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APPAREL WAGES BEFORE AND AFTER

BETTER FACTORIES CAMBODIA

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apparel and other sectors in Cambodia with differences between apparel and other sectors in other countries to approximate a *difference-in-differences* approach.

Although not the specific goal of the book, evidence supporting this *difference-in-difference* approach emerges from Robertson et al. (2009). This book compares the difference in wages between the apparel and other sectors in five countries: Cambodia, Indonesia, El Salvador, Honduras, and Madagascar. By using a common methodology across all countries, this book finds that apparel wages[1] are significantly higher (both statistically and economically) than the average wage in each country. This difference is largest by far in Cambodia. Since one of the main differences between these countries was the BFC program, this evidence is consistent with (but does not prove) BFC having significant positive effects on wages.

One obvious concern is that the higher wage premiums in Cambodia might be necessary to offset exceptionally poor conditions. This is known in economic literature as the compensating differentials hypothesis and suggests that workers will accept poor conditions in exchange for higher wages (see, for example, Marin and Psacharopoulos. 1982). There are two results that suggest that compensating differentials may not explain changes in working conditions in Cambodia. The first is that differences in conditions across countries cannot explain wage differences within countries. The second is that Warren and Robertson (2010) find very little, if any, evidence suggesting that apparel firms in Cambodia substitute higher wages for poor conditions. In fact, nearly all of the evidence in that paper suggests the opposite: wages (measured as compliance with a range of wage-related regulations, such as compliance with the minimum wage) improve along with other measures of working conditions. That is, by using factory-level monitoring reports that track changes in working conditions over time, the authors consistently find a strong positive relationship between changes in wages (again, measured by wage compliance) and changes in working conditions.

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[1] Apparel wages described here as the premium specific to the apparel industry after taking into account all other characteristics that contribute to wage, including gender, education, and others. Unadjusted average wages in apparel may be lower than in other industries because workers in apparel are those with characteristics that are associated with lower wages (specifically younger females).

The data used by Warren and Robertson (2010) represent a potentially rich source of information that can be used to implement the second strategy to evaluate BFC: changes within and across apparel firms across time. This is the strategy currently being implemented by Robertson, Dehejia, and Brown (2011). They use these factory-level reports to analyze several questions, including the effect of improvements in working conditions on the probability of firm closure during the crisis and the factors that affect the firm's decision to improve working conditions. Their preliminary results suggest that there are several dimensions of working conditions that are positively associated with the probability of survival in the face of the crisis and that buyer preferences affect the firm's decision to improve conditions.

If the first strategy to evaluate BFC can be described as comparisons across space (that is, across sectors and countries), and the second strategy can be described as comparisons across time (within firms and within the apparel sector), then the third strategy can be described as a combination of the two: looking at variation across space (that is, across industries) over time (before and after the BFC program). It is precisely this third strategy that this paper implements. This goal of this paper is to examine changes in the apparel sector relative to other sectors in Cambodia before and after the BFC program by using the 1996, 1999, 2004, and 2007 waves of the Socio-Economic Survey.

The 1996-2007 period covers both the implementation of the BFC program and Cambodia's continued efforts towards continued liberalization. The BFC program began in 2001. This program was tied to the Textile and Apparel Trade Agreement between the United States and Cambodia that became effective January 1, 1999. In January 2002 the U.S. government announced an extension of the Bilateral Textile Agreement for an additional three years, through December 31, 2004.[2] The extension included a fifteen-percent increase in the quota for most textile exports, which represented a nine percent increase over the normal six-percent increase, in recognition of improvements in working conditions. The new Agreement included additional incentives for continuing improvements in labor conditions. Cambodia became the 148th member of the WTO on

[2] December 31, 2004 was significant because that was the official end date for the Agreement on Clothing and Textiles (ACT) that was the agreement designed to phase-out the system of textile and apparel quotas codified by the Multi-Fiber Agreement (Arrangement) (MFA).

October 13, 2004 and the United States and Cambodia signed a Trade and Investment Framework Agreement (TIFA) in 2006. These agreements were significant both because of their content and because the U.S. is one of Cambodia's main export destinations. In 2008, 45% of Cambodia's total exports went to the United States, and the United States received 66.9% of Cambodia's knit exports (HS61)[3].

One significant concern about the approach applied in this paper is that it is difficult to separate the effects of the BFC program per se from the other changes that were taking place within Cambodia. In particular, this paper analyzes the possibility that changes in wages in apparel over time (relative to other sectors) were driven by the trade agreement, and specifically changes in apparel prices, rather than the BFC program *per se*. To address this concern, this paper compares the estimated wage differentials in the apparel sector with apparel export values, quantities, and prices. To provide additional context for these changes, the paper uses firm-level data from the BFC program to compare changes in working conditions with price and wage movements.

Several interesting results emerge from the analysis. First, wage differentials in apparel rise from basically zero in 1996 to 41% in 2007. The time-path of these differentials closely follows the export price over time, including a dramatic rise between 1996 and 1999 and a gradual decline between 1999 and 2007. During the same period, the quantity and value of apparel imports into the United States rises continuously[4].

One hypothesis that would be consistent with this set of results is that Cambodia remained a popular source country for global buyers during a time in which global conditions initiated a significant restructuring of global sourcing worldwide. In other words, Cambodia's attractiveness as a source country was not tied to its quota access and it was not seen as a direct competitor of China during a time in which China's share of U.S. apparel imports increased from 13.29% (in 2000) to 33.56% (in 2007). One possible explanation is that the BFC program created conditions that buyers valued ("sweatshop-free" sourcing).

[3] These statistics are based on the UN COMTRADE database.

[4] This pattern contrasts sharply with the experiences of other apparel-producing countries, such as Mexico and Sri Lanka, whose apparel wage premium falls from a significantly positive number to basically zero or negative following either China's entrance into the WTO or the end of the ACT/MFA.

The rest of the paper unfolds in three sections. Section 2 briefly outlines the theory and motivates the empirical analysis. Section 3 describes the data and summary statistics. Section 4 presents the main results and section 5 concludes.

2. THEORY

Cambodia's experience during the 1996-2007 period is largely characterized by two phenomena: trade liberalization and the BFC program. Therefore, it makes sense to begin with a very simple and canonical trade model and focus on the effects of trade liberalization on labor's wages that emerge from that model. As with all models, the goal is not to perfectly (or perhaps even approximately) capture reality. The goal of the model is to provide some guidance in understanding the relationship between wage premiums, prices, and possibly working conditions. The model is based mainly on Mussa (1974) and assumes there are two factors, capital (k) and labor (l), and two industries, apparel (a) and other activities (b). Output of the two goods (y) can be summarized with linear homogeneous, differentiable, and positive and declining marginal product production functions:

$$\begin{aligned} y_a &= X(k_a, l_a) \\ y_b &= Z(k_b, l_b) \end{aligned} \quad . \tag{1}$$

At this point we make three very unrealistic assumptions for the sake of simplicity. The first is the assumption of full employment of both capital and labor. This is a heroic assumption given the relatively high rates of unemployment and underemployment in Cambodia. The second is that capital is fully mobile between industries. Usually capital is specified as the fixed factor in this kind of model, but in the context of apparel, in which firms tend to open and close quickly with relatively low start-up costs, it is illustrative to assume capital is mobile. With these two assumptions, we can specify capital as

$$K = k_a + k_b \, . \tag{2}$$

The third unrealistic assumption is that workers are relatively specific. The main reason for this assumption is to capture the fact that women in developing countries often face strong social pressure to enter particular industries (such as apparel) and avoid others (perhaps heavy industry). While workers may be generally more mobile, apparel workers (which are largely women) may be specific to industries – especially in the short run. Capital, however, may seem more likely to be able to move freely between industries.

Mussa (1974) shows that a change in output prices will have two effects on the returns to each factor: a short-run effect and a long-run effect. Interpreting workers as the specific factor, the short-run implications for workers' wages are straightforward:

$$\begin{aligned} w_a^l &= p_a y_a - w^k k_a \\ w_b^l &= y_b - w^k k_b \end{aligned} \tag{3}$$

This representation assumes that good *b* is numeraire and that workers are paid the difference between the value of output and the payment to capital. The main implication of (3) is that the wages of workers in the short run are directly related to the price shock in a given industry. In particular, a change in price to apparel will directly affect wages in apparel and will not affect wages in industry *b*.

As Mussa (1974) demonstrates, the effect of a price shock to capital, the mobile factor, is a function of the relative factor intensity of each sector and the degree of factor substitutability in each industry. In general, however, the per-worker wage rate rises, but not as much, as the apparel price increases.

In the long run, both capital and labor are mobile between industries and this problem reduces to the familiar Stolper-Samuelson theorem, in which the effect of the change on the returns to each factor depends on the relative factor intensities. Defining θ_{ij} as the share of factor *i* in industry *j* this very well-known result is expressed as

$$\hat{w}^l = \frac{\theta_{lb}}{\theta_{ka} - \theta_{kb}} \hat{p}_a \tag{4}$$

and

$$\hat{w}^k = \frac{-\theta_{kb}}{\theta_{ka} - \theta_{kb}} \hat{p}_a . \tag{5}$$

This model can easily be adapted to compare the implications for the wages of females relative to males. In particular, if apparel is female-intensive and the price of apparel increases, the long run effect is a real increase in the relative wage of women (in every industry).

The results in equations (3) and (5) can be straightforwardly applied to empirical estimation through the traditional Mincerian wage equation. This equation is the most fundamental tool used in wage studies to decompose (or explain) an individual *k'*s wages as a function of observable characteristics. While there are slight variations across studies, the basic form of the Mincerian wage equation is something like

$$\ln wage_k = \alpha + \beta_1 female_k + \beta_2 age_k + \beta_3 age_k^{\ 2} + \beta_4 education_k + \sum_j \delta_j industry_{jk} + \varepsilon_k \qquad (6)$$

in which the subscript *k* indicates the individual, ln*wage* is the log of earnings and the other variables are self-explanatory observable demographic characteristics.

This equation can be applied to our model with repeated cross-section data, which would add a time subscript to each term in equation (6). In our case, the effect of an increase in industry *j's* price would have two effects. In the short run, the increase in price would affect the industry-specific component of the wage and would show up as a contemporaneous increase in the estimated industry-specific coefficient δ_j as implied by equation (3). The estimated coefficients on the industry dummy variables are interpreted as "inter-industry wage differentials" following Krueger and Summers (1988).

In the long run, the price increase would affect the "general" component of the wage. In our application, as long as industry *j* is female-intensive, an increase in the price of industry *j* will affect β_1, which is the economy-wide returns to being female.

One problem with applying this approach is that knowing when the long-run is. Robertson (2004) provides one of the very few estimates of when the relevant timeframe is for the "long-run" and suggests that Stolper-Samuelson effects begin to emerge in three to five years. The next section describes the data used to implement this model.

The key exogenous variable in this model is the output price.[5] The output price can be considered to be a function of two components. The first is the international price. The

[5] Another appropriate measure might be value added, which takes costs of other inputs into account. Without cost data, however, value added is difficult to calculate.

second is the demand for the output given the international price. When the demand goes up at a given international price, this is the equivalent of having the demand-adjusted price increase.

The next step is to illustrate how working conditions fit into this model. The most straightforward way is to redefine the variable *w* as compensation that includes working conditions. Working conditions can be either substitutes or complements for wages. A compensating differential approach would suggest that wages and working conditions are substitutes: firms with poor working conditions need to pay workers higher wages to compensate them for enduring the poor conditions (and pay them less for better conditions)[6].

This approach is appealing theoretically but empirical support is quite mixed. An alternative perspective is that wages and working conditions are complements. That is, firms with good working conditions may also have higher wages for several reasons. First, working conditions might be correlated with productivity: better working conditions may increase worker productivity and possibly wages. Second, improvements in working conditions may be a form of rent sharing so that more profitable firms might be able to invest in both wages and working conditions. Third, better working conditions might create a queue of workers that allows firms to select the most productive at a given wage.

Analyzing plant-level data from the BFC program, Warren and Robertson (2010) show that wage compliance (that is, compliance with wage laws) is positively correlated with working conditions. This result suggests that working conditions and wages are more likely to be complements than substitutes in Cambodian apparel firms – as long as wage compliance is a good proxy for wages (a measure that is not available in the plant-level data). In any case, the analysis that follows analyzes changes in the unit values and changes in wages and working conditions.

[6] See Marin and Psacharopoulos (1982) for empirical support of this idea with respect to accident risk.

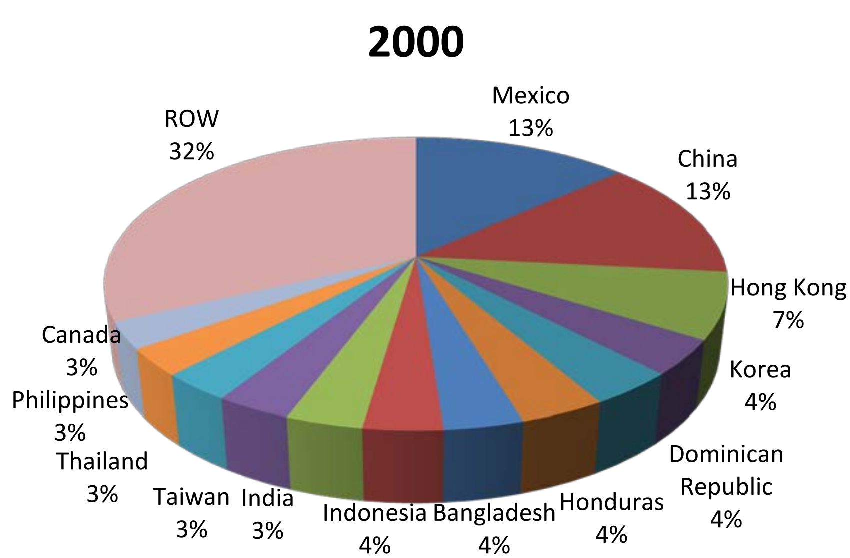
3. TRADE VOLUMES, VALUES, AND PRICES

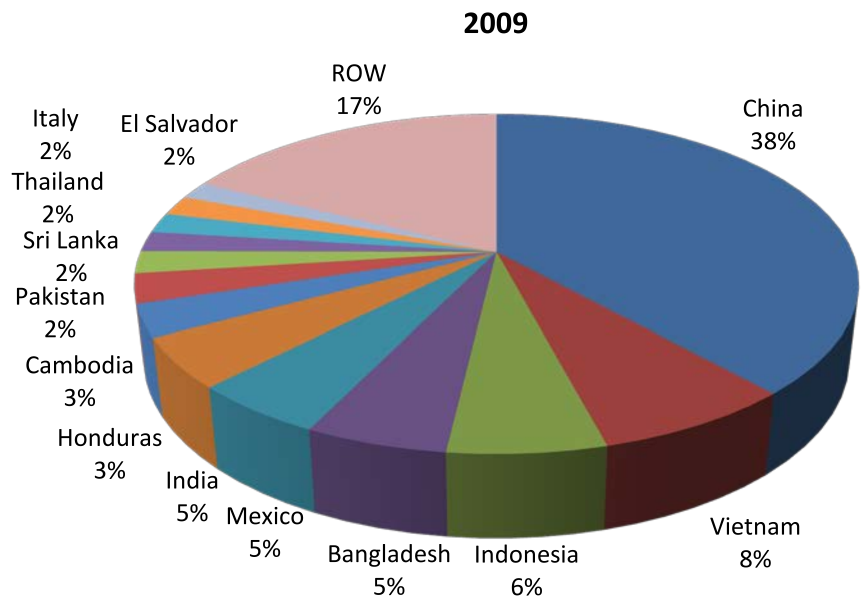
The neoclassical trade model described above highlights the importance of output price movements in understanding the effects of globalization on worker compensation. One of the reasons that few studies focus on prices is that often price data are difficult to find. In this section we describe data used to analyze apparel price movements, discuss how prices (and quantities) change in several countries over time, and describe Cambodia's unit values and quantities in the global context.

3.1 Global Restructuring of Apparel Production 2000-2009

It is well known that apparel production has shifted dramatically during the 2000-2009 decade (see in particular Brambilla, Khandelwal, and Schott 2007). While many changes characterize the decade, possibly two of the most important were China's entrance into the World Trade Organization (WTO) on November 11, 2001 and the end of the MFA/ACT on December 21, 2004. Evidence of this change is shown in figure 1, which compares U.S. apparel imports for consumption by country in 2000 and 2009.

Figure 1: US Apparel Imports 2000 and 2009





Notes: Value of Exports, General Imports, and Imports for Consumption by (NAICS - 315) Apparel and Accessories from http://censtats.census.gov/cgi-bin/naic3_6/naicMonth.pl. Figures are both based on C.I.F. consumption imports. Data for 2000 are annual cumulative total. 2009 figures are year-to-date cumulative totals through September 2009.

In 2000, the two main suppliers of apparel into the United States were Mexico with approximately equal shares each (of about 13%). The next ten countries have significantly smaller shares and include some relatively high-wage countries (such as Hong Kong, Korea, and Canada).

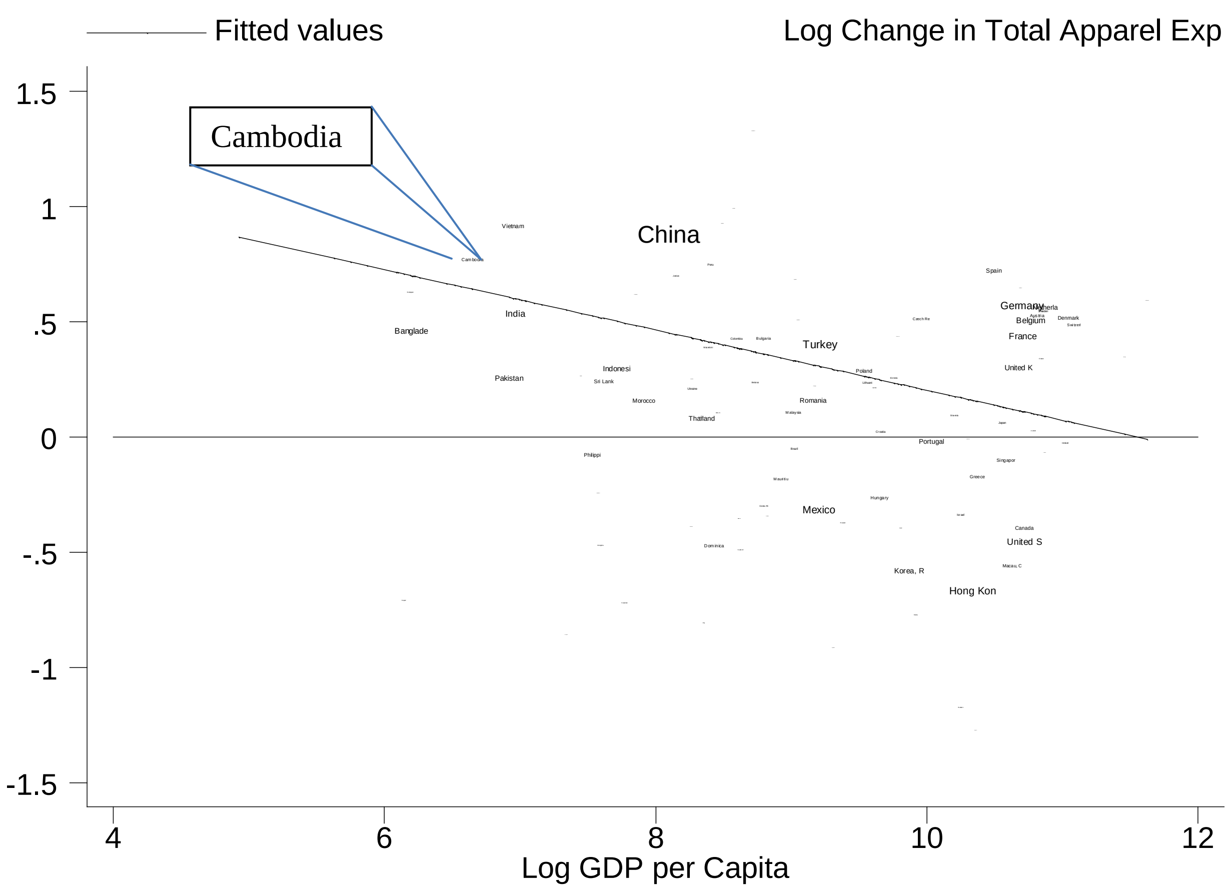
By 2009, however, the pattern had changed dramatically. China surged to supply about 38% of U.S. apparel imports. Ranks and shares of other countries also changed dramatically. Mexico fell from first to fifth (with 5% in 2009). Vietnam entered the top ten and Hong Kong, Korea, and Canada dropped out of the top 13 altogether.[7] The other significant change during this period was a significant increase in the concentration of global

[7] It is possible that the change in Hong Kong's share was affected by a change in China's export pattern. China may have shifted towards direct exports rather than first sending them to Hong Kong for re-export.

apparel production. Over this period the "four-country-concentration ratio" (the combined market shares of the top four market suppliers) increases from 37.8% to 57.2%.[8]

One explanation for this change was that when the constraints of quotas were relaxed, producers were able to shift to the lowest-wage countries. Figure 2 suggests that, indeed, this was the case.

Figure 2: Change in Total Apparel Exports by Country



Notes: Apparel exports are defined as Harmonized System categories 61, 62, and 63. The change in exports is calculated as the change in the 2000-2004 average and the 2005-2008 average total export (to world) value. Trade data are from COMTRADE. The GDP per capita are in constant U.S. dollars for 2008 and come from the World Bank's World Development Indicators database.

[8] It is worth mentioning that the total volume of apparel imports into the U.S. expanded significantly during this period, which is consistent with a very elastic demand for apparel, as documented by Khaled and Lattimore (2006).

Using 2008 GDP per capita as an imperfect indicator of wage levels, figure 2 shows a (statistically significant) negative relationship between GDP per capita and the log change in apparel exports before (2000-2004) and after (2005-2008) the end of the MFA/ACT. The names of each country in the graph are weighted by average world exports (using COMTRADE data) during the 2000-2004 period. As a result, China stands out clearly. Cambodia is highlighted on the graph. Cambodia is interesting because it appears above the prediction line, suggesting that the increase in apparel exports was not entirely explained by its low wages. Since a large share (and majority share, in the case of knit apparel) goes to the United States, we now turn to the very rich U.S. import data to examine changes in U.S. apparel imports from Cambodia and unit values of those exports.

3.2 Prices and U.S. Imports: Data Source and Description

The Office of Textiles and Apparel (OTEXA)[9] provides monthly data on both the value and quantity of apparel and textile imports into the United States by country and category. Calculating unit values for apparel imports involves first converting the quantity in each category into Square Meter Equivalents (SME) and then dividing the total (nominal) value by the SME values. The SME values are expressed in billions of SME units. The unit values are in nominal U.S. dollars. The unit values capture both quality and market conditions, and we address this possibility specifically below when discussing Cambodia's experience.

3.3 Cambodia

Figure 3a shows the evolution of both the total value (in U.S. dollars) and the quantity (in SME) of U.S. apparel imports from Cambodia between 1996 and 2010. The two series move closely together, showing Cambodia's growing contribution to total U.S. apparel imports. Figure 3a shows the clear and significant increase in U.S. imports from Cambodia following the trade agreement and a sharp decline during the crisis period.

[9] http://www.otexa.ita.doc.gov/

Figure 3a: Value and Quantity of Cambodian Apparel Exports to the United States

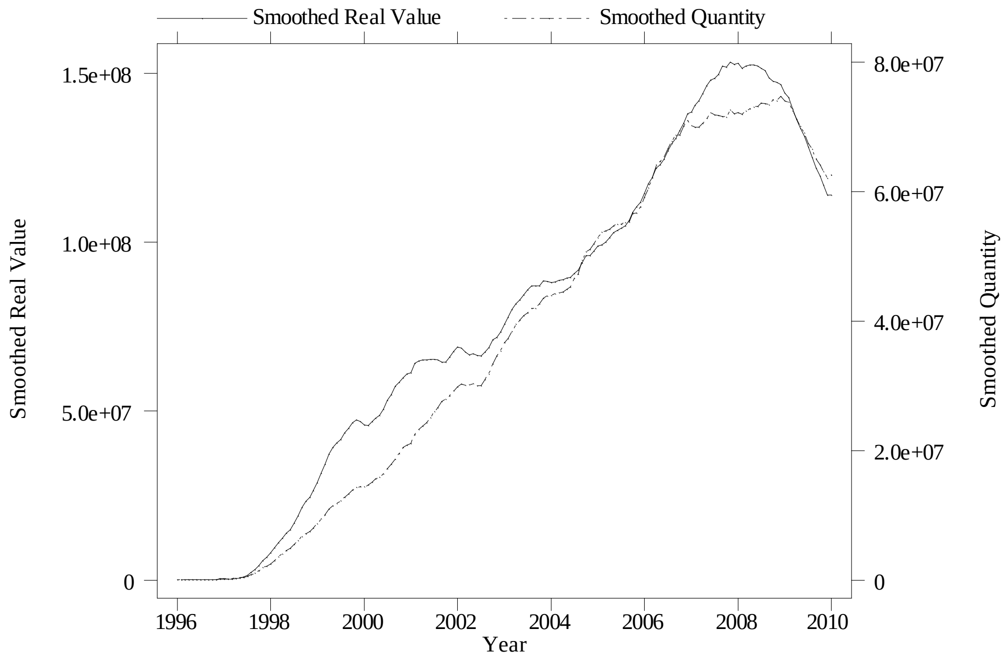
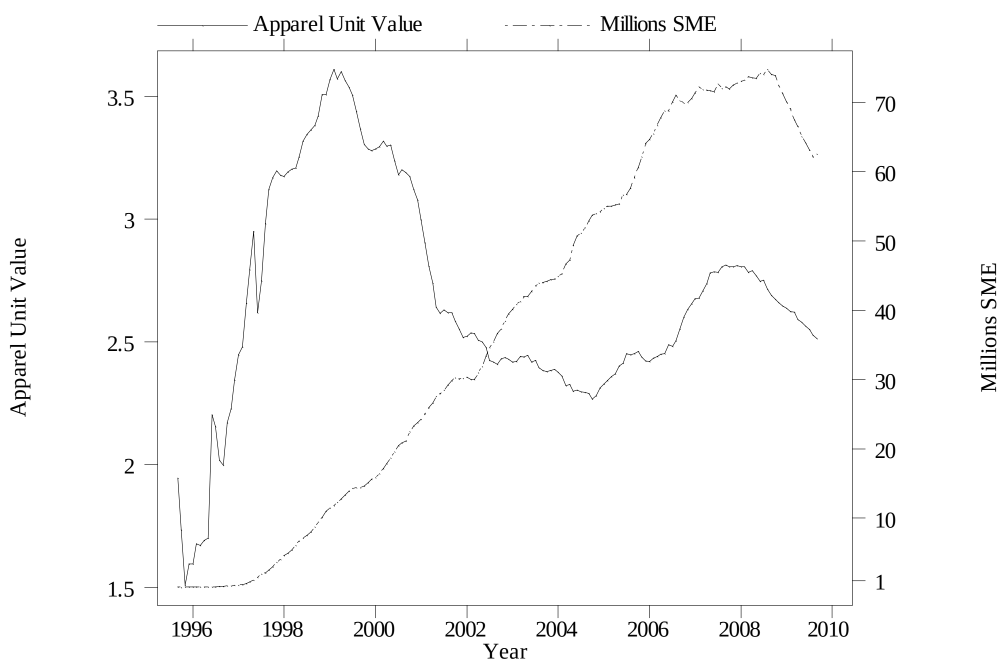


Figure 3b: Unit Values and Quantities



Notes: All series have been smoothed with a 12-month moving average filter. The quantity series is the Square Meter Equivalent (SME) of individual category quantities. The value series is in real U.S. dollars (1996=100).

Figure 3b shows the changes in the unit values calculated by dividing the total value (in U.S. dollars) by the SME quantity and smoothing the resulting series with a 12-month moving average filter. Cambodia's data effectively begin in 1996 to match Cambodia's pattern of economic reforms (Neak and Robertson 2009). Entrance into the Free Trade Agreement and the beginning of the Better Factories Cambodia program corresponded with a sharp increase in the unit value of apparel exports. Quantities start to rise as well. The spike in price, however, is followed by an increase in supply characterized by a drop in price with rising quantity.

This pattern continues until the end of the MFA/ACT. At this point, Cambodia exhibits price and quantity movements that are consistent with an increase in demand. The fact that Cambodia experiences and increase in demand following the ACT is consistent with Cambodia having achieved (and demonstrated) a niche in the apparel market, as suggested by a survey of global apparel buyers documented by the World Bank/International Finance Corporation (World Bank and IFC 2005). The final change in the market is a drop in U.S. apparel demand that coincides with the deep U.S. recession starting around 2008.

One concern about using unit value measures is that they could potentially represent two different phenomena: changes in quality and changes in market conditions (supply and demand). The unit value measures are the averages across about 30 different sub-categories of apparel that vary by unit values. Shifts from high-price (presumably high-quality) to low-price (presumably low quality) goods within apparel could explain the drop in average unit prices.

The drop in prices in Cambodia between 2000 and 2007 can be decomposed into "between" category shifts and "within" category changes that capture the effects of changes in supply and demand (assuming that within-category quality remains constant). The log change in unit value between 2000 and 2007 is -40.0%. The "between" component of this change is 29.6%, suggesting that Cambodia actually shifted towards *higher* quality sub-categories of apparel during this period. On the other hand, the "within" category component is -69.6%, suggesting that (arguably global) market forces were driving down the prices of goods that Cambodia exported. This is, of course, consistent with the sharp rise of China into the world market, which represented a significant increase to global supply.

Given these global conditions, the next step is to analyze wages and working conditions in Cambodia using household surveys guided by the theoretical framework described above in section 2.

4. WAGES AND APPAREL PRICES

In this section we discuss the household data used in the analysis, present the empirical results, and compare the wage results with Cambodian apparel price movements.

4.1 Data Description

Neak and Robertson (2009) estimate wage differentials in Cambodia using the 2003-2004 *Household Socio-Economic Survey* (CSES) conducted by the Cambodian National Institute of Statistics. This paper uses four waves of the Socio-Economic Survey, roughly spaced three to five years apart: 1996, 1999, 2004, and 2007.

Table 1 contains the summary statistics for the four years of data.

Table 1: Household Survey Sample Summary Statistics

Year	1996	1999	2004	2007
Age	33.7	34.1	32.8	33.9
Education (years)	3.5	6.1	6.9	6.8
% Female	52.27%	51.59%	53.38%	49.07%
Agriculture	0.730	0.615	0.451	0.465
Forestry	0.006	0.012	0.014	0.018
Mining	0.000	0.001	0.002	0.001
Food Bev Tob	0.009	0.014	0.014	0.020
Textiles/Apparel	0.016	0.043	0.039	0.051
Wood	0.006	0.003	0.020	0.019
Mfg Other	0.008	0.008	0.007	0.012
Utilities	0.001	0.003	0.002	0.004
Construction	0.011	0.019	0.023	0.040
Sales	0.108	0.121	0.125	0.167
Transport	0.019	0.038	0.025	0.044
FIRE	0.002	0.003	0.004	0.003
Public Admin	0.046	0.062	0.026	0.042
Soc Services	0.019	0.027	0.023	0.025
Other services	0.021	0.029	0.032	0.086
Sample Size	20469	14752	45192	8909

Notes: Sample weights are used in the estimation, but are not used to calculate the summary statistics in order to illustrate sample characteristics. Using weights show a sharper decline in agriculture and a larger increase of the share working in apparel (up to just over 10% in 2007).

The data described in table 1 are a subsample of the full data set. The sample was restricted to workers between the ages of 15 and 65 and effectively only workers with positive earnings were included in the regression analysis. The sample sizes vary a great deal, from a minimum of 8,909 in 2007 to 45,192 in 2004. Given the sample restriction, it is not surprising that the average age remains relatively constant. The average years of education increases over time, with the largest jump in the sample average being between 1996 and 1999.[10] The share of females remains relatively constant, although a slight negative trend is evident.

[10] The somewhat implausible three-year jump in average education levels is mostly due to the fact that about 20% of the sample has an education code representing "No Schooling", which enters as zero years of education. This does not occur in the later years and, when these observations are coded as missing, the average education levels are comparable. The empirical results in the subsequent sections are robust to dropping these observations from the sample.

Table 1 also contains the sample employment shares. The data in table 1 do not use sample weights, so these shares are strictly those of the sample and may not reflect those of the population.[11] The share of workers in agriculture in the sample declines steadily over time, falling from about 73% to about 47%. On the other hand, the share of workers in sales increases from about 10% to about 15% and the share of workers in textiles and apparel increases from 1.6% in 1996 to 5.1% in 2007. The share of workers in other manufacturing industries increase as well, but textiles and apparel remains the largest manufacturing employer. Other non-agricultural industries also increase employment shares, which is consistent with the fall in agricultural employment.

Table 2 contains the average monthly earnings and average hours worked by industry for 2007. Table 2 helps illustrate why some argue that apparel factories have "sweatshop" characteristics. The earnings in the apparel sector are lower than average and the hours worked are the highest among all industries. These data imply that the average hourly wage (using 4.3 weeks per month) was about US$0.49 in 2007 and that the average apparel wage was about US$.31 in 2007. On the other hand, monthly earnings are lower in several other industries, notably agriculture. One possible explanation for the lower wages in apparel is that apparel workers are often those, such as young women, who earn less throughout the economy. We explore this in the empirical analysis.

[11] Sample weights are used in the subsequent regression analysis.

Table 2: Earnings and Hours
2007 CSES Survey

Industry	Monthly Earnings	Mean Hours
Textiles App	69.99	53.22
Agriculture	39.93	34.38
Forestry	49.63	28.68
Mining	41.94	51.75
Food Bev Tob	77.92	36.65
Wood	40.68	40.67
Mfg Other	78.31	50.75
Utilities	94.93	41.23
Construction	72.24	53.14
Sales	88.86	45.91
Transport	81.90	52.97
FIRE	410.95	45.00
Public Admin	58.28	42.89
Soc Services	84.46	40.97
Other services	155.93	49.32
Total	87.19	40.99

Notes: Earnings are in U.S. dollars, calculated as the average monthly earnings by industry divided by the 2007 average exchange rate (4,006 Cambodian reil per dollar). Hours are average weekly hours worked.

4.2 Estimation Issues

The first estimation issue relates to sample selection. Sample weights are used in each estimation. The second issue involves censoring. As is well known, female wages are often censored and therefore when estimating wage equations that include females it is important to correct for the possible selection bias.[12] To address this issue, we employ the two-step Heckman approach in which a selection equation is estimated (with maximum likelihood) in the first stage and from that equation a selection correction variable (the "inverse of the Mills ratio") is generated. This selection correction variable is then included in the second-stage wage equation to control for possible selection effects.

[12] This selection bias arises because women who would be earning wages that are too low to make it worthwhile to work (due to transportation costs, for example) have earnings equal to zero rather than what they would be earning if they work. When estimating, these zero values bias the estimated values.

The third estimation issue relates directly to our estimates of interest – the inter-industry wage differentials. The estimated coefficients on the industry dummy variables are sensitive to the omitted industry, so Krueger and Summers (1988) suggest an approach that normalizes the differentials (and approximated the resulting standard errors) so that the differential estimates do not depend on the omitted industry. Haisken-DeNew and Schmidt (1997) describe a method that adjusts the differentials and their standard errors so that they measure the difference between each industry's wage and the overall mean, rather than the omitted industry. These differentials are then adjusted by raising *e* to the power of the estimated coefficient and subtracting one to adjust for the constant with the log dependent variable.

4.3 Inter-Industry Wage Differentials

Table 2 contains the inter-industry wage differential results. The income measure used is the only measure consistently available in all four waves - earnings in the primary job in the previous month – and the dependent variable is the natural log of that measure. The natural log of hours worked in the primary job in the previous week is included as an additional explanatory variable to control for differences in hours worked across sectors, as seen in table 3. Unfortunately, weeks worked in the previous month are not available, making it impossible to generate accurate hourly wage estimates.[13]

All four equations in table 3 contain several variables that are not reported in tables 1 and 2 in the interest of saving space. These variables are hours, age squared, and a set of nine occupation dummy variables. Hours and age squared are always statistically significant and have the expected signs (positive for hours and negative for age squared). The estimates for hours are a consistent 1 to 1.5% and the estimates for age squared are consistently very small (less than .1%). F-test results suggest that the nine occupation variables are significant as a set. The selection correction variable is only significant in 2007, and not including it affects the estimate of the apparel coefficient slightly.

[13] Neak and Robertson (2009) find that apparel workers work more hours, on average, than other Cambodian workers, which means controlling for hours is important.

Table 3: Regression Results by Year

	1996	1999	2004	2007
Female	-0.386	-0.166	-0.118	-0.139
	(0.042)**	(0.051)**	(0.033)**	(0.041)**
Age	0.066	0.058	0.041	0.057
	(0.012)**	(0.009)**	(0.009)**	(0.010)**
Years of Education	0.027	0.061	0.007	0.069
	(0.006)**	(0.016)**	(0.002)**	(0.012)**
Agriculture	-0.109	0.151	-0.190	-0.021
	(0.069)	(0.061)*	(0.092)*	(0.063)
Forestry	0.505	1.063	0.049	0.039
	(0.161)*	(0.099)**	(0.144)	(0.210)
Mining	0.116	0.095	-0.227	0.073
	(1.089)	(0.273)	(0.194)	(0.352)
Food Bev Tob	0.185	0.474	0.014	0.052
	(0.141)	(0.147)**	(0.114)	(0.138)
Textiles/Apparel	0.064	0.701	0.285	0.412
	(0.118)	(0.075)**	(0.047)**	(0.066)**
Wood	0.048	0.576	-0.318	-0.065
	(0.189)	(0.162)**	(0.083)**	(0.102)
Mfg Other	0.730	0.158	0.133	-0.053
	(0.150)**	(0.101)	(0.098)	(0.108)
Utilities	1.102	0.140	0.473	0.637
	(1.327)	(0.177)	(0.196)*	(0.214)*
Construction	0.745	0.758	0.303	0.480
	(0.203)**	(0.061)**	(0.041)**	(0.067)**
Sales	0.126	0.885	0.099	0.461
	(0.079)	(0.089)**	(0.064)	(0.101)**
Transport	0.100	0.387	0.048	0.315
	(0.136)	(0.066)**	(0.060)	(0.065)**
FIRE	0.052	-0.402	-0.246	1.898
	(0.493)	(0.214)*	(0.110)*	(0.268)**
Public Admin	-0.685	-0.562	-0.277	-0.643
	(0.354)**	(0.054)**	(0.040)**	(0.076)**
Soc Services	-0.677	-0.376	-0.264	-0.483
	(0.305)**	(0.066)**	(0.053)**	(0.078)**
Other services	-0.165	0.758	0.264	0.284
	(0.143)	(0.063)**	(0.033)**	(0.047)**
Constant	9.466	8.823	9.775	8.403
	(0.540)**	(0.450)**	(0.276)**	(0.453)**
Nonselection Hazard	0.009	0.258	-0.148	0.267
	(0.126)	(0.158)	(0.098)	(0.176)
Observations	4617	2971	7051	2289

Notes: * significant at 5%; ** significant at 1%. Absolute value of standard errors in parentheses. Dummy variable coefficients in this table have been adjusted from the original regression in two ways. First, the industry coefficients report deviations from the overall (grand) mean. Second, the reported coefficients are the adjusted coefficients adjusted by raising e to the estimated difference and subtracting one to account for the constant term. Each regression includes occupation dummies, age squared, and hours worked but these results are not reported to save space. The Nonselection Hazard variable is the "inverse of the Mills ratio" estimated from a first-stage labor force participation equation using marital status, age, age squared, female, and education. The first stage is estimated with the Heckman maximum likelihood technique. Sample weights are used in both the first and second stage estimation.

The main results are based on estimating (6) separately for each year of data. Several interesting results emerge from table 3. The first is that in 1996, apparel workers earned about average in 1996 (the estimated differential is small and not statistically significant). Since 1996 predates BFC, the Cambodia-US Trade Agreement, and the increase in apparel exports, this result is an important benchmark.

The apparel premium jumps to just over 70% in 1999, suggesting that in 1999 apparel workers were making 70% more than the average Cambodian worker (after adjusting for observable demographic characteristics). This jump seems very large and we explore some of the possible explanations for that in the next section. In any case, however, it is hardly necessary to point out that the difference between 1996 and 1999 is both statistically and economically significant.

After 1999, however, the premium falls. The premium falls to 29% in 2004. After 2004, the premium rises to just over 41% in 2007. As apparent from looking at the reported standard errors, the differences between 1999 and 2004 appear to be statistically significant since the 95% confidence intervals do not overlap. The difference between 2004 and 2007, is smaller and probably not statistically significant. Even at its lowest, however, the wage premium in apparel is still significantly above the 1996 value, suggesting that there was clearly a significant change in wages that occurred with the rise of apparel exports and the implementation of the BFC program.

Another potentially interesting result emerges in the differences in the estimated coefficient on the female dummy variable over time. In 1996, the females earned over 39% less than men when all other demographic and industry components were controlled for. The coefficient increases over time (the gap between men and women gets smaller), rising to about -14% by 2007.

Other industry-specific coefficients may seem volatile. Some of this volatility may be due to sampling (although sample weights are used), but other changes can be linked to industry-specific factors. Wood products is a good example. Dramatically falling wood exports reflect changes and problems within the wood products industry that affected Cambodia's wood industry in the first half of the 2000-2009 decade (Roda and Rathi 2006).

Groups generally increase quickly between the first and second visit and improve at a slower rate for subsequent visits, as shown in figure 6. Figures 5 and 6, however, just shows compliance averages and do not control for year or other effects. Progress in each group is analyzed more formally in the next section.

5.2 Methodology

The factory-level data offer two possible ways to identify some of the effects that are specific to the BFC program. Ideally, one would evaluate the BFC program with a control group of firms that were not receiving the "treatment" of the BFC program. By law, however, all firms that were exporting (and therefore for which the output prices would be relevant) were required to participate in the BFC program. Factories entered the program at different times, however, suggesting that year effects might be important. Within a given year, however, factories with their first visit did not have the treatment effect. Only after the first visit would factories receive the BFC "treatment." Therefore, one way to evaluate the success of the BFC program is to estimate the following random-effects regression:

$$condition_{ijvt} = \alpha_i + \sum_v \lambda_{vi} V_{vi} + \sum_t \delta_{ti} Y_{ti} + \beta X_{ijvt} + \eta_{ijvt} \tag{7}$$

in which the condition is the average compliance for each of 24[14] different categories of working conditions (indexed by *i*) for each factory *j* observed in visit *v* at time *t*. There are approximately 400 questions in the firm-level reports. Each question was transformed into a binary indicator in which "1" represented "compliant" with the relevant standard (with 0 indicating non-compliance). The questions are grouped into 24 categories. The dependent variable in equation (7) is the average compliance across all questions within each category within each factory in each period. Therefore, equation (7) is estimated with OLS. The *V*

[14] This classification could also include three additional groups not included here: Child Labor, Forced Labor, and Discrimination. The first two categories begin with high compliance and therefore have little to gain from the BFC treatment. Discrimination is never significant in the results that follow and is left for subsequent research.

represent dummy variables for visit, the *Y* represent dummy variables for year, and the *X* represent different firm-specific characteristics.

The purpose of this exercise is twofold. First, we focus on the year effects. These show the effects of economic (or any other non-BFC visit related) conditions affecting changes in compliance. This helps address the effect specifically of changes in prices over the different periods. The second goal is to identify the effects of the BFC visits on firms, holding year and other (variable) factory characteristics constant. This equation is estimated 24 times – once for each of 24 different groups of working conditions and the results are discussed in turn below.

5.3 Estimating Year Effects

As long as workers care about wages and working conditions, it is reasonable to consider the relationship between non-wage working conditions and output prices. Theory suggests that they would move in the same direction (following the same patterns as wages). If market forces (prices) alone were driving working conditions, then changes in working conditions should follow price movements after the effects of BFC visits are controlled for.

The main way to estimate this effect is to focus on the estimated year coefficients in equation (7). The estimated year coefficients show the difference in average working conditions for each year following 2002 for which data are available (2005-2008). The year 2002 is grouped with 2001 because these are the years that the BFC program was just getting started and there are no second visits in these years. Since prices drop between 2002 and 2005, theory predicts that, if working conditions are determined in a similar way as wages and if workers care about both wages and working conditions, working conditions should fall, on average, between 2001/2002 and 2006. Alternatively, if the other effects dominate the price effect, the estimated coefficient on working conditions for 2006 (relative to 2001/2002) should be positive.

Table 4 contains the results of the year estimates, presented relative to 2001/2002. Standard errors are in parentheses and statistically significant positive estimates are presented in bold. Statistically significant negative estimates are presented in italics. The results of the table show heterogeneity across different working conditions groups.

Table 4: Year Effects on Working Conditions (relative to 2001/2002)

	2005	2006	2007	2008
Collective Agreements	*-0.124*	*-0.071*	-0.019	-0.006
	(0.024)	(0.017)	(0.019)	(0.021)
Strikes	0.017	**0.018**	**0.016**	**0.018**
	(0.011)	(0.008)	(0.008)	(0.009)
Shop Stewards	**0.365**	**0.363**	**0.374**	**0.356**
	(0.028)	(0.020)	(0.022)	(0.025)
Liaison Officer	**0.520**	**0.512**	**0.532**	**0.534**
	(0.037)	(0.026)	(0.029)	(0.032)
Unions	**0.164**	**0.149**	**0.163**	**0.161**
	(0.020)	(0.014)	(0.016)	(0.018)
Information About Wages	**0.224**	**0.234**	**0.280**	**0.273**
	(0.034)	(0.024)	(0.027)	(0.031)
Payment of Wages	**0.082**	**0.080**	**0.116**	**0.116**
	(0.032)	(0.023)	(0.026)	(0.030)
Contracts/Hiring	*-0.142*	*-0.126*	*-0.072*	*-0.075*
	(0.024)	(0.017)	(0.019)	(0.022)
Discipline/Management Misconduct	**0.254**	**0.243**	**0.272**	**0.267**
	(0.022)	(0.015)	(0.017)	(0.020)
Disputes	0.014	-0.019	-0.005	-0.009
	(0.035)	(0.025)	(0.027)	(0.029)
Internal Regulations	**0.034**	**0.049**	**0.057**	**0.062**
	(0.016)	(0.012)	(0.014)	(0.016)
Health/First Aid	**0.135**	**0.173**	**0.220**	**0.216**
	(0.030)	(0.022)	(0.025)	(0.029)
Machine Safety	*-0.087*	0.008	**0.064**	**0.061**
	(0.027)	(0.019)	(0.022)	(0.025)
Temperature/Ventilation/Noise/Light	*-0.075*	0.037	**0.070**	**0.076**
	(0.036)	(0.026)	(0.029)	(0.032)
Welfare Facilities	**0.144**	**0.155**	**0.199**	**0.200**
	(0.021)	(0.015)	(0.017)	(0.020)
Workplace Operations	0.044	**0.087**	**0.126**	**0.125**
	(0.027)	(0.019)	(0.022)	(0.025)
OSH Assessment, Recording, Reporting	**0.300**	**0.345**	**0.367**	**0.358**
	(0.024)	(0.017)	(0.019)	(0.022)
Chemicals	-0.015	*-0.081*	-0.065	-0.085
	(0.054)	(0.038)	(0.042)	(0.046)
Emergency Preparedness	**0.127**	**0.119**	**0.150**	**0.135**
	(0.026)	(0.019)	(0.021)	(0.024)
Overtime	**0.271**	**0.234**	**0.306**	**0.280**
	(0.043)	(0.030)	(0.033)	(0.037)
Regular Hours/Weekly Rest	**0.266**	**0.336**	**0.347**	**0.343**
	(0.022)	(0.015)	(0.017)	(0.018)
Workers' compensation	**0.562**	**0.548**	**0.577**	**0.588**
	(0.028)	(0.020)	(0.022)	(0.024)
Holidays and Annual/Special Leave	-0.006	0.029	**0.098**	**0.110**
	(0.026)	(0.018)	(0.021)	(0.023)
Maternity Benefits	**0.152**	**0.188**	**0.226**	**0.208**
	(0.030)	(0.021)	(0.024)	(0.028)

Notes: This table contains coefficients from the same 24 random-effects regressions (one for each working condition group) Values in *italics* are those that are negative and statistically significant (relative to 2001/2002). Values in **bold** are positive and statistically significant (relative to 2001/2002). Categories of Discrimination, Child Labor, and Forced Labor, were omitted.

Two main lessons emerge from table 4. First, holding the effect of the visit number constant, 15 of the 24 included categories are significantly positive. This is consistent with the hypothesis that there was a general push to improve working conditions in the sector. One interpretation of this is that the presence of the BFC program and its goals became increasingly known between 2001/2002 and 2005, resulting in improvements in working conditions over and above those due to specific visits. It is important to note that these improvements came in an environment of falling prices and falling wage differentials, which suggests that these improvements are inconsistent with the theory that suggests that output prices are driving improvements in working conditions.

Not all conditions improved during the 2001/2002-2005 or 2006 period. Consistent with the theory outlined above, several groups exhibit statistically significant lower conditions (holding BFC visits constant). These include collective agreements, contracts/hiring, machine safety, temperature, and chemicals. These groups move in ways consistent with price movements and therefore may reveal areas that are more price-sensitive or resistant to external pressure. This could be because costs of these improvements are high or because the relative emphasis of the external push was weaker in these areas, or for other reasons.

5.4 The Effects of BFC Treatment (Visits)

The estimated coefficients λ_{vi} in equation (7) capture the effects of subsequent visits of the BFC program relative to the first (untreated) visits, controlling for the possibility that firms improve for other reasons over time. Statistically significant positive values of λ_{vi} suggest that the BFC program specifically is associated with improvements of the particular condition *i*. The reported coefficients (with standard errors in parentheses) are the differences in the average compliance for each group from the average value for the first visit. These coefficients show the difference both between and within factories, holding the effects of year constant but not controlling for other factory characteristics. The coefficients (and standard errors) in bold show those that are statistically significant at the 5% level.

Table 5: Changes in Working Conditions with BFC Visits

	2	3	4	5
	(0.003)	(0.003)	(0.003)	(0.005)
Collective Agreements	0.008	0.020	0.014	0.020
	(0.009)	(0.011)	(0.014)	(0.021)
Strikes	0.004	0.005	0.004	-0.011
	(0.007)	(0.008)	(0.010)	(0.014)
Shop Stewards	0.004	0.021	0.014	0.027
	(0.010)	(0.012)	(0.016)	(0.023)
Liaison Officer	**0.027**	**0.065**	**0.081**	**0.108**
	(0.012)	(0.015)	(0.020)	(0.028)
Unions	0.006	0.007	0.013	0.007
	(0.008)	(0.010)	(0.013)	(0.018)
Information About Wages	0.009	0.029	0.019	0.030
	(0.013)	(0.016)	(0.021)	(0.030)
Payment of Wages	0.020	**0.037**	**0.043**	**0.064**
	(0.012)	(0.015)	(0.020)	(0.029)
Contracts/Hiring	**0.020**	**0.035**	**0.038**	**0.078**
	(0.008)	(0.010)	(0.014)	(0.020)
Discipline/Management Misconduct	-0.006	-0.011	-0.013	-0.036
	(0.009)	(0.011)	(0.015)	(0.022)
Disputes	0.011	0.011	0.024	0.012
	(0.011)	(0.014)	(0.018)	(0.026)
Internal Regulations	0.015	**0.022**	0.020	0.020
	(0.008)	(0.010)	(0.014)	(0.020)
Health/First Aid	0.017	0.020	**0.041**	**0.055**
	(0.011)	(0.013)	(0.018)	(0.026)
Machine Safety	0.001	-0.001	0.002	0.008
	(0.010)	(0.012)	(0.017)	(0.024)
Temperature/Ventilation/Noise/Light	-0.023	-0.039	-0.083	-0.072
	(0.013)	(0.015)	(0.021)	(0.029)
Welfare Facilities	-0.004	-0.001	-0.005	-0.009
	(0.007)	(0.009)	(0.012)	(0.018)
Workplace Operations	0.005	0.010	0.012	0.035
	(0.009)	(0.012)	(0.016)	(0.022)
OSH Assessment, Recording, Reporting	**0.033**	**0.060**	**0.076**	**0.095**
	(0.009)	(0.011)	(0.015)	(0.021)
Chemicals	-0.043	-0.027	-0.025	-0.006
	(0.019)	(0.022)	(0.029)	(0.042)
Emergency Preparedness	0.000	-0.011	-0.009	-0.030
	(0.009)	(0.011)	(0.015)	(0.022)
Overtime	0.015	**0.041**	**0.059**	**0.098**
	(0.015)	(0.018)	(0.024)	(0.034)
Regular Hours/Weekly Rest	0.002	**0.020**	0.021	0.027
	(0.008)	(0.010)	(0.013)	(0.019)
Workers' compensation	0.008	0.001	-0.004	-0.020
	(0.013)	(0.016)	(0.021)	(0.031)
Holidays and Annual/Special Leave	-0.009	0.005	-0.006	0.010
	(0.009)	(0.011)	(0.015)	(0.021)
Maternity Benefits	**0.032**	**0.043**	**0.055**	**0.090**
	(0.012)	(0.015)	(0.020)	(0.028)

Notes: This table contains coefficients from the same 24 random-effects regressions (one for each working condition group) that are shown in table 4. Estimates in **bold** represent statistical significance at the 5% level.

Table 5 shows several interesting results. The first is that there are no statistically significant negative coefficients. Most, but not all, of the coefficients are positive. Given the fall in the wage differential, the lack of statistically significant negative coefficients suggests that the BFC visits were neither making working conditions worse nor were the visits becoming increasingly sensitive to different conditions over time (holding compliance constant). That said, however, about a third of the categories exhibits (small) negative coefficients.

Second, statistically significant improvements in working conditions emerge for a third of the groups (9 of the 24). While certainly subjective, one might argue that after forced and child labor are addressed, the statistically significant positive coefficients include areas that workers might put high on their list of concerns and that might potentially have the greatest effects on productivity. These include contracts/hiring, payment of wages, overtime, and, given the high percentage of women working in the factories, maternity benefits.

Rossi and Robertson (2010) highlight the importance of the liaison officer and shop stewards as playing a role in potentially facilitating future improvements in communication and working conditions in other areas. It is therefore interesting that liaison officer is another category that demonstrates significant positive improvement.

6. DISCUSSION AND CONCLUSIONS

Working conditions improved dramatically during the last ten years of the BFC program. Wages, especially those of women in the apparel sector, also improved dramatically. There are several possible explanations for these improvements. The most obvious is that the BFC program effectively achieved its goals. The second is that other factors, such as the U.S. Cambodia Trade Agreement, access to U.S. markets, and the condition that labor standards improve in order to receive access to the U.S. market are all competing factors.

This paper puts these economic conditions in context by presenting a theory that links external conditions to wages (possibly interpreted to include working conditions) in both the short run and the long run. Cambodia's experience with these external factors – specifically prices and export quantities – are placed in context of the global apparel restructuring over the last decade. Given this context, the paper then uses household surveys to decompose wages and compare specific and general movements in these wages over time. Unlike other countries, prices do not follow a continuous path in Cambodia. Wages, however, follow the same non-linear path as theory predicts.

Given this context and these wage movements, the paper then decomposes factory-specific changes in working conditions into those changes that are due to external conditions and those that are specifically due to BFC visits. Not surprisingly, the results suggest that both external forces and BFC visits play a role in improvements in working conditions over time. External forces explain some worsening conditions, but all of the statistically significant effects of BFC visits are positive. Furthermore, the changes that are attributable to BFC are arguably those that are important for productivity and high on the list of workers' concerns, such as payments of wages. As such, this paper seems to present the first concrete evidence that the BFC program was successful in its goals over and above changes due to external factors.

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