

Does Trade with Multinationals Induce Greener Production?

Evidence from the Bangladesh Fashion Industry

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Motivation

- The simultaneous pursuit of economic growth and environmental sustainability is among the major challenges faced today
- International trade functions as a primary driver of economic growth for many developing economies
- Impact on environmental pollution of international trade is mixed (*Bombardini and Li 2020; Cherniwchan 2017; Copeland et al., 2021*)
- Multinationals and their foreign affiliates contribute to two-thirds of international trade (*OECD 2018*)
- Labor standards improved with more responsible sourcing and enforcement by the MNCs, but environmental concerns did not get the same attention (*Boudreau 2023*)

This Paper

- We conduct the first study to investigate whether multinationals responsible sourcing improves the quality of the local environment
 - Does exporting to brand firms compared to non-brand firms impact water pollution differently?
- We analyze the impact of RMG export on environmental pollution in Bangladesh

Data

- Export customs records (National Board of Revenue)
 - bill of entry in 2014-2021 (ASYCUDA)
 - buyers' information (brand vs. non-brand)
 - suppliers' transaction information| shipment dates, value and weights, HS codes, etc.
 - factory addresses converted to latitude and longitude and verified by Google Maps
- Water quality data (Department of Environment)
 - in 2010-2019
 - 127 unique monitoring stations in rivers all over the country
 - monthly data on dissolved oxygen (DO) and biochemical oxygen demand (BOD)

Who are the Brands? Fashion Transparency Index

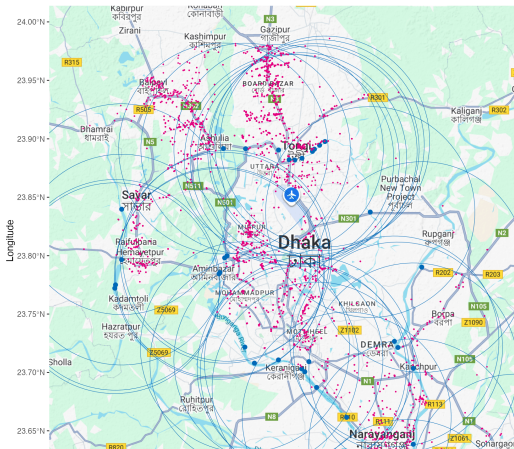
- Fashion Revolution | world's largest fashion activism movement post Rana Plaza



Rank	Brand Name	2021 Final Scores
1	OVS	196
2	H&M	168.75
3	The North Face	164.25
4	Timberland	164.25
5	C&A	162.75

Identification: Water Quality Monitoring Stations and RMG Factories

- Factories assigned to the closest stations within a 10 km buffer
- Only use factories located upstream of monitoring stations



FE Approach: Effects on Water Pollution

$$\operatorname{arcsinh}(\text{WaterQuality}_{i,m,y}) = \delta_i + \theta_m + \gamma_y + \beta_{fe} \text{Export}_{i,m,y} + \varepsilon_{i,m,y} \quad (1)$$

where i is monitoring station, m is month-of-year, and y is year

- $\text{Export}_{i,m,y}$: Exporter shares around each monitoring station i in month m in year y
- The inverse hyperbolic sine transformation allowing for zero observations using natural logarithmic approximation
- Station-level fixed effects, δ_i , Month fixed effects, θ_m , and year fixed effects γ_y are used
- Standard errors clustered at the monitoring station level

Results: Effect of Export Shares on Water Quality (DO)

	All Exports			Exports to Brands		
	(1)	(2)	(3)	(4)	(5)	(6)
Export Share	-0.225 (0.230)	-0.225 (0.202)	-0.411* (0.211)	0.031 (0.095)	0.031 (0.079)	0.029 (0.115)
Number of observations	1,339	1,339	1,267	1,339	1,339	1,267
R ²	0.708	0.708	0.704	0.708	0.708	0.702
Level of clustering SE	Station	River	Station	Station	River	Station
Grouping nearby stations	NO	NO	YES	NO	NO	YES
Mean of Dep. Variable	3.159	3.159	3.370	3.159	3.159	3.370

Notes: This table reports the two-way fixed effects regressions estimates. We include station-fixed effects, year-fixed effects, and month-fixed effects in the regressions. Standard errors are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Columns 3 and 6 present the results when averaging the water quality data from stations located within 1 km of each other.

Staggered DiD Approach: Brand vs. Non-brand

$$\operatorname{arcsinh}(\text{WaterQuality}_{i,m,y}) = \beta_{\text{DiD}} \text{ExportBrand}_{i,m,y} + \delta_i + \theta_{my} + \varepsilon_{i,m,y}, \quad (2)$$

where i is monitoring station, m is month-of-year, and y is year

- $\text{ExportBrand}_{i,m,y}$ turns to one and remains one when more than 50% of the firms surrounding station i starts exporting to brand firms.
- year-by-month fixed effects, θ_{my} ; more conservative measure to enhance the validity of parallel trend assumption
- Callaway and SantAnna (2021) estimator that is robust to negative weights in the staggered DiD setting

Results: Exports to Brand Multinationals on Water Quality

	arcsinh(DO)			
	(1)	(2)	(3)	(4)
ATT	0.390** (0.179)	0.390*** (0.137)	0.522*** (0.186)	0.394* (0.211)
Level of clustering SE	Station	River	Station	Station
Grouping nearby stations	NO	NO	YES	NO
Time Unit	Monthly	Monthly	Monthly	Quarterly

Notes: This table reports the estimated ATT from the Callaway and SantAnna (2021) estimator. We include station-fixed effects and year-by-month-fixed effects (or year-by-quarter fixed effects) in the regressions. Standard errors, clustered at the station or river level, are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

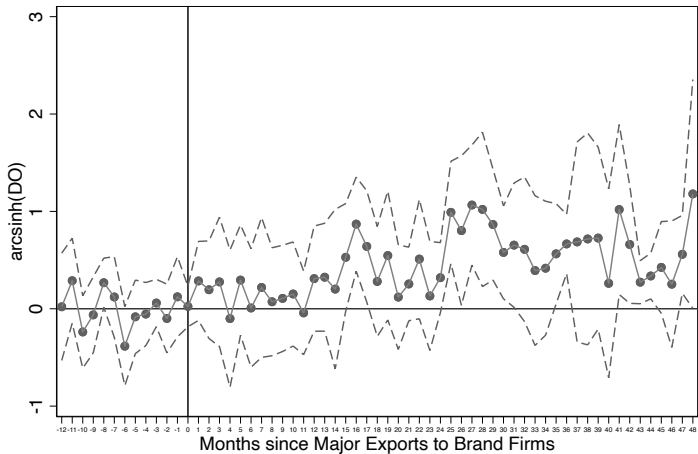
- Alternative outcome - BOD decreases by 73.4%

Event Study Specification

$$\operatorname{arcsinh}(\operatorname{WaterQuality}_{i,m,y}) = \sum_{\tau=-\underline{\tau}}^{\bar{\tau}} \beta_{\tau} \operatorname{ExportBrand}_{i,\tau} + \delta_i + \theta_{my} + \varepsilon_{i,m,y}, \quad (3)$$

- To examine pre-trends and the dynamic evolution of the treatment effects
- $\operatorname{ExportBrand}_{i,\tau}$ serves as a treatment indicator for each month relative to the start of major exports to brand multinationals

Results: Event Study



Policy Implications I

- **Strengthening Environmental Regulation Enforcement:** The Bangladesh government has established environmental standards, but enforcement remains weak. The findings suggest that leveraging private enforcement mechanisms such as multinational buyers' requirements could complement public regulatory efforts.
- **Introducing a Pollution Monitoring and Warning System:** Since exporters are often clustered in specific areas, the government could implement a real-time pollution alert system using data from water monitoring stations.
- **Harmonizing Environmental Certification Requirements:** A unified certification system, endorsed by both the government and international buyers, could reduce compliance burdens while maintaining high environmental standards.

Policy Implications II

- **Encouraging Multinationals to Support Green Production:** Policymakers should explore partnerships between multinational firms and local manufacturers to promote technology transfer and investment in cleaner production methods.
- **Global pressure on Non-Brand Buyers:** Non-brand buyers are less effective in addressing pollution concerns in source countries
 - To enhance environmental compliance among these firms, policymakers, consumer advocacy groups, and regulatory bodies in the West should exert greater pressure.
 - Strengthening consumer awareness and implementing stricter environmental due diligence requirements for all buyers.

Thank You

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