitattiin tuotantotavoitteiden avulla		
	Yrityksen suoritukseen, jota mitattiin tuotantotavoitteiden avulla		
	Ei tulospalkkioita		
	Jos tulospalkkioita ei ollut kumpanakaan vuonna, lomake hyppää kysymykseen 13a.		
12	Jos tuotantotavoitteet saavutettiin, mikä osa **johtajista** sai tulospalkkion tässä toimipaikassa vuosina 2011 ja 2016? *Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.*		
		2011	2016
	0 %		
	1 - 33 %		
	34 - 66 %		
	67 - 99 %		
	100 %		
	Tuotantotavoitteita ei saavutettu		
13a	Mikä oli ensisijainen tapa **muiden kuin johtajien** <u>ylentämiseen</u> tässä toimipaikassa vuosina 2011 ja 2016? *Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.*		
		2011	2016
	Ylennykset perustuivat ainoastaan suoritukseen ja kyvykkyyteen		
	Ylennykset perustuivat osittain suoritukseen ja kyvykkyyteen, ja osittain muihin tekijöihin (esimerkiksi tuttava- tai perhesuhteet)		
	Ylennykset perustuivat pääosin muihin tekijöihin kuin suoritukseen tai kyvykkyyteen (esimerkiksi tuttava- tai perhesuhteet)		
	Muita kuin johtajia ei yleensä ylennetä		
13b	Mitkä alla olevista vaihtoehdoista olivat ensisijaiset kriteerit **muiden kuin johtajien** <u>rekrytoimiseen</u> muualta vuosina 2011 ja 2016? *Numeroi tärkeysjärjestyksessä molempina vuosina asteikolla 1-5.* *1 on tärkein, 2 toiseksi tärkein, ... ja 5 vähiten tärkeä.*		
		2011	2016
	Tehtävään liittyvä tietämys ja kyvyt		
	Vuorovaikutus- ja neuvottelutaidot		
	Tuttu sosiaalisten verkostojen kautta (työskennellyt aikaisemmin tässä yrityksessä/toimipaikassa, kollegojen tuttu, perhesuhteet tms.)		
	Täsmällisyys ja luotettavuus annettujen tehtävien suorittamisessa		
	Motivaatio suorittamisessa		

14a Mikä oli ensisijainen tapa **johtajien** ylentämiseen tässä toimipaikassa vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Ylennykset perustuivat ainoastaan suoritukseen ja kyvykkyyteen		
Ylennykset perustuivat osittain suoritukseen ja kyvykkyyteen, ja osittain muihin tekijöihin (esimerkiksi tuttava- tai perhesuhteet)		
Ylennykset perustuivat pääosin muihin tekijöihin kuin suoritukseen tai kyvykkyyteen (esimerkiksi tuttava- tai perhesuhteet)		
Johtajia ei yleensä ylennetä		

14b Mitkä alla olevista vaihtoehdoista olivat ensisijaiset kriteerit **johtajien** rekrytoimiseen muualta vuosina 2011 ja 2016?

Numeroi tärkeysjärjestyksessä molempina vuosina asteikolla 1-5.
1 on tärkein, 2 toiseksi tärkein, … ja 5 vähiten tärkeä.

	2011	2016
Tehtävään liittyvä tietämys ja kyvyt		
Vuorovaikutus- ja neuvottelutaidot		
Tuttu sosiaalisten verkostojen kautta (työskennellyt aikaisemmin tässä yrityksessä/toimipaikassa, kollegojen tuttu, perhesuhteet yms.)		
Täsmällisyys ja luotettavuus annettujen tehtävien suorittamisessa		
Motivaatio suorittamisessa		

15 Milloin alisuoriutuva **muu kuin johtaja** erotettiin tai siirrettiin uuteen tehtävään vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Alle kuuden kuukauden jälkeen siitä, kun alisuoriutuminen havaittiin		
Yli kuuden kuukauden kuluttua siitä, kun alisuoriutuminen havaittiin		
Harvoin tai ei koskaan		

16 Milloin alisuoriutuva **johtaja** erotettiin tai siirrettiin uuteen tehtävään vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Alle kuuden kuukauden jälkeen siitä, kun alisuoriutuminen havaittiin		
Yli kuuden kuukauden kuluttua siitä, kun alisuoriutuminen havaittiin		
Harvoin tai ei koskaan		

Osa B - Organisaatio

17 Sijaitsiko yrityksen pääkonttori samassa paikassa kuin toimipaikka vuosina 2011 ja 2016?

Mikäli kyseessä on yksitoimipaikkainen yritys, merkitse molempien vuosien sarakkeisiin "kyllä".

	2011	2016
Kyllä		
Ei		

Jos kyllä molempina vuosina, lomake hyppää kysymykseen 24.

18 Missä tehtiin päätökset **pysyvien kokoaikaisten työntekijöiden palkkaamisesta** vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Vain tässä toimipaikassa		
Vain pääkonttorissa		
Sekä tässä toimipaikassa että pääkonttorissa		
Muualla, missä? ______________________________		

19 **Missä tehtiin päätökset yli 10 % palkankorotuksien toteuttamisesta** vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Vain tässä toimipaikassa		
Vain pääkonttorissa		
Sekä tässä toimipaikassa että pääkonttorissa		
Muualla, missä? ______________________________		

20 Missä tehtiin **uusia tuotteita** koskevat päätökset?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Vain tässä toimipaikassa		
Vain pääkonttorissa		
Sekä tässä toimipaikassa että pääkonttorissa		
Muualla, missä? ______________________________		

21 Missä tehtiin **tuotteiden hinnoittelua** koskevat päätökset vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Vain tässä toimipaikassa		
Vain pääkonttorissa		
Sekä tässä toimipaikassa että pääkonttorissa		
Muualla, missä? ______________________________		

22 Missä tehtiin tuotteiden **markkinointia** koskevat päätökset vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Vain tässä toimipaikassa		
Vain pääkonttorissa		
Sekä tässä toimipaikassa että pääkonttorissa		
Muualla, missä? ______________________________		

23 Kuinka paljon euromääräisesti voitiin käyttää investointeihin tässä toimipaikassa ilman valtuutusta pääkonttorista vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Alle 1000 €		
1000 € - 9999 €		
10 000 € - 99 999 €		
100 000 € - 999 999 €		
1 000 000 € tai enemmän		

24 Kuinka moni toimipaikan henkilöstöstä on suoraan tämän toimipaikan johtajan alaisia (raportoivat johtajalle suoraan) vuosina 2011 ja 2016?

Toimipaikan johtajan alaisia ovat sellaiset työntekijät, jotka ovat organisaatiossa seuraavalla alemmalla tasolla, tapaavat toimipaikan johtajaa säännöllisesti ja joiden rekrytoimiseen, palkkaukseen ja ylenemiseen toimipaikan johtaja on vaikuttanut.

	2011	2016
Alaisten määrä (arviokin riittää)		

25 Kuinka monta organisaatiotasoa tällä toimipaikalla on tuotantotasolta toimipaikan johtotasolle saakka laskettuna vuosina 2011 ja 2016?
Esimerkki: toimipaikassa, jossa on tuotantotaso, tuotannon esimiehet sekä laitoksen johtaja, tasojen lukumäärä on 3.

	2011	2016
Tasojen määrä (arviokin riittää)		

26 Kuka jakoi työtehtäviä tuotantotyöntekijöille tässä toimipaikassa vuosina 2011 ja 2016?
Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Vain johtajat		
Pääosin johtajat		
Johtajat ja tuotantotyöntekijät yhdessä		
Pääosin tuotantotyöntekijät		
Vain tuotantotyöntekijät		
Joku muu, kuka? ______________________________		

27 Mikä seuraavista kuvaa parhaiten **tiedon saatavuutta** päätöksenteon tueksi tässä toimipaikassa vuosina 2011 ja 2016?
Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Tietoa ei ollut saatavilla		
Vähän tietoa oli saatavilla		
Kohtuullisesti tietoa oli saatavilla		
Paljon tietoa oli saatavilla		
Kaikki tarvittava tieto päätöksenteon tueksi oli saatavilla		

28 Mikä seuraavista kuvaa parhaiten **tiedon käyttöä** päätöksenteon tukena tässä toimipaikassa vuosina 2011 ja 2016?
Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
Tietoa ei käytetty päätöksenteon tukena		
Päätöksenteko perustuu hieman käytettyyn tietoon		
Päätöksenteko perustuu kohtuullisesti käytettyyn tietoon		
Päätöksenteko perustuu vahvasti käytettyyn tietoon		
Päätöksenteko perustuu kokonaan käytettyyn tietoon		

29 Oppivatko **johtajat** tässä toimipaikassa käytännön johtamisesta miltään seuraavista?
***Merkitse kaikki sopivat vaihtoehdot** molempien vuosien sarakkeeseen.*

	2011	2016
Konsultit		
Kilpailijat		
Alihankkijat, tavarantoimittajat		
Asiakkaat		
Yhdistykset tai konferenssit		
Uudet työntekijät		
Pääkonttori		
Muut, mitkä? ______________________________		
Ei mikään ylläolevista		

Osa C – Taustatiedot

30 Millä organisaation tasolla työskentelit vuonna 2016?

- [ ] Toimitusjohtaja tai muu johtaja, esim. talousjohtaja
- [ ] Usean toimipaikan johtaja
- [ ] Yhden toimipaikan johtaja
- [ ] Jokin muu kuin johtaja
- [ ] Jokin muu, mikä? ______________________________

31 Minä vuonna aloitit työskentelyn tässä toimipaikassa? __________

32 Kuinka monta **johtajaa** tässä toimipaikassa työskenteli 31. joulukuuta 2011 ja työskentelee tällä hetkellä?

Johtajaksi tässä tulkitaan henkilö, jolla on sellaisia suoria alaisia, joita hän tapaa säännöllisesti, joiden rekrytoimiseen, työehtojen sopimiseen ja ylennyksien tekemiseen hän on osallistunut (esimerkiksi laitoksen johtaja, henkilöstöjohtaja tai laatupäällikkö).

	31.12.2011	tällä hetkellä
Johtajien lukumäärä tässä toimipaikassa (arviokin riittää)		

33 Kuinka monta osa-aikaista ja kokoaikaista **työntekijää** tässä toimipaikassa työskenteli 31. joulukuuta 2011 ja työskentelee tällä hetkellä?

	31.12.2011	tällä hetkellä
Muiden kuin johtajien lukumäärä tässä toimipaikassa (arviokin riittää)		

34 Kuinka suurella osalla **johtajista** tässä toimipaikassa oli vähintään alempi korkeakoulututkinto vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
20 % tai vähemmän		
21 % - 40 %		
41 % - 60 %		
61 % - 80 %		
Enemmän kuin 80 %		

35 Kuinka suurella osalla **muista kuin johtajista** oli tässä toimipaikassa vähintään alempi korkeakoulututkinto vuosina 2011 ja 2016?

Merkitse yksi vaihtoehto molempien vuosien sarakkeeseen.

	2011	2016
0 %		
1 % - 10 %		
11 % - 20 %		
Enemmän kuin 20 %		

Paljon kiitoksia vastaamisesta!

Elinkeinoelämän tutkimuslaitos

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