BETTER WORK

Better Work Discussion Paper Series: No. 12

Is There an Efficiency Case for International Labour Standards?

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October 2013

DISCUSSION PAPER No. 12

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First published *2013*

ILO Cataloguing in Publication Data

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Is there an efficiency case for international labour standards? / Drusilla Brown, Rajeev Dehejia, Raymond Robertson ; International Labour Office. - Geneva: ILO, 2013

Better Work discussion paper ; No.12; ISSN 2227-9539; 2227-9547 (web pdf)
International Labour Office

working conditions / role of ILO / international labour standards / enterprise level / textile industry / clothing industry / Cambodia

13.03.1

Cover photo: Lyno Vuth, © ILO/IFC

Printed by ILO

Abstract

International labour standards conditionality is common in both U.S. and E.U. bilateral trade agreements. Imposing labour standards on developing countries may increase production cost or improve firm performance. We examine the relationship between internationally mandated labour standards and firm performance using data from Better Factories Cambodia. Improved compliance is found to be a significant predictor of firm survival. We reject the possibility that compliance and survival are jointly determined by buyer type and credit constraints. We find evidence that compliance initially linked to conditionality forced firms to experiment with humane labour management practices that are more efficient than harsh conditions.

Acknowledgements

This paper draws on working papers by the same authors previously circulated as Better Work Discussion Papers 4 and 6 as cited in the references. We thank Kimberly Ann Elliott, seminar participants at the Center for Global Development, the 2011 Regulating Decent Work conference, and Sarah West for helpful comments and suggestions.

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I. INTRODUCTION

International labour standards conditionality for market access has become a standard component of U.S. and European bilateral trade agreements. Every bilateral trade agreement with the United States since 1986 has included human rights protections in some form. Yet, labour provisions remain highly contentious and are at the center of a larger debate concerning the links between globalization and working conditions (Elliott and Freeman, 2003).

Trade-linked labour protections impose constraints on factories operating in intensely competitive markets, thereby threatening firm survival and employment opportunities. However, trade-linked labour standards may improve market function if institutions regulating working conditions correct one or more market failures.

Market failures in global supply chains are well documented. Ann Harrison and Jason Scorse (2010) find evidence of monopsonistic exploitation of young female workers lacking a sense of agency in their analysis of the endogenous response of Indonesian foreign-owned export-oriented apparel, textile, and footwear factories to anti-sweatshop agitation in the early 1990s. International pressure on minimum wage compliance is found to raise wages and expand employment but lower profits and induce some firms to relocate. Nicolas Bloom, Benn Eifert, Aprajit Mahajan, David McKenzie and John Roberts (2013) conduct a management practices experiment in large Indian textile firms. Innovations related to quality control, inventory management, information sharing and incentives increased productivity and profits. The authors speculate that inefficient managerial techniques may persist due to limits on cognitive capacity. Rema Hanna, Sendhil Mullainathan and Joshua Schwartzstein (2012) document a failure by seaweed farmers in Indonesia to learn from experience even when provided with experimental data. Other examples include negative external effects generated by poor working conditions in noncompliant factories on national reputation (Basu, Arnab, Chau, and Grote, 2006), ineffective monitoring of working conditions by international buyers engaged in reputation risk mitigation (Polaski, 2006, 2009), and inefficient labour management technology that arises due to costly experimentation in human resource management innovation (Fung et al. 2001; Domat et al. 2013).

Labour regulations may redress a labour-management bargaining imbalance, speed the adoption of efficiency-enhancing labour-management innovations by mandating experimentation, and help firms coordinate on a set of labour practices that generate a positive reputation for humane conditions of work. Analysis of World Bank Enterprise Surveys for nine developing countries indicates that restrictive labour market regulations had a positive impact on production efficiency greater than regulations improving the business environment (Bhaumik and Dimova, 2011). Innovations in human resource management including performance-based pay, teamwork, communications and training have been shown to increase productivity, profits and product quality in small and medium sized firms in traditional industries (Bandiera et al. 2007; Hamilton et al. 2003; Ichniowski et al. 1997; Sheehan, 2013).

While some studies focus on firm-level interventions, analysis of the direct effects of labour provisions in trade agreements on factory behavior and performance focuses principally on the impact of labour standards on working conditions, comparative advantage and labour costs (Bakhshi and Kerr, 2010; Kucera and Sarna, 2006; Dehejia and Samy, 2004; Bonnal, 2010). Robert J. Flanagan (2003) finds no significant relationship between ratification of labour standards and labour cost, conditional on productivity differences in a cross-country panel for the period 1980-1999. Evidence of firm response to trade-linked labour standards is limited to Michael Huberman's (2012) analysis of internationally coordinated labour standards imposed in Europe at the end of the 19th century. Huberman contends that standards related to wages and hours induced capital deepening that rationalized the mandated restrictions.

Our study is the first in the literature to evaluate the causal relationship between internationally mandated improvements in working conditions and firm-level survival. We use unique establishment-level panel data from Cambodia to observe the evolution of compliance with and retrogression from labour standards using highly detailed observations made by outside monitors, link these changes with firms' survival and, based on a theoretically motivated set of tests, argue for the causality of this relationship.

The 1999 U.S.-Cambodia Bilateral Textile Trade Agreement formally linked market access to labour standards compliance. The International Labour Organization (ILO)'s Better Factories Cambodia[1] (BFC) program monitors working conditions in Cambodian garment factories and assesses conditions relative to ILO Core Labour Standards[2] and Cambodian labour law. Under the Multi Fiber Arrangement (MFA), improved working conditions in the garment sector were required for increased quota access to the U.S. market (Polaski, 2009). The end of the MFA, however, removed the quota-access incentives and created an environment in which to evaluate the establishment performance effects of labour standards.

We test the hypothesis that Enterprise Assessments undertaken by BFC Advisors led Cambodian firms to experiment with humane labour management systems, thereby expanding the managers' information sets to include possible labour management innovations that are both humane and productivity-enhancing. Our test does not consist of a single natural experiment or instrumental variables strategy since, to the best of our knowledge, there is no appropriate source of exogenous variation in compliance with labour standards. Rather, we demonstrate the correlation with a Kaplan-Meier survival function estimator between BFC-induced compliance and firm survival. Then, based on a

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[1] For more information, see http://www.betterfactories.org .
[2] Core labour standards are freedom of association and collective bargaining, non-discrimination, and the elimination of child labour and forced labour.

model presented in Section II, we eliminate four plausible sources of selection or omitted variable bias. In particular, we examine whether reputation-sensitive buyers[3] could enhance both firm survival and labour standards compliance by examining whether the presence of a reputation-sensitive buyer is a significant predictor of a firm's decision to retrogress, i.e., to become non-compliant with labour standards after prior compliance. The financial crisis of 2008-9 is then used to explore whether credit constraints could cause both survival and compliance, exploiting the fact that many firms experienced significant credit market restrictions during this period. In particular we test for a structural break in retrogression trends at the time of the financial crisis, using Chow and Andrews-Ploberger tests (Andrews and Ploberger 1994).

We next examine whether the mechanism for improved compliance and survival is enhanced managerial information regarding productivity-enhancing labour practices or coordination at the market level on improved labour standards. For this test we use a change in BFC rules that occurred in 2006 when the program moved from publicly disclosing non-compliance with labour standards to reporting non-compliance only to the factory and its buyers. Specifically we examine whether there is a structural break in retrogression behavior in 2006.[4] Finally, we isolate the direct contribution of learning by analyzing the compliance behavior of firms lacking a reputation-sensitive buyer after the end of the public disclosure period.[5]

Together these results suggest that compliance with labour standards required by an international trade agreement revealed efficiency-enhancing labour management strategies which

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[3] Buyers are classified as reputation sensitive if they have published corporate social responsibility reports or websites, and then are linked to the relevant factories.

[4] Brown et al. (forthcoming) focus on "regression", defined as the change from compliance to noncompliance. We distinguish this from "retrogression", which we define as the move from noncompliance to compliance and then back to compliance. These are distinct because many factories are compliant in their first visit for many questions. Retrogression captures improvements that may be experimental for factories in the sense that they experience both compliance and noncompliance.

[5] Oka (2010a and 2010b) and Ang, et al. (2012) show that relationships with reputation sensitive buyers in Cambodian garment factories significantly affect compliance levels.

made firm survival more likely. Our analysis further suggests that public disclosure of noncompliance helped Cambodian firms develop a reputation for humane conditions of work by controlling free-riding by noncompliant firms on the reputation created by firms with humane conditions of work. A description of Better Factories Cambodia and an analytical framework are presented in section II, the data in section III, and findings in section IV. Conclusions follow.

II. ANALYTICAL FRAMEWORK

Our general analytical framework incorporates characteristics of the Better Factories Cambodia program. The Better Factories Cambodia (BFC) program was established by the International Labour Organization (ILO) in 2001. The program is based on monitoring and reporting on working conditions in Cambodian garment factories. Observed conditions are evaluated relative to national law and international standards. The Cambodian government mandates that all apparel exporters submit to Assessments.

Enterprise advisors observe working conditions in all Cambodian exporting garment factories during unannounced visits. ILO-trained Cambodian monitors enter factories to complete a tool assessing the factory's compliance on a variety of working conditions and wage requirements. To avoid monitor bias, each monitoring team contains at least two people, and the same team rarely assesses the same factory twice.

BFC issues periodic synthesis reports characterizing average compliance for the Cambodian apparel industry. Prior to the end of the MFA in 2005, the United States government referred to the Synthesis Reports when determining Cambodia's apparel export quota.

Individual factory reports are made available to firms and may be accessed by a factory's subscribing buyers.[6] For factories lacking a subscribing buyer, reports are available only to BFC and the participating firm. However, prior to November 2007, BFC publically disclosed individual firm names, their individual points of noncompliance and progress on improving working conditions.

Firm-level compliance is taken to be a reflection of the profit-maximizing human resource management (HRM) system chosen by a factory manager within the constraints imposed by BFC. The HRM system is characterized by a vector Z($z_1 \dots z_N$) of working conditions. Working conditions include the hourly pay rate ($z_1 = w$), work hours (h) and other working conditions such as the quality and availability of first aid, the incidence of verbal abuse by factory supervisors, problem-solving mechanisms and other dimensions. Factory managers select the vector of working conditions Z to maximize expected profits π.

Profits for one period are given by:

$$\pi = p(\bar{Z})R(Z)hf^e(Z;I) - wh - \sum_{i=2}^{N} a_i(I)z_i + \lambda[C - \sum_{\mathrm{i=1}}^{\mathrm{N}} a_i(I)z_i] + \delta[N(D) - n(Z)] \quad (1)$$

where

- $p =$ price of output and is conditional on the national market reputation for conditions of work as indicated by publically disclosed national average working conditions $\bar{Z}$,
- $R \geq 1$ is the price premium paid by reputation-sensitive (*RS*) buyers for working conditions *Z.* R is a discrete function with

  R=1 and *RS=0* if $Z < Z_{min}$. The working conditions premium is zero for firms that do not reach the minimum level of working conditions required by a reputation sensitive buyer.

[6] Shea et al. (2010) is one recent paper that uses synthesis reports to analyze BFC.

R>1 and *RS=1* if $Z \geq Z_{min}$. The working conditions premium is positive for firms that reach the minimum level of working conditions required by a reputation sensitive buyer.

- h = hours worked,
- $f^e()$ factory manager's expectation of hourly output based on working conditions chosen, conditional on the factory manager's information set, I, concerning production technology.
- $w =$ the wage rage,
- $a_i(I)$ is the cost of providing working condition z_i as perceived by managers with information set I,
- *C* is a credit constraint faced by the firm on working conditions investments,
- *N* is a perceived norm of behavior relating to working conditions socially constructed by factory managers. *N* is a function of the public disclosure of factories and their individual points of noncompliance. $D \epsilon \{0,1\}$ with $N(1) \geq N(0) = 0$.
- $n(Z) \geq 0$ is an index of working conditions used to assess whether a firm is meeting a working conditions norm established by factory managers and
- λ and δ are Lagrange multipliers.

Factories maximizing profits π given in equation (1) choose Z^*(*I, C, D, p, w*) optimal working conditions as a function of the manager's information set (*I*), the working conditions credit constraint faced by the firm (*C*), public disclosure of noncompliance (*D*), market price (*p*) and factor price (w). Substituting *Z** into equation (1) yields the profit function π^*(*I, C, D, p, w*).

The probability of survival is taken to depend on current period profits, a credit constraint applying to operations ($\tilde{C}$) and buyer type, as given in equation (2).

$$\Pr(S) = s(\pi^*, \tilde{C}, RS) \qquad (2)$$

RS buyers typically develop long term relationships with their vendor base. The relationship may include coordinated production planning, stable orders, and technical assistance that increase the probability of survival independent of the impact on profits in a single period.

We do not observe profits π. But we do observe working conditions *Z.* By Hotelling's lemma, all economically relevant information in π^* is also implicit in Z^*. Thus, the survival function can be re-specified as

$$\Pr(S) = \tilde{s}(Z^*, \widetilde{C}, \; RS) \tag{2′}$$

Firms are assumed to acquire information $I(Z_{-t}, \bar{Z})$ concerning the impact of human resource management behavior and factory performance from previous HR choices, Z_{-t}, and by observing BFC compliance violations by other factories during the public disclosure period. Observing points of noncompliance by competitors allows each firm to infer the average market level of working conditions, $\bar{Z}$.

The challenge is to isolate the contribution of compliance to the information set of the manager. Define retrogression as the decision to return to noncompliance after a period of compliance that began after entry into the Program. Retrogression is defined as

$$z_t^* - z_{t-1}^* = g(C, D, RS, p, w; I_t, I_s) \text{ where } z_t^* = 0, z_{t-1}^* = 1, \text{and } z_s^* = 0 \text{ for } t-1>s>0. \tag{3}$$

The impact of information on firm profits can be obtained by evaluating equation (1) at the profit maximizing choice of working conditions, Z^*, and differentiating with respect to information set, *I*, to obtain

$$\frac{d\pi^*}{dI} = \sum_{i=1}^{n} \frac{d\pi^*}{dz_i^*}\frac{dz_i^*}{dI} = \sum_{i=1}^{n} \{ph[f\Delta R + Rf_i] - a_i - \lambda^* a_i - \delta^* n_i\} \frac{dz_i^*}{dI} \tag{4}$$

where f_i and n_i are derivatives with respect to the i^{th} argument and ΔR is the discrete change in the price premium for a firm achieving the working conditions standard required by a reputation sensitive buyer. Terms involving $d\lambda^*$ and $d\delta^*$ are eliminated by the envelope theorem. Either $\lambda^* = 0$ or the credit constraint binds, implying that $d\lambda^*[\mathrm{C} - \sum_{\mathrm{i}=1}^{\mathrm{N}} a_i\,(I)z_i{}^*] = 0$. Similarly, either $\delta^* = 0$ or the norm constraint binds, implying that $d\delta^*[N(D) - n(Z)]$ = 0.

Isolating the contribution to BFC-induced learning on firm performance requires a sequence of five tests. The first test is to determine whether or not improved compliance is positively associated with the probability of survival and is performed by estimating the version of the survival function as given by equation (2´). If more compliant firms are less likely to survive then we can reject an efficiency case for BFC. However, if compliant factories are more likely to survive, then we proceed to the second test. The second test requires that we determine whether there is a causal relationship between compliant behavior and survival or whether survival and compliance are jointly determined by a firm's buyer type. Co-determination of survival and BFC-human resource management innovations by buyer type can be rejected if buyer type is not a significant variable in a firm's decision to retrogress. The second test is performed by estimating the determinants of retrogression as given in equation (3). Our particular interest is whether the coefficient of the *RS* buyer type variable is statistically significantly different from zero. The third test requires that we determine whether there is a causal relationship between compliant behavior and survival or whether survival and compliance are jointly determined by credit constraints. Credit constraints for exporters significantly tightened during the financial crisis of 2008-2009. If the credit constraint is binding on compliance choices, retrogression should exhibit a structural break during the crisis period. A Chow test and the more sensitive Andrews-Ploberger test are employed to identify a structural break in retrogression during the crisis period. If we reject the codetermination of compliance and survival, we then move to determine whether BFC is helping Cambodian factories coordinate on a higher working conditions standard, $\bar{Z}$, or whether the managerial information acquired while achieving compliance is augmenting managerial capital related to human resource management.

Prior to November 2006, BFC publically disclosed factories and their individual points of non-compliance. Using compliance data from Better Factories Cambodia through 2008, Ang et al. (2012) find that public disclosure had significant effects on factory compliance. The end of public disclosure disrupted the mechanism by which Cambodian firms were controlling free riding of low compliance firms on the reputation created by high compliance firms, providing an opportunity to test whether $\delta^* = 0$ or whether the norm constraint was binding on firm behavior. If the norm constraint was binding during the public disclosure period but relaxed when the public disclosure was terminated, there should be a structural break in retrogression in November 2006, which can be detected by a Chow test.

However, the presence of a coordination effect of BFC does not preclude the possibility that Enterprise Assessments are also augmenting the managerial information set pertaining to the efficiency properties of humane labour management practices. A production efficiency effect can be detected if firms lacking a reputation sensitive buyer remain in compliance after the end of the public disclosure period.

For firms lacking a reputation sensitive buyer, R = 1 and $\Delta R = 0$. In the post-public disclosure period, the norm constraint is not binding so $\delta^* = 0$. We will find below that the credit constraint is not binding, implying that $\lambda^* = 0$. Equation (4) then becomes

$$\frac{d\pi^*}{dI} = \sum_{i=1}^{n}\{phf_i - a_i\}\frac{dz_i^*}{dI} \geq 0 \qquad (4')$$

If we assume that the impact of information is nonnegative, then it follows from profit maximization that if $\frac{dz_i^*}{dI} > 0$ then $f_i > 0$, *ceteris paribus*. That is, if available information increases the level of compliance in the absence of a norm or credit constraints, then the marginal product of compliance must be positive. Our final test, then, is to look for evidence that $\frac{dz_i^*}{dI} > 0$ for firms lacking a reputation sensitive buyer after the public disclosure period.

III. DATA

The primary data are proprietary factory-level monitoring reports generated by the BFC Program. Table 1 illustrates the sample size decomposed by visit number and year. Factories enter the sample with their first visit. As factories accumulate visits the table develops an upper triangular structure. Our data include 446 individual factories with up to ten visits. The time between visits varies, but visits typically occur every ten months. Most factories (93.7 percent) are foreign-owned, with 45.3 percent originating in either China, Hong Kong SAR, Macau SAR, or Taiwan. Very few factories (less than 3 percent) have ownership listed as a Western country.

Table 1: Factory Assessments by Year

	VISIT YEAR									
VISIT	2001	2002	2005	2006	2007	2008	2009	2010	2011	Total
1	85	34	7	188	30	37	27	20	18	446
2	0	0	18	122	136	34	28	16	6	360
3	0	0	0	48	186	33	24	27	5	323
4	0	0	0	0	80	152	27	20	11	290
5	0	0	0	0	11	112	82	24	12	241
6	0	0	0	0	0	38	102	42	12	194
7	0	0	0	0	0	0	52	75	20	147
8	0	0	0	0	0	0	11	43	28	82
9	0	0	0	0	0	0	0	13	12	25
10	0	0	0	0	0	0	0	3	2	5
Total	85	34	25	358	443	406	353	283	126	2,113

Notes: Data are missing for 2003-2004 because BFC monitors concentrated on previously-identified issues rather than completing a full evaluation. See text for details.

This study focuses on factory closure, which is quite common for Cambodian garment factories. While 446 factories enter the sample with a first visit, only 194 have survived to the sixth visit. One concern might be that factories simply changed names rather than closed. When a factory closes, it is confirmed by the BFC office, which keeps an official list of confirmed closings. We compare the confirmed closing list with factories that disappear from our sample. We use the same factory identifier for the fewer than five factories that have different names for the same address. We treat factories that close and later re-open at another location with a different name and different ownership as separate factories.

The BFC monitoring instrument contains 405 individual questions, such as “Are the internal regulations legible?”, “Does management unreasonably restrict workers from taking sick leave?” and “Does the factory have a written health and safety policy?” These responses are coded into binary variables so that they consistently indicate compliance with international standards or national law. Sixty-two of the 405 questions vary across neither factory nor visit and are therefore dropped from the analysis.

The remaining questions are first aggregated heuristically to create 31 compliance categories. The categories roughly conform to groups commonly used by the ILO. Factor analysis is then applied to the 31 compliance categories in an attempt to identify the underlying HR systems.[7] Factor analysis helps identify innovations in human resource management systems that may explain common changes in individual categories. The core standards (child labour, forced labour, and discrimination) are considered to be zero-tolerance and exhibit little variation in compliance. An orthogonal rotation is then applied to the remaining categories, generated by applying the principal-factor method to the remaining 28 of the

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[7] We apply factor analysis to the aggregated categories rather than the individual questions because the (binary) responses to the individual questions do not follow the bivariate normal distribution.

31 compliance categories.[8] The resulting matrix identifies nine possible factors, but none of the maximum values appears in factors 5 and 8, so we focus our attention on the remaining factors. Although involving a combination of subjective judgment and interpretation, it appears that the emerging pattern allows us to sort the 31 categories into the 6 factors shown in Table 2. These factors are very similar to those identified by Ang et al. (2012) and Brown et al. (forthcoming):

Factor 1: Communication and Workplace Systems involve fundamental factory organization, which includes the relationship between workers and management. One-way communication and little information sharing characterize traditional workplaces. The modern workplace, in contrast, includes systems characterized by two-way communication, teamwork, and more collaborative problem-solving. Modifications in this area involve fundamental changes relationships and responsibilities within the workplace and therefore are very challenging for factories.

Factor 2: Occupational Safety and Health introduces ambient working conditions as another dimension to the compensation package. Workers may or may not value improvements in health and safety, particularly if they come at the expense of money wages.

Factors 3 and 4: HR Innovations and Compensation include clearly specified terms of employment, wages paid as promised, and work-length regulations (days off and work day length). These practices also differentiate modern workplaces from sweatshops. Workers in sweatshops are typically viewed like machines and compensation as a cost, with little appreciation for human factors in job design. Excess hours of work and exploitation wages are the consequence. Managers in a modern workplace view hours and wages as part of a compensation package that is designed to efficiently elicit work effort. Factories constrained from engaging in exploitative wages and hours by BFC may discover the

[8] The principal-components factor method is a common alternative, but this method assumes that the commonalities are equal to one. The average of our uniqueness estimates is just over 0.65, and the principal-components method is most appropriate for uniqueness values close to zero. In our case, therefore, the principal-components analysis is probably not appropriate.

productivity-enhancing power of paying wages as promised and setting work hours to avoid the point of negative marginal productivity. Once wages and hours are seen as a mechanism for eliciting work effort, negative motivational techniques such as verbal and physical abuse are no longer necessary or even desirable.

Factor 5: Unions concerns the free operation of unions which, again, is one of the core labour standards but not quite as sensitive as child labour and forced labour.

Factor 6: Core Labour Standards includes the core labour standards that are almost universally accepted acceptance and are *zero-tolerance* compliance points for governments and reputation-sensitive buyers.

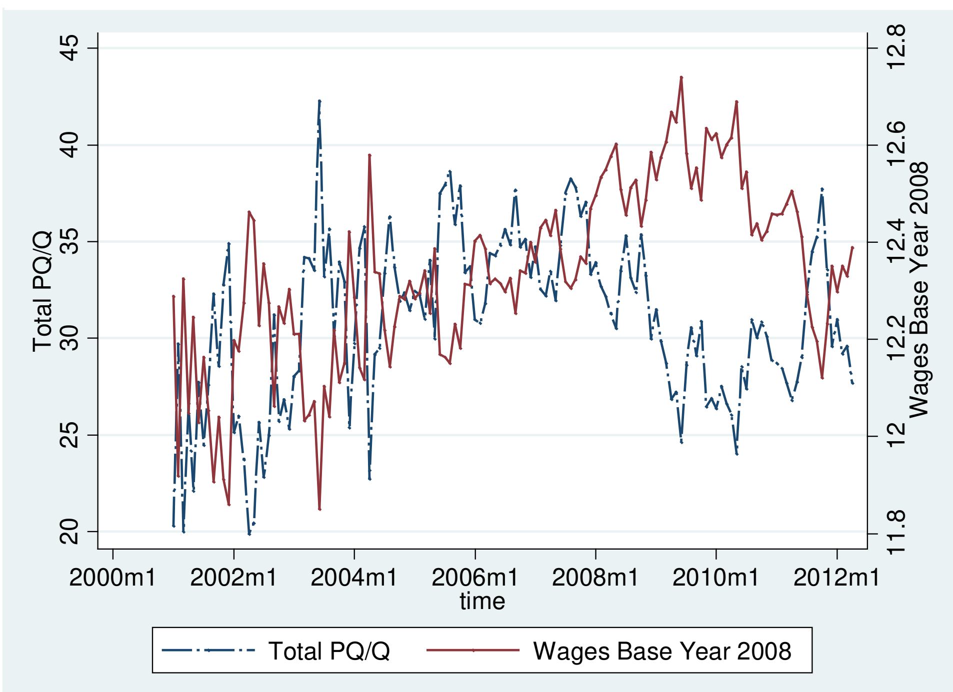
Table 2: HR Systems from Factor Analysis

Factor 1: Communication and Workplace Systems		Factor 4: Compensation	
6	Shop Stewards	10	Payment of Wages
7	Liaison Officer	11	Contracts/Hiring
23	Workplace Operations	16	Internal Regulations
		29	Accidents/Illnesses Com
Factor 2: Occupational Safety and Health		30	Holidays/Annual/Special
17	Health/First Aid	31	Maternity Benefits
18	Machine Safety		
19	Temperature/Ventilation	Factor 5: Unions	
20	Drinking Water	4	Collective Agreements
21	Sanitation	5	Strikes
22	Food	8	Unions
24	OSH Assessment/Recording	14	Sexual Harassment
25	Chemicals	15	Disputes
26	Emergency Preparedness		
Factor 3: Modern HR Practices		Factor 6: Core Labour Standards	
9	Information About Wages	1	Child Labour
12	Termination	2	Discrimination
13	Discipline	3	Forced Labour
27	Overtime		
28	Regular Hours/Weekly Rest		

Notes: Factors identified with factor analysis as described in the text. Numbers represent the original heuristic 31 categories to which the factor analysis was applied. Compliance for each category is the simple average of individual questions within each category.

Average wages are calculated from household surveys using survey data from 2002, 2004, 2007, 2008 and 2009. Wage growth between survey years is estimated and then used to interpolate average wages in the textile and garment sector. Our estimates of apparel output prices come from the unit values (in terms of square meter equivalent) using data provided on-line by the U.S. Office of Textiles and Apparel (OTEXA). The unit values are calculated both with simple weighted averages and alternatively following James Harrigan and Geoffrey Barrows (2009), who calculate indices that are robust to quality changes (quality changes in Cambodia are very modest in our sample period). The six-month moving averages of the monthly price and wage series are depicted in Figure 1.

Figure 1: Aggregate Apparel Wages and Output Prices - six-month moving averages

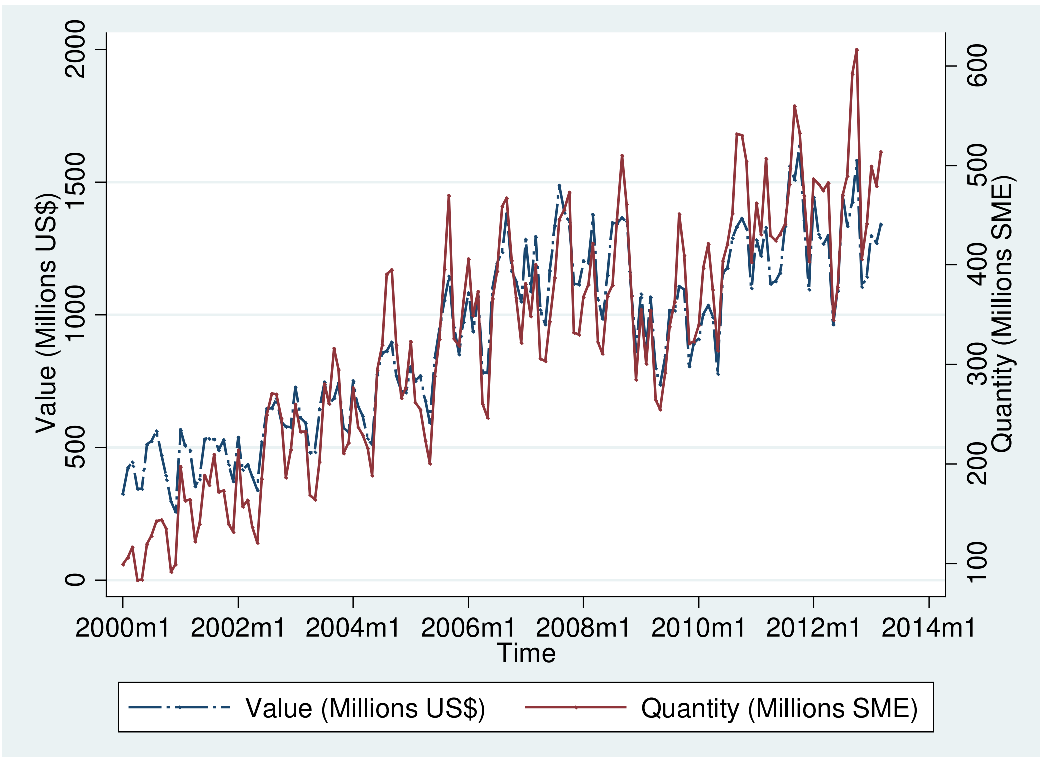


Notes: Prices are weighted averages of U.S. apparel imports from Cambodia. Wages are based on household surveys as described in the text.

IV. EMPIRICAL ANALYSIS

Preliminary evidence of a positive effect of labour standards compliance on the business performance of Cambodian apparel firms is indicated by the persistent rise in exports and export share over the past decade, as depicted in Figure 2. Prior to the end of the MFA, Cambodia's compliance performance was rewarded with an expanded quota by the United States. After the end of the MFA, quantitative restrictions no longer applied. Cambodia's export share, however, did not decline as feared by the Cambodian government and apparel factory owners. During the post-MFA period, Cambodia's relative export performance was only disrupted during the financial crisis of 2008-2009.

Figure 2: US Apparel Imports from Cambodia



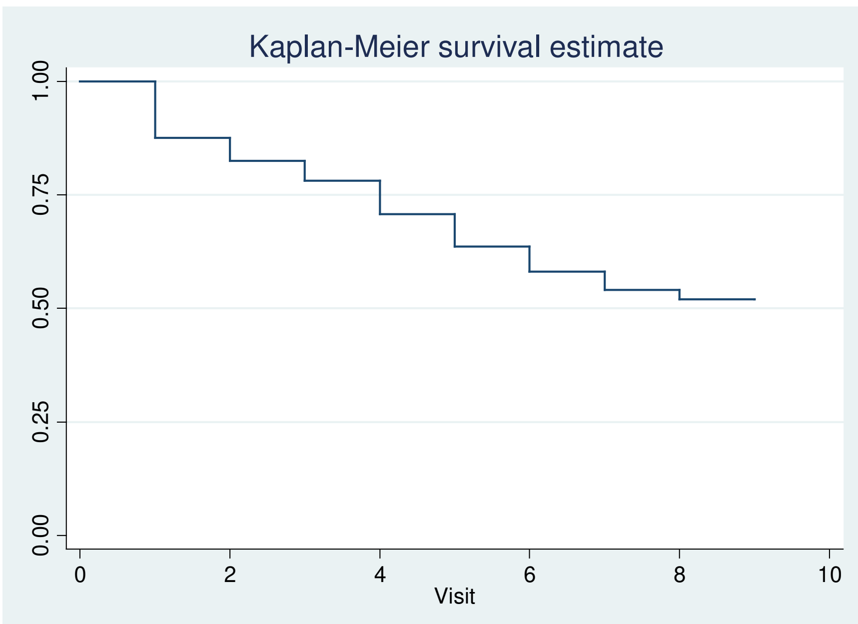
Notes: Authors' elaboration using data from U.S. Office of Textiles and Apparel (OTEXA), available at http://otexa.ita.doc.gov/. SME is Square Meter Equivalent.

In the analysis below, we begin by estimating the determinants of factory closure. In particular, our question will be whether compliance behavior that emerges after entry into the program is positively or negatively associated with survival. Our next step is to estimate the retrogression in equation (3) for the purpose of determining whether the buyer demands for compliance and/or credit constraints are binding on firm behavior. We then turn to the impact of public disclosure.

Survival Analysis

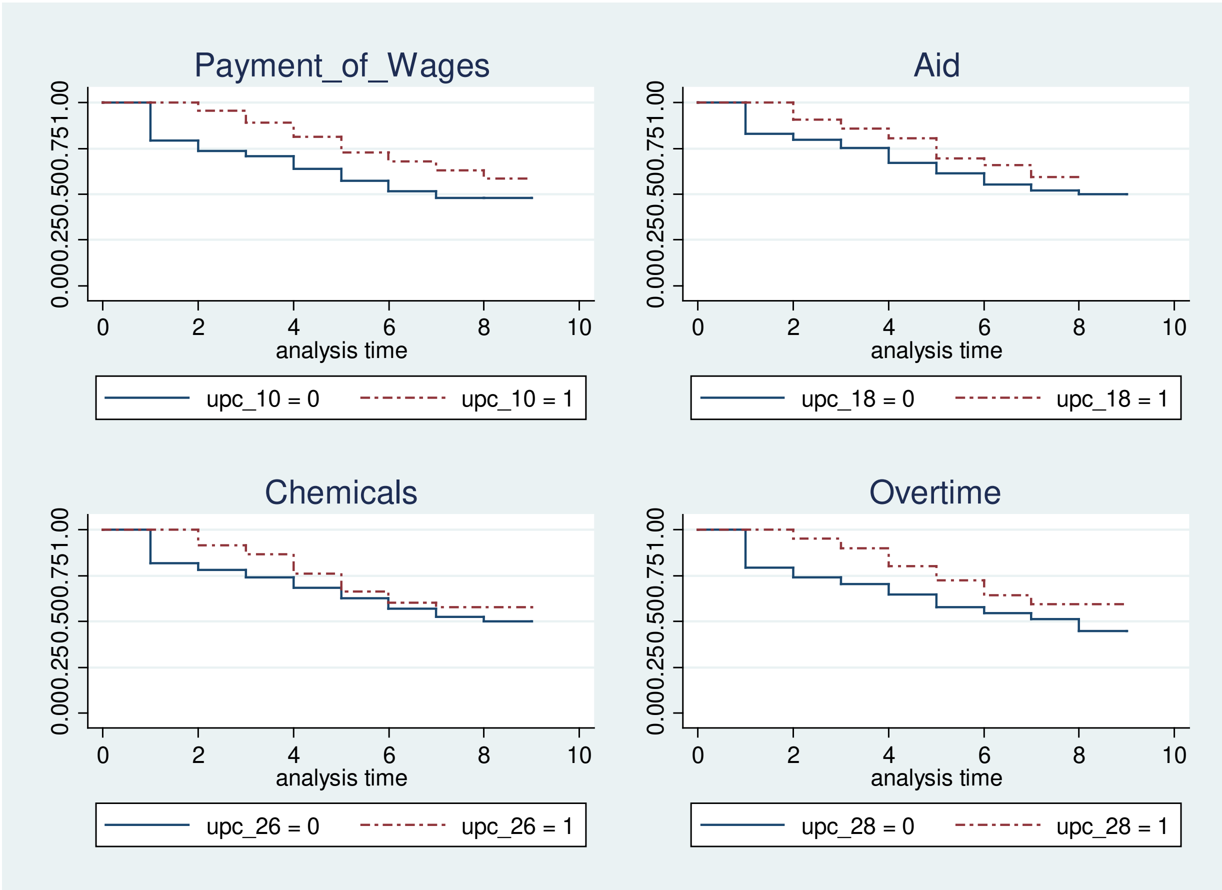
One of the first steps in survival analysis is to analyze the Kaplan-Meier survival function. Figure 3 demonstrates that the Kaplan-Meier survival estimate falls with the number of visits. Apparel manufacturing, especially at the lower end of the value chain, is risky. Turnover is high. Factory births and deaths are common.

Figure 3: Survival estimate (all factories)



One way to evaluate whether or not improvement in working conditions affects survival is to compare the survival probability conditional only on whether or not factories increased compliance prior to closing (or the end of the sample). Disaggregating Kaplan-Meier survival functions between factories that improved compliance between the first and second visit for various compliance areas, as shown in Figure 4, suggests that factories that increased compliance had higher survival rates.

Figure 4: Kaplan-Meier Survival Estimates - Selected Compliance Categories



Notes: The "UpX=1" ("UpX=0") represent factories that did (did not) improve compliance in the area described in the title (category 'X'). Lower lines indicate lower survival rates.

To test this result more formally, we conduct log-rank tests of equality of survival functions for each of the 31 compliance groups discussed above by showing both the test statistic and the p-value for two sets of tests. For the first, the groups are differentiated using a binary variable equal to 1 if the factory increased compliance between the current and previous visit (and 0 for factories that reduced compliance or remained the same). For the second, we use the change between the first and second visit to identify groups. When graphing the Kaplan-Meier survival estimates for each of the 31 categories, nearly all consistently show higher survival estimates for factories that improve compliance in that category. Our formal analysis, shown in Table 3, reveals that Payment of Wages and Emergency Preparation, in particular, have a statistically significant effect on survival probabilities.

Table 3: Log-Rank Tests of Equality of Survival across Improvement by Category

	Improvement by Visit		Improvement in Second Visit	
Category	Chi-Sq	p-value	Chi-Sq	p-value
Child Labour	0.094	0.759	0.051	0.821
Discrimination	0.955	0.328	0.047	0.828
Forced Labour	0.124	0.725	1.294	0.255
Collective Agreements	1.225	0.268	0.001	0.973
Strikes	1.137	0.286	1.281	0.258
Shop Stewards	0.315	0.575	5.772	0.016
Liaison Officer	0.380	0.538	2.899	0.089
Unions	0.090	0.764	2.779	0.096
Information About Wages	0.404	0.525	3.016	0.082
Payment of Wages	4.422	0.035	13.780	0.000
Contracts/Hiring	0.015	0.904	6.034	0.014
Termination	0.251	0.616	9.699	0.002
Discipline	0.134	0.714	2.033	0.154
Sexual Harassment	0.308	0.579	1.050	0.306
Disputes	0.091	0.763	6.000	0.014
Internal Regulations	0.056	0.813	2.458	0.117
Health/First Aid	0.213	0.644	15.503	0.000
Machine Safety	0.037	0.847	4.081	0.043
Temperature etc.	1.485	0.223	5.569	0.018
Drinking Water	0.514	0.473	1.782	0.182
Sanitation	0.819	0.365	12.988	0.000
Food	0.352	0.553	9.446	0.002
Workplace Operations	3.024	0.082	12.416	0.000

OSH…	3.600	0.058	12.081	0.001
Chemicals	3.433	0.064	9.732	0.002
Emergency Prep.	5.431	0.020	2.404	0.121
Overtime	0.004	0.950	5.212	0.022
Regular Hours…	3.625	0.057	9.575	0.002
Accident Compensation	0.111	0.739	0.321	0.571
Leave	0.239	0.625	4.870	0.027
Maternity Benefits	0.178	0.673	2.340	0.126

Notes: Test statistics represent the log-rank test of equality of survivor functions between factories that improved compliance. Each category represents a separate test. Categories are the same as in Table 2 but descriptions may be shortened here to save space.

Proportional Hazard Estimation of Closure

Factory closings are a considerable concern in developed and developing countries. As a result, there is a sizable literature that seeks to uncover the variables linked to factory survival. To analyze survival probabilities, we follow Richard Harris and Quan Cher Li (2010), Silviano Esteve-Pèrez, Amparo Sanchis Llopis, and Juan Alberto Sanchis Llopis (2004), Richard Disney, Jonathan Haskel, and Ylva Heden (2003) and others and employ the Cox (Cox 1972) proportional hazards model in equation (2´). Two of the main advantages of the Cox estimation approach are that it is quite straightforward to implement and it is robust to various specifications of the baseline hazard.

Table 4 contains the results from the Cox proportional hazards model estimation. Since we are primarily interested in sign and significance, the reported results in Table 4 (as well as in subsequent Table 5) are in log relative-hazard form (not hazard ratios).

Table 4: Factor Groups and Closure Probabilities

VARIABLES	(1) Levels	(2) Differences	(3) Visit 2 Change	(4) Visit 2 Change Indicator
Communication	-1.512**	-0.235	0.143	-0.507***
	(0.638)	(0.967)	(0.682)	(0.185)
OSH	-2.018*	-0.467	-1.626	-0.229
	(1.112)	(1.745)	(1.468)	(0.195)
HR Innovation	-0.720	-1.262	-1.025	-0.459**
	(0.956)	(1.395)	(1.097)	(0.191)
Compensation	2.057*	-2.829	-2.828*	-0.541***
	(1.057)	(1.885)	(1.507)	(0.192)
Unions	-0.712	2.202	-0.841	-0.085
	(1.191)	(2.082)	(1.820)	(0.196)
RS Buyer	-0.957***	-0.431*	-1.086***	-1.006***
	(0.213)	(0.240)	(0.215)	(0.212)
Owned: Anglo	-0.106	-0.278	-0.062	-0.194
	(0.304)	(0.374)	(0.305)	(0.314)
Owned: Korea	-0.351	-0.257	-0.426	-0.396
	(0.397)	(0.459)	(0.402)	(0.406)
Owned: China	-0.222	-0.407	-0.217	-0.283
	(0.295)	(0.362)	(0.306)	(0.307)
Owned: Other Asia	-0.180	-0.249	-0.267	-0.100
	(0.372)	(0.422)	(0.372)	(0.385)
Owned: Other	0.790*	-0.065	1.059**	0.890*
	(0.460)	(0.685)	(0.459)	(0.461)
Log Emp	-0.236*	-0.376**	-0.288***	-0.267**
	(0.122)	(0.148)	(0.110)	(0.112)
Crisis=1	1.836***	3.535***	1.865***	1.923***
	(0.188)	(0.344)	(0.186)	(0.189)

Recovery=1	1.737***	3.181***	1.692***	1.767***
	(0.245)	(0.376)	(0.244)	(0.246)
Constant	0.979	-1.578	-0.466	0.096
	(1.398)	(1.024)	(0.733)	(0.743)
Observations	1,821	1,410	1,822	1,822

Notes: Each column reports a separate maximum likelihood parametric exponential survival-time regression model. Coefficients (not hazard ratios) are reported. Compliance categories in column (4) are represented by a dummy variable equal to 1 if compliance in that area increased between the first and second visit, and 0 otherwise.

Each of the four columns in Table 4 uses a different measure of the working conditions categories while keeping the other explanatory variables (found below the working conditions variables) constant. Column (1) uses the levels of category compliance, which is measured as the simple average of the underlying questions in each category. The second column uses the difference in the simple category measures between the current and previous visit. Column (3) employs the value of the difference in the simple category measures between the first and second visit and holds that value constant across all subsequent periods. Column (4) uses the binary indicator which is equal to 1 if the factory improved in that category between the first and second visit and zero otherwise.

For the purposes of comparison, we begin by measuring the working conditions variables, *Z*, by average compliance, as reported in Column 1. Note first, that firms with a reputation sensitive buyer (-0.957) are less likely to fail and the probability of closure rises during the financial crisis (1.836) and its aftermath (1.737). Turning to the working conditions variables, the impact of compliance on closure depends on the compliance category. Higher compliance in Communication (-1.512) and OSH (-2.018) lower the probability of closure while higher compliance on Compensation (2.057) raises the probability of closure.

Results from overall compliance suggest that the relationship between survival and compliance depends on the type of compliance. Our interest, however, is specifically in changes in compliance induced by BFC. Columns (2)-(4) examine the impact of changes in compliance after entry into the Program. Column (2) considers an improvement between periods and columns (3) and (4) focus specifically at the change in compliance immediately following the first visit. Findings are most pronounced in column (4). Improvements in Communication (-0.507), Innovative Wage Practices (-0.459) and Compensation (-0.541) are all negatively associated with closure at the one to five percent level of significance.

Proportional Hazard Estimation of Retrogression

Overall, the results in Table 4 support the view that BFC-induced compliance does not increase the probability of closure and, for many compliance categories, significantly increases the probability of survival. The central question, however, is one of causality. Did the choice to come into compliance cause survival or are compliance and survival co-determined by managerial quality, credit constraints or buyer type? Co-determination can be excluded if a firm's decision to persist with BFC-induced compliance is not constrained by a firm's access to credit or buyer type.

We begin by performing a Chow-like test for a structural break in retrogression at the end of the public disclosure period in November 2006. Results are depicted in Figure 5. We observe strong evidence of a structural break in November 2006. The effect of public disclosure on retrogression may be overwhelming the structural effect of the financial crisis. In order to exclude this possibility we undertake the more sensitive Andrews-Ploberger structural break test (Andrews and Ploberger 1994). The test statistic assumes that the Andrews-Ploberger $c = 0$, $p = 1$, and their J distribution is collapsed to a single point so as to test each period separately.

As can be seen, the test statistic for a structural break rises more clearly around the time of the financial crisis, indicating that credit may have been a weak constraint on compliance. However, as can be seen from Figure 1, the wage and price series also diverge in the winter of 2008-09. In order to disentangle the contribution of credit, buyer type, wages and prices, we fit compliance retrogression in equation (3) to a Cox Proportional Hazard function. Results are reported in Table 5.

Table 5: Retrogression Hazard Estimation

VARIABLES	(1) Base	(2) Factory Controls	(3) Economic Conditions
Communication	1.101***	1.103***	1.103***
	(0.072)	(0.072)	(0.072)
OSH	0.766***	0.767***	0.767***
	(0.053)	(0.053)	(0.053)
HR Innovation	0.750***	0.752***	0.752***
	(0.061)	(0.061)	(0.061)
Compensation	0.103	0.103	0.103
	(0.066)	(0.066)	(0.066)
Unions	-2.117***	-2.118***	-2.118***
	(0.270)	(0.270)	(0.270)
RS Buyer		0.092**	0.060
		(0.043)	(0.043)
Log Employment		-0.018	-0.042
		(0.026)	(0.026)
Apparel Price Index		-0.374	-0.239
		(0.265)	(0.325)
Wages		3.113***	0.796***
		(0.156)	(0.239)
Crisis			0.079

			(0.053)
Recovery			0.066
			(0.076)
Public Disclosure			-2.286***
			(0.132)
Constant	-5.958***	-44.720***	-15.461***
	(0.041)	(1.966)	(2.984)
Observations	689,440	689,080	689,080

Notes: "Retrogression" is defined as a move from non-compliance to compliance and then back to non-compliance. Each column reports a separate maximum likelihood parametric exponential survival-time regression model. Coefficients (not hazard ratios) are reported. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. "Wages" represent the mean log of real wages, deflated by the apparel price index. The Apparel Price Index represents unit values of U.S. apparel imports from Cambodia. "RS Buyer" is equal to one for factories associated with reputation sensitive buyers.

Note first that the coefficient on the reputation sensitive buyer variable (RS Buyer) is not statistically different from zero, indicating that the presence of a reputation sensitive buyer does not affect a firm's decision concerning retrogression in compliance. Notice also that retrogression does not accelerate during the financial crisis. Thus, credit constraints that tightened during the financial crisis do not appear to have caused firms to backslide in compliance.

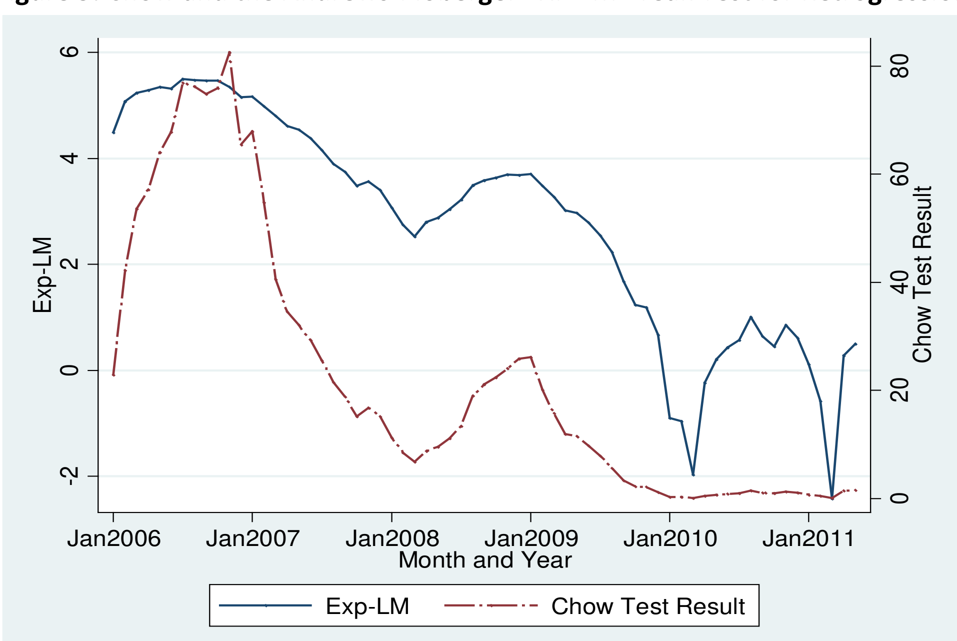
The significant determining variable in retrogression is wages (0.796). To the extent that retrogression accelerates during the crisis period, the causal factor appears to be a rise in wages relative to output price rather than a contraction of credit.

Clearly buyer type and credit constraints are significant determinants of probability of survival. As can be seen from Table 4, a reputation sensitive buyer lowers the probability of closure while credit constraints increase the probability of closure. If buyers and credit constraints are not determining retrogression, however, then they cannot be jointly determining survival and new compliance persistence.

What determines the decision to improve working conditions? Returning to Table 5, note that public disclosure (-2.286) is a statistically significant and negative predictor of retrogression. During the public disclosure period, the probability of retrogression is lower than in the aftermath. Such an outcome is consistent with a coordinating effect of Better Work that controls free riding on the reputational benefits generated by compliant firms, and extends previous work that finds that public disclosure is significantly related to compliance (Ang et al. 2012).

Confirming evidence is provided by the tests graphed in Figure 5. A pronounced structural break that dominates the entire period of the data clearly emerges in November 2006, just after the termination of public disclosure. Thus, the evidence indicates that compliant behavior emerged as a norm among Cambodian apparel managers when noncompliant behavior was publically disclosed. Firms that were publically disclosed as noncompliant and damaged Cambodia's reputation for "good" working conditions may have been targeted for some form of discipline following disclosure.

Figure 5: Chow and the Andrews-Ploberger EXP-LM Break Test for Retrogression



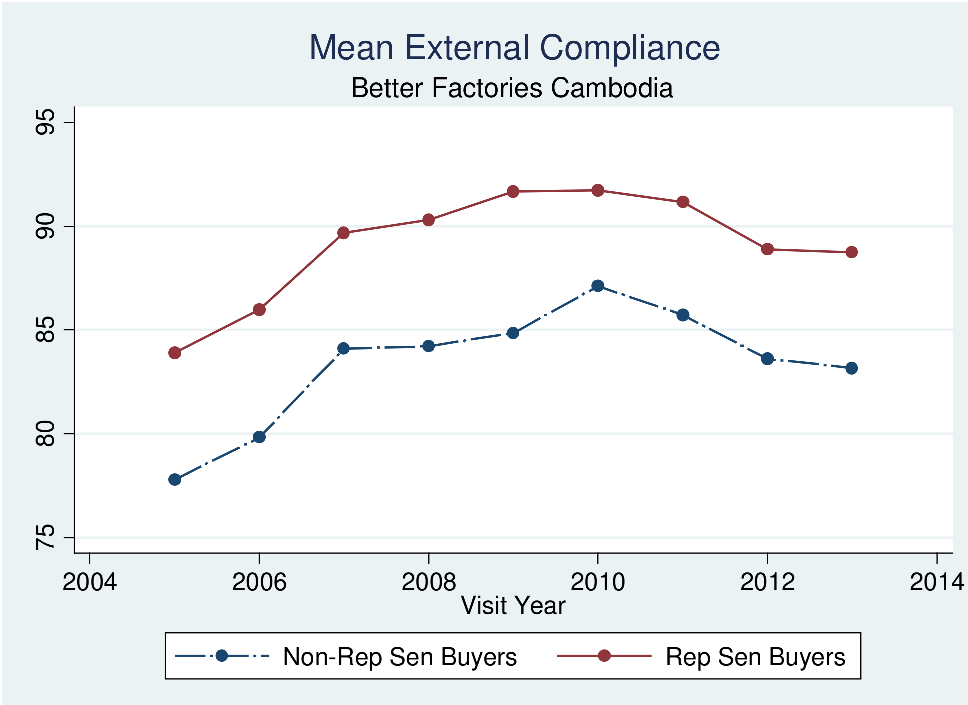
The evidence, then, is that new compliance positively predicts survival. Compliance and survival are not jointly determined by a firm's principal customer, although it is possible that compliance and survival are jointly determined by binding credit constraints. In contrast, public disclosure of noncompliance deters retrogression.

Our final question is whether firms acquired HR management knowhow while coming into compliance. Our test for learning involves examining the behavior of firms lacking a reputation sensitive buyer in the absence of public disclosure. Do these firms return to their baseline level of compliance prior to entering the program or did learning occur during an episode of new compliance resulting in a new profit-maximizing HR system?

Recall that after the public disclosure period, the compliance reports of firms lacking a reputation sensitive buyer are viewed only by BFC and the factory manager. Such firms would remain in compliance only if compliance had a production efficiency benefit or if there were an increase in compensation that manifests partly as an improvement in working conditions.

In Figure 6, we plot average compliance rates for firms with and without a reputation sensitive buyer. Factories with a reputation sensitive buyer have higher average compliance and the level of compliance is higher at the end of the period than at the beginning. OLS results show that the null that compliance in 2012-2013 is the same as compliance 2005-2006 is rejected (t-statistic = 4.24). The same results reject the null that average compliance between factories with reputation-sensitive buyers and factories with non-reputation sensitive buyers is equal (t-statistic = 10.17). The rate of improvement in compliance slows after the end of the public disclosure period. Note, however, that the average compliance rate does not return to the baseline. Firms remain fundamentally compliant. The path of compliance for firms lacking a reputation sensitive buyer does not diverge from that of firms with a buyer that requires a minimum level of compliance.

Figure 6: Average Compliance Rates by Buyer Type



Notes: OLS results show that the null that compliance in 2012-2013 is the same as compliance 2005-2006 is rejected (t-stat=4.24). The same results reject the null that average compliance between factories with reputation-sensitive buyers and factories with non-reputation sensitive buyers is rejected (t-stat 10.17).

Such a finding is particularly important for firms lacking a reputation sensitive buyer. Once the public disclosure period comes to an end, the compliance reports are seen only by the factory itself. As a consequence, the evidence is consistent with an altered perception of the firm's optimal labour management practices.

A more formal test is to estimate the working conditions function $Z^*(I, C, D, p, w)$. However, we add a time trend as a proxy for information acquired through compliant behavior. OLS estimates and standard errors are reported in Table 6. Column (1) is the basic estimation of Z^*. Column (2) includes a quadratic time term to more accurately reflect the likely possibility that the most learning occurs in the immediate period after experimentation with compliance. In column (3), the Harrigan-Barrows price index is replaced by Cambodia's export price measured by unit value.

Table 6: Compliance Over Time

VARIABLES	(1) Base	(2) Quadratic Time	(3) Alt. Prices
Time	0.001***	0.014***	0.014***
	(0.000)	(0.001)	(0.001)
$Time^2$		-0.000***	-0.000***
		(0.000)	(0.000)
Communication	-0.119***	-0.118***	-0.118***
	(0.002)	(0.002)	(0.002)
OSH	-0.079***	-0.079***	-0.079***
	(0.001)	(0.001)	(0.001)
HR Innovation	-0.061***	-0.061***	-0.061***
	(0.001)	(0.001)	(0.001)
Compensation	-0.016***	-0.016***	-0.016***
	(0.001)	(0.001)	(0.001)
Unions	0.072***	0.072***	0.072***
	(0.002)	(0.002)	(0.002)
RS Buyer	0.028***	0.029***	0.029***
	(0.001)	(0.001)	(0.001)
Log Emp.	0.018***	0.018***	0.018***
	(0.000)	(0.000)	(0.000)
Crisis	-0.005***	-0.001	-0.002
	(0.001)	(0.002)	(0.002)
Recovery	-0.008**	-0.004	-0.005
	(0.003)	(0.003)	(0.003)
Price Index	-0.023***	-0.022***	
	(0.004)	(0.004)	
Wages	0.140***	0.056***	0.053***

	(0.007)	(0.012)	(0.012)
Alt. Price Index			0.000
			(0.000)
Constant	-1.815***	-4.282***	-4.308***
	(0.066)	(0.286)	(0.297)
Observations	813,047	813,047	813,047
R-squared	0.037	0.037	0.037

Standard errors in parentheses

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

Average compliance for firms with a reputation sensitive buyer (0.028) is higher than for other firms and is independent of specification. Compliance is also positively related to wages with the coefficient ranging from 0.053 to 0.140 depending on whether price is quality controlled.

Turning to learning over time, the compliance function is concave in learning, after controlling for firm size, buyer type, credit constraints, prices, and wages. The statistical analysis, then, confirms the simple intuition in Figure 6. After the end of the public disclosure period, firms do not return to the base line level of compliance. To the extent that the average level of compliance declines from the peak in 2010, the principal driving factor appears to be a fall in wages that accompanies the end of the MFA and the global financial crisis.

V. CONCLUSIONS

International labour standards and improved working conditions are commonly resisted as anti-competitive, forcing firms and workers to deviate from market-determined wages and working conditions. The challenge to firms, however, is that acquiring the managerial knowledge necessary to optimally manage human capital can be as challenging as for physical capital, yet firms may be comparatively resistant to investing in human resource systems. A period of forced experimentation in the form of labour compliance has the potential to reveal efficient labour management practices.

In order to identify the impact of labour standards on firm outcomes, we exploit two events during the period we examine. The first is the suspension of public disclosure of factories and their individual points of noncompliance in November 2006 and the second is the financial crisis of 2008-9.

Focusing on compliance retrogression to control for managerial heterogeneity, we find first that new compliance, particularly after the first visit, positively predicts survival. However, retrogression is not predicted by buyer type and is only weakly predicted by credit constraints tightening during the financial crisis, thus ruling out the possibility that buyer type and credit constraints are jointly determining compliance and survival.

Evidence that firms learn from compliance is provided by firms' reaction to the end of public disclosure. For firms lacking a reputation sensitive buyer who can access compliance reports, only the firm itself sees the compliance report after the end of public disclosure. While retrogression does accelerate in the post-public disclosure period, these firms remain fundamentally in compliance despite the absence of external review. As a consequence, we can conclude that a firm's interest in remaining compliant is not solely driven by a concern for its reputation.

We conclude, then, that firms acquired knowledge capital concerning optimal labour management practices that increased their probability of survival. However, it is also the case that there were marginal effects related to reputation and the decline in the equilibrium wage. Retrogression accelerated when public disclosure ended. The interest in compliance declined when factory managers could not observe each other's compliance behavior. Thus, during the public disclosure period BFC may have helped Cambodian factories control free riding on the reputation created by compliant factories. We make one final observation. The average compliance rate for factories with a reputation sensitive buyer rises over the course of the program. Further, factories lacking a reputation sensitive buyer achieve the same level of compliance by the end of the study period as firms with a reputation sensitive buyer mid-way through the study period. Thus, the application of international labour standards was more effective than international buyers at achieving minimal working conditions and also reached those factories that do not fall under the discipline of global supply chains.

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