



## Preventing Factory Fires through Contracts: Case study of Garment Factories in Bangladesh

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### ABSTRACT

Following a multi-decade history of lethal fires in the Bangladeshi garment industry, Sato (2012) proposed a contract framework that encourages manufacturers to adopt measures that reduce loss of life. Apart from the humanitarian imperative, the manufacturer has an incentive to sign the contract and adopt its preventative measures because an industrial disaster will cancel its relationship with its global retailer and end the related profits. This theoretical study specifies the optimal contract that incentivizes manufacturers and reduces the occurrence of garment industry fires.

**Keywords:** Garment factory fires, optimal contract, retailer, safety measures.

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### 1.0 INTRODUCTION

The November 24, 2012, fire at a factory that produced garments for Tazreen Fashion Ltd in Ashulia near Dhaka, Bangladesh, killed 112 persons and was the worst among a spate of Bangladeshi garment factory fires.

At least 26 died in another garment factory fire in Ashulia only two years ago. That is, according to the *Daily Star* (2010b, 2010c), the fire erupted on the seventh floor of the 11-story factory of the Ha-Meem Group on December 14, 2010, and four of the seven escape routes to lower floors for the 300 workers on the top floor were blocked. Most of the victims died after falling from the building, which exacerbated the panic. The *Daily Star* (2010a, 2010c) reported that garment factory fires on a scale similar to this tragedy have occurred in Dhaka and its suburbs (Narayanganj, Narsingdi, Chittagong, and Ashulia), killing at least 267 persons during 1990–2010.

**Table 1:** Major factory fires and the number of deaths

Year	No. of Deaths	Factory
1990	32	Saraka Garments, Dhaka
1996	22	Lusaka Garments, Dhaka

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1997	24	Shanghai Apparels, Dhaka
	20	Jahanara Fashion, Narayanganj
2000	23	Macro Sweater, Dhaka
	12	Globe Knitting, Dhaka
2004	23	Chowdhury Knitwear, Narsingdi
2005	23	Shan Knitting, Narayanganj
2006	62	KTS Garments, Chittagong
2010	26	Ha-Meem, Ashulia

Source: *The Daily Star* (2010a, 2010c)

The factory at Tazreen had not implemented even rudimentary safety measures to secure escape routes, and the ensuing tragedy prompted a statement two days after the fire by global retailer Wal-Mart:

The Tazreen factory was no longer authorized to produce merchandise for Walmart. A supplier subcontracted work to this factory without authorization and in direct violation of our policies. Today, we have terminated the relationship with that supplier.

(Wal-Mart website, emphasis by author)

Paul-Majumder and Begum (2000) aroused concern with preventing factory fires in the readymade garment industry, which has been driving economic growth in Bangladesh:

Most garment factories do not have adequate fire prevention measures. The survey of 1997 shows that in addition to other fire code violations, most of the garment factories do not have fire exits or fire alarms. According to the Bangladesh Fire Brigade, up to November 1997, 58 fire accidents took place in the garment industry; 118 workers were killed, of which 90 percent were female workers. (Paul-Majumder and Begum 2000, p.15), emphasis by author)

This concern is acknowledged in five (i, ii, vi, xi, and xii) of the 13 “recommendations” by Akhter et al. (2010, p.70) that were noted from the viewpoint of female workers:

- (i) Sufficient widen fire exit doors and enough ventilation with proper maintenance for air circulation should be designed for industry building
- (ii) Regular fire drills should be held, minimum twice in a year
- (iii) More toilet facilities for female workers
- (iv) Pure water supply for drinking and washing for female workers
- (v) Fulltime medical care and first aid treatment with female doctor and highly trained nurses for female workers
- (vi) Safety management training for all kinds of worker
- (vii) Maternity leave & weekly holiday with pay for female workers
- (viii) Fixation of wages should equal and logical for male and female workers based on living standard
- (ix) Management should issues appointment latter for all kinds of workers as certainty of their job
- (x) Management should permit to arrange trade union by low
- (xi) Proper exit sign and safety sign should be applied in appropriate areas of the industry
- (xii) All the buildings of garment industries should have proper announcement system as to how to get out of the building
- (xiii) Management has to provide basic legal requirements to ensure a healthy industry.

Sato (2012) shows that the probability of a fire can be reduced through private contracts between the Bangladesh Garment Manufacturers and Exporters Association (BGMEA) and its member factories. The contracts cited in Sato (2012) can be fulfilled so long as the cost of meeting recommendations i, ii, vi, xi, and xii is not prohibitive. This paper aims to design an optimal contract that can be fulfilled while being consensual.

This paper is organized as follows: Section 2 sets the theoretical framework. Section 3 proposes an optimal contract. Section 4 points out the implication that the contract is not public but private.

## 2.0 THEORETICAL FRAMEWORK

In the 2010 factory fire, the families of employees who died received (in addition to the 100,000 Tk from the Ha-Meem Group) 100,000 Tk to 200,000 Tk from BGMEA, of which the factory is a member. In the following, the contract between BGMEA and one of its member factories is considered.

Since BGMEA must compensate families of employees killed in fires, it has a financial inducement to take the five indicated preventative measures recommended by Akhter et al. (2010). However, BGMEA is said to be unable to investigate directly whether a factory has actually implemented preventative measures because the factory lacks investigative resources and public sector inspectors are corruptible. For the factory, preventative measures have a cost  $c \geq 0$ . For simplicity, we assume

$$\theta = 1/(c + 1). \quad (1)$$

When it is common knowledge that BGMEA cannot monitor fire prevention measures directly, the factory could neglect to implement them or have no interest in doing so.

For simplicity, we make two assumptions. First, we assume there are two types of fires: small-scale fires ( $h > 0$ ) and disaster-level fires involving fatalities ( $H > h$ ). Second, we assume BGMEA can observe that both are possible after the fact. When BGMEA observes  $h$ , it can discern whether the factory had taken preventative measures, but in the case of  $H$ , it cannot establish whether the cause was the absence of preventative measures unless there is a whistle-blower. We assume that the probability of a whistle-blowing ( $p$ ) is exogenously given.

BGMEA offers  $(s, f)$  in the contract with the factory, where  $s$  is the compensation that BGMEA commits to pay. In other words, regardless of the scale of the fire, BGMEA compensates both personal and physical damage caused by a fire. On the other hand,  $f$  is the fine imposed by BGMEA on a factory when an  $H$ -scale fire was caused by the absence of preventative measures.

## 3.0 OPTIMAL CONTRACT

If a factory takes preventative measures under this contract, there is a probability  $1 - \theta(c)$  that there will be no fire and probability  $\theta(c)$  that its scale will be  $h$ . If there is a fire, BGMEA compensates the factory amount  $s$  for damages. Private cost to the factory in that case is  $c - \theta(c)s$ . On the other hand, social cost is given by  $c + \theta(c)h$ . If the compensation to bring the private cost in alignment with the social cost is represented as  $s^*$ , then  $s^* = -h$ .

If the factory neglects preventative measures, we derive from Equation (1) that  $\theta = 1$  when  $c = 0$ , so there is definitely an  $H$ -scale fire. At this time, the probability is  $1 - p$  that the factory will only be compensated with  $s$ . However,  $p$  denotes the probability that the factory's failure to take preventative measures will be detected and the factory must pay a fine of  $f$  to BGMEA. The private cost in this case is  $pf - s$ . However, the social cost is  $H$ . Considering that  $s^* = -h$ , the fine required to make the private cost consistent with the social cost would be  $f^* = (H - h)/p$ . Therefore, the optimal contract is  $(s^*, f^*) = (-h, (H - h)/p)$ .

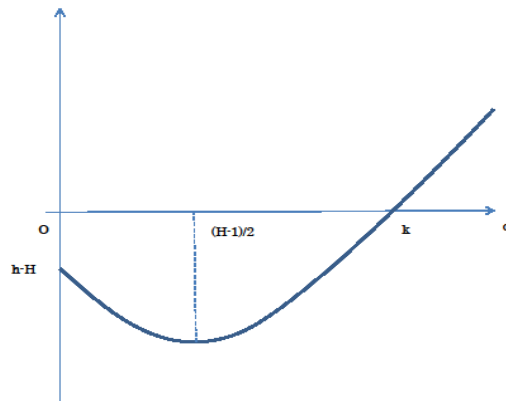
Next, we consider whether moral hazard can be prevented under this contract. When preventative measures are implemented, the private cost to the factory is  $c - \theta(c)s^* = c + h/(c + 1)$ . When preventative measures are not implemented, the private cost is  $pf^* - s^* = H$ . The difference in expected cost can be expressed as

$$\Delta C = c + h/(1 + c) - H. \quad (2)$$

When  $c < k$  and  $k = \frac{H-1 + \sqrt{(H-1)^2 + 4(H-h)}}{2}$  (graph of which is shown in Figure 1), then

$\Delta C < 0$ , and the factory has incentive to take preventative measures. Therefore, the following proposition would hold.

Figure 1: Incentive for the factory to take preventative measures.



**Proposition 1:** When worker safety can be improved for a sufficiently small cost, the optimal contract can be fulfilled at  $(s^*, f^*) = (-h, (H-h)/p)$ .

If the factory declines the optimal contract and implements no safety measures, formula (1) indicates that an H-scale fire will definitely occur. In that case, the relationship with the retailer will be cancelled and profits will be lost. Denoting this lost profit as  $g$ , if  $g > c + h/(c+1)$ , the manufacturer will lose the option to sign the contract. Therefore, it would be rational to sign the optimal contract and bear  $c$ . The following proposition would hold.

**Proposition 2:** When the profit lost due to cancellation of the relationship with the retailer is sufficiently large, the manufacturer has greater incentive to accept the optimal contract.

#### 4.0 CONCLUSION

Bangladesh ranks 144<sup>th</sup> of 174 countries (bottom 17%) in the Corruption Perception Index 2012 prepared by Transparency International. From the standard of global comparisons, there is room for improvement, thus, if public servants would conduct safety management inspections of factories, then the bribery might occur. The contracted cited by Sato (2012) and in this paper is a private contract, so it is not incompatible with the problem of corruption that arises when public servants conduct safety management inspections of factories.

In addition, under the framework of this paper, so long as the cost of safety management is an independent variable in reducing the probability of a fire, for arbitrarily  $c \in [0, k]$ , the probability of a fire occurring can be reduced.

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