

Management and Organizational Practices Survey - Colombia 2017-2018

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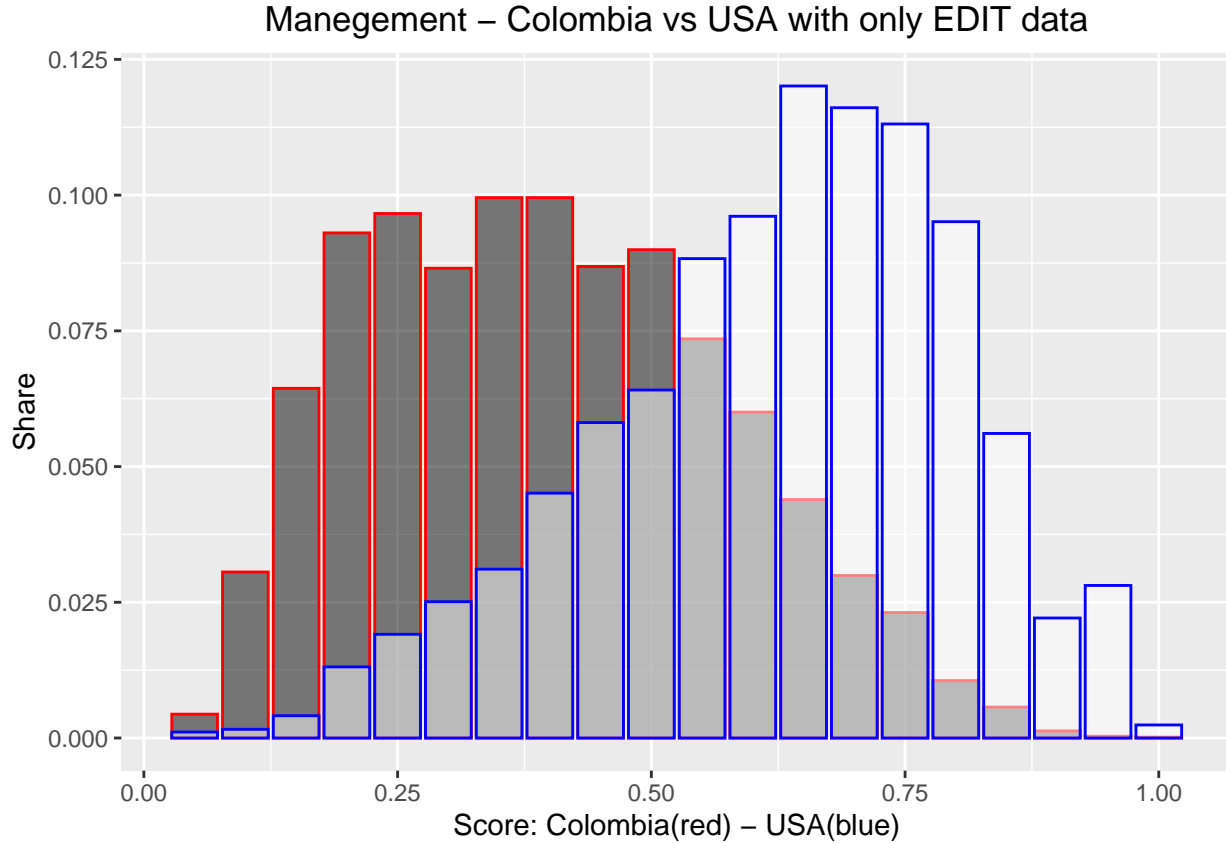
Let's analyze Management and Organizational Practices Survey - MOPS questions. The 16 questions traditionally analyzed are: non-incentives (MOPS questions 1–8: monitoring and targets) and incentives (MOPS questions 9–16: bonus, promotion, and reassignment/dismissal practices). The management score is the unweighted average of the score for each of the 16 questions, where each question is first normalized to be on a 0–1 scale following Bloom (2019). The EDIT data was recoded from categorical variables into a numerical variables in order to get a score.

Table 1: Descriptive Statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Management (1-16)	6,034	0.376	0.176	0.026	0.231	0.504	0.958
No Incentives (1-8)	6,034	0.555	0.198	0.056	0.402	0.701	1.000
Incentives (9-16)	6,034	0.222	0.191	0.000	0.071	0.357	0.952
Size(Firm employment)	6,034	125.502	254.973	0	18	117	4,181
Exporters	6,034	0.328	0.470	0	0	1	1
Multiplant	6,034	0.044	0.206	0	0	0	1

The next histogram shows the distribution for management score (16 questions). As you can see, the distribution is skewed to the left, where the total number of observations is 7,529. This histogram includes all observations with at least 11 non-missing responses to management questions.

We use the Bloom (2019) methodology: “Questions 3, 4 and 5 are scored at 0 if missing, which typically arises from firms reporting “no performance indicators” to question 2 and skipping to question 6. The rationale for this is that firms with no performance indicators have no managerial or nonmanagerial review of performance indicators, and have no performance display boards. For questions with multiple possible responses (those with “mark all that apply”) the average value was used”.



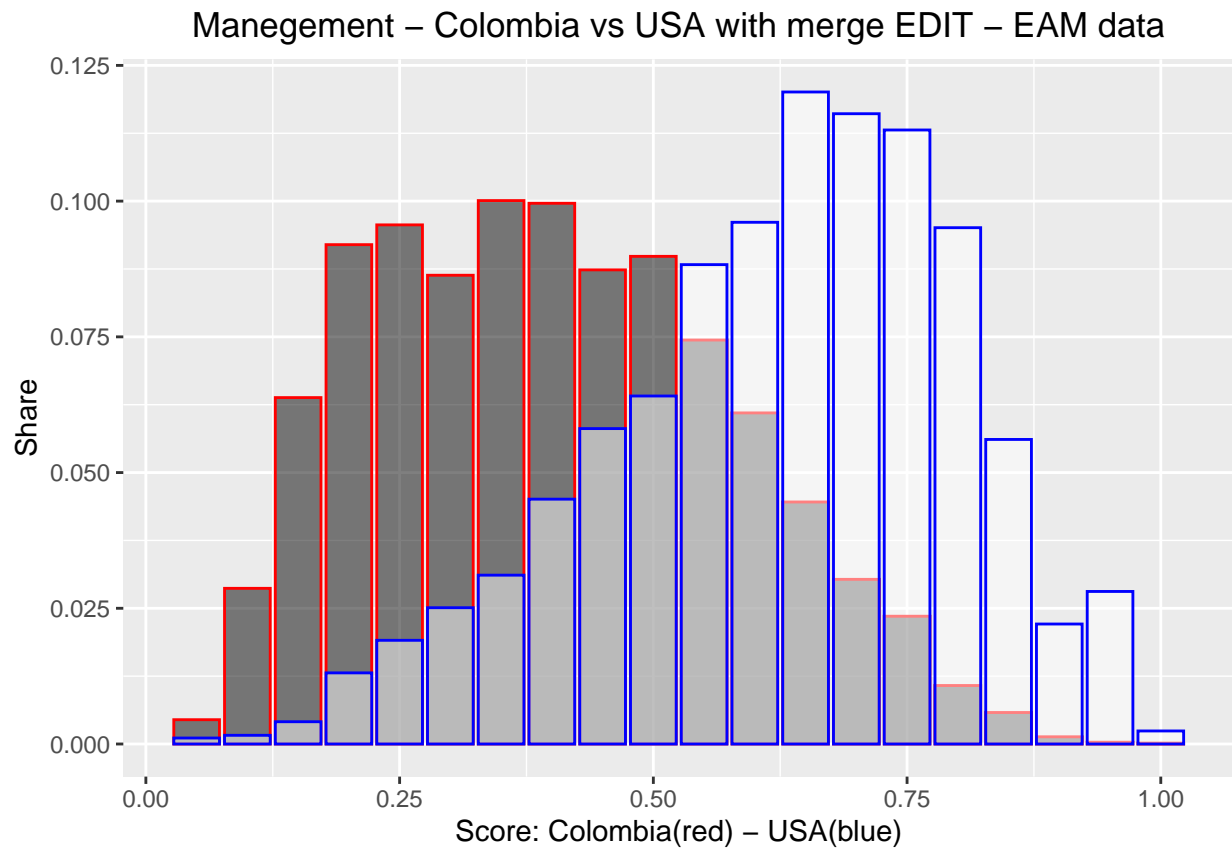
The Colombian average management score (16 questions) is 0.367 meanwhile the U.S score is 0.615. The Non-incentive management score (1-8) is 0.474 (U.S:0.643) and incentives average (9-16) is 0.232 (U.S:0.583).

Annual Manufacturing Survey

The next table shows the number of observations for each database and our estimates use the merge EDIT-EAM.

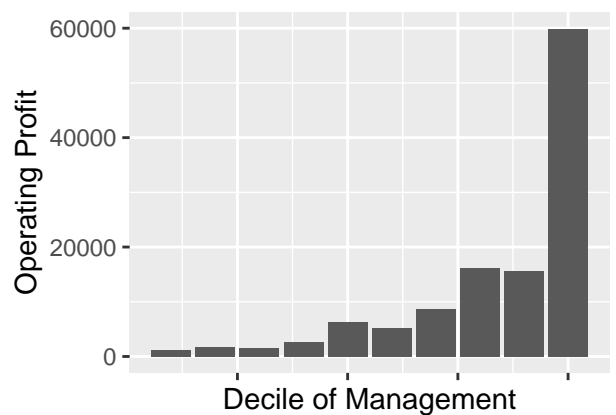
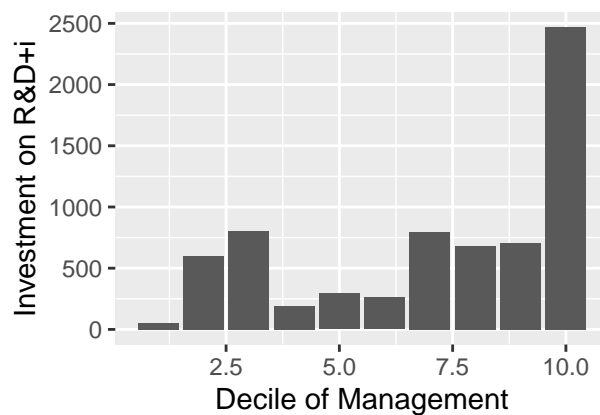
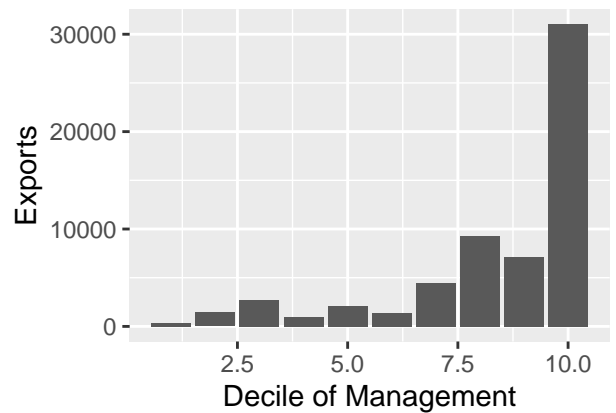
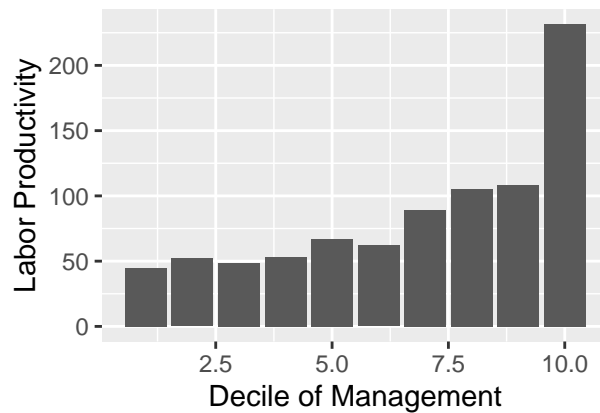
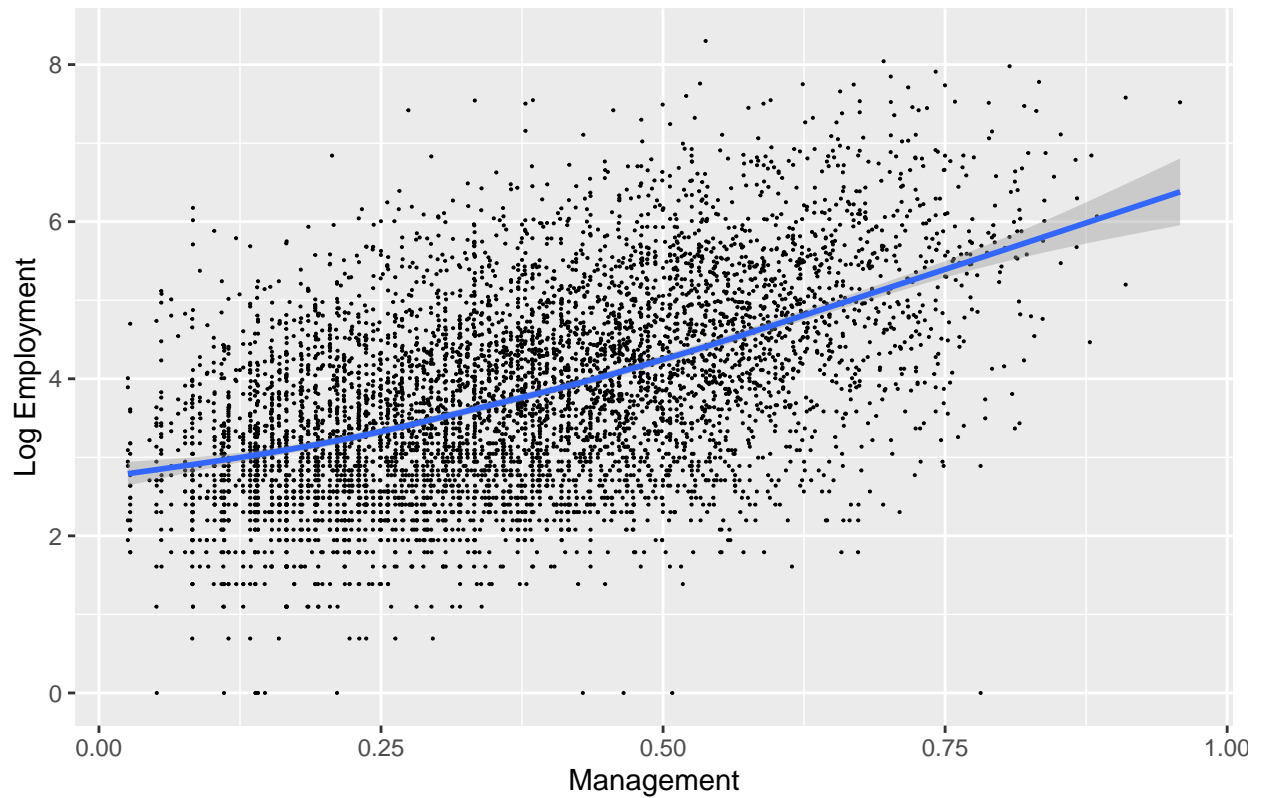
Table 2: Databases

Database	n
EDIT 1:All observations	7,529
EDIT 2:At least 11 non-missing values	6,148
EAM 1:All observations	7,911
EAM 2:Collapsed data	7,256
Merge EDIT 2 - EAM 2	6,034



The plot indicates a positive relationship among the number of employees and our management score:

Firm size rises with Management –Non-Linear fit



Suppose that the firm production function is:

$$Y_i = A_i K_i^\alpha L_i^\beta I_i^\gamma e^{\delta M_i} e^{\mu X_i} + \varepsilon_i$$

Where Y_i : Production of firm i A_i : Total factor productivity (Excluding Management Practices) K_i : Fixed assets at final of 2018 L_i : Labor inputs: the total number of employees of firm i I_i : Intermediate inputs X_i : Vector of additional factors: the percent of staff with college degree M_i : Management score (1-16)

Dividing by labor and taking logs we can rewrite this in a form to estimate on the data:

$$\log \frac{Y_i}{L_i} = \alpha \log \frac{K_i}{L_i} + \gamma \log \frac{I_i}{L_i} + (\alpha + \beta + \gamma) \log L_i + \delta M_i + \mu X_i + u_i$$

We calculate this equation by estimating an OLS regression

Table 3: Management Score and Performance

	<i>Dependent variable:</i>	
	Log(Production/employees)	Log(Sales/employees)
	(1)	(2)
Log (fixed assets / employees)	0.053*** (0.004)	0.056*** (0.004)
Log (Intermediate inputs/employees)	0.688*** (0.005)	0.677*** (0.005)
log (Employees)	0.0001*** (0.00002)	0.0001*** (0.00002)
Managememnt	0.357*** (0.031)	0.359*** (0.031)
Percent of staff with college degree	0.381*** (0.046)	0.447*** (0.046)
Constant	3.350*** (0.049)	3.423*** (0.049)
Observations	5,992	5,992
R ²	0.854	0.850
Adjusted R ²	0.853	0.850
Residual Std. Error (df = 5986)	0.376	0.377
F Statistic (df = 5; 5986)	6,979.441***	6,791.942***

Note:

*p<0.1; **p<0.05; ***p<0.01

We regress the value added per employee on: management, logarithm of investement on reserach, development and innovation, education variable, and logarithm of investment on information and communications technology.

Table 4: Drivers of Productivity Variation

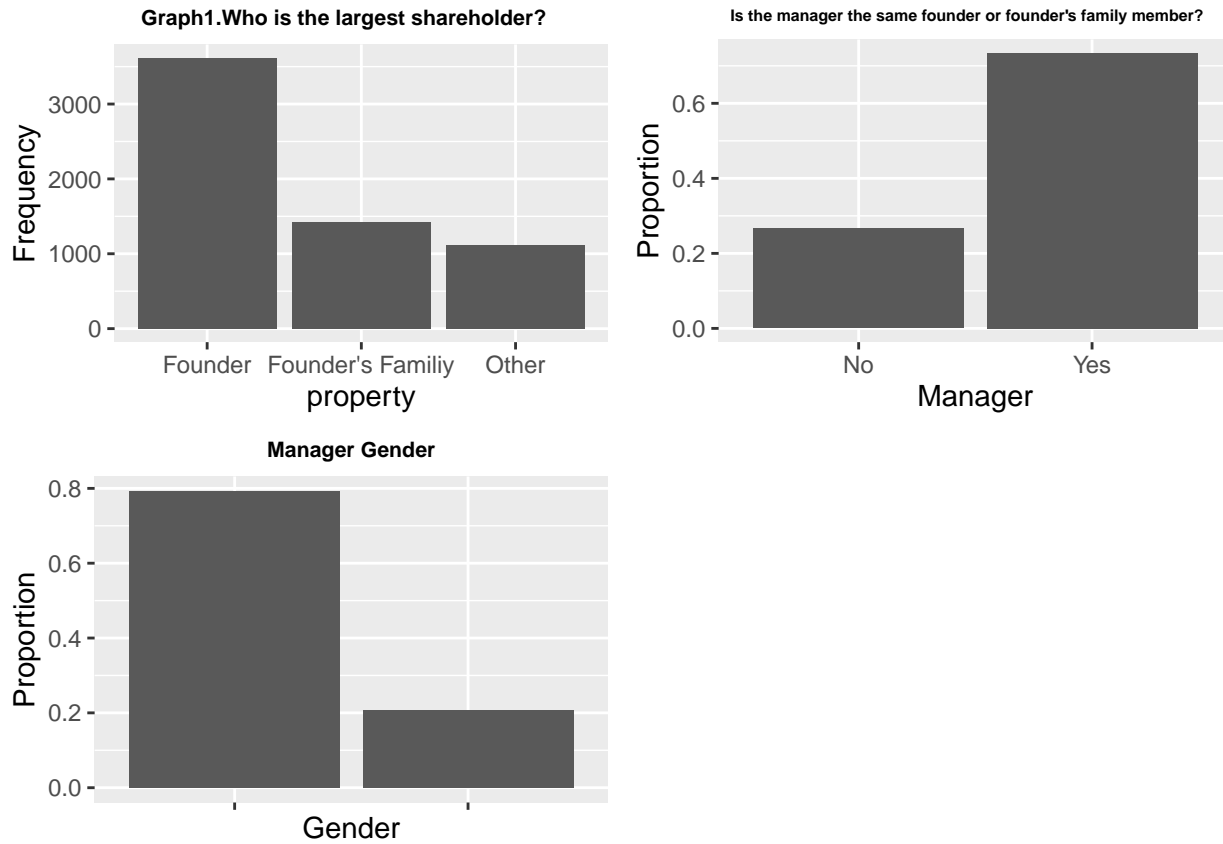
	<i>Dependent variable:</i>
	log_Value_Added_per_Employee
Management	1.496*** (0.258)
log_RD_innovation	0.172*** (0.019)
logICT_per_Employee	0.021 (0.022)
staff_with_college_degree	2.207*** (0.403)
Constant	7.886*** (0.222)
Observations	584
R ²	0.330
Adjusted R ²	0.326
Residual Std. Error	0.910 (df = 579)
F Statistic	71.431*** (df = 4; 579)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Table 5: Plant Management Scores and Performance

	<i>Dependent variable:</i>								
	Log(VA/Emp)			(Profits/sales)			RD+i/Emp		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Management	0.50*** (0.06)	0.54*** (0.06)	0.57*** (0.06)	0.05*** (0.02)	0.06*** (0.02)	0.06*** (0.02)	150.35** (70.33)	131.23* (77.60)	129.07* (74.82)
Ln(Cap/Emp)	0.21*** (0.01)	0.24*** (0.01)	0.25*** (0.01)	0.01*** (0.002)	0.005** (0.002)	0.005** (0.002)	38.11*** (8.81)	36.34*** (9.34)	28.82*** (8.55)
Ln(Emp)	0.11*** (0.01)	0.10*** (0.01)	0.11*** (0.01)	0.005** (0.002)	0.005** (0.002)	0.01** (0.002)	-58.37*** (8.42)	-53.61*** (9.36)	-49.47*** (8.96)
Degree	0.88*** (0.09)	1.52*** (0.09)	1.50*** (0.09)	0.05** (0.02)	0.11*** (0.02)	0.12*** (0.02)	-153.38 (116.97)	6.35 (110.81)	25.57 (107.51)
Observations	5,200	5,200	5,200	5,200	5,200	5,200	542	542	542
R ²	0.27	0.34	0.37	0.02	0.02	0.02	0.11	0.08	0.07
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01								

Appendix

The following graphs use data from Technology, Innovation and Development Survey (EDIT, acronym in Spanish) for Colombia 2017-2018 and manufacturing sector, with special emphasis on the Management and Organizational Practices questions. The EDIT includes 3 extra questions (Largest shareholder, Manager, gender) to the 16 that Bloom (2019)¹ analyzes, for a total of 19 questions. The first three questions are:



¹Bloom, Nicholas, Erik Brynjolfsson, Lucia Foster, Ron Jarmin, Megha Patnaik, Itay Saporta Eksten, and John Van Reenen. 2019. What Drives Differences in Management Practices?. American Economic Review 2019, 109(5): 1648–1683