E ects of Safety Law Enforcement on the Manufacturing Industry in a Developing Country: Evidence from a Multinational Involvement in the Apparel Sector of Bangladesh [1]

Shahida Pervin[2]
National Graduate Institute for Policy Studies (GRIPS), Japan

Abstract

Industrial workplace safety and workers' rights remain vulnerable in many developing countries. While developing countries need to accelerate the performance of their industrial sectors to address issues like unemployment and poverty, they must also address the safety and security of their workers. Bangladesh has faced increased scrutiny of its apparel export sector since the deadly collapse of Rana Plaza that killed more than 1100 workers and left injured more than 2500. Aiming to improve workplace safety and worker rights, international buyer groups, the Government of Bangladesh, ILO, and other organizations have taken various actions. The international buyer groups, Accord and Alliance, completed their initial ve years tenure in December 2018. This study empirically compares the export-oriented apparel sector to non-apparel sectors before and after the international surveillance episode. The study nds that in the decade prior to the Rana Plaza collapse and international involvement, places where apparel was the dominant manufacturing sector experienced substantially higher employment growth compared to places without apparel. Over the subsequent decade, this trend reversed. In fact, registered employment declined in apparel-dominant places while it increased in places without apparel. The main contribution of this study is quantifying the potential trade-o between worker safety and employment opportunities.

[1] Work in progress

[2] I am thankful to my advisor Stephan Litschig, Associate Professor, National Graduate Institute for Policy Studies (GRIPS), Japan, for his guidance in conducting this research.

1. Introduction

Over time with the global progress towards industrialization, the safety focus of the manufacturing industry has evolved and varies with the status of the country's development. Industrial workplace safety and workers' rights remain vulnerable in many developing countries. While developing countries need to accelerate the performance of their industrial sectors to address issues like unemployment and poverty, they must also address the safety and security of their workers. While undertaking safety measures improves safety conditions, there are factors to discourage the required measures. Akbar and Ahsan (2019) nd that most signi cant challenges are related to cost and nancial concerns and factory capacity and capability issues. Cohn and Wardlaw (2016) reveal that nancing friction has adverse investment impact on workplace safety that has implications for worker welfare and rm value. There is also evidence of safety improvement without much economic cost. Kerrissey and Schuhrke (2016), studying 51 countries of global south during 1985 to 2002, show that strengthening collective labor rights, increased links with INGOs are associated with fewer workers' deaths while the economic indicators like economic globalization, foreign direct investment and exports do not have signi cant relationship to fatalities. Abad et al. (2013) in an assessment of consequences of OHSAS 18001 certi cation process on safety performance and labor productivity of Spanish rms for the period 2006{2009 show that the adoption of the OHSAS 18001 has signi cantly positive e ects on safety performance and labor productivity. Implementations of the Occupational Safety and Health Act (OSHA) in 1970 draws quite a few evaluating studies in the USA (Bartel and Thomas, 1982; Gray and Scholz, 1990; Gray and Mendelo , 2002). Studies cover individual-level safety intervention, safety training, group and organizational context, supervisory and managerial safety commitment (Aburumma et. al., 2019;

injuries, fatalities, and occurrences of occupational disease are high in many countries including Bangladesh. Safety improvement requires additional expenses, where su cient safety assurance already does not exist. However, a big part of safety improvement comes from owners' caring, awareness, and workers' responsiveness, which may not necessarily incur additional costs. For example, using a re exit or keeping the main door unlocked may not need additional cost but care. On the other hand, to improve infrastructure and logistics, install safety tools need additional expenses. Being an underdeveloped industrial sector in a least developed country, both lacking have been the reality in the manufacturing sector of Bangladesh. After the deadly collapse of Rana Plaza that killed more than 1100 workers and left injured more than 2500, Bangladesh has faced increased scrutiny of its export sector, and an international buyer group became active (Greenhouse, 2013; Ministry of Labor and Employment, 2013). In 2013, about 250 European and American companies who sourced from Bangladesh's RMG sector signed two initiatives, Accord and Alliance, respectively, aiming to improve workplace safety and worker rights in 2300 factories. Since then, the Government of Bangladesh, the International Labor Organization (ILO), and other organizations have also taken various actions. Accord and Alliance completed their initial ve years tenure in December 2018. This study will help understand the implication of safety measures in the industrial sector from a developing country perspective where existing practices undermine the workers' safety and security.

Over the period, the garments industry progressed tremendously in safety compliance under three plans of actions with the most signi cant progress in structural assessment of RMG factory building (Ansary and Barua, 2015). During the surveillance period buyers organization committed to share a tiny portion of the safety improvement cost lately for them who cannot afford the expenses otherwise. However, this may not be enough to survive

in this country of high unemployment, particularly the youth unemployment. My interest in this research is to empirically assess whether the international buyers' organization led workers' safety and welfare scrutiny contributed to the sector's performance, particularly in terms of employment. Empirical approach of this study is to compare the export-oriented garments sector to non-garment sectors before and after the international surveillance episode. While the level of performance di ers across these sectors, the rate of change may have been similar prior to the spike in international enforcement. I expect to nd adverse e ect on the sector in terms of employment and overall industry performance, and perhaps positive impacts on workers' well-being through improved workplace safety. The main contribution of this study is quantifying the potential trade-o between worker safety and employment opportunities.

In this study with progress so far, I compare high apparel employment share upazila (similar geography to thana/sub-district) with low one in 2009 and 2019. I use 2001 and 2011 total employment to know the pre-treatment trend of employment. Expected mean of log of employment of the comparison upazila in 2001 is 10.95. Employment is 68 percent higher in upazilas that have apparel share in the total employment above 40 percent. Between 2001 and 2011 employment increased 14 percent in the comparison groups which is 41 percent in high apparel upazilas over low apparel upazila. Expected mean of log of registered employment of the low apparel intensive upazila in 2009 is 8.05. Di erence in means in the base period between high and low apparel share upazila exhibits very high employment in the apparel dominant upazila; registered employment is 297 percent higher. Registered employment increases 51 percent in comparison group but decreases 79 percent in treatment group over comparison group between 2009 and 2019. Log of number of establishment is 4.71 in comparison group in 2009. Number of establishment is likely to be 146 percent higher if the upazila has apparel share above 40 percent in 2009. In 2019 number of establishment in comparison group is 37 percent higher but number of establishment is 46 percent lower in treatment upazila over comparison upazila. Mean employment in comparison upazilas in 2001 about 66 thousand, high apparel upazilas more than double that level of employment. Between 2001 and 2011 total employment increased by about 1000 per year in comparison group. In high

ity. Estimated treatment e ects on wages are negative but are also close to zero and not statistically signi cant. Finally, estimated treatment e ects on employment are close to zero. Overall, the study documents a signi cant improvement in labor law compliance due to the intervention. This study has experimented with a speci c type of safety measure, safety committee assignment, only for one year on 84 factories that are covered by Accord. A world bank policy paper evaluates the e ect of the reform on garment workers using the labor force survey data. The study revealed that although there is some improvement in terms of sick leave and workplace safety measures, it has damaging consequences in job security and wage(Bossavie,L., Cho, Y., and Heath, R., 2019). Jacobs and Singhal (2017) study 39 publicly traded global apparel retailers who have signi cant garment sourcing in Bangladesh to examine if the Rana Plaza building collapse has motivated the rms to source production in high-cost developed countries rather than low-cost developing countries. The study has not found any signi cant e ect except the negative stock market e ect to retailers on the collapse day, the magnitude and signi cance of which was dissipated by the following day. Instead, as the study mention, they reacted by developing two di erent agreements to improve factory and worker safety in Bangladesh |the Accord on Fire and Building Safety in Bangladesh (AFBSB) and the Alliance for Bangladesh Worker Safety (ABWS). While the above study is useful to know the demand side response of the sector, it is also important to know the supply side response.

2. Background

RMG industry is the major industrial sector in predominantly informal sector driven economy of Bangladesh. Over time it has become the single most important export-oriented sector in Bangladesh. The sector's share in the total export of the country was 3.90 percent in 1983-84, which has been 79.33 percent in 2008-09, 81.1 percent in 2013-14 and 84.21 percent in 2018-19 (Figure 1 (a)). Being one of the main foreign exchange earning sectors of the economy among two, RMG and remittance, RMG has been enjoying uncompetitive support in the country.

Solidarity Center reports the accidents of garment sector with factory name, location, date, injuries, death and a little description of causes and outcome during November 14, 2012 {November 19, 2019 (Table 1). When we deduct 1134 deaths and 2500 injuries from period 2012-2019, the death and injuries become much lower in the later period compared to the earlier period 2005-2009. The statistics may not be complete and comparable, but we can have a sense of safety condition from the following table.

3. Data and Method

3.1. Data

Bangladesh's statistical agency, `Bangladesh Bureau of Statistics (BBS)' produces all the data I am using. The main data for this study come from two business censuses {Business Register 2009 (hereafter BR2009) and Business Directory 2019 (hereafter BD2019) and two population censuses {2001 and 2011. I purchased BR2009 and BD2019 datasets from the BBS. In BR2009 dataset, number of establishment level entry is 100194. In the BD2019, the number of establishment level entry is 127042. The minimum size of establishment in terms of number of establishment is 10 in the business censuses. In the industrial classi cation code, two digit codes 13 is for textiles and 14 for apparel industry. I only identify these two types of industry because apparel industry is our treatment group, textile industry might be somewhat connected with the apparel industry and all others are in control group.

Population census is good microdata for person's employment status, the data is collected at individual level but not at the establishment level and also detailed information is not there. I use population censuses 2001 and 2011 to observe the employment trend situation of pre-treatment period. I collected census data from IPUMS International (2020). Publicly available census data contain 10 percent observations of 2001 census and ve percent observations of the 2011 census. The information was collected through direct interviews with everyone who spent the survey night in Bangladesh. 2001 sample census is systematic samples of every 10th dwelling with a random start, drawn by IPUMS. 2011 sample census is a systematic sample of every 10th dwelling with a random start, drawn by BBS.

azila equivalent, I checked the change, split and merge of upazila between 2009 and 2019, and accordingly change the 2019 upazila. To address this, I searched upazila website, open google search and best guess using existence and non-existence of this or related upazila in the years. After this adjustment total number of upazila in 2019 535 which is same as 2009 except Mirsharai. Then I adjust 2009 and 2019 upazila in line with population censuses.

The baseline year is 2009 { pre-treatment year of available business census data. I distinguished the upazilas by share of apparel employment in the total registered employment of the upazila. The highest share of apparel employment in total registered employment in upazila is 83 percent in 2009. Taking about the middle percent share, I consider upazilas in 2009

$$t = \begin{cases} 1 & \text{year after treatment (in business census regression 2019, in population census 2011)} \\ 0 & \text{year before treatment (in business census regression 2009, in population census 2001)} \end{cases}$$

$$D_u = \begin{cases} 1 & \text{apparel share in total employment is above 40 percent in the upazila } u \\ 0 & \text{otherwise (otherwise)} \end{cases}$$

The safety law implementation after the Rana Plaza occurrence, particularly by Accord and Alliance, can be taken as exogenous. The buyer organizations enforced the safety law to the export-oriented RMG rms. Though the participation was voluntary, the export-oriented rms had no other choice except going local or out of business. Needless to say, shifting

servation upazilas (500 in each year), second columns for 860 (430 in year) observations that exclude upazilas with 0<apparel share 40%, and third columns for 826 (413 in each year) observations that exclude upazilas with 0< apparel share 40% and textile share>

apparel share above 40 percent in 2009. In 2019 number of establishment in comparison group is 45 [.33 .41] percent higher but number of establishment is 36 [-.68 -.23] percent lower in treatment upazila over comparison upazila. The results of rst column in the regression tables are plotted in corresponding gure. In the diagram, horizontal axis shows the share of apparel employment in the upazila and vertical line plots the pre and post year's mean value from zero. The round points are di erence of value in each upazila between 2009 and 2019. The solid lines present the mean value of di erence for upazila with apparel share 40% and apparel share 40%. The The continuous dot line indicates zero.

Second column in the tables presents regression result excluding the upazila that has apparel share between 0 and weakly lower than 40 percent. By dropping moderate shared apparel upazila, I can observe if the regression results are driven by some very high share of apparel upazila. From second column we do not see such an evidence. Even though the magnitude of change variables have increased and comparison upazila's mean value in base year has decreased slightly, there is no change in level of signi cance and direction of the results. In the base regressions all the coe cients are already signi cant at 1 percent level and in the robustness check regression of column two results remain similar. In addition to moderate share apparel upazila, I drop upazilas that have textile share more than 50 percent in column 3. Textile is very close to apparel sector; hence, there is chance of in uence of one sector to another through market linkage. Excluding high textile share upazila can change our result signi cantly if there is such in- uence. However, we do not see noteworthy change in the result. We can consider this as spillover e ect, which is not observed in the result. The result remain robust.

The ndings are consistent with pattern of employment in Bangladesh. The sheer size of employment in Bangladesh is in informal sector and in the formal sector apparel industry has been playing big role. As a re ection, we see big di erence between apparel and non-apparel sector dominant upazila in Panel (B) of business census data, which is not apparent in Panel(A) of

employment dominant upazila's employment is signi cantly higher in 2019 compared 2009, similar is apparent in total employment too. Comparison upazilas increase registered employment by about 5 percent per year between 2009-2019. This is expected in a country with more working age population. However, di erential change in treatment group Dy2019int, apparel dominant upazila observed a signi cant decline in registered employment in 2019, meaning high apparel upazilas show no increase in registered employment over this period, instead it decreased. This is the expected result in the wake of massive safety scrutiny.

However, I do not come to the concrete conclusion given that our conventional common trend in the pre-treatment period does not hold.

5. Conclusion

In this paper, I study the labor market and industry's outcome in terms of employment of the safety improvement in the readymade garment industry in Bangladesh led by international buyers' organisation.

I nd that in the decade prior to the Rana Plaza collapse and international involvement, places where apparel was the dominant manufacturing sector experienced substantially higher employment growth compared to places without apparel. Over the subsequent decade, this trend reversed. In fact, registered employment declined in apparel-dominant places while it increased in places without apparel.

This is my ongoing project. I am trying to explore the implications further with di erent data and methodological settings.

References

Abad, J., Lafuente, E. and Vilajosana, J. (2013). An Assessment of the

Burke, M. J., Salvador, R. O., Smith-Crowe, K., Chan-Sera n, S., Smith, A. and Sonesh, S. (2011). The Dread Factor: How Hazards and Safety Training In uence Learning and Performance. Journal of Applied Psychology, 96(1), pp. 46{70.

Cohn, J. B. and Wardlaw, M. I. (2016). Financing Constraints and Workplace Safety. The Journal of Finance, 71(5), pp. 2017-2057

Flin, R., Mearns, K., O'Connor, P. and Bryden, R. (2000). Measuring Safety Climate: Identifying the Common Features. Safety Science, 34 (1{3), pp. 177{192.

Goldenhar, L.M. and Schulte, P.A. (1996). Methodological Issues for Intervention Research in Occupational Health and Safety. American Journal of Industrial Medicine, 29, pp. 289{294.

Gray, W. B. and Mendelo , J. M. (2002). The Declining E ects of OSHA Inspections on Manufacturing Injuries: 1979 to 1998. Working Paper, 9119. National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, MA 02138. August 2002.

Gray, W. B. and Scholz, J. 1. (1990). Are OSHA Health Inspections Effective? A Longitudinal Study in the Manufacturing Sector. Working Paper 3233. National Bureau of Economic Research, 1050 Massachusetts Avenue, Cambridge, MA 02138. January 1990

Greenhouse, S. (2013). Major Retailers Join Bangladesh Safety Plan. The New York Times. https://www.nytimes.com/2013/05/14/business/global/hm-agrees-to-bangladesh-safety-plan.html (accessed on 2 February 2020)

Hale, A.R., Guldenmund, F.W., van Loenhout, P.L.C.H., Oh, J.I.H. (2010). Evaluating Safety Management and Culture Interventions to Improve Safety: E ective Intervention Strategies. Safety Science, 48, pp. 1026{1035.

Hammer, L. B., Truxillo, D. M., Bodner, P., Amy, C. and Richman, A.

(2019). Exploration of the Impact of Organisational Context on a Workplace Safety and Health Intervention. Work & Stress, 33(2), pp. 192{210.

Hofmann, D. A., Burke, M. J. and Zohar, D. (2017). 100 Years of Occupational Safety Research: From Basic Protections and Work Analysis to a Multilevel View of Workplace Safety and Risk. Journal of Applied Psychology, 102(3), pp. 375{388.

ILO (2020). Understanding the Gender Composition and Experience of Ready-Made Garment (RMG) Workers in Bangladesh. Issue Brief. International Labour Organization.

IPUMS International (2020). IPUMS, Minnesota Population Center. Integrated Public Use Microdata Series, International: Version 7.3 [dataset]. Minneapolis, MN: IPUMS, 2020.

Jacobs, B. W. and Singhal, V. R. (2017). The E ect of the Rana Plaza Disaster on Shareholder Wealth of Retailers: Implications for Sourcing Strategies and Supply Chain Governance.Journal of Operations Management, 49{51, pp. 52-66.

Kerrissey, J. and Schuhrke, J. (2016). Life Chances: Labor Rights, International Institutions, and Worker Fatalities in the Global South. Social Forces, 95(1), pp. 191-216.

Leitao, S. and Greiner, B. A. (2016). Organisational Safety Climate and Occupational Accidents and Injuries: an Epidemiology-based Systematic Review. Work & Stress, 30(1), pp. 71{90.

Ministry of Labour and Employment (2013). National Tripartite Plan of Action on Fire Safety and Building Integrity in the Ready-Made Garment Sector in Bangladesh. Dhaka: Ministry of Labour and Employment, Bangladesh.

OSHE (2014). Occupational Accident Statistics in Bangladesh: Reality, problems and challenges

Solidarity Center (2019). Fire and Other Safety Incidents in the Bangladesh Garment Sector

The Guardian (2018). Rana Plaza, ve years on: safety of workers hangs in balance in Bangladesh. https://www.theguardian.com/global-development/2018/apr/24/bangladesh-police-target-garment-workers-union-rana-plaza- ve-years-on

Table (1) Injuries and deaths in RMG industry

	2005 and 2009	Nov 24, 2012 { Nov 19, 2019
Killed	6,261	1,310
Injuries	11,783	3,883
Total	18044	5193
Source:	OSHE (2014)	Solidarity Center (2019)

Note: Solidarity center's news paper tracking contains 1134 deaths and 2500 injuries during rana plaza collapse on 24 April 2013.

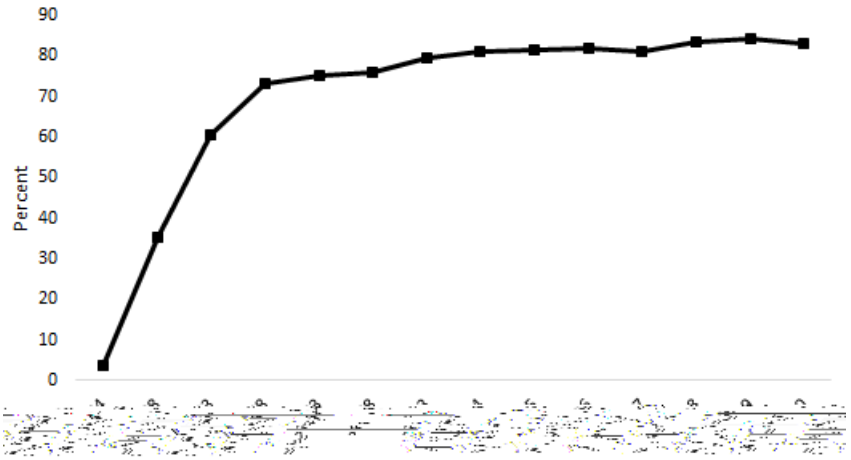
Table (2) Log employment in the upazilas between 2001 and 2019

VARIABLES	Total employment	Total employment	Total employment
Panel A: Population census 2001 and 2011			
2009 apparel			
share > 40%	0.68***	0.75***	0.76***
	(0.165)	(0.165)	(0.165)
y2011	0.14***	0.12***	0.12***
	(0.00753)	(0.00762)	(0.00787)
Dy2011int	0.41***	0.43***	0.43***
	(0.0615)	(0.0615)	(0.0615)
Constant	10.95***	10.87***	10.86***
	(0.0267)	(0.0280)	(0.0286)
Panel B: Business census 2009 and 2019			
2009 apparel			
share > 40%	2.97***	3.20***	3.26***
	(0.301)	(0.301)	(0.301)
y2019	0.51***	0.53***	0.56***
	(0.0271)	(0.0278)	(0.0277)
Dy2019int	-0.79***	-0.81***	-0.83***
	(0.171)	(0.171)	(0.171)
Constant	8.05***	7.82***	7.76***
	(0.0476)	(0.0426)	(0.0408)
Observations	1,000	860	826
Sample upazila	all	excl. 0<apparel share 40	excl. 0<apparel share 40 and textiles share>50

Table (3) Log of total registered establishment count in the upazila 2009

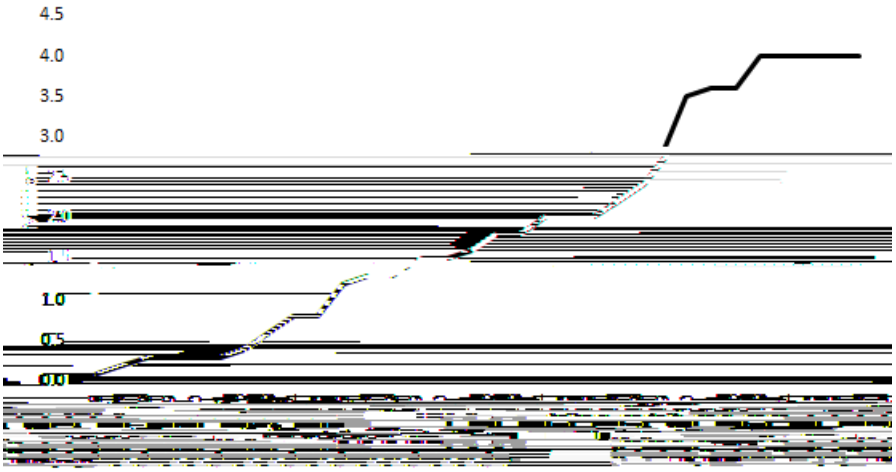
Figure (1) Total export and employment in RMG industry of Bangladesh

(a) Percent share of RMG to Total Export



Source: BGMEA, https://www.bgmea.com.bd/page/Export Performance

(b) Number of RMG employment in million



Source: ILO (2020) (original source BGMEA, http://bgmea.com.bd/home/pages/TradeInformation does not exists any more)

Figure (2) Di erence in log employment

(a) Di erence in log employment 2011 and 2001

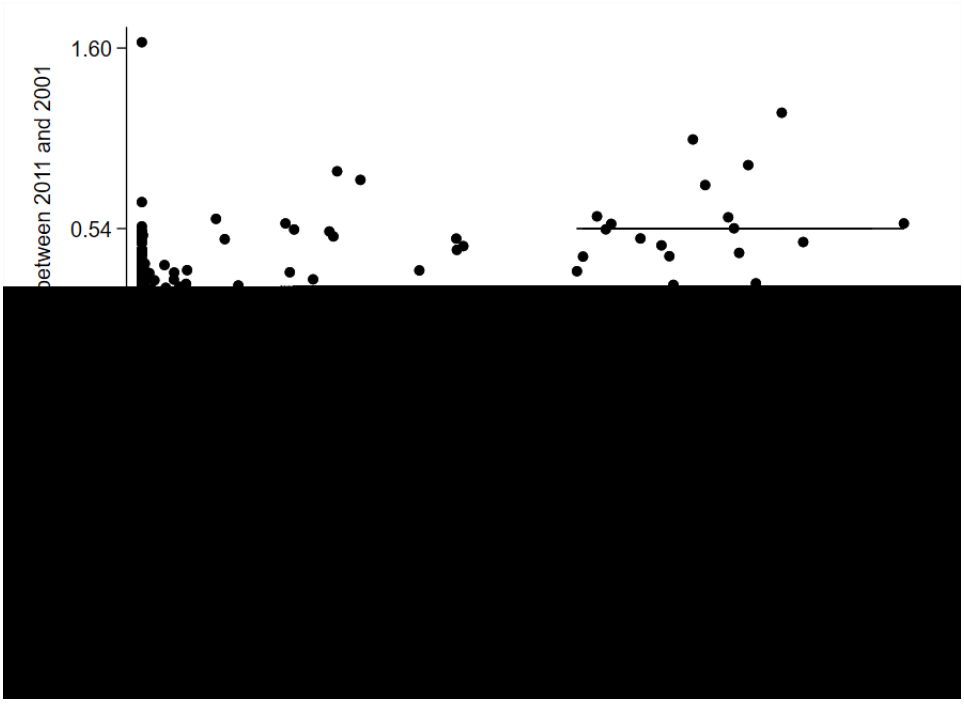
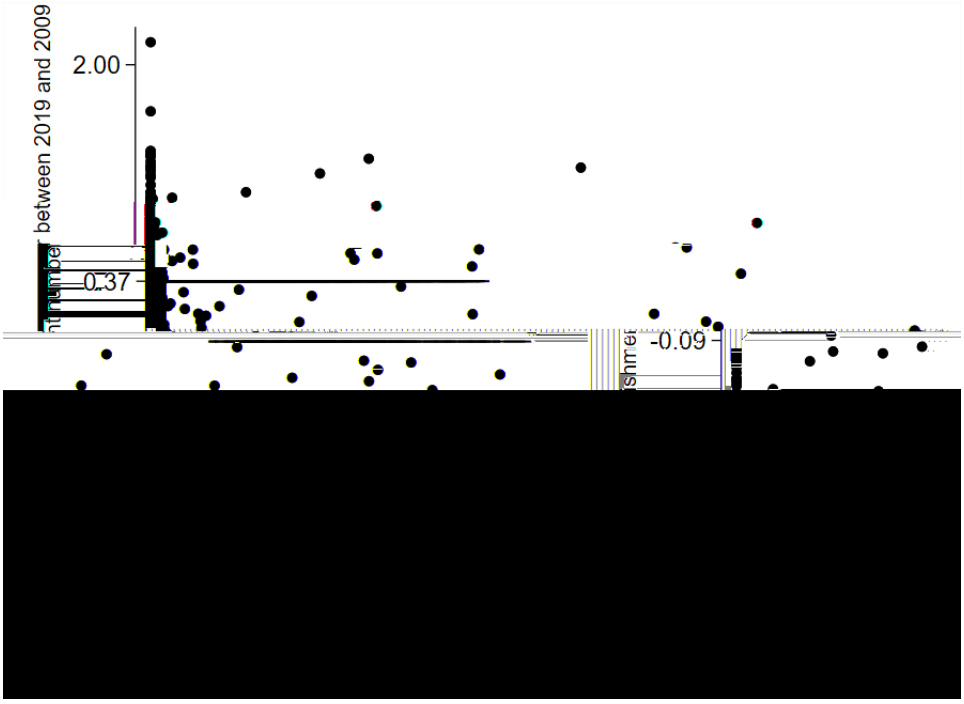


Figure (3) Di erence in number of establishment



Appendix

Table (4) Total employment in the upazila between 2001 and 2019

VARIABLES	Total employment	Total employment	Total employment
Panel A: Population census 2001 and 2011			
2009 apparel			
share > 40%	83,182***	88,620***	88,962***
	(28,562)	(28,568)	(28,573)
y2011	10,696***	7,566***	7,388***
	(811.6)	(581.6)	(594.5)
Dy2011int	125,070***	128,200***	128,378***
	(35,420)	(35,430)	(35,434)
Constant	65,711***	60,273***	59,931***
	(1,573)	(1,470)	(1,490)
Panel B: Registered business census 2009 and 2019			
2009 apparel			
share > 40%	111,490***	113,814***	114,329***
	(26,442)	(26,449)	(26,451)
y2019	3,430***	2,491***	2,697***
	(461.8)	(227.0)	(210.2)
Dy2019int	-11,206	-10,265	-10,472
	(12,308)	(12,307)	(12,308)
Constant	6,086***	3,762***	3,247***
	(508.7)	(253.0)	(153.7)
Observations	1,000	860	826
Sample upazila	all	excl. 0<apparel share 40	excl 0<apparel 40

.485.,T (0 0 Td [(<)]TJ/F8 10.90) -9408parel0 0 T 0-333 (Re) -56e[(40)]TJ -7 (2,.485 share Td ,apparel

Table (5) Total number of registered establishment in the upazila, 2009 and 2019

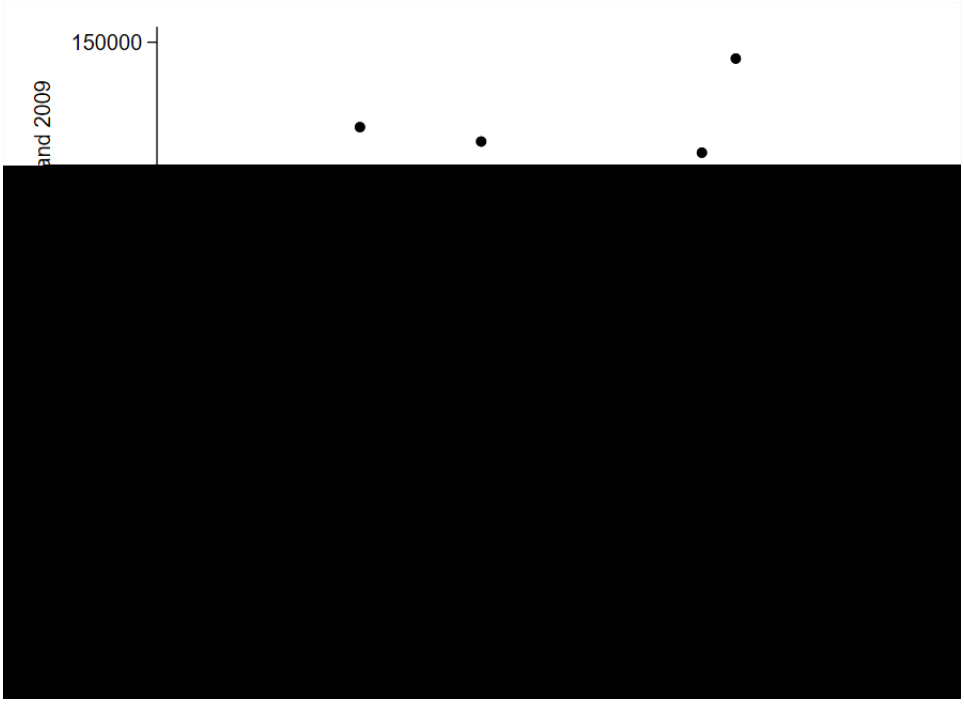
VARIABLES	No of est	No of est	No of est
2009 apparel			
share > 0.4	665.4***	712.7***	728.3***
	(205.8)	(205.7)	(205.6)
y2019	60.42***	60.15***	63.40***
	(6.864)	(4.659)	(3.915)
Dy2019int	-166.3*	-166.1*	-169.3*
	(92.21)	(92.11)	(92.09)
Constant	173.5***	126.1***	110.5***
	(11.38)	(8.159)	(3.824)
Observations	1,000	860	826
Sample upazila	all	excl. 0<apparel share 40	excl. 0<apparel share 40 and textiles share>50

*** p <0.01, ** p<0.05, * p<0.1

Notes: Standard errors clustered at upazila level in parentheses

Figure (4) Di erence between 2009 and 2019 in upazilas with apparel share>40 and 40

(a) Di erence in total employment



(b) Di erence in number of establishment