

Do Management Interventions Last? Evidence from India

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**World Bank Empirical Management Conference,
December 8th 2017**

Motivation

- Surge in management interest in economics (Roberts 2017), reviving old interest (e.g. Walker 1887, Marshall 1887)
- Recent work has started to establish a causal link between management interventions and performance in large firms – e.g. Bloom et al. (2013), Bruhn et al. (2016)
- Question is how persistent are these impacts – limited evidence (e.g. Gioricelli 2017)

This paper runs an 8-year follow up to the India firms experiment in Bloom et al. (2013), finding

1. While $\approx 50\%$ management practice improvement reversed, treatment still significant for management and performance
2. Many management practices appear to have fully spread between plants *within* (but not between) firms
3. Managerial turnover and Director time two major reasons for drop in practices, suggesting senior employees matter

Background

Current Research Project

Results

2008-2010 ran an India management RCT (Bloom, Eifert, Mahajan, McKenzie & Roberts, 2013)

- Worked with Accenture to provide free management consulting to 17 large (≈ 250 employee) Indian textile firms running 28 plants
- From these firms 20 “experimental plants” were randomized into
 - 14 treatment plants (1 month diagnostic, 4 months consulting)
 - 6 control plants (1 month diagnostic).
- Then collected 1 year of performance data

Large multi-plant firms operating 24 hours a day



Large multi-plant firms operating 24 hours a day



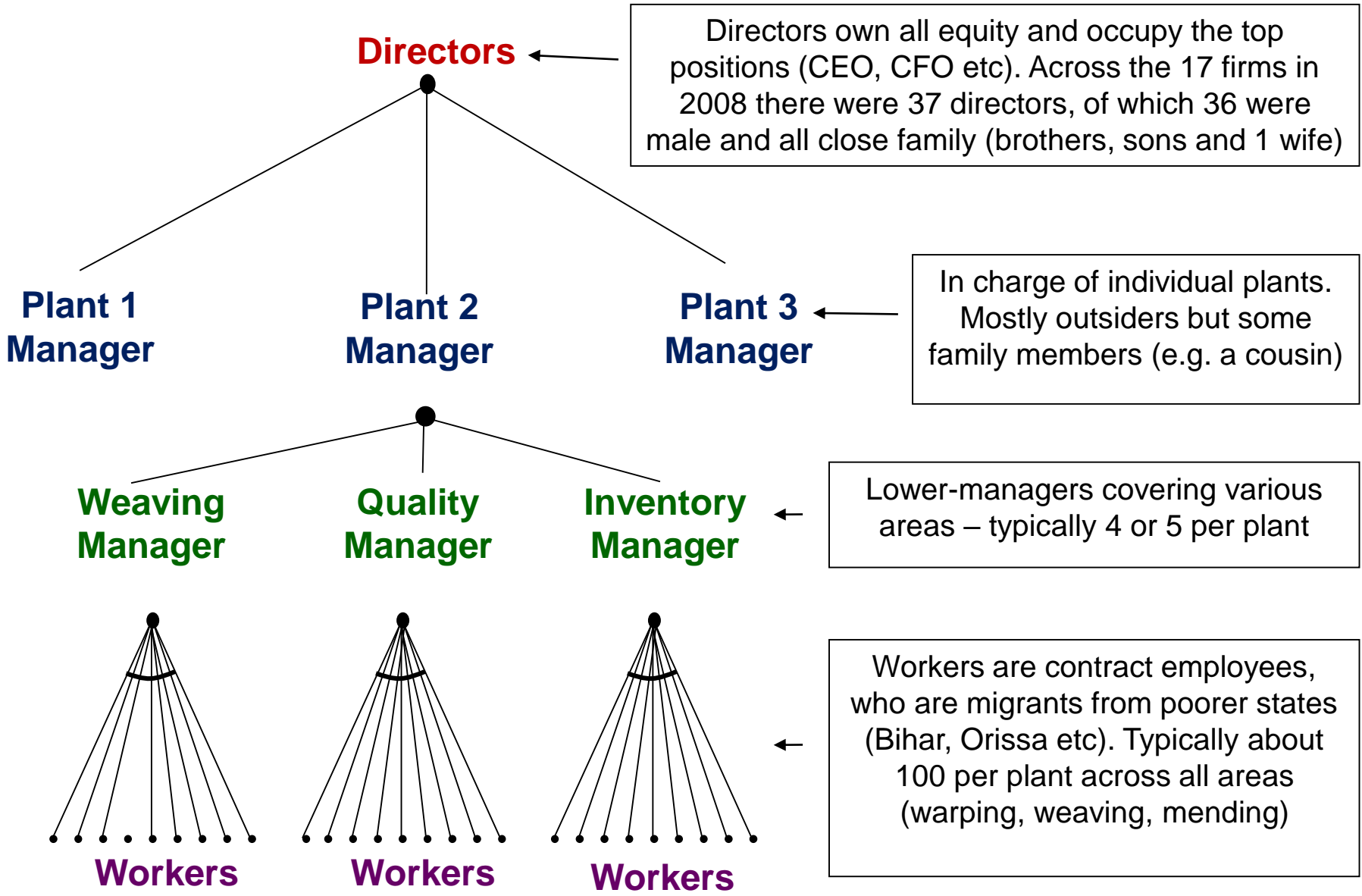
Intervention aimed at 38 core textile management practices in 6 areas

Area	Specific practice
Factory Operations	Preventive maintenance is carried out for the machines
	Preventive maintenance is carried out per manufacturer's recommendations
	The shop floor is marked clearly for where each machine should be
	The shop floor is clear of waste and obstacles
	Machine downtime is recorded
	Machine downtime reasons are monitored daily
	Machine downtime is analyzed at least fortnightly & action plans created and implemented to try to reduce this
	Daily meetings take place that discuss efficiency with the production team
	Written procedures for warping, drawing, weaving & beam gaiting are displayed
	Visual aids display daily efficiency loomwise and weaverwise
	These visual aids are updated on a daily basis
	Spares stored in a systematic basis (labeling and demarked locations)
Spares purchases and consumption are recorded and monitored	
Scientific methods are used to define inventory norms for spares	
Quality Control	Quality defects are recorded
	Quality defects are recorded defect wise
	Quality defects are monitored on a daily basis
	There is an analysis and action plan based on defects data
	There is a fabric gradation system
	The gradation system is well defined
Daily meetings take place that discuss defects and gradation	
Standard operating procedures are displayed for quality supervisors & checkers	

Intervention aimed at 38 core textile management practices in 6 areas

Inventory Control	Yarn transactions (receipt, issues, returns) are recorded daily
	The closing stock is monitored at least weekly
	Scientific methods are used to define inventory norms for yarn
	There is a process for monitoring the aging of yarn stock
	There is a system for using and disposing of old stock
	There is location wise entry maintained for yarn storage
Loom Planning	Advance loom planning is undertaken
	There is a regular meeting between sales and operational management
Human Resources	There is a reward system for non-managerial staff based on performance
	There is a reward system for managerial staff based on performance
	There is a reward system for non-managerial staff based on attendance
	Top performers among factory staff are publicly identified each month
	Roles & responsibilities are displayed for managers and supervisors
Sales and Orders	Customers are segmented for order prioritization
	Orderwise production planning is undertaken
	Historical efficiency data is analyzed for business decisions regarding designs

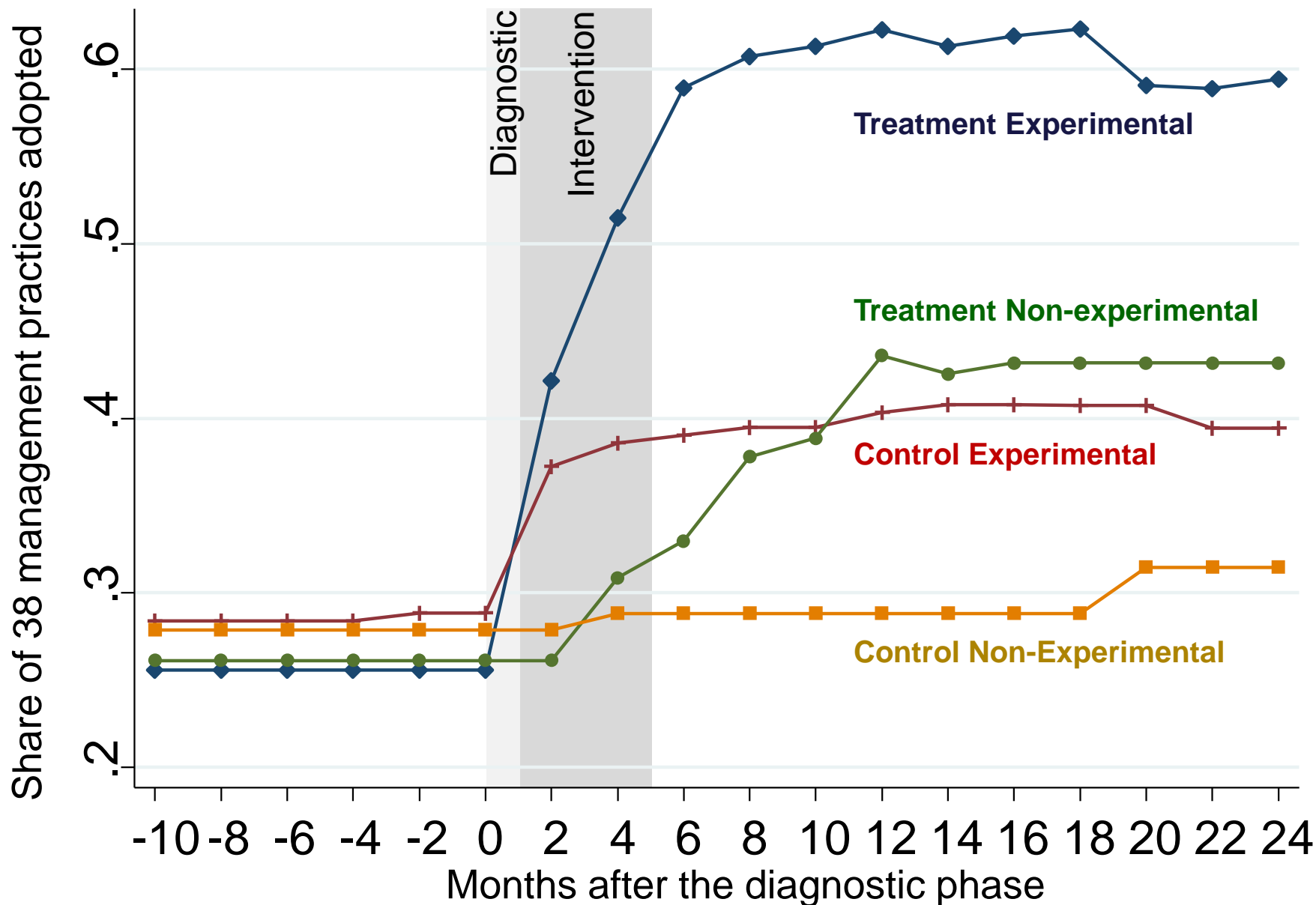
Typical organization of one of the textile firms



Experimental design has four types of plants

	Experimental	Non-Experimental
Treatment	<ul style="list-style-type: none">• 1 month diagnostic• 4 months intervention,• Performance and management measurement	<ul style="list-style-type: none">• Management measurement
Control	<ul style="list-style-type: none">• 1 month diagnostic• Performance and management measurement	<ul style="list-style-type: none">• Management measurement

Observed a large increase in the 38 management practices



The management interventions included the collection and processing of data on quality, efficiency and inventory – for example

FABRICS PVT. LTD.

Design No. 50 (1000) 12 Beam Length 10x100 Getting Date: _____
 Beam No. 665 No. of Pieces 108 Total Ends 108 x 100 = 10800 Beam Weight: _____
 Reed 515 Selvage 8296 Warp Weight: _____
 Reed Space 5/1 Total Quality Weight: 21000 +
 Picks 24 Gecs Loom No. 13 724/15-57-49-38

WARP PATTERN	DRAWING PATTERN	PEG PLAN
21-A	1-2-3-4-5-x4	1-2-3-5-7
1-B	6-7-8-9-10	1-2-4-5-9
1-B	1-2-3-4-5-x4	1-2-3-4-6
1-B	4-3-2-1-5	1-2-4-5-8
21-A	4-3-2-1-5	2-3-4-5-10
X-C		5 PK
S-A	12 dect 60cm	
J-C		
S-A		
X-C		

60cm

A - 160 d. standard P/B - 111/507
 B - 160 d. white top
 S-C - 160 d. standard right white

111/507
 111/507
 111/507
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 111/507

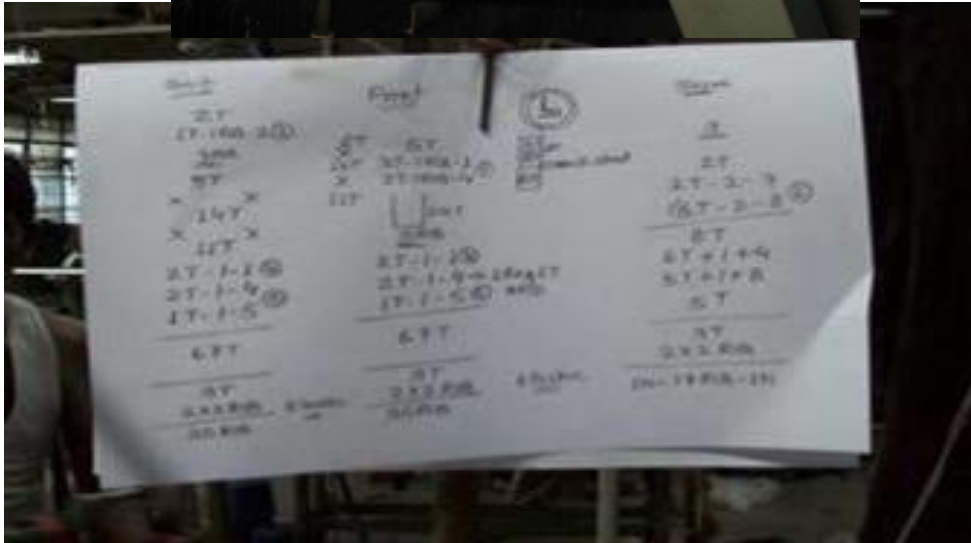
selvage
 18 dect = 26400 Amos
 8 dect = 11152
 2-1152
 2-1152
 35 dect = 108 ends

TEXTILE MILLS (P) LTD.
LOG BOOK & EFFICIENCY BOOK

Sl. No.	Machine	RE	CR	CR	CR	Picks	Production	Loss	Remarks
1	1000	67	500	400	500	50			
2	1000	67	500	400	500	50			Warp break stop - 1
3	1000	65	500	400	500	50			
4	1000	65	500	400	500	50			
5	1000	65	500	400	500	50			
6	1000	65	500	400	500	50			
7	1000	65	500	400	500	50			
8	1000	65	500	400	500	50			
9	1000	65	500	400	500	50			
10	1000	65	500	400	500	50			
11	1000	65	500	400	500	50			
12	1000	65	500	400	500	50			
13	1000	65	500	400	500	50			
14	1000	65	500	400	500	50			
15	1000	65	500	400	500	50			
16	1000	65	500	400	500	50			
17	1000	65	500	400	500	50			
18	1000	65	500	400	500	50			
19	1000	65	500	400	500	50			
20	1000	65	500	400	500	50			
21	1000	65	500	400	500	50			
22	1000	65	500	400	500	50			
23	1000	65	500	400	500	50			
24	1000	65	500	400	500	50			
25	1000	65	500	400	500	50			
26	1000	65	500	400	500	50			
27	1000	65	500	400	500	50			
28	1000	65	500	400	500	50			
29	1000	65	500	400	500	50			
30	1000	65	500	400	500	50			
31	1000	65	500	400	500	50			
32	1000	65	500	400	500	50			
33	1000	65	500	400	500	50			
34	1000	65	500	400	500	50			
35	1000	65	500	400	500	50			
36	1000	65	500	400	500	50			
37	1000	65	500	400	500	50			
38	1000	65	500	400	500	50			
39	1000	65	500	400	500	50			
40	1000	65	500	400	500	50			
41	1000	65	500	400	500	50			
42	1000	65	500	400	500	50			
43	1000	65	500	400	500	50			
44	1000	65	500	400	500	50			
45	1000	65	500	400	500	50			
46	1000	65	500	400	500	50			
47	1000	65	500	400	500	50			
48	1000	65	500	400	500	50			
49	1000	65	500	400	500	50			
50	1000	65	500	400	500	50			

Remarks:

Date	Warp Stop			Waste Stop			Other Stop		
	MF	CF	OFF	MF	CF	OFF	MF	CF	OFF
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									



Before
 (not standardized, on loose paper)

After
 (standardized, so easy to enter into a computer)

Another management intervention was the organization of inventory



Before

Yarn without labeling, order or damp protection

Different types and colors of yarn lying mixed



Before

Yarn piled up so high and deep that access to back sacks is almost impossible



Before

A crushed yarn cone, which is unusable as it leads to irregular yarn tension

Another management intervention was the organization of inventory

After



Also introduced worker and manager incentive schemes

Daily Efficiency Report

M. No.	Worker Name	Efficiency %	Worker Name	Efficiency %
1	विनायक	75%	पद्म कुमारी	73%
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
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24				
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28				
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32				
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34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
Total	3253	62.9%	391	61.9%

Synthetics Pvt. Ltd.

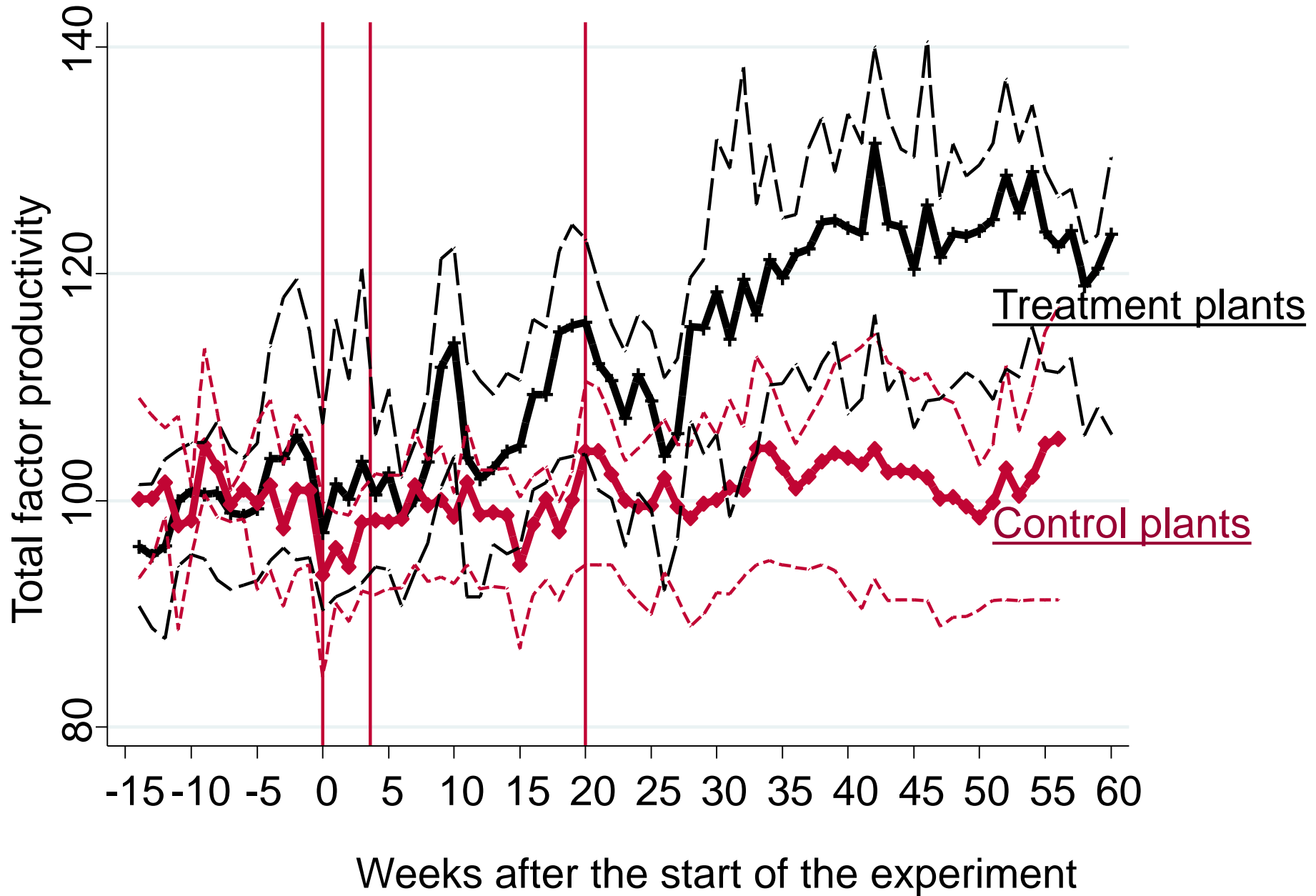
LOOM No.	Counter Reading - 'A'	Eff% - 'A'	Counter Reading - 'B'	Eff% - 'B'
1	180	75%	107	73%
2	138		133	
3	131		135	
4	129		125	
5	165		165	
6	147		164	
7	171		151	
8	146		157	
9	150		148	
10	120		121	
11	171		144	
12	0		151	
13	56		150	
14	165		160	
15	174		154	
16	150		132	
17	124		122	
18	150		125	
19	128		94	
20	162		151	
21	132		121	
22	48		151	
23	114		127	
24	148		121	
25	174		177	
26	184		207	
27	190		170	
28	146		10	
29	213		203	
30	200		105	
Total	4460	76.6%		

Jacquard Division

Loom No	Total Picks 'A'	Eff% 'A'	Total Picks 'B'	Eff% 'B'
1	76800	54	72000	41
2	112000	55	100000	50
3	102500	46	176640	42
4	53760	28	104160	45
5	180000	79	196000	31
6	92040	46	80640	37
7	104160	57	107520	43
8	147100	63	158240	52
9				
10	136000	60	72000	38
11	160000	58	80000	39
12	134000	45	120400	44
13	89600	61	104640	55
14				
15	152600	65	187200	51
16				

07/07/2009 00:58

TFP rose about 20% in treatment plants vs controls



Background

Current Research Project

Results

The current project asks what happened 8 years after the intervention ended?

BGC and McKinsey claim about 2/3 of all management interventions fail in 3 years (e.g. Sirkin et al. 2015)



In January 2017 re-contacted all the firms to collect follow-up management and performance data

All treatment & control firms agreed to work with us again, aided by:

- 1) The initial intervention has been beneficial to the firms
- 2) These are large firms, so had same address and contact details
- 3) The same Accenture manager and partners worked with us again

In January 2017 re-contacted all the firms to collect follow-up management and performance data

But two caveats:

- 1) We spent only 2 months with the firms because of a limited budget. So we collected only basic management and performance data
- 2) One treatment firm with one plant was closing down after the death of the owner (with no sons), so provided limited data

We have had firm exit, and plant entry and exit

Table A2: Plant count

	2008	2011	2014	2017
Treatment – experimental	14	14	11	11
Treatment – non experimental	6	9	9	9
Control – experimental	6	6	6	6
Control – non-experimental	2	2	4	4
Total	28	31	30	30

Notes: Lists the total number of plants in 2008 to 2017 plus ever (adds all dead and alive plants). One firm closed in 2014, so the total number of firms was 17, 17, 16 and 16 across the first four columns.

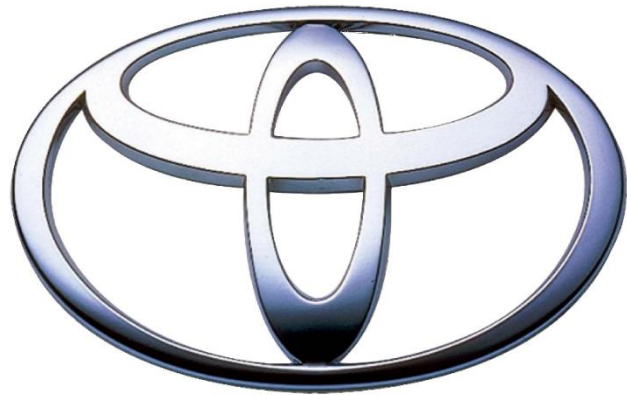
Background

Current Research Project

Results

- **persistence**
- spillovers
- practice churn

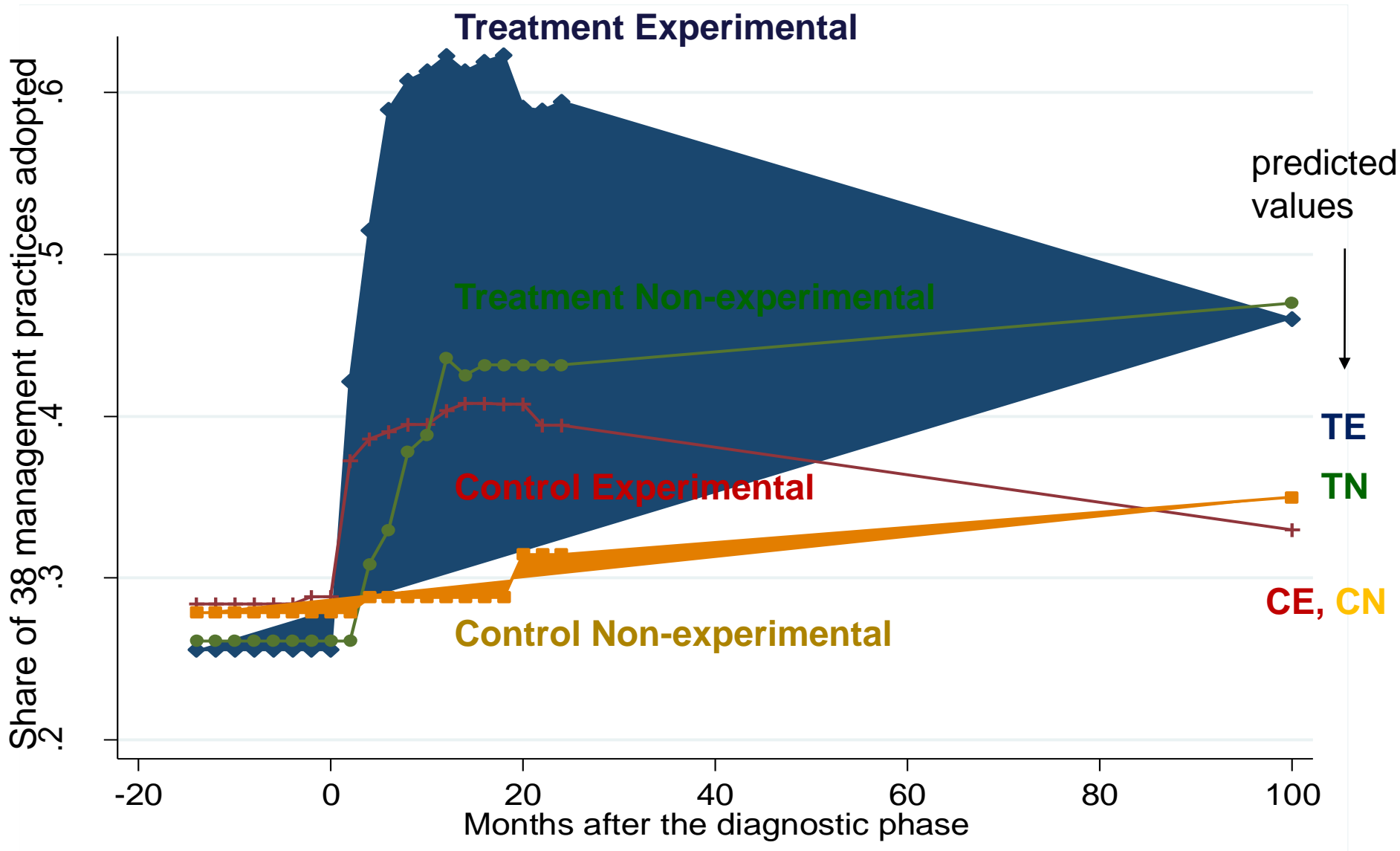
Two extreme views on the long-run persistence



TOYOTA



The management intervention was surprisingly persistent



Notes: Sample comprised of the balanced panel of plants from 2008 to 2017 (11 treatment experimental, 6 treatment non-experimental, 6 control experimental and 2 control non-experimental). The letters on the right are the average predicted values from the 3-person Accenture team and 4 co-authors made before re-contacting the firms for the Treatment Experimental (TE) at 0.4, Treatment Non-Experimental (TN) at 0.36, Control Experimental and Control Non-Experimental (CE and CN) both at 0.29 respectively.

An Ancova reveals the impact of the intervention is still significant in 2017 (indeed has hardly decreased)

Table 2: Short and long run impact on management practices

Dep Var: Proportion of management practices implemented	(1)	(2)
Treatment*Year=2011	0.206*** (0.042) [0.003]	0.249*** (0.038) [0.001]
Treatment*Year=2017	0.197** (0.062) [0.007]	0.218** (0.057) [0.007]
Year=2017	-0.122*** (0.016)	-0.122*** (0.016)
Baseline 2008 Management Score	0.668** (0.219)	0.878*** (0.176)
P-value of test of equality of treatment in 2011 and 2017	0.802	0.457
Sample Size	37	34

Notes: Notes: Robust standard errors in () parentheses and permutation test p-values in [] parentheses. Both are clustered at the firm level. *, **, and *** denote significance at the 10, 5, and 1 percent levels respectively on the robust standard errors. Permutation tests report the p-value for testing the null hypothesis that the treatment had no effect by constructing the permutation distribution of the estimator using 4000 possible permutation of firm-level random assignment. |

Procedure display practices were the least persistent, quality and operations monitoring/feedback were the most

Table A3: Practice stickiness

	Adopted	Dropped	Share Dropped
9 Written procedures for warping, drawing, weaving & beam gaiting are displayed	7	7	1.00
22 Standard operating procedures are displayed for quality supervisors & checkers	11	10	0.91
11 These visual aids are updated on a daily basis	11	7	0.64
10 Visual aids display daily efficiency loomwise and weaverwise	11	6	0.55
21 Daily meetings take place that discuss defects and gradation	13	7	0.54
18 There is an analysis and action plan based on defects data	14	7	0.50
17 Quality defects are monitored on a daily basis	16	6	0.38
4 The shop floor is clear of waste and obstacles	6	2	0.33
33 There is a reward system for non-managerial staff based on attendance	9	3	0.33
20 The gradation system is well defined	8	2	0.25
24 The closing stock is monitored at least weekly	13	3	0.23
7 Machine downtime analyzed at least fortnightly & action plans implemented to try to reduce this	15	3	0.20
8 Daily meetings take place that discuss efficiency with the production team	19	3	0.16
5 Machine downtime is recorded	9	1	0.11
6 Machine downtime reasons are monitored daily	13	1	0.08
27 There is a system for using and disposing of old stock	15	1	0.07
1 Preventive maintenance is carried out for the machines	10	0	0.00
12 Spares stored in a systematic basis (labeling and demarked locations)	6	0	0.00
16 Quality defects are recorded defect wise	20	0	0.00
19 There is a fabric gradation system	9	0	0.00
26 There is a process for monitoring the aging of yarn stock	11	0	0.00
28 There is location wise entry maintained for yarn storage	7	0	0.00
35 Roles & responsibilities are displayed for managers and supervisors	9	0	0.00
37 Orderwise production planning is undertaken	6	0	0.00

Notes: Lists the practices ordered by the share of adopters between 2008 and 2011 that subsequently dropped them by 2017.

Performance improvements also appeared to persist, with firms actively increasing consulting & marketing practices

Table 5: Longer-run performance and management changes

Dep Var	Looms (in logs) (1)	Looms per employee (in logs) (2)	Consulting days (in logs) (3)	Marketing practices (4)
Panel A: Long-run performance				
Treatment _t *(Year>=2011) _t	0.296** (0.120)	0.088** (0.038)	1.414* (0.666)	1.405** (0.514)
Permutation Test (p-value)	0.010	0.068	0.149	0.044
Panel B: Experimental and non-Experimental plants				
Experimental*Treatment _t *(Year>=2011) _t	0.171* (0.074)	0.300** (0.139)	1.21** (0.53)	1.31** (0.55)
Permutation Test (p-value)	0.127	0.128	0.167	0.063
Non-Experimental*Treatment _t *(Year>=2011) _t	0.511*** (0.067)	0.300* (0.137)	2.08 (1.39)	1.70*** (0.52)
Permutation Test (p-value)	0.008	0.084	0.278	0.058
Panel C: Treatment impact by period				
Treatment _t *(Year==2011) _t	0.123 (0.076)	0.163 (0.101)	-0.073 (0.080)	1.149** (0.450)
Permutation Test (p-value)	0.238	0.237	0.643	0.109
Treatment _t *(Year==2014) _t	0.100 (0.082)	0.289* (0.147)	1.859* (0.943)	-1.494** (0.518)
Permutation Test (p-value)	0.397	0.377	0.234	0.072
Treatment _t *(Year==2017) _t	0.296* (0.138)	0.451** (0.168)	2.77** (1.120)	2.294** (0.884)
Permutation Test (p-value)	0.059	0.047	0.109	0.023
F-test Treatment _t *(Year==2014) _t & Treatment _t *(Year==2017) _t	0.123	0.047	0.073	0.015
Control group mean (all in levels)	57.6	0.509	0.114	0.486
Years	2008, 11, 14, 17	2008, 11, 14, 17	2008, 11, 14, 17	2008, 11, 14, 17
Firms	17	17	17	17
Plants	31	31	31	31
Observations	109	109	109	109

Notes: Data for pre-treatment (2008) and post-treatment (2011, 2014 and 2017) years, except plants for which basic performance data was missing. Sales and marketing practices is an indicator from 0 to 10 defined as the count of ten 0/1 Sales and Marketing practices like “Attending trade shows”, “Hiring sales and marketing professionals”, “Analyzing product portfolios”, “Setting up a firm brand”. Regressions clustered at the firm level. *** denotes 1%, ** denotes 5%, * denotes 10%. F-test reports p-value of the joint test. Permutation tests report the p-value for testing the null hypothesis that the treatment had no effect by constructing the permutation distribution of the estimator using 4000 possible permutation of firm-level random assignment.

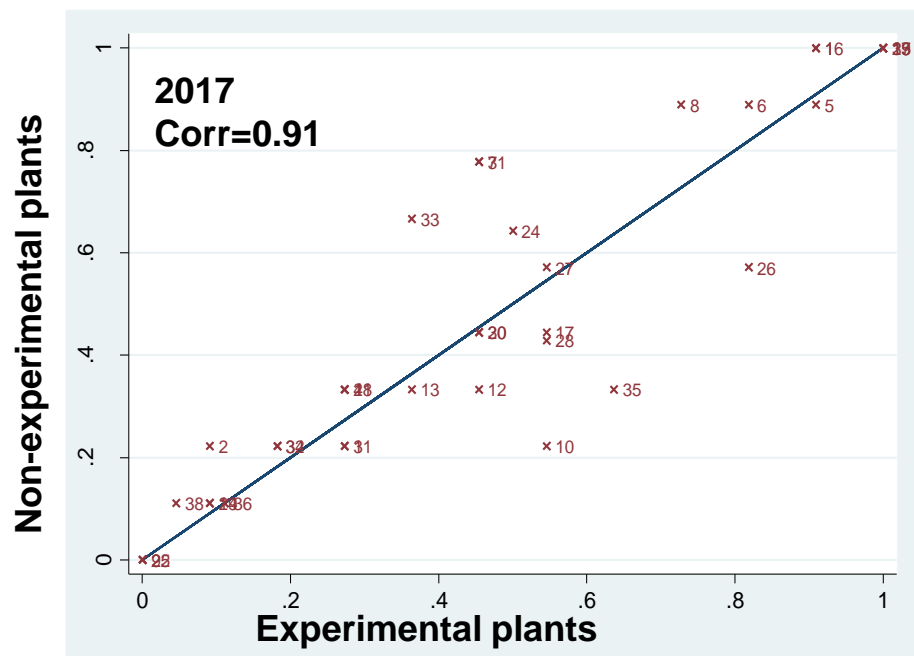
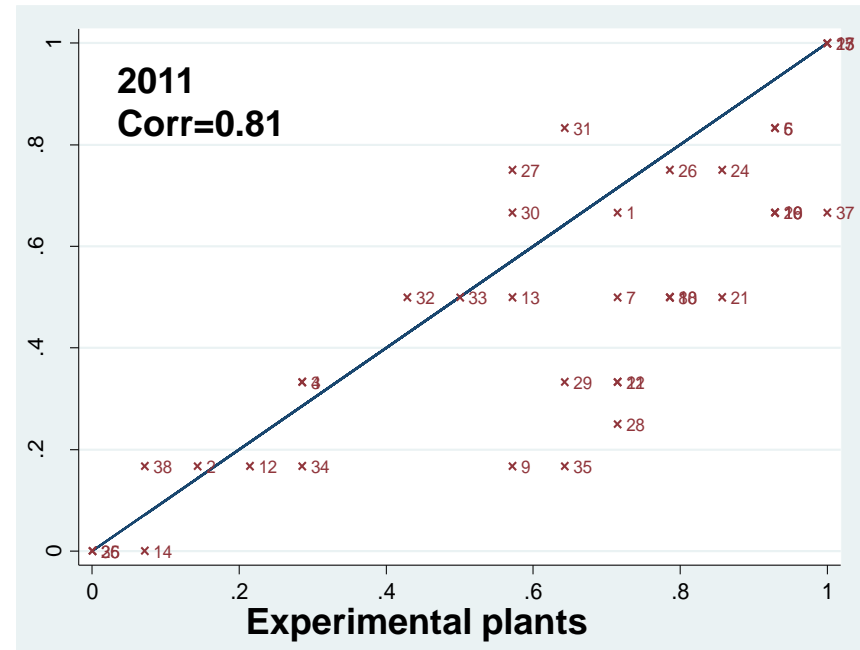
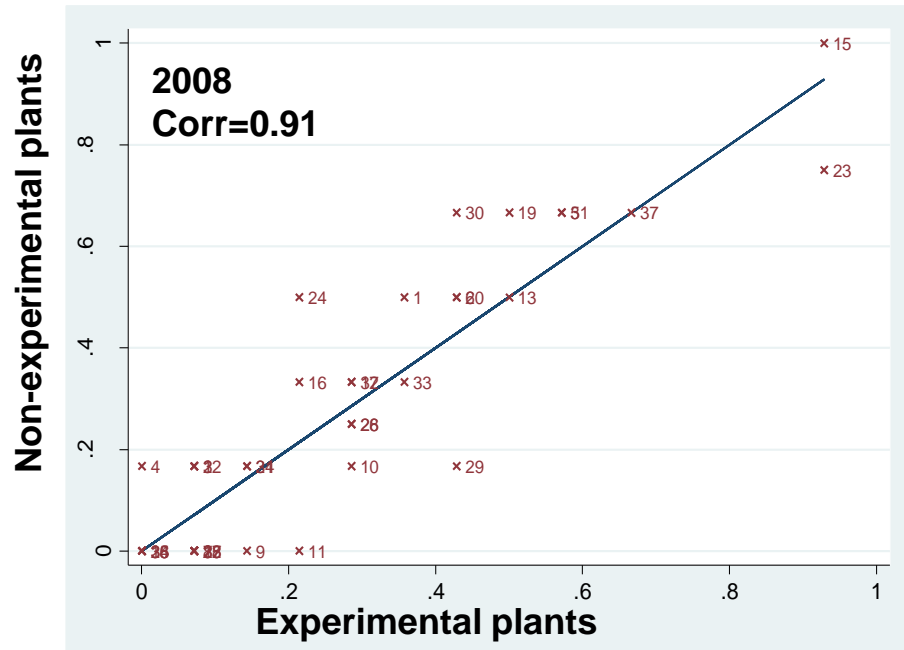
Background

Current Research Project

Results

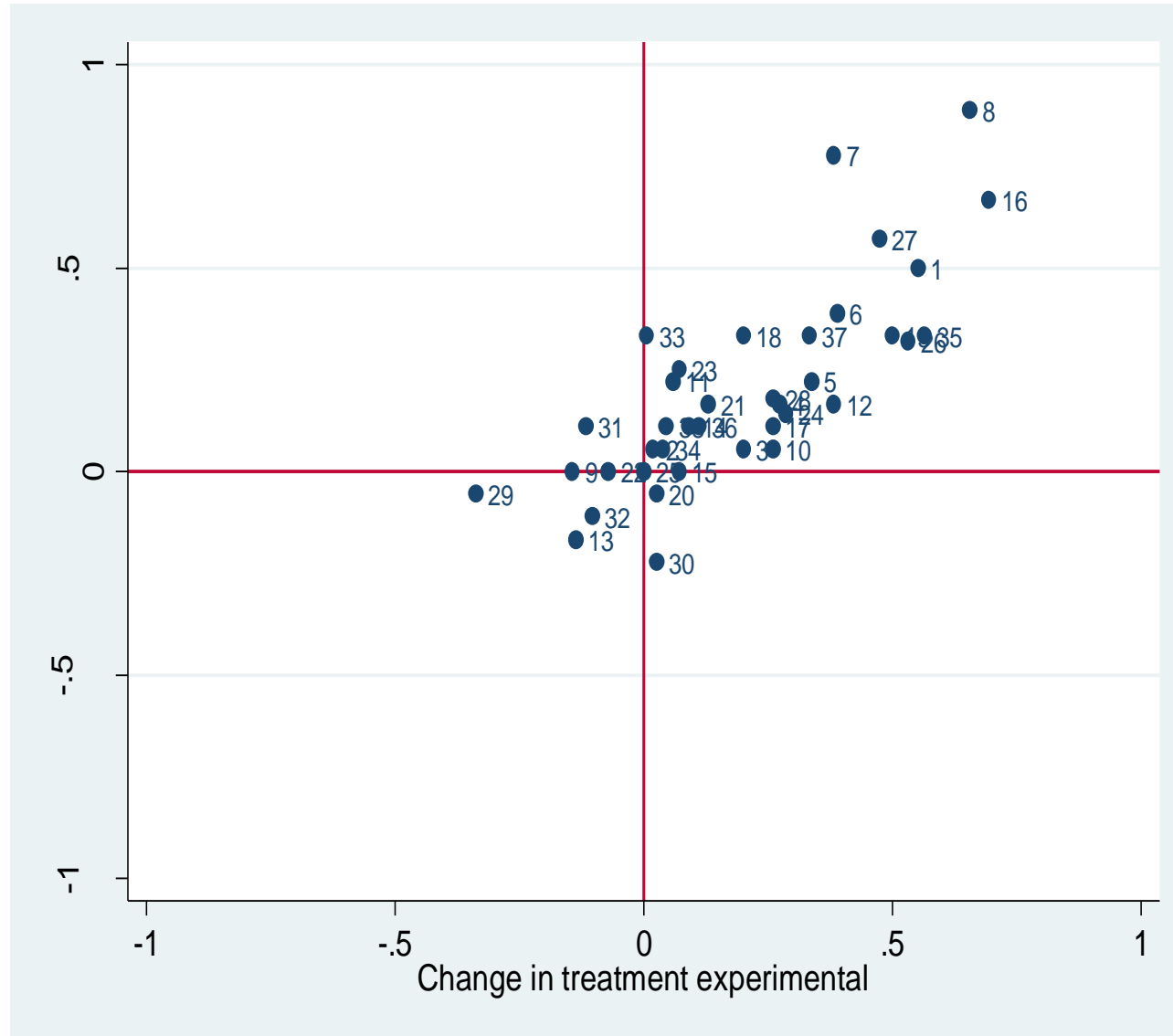
- persistence
- **spillovers**
- practice churn

Practices appear to spread out fully in treatment firms



Note: The three graphs plot the average scores for each of the 38 questions for the 14 (11 in 2017) treatment experimental plants (on the x-axis) and the 6 treatment non-experimental plants (on the y-axis) in 2008 (top-left), 2011 (top-right) and 2017 (bottom-left). The correlations between these scores for the 38 practices are reported as well on the graphs.

So Treatment Experimental and Treatment Non-Experimental plants show a very similar long-run change by practice (2008-2017)



Note: The figure plots the change in the share of practices of each of the 38 questions for the 11 treatment experimental plants (on the x-axis) and the 6 treatment non-experimental plants (on the y-axis) between 2008 and 2017.

Background

Current Research Project

Results

- persistence
- spillovers
- **practice churn**

Look at reasons for practice change, finding:

(A) Large churn in management practices.
(B) Managerial turnover, Director time and perceived negative benefit main reason for dropping practices
(C) Spillovers main reason for addition

Table 3: Reasons for the change in management practices

	Treatment Experimental	Treatment Non-Experimental	Control Experimental	Control Non-Experimental	All
Added Practices (%)					
New manager	1.2	0.6	0.4	0	0.8
Product, customer or equipment change	0.7	1.8	0	0	0.9
Spillovers from other firms	0.7	0.3	2.2	2.7	1.1
Spillovers from other plants in the same firm	0	4.2	0	0	1.3
Total	2.6	6.9	2.6	2.7	4.1
Dropped Practices (%)					
New Manager	9.9	0.6	1.8	1.4	4.6
Perceived negative benefit	2.9	3.0	5.3	1.4	4.2
Reduced directors time	3.9	3.0	3.6	4.1	3.6
Total	16.7	6.6	10.7	6.9	12.4
No Change (%)	80.7	86.4	86.7	90.4	83.5
Total	100	100	100	100	100

Notes: Lists the shares of practice by plant cells in terms of reasons for change between 2011 and 2017 in terms of practices added, dropped or left unchanged. Calculated as a share of 1,042 practices, which are comprised of the 38 practices across the 28 plants (11 treatment experimental, 9 treatment non-experimental, 6 control experimental and 2 control non-experimental) in operation in both 2011 and 2017, except for the inventory practices which are missing in plants which hold no inventory because they make to order.

Conclusion

Important question on the long-run sustainability of management practice interventions, so run 8-year follow-up

1. While $\approx 50\%$ management practices dropped, treatment impact still significant on management and performance
2. Many management practices appear to have fully spread between plants *within* (but not between) firms
3. Managerial turnover and Director time major reasons for drop in managerial practices, suggesting people matter

BACK-UP

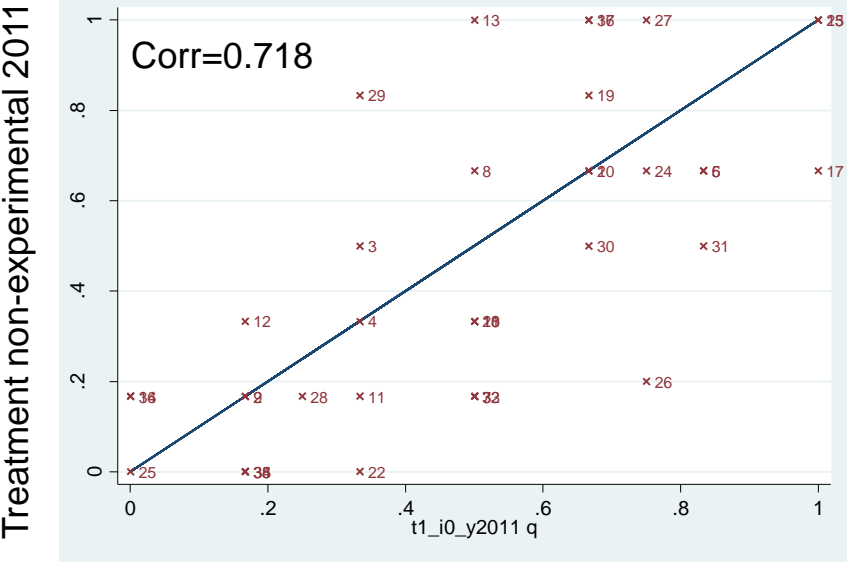
Regression analysis: saw big drops in treated experimental plants when managers left. Unusual practices also dropped more frequently (maybe indicating less good fit?)

Table 4: Determinants of changes in management from 2011 to 2017

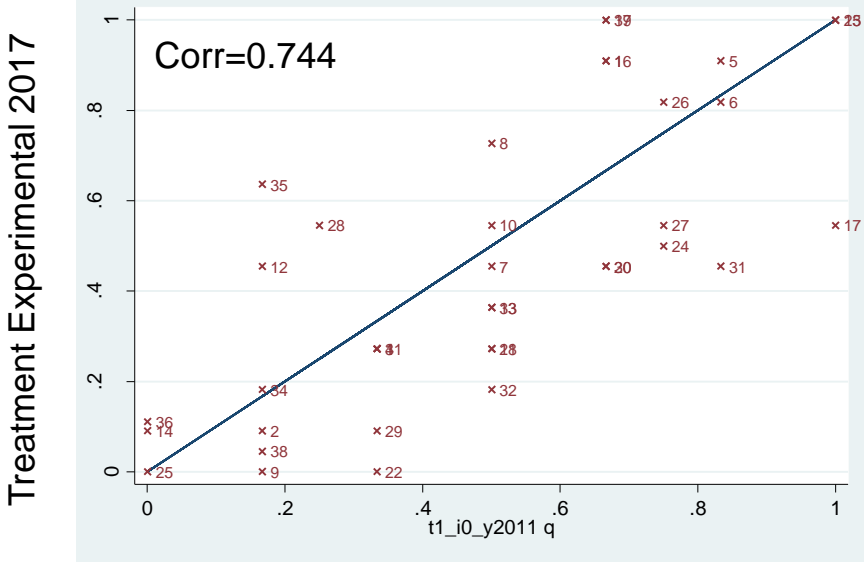
DV=0/1/-1 management score change	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Experimental plant		-0.128** (0.046)				-0.098*** (0.021)	-0.097*** (0.022)
Treatment plant			0.020 (0.037)			0.047 (0.029)	0.043 (0.023)
New plant manager*treated				-0.103** (0.047)		-0.096** (0.038)	-0.075* (0.045)
New plant manager*control				-0.035 (0.029)		-0.007 (0.027)	-0.010 (0.036)
Frequency of practice usage in 2008					0.095** (0.037)	0.095** (0.037)	0.095** (0.037)
Management score in 2011							-0.132 (0.160)
Constant	-0.083*** (0.027)	0.050 (0.046)	-0.101*** (0.015)	-0.048** (0.023)	-0.111*** (0.028)	-0.052* (0.027)	-0.052* (0.027)
Observations	1,042	1,042	1,042	1,042	1,042	1,042	1,042

Notes: Dependent variable is the change in the -1,0,1 indicator for the change in management practice between 2011 and 2017. The sample is the 38 practices across the 28 plants (11 treatment experimental, 9 treatment non-experimental, 6 control experimental and 2 control non-experimental) in operation across both periods, except for the inventory practices which are missing in plants which hold no inventory because they make to order. Regressions clustered at the firm level. *** denotes 1%, ** denotes 5%, * denotes 10%

Figure A1: Control plants in 2011 had similar scores to treatment non-experimental firms in 2011 and treatment experimental firms in 2017, but a different practice mix



Control Experimental 2011



Control Experimental 2011

Note: Plots the average scores for each of the 38 questions for the 6 control plants (x-axis) in 2011 vs 6 treatment non-experimental plants in 2011 (left plot) and 11 treatment experimental plants in 2017 (right plot) on the y-axis

Large heterogeneity in adoption rates across practices

Table A1: The textile management practices adoption rates

Area	Specific Practice	2008	2011	2017	
Factory Operations	1	Preventive maintenance is carried out for the machines	0.4	0.7	0.95
	2	Preventive maintenance is carried out per manufacturer's recommendations	0.1	0.15	0.15
	3	The shop floor is marked clearly for where each machine should be	0.1	0.3	0.25
	4	The shop floor is clear of waste and obstacles	0.05	0.3	0.3
	5	Machine downtime is recorded	0.6	0.9	0.9
	6	Machine downtime reasons are monitored daily	0.45	0.9	0.85
	7	Machine downtime analyzed at least fortnightly & action plans implemented to try to reduce this	0.05	0.65	0.6
	8	Daily meetings take place that discuss efficiency with the production team	0.05	0.7	0.8
	9	Written procedures for warping, drawing, weaving & beam gaiting are displayed	0.1	0.45	0
	10	Visual aids display daily efficiency loomwise and weaverwise	0.25	0.7	0.4
	11	These visual aids are updated on a daily basis	0.15	0.6	0.25
	12	Spares stored in a systematic basis (labeling and demarked locations)	0.1	0.2	0.4
	13	Spares purchases and consumption are recorded and monitored	0.5	0.55	0.35
	14	Scientific methods are used to define inventory norms for spares	0	0.05	0.1
Quality Control	15	Quality defects are recorded	0.95	1	1
	16	Quality defects are recorded defect wise	0.25	0.85	0.95
	17	Quality defects are monitored on a daily basis	0.3	1	0.5
	18	There is an analysis and action plan based on defects data	0.05	0.7	0.3
	19	There is a fabric gradation system	0.55	0.85	1
	20	The gradation system is well defined	0.45	0.85	0.45
	21	Daily meetings take place that discuss defects and gradation	0.15	0.75	0.3
	22	Standard operating procedures are displayed for quality supervisors & checkers	0.05	0.6	0
Inventory Control	23	Yarn transactions (receipt, issues, returns) are recorded daily	0.89	1	1
	24	The closing stock is monitored at least weekly	0.28	0.83	0.56
	25	Scientific methods are used to define inventory norms for yarn	0	0	0
	26	There is a process for monitoring the aging of yarn stock	0.28	0.538	0.72
	27	There is a system for using and disposing of old stock	0.05	0.78	0.56
Loom Planning	28	There is location wise entry maintained for yarn storage	0.28	0.61	0.5
	29	Advance loom planning is undertaken	0.35	0.55	0.1
	30	There is a regular meeting between sales and operational management	0.5	0.6	0.45
Human Resources	31	There is a reward system for non-managerial staff based on performance	0.6	0.7	0.6
	32	There is a reward system for managerial staff based on performance	0.3	0.45	0.2
	33	There is a reward system for non-managerial staff based on attendance	0.35	0.5	0.5
	34	Top performers among factory staff are publicly identified each month	0.15	0.25	0.2
	35	Roles & responsibilities are displayed for managers and supervisors	0.05	0.5	0.5
Sales and Orders	36	Customers are segmented for order prioritization	0	0	0.11
	37	Orderwise production planning is undertaken	0.67	0.89	1
	38	Historical efficiency data is analyzed for business decisions regarding designs	0	0.1	0.08
All	Average of all practices	0.271	0.576	0.466	

Notes: Reports the 38 individual management practices for all treatment plants (both experimental and non-experimental, unbalanced panel) in 2008, 2011 and 2017.