FDI and Export Participation of Local Firms in the Kenyan Garment Industry: Why did not incumbent firms start exports? *

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Abstract

FDI in the garment sector has been the single case of large-scale manufacturing investment in African low-income countries since the 1990s. While FDI has triggered the development of local industries in many developing countries through facilitating export to the markets in OECD countries, it has not yet been realized in Africa. Moreover, unlike predictions of a standard model of export participation, newly established firms with no equipment and little experience responded more positively. This paper investigates the background of local firms' behavior in Kenya using firm-level data in Kenya and Bangladesh, where the latter represents exporters. It shows that credit constraint is a primary source of inactive participation in export opportunity. Only firms which afford additional production facilities without sacrificing stable domestic supply may be motivated to start exporting. However, in comparison with Bangladeshi exporters, those firms were not as motivated as them due to the large gap in expected profits.

Key words: FDI spillover, Manufacturing, sub-Saharan Africa
JEL Classification: F21, L67, O33

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1. Introduction

Manufacturing sector has been stagnated in most of sub-Saharan African countries, and in particular manufacturing exports contribute smaller share in total exports than in other developing countries (some data from WDI). Literature argues several possible sources of the stagnation, which includes lack of foreign direct investment (FDI) in the manufacturing sector (Lall [1999], Biggst et al [1995], Pack [1993]). FDI is regarded as one of the important channels of technology transfer from developed to developing countries, and it is documented that such transfer led to the growth of local industries including textile/garment, motor bicycle, automobile and electric appliances in many developing countries (Lall and Urata [2003], UNCTAD [2002], Ernst et al. [1998]).

Lagging several decades to Asia, FDI in garment industry started to flow into several poor sub-Saharan countries, in particular Lesotho, Madagascar, Kenya and Swaziland, around the year 2000 due to provision of exclusive preferential access to the US market by the African Growth and Opportunity Act (AGOA). Around the world, garment FDI has facilitated local firms' participation to export market in developing countries, and recently success is seen even in low income countries with poor local industry like Bangladesh and Vietnam. It is argued in the literature that technology and knowledge possessed by foreign firms effectively transferred to local firms through demonstration by foreign firms, transactions between them and labour turnover from foreign to local firms (Saggi [2000]), or presence of foreign firms reduces the fixed costs associated with exporting, such as establishing distribution networks, learning about consumer demand and building transportation infrastructure (Aitken et al. [1997], Greenway et al. [2004]). In contrast to success in the world, export participation by local firms is very limited in African countries. It is partly due to slowdown of export growth from Africa after termination of Mutifiber Arrangement (MFA) in 2005, which resulted in weakening the advantage of African garments in export market. However, local participation was small even before 2005 and local firms did not know the MFA termination until it happened according to the author's interviews with Kenyan local garment firms.

Uniqueness of local participation to export market is not only its small size, but characteristics of local firms engaged in exporting. Empirical studies suggested that productivity and sunk costs associated with exporting matters export participation. Most of studies on learning-by-exporting found that firms with high productivity tend to start exporting (e.g. Delgado et al. [2002], van Biesebroeck [2005]). And studies on export participation suggested to consider sunk costs needed for exporting, and showed that firms that have experience of export (and hence paid sunk costs) are more likely to export (e.g. Roberts and Tybout [1997], Clerides et al. [1998], Bernard and Jensen [1999]). These evidences imply that new entrants with little experience in the industry and no production equipment are less likely to start exporting than old firms, since they are less productive and need to bear large sunk costs. In contrast to it, majority of local firms started exporting in Kenya are, in fact, newly established firms by the owner without experience of garment industry. Also, this is not consistent with the evidences indicated by FDI spillover literature that local firms with richer absorptive capacity are more likely to benefit from FDI spillover (Crespo and Fontoura [2006], Saggi [2000]).

Response to the emergence of FDI observed in Kenyan garment industry indicates that firm behavior differs from one supported by many empirical studies in other developing regions. This may imply that emergence of FDI does not necessarily lead to development of local firms, though literature argued lack of FDI is one of causes of the stagnation in African manufacturing sector. In the previous work, the author investigated absorptive capacity of local firms in Kenya, and found that technical and market knowledge of garment export was entailed to skilled worker, and hence, by employing expatriates who used to work in FDI firms, local firms was able to start as a subcontractor regardless of its experience and skills (Fukunishi [2010]). However, it still does not necessarily support that new entrants are more positive in exporting. Using original firm data, the present paper attempts to investigate firm response to export opportunity brought by FDI inflow based on the Kenyan case. Considering the market characteristics in Kenya, credit constraint and sunk costs associated with entry to domestic market (instead of export market) are incorporated in a standard analytical model of export participation. Empirical analysis is conducted through estimation of credit accessibility and expected profits of exporting using firm data in Kenya and Bangladesh, where the latter is used as representative exporters. The results are generally consistent with implications of the model, and in particular it suggested that credit constraint discouraged local garment firms to start exports. However, they also demonstrated that Kenyan firms are less motivated to exporting than Bangladeshi firms due to lower profitability, controlling credit constraint. Since FDI in garment industry is a single case of large scale manufacturing FDI in poor sub-Saharan Africa after the 1980s, investigation demonstrates unique behavior of African firms.

In the next section, FDI and export participation of local firms in the Kenyan garment industry is described. A modified model of a local firm's export participation is constructed in the third section. The fourth section investigates credit accessibility of local firms. Based on the result, the firms' incentive of exporting is investigated in the fifth section. The last section concludes the discussion.

2. FDI and Export Participation by Local Firms

2.1 Overview in the LICs

The assembly process of garment production is characterized by relatively simple technology compared to other manufacturing activities. The sewing machine is the main equipment and the use of a simple sewing machine remains cost effective when combined with adequate worker skill and organization (Lall and Wignaraja [1994]). In contrast, a high amount of barriers exist in marketing due to the wide variety and quick change of consumer tastes. The latest market information is assembled through retailers in developed countries, and taking that advantage, they provide full specification of products with manufacturers (Gereffi and Memedovic [2003]). While linkage with retailers is important, it is restricted with manufacturers and trading companies in developed countries and East Asia, which have established a linkage through long-standing business relations with retailers. Hence, the involvement of foreign firms is essential for the start of garment exporting from LICs, which takes the form of FDI or subcontracts from foreign trading companies or manufacturers.

Production technology and know-how is obtained by sending skilled workers to manufacturers in a host country, or sending local workers to a developed country for training. Technology and knowledge accumulated in local exporting firms is further transferred to other local firms through turnover of experienced local workers as well as subcontracting with them. Rhee and Belot [1989] and Mostafa and Klepper [2009] documented that production technology was transferred to Bangladeshi workers through training in South Korea and further spilled over to other firms through labor turnover.

Export participation by local firms was most impressive in Bangladesh. Five years after the first garment exports to the US market, about 700 local exporters were in operation. In Mauritius, FDI from Hong Kong first came in 1975 seeking for a non-quota status in the US market and the preferential trade agreement with EU, and from that time, garment exports had been expanding until 2000. Following the emergence of FDI, local entrepreneurs (i.e., local sugar corporations, small businesses and even individuals) had invested in the garment industry and it was estimated to have contributed more than 50% of the total investment (Bowman [1991]). In Sri Lanka, garment exports were triggered by FDI mainly from East Asia in the late 1970's, but local firms also ventured into exports and recorded a performance on par with foreign firms (Athukorala and Rajapatirana [2000], Lall and Wignaraja [1994]).

2.2 Garment Export in Kenya

Export opportunity was brought about through the enactment of the African Growth Opportunity Act (AGOA) in 2000. AGOA is a US domestic act devised to remove tariffs on a broad range of products imported from SSA countries satisfying certain political and economic conditions. This new trade scheme has had a drastic impact on the African garment industry. Several African countries have been rapidly increasing garment exports to the US market, and in Kenya, exports grew by 600% between 1999 and 2004 (Figure 1). Rapid growth of exports in Kenya is largely brought about by the firms registered in Export Processing Zones (EPZs), which accounted for 85% of the exports to the US in 2002. After the enactment of AGOA, new investments in the garment industry have flown into EPZs, and in 2004, 30 garment firms produced 2.2 million US dollars, and employed 34,600 workers (Table 1). EPZ firms produce mainly low-priced basic wear ordered from US buyers. All firms are funded with foreign capital from the Middle East (Bahrain, UAE), South Asia (India, Sri Lanka) and East Asia, while some firms are joint ventures with domestic capital.

The growth trend was disrupted in 2005 following the termination of the MFA. The abolition of the export quota imposed on main exporters resulted in a massive increase of exports from competitive countries like China and India, and consequently, exports from Africa have dropped by 16%. Although the adverse effect was relatively small in Kenya (-0.8%, Figure 1), the growth trend disappeared and several EPZ firms were closed down.

2.3 Local exporting firms

We have identified that at least 19 local firms started or significantly increased exports to the US and EU market after the arrival of FDI (Table A1 in appendix 1). Though many firms exported to African markets,

they are not included in FDI spillover due to their having less relevance to FDI. As African markets differ widely from the US/EU markets in terms of the type and quality of products, the volume of orders, and competition in the market, exports to the African market unlikely resulted from the transfer of technology and knowledge from foreign firms.

Although sufficient information was not obtained from some firms, we believe that our estimation of the number of local exporters is fairly accurate.[1] Among the 19 local exporters, 15 firms were newly established as an exporter (new exporter), while 4 firms used to supply to the domestic market and then, have added or switched to the US market (switched exporter). Most of the new exporters were set up after 2001. All local exporters from which we managed to get information (16 out of 19) produced export garments on subcontract order (CMT) as a major part of sales, while several firms were taking orders directly from foreign buyers (FOB) as well as subcontracting. Subcontract orders were mostly from EPZ firms in Kenya.

We have interviewed 7 new exporters and 3 switched exporters among the 19 local exporters. The number of employees of the interviewed firms range from 13 to 800 and the average is 231, which is 2.9 times larger than the average of local firms and about 20% of the average EPZ firms. Turnover also has large variation from 5.9 million to 265.0 million KShs and the average is 60.0 million KShs, which is 19% of the average EPZ firms (Table 2). There is clearly a minimum scale in export production; except for one small firm, all local exporters employ more than 70 workers and most of them have 130 workers (Table A1).[2] Although the local exporters are larger than the average local firms, they are much smaller than the average EPZ firms in terms of employment and turnover.

The imitation of the export business by local firms is surprisingly small size compared with the other garment exporting countries. The inactive response by local firms is possibly related to the termination of MFA, since they may have expected significant change in the export market after 2005 and suspended investment until they knew how the market would be.[3] If part of the capital is sunk, decision making will be forward-looking and this can be considered rational behavior regardless of a firm's risk preference (Dixit and Pindyck [1994]). However, our interview with local firms indicates that almost all of them were unaware of these institutional uncertainties in 2003. Though our interview was conducted after those events, only 4 out of 18 local non-exporting firms interviewed replied that they had known of the MFA termination and had anticipated the shrinkage of exports in 2003.[4] It was also revealed that even many local exporters were unaware of the termination of MFA when they started. This may be because EPZ firms did not have any incentive to tell local firms about these uncertainties and few local non-exporting firms had

[1] We mainly based this on the list of firms registered as Manufacturing under Bond (MuB) to identify a local exporter, because they are likely to register as MuB, which allows them to keep imported material bonded. However, we were not able to confirm 14 firms on the list, mainly because the registered phone number was not in service. It is likely that most of unidentified 14 firms did not start an operation.

[2] One small firm (firm C in Table A1) specialized in printing.

[3] There was another uncertainty in regard to the AGOA. While the concessional rule of origin was crucial for African exporters to remain competitive in the US market, it was scheduled to be revised in July 2004 and just before the termination date, no decision regarding the change had been reached (the rule was finally maintained).

[4] Since those four firms replied they did not know AGOA change, their replies that they were aware of termination of MFA are reserved.

connections with foreign firms.[5] This evidence suggests that the institutional uncertainties were unlikely to have affected the local manufacturers' choice of market.

It is also noted that the volume of FDI and the growth of garment exports in Kenya was no less than that of the other garment exporting countries. Employment by EPZ firms in 2004 was as large as that of Mauritius in 1984 and larger than that of Sri Lanka in 1985, which is about 10 years after the start of exports in both countries. The annual growth rate of exports between 2000 and 2004 in Kenya was 58.5%, which is much faster than the growth rate in Mauritius from 1985 to 1990 (30.0%) when the fastest growth was recorded. Reflecting the growth of exports, EPZ firms offered subcontracts to many local firms. Among the local firms in which the author conducted interviews, 72.7% were contacted by them about subcontracts.[6] Although there were about 120-150 garment firms with more than 10 employees in Kenya based on our estimation (Table 2), only 4 firms switched to the export market.

In contrast, the newly established firms have been more positive about starting an export business. Owners of the new export firms were mainly from another industry and invested in garment exports as a diversification of business. As far as we know, four owners have experience in the textile or garment industry, while eight owners have experience in another industry or public sector, which includes the export of horticultural products, transportation, supermarkets and hotels. An investment seminar held by the government and World Bank in 2003 facilitated the dissemination of information regarding investment opportunities. Although these business owners had very little experience and knowledge in garment production, it is found that all new exporters employed expatriates who used to work in EPZ firms. They have substantial knowledge in marketing as well as production technology for garment exporting, and owners of new exporters expressed that they had no serious problem in staring exporting business (Fukunishi [2010]). Though sample is small, new exporters performed as efficient as Kenyan EPZ firms and Bangladeshi firms.[7] Transfer of knowledge through labour turnover is commonly seen in other developing countries, where the Bangladeshi case is most famous, and it implies that absorptive capacity is not a significant barrier of local participation into export market.

3. Analytical Framework and Methodology

3.1 Analytical Framework

Entering the export market entails investment in most cases. If a firm starts production for an export market, it needs to invest in physical capital and possibly in the creation of distribution channels, logistics infrastructure, human capital and knowledge of market demand. Given the uncertainty regarding the future profitability of the export market, whether or not such investment is sunk becomes a crucial issue in making the decision to export. As Dixit and Pyndick [1994] argued, if uncertainty is a Markov process and investment is irreversible, a firm may have incentive to refrain from investment even when expected future

[5] This evidence is based on the author's interview.
[6] New exporters are not included.
[7] See Table 8 for comparison of technical efficiencies.

profits are greater than the investment value. Standard model assumes that a firm needs to invest sunk cost I when it participates in the export market if it does not export during the period right before, and profit from the export market, π^f_t, is serially correlated. Let the profit from the domestic market be π^d_t, discount rate be ρ, and the decision of export participation be s_t where s_t=1 when a firm starts to export. A firm's value function is described as

$$V_t = \max_{s_{t+\tau}} \left(E_t \sum_{\tau=0}^{\infty} \rho^\tau \left[s_{t+\tau} \left(\pi^f_{t+\tau} - (1 - s_{t+\tau-1}) I \right) + \pi^d_{t+\tau} \right] \right) ,$$

which leads to Bellman's equation

$$V_t = \max_{s_t} \left(E_t \left[s_t \left(\pi^f_t - (1 - s_{t-1}) I \right) + \pi^d_t + \rho E_t \left[V_{t+1} | s_t \right] \right] \right) .$$

This characterization implies that a firm participates in exporting whenever

$$\pi^f_t + \rho E_t \left[V_{t+1} | s_t = 1 \right] \geq (1 - s_{t-1}) I + \rho E_t \left[V_{t+1} | s_t = 0 \right].$$

This implies that non-exporting firms start exporting when expected future profits earned from starting to export at that time are greater than sunk costs plus expected future profits should they decide to wait during this period. Since a firm can start exporting after t+1, the second term in the RHS contains not only future profits of domestic supply but that of export supply, which is called the option value (Dixit and Pyndik [1994]). As option value is greater than or equal to zero, a firm has an incentive to wait even if future expected profits in export market exceed fixed costs plus future domestic profits.[8]

We make some modifications to the standard model so that our model fits with the reality of the Kenyan garment firms. Though the standard model does not incorporate it, credit constraint is significant among Kenya firms (Isaksson and Wihlborg [2002]), and has received considerable attention in the FDI spillover literature. A firm with credit constraints may find it difficult to finance investment to supply to the export market or to multinational firms (Javorcik and Spatareanu [2009]). In the case of the garment industry, initial investment is needed mostly for expansion of physical capital, given that subcontracting from foreign firms does not require a long-distance logistics factor, distribution channels in foreign countries or customs clearance as we will see in section 4. However, as mentioned, there is a minimum production scale for export production, which is larger than the average scale of local firms. A firm that is unable to finance at a minimum scale has no possibility of participating in the export market. And given the exchangeability of equipment between domestic and export supply, moderately credit-constrained firms may manage to prepare the minimum capital by utilizing the current capital used to supply in the domestic market. In contrast, those with good credit access can finance export production facilities in addition to domestic ones as assumed in the standard model. Therefore, the degree of credit access substantially affects the export decision problem, and for convenience, we call the firm that is not able to finance minimum capital a Type

[8] On the other hand, the above condition implies incumbent exporters continue to export under the less restrictive condition as they do not consider fixed cost I anymore. So sunk cost leads to a difference in export decision between current exporters and non-exporters. Robert and Tybout [1997] showed empirical evidence of effect of sunk cost on export decision (as did some other studies, i.e., Bernard and Jensen 1999, Clerides, Lach and Tybout 1998).

1 firm, the moderately constrained firm a Type 2 firm and the firm with good credit access a Type 3 firm. For Type 2 firms, the export decision problem becomes a choice between participation in the domestic or the export market.

Another important characteristic in the Kenyan context is that once a firm withdraws from the domestic market, re-entrance to it necessitates sunk cost to rebuild the relationship with buyers due to the strong linkage between buyers and suppliers. Because of the low number of suppliers in the Kenyan garment market and the fact that the main products of local firms, uniforms, require frequent contact with buyers to satisfy customers' exact specifications, linkages between buyer and supplier are relatively stable. In contrast, the investment for exports is less likely to be sunk, since the investment is mainly for physical capital and there is a secondhand market in Kenya.[9] Thus, for the Type 2 firm, the decision problem is dynamic because of the sunk cost of the domestic market, while it is more of a static problem for Type 3 firms given the substantial reversibility of investment.

Let us assume a positive sunk cost for re-entrance to the domestic market, W>0, no sunk cost for the export market, and reversible physical capital. Now the cost of capital is incorporated in profit as a rental cost, and then, Bellman's equation for a Type 2 firm is

$$V_t = \max_{s_t}\left(E_t\left[s_t\pi_t^f + (1-s_t)(\pi_t^d - s_{t-1}W) + \rho E_t\left[V_{t+1}\middle|s_t\right]\right]\right).$$

And a firm decides to export when the following condition is satisfied:

$$\pi_t^f \geq \pi_t^d - s_{t-1}W + \rho\left(E_t\left[V_{t+1}\middle|s_t=0\right] - E_t\left[V_{t+1}\middle|s_t=1\right]\right). \qquad (1)$$

This condition differs from the one based on the standard model in several aspects. Firstly, given that sunk cost applies to the domestic market rather than the export market, the critical profit level that a firm chooses an export market for the exporter is $\pi_E^{f*} = \pi_t^d - W + \rho\left(E_t\left[V_{t+1}\middle|s_t=0\right] - E_t\left[V_{t+1}\middle|s_t=1\right]\right)$ and they now consider sunk cost W, while the one for non-exporters is $\pi_N^{f*} = \pi_t^d + \rho\left(E_t\left[V_{t+1}\middle|s_t=0\right] - E_t\left[V_{t+1}\middle|s_t=1\right]\right)$ and they do not. Secondly, as the problem is making the choice between the two markets, the profit of exports is compared with the profit from the domestic market. It is noted that the third term in the RHS of (1) is the difference of expected future profit when s_t= 0 and s_t = 1, and it is necessarily positive for non-exporters at t. By remaining in domestic supply at t, a firm can avoid the possible loss that an exporter incurs at t+1 in case $\pi^f_{t+1} < \pi^{f*}_E$, while it can switch to the export market without sunk cost whenever it is more profitable. Therefore, $E_t\left[V_{t+1}\middle|s_t=0\right] > E_t\left[V_{t+1}\middle|s_t=0\right]$ holds and the last term in (1) is positive. The reservation of this statement would be in the case where future profit (π^f_t) has an upward trend. Learning-by-exporting is a typical example; firms supplying the export market necessarily improve productivity faster than non-exporting firms, and hence, future profits grow faster.[10] Then, the last term in (1) can be negative. Hence, if the learning-by-exporting effect is not

[9] Secondhand machines were used in many factories. Most respondents replied to the question about resale value of equipment in our survey.

[10] Empirical evidence of learning-by-exporting is mixed. Some empirical studies support the link between exports and productivity growth through learning-by-exporting, competitiveness pressure and increasing returns

substantially large, the participation condition (1) indicates $\pi^f_t > \pi^d_t$, that is, a non-exporter does not switch to the export market unless the current export profit is greater than current domestic profit. On the other hand, the decision problem of Type 3 firms is static as long as no sunk cost for export participation, and they start exporting when the current export profit is positive.

The above model assumes risk neutral firms, but in the context of Africa, literature indicates that firms are risk averse because of poor access to credit (Collier and Gunning [1999], Bigsten et al. [2003]). Due to stronger linkages between buyers and suppliers in the domestic market, it is reasonable to assume that domestic profits are more stable than those of exports, and risk-averse firms prefer the domestic market if expected profit is the same. In that case, critical profits triggering export participation (π^{f*}_N) rises by risk premium, which is determined by difference in perceived risks in the two markets and degree of risk aversion of individual firms.

This analytical framework is consistent with the result of the interview with local exporters. Table 3 indicates that 10 firms among 18 samples named difficulty of physical investment as a reason not to start exporting. Six firms replied that the export market is risky mainly because of the volatility of demand. The profitability of the export market is questioned by 10 firms (including those that replied that the current domestic business is profitable) in comparison with the domestic market. This implies that they compare the export and domestic markets rather than viewing the export market independently. Many firms explained that low expectations of the export market are mainly due to uncertainty of order and the relatively large physical investment required.

Though the above model assumes unbiased information about profitability of exporting, one may think that there is uncertainty and firms need to guess based on the available knowledge, as discussed in social learning literature. We rule out the possibility of social learning in our analysis due to the following evidence. Most of the local firms communicated with EPZ and got to know the details of subcontract orders such as product specification, quantity and order price. The interviews with managers revealed that for local firms with experience in garment assembly, it was not difficult to guess how profitable they were.

3.2 Strategy for Identification

Though standard methodology to identify determinants of export participation is an econometric approach using the probit or logit model (i.e., Roberts and Tybout [1997], Bernard and Jensen [1998], Javorcik and Spatareanu [2009]), it is not applicable in our case due to the small number of firms entering the export market in the sample as well as in the population. Our approach is to directly investigate the structure of firm's market choice problem using the qualitative and quantitative information of individual firms. Based on the above framework, local firms' non-participation in the export market is attributed to that they were either not able to do so due to lack of credit access, or they were not motivated due to unattractive profitability and/or high risk in the export market. In this paper, these two factors are

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to scale (Van Biesebroeck [2005], DeLoecker [2007], Bigsten et al. [2004], Grima, Greenway and Kneller [2004]), while some of them support self-selection explanations (Clerides, Latch and Tybout [1998], Bernard and Jensen [1999], Delgado, Farinas and Ruano [2003]).

approached separately.

Firms' credit access is investigated through interviews with local firm managers. Credit access will be estimated from local firms' credit use. Also, by estimating the minimum capital value from capital demand function and comparing it with local firms' current capital value, we will determine the investment necessary for an individual firm to start exporting. In principle, these estimates will tell us whether a firm can start to export or not, but in practice, it is very difficult to know precisely how much credit a firm can access. Therefore, we will at least identify a firm without access to formal credit, and if its capital value is less than the minimum scale, we deem that the firm is Type 1 and not able to participate in the export market.

For moderately credit-constrained firms (Type 2), our model indicates that to satisfy the participation condition (1), export profits have to be larger than domestic ones plus risk premium. Since Type 2 firms are seriously constrained from expansion of production capacity, they are motivated to exporting when there is a significant gap in profitability in export and domestic markets or learning-by-exporting works. Using firm data of Kenyan and Bangladeshi industry, production functions of exporters and domestic suppliers are estimated and learning-by-exporting effect is tested. For Type 3 firms which starts exporting when expected profits are positive, expected profits are simulated based on the estimates of production function. If estimation results are consistent with their response, our model explains the incentives structure of local firms. In addition to those exercise, expected profits of exporters in Kenya and Bangladesh are simulated and compared to those of local exporters. This indicates whether our model can explain the heterogeneous response to export opportunity.

This approach has advantages of investigating the structure of the decision problem. In most econometric approaches, the reduced form representing the relationship between a firm's characteristics and realized choice is estimated, yet the true structure is that characteristics affect choice through a firm's expectation on profit earned in a new market. The reduced form relationship may incorrectly estimate determinants if omitted variables and/or endogeneity problems are significant. By directly looking at expected profit, our methodology avoids misidentification of determinants.[11] On the other hand, difficulties lie in the collection of measurable data related to decision making, such as precise information on credit access and risk preference. In particular, lack of knowledge about risk preference of individual firms caused ambiguity in empirical test of the theoretical model. In case that the evidence is not consistent with the model prediction, we cannot systematically investigate whether it is caused by firms' risk preference or assumptions on which our model based. This arises in the analysis of Type 3 firms in section 6.2, but fortunately the result denied effect of our assumption.

3.3 Estimation of Production Function, Productivity and Expected Profits

Given the small number of exporters in Kenya, we added Bangladeshi firms to the sample to estimate

[11] Conley and Udry [2010] also estimated expected profits in a study of farmers' learning of new technology in Ghana. They used neighboring farmers' realized profits (with control of production characteristics) for expected profits, and it is basically same methodology as ours.

production function so as to have robust estimates. Bangladeshi firms are exporting low-priced garments, which are in the same market segment as the products of Kenyan exporters. Given their success in the export market for more than 20 years, it is reasonable to regard them as a representative exporter in a low-income country. Furthermore, the addition of Bangladeshi firms allows us to compare expected profits between local firms in Kenya and a successful exporting country, and to investigate the difference of local firms' responses to export opportunity.

OLS and stochastic production frontier model are used for the estimation of production function. The endogeneity problem on input choice may arise if a firm determines the amount of input, particularly labor, knowing its own productivity which is unobservable for us. The fixed effect model and some estimation procedures, such as those by Olley and Pakes [1996] and Levinson and Petrin [2003], have been suggested, but they are not applicable to cross-sectional data. Stochastic frontier model can avoid this problem by making assumptions on the distribution of productivity. In this methodology, a firm's productivity is measured as technical efficiency which represents dispersion from the production frontier indicating the greatest output given inputs among the samples. Specifically, it assumes a production function

$$Y_i = \alpha\, K_i^{\beta 1} Ls_i^{\beta 2} Lu_i^{\beta 3}\, TE_i\, error_i, \qquad (2)$$

where *Y*: output, *K*: utilized capital, *Ls*: skilled labor, *Lu*: semi-skilled labor, *TE*: technical efficiency with value between 0 to 1, *error*: stochastic errors with mean at one, and *i* represents an individual producer. TE is estimated by separating regression residual to TE and random error based on the assumption on distribution of TE (Jondrow et al. [1982]), though we do not know it. As choice of distribution affects estimate of parameters as well as technical efficiency (Kumbhaker and Lovell [2000]), we have used several distributions to check sensitivity. The learning-by-exporting effect is tested based on the cross-sectional variation of technical efficiency according to export experience.

To see sensitivity of distributional assumption to technical efficiency, we estimated parameters by OLS without distributional assumption, and then, technical efficiency is separated by method of moment with distributional assumption following Olson et al. [1980]. Further, alternative productivity estimates are obtained by the index number method, which is free from the arbitrary assumption on distribution and endogeneity problem of input choice. Following Caves et al. [1982], productivity of an individual firm is measured relative to a hypothetical average firm with average inputs, output, and factor shares by the following formula.

$$\left(\ln TFP_i - \overline{\ln TFP}\right) = \left(\ln Y_i - \overline{\ln Y}\right) - \sum_n \left(\frac{s_i^n + \overline{s^n}}{2}\right)\left(\ln x_{ni} - \overline{\ln x_n}\right) + \sum_n \left(\frac{\left(s_i^n + \overline{s^n}\right)(1-\xi)}{2}\right)\left(\ln x_{ni} - \overline{\ln x_n}\right),$$

where x_n is input ($n = K, Ls, Lu$), s^n is the factor share of each input, ξ is returns to scale, and the variables with upper bar (i.e., $\overline{\ln Y}$) are sample averages. The third term is added to control returns to scale, so that estimates can be compared with technical efficiency which does not include the returns to scale effect on

productivity.

The estimation of expected profits is based on a production function estimate. The use of production function instead of profit function is to avoid bias stemming from the use of rental price that is not clearly observable for us. In many cases, firm owners provide their own land or money for their firms but dividend for their contribution is not clearly shown in an accounting book. Therefore, capital service cost in our firm data can be wrongly measured and, consequently, so can the rental price. If we assume the Cobb-Douglas production function, then duality allows the identification of cost function from production function estimates. With the production function (2), a firm minimizes cost, $C_i = r_iK_i + ws_iLs_i + wu_iLu_i$, where r_i is rental price of capital, ws_i is the wage for a skilled worker and wu_i is the wage for a semi-skilled worker. It is assumed that the firm may misallocate inputs, and then, actual cost becomes greater than the minimum cost (allocative inefficiency). The first order conditions of cost minimization with allocative inefficiency are expressed as

$$\frac{K_i}{Ls_i} = \frac{\beta_1 ws_i}{\beta_2 r_i} AE_{1i}$$
$$\frac{K_i}{Lu_i} = \frac{\beta_1 wu_i}{\beta_3 r_i} AE_{2i} \ ,$$
$$\frac{Ls_i}{Lu_i} = \frac{\beta_2 wu_i}{\beta_3 ws_i} AE_{3i}$$

where $AE_{ni} > 0$ for all n, and it is equal to one when factor allocation is optimal, given factor price ratios.

From (2) and FOCs of cost minimization, conditional input demand functions are given by

$$K_i = \left[\frac{\beta_1^{\beta 2+\beta 3}}{\beta_2^{\beta 2}\beta_3^{\beta 3}} \alpha^{-1} \frac{ws_i^{\beta 2} wu_i^{\beta 3}}{r_i^{\beta 2+\beta 3}} \left(\frac{Y_i}{TE_i * error_i} \right) AE_{1i}^{\ \beta 2} AE_{2i}^{\ \beta 3} \right]^{\frac{1}{\beta}}$$
$$Ls_i = \left[\frac{\beta_2^{\beta 1+\beta 3}}{\beta_1^{\beta 1}\beta_3^{\beta 3}} \alpha^{-1} \frac{r_i^{\beta 1} wu_i^{\beta 3}}{ws_i^{\beta 1+\beta 3}} \left(\frac{Y_i}{TE_i * error_i} \right) AE_{1i}^{\ -\beta 1} AE_{3i}^{\ \beta 3} \right]^{\frac{1}{\beta}} \quad , \qquad (3)$$
$$Lu_i = \left[\frac{\beta_3^{\beta 1+\beta 2}}{\beta_1^{\beta 1}\beta_2^{\beta 2}} \alpha^{-1} \frac{r_i^{\beta 1} ws_i^{\beta 2}}{wu_i^{\beta 1+\beta 2}} \left(\frac{Y_i}{TE_i * error_i} \right) AE_{2i}^{\ -\beta 1} AE_{3i}^{\ -\beta 2} \right]^{\frac{1}{\beta}}$$

where $\beta = \beta_1 + \beta_2 + \beta_3$. Multiplying respectively by a factor price, the cost function is given by

$$C_i = r_iK_i + ws_iLs_i + wu_iLu_i = A\, r_i^{\frac{\beta 1}{\beta}} ws_i^{\frac{\beta 2}{\beta}} wu_i^{\frac{\beta 3}{\beta}} \hat{Y}_i^{\frac{1}{\beta}} TE_i^{\frac{-1}{\beta}} \overline{AE_i} \ ,$$

where $A = \beta \left(\alpha \prod_n \beta_n^{\beta n} \right)^{\frac{-1}{\beta}}$ n=1,2,3, $\hat{Y}_i = \alpha\, K_i^{\beta 1} Ls_i^{\beta 2} Lu_i^{\beta 3} TE_i$ (predicted output), and $\overline{AE}_i = \frac{1}{\beta} \left[\beta_1 AE_{1i}^{\frac{\beta 2}{\beta}} AE_{2i}^{\frac{\beta 3}{\beta}} + \beta_2 AE_{1i}^{\frac{-\beta 1}{\beta}} AE_{3i}^{\frac{\beta 3}{\beta}} + \beta_3 AE_{2i}^{\frac{-\beta 1}{\beta}} AE_{3i}^{\frac{-\beta 2}{\beta}} \right]$. The first through fifth terms on the right hand side compose the cost frontier function, and the last two terms represent the dispersion of actual

cost from the frontier; they are the costs of technical inefficiency and allocative inefficiency respectively.[12]

Note that the above cost function accounts only for utilized inputs, since capital in the production function is adjusted by the utilization rate. Adding the cost of idle capital, η, in multiplicative form, the actual cost is described as

$$TC_i = A\, r_i^{\frac{\beta 1}{\beta}} ws_i^{\frac{\beta 2}{\beta}} wu_i^{\frac{\beta 3}{\beta}} \hat{Y}_i^{\frac{1}{\beta}} TE_i^{\frac{-1}{\beta}} \overline{AE}_i \;\eta_i, \qquad (4)$$

where $\eta \geq 1$. Expected profit is obtained by subtracting expected cost from sales in the export market,

$$\hat{\pi}_i = pY - \hat{TC}_i\left(r_i, ws_i, wu_i, Y, TE_{i,} \overline{AE_i}, \eta_i\right). \qquad (5)$$

Estimates of expected profit will be given by inserting an individual firm's factor prices, production size, inefficiencies and share of idle capital.

It is noted that our approach can avoid bias due to measurement error of rental prices not only in parameter estimates but in the estimation of expected profits given by (5). Though rental price enters into the equation (5) directly, measurement error is offset by $\overline{AE}$, since AE_1 and AE_2 incorporate the error of rental price as shown in the FOCs of cost minimization.

3.3 Source of Information

Two types of information were collected by the author and collaborators. Firm data of the Kenyan and Bangladeshi garment industries were collected in 2003 by the Institute of Developing Economies, University of Nairobi and University of Dhaka. The survey includes 71 firms in Kenya and 222 firms in Bangladesh, of which 47 and 165 firms were used for the analysis after the elimination of the samples of poor quality. The number of samples reflects the size of the industries, where the Bangladeshi industry has more than 3000 firms and the Kenyan industry is estimated to consist of 120-150 firms. The sample was selected using the stratified sampling method in Bangladesh, while the Kenyan sample is the result of an exhaustive survey based on several incomplete firm lists due to the non-existence of a complete list.[13] The Kenyan sample consists of 3 local exporters, 5 foreign exporters and 39 local firms supplying to domestic and African markets (Table 4). On the contrary, all Bangladeshi firms in the sample are exporters and only two of them are foreign owned; the rest are domestically owned.

Firm interviews were conducted for Kenyan local firms by the author in 2005 and 2006 in order to collect qualitative and quantitative information about the adoption process of local exporters, and the absorptive capacity, credit access and incentives of local non-exporters to start exporting. It includes 10 local exporters and 18 local non-exporting firms (Table 4). For supplementary information, 5 EPZ firms, Export Processing Zones Authority, Ministry of Trade and Industry and Kenyan Association of Manufacturers (industrial association) were interviewed.

Information obtained through the firm interview is mainly used for the analysis of credit access, while

[12] $\overline{AE} \geq 1$ and equality holds when AE_n=1 for all n; the cost of allocative inefficiency is null when there is no inefficiency in input allocation.

[13] See Appendix 2 for details of the sampling method and data construction.

that of the firm survey is used in the estimation of production function and simulation of profits. It is noted that the two are not perfectly matched; the survey sample is larger. Therefore, qualitative information about credit access obtained through the interviews was generalized to the simulation samples and applied to the simulation. In the process of generalization, we have been careful regarding the possible difference of firms' characteristics between the two samples. As for credit access, we used firm size as a key by which to apply the findings of the interviews to simulation exercise given the clear relationship between size and credit use.

5. Credit Constraint and Export Opportunity

The initial investment required for a garment assembler is relatively small because of its labor intensiveness. The most crucial equipment is sewing machines; machines for cutting fabrics and washing and pressing final products may also be needed, depending on the product. While Kenyan local manufacturers have 51.6 sewing machines on average, the average number in Bangladeshi firms is 173 machines, and even the 25 percentile firm equips 111 machines. Therefore, many of the Kenyan local firms needed to expand their capacity. Minimum capital size is estimated by conditional capital demand function shown in equation (3) with assumption on minimum output.[14] We refer to the actual output of the relatively small local exporter, which employs 84 workers, as the minimum scale. Firm's characteristics, such as factor prices and efficiencies, are entered into the function, which gives an estimated capital demand for an individual firm. Based on the result of the previous section on absorptive capacity, local firms are assumed to maintain the same technical and allocative efficiency as they did in the domestic market.

Thirty-nine local non-exporting firms in the survey were used for simulation. The simulated value for a firm with average characteristics is 38,873 US$. Comparing the estimates with the current capital value, necessary investment is estimated for the individual firm. Table 5 indicates the ratio of necessary investment to current capital value by firm size. It shows that 3 firms have sufficient capital, while 36 firms need expansion and 23 of them need to increase by more than double.

Credit accessibility is investigated through interviews. Access to formal credit clearly differed according to the size of the firm. With the exception of one case, none of the firms with less than 49 workers had used formal credit for last 5 years, while 75% of those with more than 50 workers have used formal credit (Table 6). The manager's judgment of credit accessibility almost always corresponded with credit use (right hand side of Table 6). Then, we set a boundary for credit access at 50 workers. Combining this information and Table 5, it has been identified that firms with less than 49 workers and less than the minimum capital size cannot start to export due to lack of credit (Type 1 firm) and account for 71.8% of local non-exporting firms in our sample (shaded area of Table 5). Assuming our sample represents the population, the simulation results suggested that about 72% of local firms were not financially feasible to enter the export market.

The other 11 firms are possibly Type 2 or 3. Since most of financial institutes require collateral in Kenya,

[14] The simulation does not include land and building as these can be rented. See appendix 3 for details of the simulation method.

the amount of credit depends on the firm's assets. Hence, unless they assume assets other than production equipment, a firm cannot make an investment greater than the value of its current equipment. With this conservative assumption, all 11 firms can start to export by using their current equipment, given that needed expansion of equipment is smaller than current equipment value in all cases. With the same assumption, only three firms can invest in an additional production site for export supply, as the rest of firms' equipment value is less than the minimum scale and is not large enough for collateral. Then, only three firms are candidates for Type 3 firms, and they account 7.7 % of our sample.

6. Expected Profitability of Local Firms

6.1 Production Function Estimation

To investigate the difference of production characteristics for export and domestic markets, a separate production function is estimated. Estimations use OLS and the stochastic frontier model, which is described as

$$\ln Y_i = \beta_{01} + \beta_{02} Sewing_i + \beta_1 \ln K_i + \beta_2 \ln Ls_i + \beta_3 \ln Lu_i - u_i + v_i ,$$

where *Sewing* is a dummy variable discerning firms with only a knitting process (=0) and those with a sewing process (=1), $\beta_{01} + \beta_{02} = \exp(\alpha)$, $u_i = -\ln TE_i$, $u_i > 0$, and $v_i = \ln(error_i)$. Inefficiency, u_i, is assumed to follow a half-normal distribution, $N^+(0, \sigma_u^2)$, or exponential distribution, $N^+(\mu, \sigma_u^2)$, and the random error component, v_i, is assumed to be normally distributed with mean zero, $N(0, \sigma_{vi}^2)$. Heteroskedasticity on random errors is considered, since group-wise heteroskedasticity around process dummy (*Sewing*) was indicated (results not reported). Specifically, auxiliary model, $\ln\sigma_{vi} = \delta(1, Sewing)$ was added to estimate σ_{vi}.

The first set of models incorporates different parameters for exporters and non-exporters to reflect their heterogeneity by adding a non-exporter dummy and its interaction terms with inputs (columns 1 and 2 of Table 7). They show that all interaction terms are statistically insignificant. The second set incorporates only a non-exporter dummy (no interaction term), and no significant difference of a constant by market orientation is indicated in either model (columns 3 and 4). Estimates based on stochastic frontier with exponential distribution assumption show the same result (not reported). Those results indicate that parameters are homogenous between exporters and non-exporters, and then, a model without a non-exporter dummy is estimated (column 4-6). Exclusion of the dummy does not lead to a drastic change of parameter estimates, while the parameter estimate for capital becomes smaller and that of labor becomes larger. Estimates of the input coefficient are significant except for a capital coefficient in the OLS model. As for the economies of scale, aggregation of parameters is greater than one in all the three cases, but the hypothesis of constant returns to scale is not rejected at the 10% level except one case. These exercises show that there is no significant change in production function by market orientation, and only weak support is found for increasing returns to scale. Therefore, shifting from the domestic to the export market does not bring substantial increase in profits without a large expansion of scale or productivity

improvement.

The relationship between exporting and productivity is investigated to examine the learning-by-exporting effect. To get an overview of the relationship, technical efficiency is compared with market orientation. The results of estimation are in lines 4 and 5 of Table 8. Although the level of the averages differs by estimation model, all estimates show that the average of exporters is not higher than that of non-exporters.

To form a more rigorous investigation, effect of export status on technical efficiency is estimated. Following Kumbhakar, Gosh and McGuckin [1991], export status and export years as well as other exogenous variables are assumed to correlate with technical efficiency through the mode of its distribution (μ) as

$$\ln Y_i = \beta_0 + \beta_1 \ln K_i + \beta_2 \ln Ls_i + \beta_3 \ln Lu_i - u_i + v_i$$
$$\mu_i = \theta_1 Export + \theta_2 Age + \theta_3 Age * Export + \boldsymbol{\varphi} \mathbf{W}_i \quad ,$$

where $u_i \sim N^+(\mu_i, \sigma_u^2)$, $v_i \sim N(0, \sigma_v^2)$. *Export* is a dummy variable taking one for exporters, *Age* is firm age, *Age*Export* is interaction term, and $\mathbf{W}_i$ is a vector of the variables related to a manager's characteristics and business environment. As all exporters in our sample have been serving the export market since their establishment, the interaction term (*Age*Export*) picks up the effect of export experience, while the effect of general operation experience is controlled by *Age*. On the other hand, *Export* will capture the effect of export status regardless of length of experience. As frequently mentioned, the relationship between export status and efficiency can be two ways, and thus our estimates indicates only association. However, estimated associations of *Export* and *Age*Export* are not significant regardless of inclusion of other variables (Table 9).

There may be another possibility of learning-by-exporting that export will improve allocation of factors. Then, effect on allocative efficiency is investigated. Allocative efficiency enters into cost function as $\overline{AE}$ shown in equation (4). Log of $\overline{AE}$ is regressed on exogenous variables, assuming a proportional effect of export years. Table 10 shows that no significant association of export status and experience, while excluding export dummy, export years significantly reduces $\overline{AE}$. Hausman's test does not reject the null that OLS estimator is consistent, and thus, we accept the significant and negative coefficient of export experience.[15] One year of experience reduces 0.49% of the cost of allocative efficiency, which leads to a 0.14% increase in profit. Though this evidence is based on a cross-sectional sample, learning-by-exporting is also confirmed in the panel data of the Moroccan garment industry (Clerides, Latch and Tybout [1998]).

These exercises indicate that while shifting from the domestic to the export market does not entail a structural change of production function and does not lead to the improvement of productivity, it does bring about the reduction of allocative inefficiency according to years of export experience. The learning-by-exporting effect is supported, but relative to the size of discount rate, and the effect is so small

[15] To control endogeneity of export years, IV estimation was carried out using the average tenure of skilled workers and that of semi-skilled workers as an instrumental variable. While average tenure tends to be correlated with firm's age, it is unlikely to have causation with cost of allocative efficiency that is fundamentally related to managerial capacity.

that it is unlikely to have a significant impact on a firm's decision on market choice. Though expected future profits will increase by 0.14% every year, it is also discounted by 10.67% if the real interest rate is used.[16] Therefore, our exercise indicates that no significant profit change is expected for local firms by simply changing from the domestic to export market, and this leads to the following three implications. First, in the absence of any significant learning-by-exporting, the participation condition (1) holds. A local firm switches to the export market when export profit at this period is greater than domestic profit plus loss of future profits by choosing to export, which results from the sunk cost of re-entry into the domestic market. Second, to realize greater profit from the export market, a local firm needs to expand its production capacity or improve its efficiency through the firm's unique effort. Third, as the export market is large enough to allow a firm to freely expand its production capacity, FDI may contribute to the development of local industry through an increase of production scale rather than through productivity improvement. Yet, credit access will be a constraint for expansion.

6.2 Simulation of Expected Profits of Type 3 Firms

Based on the production function estimates (OLS3 in Table 7), cost function was drawn as the equation (5) and profit is simulated by the equation (6) for Type 3 firms. We assume that local manufacturers will perform in the export market as efficiently as they do in the domestic market, based on the result that local exporters' performances were no less efficient, and that no significant learning-by-exporting effect was identified. Also, it is assumed that local manufacturers can employ labor for the same wages they were paying, given the substantial pool of semi-skilled workers resulting from the shrinkage of the industry after the trade liberalization. In terms of rental price, interviews demonstrated that local firms with more than 50 employees were able to borrow from financial institutions at a rate of between 14 and 20%, and in the simulation, rental price was estimated assuming a nominal interest of 20%, the maximum in the above range.[17]

Three firms with 50 workers and a minimum production scale are used for simulation. The production scale is set to the minimum. The result indicates that expected profit is positive for all three firms (line 2 in Table 10). And in two out of three firms, profit per capital value is larger than one; that is, one year of operation will cover capital investment. This simulation result indicates that the export market is expected to be very profitable.[18] Therefore, within our framework, non-participation by those local firms can be attributed to their risk-averseness; that is, expected profitability was not large enough to cover the risk premium that local firms require. It is noted that this discrepancy between the model implication and evidence may be resulted from our assumption of no sunk entry cost in export market, but the result that expected profits is larger than capital investment denies effect of sunk cost on non-participation.

[16] Average from 1999 to 2003 based on the World Bank [2006].

[17] We chose 20% considering information from World Bank RPED data, which showed that the interest rates of bank loans used by garment firms are between 17 and 21%. See appendix 2 for the estimation method of rental prices.

[18] This tendency does not alter even if we include Type 2 firms in the simulation. For 11 local firms with more than 50 workers, the median is 3.0. High profit-capital ratio is a feature of exporters in our survey sample. The same trend was observed in Bangladeshi garment firms in Bakht et al. [2009].

6.3 Comparison with Exporters

All local Kenyan exporters, except for one case, started production for the export market as a new project rather than as an alternative to the domestic market like a Type 2 firm. Among four switched exporters, three firms were continuing domestic supply after starting to export. For the new exporters, they did not own a garment factory before they started exporting, and investment in a garment export project did not compete with those in domestic supply. According to Rhee and Belot [1989], the Bangladeshi garment industry was so small before the export boom in the early 1980s that most of local exporters were established by former workers in exporting firms with local investors. This is the same pattern as that of the new exporters in Kenya. Their investment decision, therefore, does not compete with production for the domestic market. Hence, their decision problem is fundamentally the same as that of a Type 3 firm.

Expected profit is compared between non-exporters (Type 3) and exporters to see the relationship between expectation and response to export opportunity. It is noted that we do not have information on firms that started to export in 2003; that is, a counterpart of the local non-exporter.[19] Then, characteristics of such firms were replicated from those of exporters in our survey sample. Estimating the correlation between firm age and characteristics among exporters, firms that started exporting in 2003 were replicated.[20] The comparison shows that the average expected profit of Kenyan local exporters is higher than that of non-exporters but the difference is not significant (Table 10). Figure 2 shows that distributions of expected profits for local exporters and non-exporters overlap. This indicates that export was highly profitable for local exporters and hence, a firm with substantial financial capacity has incentive to start exporting. This is consistent with that fact that new exporters established by entrepreneur are more positive than existing firms that have generally weak finance. It also suggests that different responses to export opportunity between Type 3 firms and local exporters can be explained by risk preference.

In contrast, a comparison with Bangladeshi exporters yields a large and significant difference in expected profits. On average, the expected profits of Bangladeshi firms are greater than Kenyan non-exporters by 1.8 times (Table 10). The peak of the distribution of expected profits for Bangladeshi firms lies to the right hand side of the distribution of Kenyan non-exporters, and the overlap is small (Figure 2). Therefore, in comparison with Bangladeshi firms, most Kenyan local firms expected smaller export profit, and this is one of the reasons for their less active response to export opportunity. In conjunction with the result in section 6.2, we can conclude that Kenyan local firms did not diversify to the export market due to risk-averseness, yet it does solely account for the different response from Bangladeshi firms; they are more likely to be motivated to export even if they are as risk averse as Kenyan firms.

Through estimation of production function and expected profits, it is demonstrated that simply switching from domestic supply to export does not bring about an increase of profits. Since the export market provides the opportunity for profit gain through expansion of the production scale rather than productivity improvement, only firms that afford substantial expansion are motivated to start exporting. Under this

[19] This is because the sample was drawn from the firm lists updated in early 2003 or before.
[20] See Appendix 3 for results of the estimation.

condition, Type 2 firms with relatively poor credit access have little incentive to participate to exporting. In the case of diversifying to the export market (Type 3), simulation found that expected profits are positive and large. As the participation condition was met for risk-neutral firms, the risk-averse preference of local firms was what primarily led Type 3 firms to non-participation in exporting. Risk preference also explains the different response of Kenyan local exporters, yet it does not necessarily when compared with Bangladeshi exporters. In comparison with Asian firms, the limited participation of Kenyan local firms resulted from relatively small profits in the export market.

7. Conclusion

FDI in the garment sector has been the only case of large-scale manufacturing investment in the African low-income countries since the 1990s. While FDI has triggered development of local garment industries in many developing countries, it has not yet been significant in Africa. This can be partly attributed to the termination of MFA, which resulted in a stagnation of exports from Africa, but our investigation of the Kenyan industry suggested that it is also related to the local factor markets.

While local firms can absorb technology and market information by employing skilled expatriates, the majority of them were unable to finance the minimum production scale needed for export production due to credit constraint. Some firms were able to prepare capital by giving up domestic supply. However, profit gain by export participation stems only from expansion of production, and in this case, the export decision required a consideration of the opportunity cost of market switch, which includes the sunk cost needed to re-enter a domestic market. Under local firms' financial capacity of expansion, export profit was not large enough to cover the opportunity cost of exporting and risk premium that a risk-averse firm requests. Switching from a domestic market was not a viable choice.

In the case where a firm starts export supply as a new project in addition to domestic supply (or any other business), the investment decision depends solely on export profits. While our simulation indicated positive and high expected profit relative to capital value, only 7% of local firms are estimated to have sufficient credit access. Those results are consistent with the fact that newly established firms with rich financial capacity are more positive to start exporting than existing garment firms. Controlling financial capacity, risk-averseness may account for the difference of response among Kenyan firms, but it is not the sole determinant of the difference from Bangladeshi firms. Their expected profit is significantly higher than that of Kenyan local firms and it clearly gave an advantage to Bangladeshi firms.

In the Kenyan garment industry, credit constraint, rather than absorptive capacity, is a primary source of inactive participation in export opportunity. Only firms which afford additional production facilities without sacrificing domestic supply may be motivated to start exporting. However, in comparison with successful Asian exporters, those firms were not motivated as much as Asian exporters due to the large gap in expected profits.

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Table 1 Performance of Garment EPZ Firms

	2000	2001	2002	2003	2004	2005
Number of Enterprises	6	17	30	35	30	25
Exports (million US$)	30	55	104	146	221	195
Investment (million US$)	16	48	88	128	108	132
Employment	5,565	12,002	25,288	36,348	34,614	34,234
Expatriates	235	314	701	912	837	

Source: Export Processing Zones Authority [various issues]

Table 2 Overview of the Garment Industry in Kenya (2003)

	Number of Firms	Total Employment	Total Production (mil.Kshs)	Employment per firm	Average Turnover (mil. Kshs)	Share of Exporter (%)	Share of foreign firm (%)
EPZ Firm	35	36348	11083	1038.5	316.7 ($4.0 mil)	100.0	100.0
Local Firm	*120-150*	*8000-9500*	*2200-2600*	88.2	42.9 ($0.5mil)	27.6	16.9
Local Exporting Firm	19	—	—	231.1	60.0 ($0.75mil)	100.0	0

Source: (EPZ Firm) Export Processing Zones Authority [2004], (Local Firm) Firm survey in 2003, figures shown in italic are estimated, (Local Exporter) Author's interview,

Table 3 Reason not to take subcontract of EPZ firms

Question: Why did not your company attempt to take subcontract of EPZ firms?

(N=18, multiple answer)

	Number of replies
No offer/contact from EPZ firms	6
Current business is sufficiently profitable	3
Export market is not profitable	10
Export market is risky	6
Difficulty in physical investment	10
Difficulty in training	2
Other	5

Source: Author's interview in 2005 and 2006

Table 4 Sample Size of Interview and Survey in Kenya

		Interview (2005-6)	Survey (2003)	Population
Total		28	47	
Local non-Exporting Firms		18	39	120-150* (2003)
Local Exporting Firms	Switched Exporters	3	1	4** (2001-06)
	New Exporters	7	2	15** (2001-06)
EPZ firms		5	5	35 (2003)

*: Estimation by the author for firms with more than 10 employees.
**: Total number of firms existed between 2001 and 2006.

Table 5 Necessary Addition of Capital by Firm Size

Employment	Ratio of addition to initial capital			
	0%	[0%, 50%)	[50%, 100%)	more than 100%
50≤	3	7	1	0
30-49	0	1	2	0
30>	0	1	3	23
Total	3	9	6	23

Note: Numbers of firms are indicated by ratio of addition and employment size (N= 39).
Shaded area indicates firms able to finance capital addition.
Source: Author's estimation

Table 6 Credit availability of Local Firms by Firm Size

Employment	Credit Use Experience (last 5 years)		Credit Accessibility		
	Yes	No	Yes	No	Unknown
50≤	9	3	10	0	2
30-49	0	1	1	0	0
30>	1	4	1	4	0
Total	10	8	12	4	2

Note: Local firms not exporting only (N=18). Access to formal credit (excluding micro finance) was questioned.
Source: Author's interviews

Table 7 Production Function Estimation

Dependent variable: ln *Value Added*

	1	2	3	4	5	6	7
	OLS	SF	OLS	SF	OLS and Method of Moment	SF	SF
		Half Normal		Half Normal	Half Normal	Half Normal	Exponential
ln *K*	0.170 (0.131)	0.210** (0.085)	0.137 (0.091)	0.172** (0.072)	0.128 (0.089)	0.158** (0.073)	0.163** (0.072)
ln *Ls*	0.357** (0.153)	0.333*** (0.121)	0.381*** (0.133)	0.446*** (0.106)	0.394*** (0.129)	0.447*** (0.109)	0.452*** (0.107)
ln *Lu*	0.419** (0.169)	0.278** (0.126)	0.484*** (0.153)	0.393*** (0.118)	0.546*** (0.135)	0.479*** (0.105)	0.478*** (0.105)
Sewing	0.142 (0.131)	0.189 (0.124)	0.137 (0.121)	0.191 (0.127)	0.150 (0.120)	0.201 (0.133)	0.243* (0.127)
ln*K*NoExport*	-0.118 (0.210)	-0.135 (0.159)					
ln*Ls*NoExport*	0.049 (0.377)	0.240 (0.273)					
ln*Lu*NoExport*	0.190 (0.472)	0.191 (0.306)					
NoExport	-0.040 (1.447)	-0.654 (1.110)	-0.249 (0.277)	-0.314 (0.210)			
Constant	7.963*** (1.373)	9.179*** (0.844)	7.856*** (0.660)	8.470*** (0.566)	8.399*** (0.585)	8.060*** (0.509)	7.769*** (0.499)
σ_v^2					0.194*** (0.033)		
σ_u^2		0.891*** (0.284)		0.906*** (0.308)	1.234*** (0.143)	0.842*** (0.364)	0.290*** (0.127)
Auxiliary Model: Dependent var: lnσv2							
Sewing		1.847*** (0.707)		1.304** (0.569)		1.198** (0.541)	0.890** (0.422)
Constant		-2.897*** (0.710)		-2.391*** (0.548)		-2.206*** (0.501)	-1.822*** (0.358)
Constant returns to scale: $\chi 2$ and p-value			0.000 [0.979]	0.030 [0.870]	1.94 [0.165]	2.54 [0.111]	3.43 [0.064]
Average technical efficiency		0.542 (0.177)		0.540 (0.176)	0.495 (0.201)	0.549 (0.168)	0.650 (0.162)
N	212	212	212	212	212	212	212

Note: White's heteroskedasticity robust standard errors are reported for OLS.
Constants are larger in frontier models given that they represent production frontiers.
TE in OLS3 is calculated by method of moment estimation. See text for detail.
Constant for the OLS and Method of Moment is adjusted so that function represents frontier (+E[u]).

Table 8 Average of Technical Efficiency and Relative TFP

		1	2	3	4	
		Technical Efficiency				
		SF Half Normal	SF Exponential	OLS and Method of Moment Half Normal	Relative TFP	N
1	Total	0.549 (0.168)	0.650 (0.162)	0.495 (0.201)	-0.134 (0.805)	212
2	Kenyan Local Exporter	0.731 (0.075)	0.800* (0.050)	0.692 (0099)	0.448 (0509)	3
3	Bangladeshi and Kenyan EPZ Exporters	0.548 (0.174)	0.648 (0.169)	0.497 (0.205)	-0.143 (0.838)	170
4	Exporter	0.551 (0.174)	0.650 (0.169)	0.500 (0.205)	-0.133 (0.836)	173
5	Non-Exporter	0.540 (0.140)	0.650 (0.133)	0.474 (0.180)	-0.139 (0.659)	39

Note: Corresponded production function estimates of the results in column 1, 2, 3 are shown in column 6, 7, 5 in Table 9, respectively.

* indicates difference with the figure in line 3 is significant at 5%.

Table 9 Estimation of Learning-by-Exporting Effect

(a) Effect on technical efficiency Dependent variable: ln (Value added)		
	SF Truncated Normal	SF Truncated Normal
ln *K*	0.108 (0.079)	0.188** (0.076)
ln *Ls*	0.431*** (0.139)	0.440*** (0.105)
ln *Lu*	0.605*** (0.148)	0.483*** (0.116)
Sewing	0.260 (0.200)	0.346*** (0.127)
Constant	7.657*** (0.540)	7.572*** (0.509)
Auxiliary Model: Dependent variable μ		
Age	-0.038 (0.226)	0.059 (0.229)
*Age*Export*	0.128 (0.273)	-0.035 (0.244)
Manager-Edu	-1.297 (1.715)	
Delivery	0.064 (0.073)	
Sales Collection	-0.093 (0.088)	
Blackout	0.022 (0.020)	
*Blackout*Generator*	-0.025 (0.037)	
Export	2.762 (5.512)	2.544 (9.947)
Constant	-2.180 (5.951)	-11.058 (41.382)
σ_u^2	1.098 (2.065)	6.559 (20.767)
σ_v^2	0.407* (0.199)	0.249*** (0.069)
N	183	208

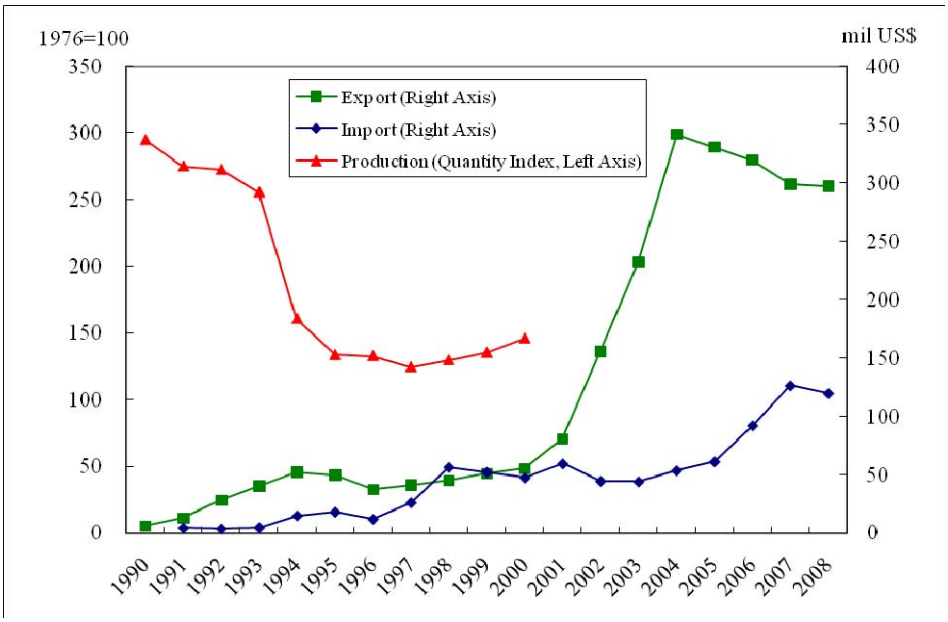
(b) Effect on Cost allocative efficiency Dependent variable: ln (Cost of AE)		
	OLS	OLS
Age	0.001 (0.003)	0.002 (0.002)
*Age*Export*	-0.003 (0.004)	-0.005** (0.002)
Manager-Edu	0.016 (0.060)	0.001 (0.061)
Manager-Exp	-0.002 (0.002)	-0.002 (0.002)
Export	-0.049 (0.061)	
Constant	0.225*** (0.070)	0.197*** (0.057)
R^2	0.048	0.042
Hausman's Specification test		
$\chi^2(4)$ p-value		4.79 [0.309]
N	182	182

Note: White's heteroskedasticity robust standard errors are reported.
Hausman's test was carried out based on the IV estimates using average tenure of skilled and semiskilled workers for *Age*.

Table 10 Simulation of Expected Profits (US$)

	Mean	Median	Std. Dev	Min	Max	N
Kenyan Local non-Exporter	108672	148830	77014	19879	157306	3
Kenyan Local Exporter	149949		56649	96520	209345	3
Bangladeshi Exporter	194479		39856	76718	241171	51

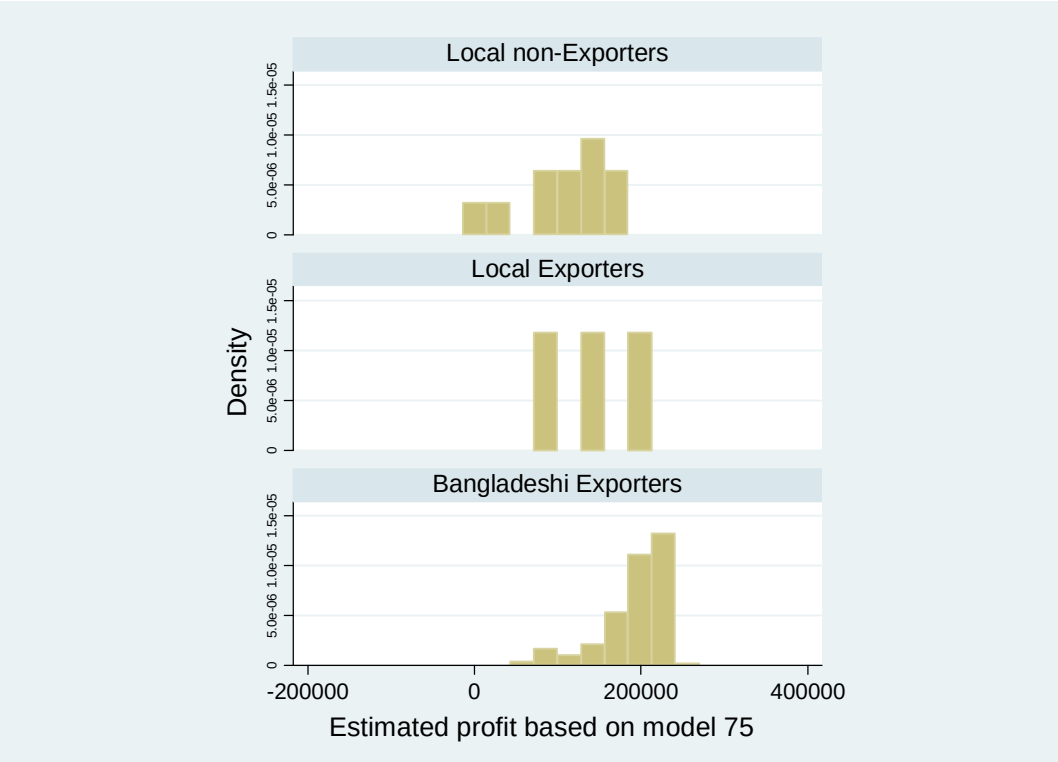
Figure 1 Garment Production, Exports and Imports



Note: Imports includes secondhand clothing after 1997 when data become available. Production index is dropped after 2000, because it is unlikely to cover EPZ production.

Source: (production) Central Bureau of Statistics, *Economic Survey*, and *Statistical Abstract*
(Export and Import) UN Comtrade.

Figure 2 Distribution of Expected Profits



Appendix 1. List of Local Exporters

Table A1 Local Exporters (including not interviewed)

	Year Stat Operation	Ethnicity of Owner	Market	Employment	Sewing Machine	Sales (mil Ksh)
A	1978	Asian	USA 17%, EU 26%, EAC 43%, Local 15%	*800*	*350*	*265.2*
B	1990	British	USA 61%, UK Swiss 11%, Kenya 28%	*175*	*42*	*36.1*
C	1996	Asian	Mainly USA	13		
D	1997	African	USA 100%	347	302	56.2
E	2001	African	USA 100%	84	36	21.3
F	2001	Asian	USA 100%	311	233	144
G	2001	Asian	USA 90%, Kenya 10%	138	125	74.5
H*	(2002)	(African)				
I*	(2003)	(Asian)				
J	2004	African	Mainly USA	70	60	6.5
K	2004	African	USA 100%	230	139	
			Kenya, West Africa	*45*	*139*	*8.4*
L*	(2004)	(African)				
M	2004	African	USA 100%	233	216	17.8
N	2004	African	USA, EU	135	84	5.9
O	2004	African	USA 100%	206		
P	2004	African	USA 100%	*270*	*133*	*34*
Q	2005	African	USA 50%, EU 50%	166	117	24
R	2005	African	USA 100%	340	550	34.1
S	2006	African	USA 95%, Japan 5%	*180*	*250*	*na*

Note: Information of the firms stopped operation indicates record when firms were operated, and for the firms in operation as of Dec. 2006, it is the latest figure (FY2005-06, shown in italic). For Firm K, information in the upper column is when it was taking CMT, and that in the lower column is after it shifted to local market.

Firm A, B, D, J, K, M, P, Q, R, and S (bolded) were interviewed by the author in 2005 and/or 2006 (some of them are covered by the firm survey). Firm C, E, F, G, and O were covered by firm survey in 2003 and/or 2005. Information of firm H, I, and L (with asterisk) was from Kenyan Association of Manufacturers. Information in parenthesis is from indirect source. Blank space means no information.

Nationality of Expatriate	Operation Status (as of Dec 2006)	Previous Occupation of Owner	Note
India, UK	in operation	Working in the same company	Started UK export in 1992, US export in 2002
No expatriate	in operation	Textile trader in West Africa	Started US export in 2004
	(Closed 04/05)		Started US export in 2003
Bangladesh, Sri Lanka	in operation [mainly domestic]	Garment firm	
	Closed 04/05		
	Closed 04/05		
	Closed 04/05	Garment firm [relative of a local firm owner]	
	(Closed 04/05)		
	(Closed 04/05)		
Sri Lanka	Closed 06	Textile trading, Min of Defense	
India	in operation [mainly domestic]	Owner of supermarket, Banker	
Sri Lanka	(Closed 04/05)		
Sri Lanka	Closed 06	Cargo business in East Africa	
	Closed 06		
	Closed 06	(wife of former president)	
Sri Lanka	in operation	Shoes trading business	
Sri Lanka	Closed 06	Horticulture trading, Min of Treasury	
India	Closed 06	HR manager of EPZ, HR manager of bank	Took over firm O
India	in operation	Min of Local Government, Engineering consultant	Took over firm M

Appendix 2. Summary of the 2003 Firm Survey

Firm surveys were jointly conducted with the Institute of Developing Economies, the Institute of Development Studies, University of Nairobi, and the Institute of Business Administration, University of Dhaka in 2003.

The Kenya survey began with construction of a firm list since there is no comprehensive firm list. Integrating several incomplete lists, including lists compiled by the Central Bureau of Statistics, the Investment Promotion Center, the Export Processing Zones Authority, the Kenyan Association of Manufacturers and the Institute of Development Studies, an extensive firm list containing 322 firms with more than 10 employees in Nairobi, Mombasa, Nakuru, Thika and Eldoret was constructed. Because this list includes firms that had closed down, all firms in the list were contacted and interviews were conducted with those still in operation. They survey collected information of 71 firms out of 104 firms in operation. Neither the population nor characteristics of the remaining 33 firms were known, it is difficult to determine whether our samples have bias or not except that responses from EPZ firm were less than other firms.

In the Bangladesh survey, samples were selected from the member list of the Bangladesh Garment Manufacturers and Exporters Association (BGMA) using a stratified sampling method. Another industrial association, the Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA), which is mainly constituted by knit wear producers, was not included in order to retain accordance with the Kenyan sample that was mainly composed of woven wear producers. Among 2891 members, data was collected from 222 firms. For detail of the sampling procedure, see Fukunishi et al. [2006].

Table A2 Average Output and Input by Group

	Gross output (1000US$)	Value added (1000US$)	Number of workers	Capital value (1000US$)	Profit/ VA	N
Bangladeshi Firms	2977.7 (2247.7)	1554.1 (1261.5)	535.2 (250.7)	121.1 (85.1)	0.715 (0.228)	165
Kenyan Local Firms	549.8 (1115.5)	261.5 (720.3)	78.5 (161.5)	45.2 (91.0)	0.252 (0.502)	42
Kenyan EPZ Firms	13800.0 (21100.0)	8739.4 (15100.0)	892.4 (376.9)	716.8 (809.8)	0.481 (0.486)	5

Note: Standard deviations are in parentheses.

Rental costs are estimated. Assuming that all investments yield same rate of return and perfect foresight, rental price was estimated by the arbitrage condition

$$R_i = r_{i,t} p_{i,t} - \delta p_{i,t} + (p_{i,t+1} - p_{i,t}),$$

where R: rate of return (real interest rate), δ: depreciation rate, and p_t: asset price of capital at t. Since all firms have used imported equipment, it is assumed that asset prices are same for all samples, $p_i = p$. Arranging the arbitrage condition, rental price is given as

$$r_{i,t} = \left(R_i + \delta - \frac{p_{t+1} - p_t}{p_t} \right) p_t .$$

For added capital, real interest rate is obtained by subtracting GDP deflator from nominal interest rate, 20%. For existing capital, real interest rates listed in *World Development Indicators* are used (average of 1999 to 2003). Asset price is normalized to one, and its growth rate is drawn from US deflator of capital goods. Consequently, rental price is set to 0.2387 and 0.17068, respectively.

Appendix 3. Simulation of Capital demand and Expected Profits

1. Necessary Capital to Start Exports

Conditional capital demand function is given by the first equation (3). Firm's own factor prices, technical and allocative efficiency, and the minimum output level, set to 262643.7 US$ is inserted into the equation. For the firms needing addition of capital, higher rental rate is used according to its rate of addition. Considering that utilization rate of capital is less than 100% in most exporters, cost of unused capital (η) is set to the average of exporters. The simulated capital value reflects firm's characteristics.

Additional capital value needed for export is obtained by subtracting existing capital value from estimated capital value. Only currently utilized capital value are counted for existing capital, assuming that utilization rate reflects equipment's exchangeability for export production. That is, equipment currently used infrequently will be less used for production of export products.

2. Expected Profits of Export Market

Cost function given by (4) is used for simulation. Firm's own factor prices, technical and allocative efficiency are inserted. Output level is set to twice of current production (fitted value) for the case of switching case (please refer to the text for reasoning), and to the minimum level, 262643.7 US$, for the case of diversifying, since some firms may not afford to start with larger scale. Rental price reflects addition of equipment of individual firm. Cost of unused capital (η) is also changed to the average of the exporting firms.

Profits are obtained subtracting simulated cost as well as rent that is not included in the cost function, from output value.

Expected profits of diversifying case were estimated for both local non-exporters and exporters in Kenya and Bangladesh for the purpose of comparison. As our one-time dataset does not contain information of the firms started export in 2003, we replicated such firms from the young exporters with experience less than 3 years. Replication is based on adjustment of age effect of firm's characteristics. We found that firm age has significant correlation with skilled wage in Kenyan firms and with cost of allocative efficiency (AE bar) among pooled samples (Table A3). Given weak explanatory power of these regressions, only marginal change by firm age was reflected for skilled wage of Kenyan exporters and cost of allocative efficiency for all young exporters. By using only young exporters, bias that may be caused by the replication procedure was minimized.

Table A3 Estimate of Firm Age Effect

	Pooled		Kenyan Firms		Bangladeshi Firms	
Dependent variable	Cost of allocative efficiency		Skilled wage	Semi-skilled wage	Skilled wage	Semi-skilled wage
Age	0.003	Age	*0.014***	0.006	-0.007	-0.008
	(0.002)		(0.007)	(0.004)	(0.007)	(0.006)
Age*Export	**-0.005*** **	Sewing	0.000	0.000	0.001	0.000
	(0.002)		(0.002)	(0.001)	(0.000)	(0.000)
Manager's	-0.013	Location in	0.111	0.197	*0.171***	-0.074
Education	0.053	capital city	0.251	0.156	0.076	0.074
Managers	-0.002	non-EPZ	-0.313	0.161		
Experience (years)	0.002	dummy	0.838	0.412		
_cons	**0.158*** **	_cons	**7.766*** **	**6.384*** **	**6.983*** **	**5.807*** **
	0.050		0.874	0.439	0.083	0.086
Adjusted R2	0.074		0.143	0.131	0.017	0.044
N	182		44	44	165	165

Note: Heteroskedasticity robust standard errors are in parentheses.