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Determinants of Export Participation in East African Agricultural Manufacturing Firms

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Abstract: The main objective of this study was to analyze the determinants of export participation of agricultural manufacturing firms in East Africa. In order for East African agricultural manufacturing firms to achieve global competitiveness, they need to have an indication of the factors that influence their export participation. Regression results using probit estimation procedure indicate that capital, foreign ownership and training in Uganda, average education, location in Nakuru and proportion of unskilled workers in Kenya, and firm size and location in Arusha and Mwanza in Tanzania, positively influences export participation of agricultural manufacturing firms. To promote exports, Tanzania should design strategies to grow small firms into large ones using measures such as loan guarantee schemes for small and medium firms, tax holidays for joint ventures and mergers, etc. The Ugandan government should also provide incentives for capital imports such as maintaining the current zero rating of capital imports. Lastly, Ugandan government should design strategies aimed at attracting foreign direct investment, such as improving economic productivity through the provision of infrastructure and labour force training.

Key words: Capital, export, manufacturing, participation, size, training

INTRODUCTION

This study analyzed the determinants of export participation of East African agricultural manufacturing firms. An understanding of the determinants of export participation of agricultural firms is important in establishing competitive strength of East African agricultural manufacturing firms in the global market. In order for East African agricultural manufacturing firms to achieve global competitiveness, they need to have an indication of the factors that influence their participation in export markets.

The economic structure of East African economies is dominated by the agricultural sector. It is the main foreign exchange earner and also one of the largest employers. In 2007, the agricultural sector contributed 22.7, 31.1 and 45.3 to total GDP in Kenya, Uganda and Tanzania respectively (Table 1). In Kenya, the agricultural sector grew on average by 3.5 percent compared to 4.5 percent and 4.5 percent in Uganda and Tanzania respectively between 1997 and 2007. It is projected agriculture will remain one of the major sectors in the region in the medium term. With 45.3 percent of GDP in 2007 accruing from agriculture, Tanzania has the highest dependency on this sector among the East African countries.

The manufacturing sector on the other hand accounts for a low percentage of GDP compared to the service sector and agriculture sector (Table 2). According to UNIDO (2003), out of 87 countries studied in terms of Manufacturing Value Added per capita, Kenya ranked 77th compared to Uganda and Tanzania which ranked 81st and 85th respectively. Manufacturing Value Added per capita in Kenya was only US$37, compared to US$24, US$16, and US$40 in Uganda, Tanzania and the Sub-Saharan Africa respectively in 1998.The manufacturing sector has registered modest growth during the last decade, for instance, the sector grew on average by 6.9 percent, 6.8 and 2.8% in Tanzania, Uganda and Kenya respectively between 1997 and 2007 (Table 1). Although the share of the manufacturing sector has been growing in both Kenya, and Uganda, the increase has been relatively sluggish in Kenya compared to Uganda. The difference is a result of Uganda recovering from long periods of political and military upheaval and negative growth (Lawrence, 2005). Accounting for about 6.9% of GDP in 2007, Tanzania's manufacturing sector is one of the smallest in Africa. It was hard hit during the 2002-2003 drought years and again in 2005-2006 by persistent power shortages caused by low rainfall in the hydroelectric dam catchment area, a condition compounded by years of neglect and bad management at the state-controlled electric company.

There are several ongoing debates in the trade literature about the determinants of level of export by manufacturing firms. Very recently, export activity of individual firms has been the focus of a significant body of theoretical and empirical research. The stylized fact

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Table 1: Sectoral structure of east african economies

	Agriculture			Manufacturing			Services		
	1987	1997	2007	1987	1997	2007	1987	1997	2007
Kenya	31.5	31.6	22.7	11.6	12.7	11.8	50.0	50.2	58.2
Uganda	56.8	42.0	31.1	5.9	8.6	8.8	33.2	40.5	50.7
Tanzania	62.8	46.8	45.3	-	6.9	6.9	29.1	38.9	37.3

Source: World Bank (2008), World Development Indicators.

Table 2: Determinants of export participation: random effects probit estimates, dependent variable: exporting dummy

	Kenya	Uganda	Tanzania
Constant	- 37.207(-.75)	- 20.491(2.69)***	51.396(.70)
Efficiency $_{t-1}$	- 2.783(-1.31)	- 0.902(-.95)	- 6.0298(-1.42)
Ln(capital)$_{t-1}$	0.213(.48)	0.782(2.71)***	- 0.263(-.39)
Ln(size)$_{t-1}$	0.00725(.01)	- 0.0175(-.04)	6.326(1.78)*
Ln(size^2)$_{t-1}$	- 0.0942(-.20)	- 0.700(-2.66)***	- 1.071(-2.09)**
Ln(firm age)	0.588(.71)	0.629(1.12)	- 0.623(-.54)
Ln(firmage^2)	- 0.304(-.68)	- 0.00666(-.03)	0.0971(.15)
Foreign ownership	0.0114(.45)	0.0320(2.83)***	0.0323(1.21)
Ln(workers age)$_{t-1}$	0.0508(.00)	1.951(.84)	- 23.260(-1.18)
Ln(workers age^2)$_{t-1}$	0.102(.44)	0.116(.64)	2.0259(1.32)
Ln(average education)$_{t-1}$	14.728(1.83)*	- 2.152(-.80)	- 10.080(-1.04)
Training $_{t-1}$	2.203(1.21)	1.856(2.08)**	- 0.781(-.29)
Skilled proportion $_{t-1}$	- 0.0471(-1.69)*	0.00861(.47)	0.00314(.05)
Ln(education of the manager)	2.572(1.38)	12.0433(.80)	
City location dummy1	- 0.607(-.25)	- 1.288(-1.11)	9.0438(1.83)*
City location dummy2	- 8.788(-.03)	12.310(1.91)*	
City location dummy3	2.741(1.21)		5.099(1.61)
City location dummy4	0.187(1.74)*		0.261(.06)
Log likelihood	-23.104	-37.279	-14.654
No. of observations	102	175	100

***, **,*: indicate statistical significance at the 1 percent, 5 percent, and 10 percent 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

that emerges from the recent studies is that firm size is a major determinant of a firm's propensity to export (Clerides *et al*., 1998; Bigsten *et al*., 2004; Teal, 1999; Soderbom and Teal, 2003; Bigsten *et al*., 2004; Clarke, 2005; Roberts and Tybout, 1997; World Bank, 2004; Neil *et al*., 2006). The evidence on the association of firm age (Roberts and Tybout, 1997; Fafchamps and Hamine, 2001), foreign ownership (World Bank, 2004; Clarke, 2005), efficiency and propensity to export is mixed. Capital intensity (Wakelin, 1998; Sterlacchini, 1999), R&D, skill intensity, was shown to be positively associated with propensity to export in some studies.

This study was motivated by the existing empirical research gap on the determinants of export participation of East African agricultural manufacturing firms. The importance of this study also lies on the role played by the manufacturing sector as a dynamic engine of growth and development as experiences from developed countries indicate. Understanding the determinants of participation in exports markets by East African agricultural manufacturing firms is an important step towards enhancing the crucial role played by manufacturing firms in the development process.

Theoretical framework: Trade theory suggests factor intensities and technical innovations as the standard determinants of trade structure. Factor intensity theories argue that factor-based advantages may be important if the firm has either a natural monopoly of a particular factor or is located in a particular region where a factor is plentiful. According to the Heckscher-Ohlin model of comparative advantage the focus is on the mapping from factor proportions to trade patterns (Graner and Isaksson, 2002). If the comparative advantage model is correct then firms producing commodities that make intensive use of the country's abundant factor should have a higher probability of being exporters than firms using a scarce factor intensively. Extending the more traditional range of factors included in the trade models, beyond labour and capital, different dimensions of human capital, organizational resources and natural resources are usually included.

Technical innovations reflect the technology gap theory of trade originally suggested by Posner (1961) and formalized by Krugman (1979), together with the product cycle theory of Hirsch (1965) and Vernon (1966). Both these theories assign a crucial role of technological innovation in the structure of trade. Technology-based

models of export performance focus on firms' investments or achievement in implementing new technologies or the development of new products or processes. This capability will depend both on the internal strengths of the plant, including where applicable its links to other group companies and on the support available from the regional or national innovation system within which the firm is operating (Metcalfe, 1997). The presence of a research and development (R&D) function within a plant, for example, may stimulate innovation through the type of technology push process envisaged in linear models of innovation.

A set of theoretical models by Dixit (1989) and Krugman (1989) and others suggest that hysteresis in exports may be due to the sunk costs in entering the export market at firm level. The underlying theory is that there are fixed costs of exporting that deter those firms operating below a threshold level of efficiency because their prospective profits from exporting do not compensate for additional costs (Roberts and Tybout, 1997). Sunk costs may include expenses related to establishing a distribution channel and modification of commodities to foreign tastes. These costs may vary with the skill of staff, firm age, firm size and ownership structure of the firm (Graner and Isaksson, 2002).

Firm age may capture the extent of firms learning experience (Graner and Isaksson, 2002). If market forces sort out technically inefficient producers, then older plants will tend to be more competitive in the world markets (Roberts and Tybout, 1997). The structure of ownership may also be important for the cost to access foreign markets, proprietary information and access to marketing networks abroad (Berry, 1992). Similarly, foreign-owned firms may have better access to finance, making it easier to bear the fixed costs associated with entering the export market. The skill intensity of operations may capture the potential for technological activities such as research and development.

Exporting may give the firm higher marketing costs than domestic sales, and the larger the firm the lower the average cost of exporting (Bigstein *et al.*, 2004). Related to sunk costs, firm size may also serve as a proxy for the magnitude of the firm's resources that are important for the decision to enter into the international markets (Bernard and Jansen, 1999; Sterlacchini, 1999; Wagner, 1995). Firms that are relatively more productive may self-select into the export market because they expect the future returns to be greater than the entry costs (Clerides *et al.*, 1998). Both the learning by exporting and the self-selection arguments predict that exporting firms ought to be more technically efficient than non-exporters.

The literature on economic geography and trade (Krugman, 1992) hypothesizes that activities of neighbouring firms may reduce entry costs. Geographical location is thought to capture factors that influence transport costs and infrastructure, spillover effects and natural resources.

MATERIALS AND METHODS

This study was conducted in 2009 at Makerere University. We estimated the model explaining the decision to export determined mainly by the magnitude of sunk costs using probit regression. The theoretical basis of sunk cost models was developed by Dixit (1989) and Krugman (1989). The relationship between exporting and sunk costs has been the subject of a number of inquiries (Roberts and Tybout, 1997; Bernard and Wagner, 2001; Bernard and Jensen, 1999). The presence of sunk costs can be detected by testing if the previous export activity of the firm can be used to explain its current status, controlling for other firm-level characteristics that may influence export activity. Previous studies found that significant sunk costs exist in entering the export market, with exporting in the previous period increasing the probability of current exporting by over 30%. Previous studies used firm-level panel data with a relatively long time-series component using a two-stage procedure that controls for initial conditions to analyse the relationship between the decision to export and the sunk costs. This two-step procedure involves first estimating the initial conditions probit equation (for the first year of the sample period) and then using the generalized residuals from this as a correction to the random effects probit model for the rest of the sample. The data we have for East African agricultural manufacturing firms do not have sufficient time series observations to allow us to use this procedure explicitly in this study. We instead use firm size and foreign ownership as proxies for sunk costs following previous studies (Roberts and Tybout, 1997). We also assumed that that there is no state dependence. This suggests a basic model of the form:

$$X_{ij} = b + fT_{ij} + lF_{ij} + v_i + e_{it...}$$

Where X_{ij} is the export participation of firm i in sector j; T_{ij} is a vector representing firm size and foreign ownership; and F_{ij} is a vector of control variables. b is a constant, f and l are vectors of parameter estimates, e_{it} are unobserved components affecting the firm export decision which does change overtime, and v_i are time constant factors export decision . 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.

The variables that were used in the export participation model are defined as follows. Technical efficiency scores were 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 was 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: It was defined as the percentage of ownership of a firm by a foreign citizen. 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: It was 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 was 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 included both plant size and its square in the estimated models to test for non-linearity' and expected to find a quadratic relationship with export participation.

Firm age: It was 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 (Baldawin, 1998). 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; Hopenhayn, 1992).

Capital: It was 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, 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 was 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: It was 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 was used as the 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. All continuous variables are in logarithms. We used the STATA computer package in our analysis.

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 at the same time. The relevant sample included all agricultural manufacturing firms that had complete data on all variables of our interest. This was around 189 firms, which included both exporting and non-exporting companies. 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 2 shows estimation results of the export participation model (1). Firm size in Tanzania was shown to be an important determinant of the probability of participation in export market, suggesting that fixed costs may be important for exporting. This result was not surprising since the high fixed costs of exporting make it difficult for small firms to enter export markets. This result thus supports the existing theory of sunk costs of entering into the export market. This result was comparable to the findings of other studies (Bigsten *et al*., 2004; Teal, 1999; Soderbom and Teal, 2003; Clarke, 2005; Clerides *et al*., 1998). The results for Tanzania also show a quadratic or non-linear relationship between firm sizes with export propensity. The finding of a non-linear relationship is consistent with earlier findings by Wakelin (1998) and Sterlacchini (1999) study that identified an inverted U-shape relationship between firm size and export propensity. Firm size was shown to be insignificantly associated with the probability of exporting in Uganda and Kenya.

The human capital variables that were found to have positive marginal effects on export participation were training in Ugandan agricultural manufacturing firms and average education of workers in Kenyan agricultural manufacturing firms. The finding of a positive marginal effect of training on export participation is consistent with Arrow's (1962) assertion that continuous workers training may enhance the learning process. The finding of a positive marginal effect of the education of the top manager in Uganda manufacturing firms is also consistent with Wood and Jordan (2000) argument that managers with higher levels of education 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. However, we found a negative marginal effect of the proportion of skilled labour in Kenyan manufacturing firms on export participation. A firm is thought to be more likely to export if its production is intensive in a factor whose price is relatively low, which in the Heckscher-Ohlin model would be the result of a relatively large endowment of the factor concerned. Thus, these results are consistent with prediction of the Heckscher-Ohlin model since Kenya is endowed a with relatively more unskilled and less educated labor compared with their international trade partners.

The location effects in Uganda are insignificant, leading to the rejection of the hypothesis that the propensity to export varies across locations. This finding thus provides no support to the theory of economic geography and trade by Krugman (1992). This finding is consistent with Muluvi's (2008) who also found no location effects in Kenyan manufacturing firms. In Tanzania, location of agricultural manufacturing firms in Arusha and Mwanza were shown to more likely to export than manufacturing firms located in Dar es Salaam. In Kenya, location of agricultural manufacturing firms in Nakuru were shown to more likely to export than agricultural manufacturing firms located in Nairobi.

The estimated positive marginal effects of capital suggest that the marginal effect of exporting increases with the capital in Uganda. This finding of positive association between capital and propensity to export confirms our expectation and this may suggest that newer machines, embody newer technology that leads to better productivity and better quality products and as a result, the ability to compete both at home with imports and abroad. In addition, the significant positive marginal effects on the probability of exporting are likely to be a

result of expensive skilled labour in Uganda. This is likely to result in better price competitiveness because of a lower unit labour cost. This finding is consistent with those of Wakelin (1998) among UK firms.

Foreign ownership of agricultural manufacturing firms in Uganda was shown to be an important determinant of the probability of participation in export market. Roberts and Tybout (1997), Clarke (2005) also found that foreign-owned enterprises were more likely to export than similar private domestically-owned firms. 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). However, foreign ownership was found to be insignificantly associated with export participation in Kenya and Tanzania, a result that is consistent with findings by Muluvi (2008) in Kenyan manufacturing firms.

Older firms do not appear to export more or less than similar younger firms in all the East African agricultural manufacturing firms. In all the specifications the effect of firm age was found to be insignificant, thus providing no evidence for the theory predicting that older firms are more efficient than younger ones as a result of a self-selection process taking place. Clarke (2005) and Soderbom and Teal (2003) also found that older firms don't appear to export more or less than similar younger firms. We also found no quadratic or non-linear relationship between firm ages with export propensity.

CONCLUSION

The main objective of this study was to analyze the determinants of export participation of agricultural manufacturing firms in East Africa. An understanding of the determinants of export participation is central in establishing competitive strength of East African agricultural manufacturing firms in the global market. In order for East African agricultural manufacturing firms to achieve global competitiveness, they need to have an indication of the factors that influence their export participation. Regression results indicate that capital, foreign ownership and training in Uganda, average education, location in Nakuru and proportion of unskilled workers in Kenya, and firm size and location in Arusha and Mwanza in Tanzania, positively influences export participation of agricultural manufacturing firms. Several policy implications arise from these findings. First, to promote exports, Tanzania should design strategies to grow small firms into large ones; measures could include loan guarantee schemes for small and medium firms, tax holidays for joint ventures and mergers, etc. Second, the Ugandan government should provide incentives for capital imports such as maintaining the current zero rating of capital imports. Thirdly, Ugandan government should design strategies aimed at attracting foreign direct investment, such as improving economic productivity through the provision of infrastructure and labour force training.

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