Online Appendix

Towards Improving Factory Working Conditions in Developing Countries: An Empirical Analysis of Bangladesh Ready-Made Garment Factories

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Robustness Checks

Alternative Measures of Supplier Factory Size

We collected additional data and explored potential surrogate measures relating to supplier factory size. Specifically, we identify three additional variables that are correlated with supplier factory size (as shown in Table A-1 below), and can be used as controls for various aspects of supplier factory size: number of machines, factory square footage, and number of floors/stories associated with the factory. As shown in Table A-2, model estimation results including these additional variables (Models M2a, M2b, M2c and M3) are consistent with the original results pertaining to the effect of supplier factory size (M1) on supplier trustworthiness.

Table A-1. Pairwise Correlation between Number of Workers and Alternative Measures of Supplier Factory Size

	Mean	Median	SD	Min	Max	1	2	3
1. Factory Size	1301.95	1000	940.48	48	4500			
2. Total Floor Area (Square Feet)	90020.89	66000	77264.55	3400	380000	**0.52*** **		
3. Total Number of Stories	6.66	6	3.34	1	17	**0.27*** **	0.31***	
4. Number of Machines	420.36	324	295.87	20	1500	**0.38*** **	0.23***	0.04

Note: Based on 550 unique factories (after removing extreme values outside 2 x 1st and 3rd quartile for each variable).

Table A-2. Inclusion of Additional Variables Relating to Supplier Factory Size as Controls

Variable	M1	M2a:Machines	M2b:Areas	M2c:Stories	M3:Full Model
Intercept	0.95 (0.51) +	0.93 (0.52) +	0.89 (0.81)	1.09 (0.70)	0.82 (0.87)
Factory Age	-0.01 (0.00)	-0.01 (0.00)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Joint Inspection	0.31 (0.08) ***	0.34 (0.09) ***	0.38 (0.11) ***	0.38 (0.10) ***	0.37 (0.11) ***
Inspection Date	-0.00 (0.00) **	-0.00 (0.00) **	-0.00 (0.00)	-0.00 (0.00) *	-0.00 (0.00)
Area Division	0.20 (0.12)	0.19 (0.13)	0.28 (0.16) +	0.25 (0.14) +	0.30 (0.17) +
Bangladesh Small and Cottage Industries Corporation (BSCIC) Region	-0.14 (0.11)	-0.14 (0.12)	-0.14 (0.18)	-0.15 (0.14)	-0.10 (0.19)
Export Processing Zone (EPZ) Region	-0.02 (0.12)	-0.07 (0.13)	-0.19 (0.17)	-0.10 (0.14)	-0.18 (0.18)
Multi-building	0.27 (0.07) ***	0.26 (0.07) ***	0.20 (0.09) *	0.21 (0.08) **	0.22 (0.09) *
Multi-factory/Multi-purpose Building	-0.36 (0.09) ***	-0.35 (0.09) ***	-0.40 (0.14) **	-0.41 (0.10) ***	-0.30 (0.13) *
Factory Size (log)[b]	0.43 (0.05) ***	0.39 (0.05) ***	0.43 (0.08) ***	0.44 (0.05) ***	0.44 (0.07) ***
Structural Risk (log)[a]	-0.05 (0.03) +	-0.06 (0.04) +	-0.00 (0.06)	-0.05 (0.05)	0.02 (0.06)
Fire Risk (log)[a]	-0.01 (0.04)	-0.05 (0.04) +	-0.11 (0.05) *	-0.07 (0.04) +	-0.12 (0.05) *
Electrical Risk (log)[a]	-0.06 (0.04) *	-0.15 (0.03) ***	-0.17 (0.04) ***	-0.14 (0.04) ***	-0.18 (0.04) ***
Factory Size (log)[b] x Structural Risk (log)[a]	0.11 (0.03) ***	-0.00 (0.04)	-0.07 (0.07)	-0.05 (0.05)	-0.08 (0.07)
Factory Size (log)[b] x Fire Risk (log)[a]	-0.14 (0.03) ***	0.10 (0.03) **	0.13 (0.05) **	0.12 (0.04) ***	0.17 (0.05) ***
Factory Size (log)[b] x Electrical Risk (log)[a]	0.07 (0.03) *	0.07 (0.03) **	0.06 (0.05)	0.09 (0.04) **	0.04 (0.05)
Number of Machines (log)[b]		0.05 (0.04) +			0.05 (0.04)
Total Floor Area (Square Feet - log)[b]			0.10 (0.04) **		0.11 (0.04) **
Total Number of Stories (log)[b]				-0.02 (0.08)	0.02 (0.09)
AIC	3265.94	3131.60	1654.10	2277.65	1530.69
Log Likelihood	-1616.97	-1548.80	-810.05	-1121.82	-746.35
Num. obs.	936	896	506	663	474

*** p < 0.001, ** p < 0.01, * p < 0.05, + p < 0.1. One side test for main independent variables. [a] Normalized score in each type. [b] Centered score.

Additional Robustness Checks

We normalized the count measures of working condition risks by supplier factory size to ensure comparability of the measures across the sample. While normalization allows us to investigate the main effects of working condition risks, it does not allow us to examine the interaction effects associated with the risks here. As the results in Table A-3 indicate, the coefficients of the main effects of working condition risks on supplier trustworthiness are consistent with those from the main analysis, highlighting the robustness of our analysis.

Table A-3. Fixed-Effects Negative Binomial Regression Model with Robust Standard Errors (Risks are normalized by Supplier Factory Size)

Variable	M1:Base	M2a:Structural	M2b:Fire	M2c:Electrical	M3:Full
Intercept	0.76 (0.31) *	0.88 (0.46) +	0.94 (0.47) *	0.95 (0.47) *	0.94 (0.49) +
Factory Age	-0.01 (0.00) **	-0.01 (0.00)	-0.01 (0.00) *	-0.01 (0.00) +	-0.01 (0.00)
Joint Inspection	0.29 (0.07) ***	0.29 (0.09) **	0.30 (0.09) ***	0.27 (0.09) **	0.31 (0.09) ***
Inspection Date	-0.00 (0.00) ***	-0.00 (0.00) **	-0.00 (0.00) **	-0.00 (0.00) **	-0.00 (0.00) **
Area Division	0.26 (0.10) **	0.22 (0.12) +	0.22 (0.12) +	0.20 (0.12)	0.22 (0.13) +
Bangladesh Small and Cottage Industries Corporation (BSCIC) Region	0.08 (0.09)	-0.08 (0.11)	-0.09 (0.11)	-0.08 (0.11)	-0.12 (0.12)
Export Processing Zone (EPZ) Region	-0.02 (0.10)	-0.03 (0.12)	-0.04 (0.13)	-0.02 (0.13)	-0.04 (0.13)
Multi-building	0.32 (0.06) ***	0.31 (0.07) ***	0.24 (0.07) ***	0.25 (0.07) ***	0.26 (0.07) ***
Multi-factory/Multi-purpose Building	-0.23 (0.07) **	-0.34 (0.09) ***	-0.37 (0.09) ***	-0.35 (0.09) ***	-0.35 (0.09) ***
Factory Size (log)[b]	0.41 (0.04) ***	0.41 (0.05) ***	0.47 (0.05) ***	0.45 (0.05) ***	0.47 (0.05) ***
Structural Risk (log)[a] Normalized by Size		-0.03 (0.01) *			-0.02 (0.01) +
Fire Risk (log)[a] Normalized by Size			-0.03 (0.01) **		-0.02 (0.01) +
Electrical Risk (log)[a] Normalized by Size				-0.05 (0.01) ***	-0.04 (0.01) ***
AIC	5246.83	3498.40	3431.36	3461.70	3280.99
Log Likelihood	-2613.41	-1738.20	-1704.68	-1719.85	-1627.50
Num. obs.	1587	1007	978	986	936

*** p < 0.001, ** p < 0.01, * p < 0.05, + p < 0.1. One side test for main independent variables. a Normalized score in each type. b Centered score.
We normalize the risks by dividing the risk score by the factory size and then times 2000.

Additionally, we carried out analyses by splitting the sample into quartiles based on the supplier factory size variable to reduce unobserved heterogeneity effects associated at different levels of this variable. While such an approach results in a considerable reduction of sample size for each quartile, the results of this analysis shown in Table A-4 are qualitatively consistent with the main analysis results. Specifically, from smaller supplier factories to larger supplier factories, we observe that the magnitude of the negative main effect for electrical risk is reduced from (-0.22 to 0), although its interactions with factory size are no longer significant in each group (but still positive). This result is consistent with our main results that larger supplier factories have less impact from electrical risks. Further, the main effects for fire risk have negative signs but are only marginally significant in small and medium factory size groups. Interaction effects are positive and significant in medium to larger factory groups.

Table A-4. Fixed-Effects Negative Binomial Regression Model with Robust Standard Errors (Supplier Factory Size Subgroup Analysis)

Variable	M1:1st Quartile	M2:2nd Quartile	M3a:3rd Quartile	M3b:4th Quartile
Intercept	0.74 (1.48)	1.15 (2.04)	1.69 (1.56)	0.18 (0.92)
Factory Age	-0.01 (0.01)	-0.01 (0.01)	-0.02 (0.01)	0.00 (0.01)
Joint Inspection	-0.01 (0.23)	0.47 (0.21) *	-0.04 (0.25)	0.48 (0.27) +
Inspection Date	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00) +	-0.00 (0.00) +
Area Division	-0.04 (0.24)	0.08 (0.30)	0.21 (0.36)	0.79 (0.37) *
Bangladesh Small and Cottage Industries Corporation (BSCIC) Region	-0.30 (0.28)	-0.06 (0.23)	-0.89 (0.64)	0.07 (0.29)
Export Processing Zone (EPZ) Region	-0.13 (0.29)	-0.19 (0.32)	-0.04 (0.39)	0.09 (0.29)
Multi-building	0.40 (0.19) *	0.49 (0.15) **	0.12 (0.15)	0.22 (0.21)
Multi-factory/Multi-purpose Building	0.03 (0.24)	-0.31 (0.20)	-0.65 (0.23) **	-0.44 (0.27)
Number of Workers	0.60 (0.13) ***	0.61 (0.10) ***	0.48 (0.09) ***	0.32 (0.13) *
Structural Risk (log)[a]	-0.02 (0.10)	-0.12 (0.07) +	0.00 (0.07)	-0.06 (0.08)
Fire Risk (log)[a]	-0.11 (0.07) +	-0.06 (0.09)	-0.15 (0.09) +	-0.03 (0.12)
Electrical Risk (log)[a]	-0.22 (0.07) **	-0.20 (0.07) **	-0.08 (0.09)	0.00 (0.08)
Factory Size (log)[b] x Structural Risk (log)[a]	0.06 (0.11)	0.10 (0.09)	-0.13 (0.10)	0.06 (0.10)
Factory Size (log)[b] x Fire Risk (log)[a]	0.08 (0.11)	0.15 (0.09) *	0.26 (0.08) ***	0.13 (0.09) +
Factory Size (log)[b] x Electrical Risk (log)[a]	0.03 (0.07)	0.07 (0.08)	0.06 (0.10)	0.03 (0.11)
AIC	575.25	605.56	595.18	643.95
Log Likelihood	-271.62	-286.78	-281.59	-305.97
Num. obs.	169	185	166	177

*** p < 0.001, ** p < 0.01, * p < 0.05, + p < 0.1. One side test for main independent variables. [a] Normalized score in each type. [b] Centered score.

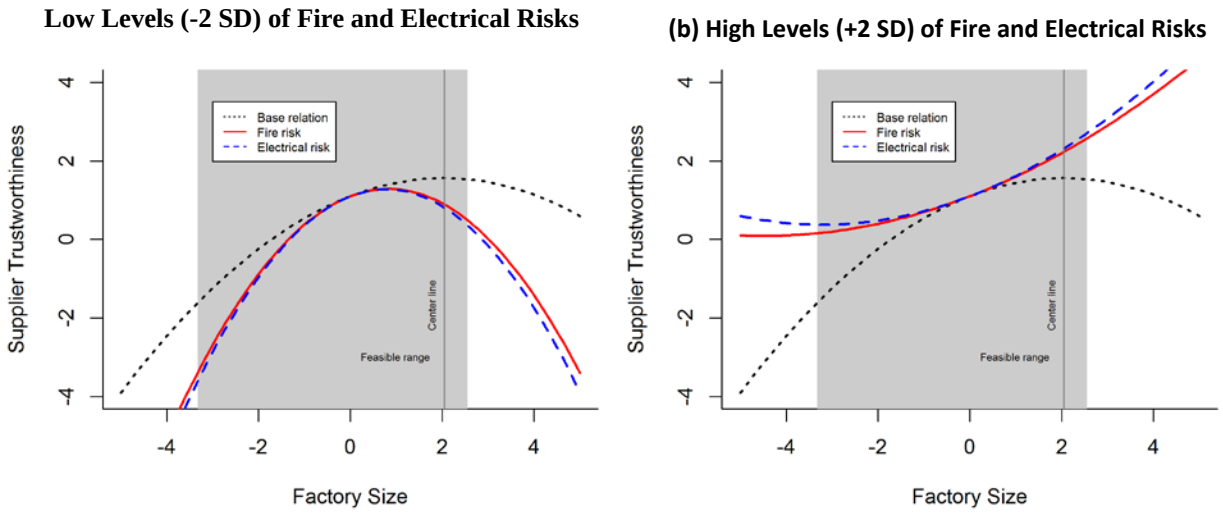
To check the possible U-shaped relationship between supplier factory size and supplier trustworthiness, we conducted an additional robustness check that includes the quadratic term of supplier factory size in our main analysis. The estimation results of models M1 and M2 in Table A-5 and Figure A-1 show that both the main and quadratic terms of supplier factory size are significant. However, the effect is not U-shaped, but rather, inverted U-shaped. We further check how the quadratic term interacts with working condition risks. We find that the interactions are significant and positive with fire and electrical risks, which is consistent with our main analysis (as shown in Table 2). Further, the U-shaped relationship is observed for factories where fire and electrical risks are high. To evaluate our linear relationship argument between working condition risks and supplier trustworthiness, we systematically check the range of the quadratic effect. Within the feasible range of supplier factory size, there is a increasing trend and the center line is close to the maximum value for supplier factory size. Such a trend holds for both when the risks are high (+2 sd from the mean) and when the risks are low (-2 sd from the mean).

Table A-5. Fixed-Effects Negative Binomial Regression Model with Robust Standard Errors (Quadratic Term for Supplier Factory Size)

	Dependent Variable: *Supplier Trustworthiness*	
Variable	**M1**	**M2**
Intercept	1.06 (0.11) ***	1.11 (0.11) ***
Factory Age	-0.01 (0.00) ***	-0.01 (0.00) ***
Joint Inspection	0.31 (0.02) ***	0.32 (0.03) ***
Inspection Date	-0.00 (0.00)	-0.00 (0.00)
Area Division	0.21 (0.23)	0.19 (0.23)
Bangladesh Small and Cottage Industries Corporation (BSCIC) Region	-0.13 (0.06) *	-0.15 (0.09) +
Export Processing Zone (EPZ) Region	-0.03 (0.05)	-0.04 (0.04)
Multi-building	0.27 (0.06) ***	0.27 (0.05) ***
Multi-factory/Multi-purpose Building	-0.35 (0.01) ***	-0.37 (0.00) ***
Factory Size (log)[b]	0.47 (0.00) ***	0.45 (0.00) ***
Structural Risk (log)[a]	-0.05 (0.04)	-0.04 (0.03) +
Fire Risk (log)[a]	0.01 (0.01) +	-0.05 (0.01) ***
Electrical Risk (log)[a]	-0.13 (0.05) **	-0.19 (0.04) ***
Factory Size (log) - Squared	-0.08 (0.02) ***	-0.11 (0.02) ***
Structural Risk (log)[a] x Factory Size (log) – Squared		-0.02 (0.03)
Fire Risk (log)[a] x Factory Size (log) – Squared		0.08 (0.02) ***
Electrical Risk (log)[a] x Factory Size (log) – Squared		0.09 (0.01) ***
AIC	3273.73	3263.07
Log Likelihood	-1622.87	-1614.54
Num. obs.	936	936

*** p < 0.001, ** p < 0.01, * p < 0.05, + p < 0.1. One side test for main independent variables. [a] Normalized score in each type. [b] Centered score.

Figure A-1. Quadratic Relationship between Supplier Factory Size and Supplier Trustworthiness



Finally, we recognize that the measure of supplier trustworthiness in our study—based on the number of retailers contracting with a supplier factory—may not reflect heterogeneity in the contracting relationship across retailers in terms of order quantities (volume) and the monetary value of a contract associated with each retailer. Our follow up with Alliance and Accord indicated that such data are not collected by either consortium. Nonetheless, we collected additional data on Corrective Actions Plans (CAPs) that track the progress made by supplier factories in terms of the percentage of safety violations

addressed. These data is only available for the Accord consortium. While Accord attempts to provide financial assistance to supplier factories for corrective actions (that typically ranges from $250,000-350,000 per supplier factory (Accord 2015)), it can be argued that the extent of progress made by a supplier is likely to be indicative of supplier attitudes and motivation toward following up on commitments made to retailers on remediation efforts.

Taking this information into account, we created a formative measure of supplier trustworthiness that comprises of both: (i) number of retailers and (ii) percentage of safety violations addressed. As shown in Table A-6, the estimation results using this new variable are largely consistent with the results of the main analysis (as shown in Table 2), thereby highlighting the robustness of our dependent variable: supplier trustworthiness.

Table A-6. Negative Binomial Regression Model with Robust Standard Errors using Accord Data on Corrective Action Plans (CAP) Progress

	Dependent Variable: ***Supplier Trustworthiness [Composite Measure]***
Variable	
Intercept	-0.83 (0.27) ***
Factory Age	-0.01 (0.01)+
Joint Inspection	0.31 (0.10) ***
Inspection Date	-0.00 (0.00) ***
Area Division	0.46 (0.12) ***
Bangladesh Small and Cottage Industries Corporation (BSCIC) Region	-0.21 (0.12) +
Export Processing Zone (EPZ) Region	-0.07 (0.13)
Multi-building	0.25 (0.07) ***
Multi-factory/Multi-purpose Building	-0.32 (0.10) ***
Factory Size (log)[b]	0.50 (0.05) ***
Structural Risk (log)[a]	-0.02 (0.04)
Fire Risk (log)[a]	-0.07 (0.04) *
Electrical Risk (log)[a]	-0.11 (0.03) ***
Factory Size (log)[b] x Structural Risk (log)[a]	0.01 (0.04)
Factory Size (log)[b] x Fire Risk (log)[a]	0.10 (0.03) ***
Factory Size (log)[b] x Electrical Risk (log)[a]	0.05 (0.03) *
AIC	2846.58
Log Likelihood	-1405.29
Num. obs.	714

*** p < 0.001, ** p < 0.01, * p < 0.05, + p < 0.1.
One side test for main independent variables. [a] Normalized score in each type. [b] Centered score.