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Retrogression in working conditions:
Evidence from Better Factories Cambodia

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RETROGRESSION IN WORKING CONDITIONS:
EVIDENCE FROM BETTER FACTORIES CAMBODIA

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Abstract: Factories may improve working conditions and then learn whether or not these improvements were beneficial. Examining the decision to reverse previous improvements in working conditions (retrogress) reveals information that may help make programmes to improve working conditions self-sustaining.

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1.   INTRODUCTION

Efforts to improve working conditions in developing countries have generated a large and growing literature (Elliott and Freeman 2003, Harrison and Scorse 2010). One key issue in the debate centers on the optimality of such improvements (Brown et al. 2011a). While such improvements are generally believed to be beneficial to workers, the effects on the factory as a viable economic unit are less clear. If factories are optimizing and efficient, imposing additional constraints from the outside pushes factories from their privately-determined optimal practices.[1] On the other hand, such improvements may have efficiency-wage-like effects and increase productivity in ways that make the changes beneficial to the firms. In either case, factory managers may face uncertainty about the effects of the changes in working conditions *ex ante* and only learn about their true effects *ex post*. After the effects of the changes are understood, factories may realize that the changes were not optimal and reverse the improvements. Identifying factors affecting the decision to worsen conditions, which we refer to in this paper as retrogression, may provide information that would help identify the kinds of changes that are beneficial, the factors that may increase the sustainability of such improvements, and the improvements whose costs outweigh the benefits.

This paper analyses retrogression in the context of Cambodian apparel factories. The 1999 U.S.-Cambodia trade agreement created the incentive for factories to improve working conditions by linking such improvements to increased access to the U.S. market (Polaski 2004, Berik and van der Meulen Rogers 2010). Such market access captured the attention of Cambodian producers because apparel trade was restricted by the Multi-Fibre Arrangement (MFA) and the Agreement on Textiles and Clothing (ATC). The Better Factories Cambodia (BFC) programme was created to monitor and help factories

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[1] Some regulations seem to push factories so far from their optimal practices that they increase the probability of closure (Biørn et al. 1997). There are very few papers that examine the link between factory survival and improvements in working conditions; Harrison and Scorse (2010) is one notable exception.

improve working conditions. The monitoring reports were used by the U.S. government to determine Cambodia's apparel export quota allocation.

The BFC programme has captured a great deal of attention in academic literature. Combining interviews, observations, and BFC synthesis reports, Shea et al. (2010) document sustained increases in working conditions in Cambodia. Others, such as Polaski (2006), Adler and Woolcock (2010), and Miller et al. (2009) also document progress linked to, and concerns about, the BFC programme and generally agree that the programme has made positive contributions towards improvements in working conditions in Cambodia.

The market incentive linked to the MFA and the BFC programme were probably not the only factors affecting working conditions. Several papers that analyse the effects of the BFC programme consider other factors that might also have been at work. In particular, Oka (2010a and 2010b) and Robertson et al. (2011) show that the presence of a reputation-sensitive buyer and the policy of public disclosure of noncompliance through the BFC programme both increased the likelihood of compliance. Some of these factors changed during the 2001-2011 period. Although the MFA/ACT ended January 1, 2005, Beresford (2009) in particular finds that, overall, working conditions did not fall in response to an increasingly competitive environment. Ang et al. (2011) find that ending the programme of public disclosure reduced the rate of compliance, especially between the first and second visit. Another challenge emerged with the global financial crisis in late 2008. Exports fell and recovered, but the effects on compliance, much less retrogression, have not been examined.

To analyse retrogression, this paper uses factory-level data from the Better Factories Cambodia programme. The dataset has several characteristics that make it ideal for analysing retrogression. First, the data track individual factories over time so that individual fixed effects can be included in the empirical analysis. Second, the data include over 400 measures of individual compliance points allowing us to identify both the effects of various factors on both broad and narrowly-defined areas of compliance.

Third, the data span several important changes in environment that could affect retrogression, allowing us to separately identify the effects of each change.

We contribute three main results to the literature. Our first main result is that retrogression rates are overall quite low. Even when the market-access incentive is diminished, the rates of retrogression do not increase dramatically. Second, consistent with capital investment literature, adjustment costs matter. Costly investments are less likely to be reversed. Third, factors that affect compliance also, not surprisingly, affect retrogression. In particular, public pressure also matters: we find a significant break in behaviour following the BFC policy change in 2006 related to public disclosure of factory-level working conditions. Together these results do not seem to support the hypothesis that improvements are harmful to factories. On the contrary, taken together the results seem consistent with the hypothesis that such improvements help factories.

2.   THEORETIC FOUNDATION

Factory-level working conditions decisions can be modelled with a simple investment model with uncertainty about the productive value of the investment loosely following Bloom et al. (2007). Under the assumption that market information is reflected in current prices, rational factory managers will use current output, prices, input prices, and their information and beliefs (called their "information set") about the productivity of the inputs (labour, capital, and so on) for their investment decisions. The BFC programme may affect the information set by creating the expectation of higher prices through participation in the programme or higher marginal products. That is, the changes in HR practices might be viewed as a technological improvement that could have positive productivity effects, such as those documented by Ichniowski et al. (1997).

Solving such a model simply predicts that the factories will adjust capital investments based on current information. Changes in the information set may include information about the BFC programme, relationships with buyers, or information about the trade agreement that might change the expectation of the value of personnel

investments (e.g. capital that improves working conditions). The new information may drive improvements in working conditions.

It is important to point out that the actual benefit of such improvements is only discovered after such investments are made. If a given improvement does not meet expectations, firms may reduce or even reverse those investments in the next period.[2] Sometimes these adjustments may be expensive, and such adjustment costs could therefore affect the decision to retrogress: areas with high adjustment costs will be less likely to be reversed than areas with lower adjustment costs.

But the main hypothesis, of course, is simply that factories will have an incentive to reverse investments that turn out to not be beneficial. The goal of the empirical work that follows is to identify what factors are correlated with the factory's decision to regress in various dimensions of working conditions.

3.   DATA DESCRIPTION, SUMMARY STATISTICS, AND FACTOR ANALYSIS

The Better Factories Cambodia programme was established by the International Labour Organization (ILO) in 2001. Since the programme is becoming increasingly well-known, readers are referred elsewhere for a detailed description of the programme.[3] It combines monitoring, remediation, and training with the goal of improving working conditions in apparel-exporting factories. Monitors observe working conditions in all apparel-exporting factories during unannounced visits. To avoid monitor bias, each monitoring team contains at least two people, and the same team rarely assesses the same factory twice. Up to 2006, BFC published the firm's name and progress on improving working conditions in semi-annual public synthesis reports. After 2006, the synthesis reports presented aggregate compliance rates without naming individual factories. Much of the recent literature that focuses on the BFC programme use data

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[2] Quadratic adjustment costs will induce factories to gradually change working conditions investments over time, and differences in adjustment costs (as well as marginal products and direct costs) across factors K and Z will result in potentially different rates of change and levels in working conditions over time.
[3] Prominent examples include Polaski, 2004 and 2006, Berik and van der Meulen Rogers 2010, Oka 2010a. More information can be found at http://www.betterfactories.org/.

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contained in these publically-available synthesis reports (such as Beresford 2009 and Shea et al. 2010).

National law mandated universal participation, reaching 119 factories in the original 2001-2002 wave of visits. In the next three years, however, monitors focused on following up on previously non-compliant items rather than comprehensively assessing factories against the full checklist. As a result, data are unavailable for this three-year period. The launch of the improved Information Management System (IMS) survey in December 2005 marks the beginning of the next wave of documented visits in which monitors have visited each factory once every ten months on average.

SUMMARY STATISTICS

Rather than aggregate synthesis reports, this paper uses factory-level monitoring reports generated by the BFC programme. Table 1 shows the number of factories by visit by year for the 2001-2011 period. New firms entering each year (with a first visit) and existing firms accumulating visits generate the table's upper triangular structure. The total of 2,113 total observations is the product of 446 individual factories times each factory's number of individual visits (the maximum number of visits observed for any factory is 10). Visits typically fall about ten months apart, but the time between visits varies widely. National ownership also varies. The vast majority of the sample (93.7%) is foreign-owned, with 42% owned by China, Hong Kong SAR, and Macau SAR, 23.3% owned by Taiwan, and less than 3% owned by Western countries.

Table 1 also reveals significant attrition in the data. While there are a total of 446 factories with an initial visit, there are only 241 with a fifth visit. Much of the lack of 5th visit observations comes from the fact that the second "wave" is relatively large. Since tracking factories over time is important, we take care to identify factories that have actually closed rather than simply changed names. We combine an official list maintained by the BFC programme of confirmed closings and we compare the addresses of the factories over time. Fewer than five have the same address with distinct names (we use the same factory identifier for these observations). If a factory closes and then

re-opens at another location with a different name and different ownership (e.g. Macau SAR may have a factory that closes and passes its business to a firm owned by mainland China), we treat these as separate factories.

Table 1: Factory Visits by Year

Visit	2001	2002	2005	2006	2007	2008	2009	2010	2011	Total
					Visit Year					
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.

Working conditions are evaluated using 405 individual questions, such as "Has management appointed a liaison officer?", "Are women paid their maternity leave benefits either before or during leave?", and "Does management keep an up-to-date list showing each worker's schedule for weekly time off?". These questions are then compared to domestic law and international standards and coded into binary variables that indicate compliance. Of these 405 questions, 62 show no variation across both factory and visit. These questions are dropped from the analysis. The remaining questions are analysed at three levels of aggregation: six factors that are identified through factor analysis, 31 aggregate compliance groups that roughly conform to groups commonly used by the ILO, and individual questions.

We employ two definitions of retrogression. The first is a change from being compliant to being non-compliant. The second is a change from non-compliance to compliance and then back to non-compliance. In practice our measures of retrogression also vary by aggregation level. At the individual question level, retrogression is measured using a binary variable equal to one for factory-question observations that

have made either change described by our two definitions of retrogression (and zero otherwise). For aggregate levels, retrogression is measured as the change in the average value across all questions within each group for each factory. This approach gives us a continuous measure of compliance that allows us to assess the magnitude of changes as well as the direction. Retrogression in this case is defined as either a negative change in the compliance average or with a binary indicator for the cases in which the change in the aggregate measure at the factory level was less than zero. All changes are based on the difference between the current and the previous visit unless otherwise indicated.

Table 2 contains the average of the binary retrogression measures for the 31 aggregate compliance groups for 2006, 2008, and 2010. The changes vary considerably across groups. The core labour standards, such as forced labour, have very little retrogression. Core labour standards such as forced labour and child labour are *zero-tolerance* points from the perspective of reputation-sensitive buyers. These are highly sensitive issues for buyers that are extremely likely to result in the buyer ending the relationship with the factory. Areas related to industrial relations such as shop stewards, unions, and strikes have some of the lowest retrogression rates. This may be because these changes are relatively costless to the factory to implement and, once these changes are put in place, it would take a deliberate and conspicuous effort to remove them (going from having a shop steward to not having a shop steward, for example). It is important to note that areas such as "strikes" and "unions" do not necessarily imply that an active union that engages in strikes is present in the factory. These areas are based on questions that are designed to capture compliance with national labour law with respect to these areas. Note that the area of "Collective Agreements" and "Disputes" have relatively high rates. These areas capture potentially contentious areas that may easily change through time depending on changes within the factory.

Others, such as "Holidays/Annual/Special Leave", "Termination," and "Maternity Benefits" also have relatively high rates. These areas illustrate areas that do not necessarily represent an investment on the part of the factory. Violations in these areas

might also be the result of idiosyncratic situations that may not have emerged or tested the factories in earlier surveys.

Table 2: Retrogression Summary Statistics - 31 Compliance Groups

Group	2006	2008	2010
Forced Labour	0.357	0.005	0.000
Sexual Harassment	0.065	0.051	0.015
Strikes	0.000	0.000	0.000
Accidents/Illnesses Compensation	0.224	0.024	0.038
Unions	0.006	0.008	0.004
Discrimination	0.077	0.141	0.160
Internal Regulations	0.047	0.060	0.042
Child Labour	0.071	0.035	0.027
Collective Agreements	0.200	0.244	0.262
Liaison Officer	0.394	0.301	0.297
Disputes	0.371	0.252	0.247
OSH Assessment/Recording/Reporting	0.377	0.320	0.224
Machine Safety	0.229	0.157	0.152
Shop Stewards	0.006	0.000	0.000
Discipline	0.135	0.089	0.049
Emergency Preparedness	0.076	0.024	0.046
Maternity Benefits	0.207	0.236	0.335
Drinking Water	0.231	0.146	0.110
Information About Wages	0.331	0.352	0.338
Regular Hours/Weekly Rest	0.408	0.211	0.156
Food	0.254	0.266	0.278
Contracts/Hiring	0.255	0.190	0.274
Holidays/Annual/Special Leave	0.284	0.214	0.300
Health/First Aid	0.089	0.122	0.125
Sanitation	0.408	0.325	0.319
Workplace Operations	0.284	0.206	0.163
Termination	0.341	0.306	0.285
Overtime	0.147	0.257	0.236
Payment of Wages	0.067	0.030	0.000
Chemicals	0.396	0.263	0.202
Temperature/Ventilation/Noise/Light	0.148	0.230	0.198

Notes: OSH denotes "Occupational Safety and Health." These measures are calculated by taking the average of the binary compliance indicators across individual questions within each group and across all existing factories in the sample for each year.

For most areas, there is no clear trend overall in retrogression rates over time. They increase across years for some, fall across years for others, and exhibit other patterns as well. One area that seems to show consistent improvement over time is the rates of retrogression in Payment of Wages, and Regular Hours/Weekly rest. These are the areas that seem to be most closely linked to the "efficiency wage" literature that suggests that workers that are paid and get adequate rest might be more productive and therefore offer direct benefits to factories through compliance. This is an example of the possibility that individual groups patterns are driven by underlying factors. To identify groupings of these categories that may be driven by underlying factors, we turn to factor analysis.

FACTOR ANALYSIS

Factor analysis helps identify a few common factors that may explain common changes in individual categories. The groupings are admittedly subjective in factor analysis, and therefore we explain our steps carefully.

Table 3: Groupings Resulting from Factor Analysis

Factor 1: Communication and Workplace Systems
6	Shop Stewards
7	Liaison Officer
23	Workplace Operations

Factor 2: Occupational Safety and Health
17	Health/First Aid
18	Machine Safety
19	Temperature/Ventilation
20	Drinking Water
21	Sanitation
22	Food
24	OSH Assessment/Recording
25	Chemicals
26	Emergency Preparedness

Factor 3: Modern HR Practices
9	Information About Wages
12	Termination
13	Discipline
27	Overtime
28	Regular Hours/Weekly Rest

Factor 4: Compensation
10	Payment of Wages
11	Contracts/Hiring
16	Internal Regulations
29	Accidents/Illnesses Com
30	Holidays/Annual/Special
31	Maternity Benefits

Factor 5: Unions
4	Collective Agreements
5	Strikes
8	Unions
14	Sexual Harassment
15	Disputes

Factor 6: Core Labour Standards
1	Child Labour
2	Discrimination
3	Forced Labour

The core labour standards of child labour, forced labour, and discrimination start with generally high compliance and vary little, so we group them. We then apply an orthogonal rotation to the results generated by applying the principle-factor method to the remaining 28 of the 31 compliance categories.[4] The resulting matrix identifies nine possible factors, but none of the maximum values appear 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 5 additional factors shown in Table 3.

Table 4 contains the summary retrogression measures for the six factors identified in Table 3. Some of the compliance groups in Table 4 fall (Unions and Core Labour Standards). Others rise and then level off (Compensation). The others rise over time. The rates are also higher. The rates start relatively low in 2006, but increase in 2010. While always below fifty per cent, some of the rates, such as Modern HR practices in 2010, seem very close to fifty per cent. The core labour standards remain relatively low, possibly suggesting that these are considered important to buyers or have stronger consequences associated with noncompliance.

Table 4: Aggregate Retrogression Rates for Underlying Factors

Factor	2006	2008	2010
Communication and Workplace Systems	0.095	0.278	0.332
Occupational Safety and Health	0.142	0.451	0.488
Modern HR Practices	0.159	0.421	0.495
Compensation	0.115	0.392	0.392
Unions	0.142	0.116	0.085
Core Labour Standards	0.176	0.052	0.014

Notes: The individual factors are comprised of various groups as described in Table 3.

One of the concerns with the aggregate measures presented in Tables 2 and 4 is that they include composition effects. The entrance of factories that are more likely to

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[4] The principle-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 principle-components method is most appropriate for uniqueness values close to zero. In our case, therefore, the principle components analysis is probably not appropriate.

retrogress would increase average retrogression rates. It seems likely that both of these results are due to aggregation and the definition of retrogression that we use. We control for this by using question-level regressions and an alternative definition of retrogression in the analysis. The second measure is a dummy variable equal to one for factories that move from non-compliance to compliance and then back to non-compliance, and zero otherwise. One concern about this measure is that it requires an additional period of data (relative to the first measure) and it treats factories that are never compliant equally with firms that are always compliant. To adjust for this, we calculate the average value of this retrogression measure by dividing by the total compliance at the factory-visit level. The result is an average retrogression measure of 0.8 per cent. While this measure varies somewhat across visit (ranging from 0.5% in visit 9 to 0.9% in the fourth and seventh visits), the rates are always below 1 per cent. These numbers suggest that factories that become compliant are extremely unlikely to reverse this decision. In the next section we focus on question-level compliance to compare retrogression rates across compliance areas and identify the relevance of factors identified in the theory section that may affect retrogression.

4.   EMPIRICAL ANALYSIS

In this section we take two approaches. We first apply a Chow-like test to evaluate the possibility of a structural break in the pattern of retrogression as a result of a policy change in the middle of our sample. We then apply a question-level regression analysis to identify the importance of several factors that theory suggests would affect retrogression.

DID PUBLIC DISCLOSURE MATTER? A CHOW TEST FOR STRUCTURAL BREAK

As noted earlier, one of the characteristics of the BFC programme involves audits in which monitors enter the plants and record observations. These observations were the basis of BFC Synthesis Reports that were publically available on the internet. These reports named factories and linked them directly to working condition violations. The

policy of posting these reports changed in November 2006, at which point Synthesis Reports stopped naming specific factories and only published aggregate compliance data.

This change in policy provides an opportunity to investigate the possible role that public disclosure has in plant manager behaviour. To investigate this change formally, we first apply a Chow-type test for a structural break in retrogression. Retrogression is calculated at the compliance question level and is defined as a factory being observed as compliant and then subsequently observed to be noncompliant.

Figure 1 shows that two peak values emerge for our first definition of retrogression, and Figure 2 shows the results when we apply the second definition of retrogression. The peak values in both figures suggest that a structural break occurred around October 2006 (Figure 1 also suggests that a second break occurred at the onset of the financial crisis). The fact that the data suggest a structural break at approximately at the same time as the policy change supports the hypothesis that public disclosure affects retrogression. The fact that the break appears one month before the policy change would be consistent with some advance notice of the change occurring or that the break induced the policy change. Discussions with ILO/BFC management, however, suggest that the former is a much more likely explanation.

Figure 1: Chow-type Test for Structural Break
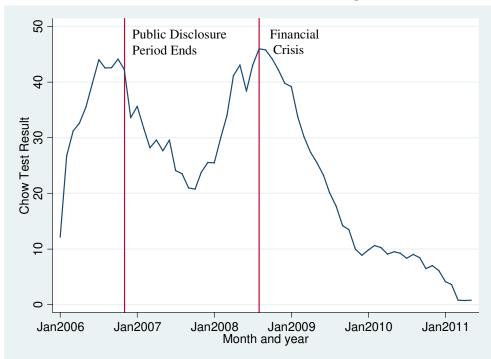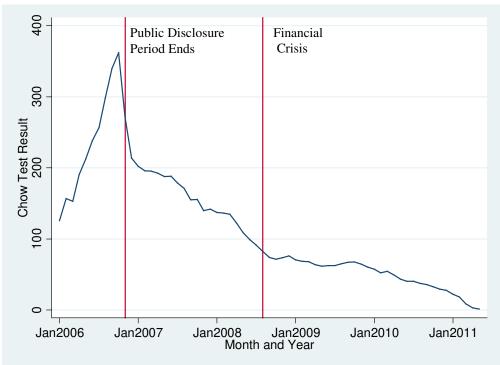**General Definition of Retrogression**

Figure 2: Chow-type Test for Structural Break
Restrictive Definition of Retrogression

Given the strong evidence supporting the possibility of a change in behaviour at the same time public reporting ceased, we now turn to a more detailed regression analysis. In the regressions that follow we first create a retrogression variable for each question so that the unit of observation is a factory-question in each visit. Define g_{qit} = 1 if question q in plant i at time t changes from compliant to non-compliant and 0 otherwise. Using this as a dependent variable gives us about 300,000 observations (questions * plants * visit).

The mean of the first retrogression dummy variable *retrogression* is 0.035. This 3.5% of the question-plant-period observations can be decomposed to reveal falling rates of retrogression as the visit number increases. Between the first and second period the retrogression rate (which is across all questions and factories) is 7.3%, but that rate falls to 3.3% between the fourth and fifth visit. Part of this may be explained by a selection bias if the least successful firms are most likely to regress and are more likely to drop out of the sample. These means are much smaller than the aggregate figures presented in Tables 2 and 4, which, though aggregation, contain composition effects.

In order to investigate the impact of buyer reputation sensitivity on labour law compliance, we collect data on each buyer's commitment to corporate social responsibility, whether the firm is an apparel retailer or mass merchandiser, and other measures of brand value as determined by consulting firms such as Inter-Brand's Best Global Brands Ranking and *Fortune*'s "Most Admired Companies" scoring system. Based on this survey of information, buyers were first separated into apparel retailers and mass merchandisers. Apparel retailers are primarily in the business of selling apparel and may sell other related but non-apparel goods. Mass merchandisers refer to large chain stores that sell a wide range of products, with apparel being only one subgroup. These two groups of buyers differ principally in terms of product quality measures both in terms of the technical characteristics of the garment and defect rate.

Within these two groups, buyers are subsequently divided by reputation sensitivity. Reputation-sensitive firms are characterized by evidence of a policy on corporate social responsibility in the form of a website or public report. Of buyers sourcing from Cambodia during the study period, firms fell into four broad categories. The first (Type 1) includes apparel retailers with significant evidence of corporate social responsibility. Apparel retailers with little evidence of a policy relating to corporate social responsibility fall in the second group (Type 2). Type 3 buyers are mass merchandisers with significant evidence of corporate social responsibility. No buyers fell into the category of mass merchandiser without evidence of CSR. The last type (Type 4) consists of buyers that were not accessing BFC compliance reports.

Tables 5-7 include results for the first definition of retrogression. The simplest specification results, broken down by buyer type and using just the factors identified in the factor analysis, are found in Table 5.

Table 5: Retrogression Main Factor Groups
Question-level Linear Probability Model

VARIABLES	(1) Means Full sample	(2) Means Buyer type=1	(3) Means Buyer type=3
Communication and Workplace Systems	0.040***	0.037***	0.040***
	[0.001]	[0.002]	[0.002]
Occupational Safety and Health	0.044***	0.039***	0.041***
	[0.001]	[0.002]	[0.002]
Modern HR Practices	0.036***	0.033***	0.034***
	[0.001]	[0.002]	[0.002]
Compensation	0.027***	0.022***	0.026***
	[0.001]	[0.001]	[0.001]
Unions	0.010***	0.008***	0.010***
	[0.001]	[0.001]	[0.001]
Core Labour Standards	0.007***	0.006***	0.009***
	[0.001]	[0.001]	[0.002]
Observations	459,589	128,605	141,991

Notes: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.10$

The regressions in all columns represent OLS estimation of a linear probability model of the binary dependent variable *retrogression* described above. We do not

report the R-squared statistic because it has limited applicability in the linear probability model. Probit estimation generates very similar results. The constant term is suppressed to allow the main effects of the various groups to each be represented as conditional means. In other words, the results in Table 5 simply represent the conditional means of the retrogression rates calculated at the question level for each of the groups identified in the factor analysis. These numbers differ from those in Table 2 because those were the group averages (which are in a sense cumulative within the group) rather than the question-level averages.

The overall results are very similar across buyer types. Considerable cross-factor variation in retrogression occurs across the six factors. There is very little retrogression in Core Labour Standards which, as described earlier, are *zero-tolerance* points of compliance for buyers. Thus, it is not surprising to see low probability of retrogression. By contrast, retrogression in compliance points that involve more complex factory organizational change is considerably higher. The probability BFC enterprise advisors would observe noncompliance on a visit following a visit where the factory was found to be in compliance in Communication and Workplace Systems, Occupational Safety and Health and Modern HR Practices are all close to 0.04.

CONTROL VARIABLES

The means in Table 5 are largely descriptive and are meant to illustrate the differences across the different compliance areas, but omit variables identified in the theory section that might affect retrogression. The first control variables we add are geographic fixed effects that control for the nation of factory ownership. They are added to the regression as a set of dummy variables (one variable for each country identified in the data). Previous studies have found a significant effect of foreign ownership on technology adoption and survival (Harris and Li 2010).[5] Although we are not aware of studies that have included this variable in studies of retrogression, we include these effects in each of the columns of Table 6.

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[5] Brown et al. (2011b) examine improvements in working conditions and factory survival in Cambodian apparel factories.

Table 6: Retrogression Main Factors with Controls

VARIABLES	(1) Full sample	(2) Buyer type=1	(3) Buyer type=3
Communication and Workplace Systems	0.052***	0.039***	0.051***
	[0.003]	[0.005]	[0.004]
Occupational Safety and Health	0.059***	0.043***	0.055***
	[0.003]	[0.004]	[0.004]
Modern HR Practices	0.046***	0.033***	0.043***
	[0.003]	[0.005]	[0.004]
Compensation	0.038***	0.022***	0.035***
	[0.003]	[0.004]	[0.004]
Unions	0.019***	0.008*	0.018***
	[0.003]	[0.004]	[0.004]
Core Labour Standards	0.017***	0.005	0.017***
	[0.003]	[0.004]	[0.004]
Reputation-sensitive buyer	-0.006***		
	[0.001]		
Physically irreversible compliance point	-0.015***	-0.014***	-0.017***
	[0.001]	[0.002]	[0.002]
Union active in labour rights	-0.004*	-0.001	-0.007*
	[0.002]	[0.004]	[0.004]
Small unions possibly controlled by management	-0.005*	-0.001	-0.009*
	[0.003]	[0.006]	[0.005]
Unions known to be politically affiliated	-0.013***	-0.006	-0.026***
	[0.004]	[0.004]	[0.005]
Large unions known to serve management	0.001	0.004	-0.001
	[0.003]	[0.006]	[0.005]
Public Disclosure Period	0.030***	0.020***	0.033***
	[0.004]	[0.007]	[0.007]
Crisis Period	-0.007***	-0.003	-0.010**
	[0.002]	[0.004]	[0.004]
Recovery Period	-0.006**	-0.003	-0.004
	[0.002]	[0.004]	[0.005]
Observations	445,817	122,322	139,324

Notes: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.10$. Buyer types are explained in the text.

We also add several other variables that theory suggests might play a role. Previous papers have found that a relationship with a reputation-sensitive buyer increases the propensity to improve working conditions (Oka 2010a). The first column of Table 6 shows that this relationship is statistically significant effect on the decision to

retrogress as well: a relationship with a reputation-sensitive buyer deters retrogression. This effect is relatively small, however, as suggested by the point estimate.

The discussion of the theory in Section 2 suggests that adjustment costs can affect the retrogression. We model adjustment costs by classifying each of the areas in the survey with a dummy variable equal to one if the change implied represents a "physically irreversible" decision (such as the purchase of capital or some other physical equipment that would be costly to remove), and zero otherwise. The results in Table 6 suggest that the presence of a physically irreversible compliance point has a statistically significant effect of reducing retrogression. This effect is quite similar across buyer types as well, and is consistently negative. This result is consistent with the investment literature that shows that irreversibility matters (Anderson et al. 2010, Mason and Weeds 2010).

We also consider whether or not the threat of public disclosure of noncompliance can also deter retrogression. In Table 6 the coefficients of the Public Disclosure variable are all positive, suggesting that retrogression rates were higher during the public disclosure period. The effect is relatively large and is not consistent with Ang et al. (2011), who find that compliance generally was higher during the public disclosure period. We explore this result further with our alternative definition of retrogression below.

We also include four union variables. Unions are particularly interesting in Cambodia because they may either represent workers, and therefore support improvements in working conditions (holding all else constant) or they may be aligned with either factory managers or political parties that either support or do not support such improvements. The estimates in Table 6 show very few statistically significant union coefficients. This may be due to large but heterogeneous union effects (therefore giving rise to large standard errors) or very small effects of unions (small estimated coefficients). The estimated coefficients in Table 6 are quite small, suggesting that unions have very little effect on retrogression. Unions active in labour rights are the only ones with statistically significant coefficients, and these are both positive (in columns (1)

and (3)). The positive coefficients suggest that the presence of these unions increases the likelihood of retrogression, which is a result that merits additional research.

Finally, we also include controls for the financial crisis (June 2008-December 2009) and recovery period (beginning in January 2010 and extending to the end of the sample period). During the financial crisis developed-country demand dropped considerably (Baldwin 2009), causing Cambodian exports to drop sharply, which placed increased pressure on factories. Factory closures increased significantly. The crisis therefore offers an opportunity to consider the effects of an exogenous adverse demand shock. If sustaining improvements is costly or a burden to factories, then it is possible that retrogression would increase during the crisis. A negative estimate could be consistent with positive effects of working conditions such that retrogression is less attractive during the crisis.

The crisis coefficient estimates in Table 6 are negative, suggesting that retrogression fell during the crisis. These results seem inconsistent with the hypothesis that reversing improvements in working conditions helped factories during adverse economic times because they were burdensome. Given that there were significant productivity improvements in Cambodian apparel factories that occurred along with improvements in working conditions (Asuyama et al. 2010), it seems possible that the two improvements might be related.

One concern about the results in Table 6 is that unobserved firm-specific characteristics could be driving our results. For example, it is possible that more able managers are more likely to be able to make improvements in working conditions increase the productivity of the factory and therefore they are less likely to retrogress. One advantage of our data is that factories are followed over time, which allows us to include factory-specific fixed effects.

Table 7 contains the results that include factory-specific fixed effects. This set of dummy variables (one for each factory) controls for any factory characteristic that is constant over time (such as a manager or factory owner that remains in his/her position for the entire sample). The results with these controls are very similar to those in Table

6, suggesting that Table 6 results are not driven by unobserved factory-specific characteristics. In particular, physically irreversible compliance points and the crisis reduce retrogression. The union variables remain largely insignificant but follow similar patterns as those suggested in Table 6.

Table 7: Factory-level Fixed Effects

VARIABLES	(1) Full sample	(2) Buyer type=1	(3) Buyer type=3
Communication and Workplace Systems	0.060***	0.036***	0.056***
	[0.005]	[0.005]	[0.003]
Occupational Safety and Health	0.067***	0.040***	0.060***
	[0.005]	[0.004]	[0.003]
Modern HR Practices	0.054***	0.030***	0.049***
	[0.005]	[0.005]	[0.003]
Compensation	0.046***	0.019***	0.040***
	[0.005]	[0.004]	[0.003]
Unions	0.028***	0.004	0.023***
	[0.005]	[0.005]	[0.003]
Core Labour Standards	0.025***	0.002	0.022***
	[0.005]	[0.005]	[0.003]
Physically irreversible compliance point	-0.015***	-0.014***	-0.017***
	[0.001]	[0.002]	[0.002]
Union active in labour rights	-0.003	-0.004	-0.005
	[0.003]	[0.005]	[0.005]
Small unions possibly controlled by management	-0.004	-0.004	-0.002
	[0.003]	[0.006]	[0.005]
Unions known to be politically affiliated	-0.018***	0.002	-0.019***
	[0.004]	[0.004]	[0.004]
Large unions known to serve management	0.003	0.003	0.002
	[0.004]	[0.006]	[0.005]
Public Disclosure Period	0.032***	0.026***	0.036***
	[0.004]	[0.008]	[0.006]
Crisis Period	-0.005**	-0.003	-0.006
	[0.003]	[0.005]	[0.004]
Recovery Period	-0.003	-0.003	0.000
	[0.003]	[0.004]	[0.005]
Observations	445,817	122,322	139,324

Notes: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.10

AN ALTERNATIVE DEFINITION OF RETROGRESSION

One concern about the definition of retrogression used thus far is that factories may enter the sample compliant in various areas. These factories may be different than those that are originally non-compliant, become compliant, and then decide, having tried both compliance and non-compliance, to revert to non-compliance. In other words, the decision to revert back to non-compliance may be different than to simply become non-compliant. In fact, one might argue that the more restrictive definition of retrogression that includes factories that have experienced both compliance and non-compliance is closer to the spirit of the model described in section 2.

Table 8 mirrors Table 5 except that it uses the more restrictive definition of retrogression as the binary dependent variable. The main difference between the results in Table 5 and Table 8 is that the rates of retrogression are much lower. They follow the same pattern in both tables, with the highest rates being in Communication and Workplace systems and the lowest being in Core Labour Standards and Unions. Interestingly, the rates of retrogression are below 0.000 for Unions and Core Labour Standards in Table 8. After these areas, the very low levels of retrogression in the area of Compensation are consistent with efficiency-wage-type explanations for improvements in working conditions highlighted in other papers. In contrast to Table 5, the results across buyer types in Table 8 are identical.

Table 8: Alternative Retrogression Measure
Main Factor Group Means

VARIABLES	(1) Full sample	(2) Buyer type=1	(3) Buyer type=3
Communication and Workplace Systems	0.009***	0.010***	0.010***
	[0.000]	[0.001]	[0.001]
Occupational Safety and Health	0.007***	0.007***	0.007***
	[0.000]	[0.001]	[0.001]
Modern HR Practices	0.007***	0.007***	0.007***
	[0.000]	[0.001]	[0.001]
Compensation	0.003***	0.003***	0.003***
	[0.000]	[0.000]	[0.000]
Unions	0.000***	0.000*	0.000*
	[0.000]	[0.000]	[0.000]
Core Labour Standards	0.000*	0.000	0.000
	[0.000]	[0.000]	[0.000]
Observations	616,996	158,208	175,712

Notes: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.10. The dependent variable in this linear probability model equals 1 for factory-questions that follow the pattern non-compliant → compliant → non-compliant and zero otherwise.

Table 9 contains the results of the linear probability model with added control variables (analogous to Table 6), and Table 10 adds factory-level fixed effects (analogous to Table 7). Two main differences emerge with the alternative definition of retrogression. The first difference between these and the earlier results is that the public disclosure period variable switches sign and is now negative in Tables 9 and 10. The difference in results suggests that factories were less likely to exhibit retrogression after having tried both compliance and noncompliance during the period of public disclosure.

Table 9: Alternative Retrogression Measure
Main Factors with Controls

VARIABLES	(1) Full sample	(2) Buyer type=1	(3) Buyer type=3
Communication and Workplace Systems	0.009***	0.013***	0.009***
	[0.001]	[0.003]	[0.002]
Occupational Safety and Health	0.007***	0.009***	0.007***
	[0.001]	[0.003]	[0.002]
Modern HR Practices	0.006***	0.008***	0.006***
	[0.001]	[0.003]	[0.001]
Compensation	0.003***	0.005*	0.002
	[0.001]	[0.002]	[0.001]
Unions	-0.000	0.002	-0.001
	[0.001]	[0.002]	[0.002]
Core Labour Standards	-0.000	0.002	-0.001
	[0.001]	[0.003]	[0.002]
Reputation-sensitive buyer	0.000		
	[0.000]		
Physically irreversible compliance point	-0.002***	-0.002***	-0.002***
	[0.000]	[0.001]	[0.001]
Union active in labour rights	0.001**	0.002**	0.001
	[0.000]	[0.001]	[0.001]
Small unions possibly controlled by management	0.000	0.001	-0.001
	[0.001]	[0.001]	[0.001]
Unions known to be politically affiliated	-0.000	-0.001	-0.001
	[0.000]	[0.001]	[0.001]
Large unions known to serve management	0.000	0.003**	0.001
	[0.001]	[0.001]	[0.001]
Public Disclosure Period	-0.005***	-0.005***	-0.004***
	[0.000]	[0.001]	[0.000]
Crisis Period	0.002***	0.003***	0.003***
	[0.000]	[0.001]	[0.001]
Recovery Period	0.004***	0.005***	0.006***
	[0.001]	[0.001]	[0.001]
Observations	597,323	150,514	172,463

Notes: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.10

Table 10: Alternative Retrogression Measure: Fixed Effects

VARIABLES	(1) Full sample	(2) Buyer type=1	(3) Buyer type=3
Communication and Workplace Systems	0.013***	0.009***	0.007***
	[0.001]	[0.001]	[0.001]
Occupational Safety and Health	0.011***	0.005***	0.006***
	[0.001]	[0.001]	[0.001]
Modern HR Practices	0.010***	0.004***	0.005***
	[0.001]	[0.001]	[0.001]
Compensation	0.007***	0.001	0.001
	[0.001]	[0.001]	[0.001]
Unions	0.004***	-0.002**	-0.002***
	[0.001]	[0.001]	[0.001]
Core Labour Standards	0.004***	-0.002***	-0.003***
	[0.001]	[0.001]	[0.001]
Physically irreversible compliance point	-0.002***	-0.002***	-0.002***
	[0.000]	[0.001]	[0.001]
Union active in labour rights	0.001	-0.000	0.000
	[0.001]	[0.001]	[0.001]
Small unions possibly controlled by management	0.000	0.000	0.000
	[0.001]	[0.001]	[0.001]
Unions known to be politically affiliated	-0.001	0.001	-0.003
	[0.001]	[0.001]	[0.002]
Large unions known to serve management	0.000	0.003*	-0.000
	[0.001]	[0.001]	[0.002]
Public Disclosure Period	-0.005***	-0.005***	-0.004***
	[0.000]	[0.001]	[0.001]
Crisis Period	0.003***	0.003***	0.003***
	[0.001]	[0.001]	[0.001]
Recovery Period	0.007***	0.005***	0.007***
	[0.001]	[0.001]	[0.001]
Observations	597,323	150,514	172,463

Notes: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

The second result is that the crisis is now associated with higher retrogression. This change suggests that the pressure from the unanticipated crisis induced those factories that had tried both compliance and noncompliance to become less compliant when product demand fell. This is a somewhat intuitive result that would emerge if compliance is costly, and compliance may be more costly for factories that were initially non-compliant than factories that were originally compliant.

5.   CONCLUSIONS

Changes to human resource policies can be considered "innovations" akin to adoption of production technologies. While there are an increasing number of papers that examine the adoption of technology, there are fewer that focus on changes to human resource policies. Even fewer papers consider the long-run sustainability of HR innovations by considering retrogression. Using data from the BFC programme, this paper identifies several factors that may affect a factory's decision to reverse compliance with a very large number of working conditions.

An important determinant of a factory's decision to retrogress is adjustment costs. Compliance areas that require an investment, or that are costly to reverse, are less likely to be reversed. While this may seem like a trivial point, the implication of this is that there are points that might be beneficial to the factory (that would bring the benefits that compliance brings), but not implemented by the factory because of the certainty of the cost and the uncertainty of the benefit combine to make managers hesitant to implement such changes. When given additional incentive to make these investments, such as through the Better Factories programme, factories may "take the leap" and then later discover that the changes were indeed beneficial. The large and growing investment literature focusing on the dynamic effects of irreversibility suggest that the strategic implications of the effects of irreversibility merit attention in future research.

The mixed results for public disclosure of noncompliance and the economic crisis also merit further research, since these results depend critically on the definition of "retrogression" used in the analysis. The results suggest that public disclosure deters retrogression for factories that begin non-compliant but become compliant, but may have the opposite results for factories that start out compliant. The crisis period also generates mixed results depending on the definition of retrogression used.

The main conclusions from this study are that retrogression rates are extremely low among Cambodian garment factories, a result that seems inconsistent with the idea that improvements in working conditions are especially burdensome for factories.

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Retrogression rates are lowest in the areas of Core Labour Standards and Unions. Compensation follows these areas with much lower rates of retrogression than other areas such as Communication and Workplace systems. The low rates of retrogression in this area are consistent with the "efficiency-wage" idea that offering consistent compensation to workers may help improve productivity and increase factory performance.

In terms of policy recommendations, this paper has important implications. Other papers have produced results that suggest that improving human resource policies may have positive benefits for the factory, but may not be implemented by the factory. One reason for this is that factories are uncertain about the benefits and certain about the one-time costs of implementing some of the measures. Subsidizing one-time investments and sharing information about the specific reforms that factories have tried and have proven to be beneficial would help other factories overcome these obstacles and lead to more beneficial improvements in working conditions.

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