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Export Participation and Technical Efficiency in East African Manufacturing Firms

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Abstract: The study analyzed two explanations for the positive association between export-participation status and efficiency, i.e., self-selection of the relatively more efficient firms into exporting, and learning-by-exporting. Measures of firm-level efficiency using Data Envelopment Analysis (DEA) were estimated to investigate the relationship between export participation and firm-level efficiency. As a result of the binary nature of the export participation, probit technique was used to estimate the export participation equation. No evidence of self-selection by the relatively more efficient firms into-exporting was found, as lagged efficiency does not affect the probability of exporting in East African manufacturing firms. One explanation is that factors other than technical efficiency may be playing a more prominent role as determinants of the export decision in East African manufacturing firms.

Key words: Learning by exporting, self-selection, technical efficiency

INTRODUCTION

This study analyzes the relationship between export participation and technical efficiency in East African manufacturing firms. The relationship between a firm's exports activities and its technical efficiency has been a subject of much interest in the development literature. Given the importance attributed to export performance and the role of manufacturing sector in the development process, it is not surprising that the topic has generated considerable interest among academics and policy makers alike. Earlier studies showed that exporting firms are more efficient than non-exporting firms (Handoussa *et al*., 1986; Haddad, 1993; Aw and Hwang, 1995; Bernard and Jensen, 1995). However, this evidence was not helpful for policy design since it does not address potential simultaneity between exporting and technical efficiency.

The second wave of studies analyzed whether more efficient firms become exporters (self-selection hypothesis) or exporting causes efficiency gains (learning-by-exporting hypothesis) (Bernard and Jensen, 1995; Clerides *et al*., 1998). Empirical evidence shows a consistent positive correlation between a firm's export activities and its technical efficiency but the forces that generate this trend are less clear. Earlier studies tend to emphasize the conclusion that export participation leads to increased efficiency through learning effects. However, recent studies focus on an alternative explanation that relatively efficient firms self-select into export activities because the returns on doing so are relatively high for them (Roberts and Tybout, 1997). Only the most efficient firms from the outset have a sufficient cost advantage to overcome transportation costs and compete internationally.

A review of studies outside Africa by Bigsten *et al.* (2004), has found more evidence that causation runs from efficiency to exporting, that is, there is self-selectivity into exporting rather than from exporting to efficiency. This seems to suggest that it is not export-participation that makes a firm more efficient, but rather efficiency that causes export-participation. From a policy perspective this could call for policies different than if the learning-effects hypothesis holds. However, the few studies that have been carried out in Africa show mixed evidence that exporting causes efficiency gains or those efficient firms may self-select into the export market. Bigsten *et al.* (2004) found evidence of a learning-by-exporting effect as well as self-selection of the most efficient firms into exporting compared to Rankin *et al.* (2006) who found weak evidence supporting self-selection of most efficient firms into exporting.

Several studies have investigated the relationship between exports and efficiency in developing countries, however, mainly on Latin American and Asian countries. Compared with the great volume of empirical studies based on macro-data, there are relatively few studies using micro-data in Sub Saharan Africa. To our knowledge, there are only seven previous studies that investigate the relationship between efficiency and exports that use firm level data from Sub-Saharan African

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(SSA) countries (Bigsten *et al.*, 2004; Graner and Isaksson, 2002; Graner and Isaksson, 2002; Rankin *et al.*, 2006; Muluvi, 2008). Lack of firm level data has hampered progress in this research area. This study is motivated by the existing empirical research gap on the relationship between export participation and efficiency in manufacturing firms in Sub-Saharan African countries.

Measures of firm-level efficiency using Data Envelopment Analysis (DEA) are estimated to investigate the relationship between export participation and firm-level efficiency. To analyze importance of self-selection and learning by doing effects, we adopt Hopenhayn model as our basis for empirical analysis of the relationship between technical efficiency and export market participation. This study therefore contributes to the limited empirical evidence on the relationship between export participation and technical efficiency in developing countries.

MATERIALS AND METHODS

This study was conducted in 2009, at the University of Dar es Salaam, Tanzania. The following empirical methodology derives from the method proposed by Clerides *et al.* (1998), Bigsten *et al.* (2004), Graner and Issakssom (2002). The methodology use firm-level panel data to analyze the direction of causality between firm performance and export status allowing for the not mutually exclusive hypotheses: self-selection (pre-entry premium) and learning by exporting (post entry premium). We follow Clerides *et al.* (1998) and Bigsten *et al.* (2004) approach to isolate self selection and learning by exporting effects by estimating the efficiency equation jointly with an export-participation equation. A system with the following structure is estimated:

$$TE_{it} = \beta_1 EXP_{i,t-1} + \beta_2 X_{i,t} + v_{i1} + \varepsilon_{it1} \quad (1)$$

$$EXP_{it}^{*} = \beta_3 TE_{i,t-1} + \beta_4 Z_{i,t} + v_{i2} + \varepsilon_{it2} \quad (2)$$

Where TE_{it} is technical efficiency of firm i at time t {t=1, 2, 3}, EXP^* is the latent export dummy variable, X is a vector of strictly exogenous control variables that include; location, sector effects, firm age, and foreign ownership. Z is a set of control variables explaining exports that include; firm size, firm age, human capital indicators, and foreign ownership, sector and location effects. $_{it1}$ and $_{it2}$ are unobserved components affecting the firm technical efficiency and export decision respectively which does change overtime, v_{i1} and v_{i2} are time constant factors affecting technical efficiency and export decision respectively. Since our sample have been drawn from a large population, we treat firms unobserved heterogeneity as a random variable by assuming that unobserved errors are uncorrelated and there is no autocorrelation overtime and cross individual units for each kind of error. To control reverse causality from export status to technical efficiency we use lagged instead of contemporaneous exports. We observe only the binary outcome of whether or not the firm exports, which, based on Eq. (2), follows the following discrete process:

$$EXP_{it} = \begin{pmatrix} 1 if\ \beta_3 TE_{i,t-1} + \beta_4 Z_{i,t} + v_{i2} + \varepsilon_{it2} \geq 0 \\ 0 \quad otherwise \end{pmatrix} \quad (3)$$

This yields the probit model. We are mainly interested in estimating the coefficients on the lagged variables, as these would shed light on i) if there is support for self-selection-into-exporting, i.e. that efficient firms become exporters (in which case β_3 will be positive; Bigsten *et al.*, 2004); ii) if there is support for learning-by-exporting, i.e. that firms improve efficiency as a result of exporting (in which case β_1 will be positive; Bigsten *et al.*, 2004).

One shortcoming of Eq. (1) is that it does not control for the export history of a firm. The relationship between lagged exports and current firm technical efficiency may depend on the export history of a firm for a number reason. If for example entering the export market is associated with a onetime improvement in technical efficiency, then the relationship will only be in the first few years after the firm enters the market, but not if the firm has been exporting for so many years. Arrow's (1962) argues that the largest learning only takes a place as firms enter the export market. On the other hand, if learning was an ongoing process, then lagged exports will be positively associated with current performance even in firms that have been exporting for many years. According to Rosenberg's (1982) "learning-by-using" hypothesis, learning occurs after being in the export market continuously overtime. In addition, if there are highly entry costs which must be increased before a firm can begin to export, and then measured firm performance may initially deteriorate as it breaks into export market. Exports will be associated with firm performance only after the firm recovers start up costs.

Since Eq. (1) imposes the same coefficient on lagged exports for all firms regardless of their export history, this may raise the possibility that the equation is mispecified. We address this concern, by re-estimating Eq. (1), allowing the coefficient on lagged exports to vary with export history of the firms. Firms that exported from 2000 are classified as new entrants and firms that started exporting before that period and were still exporting by 2001, are classified as continuous exporters. The following equation that takes into account export history is estimated.

$$TE_{it} = \beta_1 Y_{i,t-1} + \beta_2 Z_{i,t-1} + \beta_3 X_{i,t} + v_{i1} + \varepsilon_{it1} \quad (4)$$

Where Y is a new export entrant dummy variable taking the value of one if a firm started exporting from 2000 and was still exporting by 2001 and zero otherwise, and Z is continuous exporting firm dummy variable that takes on a value of one if a firm that started exporting before 2000 and was still exporting by 2001 and zero otherwise.

The variables that are used in the export participation model are defined as follows. Technical efficiency scores are calculated using DEAP version 2.1 computer program written by Coelli (1996). Both the learning by exporting and the self-selection argument predict that exporting firms ought to be more technically efficient than non-exporters. The lagged firms' technical efficiency variable is expected be positively related to the decision to export, since more productive plants self-select into the export market because the returns to doing so are relatively high for them (Clerides *et al*., 1998).

Foreign ownership is defined as the percentage of ownership of a firm by a foreign citizen. A sizable body of research has focused on the role of multinationals and foreign ownership more generally, in cross border trade. The structure of ownership may be important for the cost to access foreign markets. The importance of foreign ownership reflects the advantages of proprietary information, as well as special access to marketing networks (Berry, 1992).

Firm size is proxied by the total number of employees, being average of permanent workers and temporary workers employed as a general indicator of the strength of a plant's resources base. This is expected to have a positive relationship to export propensity as larger plants have more resources with which to enter foreign markets. This may be particularly important if there are fixed costs to exporting such as information gathering or economies of production or marketing, which may benefit larger firms disproportionately. Scale may be important in overcoming such initial cost barriers as gathering information or uncertainty of a foreign market but may be less significant in determining the extent of firms export activity. There may also be economies of production and marketing that benefit large firms. Support for this assertion comes from the non-linear relationship between plant size (employment) and export propensity found by Wakelin (1998) and Sterlacchini (1999), each of which identifies an inverted-U shaped relationship. We therefore include both plant size and its square in the estimated models to test for non-linearity' and expect to find a quadratic relationship with export participation.

Firm age is measured by the number of years from when a firm started operating in the East African countries until the time of the survey. A firm's maturity may lead to stronger local linkages and greater local sourcing. Older firms may have had time to establish and expand their distribution networks and also to position themselves to tap export markets. In addition, mature firms may have accumulated considerable knowledge stocks. On the other hand, core capabilities can become core rigidities or competence traps (Leonard-Barton, 1992) and younger firms may be more proactive, flexible and aggressive. Relatively younger firms may utilize more recent technology, while older firms are stuck with obsolete physical capital. We included age and age squared in order to capture potential changes in the quality of the firm, as models of learning suggest (Jovanovic, 1982 and Hopenhayn, 1992).

Capital is defined as the replacement cost of existing machinery and other equipment used in the production process, multiplied by the degree of capacity utilization. Newer machines, as proxied by a higher capital–labour ratio, embody newer technology that leads to better productivity and better quality products. One result is the ability to compete both at home with imports and abroad with other firms.

Human capital intensity in a given firm is proxied by the education of the top manager, average education, skill proportion, training and average age of workers that captures workers experience. Managers with higher levels of education, for example, might be more likely to have contacts abroad, especially if they obtained their degrees outside their home countries, or might be willing to overcome bureaucratic barriers to exporting (Wood and Jordan, 2000). In addition, a firm with high proportions of skilled and more educated workers is likely to benefit more from learning process. Since learning is associated with diminishing returns (Arrow, 1962), continuous workers training may enhance the learning process. According to Arrow (1962), learning is a product of experience and takes place during activity. Firms with more experienced workers are therefore expected to participate in the export market.

Location is measured by a dummy variable equal to one for manufacturing firms located in a given main town and zero otherwise. This dummy variable captures factors that influence transport costs, infrastructure and business services (Graner and Isaksson, 2002). The main capital city is used as the base category. Export behaviour is likely to vary across sectors. Sector dummies are included to capture unobserved sector specific variables such as the extent of domestic and foreign competition and product characteristics with respect to export behaviour. For example, some products might be more difficult to transport than others, thus limiting export potential. Firms are grouped under the following sectors: agro-based, textiles, wood products and furniture, metal work and machinery, chemicals, and others that include; paper, printing and publishing, paints and plastics, garments and leather, and construction. The agro-based sector is used as

our base category. The suspected simultaneous bias caused by potentially endogenous explanatory variables such as, workers age, capital, etc. is rectified by using the first lag of these variables, (Graner, 2002). All continuous variables are in logarithms.

Data sources: The analysis contained in this study was based on a sample of agricultural manufacturing firms across Kenya, Tanzania and Uganda. The data used in this study was obtained from survey data that was collected from an interview during 2002- 2003, by World Bank as a part of the Investment Climate Survey, in collaboration with local organizations in East Africa. The collaborating institutions for the design and enumeration of the East African surveys were the Kenya Institute for Public Policy Research (KIPPRA), the Economic and Social Research Foundation–Tanzania (ESRF) and the Uganda Manufacturers' Association Consulting Services (UMACIS).

The sampling strategy was standardized across the East African surveys. The firms were randomly selected from a sampling frame constructed from different official sources and stratified by size, location and industry. Investment climate surveys were completed in the three East African countries almost at the same time. The relevant sample included all manufacturing firms that had complete data on all variables of our interest. This was around 403 firms, although the data are not strictly comparable to surveys in other countries, useful comparisons were made between the results obtained from the survey data and those obtained in other African countries.

RESULTS AND DISCUSSION

Questions about the correct estimation procedure arise from the export participation empirical model. If the propensity to export is used as an indication of export behaviour, it varies by definition between zero and one. As a result, OLS regression may not be the most suitable estimation procedure, as it can give estimates that imply predictions of the propensity to export outside the feasible range. Tobit estimation is the most popular in empirical studies on export behaviour (Wagner, 1995). The Tobit model assumes that any variable that increases the probability of positive exports must also increase the average volume of exports of the exporting firms. The Tobit model incorporates the decision of whether or not to export and the level of exports relative to sales in one model, that is, it imposes the same coefficients on the explanatory factors for the two decisions.

The other most popular estimation procedure is the probit model that is used when the dependent variable is represented by a binary choice variable. The probit model has been popular for the random effects model (Baltagi, 2005). This study adopts the probit model, which is estimated using random effects model to establish the relationship between export participation and technical efficiency and also establish other determinants of export participation among East African manufacturing firms. The panel data for three years on export participation we have access to in all the three countries, was in binary form and probit model is the most suitable model for such data.

Table 1: Determinants of technical efficiency: GLS Random Effects Estimates Dependent variable: Ln(Transformed Technical Efficiency Scores)

Parameter	Kenya	Tanzania	Uganda
Constant	- 0.477(-.72)	- 1.038(-1.15)	- 0.189(-.34)
Export dummy $_{t-1}$	- 0.0353(-.17)	0.142(.48)	0.615(1.99)**
Ln(size) $_{t-1}$	0.014(.17)	- 0.258(-2.14)**	- 0.363(-4.90)***
In(size^2) $_{t-1}$	0.0588(1.19)	0.137(2.38)**	0.112(1.89)*
Ln(firm age)	- 0.172(-1.44)	0.216(1.48)	- 0.075(-.71)
Ln(firm age^2)	- 0.0595(-1.45)	- 0.109(-1.32)	- 0.0567(-1.17)
Foreign ownership	0.00758(2.29)**	0.00758(2.29)**	- 0.0029(-.99)
Chemicals dummy	0.850(2.32)**	0.545(1.04)	- 0.694(-1.74)*
Textiles dummy	0.0332(.12)	1.158(2.01)**	0.483(1.12)
Metals dummy	- 1.159(-4.45)*	0.684(1.14)	- 0.646(-1.65)*
Furniture dummy	1.428(3.66)*	0.109(.24)	0.602(2.34)**
Other sectors	0.541(1.22)	0.796(2.51)***	- 0.716(-3.05)***
City location dummy1	- 0.345(-1.08)	- 0.310(-.59)	0.0139(.06)
City location dummy2	0.116(.19)	- 1.189(2.46)*	
City location dummy3	- 0.263(-1.02)	- 1.535(-2.98)*	
City location dummy4	- 0.107(-.30)	- 0.947(-2.45)*	
R-sq - Within	0.0017	0.0854	0.0006
Between	0.341	0.179	0.292
Overall	0.25	0.164	0.172
No. of observations	281	274	417
Hausman test			
Chi^2	3.36	16	1.40
Prob>chi^2	. 998	1.00	0.999

***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Values in brackets are robust Z-statistics.
City Location: Tanzania: 1 = Arusha, 2 = Tanga, 3 = Mwanza, 4 = other cities
Kenya: 1 = Eldoret, 2 = Kisumu, 3 = Mombasa, 4 = Nakuru
Uganda: 1 = South West, 2 = North East

The results from the technical efficiency model and export participation model are analyzed jointly to establish whether more efficient firms become exporters (self-selection hypothesis) or exporting causes efficiency gains (learning-by-exporting hypothesis). Regression results of the technical efficiency and export participation equations are reported in Table 1-3.

Table 1 shows estimates of the technical efficiency Eq. (1). The positive sign on the lagged export dummy was as expected in the regression using Uganda manufacturing firm's data. This finding is consistent with a causality pattern flowing from exporting experience to improvements in performance, thus providing support for the learning-by-exporting hypothesis. This finding is consistent with results of some previous studies (Bigsten *et al*., 2004; Graner and Isaksson, 2002; Biesebroeck, 2005).

The estimated coefficients for Kenyan and Tanzanian manufacturing firms on the lagged export status were insignificant thus providing no support to learning by exporting hypothesis. This result is consistent with Bigsten *et al.* (2004) findings for Sub Sahara African manufacturing firms. Bigsten *et al.* (2004) found insignificant results on lagged exports status in the

production function when they integrate out a random firm effect following Clerides *et al.* (1998). A robustness check still yielded insignificant results. Other studies also find little or no evidence of learning by exporting (Aw *et al.*, 2000; Clerides *et al.*, 1998; Bernard and Jensen, 1999 and Wagner, 1995). These results, however, are not consistent with evidence reported by a number of authors (Graner and Isaksson, 2002; Biesebroeck, 2005).

There are several possible explanations for the difference in findings between the two groups of studies. One is that while learning-by-exporting may have been more important as a source of expertise and knowledge in the early period of manufacturing sector expansion, much of the knowledge will have been acquired and disseminated after a long period. When the role of export spillovers is considered, exporters may be recipients of knowledge from their foreign buyers, which indirectly or shortly is transferred to non exporters too and this may explain why post entry effects may not be visible. Another explanation is that the knowledge gained from exporting diffuses quickly across exporters and non-exporters as a result of labor mobility among firms. Rapid diffusion would make it less likely to observe productivity differences across the groups of exporters and non-exporters. In addition, the three year time-series improvements in technical efficiency analyzed in this study that follow from export-led learning could simply be so small relative to the cross-sectional differences in technical efficiency which are present in the data that they are very difficult to detect. Yet another explanation is that, despite the fact that all the studies rely on micro data, there are significant differences in the level of industry aggregation. While the production of specific products may benefit from knowledge gained through exporting, the products are simply too small as a share of sector production to be detected in the comparisons.

Table 2 shows estimates of the technical efficiency Eq. (4) that takes into account the export history of firms. There was no significant difference in technical efficiency scores between new entrants in the export market and non-exporting firms in all the regressions, evidence that was consistent with the view that entry into the export markets is initially costly. Biesebroeck (2005) argues that, firms invest heavily and hire more workers in years leading up to the export market entry. This is not usually accompanied by a corresponding increase in sales and hence the technical efficiency measures.

The results show systematic differences between continuous exporting firms and non-exporting manufacturing firms in Uganda. This seem to suggest that learning-by- exporting efficiency gains, favors more the continuous firms relative to new entrant firms. This finding is consistent with Rosenberg's (1982) "learning-by-using" hypothesis, which states that learning occurs after being in the export market continuously overtime.

Table 2: Determinants of Technical Efficiency: GLS Random Effects Estimates. Dependent Variable: Ln (Transformed Technical Efficiency Scores).

	Kenya	Tanzania	Uganda
Constant	- 0.567(-.85)	- 1.197(-.30)	- 0.306(-.54)
Export entrant dummy	0.451(.95)	0.104(.21)	0.147(.27)
Export continuous dummy	- 0.0457(-.21)	0.226(.60)	0.712(2.24)**
$Ln(size)_{t-1}$	0.0185(.23)	- 0.238(-1.78)***	- 0.366(-4.96)***
$In(size^2)_{t-1}$	0.0652(1.31)	0.142(2.29)**	0.123(2.06)**
Ln(firm age)	- 0 0.171(-1.43)	0.0287(.18)	- 0.069(-.66)
$Ln(firm\ age^2)$	- 0.0636(-1.54)	- 0.109(-1.25)	- 0.0537(-1.0)
Foreign ownership	0.00748(2.28)**	0.00601(1.35)	- 0.00310(-1.05)
Chemicals dummy	0.883(2.4)**	0.0804(.15)	- 0.697(-1.74)*
Textiles dummy	0.0504(.19)	1.162(2.11)**	0.502(1.16)
Metals dummy	- 1.157(-4.36)*	0.882(1.47)	- 0.631(-1.60)
Furniture dummy	1.458(3.73)*	0.513(1.12)	0.615(2.37)**
Other sectors	0.956(2.24)**	- 0.694(-2.91)***	
City location dummy 1	- 0.233(-.90)	0.0772(.15)	- 0.014(-.06)
City location dummy 2	- 0.0740(-.21)	- 0.696(-1.50)	
City location dummy 3	- 0.358(-1.11)	- 1.0934(2.15)**	
City location dummy 4	0.137(.22)	- 0.693(-1.81)***	
R-sq- Within	0.0022	0.188	0.0068
Between	0.349	0.208	0.291
Overall	0.255	0.204	0.175
No. of observations	281	186	417

***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Values in brackets are robust Z-statistics.
Tanzania: City location: 1 = Arusha, 2 = Tanga, 3 = Mwanza, 4 = other cities
Kenya: 1 = Eldoret, 2 = Kisumu, 3 = Mombasa, 4 = Nakuru
Uganda: 1 = South West, 2 = North East

Table 3: Determinants of Export Participation: Random Effects Probit Estimates. Dependent Variable: Exporting Dummy

	Kenya	Uganda	Tanzania
Constant	- 08.319(-1.54)	- 7.465(-2.93)***	4.272(1.12)
$Efficiency_{t-1}$	0.0791(.18)	- 0.462(-1.12)	- 0.627(-1.46)
$Ln(capital)_{t-1}$	0.140(1.86)**	0.288(3.55)***	0.0633(.73)
$Ln(size)_{t-1}$	0.0805(.67)	0.0479(.36)	0.754(4.49)***
$Ln(size^2)_{t-1}$	- 0.205(-2.49)**	- 0.238(-3.56)***	- 0.136(-2.53)***
Ln(firm age)	0.0349(.24)	0.162(1.05)	-.0819(-.58)
$Ln(firmage^2)$	- 0.00783(-.16)	0.0231(.36)	-.189(-2.41)**
Foreign ownership	0.00683(1.20)	0.0152(5.02)***	0.0127(3.01)***
$Ln(workers\ age)_{t-1}$	0.435(.38)	- 0.685(-.92)	- 1.765(-2.15)**
$Ln(workers\ age^2)_{t-1}$	- 0.136(-2.67)***	- 0.055(-.87)	0.141(1.94)**
$Ln(average\ education)_{t-1}$	1.625(1.54)	0.359(.39)	- 1.523(-2.04)**
$Training_{t-1}$	0.422(1.73)*	0.414(1.64)*	0.272(1.11)
$Skilled\ proportion_{t-1}$	- 0.0106(-2.51)***	0.00193(.42)	- 0.00141(-.28)
Ln(education of the manager)	0.866(1.30)	1.50(2.42)**	0.715(1.13)
Furniture dummy	0.187(.37)	- 7.997(-.00)	- 0.0165(-.04)
Chemicals dummy	7.087(.00)	- 0.326(-.83)	- 1.12(-2.45)***
Textiles dummy	0.694(1.96)**	- 8.439(-.00)	0.895(1.80)*
Metals dummy	0.690(.20)	- 7.778(.00)	- 2.109(-2.42)**
Other sectors	0.228(.70)	- 1.61(-4.50)***	- 0.552(1.46)
City location dummy 1	- 0.0521(-1.48)	- 0.0580(-.14)	
City location dummy 2	- 0.242(-.29)	0.381(1.05)	0.705(1.74)*
City location dummy 3	0.118(.40)	0.573(1.39)	
City location dummy 4	0.291(.54)	0.199(.55)	
Log likelihood	- 104.966	- 83.75	- 81.69
No. of observations	225	438	271

***, ** and * indicate statistical significance at the 1%, 5%, and 10 % levels, respectively. Values in brackets are robust Z-statistics.
Tanzania: City location: 1=Arusha,2=Mwanza,3=Tanga, 4=other cities
Kenya: 1=Eldoret, 2=Kisumu, 3=Mombasa, 4 =Nakuru
Uganda: 1=North East, 2=South West

However, we found no significant differences in technical efficiency scores between continuous and non-exporting firms in Kenya and Tanzania, a finding that was consistent with results of some previous studies (Clerides *et al.*, 1998; Graner, 2002; Aw *et al.*, 2000; Delgado, 2002). One possible explanation is that the knowledge gained from exporting diffuses in the long run across exporters and non-exporters as a result of labor mobility among firms. Diffusion effects would therefore make it

less likely to observe efficiency differences across the groups of continuous exporters and non-exporting firms.

Table 3 shows estimation results of the export participation model (2). All estimated coefficients on the lagged technical efficiency were insignificant. Consistent with AW *et al.* (2000), we find no evidence of self-selection by the relatively more efficient firms into-exporting, as lagged efficiency does not affect the probability of exporting in East African manufacturing firms. This was a quite surprising finding considering the fact that most previous studies including studies by Bigsten *et al.* (2004) and Graner and Isaksson (2002) stablished that self-selection is the norm. There are several possible explanations for the difference in findings between the two groups of studies. One explanation is that technical efficiency may be less useful as an indicator of the firm's long-run expected profits from exporting, which should guide the export decision in all the East African manufacturing firms. If factors other than technical efficiency are important determinants of expected profitability, and these differ substantially across firms, this will tend to weaken the correlation between a firms technical efficiency and export participation. Aw *et al.* (2000) provides evidence showing that factors other than production efficiency play a more prominent role as determinants of the export decision in Korea.

Biesebroeck (2005) also argues that firms export for different reasons. They export for example, because the owner has family or business partners abroad even though their productivity level does not warrant entry into the export market. Another explanation for differences in results is that the dense network of subcontractors and export traders in some countries lowers the costs of entry into and exit from the export market, particularly for small firms. In contrast, the weaker network of subcontractors and traders in some countries imply substantially higher initial investment costs by the producer, which can introduce hysteresis into the export decision. In such a case, the producer's prior export experience becomes an important determinant of the decision to export and this will weaken the link between previous technical efficiency and exporting participation.

A number of researchers (Pack and Westphal, 1986; Rodrik, 1995) have also documented the importance of government investment and export promotion subsidies. These policies may include provision of credit at negative interest rates, setting up of export processing zones, tax exemptions, and export guarantees. In this context, decisions of producers to enter, continue or exit the export market are less likely to be closely linked to technical efficiency and more closely related to whether they have access to the necessary finance, tax exemption, contacts, or insurance provided by the government.

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