

The Role of Innovation and Management Practices in Determining Firm Productivity: Evidence from Transition Economies

Wiebke Bartz (OECD)

Pierre Mohnen (UNU-MERIT)

Helena Schweiger (EBRD)

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Aim of the paper

- What improves productivity more, innovation or better management practices?
- Does this depend on
 - the level of development?
 - the level of technological intensity?
- Evidence from 30 transition countries

Originality of the paper

- Inclusion of both innovation and the quality of management practices in the same model
- Sample covering a diverse group of countries
- Cleaned measures of product and process innovation

EBRD-WB BEEPS V Survey

- Enterprise survey
- Objective: perception of the business environment to be able to assess the constraints to growth and performance
- Representative sample, stratified by sector, size and region
- 30 countries, face-to-face interviews with top managers conducted between August 2011 and July 2014

EBRD-WB BEEPS V Survey

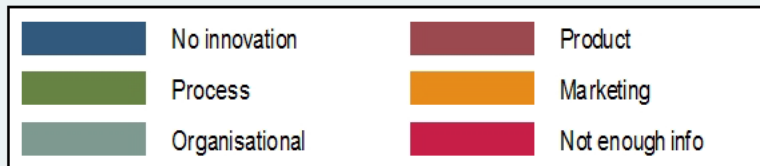
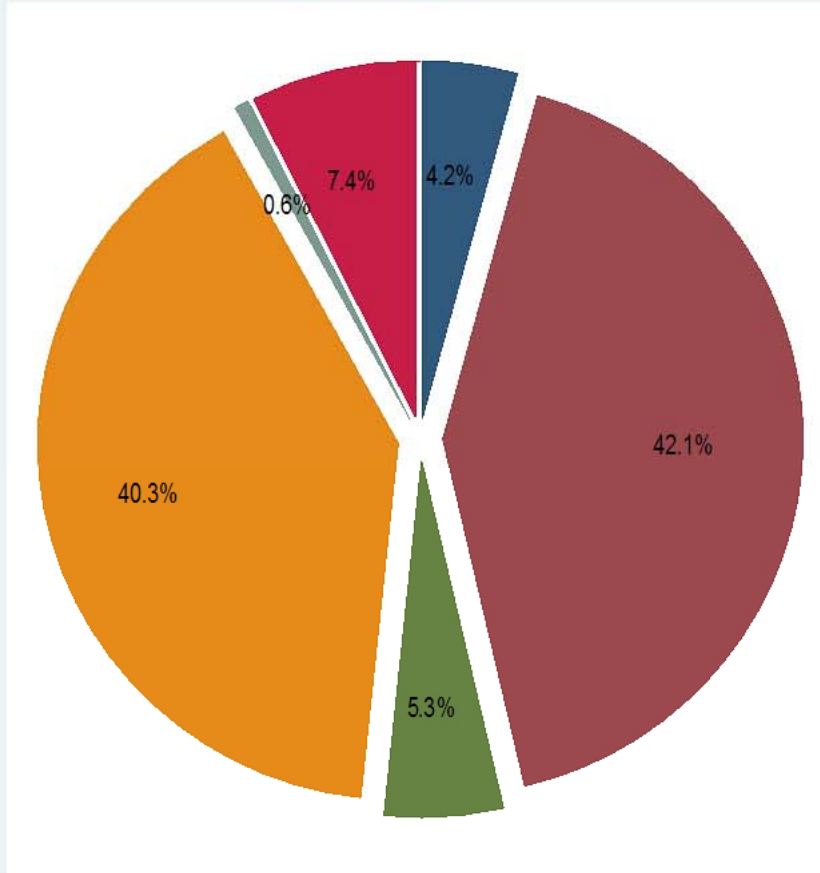
- New: Innovation Module, which includes selected questions on management practices from the U.S. Census Bureau's Management and Organisational Practices Survey (MOPS) and the occurrence of different kinds of innovation
- Focus on subsample of 3000+ manufacturing firms with at least 20 employees (50 in Russia)

Clean innovation

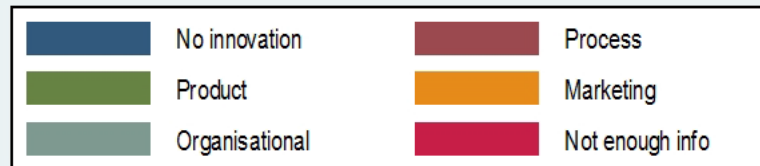
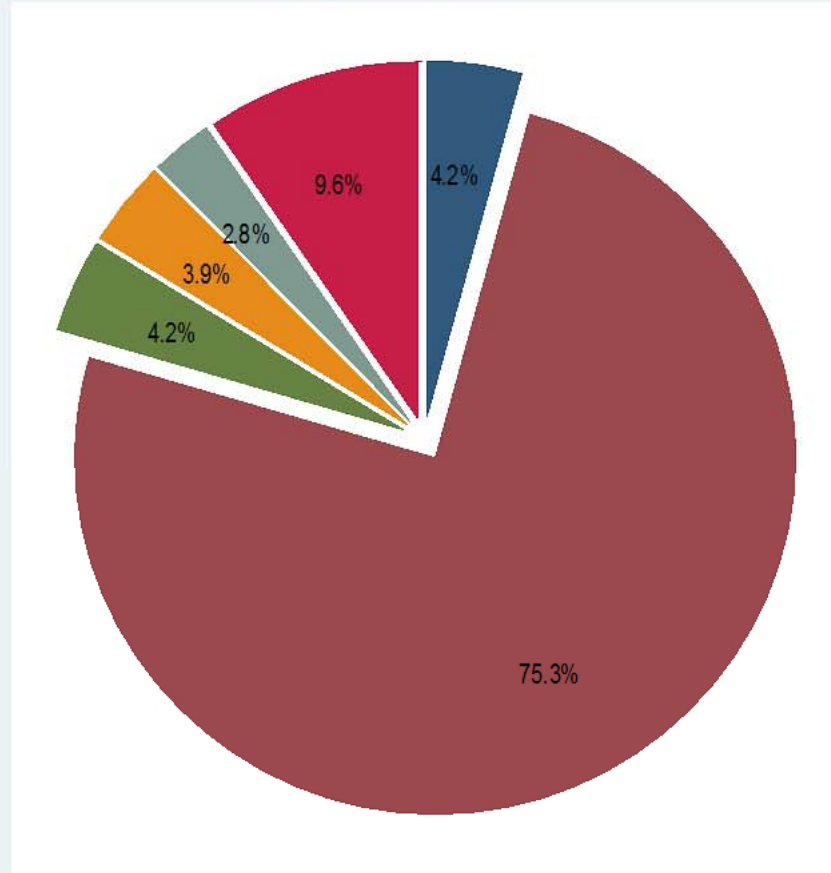
- Ask the firms to describe their new product and process
- Use the guidelines established in the Oslo Manual to reclassify innovations accordingly

Reclassification of self-reported:

Product innovation



Process innovation



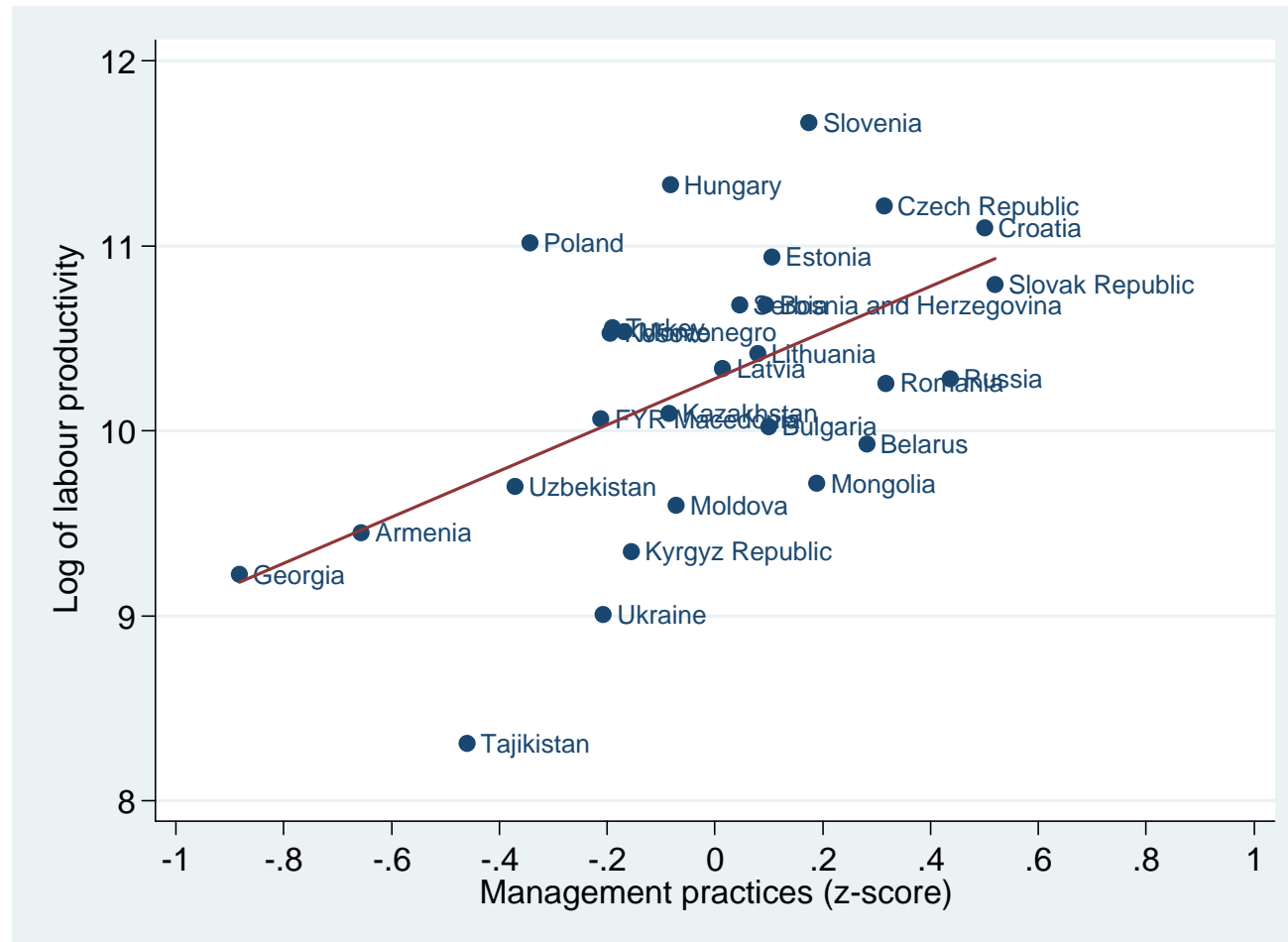
Measuring management practices

- Questionnaire following Bloom and Van Reenen (2007, 2010)
- Four areas:
 - operations: how the firm handled a process-related problem such as a machinery breakdown
 - monitoring: collection of information on production indicators
 - targets: timescale, difficulty and awareness
 - incentives: criteria governing promotion, rewards, practices for addressing poor performance

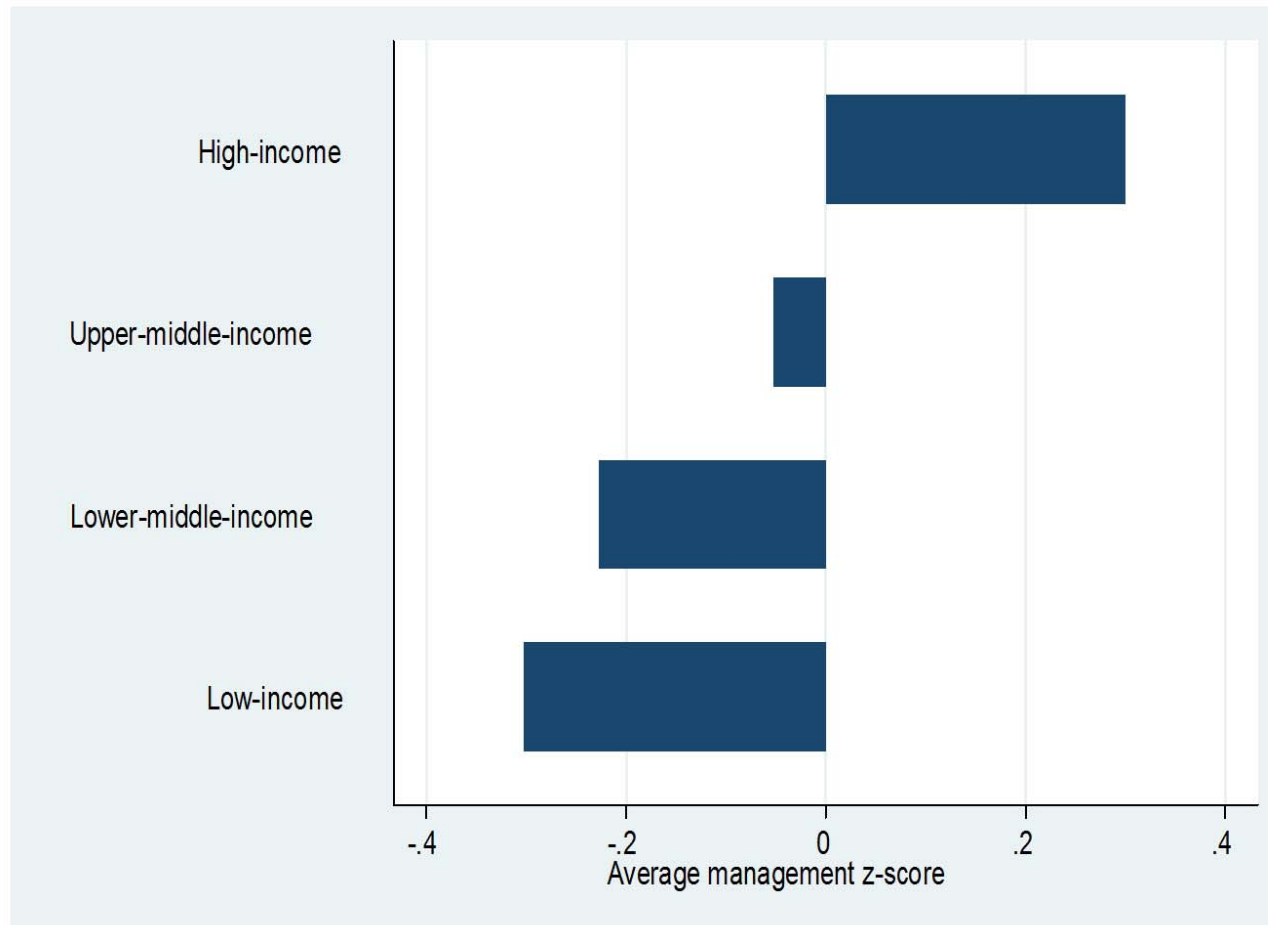
Measuring management practices

- Calculation of scores:
 - Convert categorical answers to z-scores by normalising each practice to mean 0 and standard deviation 1
 - Calculate unweighted averages for each of the four areas
 - Calculate unweighted average across the four areas and convert to a z-score
- Dichotomize: the management variable takes on value 1 if the score is above sample median and 0 otherwise

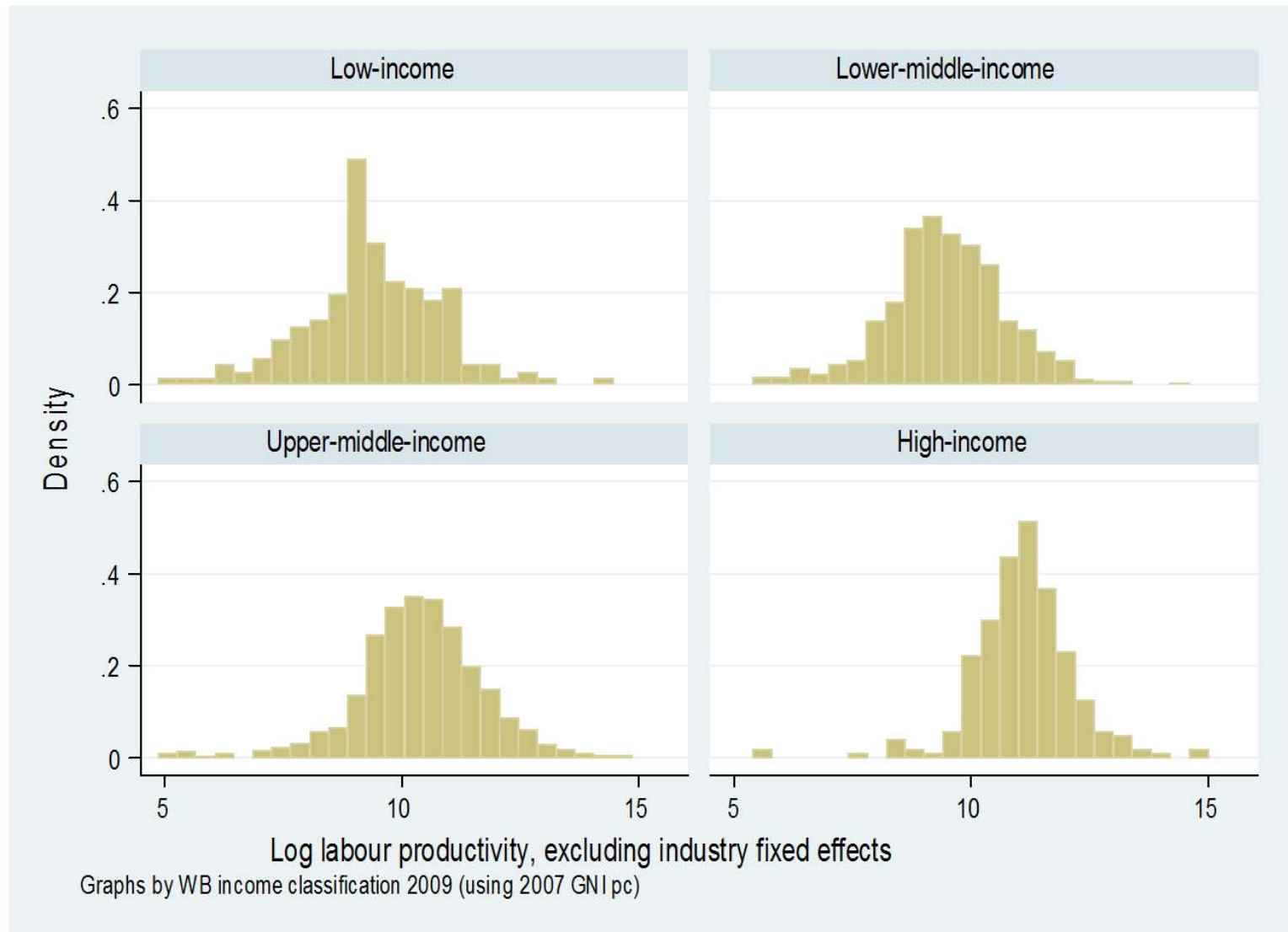
Average quality of management and average labour productivity



Average quality of management practices by level of development



Distribution of labour productivity

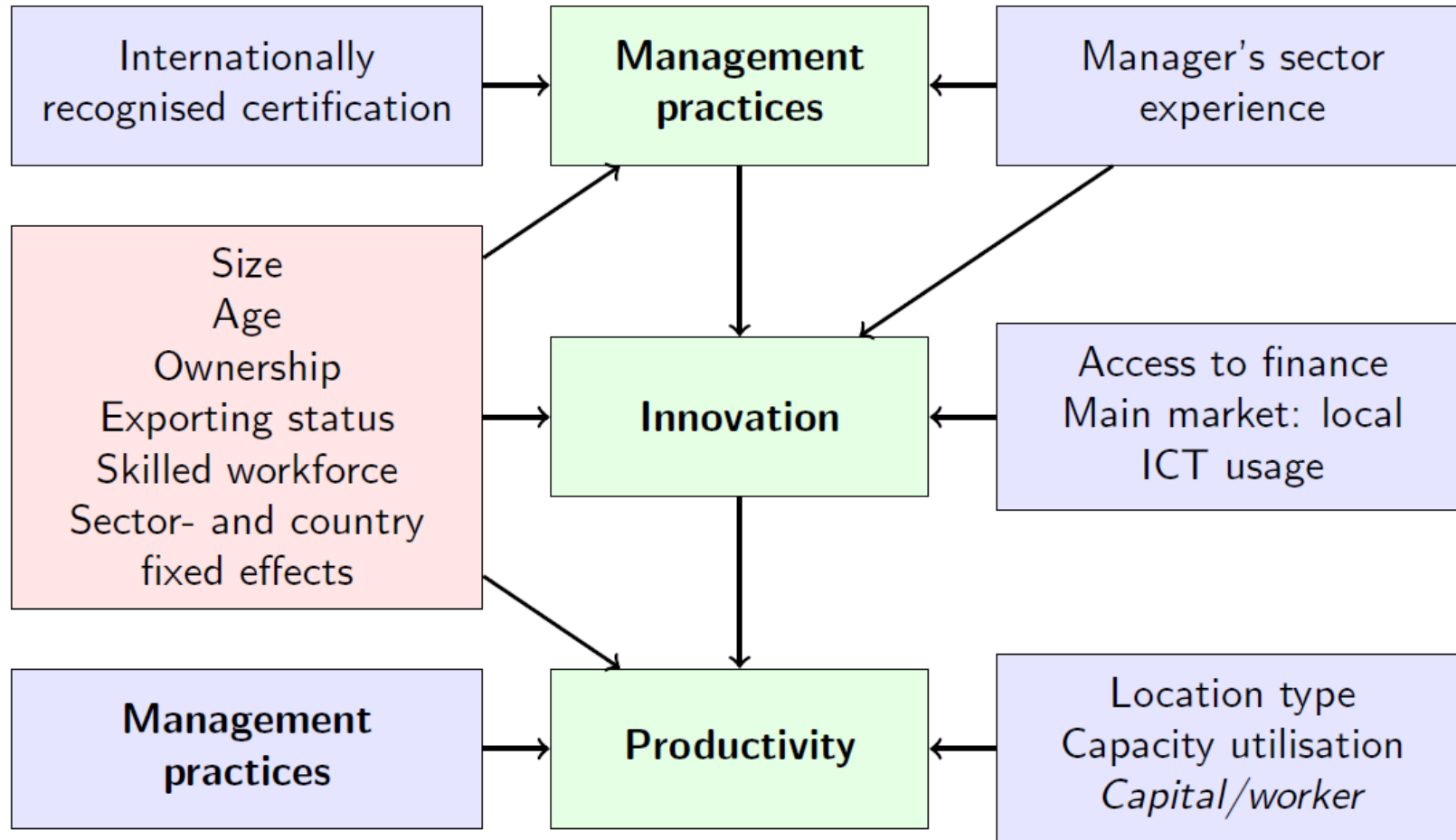


Sample breakdown

Country	All	With LP	With LP and KL	Income	Country	All	With LP	With LP and KL	Income
Albania	52	46	8	LM	Latvia	52	47	12	UM
Armenia	67	46	19	LM	Lithuania	56	50	25	UM
Azerbaijan	72	55	7	LM	Moldova	53	47	13	LM
Belarus	74	66	32	UM	Mongolia	60	58	15	LM
BiH	59	53	37	UM	Montenegro	16	10	5	UM
Bulgaria	58	57	37	UM	Poland	109	79	18	UM
Croatia	57	53	40	High	Romania	101	95	72	UM
Czech Rep.	66	61	28	High	Russia	479	407	150	UM
Estonia	40	37	26	High	Serbia	50	47	28	UM
FYR Macedonia	56	54	40	LM	Slovak Rep.	57	42	16	High
Georgia	54	50	21	LM	Slovenia	37	36	26	High
Hungary	47	30	16	High	Tajikistan	57	38	14	Low
Kazakhstan	121	100	22	UM	Turkey	693	459	196	UM
Kosovo	39	34	20	LM	Ukraine	380	282	71	LM
Kyrgyz Rep.	63	54	19	Low	Uzbekistan	94	87	66	Low
Total						3219	2580	1099	
Higher-income						2172	1729	786	
Lower-income						1047	851	313	

Note: WB income classification is based on GNI per capita in 2007. LP - labour productivity (sales per employee). KL - fixed assets per employee. LM - lower-middle-income, UM - upper-middle-income.

Diagram of the model



Estimation

- Asymptotic least squares
- Probit for management practices, probit for innovation, linear regression for labor productivity
- Predicted latent value of management used in innovation and productivity and of innovation in labour productivity
- Identification by exclusion restriction confirmed by test of overidentifying restrictions
- Winsorised labour productivity at 1% level
- Industry and sector fixed effects

Average marginal effects on management practices

	Management practices
<5 years old	-0.053 (0.039)
20-99 employees	-0.124*** (0.020)
25+% foreign ownership	0.060** (0.029)
25+% state ownership	-0.0113 (0.056)
Direct exporter	0.089*** (0.021)
% FTE with university degree	0.001* (0.001)
Manager sector experience	- 0.000 (0.001)
Internationally recognized certification	0.083*** (0.020)
Sector FE	Yes
Country FE	Yes

Average marginal effects on innovation

	1	2	3
	Product	Process	Technological
Management practices	0.131 (0.213)	0.155 (0.232)	0.19 (0.173)
<5 years old	-0.004 (0.032)	-0.003 (0.028)	-0.004 (0.030)
20-99 employees	-0.043 (0.029)	-0.077** (0.036)	-0.074** (0.031)
25+% foreign ownership	0.005 (0.027)	0.005 (0.027)	0.007 (0.029)
25+% state ownership	0.000 (0.030)	-0.000 (0.027)	-0.000 (0.028)
Direct exporter	0.020 (0.026)	0.025 (0.028)	0.030 (0.029)
% FTE with university degree	0.001 (0.001)	0.001 (0.001)	0.001* (0.001)
Access to finance	0.062*** (0.0130)	0.075*** (0.014)	0.107*** (0.016)
Manager sector experience	0.002 (0.003)	0.000 (0.001)	0.002 (0.001)
Main market: local	-0.030** (0.014)	-0.022 (0.015)	-0.043** (0.017)
ICT Usage	0.072*** (0.026)	0.082*** (0.025)	0.117*** (0.031)
Internationally recognized certification	0.018 (0.032)	0.019 (0.034)	0.022 (0.031)
Sector FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes

Marginal effects on labor productivity

Type of innovation	1 Product	2 Process	3 Technological
Management practices	0.586*** (0.185)	0.665*** (0.240)	0.593*** (0.179)
Cleaned innovation	0.585*** (0.128)	0.640*** (0.129)	0.559*** (0.115)
Capacity utilisation	0.005*** (0.001)	0.005*** (0.001)	0.005*** (0.001)
Capital or main business city	0.170** (0.071)	0.180** (0.071)	0.174** (0.071)
<5 years old	-0.209 (0.162)	-0.230 (0.174)	-0.219 (0.155)
20-99 employees	0.230** (0.112)	0.232 (0.144)	0.232** (0.111)
25+% foreign ownership	0.374*** (0.121)	0.366*** (0.136)	0.370*** (0.118)
25+% state ownership	0.210 (0.235)	0.197 (0.253)	0.205 (0.227)
Direct exporter	0.306*** (0.103)	0.307** (0.125)	0.305*** (0.102)
% FTE with university degree	0.004** (0.002)	0.004* (0.002)	0.004** (0.002)
Access to Finance	0.168*** (0.049)	0.193*** (0.053)	0.193*** (0.049)
Manager Sector Experience	0.006** (0.002)	0.002 (0.003)	0.004* (0.002)
Main market: local	-0.084** (0.041)	-0.064 (0.042)	-0.081** (0.035)
ICT Usage	0.195** (0.096)	0.225** (0.099)	0.218*** (0.081)
Internationally recognized certification	0.107** (0.049)	0.127** (0.063)	0.109** (0.048)

Average marginal effects on labour productivity by GNI/capita

	1	2	3
Type of innovation	Product	Process	Technological
Higher-income economies			
Management practices	0.401* (0.209)	0.605** (0.250)	0.482** (0.217)
Innovation	0.551*** (0.148)	0.643*** (0.168)	0.571*** (0.150)
Lower-income economies			
Management practices	1.106* (0.600)	0.266 (0.463)	1.117** (0.529)
Innovation	0.595*** (0.228)	0.422*** (0.154)	0.632*** (0.208)

Average marginal effects on labour productivity by technological intensity

	1	2	3
Type of innovation	Product	Process	Technological
High- and medium-high-tech			
Management practices	0.412*	0.398	0.481*
	(0.237)	(0.249)	(0.271)
Innovation	0.548	0.328	0.623
	(0.369)	(0.261)	(0.438)
Medium-low-tech			
Management practices	0.524	0.767*	0.603*
	(0.352)	(0.408)	(0.324)
Innovation	0.444	0.479*	0.392*
	(0.365)	(0.254)	(0.234)
Low-tech			
Management practices	0.724	0.334	0.607*
	(0.443)	(0.270)	(0.330)
Innovation	0.674***	0.453***	0.552***
	(0.165)	(0.128)	(0.141)

Robustness analysis

- Self-reported vs. clean innovation measures
- Controlling for capital/employee
- Differences in sample size across countries
- OLS estimation

Self-reported versus cleaned innovation

Type of innovation	1 Product	2 Process	3 Technological
Management practices	0.586*** (0.185)	0.665*** (0.240)	0.593*** (0.179)
Cleaned innovation	0.585*** (0.128)	0.640*** (0.129)	0.559*** (0.115)

Type of innovation	1 Product	2 Process	3 Technological
Management practices	0.538*** (0.206)	0.839*** (0.251)	0.598*** (0.209)
Self-reported innovation	0.598*** (0.123)	0.655*** (0.129)	0.596*** (0.120)

Controlling for capital intensity

Type of innovation	Controlling for capital per worker			Sample for which capital per worker is available		
	1 Product	2 Process	3 Technologica 	4 Product	5 Process	6 Technologica
Management practices	0.245 (0.172)	0.306 (0.213)	0.249 (0.166)	0.359* (0.189)	0.420* (0.233)	0.355** (0.181)
Self-reported innovation	0.370** (0.170)	0.463** (0.181)	0.369** (0.154)	0.427** (0.178)	0.521*** (0.185)	0.420*** (0.159)
Capacity utilisation	0.007*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.007*** (0.002)
Capital or main business city	0.263** (0.106)	0.273*** (0.106)	0.267** (0.106)	0.304*** (0.108)	0.314*** (0.108)	0.308*** (0.108)
Capital per Worker	0.124*** (0.018)	0.124*** (0.018)	0.124*** (0.018)			

Dropping one of the three largest countries in the sample

Type of innovation	1 Product	2 Process	3 Technological
Baseline			
Management practices	0.586*** (0.185)	0.665*** (0.240)	0.593*** (0.179)
Cleaned innovation	0.585*** (0.128)	0.640*** (0.129)	0.559*** (0.115)
Without Russia			
Management practices	0.674*** (0.241)	0.484** (0.231)	0.621*** (0.211)
Cleaned innovation	0.684*** (0.163)	0.619*** (0.146)	0.632*** (0.144)
Without Turkey			
Management practices	0.830*** (0.239)	0.906*** (0.299)	0.835*** (0.222)
Cleaned innovation	0.639*** (0.156)	0.620*** (0.126)	0.574*** (0.123)
Without Ukraine			
Management practices	0.620*** (0.202)	0.692*** (0.263)	0.613*** (0.190)
Cleaned innovation	0.619*** (0.138)	0.649*** (0.131)	0.585*** (0.121)

Estimation by OLS

	1	2	3
Type of innovation	Product	Process	Technological
Management practices	0.146** (0.057)	0.134** (0.057)	0.138** (0.057)
Cleaned innovation	0.227*** (0.073)	0.214*** (0.069)	0.247*** (0.061)
Capacity utilisation	0.005*** (0.001)	0.006*** (0.001)	0.006*** (0.001)
Capital or main business city	0.217*** (0.071)	0.200*** (0.071)	0.210*** (0.072)
<5 years old	-0.280** (0.115)	-0.283** (0.115)	-0.277** (0.114)
20-99 employees	0.189*** (0.058)	0.213*** (0.058)	0.200*** (0.058)
25+% foreign ownership	0.341*** (0.085)	0.359*** (0.085)	0.341*** (0.085)
25+% state ownership	0.168 (0.169)	0.256 (0.172)	0.235 (0.171)
Direct exporter	0.402*** (0.061)	0.399*** (0.061)	0.394*** (0.062)
% FTE with university degree	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)

Conclusion

- Both innovation and the quality of management practices are positively and significantly associated with firm productivity
- In lower-income economies, higher returns to management practices than to innovation
- In higher-income economies, management practices play a less important role
- Somewhat mixed results by technological intensity: if the quality of management practices is significant, then more important for firms in low-tech sectors than innovation
- Results broadly robust to a series of robustness checks

Thank you