Firm dynamics in the Cambodian garment industry: firm turnover, productivity growth, and wage profile under trade liberalization

INSTITUTE OF DEVELOPING ECONOMIES

IDE Discussion Papers are preliminary materials circulated to stimulate discussions and critical comments

IDE DISCUSSION PAPER No. 268

Firm Dynamics in the Cambodian Garment Industry: Firm Turnover, Productivity Growth, and Wage Profile under Trade Liberalization

Yoko ASUYAMA[*], Dalin CHHUN[†], Takahiro FUKUNISHI[‡], Seiha NEOU[§], and Tatsufumi YAMAGATA[**]

December 2010

Abstract
The international garment trade was liberalized in 2005 following the termination of the MFA (Multifibre Arrangement) and ever since then, price competition has intensified. Employing a unique firm dataset collected by the authors, this paper examines the changes in the performance of Cambodian garment firms between 2002/03 and 2008/09. During the period concerned, frequent firm turnover led to an improvement of the industry's productivity, and the study found that the average total-factor productivity (TFP) of new entrants was substantially higher than that of exiting firms. Furthermore, we observed that thanks to productivity growth, an improvement in workers' welfare, including a rise in the relative wages of the low-skilled, was taking place. These industrial dynamics differ considerably from those indicated by the "race to the bottom" argument as applied to labor-intensive industrialization in low income countries.

Keywords: Cambodia, firm turnover, garments, labor-intensive industrialization, Multifibre arrangement, race to the bottom, total factor productivity

JEL classification: D24, J31, L67, O14, O53

[*] Poverty Alleviation and Social Development Studies Group, Inter-disciplinary Studies Center, IDE (Yoko_Asuyama@ide.go.jp)
[†] KDI School of Public Policy and Management (chhundalin@gmail.com)
[‡] African Studies Group, Area Studies Center, IDE (fukunis@ide.go.jp)
[§] Economic Institute of Cambodia (seiha.neou@eicambodia.org)
[**] Director, Poverty Alleviation and Social Development Studies Group, Inter-disciplinary Studies Center, IDE (Tatsufumi_Yamagata@ide.go.jp)

The Institute of Developing Economies (IDE) is a semigovernmental, nonpartisan, nonprofit research institute, founded in 1958. The Institute merged with the Japan External Trade Organization (JETRO) on July 1, 1998. The Institute conducts basic and comprehensive studies on economic and related affairs in all developing countries and regions, including Asia, the Middle East, Africa, Latin America, Oceania, and Eastern Europe.

INSTITUTE OF DEVELOPING ECONOMIES (IDE), JETRO
3-2-2, WAKABA, MIHAMA-KU, CHIBA-SHI
CHIBA 261-8545, JAPAN

Firm Dynamics in the Cambodian Garment Industry: Firm Turnover, Productivity Growth, and Wage Profile under Trade Liberalization*

Yoko Asuyama, Dalin Chhun, Takahiro Fukunishi,

Seiha Neou, and Tatsufumi Yamagata

December 2010

Abstract

The international garment trade was liberalized in 2005 following the termination of the MFA (Multifibre Arrangement) and ever since then, price competition has intensified. Employing a unique firm dataset collected by the authors, this paper examines the changes in the performance of Cambodian garment firms between 2002/03 and 2008/09. During the period concerned, frequent firm turnover led to an improvement of the industry's productivity, and the study found that the average total-factor productivity (TFP) of new entrants was substantially higher than that of exiting firms. Furthermore, we observed that thanks to productivity growth, an improvement in workers' welfare, including a rise in the relative wages of the low-skilled, was taking place. These industrial dynamics differ considerably from those indicated by the "race to the bottom" argument as applied to labor-intensive industrialization in low income countries.

Keywords: Cambodia, firm turnover, garments, labor-intensive industrialization, Multifibre arrangement, race to the bottom, total factor productivity

JEL codes: D24, J31, L67, O14, O53

* We would like to express our special thanks to all the Cambodian garment firm managers who kindly participated in our surveys in 2003 and 2009. We are grateful to the substantial assistance from the Council for the Development of Cambodia (CDC), the Cambodia Investment Board (CIB), and the Garment Manufacturers Association in Cambodia (GMAC). Our field surveys would not have been possible without the hard work of staff belonging to LIDEE Khmer (in 2003) and the Economic Institute of Cambodia (EIC) in 2009. The 2009 field survey was undertaken by Madhurjya Kumar Dutta, Neou Seiha (supervisors); Chhun Dalin, Chann Sokros, Tong Sokhom, Chou Hout (team leaders); Mao Chankosal, Kim Daro, Ith Narim, Heng Tikunkeo, Ouch Litech, Nov Linda, Vo Vannarith (assistants); and Ly Nita (administration). For the 2003 survey, see Yamagata (2006). We thank all the seminar participants at the EIC-IDE joint seminar held in Phnom Penh on August 5, 2010, and those at the 12th International Convention of the East Asian Economic Association. We also thank Sok Hach, Kaing Monica, Amornrat Apinunmahakul, Tomohiro Machikita, and Naomi Hatsukano. The research for this study was financially supported by the Institute of Developing Economies, Japan External Trade Organization (IDE-JETRO). All remaining errors are our own.

1. Introduction

Exporting garments has been a first step for industrialization and economic growth for many low-income countries with abundant and inexpensive labor. After the Second World War, East Asian countries such as Hong Kong, Taiwan, South Korea, and later, China, and other many developing countries, expanded their garment exports, and diversified their industrial structures. Since the mid-1990s, even least developed countries such as Bangladesh, Cambodia, and Madagascar have rapidly increased their garment exports.

In Cambodia, the export-oriented garment industry started to grow around 1994, triggered by foreign investment from Hong Kong, Taiwan, Malaysia and Singapore (Bargawi, 2005). Since then, the industry has expanded along with further foreign investment, from countries such as Taiwan, China, Hong Kong, Korea, Malaysia, the United States and Singapore. As of December 2008, 284 garment factories were operating in Cambodia (Cambodia Ministry of Commerce data), and garment exports amounted to US$ 2.9 billion (Cambodia Ministry of Economy and Finance data). The growth of Cambodia's export trade has been fueled by garment exports which nowadays account for 70-80% of the country's total exports. The garment industry has also contributed to poverty reduction by providing many formal employment opportunities for poor low-skilled people, mostly young women from rural areas (Chan and Sok, 2007; Yamagata, 2006). As of December 2008, the industry employed 325,000 people, equivalent to 47% of the country's manufacturing employment and 4% of its total employment.[1] Remittances from garment workers have been an important source of financial support for workers' families in rural areas.[2]

From the mid-1970s to the mid-2000s, quota restrictions were imposed on garment exports under the international trade regime known as the Multifibre Arrangement (MFA). However, the international garment trade was liberalized at the end of 2004 following the termination of the MFA and since then, price competition has

intensified. Since low-income exporters probably benefited from the quotas imposed on the large exporters, this change raised apprehensions concerning the sustainability of growth and poverty reduction in garment-exporting low-income countries such as Cambodia. In fact, some researchers anticipated a decline in garment exports and employment in relatively small countries such as Bangladesh and Cambodia (Nordås, 2004; Ernst et al., 2005). Furthermore, as the Stolper-Samuelson Theorem predicts, if output prices fall as a result of liberalization, wages of workers in the garment industry will drop (Jones, 1965). Some researchers argue that this effect is particularly significant in labor-intensive industries given the competitive character of the assembly sector in developing countries and the oligopolistic structure of the retail sector in developed countries (Kaplinsky, 2000; Kaplinsky and Moriss, 2001). Since a drop in wages can lead to the growth of both production and exports, this mechanism has been characterized as a "race to the bottom" and "immiserizing growth". In fact, export prices of garments were followed a declining trend from the mid-2000s onwards, as will be made clear in the next section.

Contrary to pessimistic views of future trends in the industry, productivity growth can bring a new future for industry under intensified competition. If productivity growth is sufficient, firms will be able to survive in a market without cutting wages. Employing a unique dataset of Cambodian garment-producing firms collected by the authors, this paper analyses the changes in the Cambodian garment industry during the period of the MFA phase-out. Specifically, it examines whether firm performance has improved, and if employment reduction, wage cuts, and worsening working conditions actually occurred in Cambodia as the "race to the bottom" argument would have us believe.

The key findings of the paper are as follows. Despite intensified competition, the Cambodian garment industry grew continuously after 2004 in terms of exports, number of firms, and employment. The industry improved its productivity through very

frequent turnover in the firms operating in the sector. Since the average total-factor productivity (TFP) of the new entrants is substantially higher than exiting firms, the high turnover rate led to an improvement in the industry's productivity. Furthermore, at least partially, productivity growth bolstered wage rates despite a significant fall in output prices. In particular, the relative wages of low-skilled workers increased, and pro-poor welfare improvement of workers' circumstances was observed. These dynamics within the industry differ considerably from those implied by the "race to the bottom" argument and other similar prognostications.

To the authors' knowledge, almost no research has been conducted on changes in the performance of the garment industry at firm level before and after termination of the MFA. Several studies have analyzed trends in the exports of major garment-exporting countries in terms of macroeconomic indicators such as exports, investment, and employment (Kowalski and Molnar (2009) and Harrigan and Barrows (2009) for major garment-exporting countries; Beresford (2009) for Cambodia). An exceptional case is that of Rahman et al. (2008), who analyzed changes in the performance of Bangladeshi garment firms by means of a firm dataset. However, their time frame was a relatively short one (between 2004 and 2005), and they did not examine the change in TFP nor did they consider the entry and exit of firms in the garment sector. In the context of the Cambodian garment industry, the present study benefits more than others from the use of a firm dataset with a sizable sample. Hitherto, most firm-based surveys of the Cambodian garment industry have used relatively small samples and, moreover, none of them was concerned with the actual impact of the MFA phase-out (see, for example, USAID, 2005; Chan and Sok, 2007; GIPC et al., 2008; ILO and IFC, 2009; CAMFEBRA and BDLINK, 2010).[3] By means of a detailed investigation of firms' performances and turnover, this paper investigates the dynamics of the Cambodian garment firms after the termination of the MFA.

The remaining sections of the paper are organized as follows. Section 2

examines recent changes that have occurred in the international garment trade in terms of institutional characteristics, demand, and price. Section 3 describes the firm dataset compiled by the authors. By employing the data collected, Section 4 examines changes in firm performance such as profitability and productivity. Changes in the welfare of workers in terms of employment, wages, and other working conditions are examined in Section 5. Section 6 concludes by summarizing the results of the research.

2. Changes in the Trade Environment Surrounding Cambodian Garment Exports

For most of the last three decades, the global trading of textiles and garment products was conducted under the terms of the Multifibre Arrangement (MFA), which was eventually replaced, in 1995, by the Agreement on Textiles and Clothing (ATC). The global quota-based trading system that governed the amount of textiles and garment products that developing countries could export to developed countries was put into an end with the expiry of the ATC at the end of 2004.

Amongst economists, there was much speculation as to whether or not the export-oriented garment industry in small developing countries could compete with its counterparts in giant exporting nations such as China. Many believed that Cambodia, one of the smaller of the developing countries, would not be able to come to terms with the more competitive environment of garment industry (see for example Nordås, 2004). In the new liberalized trading environment, the Cambodian garment industry had to compete with other countries based on quality and price.

At the time of liberalization, about 70% of Cambodian garment exports went to the United States, which is the largest overseas market for Cambodian garment exports, and these exports were in direct competition with garment exports from China (EIC, 2008). Nonetheless, it is worth noting that some quota restrictions were still being imposed in bilateral trade agreements between China and the United States, and China and the European Union (EU). The quota restriction regime did not fully expire until

2008 because temporary safeguard measures, a form of quota limitation imposed by the US and EU, were still being enforced on some exports of garment products from China (until the end of 2008 and 2007, respectively). Although these safeguard measures could have partially helped small developing countries such as Cambodia to expand their garment exports, it was still the case that the international garment trade became far more liberalized with the end of the MFA and as will be made clear below, harsh price competition ensued.

Some 88% of Cambodian garment exports to the United States were also in direct competition with exports from Vietnam (EIC, 2008). Vietnam's accession to WTO membership in 2007 has had important implications for Cambodian garment exports. Buyers frequently claim that Vietnam has a more attractive investment climate in terms of investment security, lower energy costs, and what is perceived as a skilled labor force (Chan and Sok, 2007, pp.23-35). It follows that so far as Cambodian garment exports are concerned, Vietnam has emerged as a strong competitor. In fact Vietnam is presently among the top five garment exporters to the United States and is the source of about 7% of total American garment imports.

The global demand for garment imports kept plummeting over the period 2002-2008 (which corresponds to our survey period), and was derailed after the global economic downturn. Despite this trend, and although both China and Vietnam, Cambodia's competitors, also continued to achieve growth in exports of garments, Cambodia's garment exports increased by 53% between 2002 and 2004 and by 123% between 2002 and 2008 and amounted to US$ 2.9 billion by 2008 (Cambodia Ministry of Economy and Finance data). These impressive rates of expansion show that the Cambodian garment industry performed very well both during and after the period of the quota system.

Be that as it may, Cambodian garment exports have encountered intensified price competition since the end of the quota system. According to data compiled from

Cambodian Ministry of Economy and Finance sources, the unit value of garment products exported from Cambodia increased slightly between 2002 and 2004, but followed a gradually declining trend from 2005 to 2008. During the 2002-2008 period as a whole, the unit value of garment products fell by 23%. Even so, the overall quantity of Cambodian garment exports showed a continued steady expansion, increasing by 191% during the same period (Figure 1).

It is worth noting that unit values of Cambodian garment exports to the American market fell by 36% (a faster rate than the average) during the same period. Data compiled from the Global Trade Atlas showed that the unit price of T-shirts imported from Cambodia decreased by 29.4%. The unit price of sweaters and pullovers produced in Cambodia underwent a relatively severe contraction of 37.0%. Among the five major garment products imported from Cambodia into the American market, only men's shirts departed from the trend, with a unit price increase of 5.9%.

In spite of such intensified price competition during 2002 and 2008, the Cambodian garment industry grew continuously not only in terms of exports, but also as regards the number of firms and employment in the sector. Thus between 2002 and 2008, the number of garment firms increased from 188 to 284, while the number of workers employed in the industry also increased, from 210,000 to 325,000 (Cambodia Ministry of Commerce data).

3. Research Data

We conducted garment firm surveys at two points in time: August-October 2003 and August-November 2009 respectively. The surveys were conducted by the Institute of Developing Economies, Japan External Trade Organization (IDE-JETRO) jointly with the LIDEE Khmer in 2003 and the Economic Institute of Cambodia (EIC) in 2009. We contacted all the garment-producing exporters that were the members of Garment Manufacturers Association in Cambodia (GMAC). The GMAC covers almost

all the garment exporting firms in Cambodia. As a result of our enquiries, we collected 164 and 123 questionnaires in 2003 and 2009, respectively. A comparison of these numbers with the number of garment firms recognized by the Cambodia Ministry of Commerce, suggests that our sample covered 85.4% of all the garment firms in Cambodia in 2003 and 49.0% in 2009.[4]

The surveys asked for a variety of information, including general firm characteristics (location, year of establishment, ownership structure etc.) as well as detailed data for production and sales, equipment, employment, wages, and financial accounts. Most of the data that we asked for related to the fiscal years (FY) 2002 and 2008. In most cases, they corresponded to the calendar years 2002 and 2008 starting from January and ending in December. The results of the 2003 survey were presented in detail in Yamagata (2006). It should be noted that our FY 2008 data for the most part captured firm performance before the global economic downturn, since the Cambodian garment industry started to suffer from the global financial crisis only after late 2008.

4. Changes in Firm Performance

4.1 Descriptive statistics and methodology

On average, the size of firms grew between 2002 and 2008. The real gross product increased from US$ 7.6 million to US$ 11.2 million, and in particular, the real value-added expanded by more than twofold (Table 1). The capital value nearly doubled, while the growth of labor was modest. Growth of production on such a scale reflects not just the expansion of firms that remained in operation for the six years covered by the surveys, but replacement of firms through entry and exit as well. Based on the GMAC member list, 47.8% of the firms that were operating in 2003 closed down between 2003 and 2009, while in the same period, more firms were established than those that closed and consequently new entrants consisted of 63.5% of the firms operating in 2009. These statistics show that the growth of export value over the period of the MFA phase-out

was related to high firm turnover.

To continue growth under a fall in output prices, a firm needs to cut either its costs or its profits. The survey results indicate that in conjunction with the raising of production, profits, in terms of level and share in gross product, also increased on average. The profit value of the individual firm was obtained by subtracting costs from gross product.[5] In terms of their share of gross product, profits increased from 24% in 2002, to 32% in 2008 (Figure 2). This indicates a reduction in the share of total costs. In fact, while the share of labor costs rose slightly, the share of material costs fell by an average of 13%.[6] Given that the output price fell during this period across the industry (and assuming the same trend occurred in our sample), reduction of costs must have entailed either reduction of factor prices or productivity growth (or both).

To understand the background of the profit increase, productivity was estimated using the index number approach (Caves et al., 1982). Using Törnqvist's index, this approach enables consistent comparison of total-factor productivity (TFP) of two firms assuming the translog production function. Since parameter estimation is not needed, it is free from the endogeneity problem of labor input that has been argued in the literature on production function estimation.[7] In exchange of the advantage, it is prone to productivity shock and measurement error, since it does not incorporate stochastic errors in production. To deal with the problem, outliers were carefully ruled out (see appendix). For multilateral comparison, an individual firm's productivity was benchmarked as the hypothetical average firm that possesses an average input, output, factor share and amount of operation hours, which is expressed by the following formula.

$$\ln TFP_i = \left(\ln Y_i - \overline{\ln Y}\right) - \sum_n \left(\frac{s_i^n + \overline{s^n}}{2} \right) \left(\ln x_{n,i} - \overline{\ln x_n}\right) + \left(\ln u_i - \overline{\ln u}\right) ,$$

where Y is output (value-added), x_n (n = K, L) is input, and s^n is factor share, u is operation hours, and i is a suffix which represents a firm.[8] The variables with a

superscript bar (e.g. $\overline{\ln Y}$) indicate a sample mean, which was taken over the pooled sample of two years. The TFP index is positive (negative) when a firm's TFP is higher (or lower) than the hypothetical firm.

An individual firm's productivity index was aggregated with the weight based on market share, to obtain an industry-wide productivity index. Let $\theta_{i,t}$ be the market share (based on value-added) of firm i at year t, and the industry-level productivity index is described as

$$\ln TFP_t = \sum_i \theta_{i,t} \ln TFP_{i,t} \ ,$$

and the growth rate of the industry-wide productivity index is

$$\Delta \ln TFP = \ln TFP_{t+1} - \ln TFP_t \ .$$

The growth rate can be decomposed into growth of firms continuing operation throughout the period and growth resulting from entry and exit. Let I denote the group of firms continuing in operation, X the group of firms that exited after the first survey, and E the group of firms that entered after the first survey. The growth rate can then be decomposed using the following equation,

$$\begin{aligned}\Delta \ln TFP &= \sum_{i\in I} \theta_{i,t+1} \ln TFP_{i,t+1} + \sum_{i\in E} \theta_{i,t+1} \ln TFP_{i,t+1} - \left(\sum_{i\in I} \theta_{i,t} \ln TFP_{i,t} + \sum_{i\in X} \theta_{i,t} \ln TFP_{i,t} \right) \\ &= \left(\sum_{i\in I} \theta_{i,t+1} \ln TFP_{i,t+1} - \sum_{i\in I} \theta_{i,t} \ln TFP_{i,t} \right) + \left(\sum_{i\in E} \theta_{i,t+1} \ln TFP_{i,t+1} - \sum_{i\in X} \theta_{i,t} \ln TFP_{i,t} \right)\end{aligned} \ .$$

The first parenthesis in the second line on the right hand side represents the contribution of firms continuing in operation (hereafter continuing firms), and the second represents that of entry and exit.

The change of the weighted TFP of each group is the result of change of TFP and change of weight, that is, market share. Several methods of decomposition have been suggested. Aw et al. (2001) have proposed the following

$$\Delta \ln TFP = \left(\frac{\theta_{Xt} + \theta_{Et+1}}{2} \right) \left(\ln TFP_{Et+1} - \ln TFP_{Xt} \right) + \sum_{i \in I} \left[\left(\frac{\theta_{i,t} + \theta_{i,t+1}}{2} \right) \left(\ln TFP_{i,t+1} - \ln TFP_{i,t} \right) \right]$$
$$+ \left(\frac{\ln TFP_{Et+1} + \ln TFP_{Xt}}{2} \right) \left(\theta_{Et+1} - \theta_{Xt} \right) + \sum_{i \in I} \left[\left(\frac{\ln TFP_{i,t+1} + \ln TFP_{i,t}}{2} \right) \left(\theta_{i,t+1} - \theta_{i,t} \right) \right] ,$$

where θ_{Xt} represents the market share of all exited firms at year *t*, and $\ln TFP_{Xt}$ is the weighted average of TFP of exited firms at year *t*, where weight is based only on exited firms. Likewise, θ_{Et+1} and $\ln TFP_{Et+1}$ were created for the entering firms. The purpose of this aggregation is to create one exiting firm and one entering firm so that the change of TFP and market share are measured in the absence of panel data for those firms. Due to unbalanced panel data for the continuing firms in our sample, the same procedure was applied to them. Creating θ_{It} and $\ln TFP_{It}$, for the continuing firms, the growth rate of TFP is decomposed in

$$\Delta \ln TFP = \left(\frac{\theta_{Xt} + \theta_{Et+1}}{2} \right) \left(\ln TFP_{Et+1} - \ln TFP_{Xt} \right) + \left(\frac{\theta_{It} + \theta_{It+1}}{2} \right) \left(\ln TFP_{It+1} - \ln TFP_{It} \right)$$
$$+ \left(\frac{\ln TFP_{Et+1} + \ln TFP_{Xt}}{2} \right) \left(\theta_{Et+1} - \theta_{Xt} \right) + \left(\frac{\ln TFP_{It+1} + \ln TFP_{It}}{2} \right) \left(\theta_{It+1} - \theta_{It} \right) \quad . (1)$$

It should be noted that because of this procedure, our decomposition of the continuing firms' contribution (the second and fourth terms in the right hand side of equation (1)) is different from a standard procedure.

4.2 Change of TFP

Table 2 contains statistics of the estimated TFP. It shows that the unweighted average of TFP improved between 2002 and 2008, where the difference is statistically significant at the 1% level. The weighted average shows the same trend and the difference, again, is significant. These statistics demonstrate that over the period of the MFA phase-out, the Cambodian garment firms on average raised their productivity and as a result, industry-wide productivity grew. Through cost reductions, productivity growth allows an increase in profit share despite the fall of output prices and the maintenance of the wage level throughout the period.

The unweighted averages of TFP by entry and exit are shown in the second to fourth lines in Table 2. In 2002, the firms that exited after 2003 demonstrated lower productivity than the firms that continued operation until 2009, though the difference was not significant. In 2008, on the other hand, the firms that entered after 2003 performed better than the firms that continued in operation throughout the entire six years. In addition, a comparison of TFP in 2002 and 2008 shows that the continuing firms improved their productivity, while the entering firms performed significantly better than the exited firms. These results are consistent with Hopenhayn's entry/exit model (Hopenhayn 1992), which assumes the Markov process in productivity change and sunk costs at entry. In his model assuming a competitive market, a firm exits when its productivity becomes less than the threshold that leads to negative expected future profit, and thus, the exited firm's productivity is lower than that of the firms which continued in operation. On the other hand, a new entrant's productivity is higher than that of the exited firm to compensate for the sunk costs needed at entry.[9] Our results are mostly consistent with this model, and they suggest that trade liberalization after 2005 has formed a competitive market.[10]

The contributions of the continuing, exited and entering firms are identified using equation (1) (Table 3). The largest contribution is the TFP change by entry/exit, and the change of market share of entering/exited firms is the next largest. The TFP change of the continuing firms makes a positive contribution, while their change of share has a negative impact. Consequently, entry and exit accounted for all of the industry-level productivity growth through the replacement of poor performers by good performers and by an inflow of entrants that exceeded the outflow of exiting firms. The continuing firms also showed productivity growth, but to a smaller degree, and their market share decreased. The substantial effect of entry and exit on industry-wide productivity change has been observed in other developing countries including Taiwan, investigated by Aw et al. (2001) and Ethiopia, examined by Shiferaw (2007). However,

the entry-exit effect that we found at work in the Cambodian garment industry is much more substantial than in the other country-based examples. This may be explained by the fact that in general terms, a high rate of firm turnover is a characteristic of the garment industry, which requires a small fixed cost, and in which multinational firms resumed the global location of production sites in the process of their adjustment to the MFA phase-out.

The impact of market share change is occasionally interpreted as the effect of a reallocation of producers, in the sense that it captures whether or not successful performers increase their market share (Baily et al. (1992) and others). However, since exited and entering firms are treated as one firm respectively, and in our analysis the same procedure is applied to continuing firms, reallocation among individual firms is not captured. As suggested in Olley and Pakes (1996), the difference between weighted and unweighted averages indicates resource allocation. That is,

$$\ln TFP_t - \overline{\ln TFP_t} = \sum_i \left[\left(\theta_{i,t} - \overline{\theta_t}\right)\left(\ln TFP_{i,t} - \overline{\ln TFP_t}\right)\right],$$

where $\overline{\ln TFP_t}$ is the unweighted average of TFP over all firms in year *t*, and $\overline{\theta_t}$ is the average of market share. The right hand side is the sample covariance TFP and market share multiplied by the number of observations. In our dataset, this index divided by the number of observations is 0.007 in 2002 and 0.025 in 2008, and thus, it indicates an improvement in resource allocation during the trade liberalization period.

5. Changes in the Welfare of Workers

Despite increased competitive pressures, the Cambodian garment industry managed to increase its production and its profits by improving its productivity. Was this achieved by sacrificing the welfare of workers, especially the low-skilled? This section examines changes in the welfare of the workers in terms of employment, wages, and other welfare-related working conditions.

According to the official statistics, employment in the Cambodian garment

industry rose from 210,000 in 2002 to 325,000 in 2008 (see Section 2). The official statistics, moreover, show an increase in average employment per firm, from 1,119 to 1,144. Our own survey data also show its increase from 1,026 to 1,103.[11] Throughout the periods of investigation, the industry continuously offered many employment opportunities to low-skilled and female workers. The "low-skilled" workers, who include operators, helpers, and holders of other miscellaneous jobs (e.g. cutters, ironers, cleaners, security guards, and messengers) accounted for 89.3% (2002) and 87.5% (2008) of the aggregated employment of the all the sample firms. The ratio of female employees was 87.7% in 2002 and 91.7% in 2008, respectively.

Table 4 shows changes in the monthly wages by job categories in both nominal and real terms. Real wages in 2002 USD prices have been constructed by deflating nominal wages by the consumer price index (CPI). The consumer price index increased by 159.8% between 2002 and 2008. Figures in the table are the average monthly wages including bonuses, allowances, and subsidies across the sample firms weighted by employment of each job category. As the table shows, nominal wages increased for all job categories between 2002 and 2008. Real wages for low-skilled workers (operators and helpers) also increased by 5.0% and 17.7% respectively, but in contrast, real wages for highly-skilled employees such as managers and executives, engineers, and quality controllers (QCs) decreased by 26.1%, 17.5%, and 8.1%, respectively.

The rise in the real monthly wages of low-skilled workers may be due to longer working hours, which may offset the welfare improvement if measured purely in terms of wages. The estimated average working hours per month increased from 215.7 hours to 226.4 hours.[12] This increase in monthly working hours is statistically significant at the 1% level. The average of estimated real hourly wages of operators and helpers by gender and length of experience are given in Table 5. Although real hourly wages of some positions decreased, those of helpers, the least skilled of the various job categories, increased in most cases. In addition, the least experienced operators also enjoyed a real

hourly wage increase.

The above results seem to indicate a narrowing of the wage gap between highly-skilled and low-skilled workers, but this is simply a trend across firms and does not necessarily reflect the existence of a within-firm wage gap. To investigate the changes at the single firm level, the following wage function was estimated for each year:

$$\ln Y_{\mathrm{i,\,j,\,t}} = \alpha_t + \beta_t X_{i,j,t} + F_{j,t} + u_{i,j,t},$$

where ln$Y$ indicates the logarithm of the real monthly wage (2002 USD price).[13] Xs are dummies for job categories, female workers, and three experience categories, and estimated years of education. F represents firm fixed effect and u is the error term. Subscript i indicates the unit of observation defined by job category, gender, and length of experience. Subscripts j and t indicate firm and year, respectively.

Table 6 shows the estimation results for the above wage function. The wage function in Result 1 contains dummies for six job categories (the base category is that of helpers), female workers, two experience categories (the base category is less than one year of experience), and firm fixed effect, as the explanatory variables. The wage function in Result 2 restricts the sample to the wages of supervisors, operators, and helpers. One more variable, the estimated years of education, is added to the explanatory variables in Result 3. Figures in the column entitled "Difference (2008-2002)" are the differences of the coefficients between two years, and a negative sign indicates a decline in wage relative to the base category's wage.[14] First, we can observe that the wage gap between higher skilled positions and helpers narrowed (with statistical significance except in Result 3). Second, the wage gap across the working experience and years of education categories also shrank.[15] In short, as is the case in the results shown in Tables 4 and 5, the relative wages of workers in low-skilled job categories and those of less-experienced workers increased between 2002 and 2008.

Although, as already noted, working hours have increased, other working

conditions seem to have improved relative to the past. First, during the study periods, the length of time needed to be promoted from a helper to an operator was significantly shortened, on average, from 10.2 months to 3.4 months. Consequently, entry-level workers were able to earn the higher wages of an operator within a shorter period than before. Monitoring of working conditions is also frequent in Cambodia. In the 2009 survey, 93.2 % of the 118 firms giving a valid response recognized that it is mandatory for them to accept labor monitoring conducted by the buyer or the third party organization in order to receive orders from one or other of their buyers. Labor monitoring of Cambodian garment firms is very comprehensive and exhaustive: over 500 items including aspects such as the presence or absence of child labor, the minimum wage paid, the possible existence of forced labor, working hours, periods of leave from work, safety conditions, and labor union issues are monitored (see the Better Factories Cambodia's website). This monitoring system, currently called "Better Factories Cambodia", is a unique project of the International Labour Organization (ILO), and was introduced in 2001. The project was created to help the Cambodian garment industry to respond to the 1999 United States-Cambodia trade agreement, in which the United States allowed an expansion of the garment import quota from Cambodia in exchange for the introduction of improved working conditions.

The most direct and obvious reason for the relative increase of the wages paid to entry-level workers was a rise in the minimum wage. In 2007, the monthly minimum wages of regular employees hired in the Cambodian garment industry were raised from US$ 45 to US$ 50.[16] If we include in the definition of minimum wage other statutory bonuses and allowances, namely the attendance bonus and the Cost of Living Allowance (COLA), the total amount paid increased from US$ 50 in 2002 to US$ 61 in 2008.[17]

For a low-skill labor-intensive industry such as garment manufacture in the low-income countries, minimum wage increases can bring an impact that is far from

negligible: they can increase production costs and reduce profits. As a result of labor cost increases accompanied by falls in output prices, some firms can be forced to exit from the industry, and indeed as we have seen in the previous sections, some firms actually did exit. However more firms entered the industry as newcomers, and as a result, the Cambodian garment industry grew in terms of the number of firms, and also in terms of exports and employment at both firm- and industry-level. This was made possible by the productivity improvements discussed in Section 4.2.

Part of the productivity increase can probably be explained by an enhancement of the ability of workers, an aspect that has yet to be confirmed empirically. As shown in Table 7, between 2002 and 2008, the estimated average years of education of workers increased from 10.0 to 10.2 for supervisors, from 6.6 to 7.1 for operators, and from 6.3 to 7.4 for helpers. The most common educational background of supervisors shifted upwards, from the lower secondary to the higher secondary level. Likewise, those of operators and helpers also moved up from the primary to the lower secondary level. There was clearly an association between a higher education level and higher wages (6% and 2% higher in 2002 and 2008 as can be seen in Result 3 in Table 6). Adding "years of education" to the equation as an explanatory variable in Result 2 in Table 6, the reduction in the wage gap between supervisor and helper fell from 17.1% points to 1.2% points (see the columns entitled "Difference" (2008-2002) of Results 2 and 3). This shows that the narrowing of the wage gap can be partly explained by the relative improvement in the educational level of low-skilled workers such as helpers. Workers who have attained a higher educational level may be able to understand the workflow better, may help to produce more garments, and may receive higher wages. Our surveys also reveal that around 75% of the surveyed firms provided formal training to their employees in both 2002 and 2008. Such continuous provision of training, in addition to the overall educational improvement, may well have played a key role in enhancing firm productivity.

6. Concluding Remarks

Many observers have pointed out that the Cambodian garment industry continues to face a number of important challenges (see for example Chan and Sok, 2007; CAMFEBA and BDLINK, 2010), These include dependence on imported materials due to the absence of an indigenous textile industry; absence of domestic designing and marketing functions; higher electricity costs compared to neighboring countries; and a high level of unofficial fees. But our findings have shown that the Cambodian garment industry has the capacity to grow by improving productivity even in the presence of such constraints.

In this paper, we have examined firm dynamics in the Cambodian export-oriented garment industry under the conditions of intensified competition that followed from trade liberalization, namely the termination of the MFA at the end of 2004. Despite a decline in the export price of its products, the Cambodian garment industry continuously expanded in terms of exports, number of firms, and employment, even after the end of the MFA regime. By employing a unique firm dataset, this paper has examined changes in firm performance and in the welfare of workers between 2002/2003 and 2008/2009. The average size of production, capital value, and employment grew during the period, and the average share of profits in gross product also increased. This was made possible because of productivity growth, which was attained through a frequent firm turnover as well as by the efforts of the surviving firms. Between 2003 and 2009, nearly half of the firms exited from the industry, while almost twice the number of those exiting entered the industry as newcomers. Since the average TFP of the new entrants was significantly higher than that of the exiting firms, the high turnover rate led to a significant improvement in the industry's productivity. The surviving firms which continued operation throughout the 2003-2009 period also achieved improvements in productivity. We also found some evidence of improved

resource allocation in the sense that productive firms increased their market share. These results are consistent with our preferred theoretical model of firm dynamics in a competitive market.

Examination of employment, wages, and other working conditions revealed that pro-poor or pro-low-skilled welfare improvements occurred between 2002 and 2008 despite increased competition. The industry continuously provided many employment opportunities for poor low-skilled people, especially women. The relative wages of low-skilled workers such as operators and helpers rose in comparison with those of high-skilled workers, and the wage gap narrowed. Such welfare improvement came about partly from improvements in the productivity of the Cambodian garment firms.

The firm dynamics we found in the Cambodian garment industry differed considerably from those postulated by pessimistic observers including supporters of the "race to the bottom" argument. The Cambodian experience clearly shows that garment-producing firms as well as industry in general in low-income countries have the capacity to grow by improving productivity in a liberalized market.[18] More micro-level analyses on factors of productivity growth are left for future research.

Footnotes

[1] Calculated from Cambodia Ministry of Commerce data and from ADB (2009).

[2] According to Chan and Sok (2007, p.19), in 2005, 270,000 workers sent home around US$ 50 million, which was equivalent to 3% of the total income generated from the whole of the agriculture sector.

[3] Although sample sizes of some firm surveys such as ILO (various years), Oka (2010), and Kang and Dannet (2010) are relatively large, their focus is on labor-related issues and they did not collect firm performance data.

[4] According to data of the Cambodia Ministry of Commerce, there were 192 and 251 garment firms as of September 2003 and 2009 respectively.

[5] Our estimate of profits includes tax. Note that part of the capital cost, such as rent and dividends, may not be subtracted in cases where a firm owner has used his or her own assets for the purchase of land, premises and equipment, unless the details are shown in an accounting book. Hence, profits may be overestimated, but we think that change of profit is more reliable assuming that ignorance of the owner's contribution occurs at roughly same frequency in both surveys.

[6] Share of profits in gross product varies according to whether or not the firm operated as a subcontractor, since a subcontractor does not purchase material, and thus, its gross product does not include material costs. The figures in Figure 2 are based on the firms with non-zero material costs. If the sample is restricted to the firms whose share of material cost is greater than 20%, the share of material cost becomes 55% in 2002 (N=70) and 47% in 2008 (N=15), and the share of profits increases from 15% in 2002 and to 21% in 2008.

[7] If a firm manager can predict productivity in the next period, he or she can adjust the labor input. Thus, labor input may be correlated with the residual through correlation with productivity (Marschak and Andrews, 1994).

[8] Constant returns to scale (CRS) are assumed based on the fact that the hypothesis test

of CRS for estimated parameters by OLS could not be rejected.

[9] The model indicates that the exit threshold clearly separates exited firms from continuing firms, but our results do not exhibit such a threshold and productivity of exited and continuing firms overlaps. This is possible under heterogeneous factor prices and transaction costs. Besides, there is at the longest a lag of six years in our dataset between the timing of the productivity measurement and the actual exit.

[10] The result that the entering firms exhibit higher productivity than the incumbent firms is not consistent with Hopenhayn's model, where incumbents continuously improve productivity and consequently their productivity is higher than new entrants. As most of the new entrants in Cambodia are subsidiaries of a foreign firm, they may inherit the high productivity of their parent company.

[11] Sample size (number of firms) was 164 in 2002 and 121 in 2008, respectively.

[12] The figures are for the sewing section. The average working hours per month were estimated by multiplying the average working hours per shift per day (9.2 hours in 2002 and 9.3 hours in 2008) by the average annual working days divided by 12 months (23.6 days in 2002 and 24.4 days in 2008).

[13] Since we do not have working hour data for highly skilled workers, we examined monthly wages.

[14] We pooled the 2002 and 2008 samples, added interaction terms between all the explanatory variables and a 2008 year dummy, and regressed the log wage on all explanatory variables including the aforementioned interaction terms. It follows that the coefficients for the interaction terms indicate the differences of coefficients between the two years.

[15] The decrease in wage premium for working experience is bad news for experienced operators. This might be related to changes in labor contracts: for instance, employers might have increased the use of short-term contracts and may have decided to renew them in order to avoid having to award a seniority bonus for the experienced workers.

Unfortunately, our surveys did not ask about the duration of labor contracts. This aspect will be left for future research.

[16] The monthly minimum wage in the Cambodian garment industry was raised further to US$ 61 (including US$ 6 COLA) in October 2010.

[17] The attendance bonus (US$ 5) and the COLA (US$ 6) have been introduced since 2000 and 2008, respectively.

[18] Our analysis mostly applied to the period between 2002 and 2008. After late 2008, the Cambodian garment industry was hit hard by the global financial crisis. In 2009, Cambodian garment exports fell by 16 %, and many factories were closed and workers laid off. The unit price of an exported garment in April 2010 was 10% lower than that in 2008 (Cambodia Ministry of Economy and Finance data). However, since 2010, garment exports and employment have started to increase again and new factories have opened (*The Cambodia Daily*, June 30 and July 20, 2010). These signs of recovery in 2010, even under conditions of increasingly tough price competition, seem consistent with our findings on the productive features of Cambodian garment firms.

References

ADB (Asian Development Bank), 2009, *Key Indicators for Asia and the Pacific 2009*. Asian Development Bank: Mandaluyong City, Philippines [online; cited February 2010.] Available from URL: http://www.adb.org/Documents/Books/Key_Indicators/2009/

Aw, B.Y, X. Chen, and M. J. Roberts, 2001, Firm-level Evidence on Productivity Differentials and Turnover in Taiwanese Manufacturing. *Journal of Development Economics*, 66, pp.51-86.

Baily, M. N, C. Hulten and D. Campbell, 1992, Productivity Dynamics in Manufacturing Plants, *Brookings Papers: Microeconomics*, pp.187-249.

Bargawi, O, 2005, Cambodia's Garment Industry: Origins and Future Prospects. *ESAU Working Paper 13*, London: Overseas Development Institute.

Beresford, M, 2009, The Cambodian Clothing Industry in the Post-MFA Environment: A Review of Developments. *Journal of the Asia Pacific Economy*, 14, pp.366-388.

Better Factories Cambodia's website: Available from URL: http://www.betterfactories.org/ILO/

Cambodia Daily, June 30, 2010, Garment Export Rise, Job Growth Still Bleak.

Cambodia Daily, July 20, 2010, Gov't Approves $153 Million of Investment in June.

CAMFEBA and BDLINK (Cambodia) Co., Ltd, 2010, Understanding the Impact of the Global Economic Crisis on the Cambodian Garment Sector.

Caves, D. W, L. R. Christensen, and W. E. Diewert, 1982, Multilateral Comparisons of Output, Input, and Productivity Using Superlative Index Numbers. *Economic Journal*, 92, pp.73–86.

Chan, V. and H. Sok, 2007, Cambodia's Garment Industry Post-ATC: Human Development Impact Assessment. In: Export Diversification and Value Addition for Human Development: Addressing the Impact of the Agreement on Textile and Clothing Expiration on Cambodia (Economic Institute of Cambodia), Part I,

pp.1-86. Economic Institute of Cambodia, Phnom Penh.

EIC (Economic Institute of Cambodia), 2008, Cambodia Economic Watch, April 2008.

Ernst, C, A. H. Ferrer and D. Zult, 2005, The End of the Multi-Fibre Arrangement and Its Implication for Trade and Employment. *ILO Employment Strategy Paper* 2005/16.

GIPC (Garment Industry Productivity Center), GMAC (Garment Manufacturers Association of Cambodia), and HR Inc. Cambodia, 2008, Garment Industry Salary Survey 2007-8.

Harrigan, J. and G. Barrows, 2009, Testing the Theory of Trade Policy: Evidence from the Abrupt End of the Multifiber Arrangement. *The Review of Economics and Statistics*, 91, pp.282–294.

Hopenhayn, H. A, 1992, Entry, Exit, and Firm Dynamics in Long Run Equilibrium. *Econometrica*, 60, pp.1127-1150.

ILO (International Labour Organization), various years, Synthesis Report on Working Conditions in Cambodia's Garment Sector.

ILO (International Labour Organization) and IFC (International Finance Corporation), 2009, Energy Performance in the Cambodia Garment Sector: A Benchmarking Survey.

Jones, R. W, 1965, The Structure of Simple General Equilibrium Models. *Journal of Political Economy*, 73, pp.557-572.

Kang, C. and L. Dannet, 2010, Tracking Study of Cambodian Garment Sector Workers Affected by the Global Economic Crisis: Benchmarking Survey Report.

Kaplinsky, R, 2000, Globalisation and Unequalisation: What Can Be Learned from Value Chain Analysis. *Journal of Development Studies*, 37, pp.117-146.

Kaplinsky, R. and M. Morris, 2001, A Handbook for Value Chain Research [online; cited February 2010.] Available from URL: http://asiandrivers.open.ac.uk/documents/Value_chain_Handbook_RKMM_

Nov_2001.pdf

Kowalski, P. and M. Molnar, 2009, Economic Impacts of the Phase-Out in 2005 of Quantitative Restrictions under the Agreement on Textiles and Clothing. *OECD Trade Policy Working Papers*, No. 90, OECD Publishing.

Marschak, J. and W. H. Andrews, 1944, Random Simultaneous Equations and the Theory of Production. *Econometrica*, 12, pp.143-205.

Nordås, H. K, 2004, The Global Textile and Clothing Industry post the Agreement on Textile and Clothing, *Discussion Paper* No.5, World Trade Organization: Geneva.

Oka, C, 2010, Accounting for the Gaps in Labour Standard Compliance: The Role of Reputation-Conscious Buyers in the Cambodian Garment Industry. *European Journal of Development Research*, 22, pp.59-78.

Olley G. S. and A. Pakes, 1996, The Dynamics of Productivity in the Telecommunications Equipment Industry. *Econometrica*, 64, pp.1263-1297.

Rahman, M, D. Bhattacharya, and K. G. Moazzem eds., 2008, *Bangladesh Apparel Sector in Post MFA Era: A Study on the Ongoing Restructuring Process*. Centre for Policy Dialogue: Dhaka.

Shiferaw, A, 2007, Firm Heterogeneity and Market Selection in Sub-Saharan Africa: Does It Spur Industrial Progress? *Economic Development and Cultural Change*, 55, pp.393-423.

USAID (United States Agency for International Development), 2005, Measuring Competitiveness and Labor Productivity in Cambodia's Garment Industry.

Yamagata, T, 2006, The Garment Industry in Cambodia: Its Role in Poverty Reduction through Export-Oriented Development. *Cambodian Economic Review*, 2, pp. 81-136.

Appendix: Data Construction for Productivity Analysis in Section 4

The input and output value information was deflated at 2002 prices. For the productivity calculation, item-specific deflators were used wherever possible; data used include the apparel wholesale price index in the United States (Bureau of Economic Analysis) for gross product and material cost, the fuel and electricity price index in Cambodia for energy cost, the utility price index for utility cost, and the GDP deflator in Cambodia for the remaining items. The input and output figures for descriptive statistics were deflated by the GDP deflator.

The capital value was calculated by the perpetual inventory method. Based on the information of purchase year and price of equipment, capital value was constructed applying a 10% depreciation. Deflation was based on the price index of 'Special Industry Machinery' calculated by the Bureau of Economic Analysis in United States, since most equipment was imported. For the observations without purchase price or year, capital value was estimated from the resale value given by a respondent. The capital value does not include value of land and buildings. Assuming perfect complementarities between equipment and land (building), only the value of equipment was used.

Despite such assumptions, rent is needed in order to know the share of capital service costs in production costs. Information on rents and interest was collected and depreciation was estimated from the capital value. However, in cases where a firm owner did not record dividends for his or her contribution in an accounting book, the information was not captured and was included in profits as a residual. Our attempt to regress rent on firm size and location did not yield successful results.

The observations showing negative value-added, or an extremely low share of labor cost in value-added, or an average wage lower than 80% of the minimum wage excluded. On the assumption that the number of workers was the most reliable of the information available, firms with unnatural labor costs and value-added per worker were

excluded through the second and third conditions explained above. With this procedure, 111 (2003) and 59 (2009) firms were left for analysis, and finally, 94 and 37 firms gave information that was detailed enough for productivity analysis.

Figure 1 Quantity and unit price of Cambodian garment exports (2001-2009)

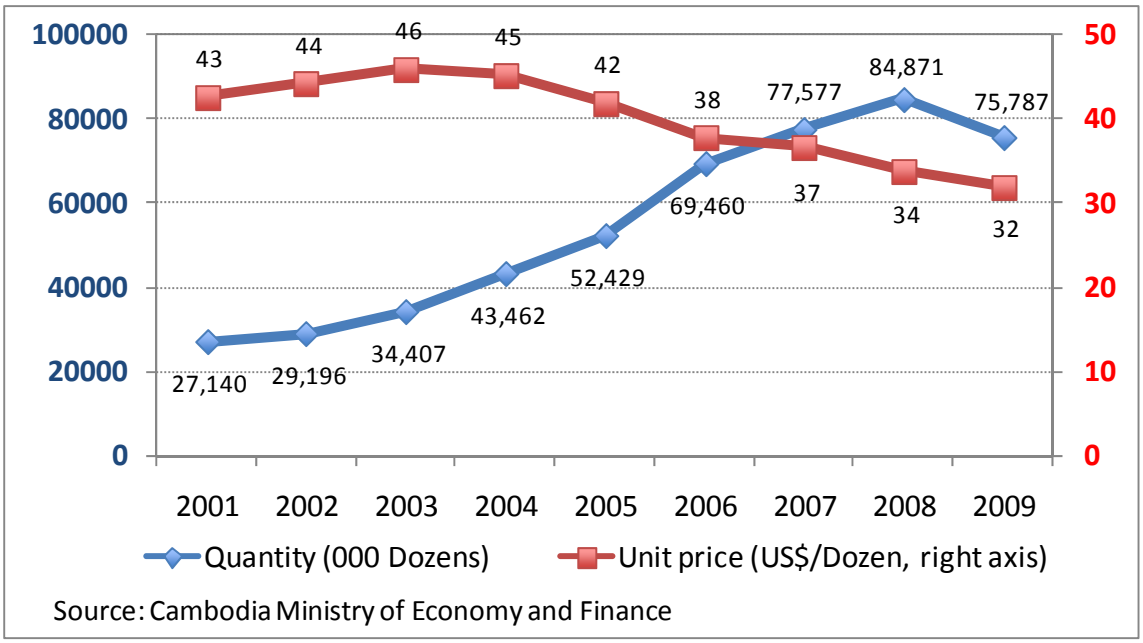
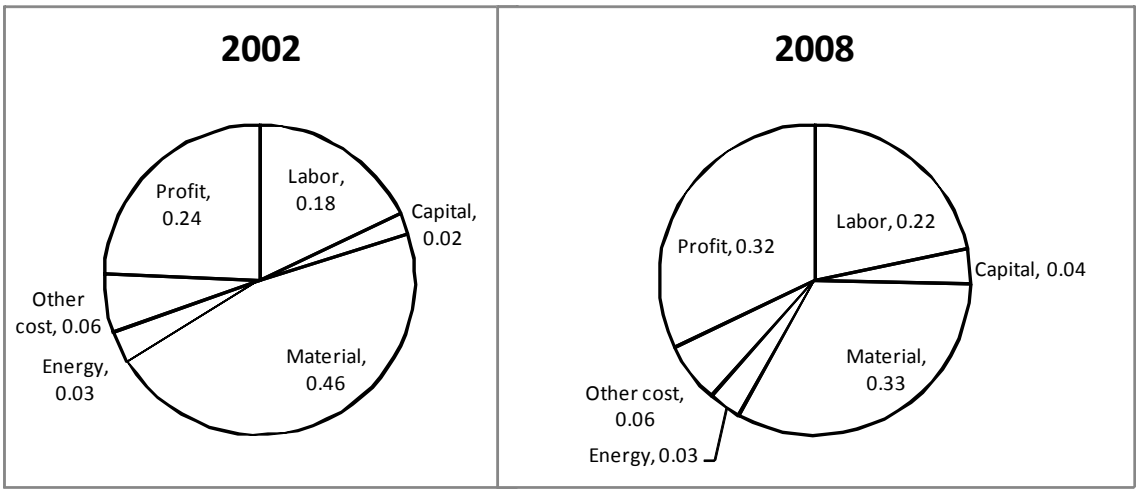


Figure 2 Share of profit and cost in gross product



Source: Authors' calculation

Note: Profit is residual after subtraction of costs from gross product. Tax is included in profit. Also see footnotes 5 and 6.

Table 1 Descriptive statistics for productivity analysis in Section 4 (2002 price)

	2002	2008	Ratio (2008/2002)
Gross product ($)	7,558,977	11,234,579	1.486
	(9,756,307)	(17,717,692)	
Value added ($)	3,600,869	8,581,026	2.383
	(5,313,545)	(15,687,910)	
Profit ($)	2,515,125	7,174,037	2.852
	(4,634,377)	(15,017,091)	
Number of workers	1087.7	1329.3	1.222
	(1230.1)	(1152.8)	
Capital value ($)	395,867	704,009	1.778
	(569,163)	(1,055,086)	
Labor cost per worker ($)	924.9	936.3	1.012
	(350.3)	(254.0)	
Labor productivity ($)	3615.3	5996.1	1.659
	(3839.9)	(5660.9)	
Capital value per worker ($)	519.1	556.5	1.072
	(1169.9)	(790.1)	
N	94	37	

Source: Authors' calculation
Note: The figures in parenthesis are standard deviation.

Table 2 Statistics of TFP index

	2002	2008
Unweighted Average		
Total	-0.218	0.461***
	(1.046)	(1.134)
N	94	37
Continuing Firms	-0.136	0.333
	(1.083)	(1.443)
N	45	10
Exited Firms	-0.294	
	(1.017)	
N	49	
Entering Firms		0.500
		(1.045)
N		26
Weighted Average	0.422	1.382***
	(0.897)	(1.069)
N	94	36

Source: Authors' calculation
Note: Calculated over the pooled sample (one firm in the 2009 sample lacked entrance information and was excluded from the weighted average calculation). Productivity index of hypothetical average firm is zero. The figures in parenthesis are standard deviation. *** indicates that the average for 2008 differs significantly from that for 2002 at the 1% level.

Table 3 Decomposition of TFP growth rate

	Continuing firms	Exited and entered firms	Total (Growth rate of TFP)
TFP change	0.212	0.606	
Market share change	-0.285	0.428	
Total	-0.073	1.033	0.960

Source: Authors' calculation

Table 4 Average monthly wages by job categories

(USD, %)

Position	2002	2008		Nomnal	Real Change
	Nominal	Nominal	Real	Change (%)	(%)
Manager/Executive	615	700	454	13.9	-26.1
Other Officers	144	256	166	77.3	15.0
Engineer	154	196	127	27.3	-17.5
Supervisor	129	201	130	56.2	1.3
QC	69	98	64	41.7	-8.1
Operator	58	93	60	61.9	5.0
Helpers	48	87	56	81.5	17.7

Source: Authors' calculation

Notes: The number of sample firms was 164 in 2002 and 122 in 2008. Wages are weighted by employment. Real wages are in 2002 USD prices and were constructed by deflating nominal wage by CPI. The categories of engineer, supervisor, quality controller (QC), operator, and helper apply only to the garment section (sewing and knitting sweaters/socks).

Table 5 Estimated real hourly wages of operator and helper by gender and experience (garment section)

(Real 2002 USD, %)

Position	Experience	Less than 1 year		1-5 years		More than 5 years		Average
	Gender	Male	Female	Male	Female	Male	Female	
Operator	2002	0.25	0.25	0.28	0.27	0.36	0.32	0.27
	N	38	65	88	134	10	20	148
	2008	0.27	0.28	0.25	0.26	0.28	0.28	0.27
	N	8	27	29	84	6	27	107
	F test		*					
	Change (%)	7.6	14.1	-8.6	-2.0	-21.4	-12.4	-0.7
Helper	2002	0.20	0.21	0.22	0.23	0.21	0.21	0.22
	N	13	28	49	89	2	7	115
	2008	0.29	0.27	0.21	0.24	-	0.34	0.26
	N	7	25	4	65	-	4	84
	F test	**	***		*		**	***
	Change (%)	44.1	29.8	-7.2	7.2	-	62.2	17.1

Source: Authors' calculation

Notes: Wages are weighted by employment. Real wages are in 2002 USD prices and were constructed by deflating the nominal wage by the CPI. The sample is restricted to the garment section (sewing and knitting sweaters and socks). *, **, and *** indicate that the wages of 2002 and 2008 are statistically different at 10%, 5%, and 1% significance level, respectively.

Table 6 Estimation results for wage functions (firm fixed effect model)

Independent variable	Result 1			Result 2			Result 3		
	2002	2008	Difference (2008-02)	2002	2008	Difference (2008-02)	2002	2008	Difference (2008-02)
Manager/Executive	2.234 ***	1.406 ***	-0.828 ***						
Other Officer	1.025 ***	0.760 ***	-0.266 ***						
Engineer	1.067 ***	0.548 ***	-0.518 ***						
Supervisor	0.795 ***	0.547 ***	-0.248 ***	0.756 ***	0.584 ***	-0.171 **	0.538 ***	0.526 ***	-0.012
QC	0.456 ***	0.196 ***	-0.260 ***						
Operator	0.126 ***	0.064 **	-0.062 *	0.095 ***	0.072 **	-0.022	0.082 ***	0.072 ***	-0.009
Female	-0.039 **	-0.039 *	-0.000	-0.012	-0.033	-0.021	-0.012	-0.036	-0.024
1-5 year experience	0.069 **	0.060	-0.010	0.092 ***	0.032	-0.060	0.087 ***	0.018	-0.069
6+ year experience	0.328 ***	0.272 ***	-0.056	0.379 ***	0.119 **	-0.260 **	0.347 ***	0.096 *	-0.252 **
Years of education							0.060 ***	0.022 ***	-0.037 **
Constant	3.820 ***	3.909 ***	0.090	3.809 ***	3.929 ***	0.120	3.435 ***	3.784 ***	0.349
N	1709	1062	2771	873	466	1339	865	439	1304
Number of firms	164	108	272	163	103	266	162	96	258
R squared	0.761	0.743	0.757	0.723	0.764	0.734	0.738	0.771	0.747
F statistics	183.99 ***	95.22 ***	140.08 ***	57.13 ***	31.39 ***	44.42 ***	49.72 ***	29.45 ***	39.75 ***

Source: Authors' calculation

Notes: The unit of observation is defined by year, firm, job category, gender and experience categories. The dependent variable is the logarithm of real monthly wage (2002 USD price). Base categories are helper, male, and less than one year experience. Job categories for engineer, supervisor, quality controller, operator, and helper include only those in the garment section (sewing and knitting sweaters/socks). *, **, and *** indicate 10%, 5%, and 1% significance level, respectively. With regard to "Constant", a test for mean difference is not possible because "Constant" measures the average fixed effect of each year.

Table 7 Average educational level of employees (recognition of managers)

(%, years)

	Manager	Engineer	Supervisor		Operator		Helper		
	2008	2008	2002	2008	2002	2008	2002	2008	
Below Primary	0.0	3.0	0.0	1.8	0.6	12.5	1.9	15.3	
Primary	0.0	3.0	9.3	7.3	79.8	40.2	87.2	30.6	
Lower secondary	2.6	23.0	55.9	43.6	17.2	43.8	9.6	38.7	
Higher secondary	38.3	52.0	29.2	46.4	2.5	3.6	1.3	14.4	
Bachelor or higher	59.1	19.0	5.6	0.9	0.0	0.0	0.0	0.9	
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Estimated years of education (years)	**14.4**	**11.7**	**10.0**	**10.2**	**6.6**	**7.1**	**6.3**	**7.4**	***
N	115	100	161	110	163	112	156	111	

Source: Authors' calculation

Notes: Estimated average years of education have been computed by assigning the following years of education to the original education categories in the questionnaire: Below primary (0 years) ; Primary (6 years); Lower secondary (9 years); Higher secondary (12 years); Bachelor degree or higher (16 years). *** indicates that the estimated average years of education in 2002 and 2008 were statistically different at the 1% significance level.

Appendix Table: Summary of survey sample

	2003	2009
Total	164 (94)	123 (37)
Firms continuing in operation between 2003 and 2009	79 (45)	45 (10)
Firms that exited between 2003 and 2009	85 (49)	
Firms that entered between 2003 and 2009		75 (26)

Note: The figures in parenthesis indicate the number of samples used for productivity analysis. Three firms in the 2009 sample lacked entrance information.