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The Importance of Sunk Costs of Exporting in the Sub-Saharan Africa

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ABSTRACT

Foreign trade is an important part in Africa's internationalization process. In order to assess the entrepreneurial possibilities in Sub Saharan Africa, one can look at firm's probability of entering the export market. The aim of this paper is to examine the importance of sunk costs of exporting for Sub Saharan African firms. This is done by assessing the importance of past export performance on today's export participation using a binary choice model. A second aim is to compare the relative importance of sunk costs of exporting for African countries with results found from studies using firm level data on more advanced countries. By using a firm level panel dataset on firms in manufacturing sectors this paper finds that the importance of sunk cost of exporting is on average 16% for the Textiles & Garment sector, 20% for the Food & Bakery sector and 20% for the Metals, Machinery & Chemical sector. We find that this is low compared to more advanced countries and that the productivity and size of the firm is generally of more importance for exporting than previous experience.

Key Words: Sunk costs of exporting, persistence in export markets, heterogeneous firms, African exports

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1. INTRODUCTION

Exporting is not only of strategic importance for individual firms, it is determinant for countries overall economic development. Promoting exports may be especially significant in Africa, the world's poorest continent and increasing export can accelerate the overall economic growth. In order to assess the entrepreneurial possibilities and exporting in Sub Saharan Africa one can look at firm's probability of entering the export market. The firm's decision if to join the foreign market depends on the difference between the expected future profit, the current costs of serving and the estimated cost of joining. The firm has to be sure that it can cover the current and future irreversible costs with the expected future profit (Melitz (2003)). There are obstacles on the export market that prevent them from entering. Previous research has shown sunk costs to be one of these obstacles. These costs are irrecoverable for the firm, increase the firm's risks, affect the firm's breakeven point and are usually different kinds of transport, search and transaction costs. However, the importance of these costs can be further investigated by looking at the firm's probability to export under sunk costs. The importance of sunk costs of exporting is believed to be especially large for developing countries. This is partly due to poor trade facilitation (Naude & Matthee (2012), p.11). These sorts of costs are also believed to have the largest impact on developing countries because foreign trade is their most important form of internationalization (Borgersen (2006), p. 115).

This paper aims to estimate the importance of sunk costs of exporting for firms in four Sub Saharan African countries. Firm level panel data will be used to assess the importance of past export performance on today's export decision and we will estimate this by using a lagged export dummy as an independent variable. The estimation will be made for three industries respectively; the Textiles & Garment (TG) sector, Food & Bakery (FB) sector and Metal, Machinery & Chemicals (MMC) sector. We want to see if the importance of sunk costs differs between industries. A sample of four Sub Saharan African countries: Ghana, Kenya, Tanzania and Nigeria during the period 1991-2003 will be used. A second aim is to compare these measures of importance with those on more advanced countries. The Sub Saharan African firms are expected to find the importance of sunk cost of exporting to be especially large. This is because the region has relatively high transport costs as well as

being relatively small, open and technologically backwards. Our knowledge of how the importance of sunk costs varies between developing and developed countries is limited and especially for African countries (Naude & Matthee (2012), p. 8). Hence, his paper focuses on African firms with the intention to increase the empirical evidence in this area.

The rest of the paper is organized as follows. The second chapter presents previous empirical research and the following chapter will outline the theoretical framework. The fourth chapter will present the data that is used in our empirical estimation and afterwards our method of estimation will be set out. In chapter six the results will be presented followed by a discussion and suggestions for further research. Lastly, the conclusion will be stated.

2. PREVIOUS RESEARCH

This section presents previous research on the importance of sunk cost of exporting. Results found on firms in developed and developing countries as well as studies on African firms are included.

The general finding in the previous literature is that sunk costs play an important role for the firm's decision to export. Table 1 presents previous findings on the importance of sunk costs of exporting for developed, developing and African countries. It is found that, on average, firms in developing countries face a higher importance of sunk costs than developed countries. Thus, African firms differ in this pattern and have the lowest importance of sunk cost compared to developing and developed countries. Generally, the previous research presented below has used similar approaches as this paper in order to estimate the importance of sunk costs and are therefore comparable to the findings of this paper.

Table 1

Previous research on the importance of sunk cost of exporting

Developed/advanced countries Developing/transitioning countries African countries

Sweden	37%	Columbia	60%	South Africa	17%
Italy	70%	Chile	84%	Sub Saharan Africa	14%
United States	30%	India	80%	Uganda	20%
United Kingdom	75%	Argentina	70%	Kenya	18%

Bernard and Jensen (2004) is examining US manufacturing firms and investigate the factors that increase the probability of exporting. They find that previous exporters of US manufacturing plants increase their probability of exporting this period with 30%. They find that entry costs and firm characteristics are significant and that spillovers and state export promotion is not so important for export participation (Bernard & Jensen (2004), p.567). Additionally, they find that the importance of sunk cost of exporting differ much between industries (p.561). Bugamelli and Infante (2003) found the importance of sunk costs to be 70% for Italian manufacturing firms. Gullstrand (2011) finds that firms in the Swedish food

and beverage sector have an average importance of 37%. He finds that sunk costs differ between firms and that firms who are larger in size and more productive are more likely to enter the export market in the presence of sunk costs. Requena & Silvente (2005) found the importance of sunk costs to be 75% for UK manufacturing firms. As can be seen there is a large variation among the results, this may be due to different sources and quality of data as well as different use of control variables. Thus, the findings do all support the hypothesis that previous export performance is of importance for today's export participation.

Turning to the investigations of developing countries, Roberts & Tybout (1997) study Columbian manufacturing firms and find that the average importance of sunk cost of exporting is 60%. They find, as Gullstrand (2011) that export participation is to a large extent dependent on the productivity and size of the firm. Irarrazabal et. Al (2006) found that previous export participation increase the probability of exporting with 84% for manufacturing Chilean firms, Ranjan et al. (2011) found this importance to be 80% for Indian manufacturing firms and Espanol (2007) found it to be 70% for Argentinean manufacturing firms. Albornoz (2012) introduce a concept of 'sequential exporting' while studying Argentinean firms export behavior. He finds that a firm discovers its profitability as an exporter only after the exporting takes place. Because of this, firms enter foreign markets sequentially and may experiment by using nearby countries as testing grounds for their exporting. Moreover, as can be seen the developing countries seems to suffer from a larger persistence in the export market than developed countries.

The importance of sunk costs of exporting for African firms is on average lower than the results of firms in more advanced countries. Naude & Matthee (2012) find the importance of sunk cost of exporting to be 14% for Sub Saharan manufacturing firms. In their study they see that African firms find it easier to enter the export market but that they, on average, face higher export costs than firms in other parts of the world. Thus, the extent of the firms export is on average less than elsewhere and that this points towards inefficiency in the export market. Additionally, they find that younger firms have a larger probability to export (Naude & Matthee (2012) p. 1). Gumede (2004) finds past export performance to increase the probability of exporting with 17% for South African firms. The South African export market is also found to have many exporters (70%) that export little each (18% of total output) and few specialists (Rankin, p.2). Bbaale (2011) finds the importance of past exporting performance to be 20% for Ugandan firms and Muluvi (2011) finds this to be 18%

for Kenyan firms. Further, they also find that the factors effecting export within Africa and outside Africa are different. The general experience gained in the domestic market only increase the likelihood of exporting within Africa and not outside (Muluvi (2011). P, 17). Bigsten et al. (1999) find that previous exporting experience has a significant effect on the efficiency (productivity) of the African firms, which provides evidence for a learning-by-exporting effect. Even for firms which have a previous history of exporting, an additional year of exporting raises their efficiency in the next period with 10% and this gain is even larger for a new entrant. Van Biesebroeck (2003) examines if African manufacturing plants that export will have a higher productivity level. He finds that exporters are more productive than non-exporters and that they increase their productivity advantage after entry into the export market. He thereby finds evidence to both a self-selection effect and a learning-by-exporting effect but he finds that the effect on self-selection overweight's that of the learning-by-exporting.

3. THEORY

This chapter is presenting the theory of sunk costs, which is further illustrated by an Entry and Exit Model with Sunk Cost.

Generally, exporters are known as being “few and skewed”. This means that the export market is mainly built up out of few exporters who, each one, accommodate a large share of the export market (Feenstra (2011)). This has been argued to be a result of the large degree of persistence in the export market which is caused by costs that makes it more difficult to enter and exit the market. The persistence in the number of entries and exit’s in the export market can be modeled by sunk costs. If the firm’s expected future profit is not certain enough it may be difficult to comply with sunk costs and the firm may choose not to export. A firm may also stay in the market, even though it is not currently making a profit, because of an exit (re-entry) cost. These costs will lessen the entries and exits in the export market and as a result, this can create a hysteresis in the export market which may make the market more inefficient. Dixit (1989) finds that export hysteresis play a part in an uncertain export environment.

Roberts and Tybout (1997) illustrate the behavior of firms on the export market in the presence of sunk costs with an *Entry and Exit model with Sunk Costs*. They start with deriving the firm’s *participation constraint* (1) which assesses whether or not it will be profitable for the firm to export. It is assumed that the firm is risk averse and therefore it does not enter the export market if there is a risk that expected future profit will not cover the current costs of serving and sunk costs of entering. The firm is assumed to be profit maximizing and the firm will choose not to export if it is not profitable, and vice versa. Using a discrete-choice specification, which depends on the expected revenue, they define an indicator variable Y_{it} which takes a value of 1 if the firm is exporting in period t and 0 otherwise. The subscript i shows that the sunk costs of exporting may vary depending on firm characteristics and t shows that these may vary through time. Firms i ’s decision to export at time t may be represented as follows by the dynamic discrete equation:

$$Y_{it} = \begin{cases} 1, & \text{if } \pi_{it}^* - F_i^0 + (F_i^0 + X_i)Y_{i,t-1} + \sum_{j=J}^J (F_i^0 - F_i^j)\tilde{Y}_{i,t-j} \geq 0 \\ 0, & \text{otherwise.} \end{cases} \quad (1)$$

where

$$\pi_{it}^* = \pi(p_t, s_{it}) + \delta [E_t(V_{i,t-1}(\cdot) | Y_{it} = 1) - E_t(V_{i,t-1}(\cdot) | Y_{it} = 0)] \quad (2)$$

In equation (1) the export decision depends on the profit π_{it}^* relative to the sunk cost. The sunk costs are modeled as entry (F_i^0), re-entry (F_i^j) and exit costs (X_i). Absence from market (j) (can reflect the cost of upgrading information and products etc.) is also modeled; If the i th firm last exported in year $t - j$ ($j \geq 2$) the firm faces a reentry cost of F_i^j and get a new profit condition of $\pi(p_t, s_{it}) - F_i^j$. Hence, if the firm exported in the previous period it does not face an entry cost. In the same way it follows that if the firm has never exported previously it faces an entry cost of F_i^0 and thus a profit condition of $\pi(p_t, s_{it}) - F_i^0$ (These entry and re-entry costs will only have to be paid for the first year of exporting and the next period the profit will be $\pi(p_t, s_{it})$). The term $-(F_i^0 + X_i)$ represents the sum of the sunken entry costs for a firm that never exported and the re-entry cost for a current or previous exporter. In equation (2) the decision to export depends on the profit π_{it}^* , which in turn depends on firm characteristics and exogenous market characteristics. $E_t(\cdot)$ is the expected values of future income depending on the firms export decision today. δ is the one period discount rate (measures the loss of not exporting; absence from market).

This theory captures the individual firm's entry and exit options and can therefore be used to further study the importance of sunk cost of exporting empirically.

4. DATA

This section presents the data that will be used in our empirical estimation. We highlight firm characteristics and main patterns.

In order to test the "Entry and Exit Model with Sunk Costs" theory empirically, we use a firm-level panel dataset which contains information on firm export status and firm characteristics. Our data is downloaded from the *Center for the study of African economies* at the University of Oxford. The data comes from the second data set of their section on *Comparative firm-level data for the manufacturing sector*. The dataset derives from a survey and is a part of the Regional Program on Enterprise Development (RPED) organized by the World Bank. The dataset has a total of 10,359 firm-time observations of 1,447 firms through the years 1991-2004. The dataset contains information on 75 variables, such as exports status and firm characteristics. It contains information on firms in the countries: Kenya, Ghana, Tanzania, Nigeria and South Africa and have dummy variables indicating whether the firm belongs to the garment, textile, food & bakery, metals; machinery & chemical, furniture or wood sector. The observations are not recorded yearly and contain gaps. The dataset does not have estimates for missing data and as a result, the export of a firm may present a bias. Thus, we do not take further action to correct for this but only disregard the missing observations. Since we examine averages of firms and variables, it should not be a substantial problem, but it is something to bear in mind.

This paper uses a subset of the data described above. Data on the Textile & Garment (TG), Food & Bakery (FB) and Metals, Machinery & Chemical (MMC) sectors will be used. These three sectors are believed to be diverse enough to generate interesting comparisons. We restrict our data to four Sub Saharan African countries: Ghana, Kenya, Tanzania and Nigeria. This gives us a broad enough insight between the sectors and also the possibility to examine only African developing countries. For this we get a total of 3,595 observations of 842 firms through the years 1991-2004. We choose to merge the textile and garment sector into one sector in order to get a larger number of observations.

Table 2 presents the share of exporting firms and observations for each subsector.

Table 2

Number of exporting firms and observations in sample

	<u>Number of exporting firms</u>	<u>Number of exporting observations</u>
TG	30%	20%
FB	49%	26%
MMC	39%	18%
All	38%	21%

Source: CSAE dataset

Comment: Percentages relative to the total number of firms/observations in the sample.

As we can see from table 2 the numbers of exporting firms are relatively many, in all sectors. The total share of firms that export is 38% and the total share of observations of exporters is 21%. Since the relative number of firm's that exports are larger than the exporting observations, the extent of exporting may be relatively equally divided among firms.

The average number of years that a firm is active on the exporting market is 3 years. No firm is exporting through all years and the number of firms only exporting 1 year are 8% of total exports. These figures above can perhaps give a hint towards the skewness of the distribution of firms on the export market. We see that the market is not build up out of few exporting firms who accommodate many years of exporting but rather, many firms who export for a few years each. This suggests that there is not a large degree of persistence in the export market. This can further be examined by looking at the entries and exits in the export market. By constructing an entry and exit transition table of the export market (Appendix) we find that 24% of the firms are entering the export market and 13% of the firms are exiting the market in the next period. The high entry and exit suggests that it is relatively easy to get into the market and that many of the firms choose to stay inside. Thus, the fact that the entry is higher than the exit could suggests that there is a sort of persistence, creating inefficiency, in the market. Also, this may suggests that the African export market expanded during out sample period.

Table 3 below presents characteristics of firms. The first part shows the share of firms with number of employees larger than 50, in between 1 and 50 as well as the number of self employed firms. The second part shows the differences in averages of firm characteristics between exporters and non exporters.

Table 3

Firm characteristics

<i>Number of employees (% of total firms)</i>				<i>Relative values between exporters and non exporters</i>	
	TG	FB	MMC		
>50	22	36	25	Employment	188
1>50	75	63	73	Productivity	16 000
Self-employed	3	1	2	Capital intensity	13 000
				Firm age	4

Source: CSAE dataset

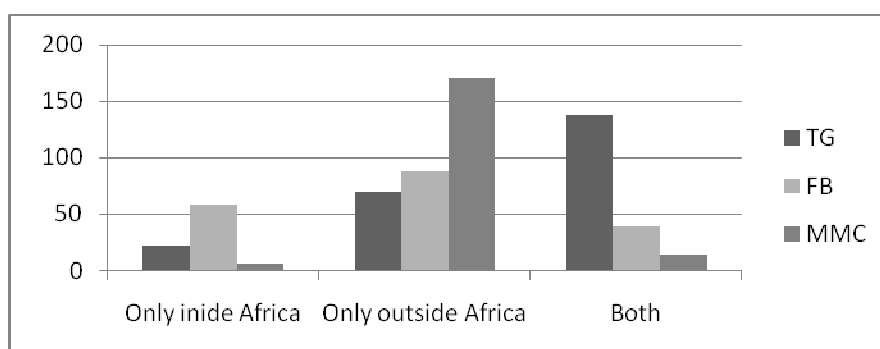
Comment: The values in the first part of table is in percentages and the second part is in US\$. Employment is number of employees, productivity is output per worker and capital intensity is the capital-labor ratio. Firm age is number of years.

Most firms have between 1 and 50 employees. Around a fourth of the total firms have more than 50 employees. The TG sector has most firms with above 50 employees. Thus, calculations, which are not shown in the table above, show that the average number of employees for the TG sector is 233, which is a fairly modest size. The average number of employees of the FB sectors is 110 and of the MMC sector 58. The firm characteristics show that the number of employees differs between exporters and non exporters with 188. Thus, we may have a large firm bias and this will be worth controlling for in our estimation. Productivity and capital-labor ratio also differs substantially between exporters and non exporters but firm age does not.

The number of observations of firms exporting inside and outside Africa will be shown below in figure 1.

Figure 1

Observations of exporting inside and outside of Africa



Source: CSAE dataset

Comment: The number of observations of firms that exports inside and outside Africa.

Overall, there are most observations of firms exporting outside of Africa. This suggests that these firms may be most subject to sunk costs coming from outside of Africa. Thus, the FB sector is the sector which has most observations of exporting only within Africa and the MMC sector is the sector that exports mostly only outside. The TG sector has a fairly equal share on both markets. Many firms in all sectors export both inside and outside Africa. The TG sector exports mostly inside with 69% of its total exports (adding the columns of “exports only within” and “both”). The FB sector exports within Africa with 10% and the MMC sector with 3% of total exports.

5. METHOD

This chapter is describing the estimation procedure used to assess the importance of sunk costs of exporting. Firstly, the econometrical specification and model will be described, and secondly, the variables used in our estimation. After, some econometrical issues will be presented and lastly, our final specification.

To empirically test our theory we followed the work of Roberts and Tybout (1997) as well as Gullstrand (2011), using minor justifications. A model of Entry and Exit with Sunk Costs was used to determine the probability exporting in the presence of sunk costs. The objective was to estimate the average importance of sunk cost of exporting for three different subsectors, respectively. This was done in STATA by using a binary choice model.

5.1. Econometrical specification

To examine how previous export status affects today's export participation of firms; the model uses the export decision, which depends on the expected revenues, as a dependent variable. In order to explain the behavior of firms in the export market in the presence of sunk cost, a lagged export dummy is included as an explaining variable. Capturing the past performance by using a lagged export dummy as an explaining variable allow us to estimate the sunk costs of the firm. A dummy variable that captures if the firm exported in the initial period as well as variables on firm characteristics are also incorporated as explaining variables. A dynamic random effects Probit model is used for estimation and the binary outcome is modeled by the latent variable Y_{it} which has two outcomes: it takes the value of 1 if the firm exports and 0 otherwise. Y_{it} gives us an estimate of the probability of participating in the export market and will depend on sunk cost of exporting and specific firm characteristics. The indexes allow us to see differences between firms and through time. There are some limitations to the model used in our method compared to the entry and exit model with sunk costs describe in the *theory* section. This is that we did not take external market factors into account due to the lack of data on export destination.

From the theoretical chapter 3 we have the decision to export in eq. 1. By approximating $\pi_{it}^* - F_i^0$, this paper followed the method of Roberts & Tybout (1997) and

used the reduced form approach to parameterize the model. The following equation is the reduced form of Eq. (1) and is parameterized by firm specific variables. We assume that variation in $\pi_{it}^* - F_i^0$ arise from two different factors: observable differences in plant characteristics Z_{it} and noise ε_{it} .

$$\pi_{it}^* - F_i^0 = \beta Z_{it} + \varepsilon_{it} \quad (3)$$

Z_{it} is reflecting the firm specific characteristics and start up costs (s_{it} and F_i^0). ε_{it} is a firm-time specific shock. β is a vector of parameters to be estimated. The point is to capture the relationship between different variables and the export decision in order to test whether they are of importance. We want to find out the importance of sunken entry cost and to what extent they affect the firms export decision today. This is modeled below in equation 4 where we add a restriction to model the sunk costs.

$$Y_{it} = \begin{cases} 1, & \text{if } 0 \leq \beta Z_{it} + \gamma^0 Y_{i,t-j} + \sum_{j=1}^J \gamma^j \tilde{Y}_{i,t-j} + \varepsilon_{it} \\ 0, & \text{otherwise.} \end{cases} \quad (4)$$

γ represents the sunk costs: $\gamma^j = F^0 - F^j (j= 2, \dots, J)$ and $\gamma^0 = F^0 - X$ and are vectors with estimates indicating the importance of sunk costs on the probability of exporting. If these parameters are larger than zero, that means the importance of sunk costs matters. They will show the estimated mean importance of sunk costs. Equation (4) is our basic equation. It is a binary choice model derived from the original participation constraint but in a reduced form and with a restriction on sunk costs. For the firms that have not exported for J years the reentry costs is $F_i^J = F^J$ All firm's currently exporting face the same exit cost $X_i = X$.

5.2. Variables used in the estimation

This section presents the variables used in the econometric specification. The export decision is used as the dependent variable. In order to measure sunk costs, we include a one period lagged export dummy and a two period lagged export dummy. The second lagged export dummy captures the effect of a two period absence from the export market because we believe that the benefit of previous exporting may wear off slowly. Thus, we expect the sunk costs to be larger for a one period absence than for two. To capture the dynamic export decision of the firm we included a dummy indicating whether the firm exported in the initial period. We used dummy variables to control for years and countries. To further

assess the strength of an independent relationship between the lagged export dummy and the export participation decision, we included control variables on firm characteristics. We used variables on employment, productivity, capital intensity, age and a dummy that captures if the firm has any foreign ownership. A description of our variables can be found in table 4 below.

Table 4

Explaining variables- firm level

<u>Variable</u>	<u>Definition</u>
Exported last year	Export status in year $t-1$
Exported two years ago	1 if plant exported in year $t-2$; 0 otherwise
Exported in the initial period	1 if the firm exported in the initial period
Employment	Log of number of employees
Productivity	Log of total output per worker
Capital intensity	Log of capital-labor ratio of firm
Age	Log of age of firm
Any foreign ownership	1 if the firm has any foreign ownership; 0 otherwise

We use a variable on the number of employees in the firm to control for the size of the firm. The size of the firm is expected to have a large importance for if the firm exports or not. Gullstrand (2011) found that larger firms are more likely to export. We use output per worker as a measure of the productivity of the firm. On the one hand, we expect productivity to be important in order to export. According to Krugman (1980) a firm's decision to export occur after knowledge of its productivity and further, uncertainty concerning productivity can make the firm not enter the export market in the presence of sunk costs. Melitz (2003) found that more productive firms are more likely to export and that there is self selection on the export market. On the other hand, it has been shown that firms in Africa can increase their productivity through exporting. Bigsten et. al. (1999) found that African exporters achieved more rapid efficiency gains than non exporters and that the export market is characterized of a high degree of learning-by-exporting. Van Biesebroeck (2005a; 2005b) confirms that exports in Africa are associated with higher productivity. He has also found that firms in Africa can improve their productivity through exporting. We use capital- labor ratio to measure the capital intensity of the firm. We expect this variable to be of large importance but that it may differ between sectors. Biggs and Raturi (1997) found

that firms with a higher capital labor ratio are more likely to compete on the export market because of a lower unit labor cost. We use a variable on firm age. Generally, we expect old firms to be more likely to export because they have had longer experience and a higher possibility to increased their productivity and knowledge. Controversially, it is found that younger firms are more likely to export in Africa. Naude & Matthee (2012) explain this as the phenomena “born global “. This means that once the productivity distributions are known, firms directly react either by quitting, exporting or not exporting. They do not wait to learn or grow, but instead sort themselves directly into exporting or non exporting markets (p.5). A dummy that indicates if the firm has any foreign ownership is included in the estimation. This dummy is likely to reflect international linkages and connections that may have an effect on the probability of exporting. However, the interpretation of this variable’s effect is ambiguous. If the FDI is a substitute for export it is likely to have a negative effect on the export participation. Thus, if the foreign ownership belongs to a vertical integration that is a part of the production process, then its effect is likely to be positive (Gullstrand (2011)).

5.3. Econometrical issues

The export decision may depend on other things than the history of exporting. The export status of today may depend on persistent unobservable firm characteristics which may lead to a persistent export decision. In this case, it will lead to overestimating the importance of sunk costs on the firms export decision. There will always be persistent unobservable effects we cannot control for; therefore the error term will consist of one transitory component and one firm specific component. Our new error term specification will be $v_{it} = \mu_{it} + n_{it}$ where μ_{it} is a transitory error component is and n_{it} is a firm specific error component.

Another issue is the choice of estimation strategy to explain the export decision in the setting of persistent firm characteristics. If OLS is used the importance of the sunk costs becomes overestimated since we also capture cross-sectional variations due to persistent effects. This means that we can use either a random or a fixed effects model to control for these unobservable characteristics. A random effects model requires these characteristics to be uncorrelated with the error term, which is unlikely. The fixed effect model will underestimate the importance of sunk cost because firm effects are correlated with lagged

export decisions. These persistent firm effects cannot be ignored and therefore a robust strategy is to use the dynamic panel model. It removes the problem with persistent effects when we have a lagged dependent variable on the right hand side. Further, we follow Roberts and Tybout (1997) and use a non linear model. This is because our dynamic panel model will control for the persistent effects and because we prefer it to have our estimates bounded between 0 and 1.

There is a problem with endogeneity and simultaneity bias. This is because today's export status may be determined simultaneously as certain firm characteristics, such as productivity. To avoid this, all firm specific variables will be lagged one period.

The dummy C_{it} is included to control for the selected countries and the dummy τ_t is included to control for years. The dummy D_{it} captures if the firm exported in the initial period. The γ 's are estimated coefficients indicating the mean importance of earlier export performance on today's export decision, the sunk cost. We expect γ^1 to be larger than γ^2 , hence they reflect the discount rate; how the benefit of previous exporting is discounted over time.

$$Y_{it} = \begin{cases} 1, & \text{if } 0 \leq \delta \mathbf{Z}_{it-1} + \sum_{j=2}^J \gamma^j \tilde{Y}_{i,t-j} + D_{it} + \tau_t + C_{it} + v_{it} \\ 0, & \text{otherwise.} \end{cases} \quad (5)$$

Equation 5 is the final equation that is estimated and it is the equation that will tell us about the importance of sunk cost. In this equation we assume that re-entry and exit costs are the same. As mentioned, the variables in vector Z are lagged one period in order to decrease the possibility of endogeneity and simultaneity bias. As shown, we control for firm specific effects that we believe can help to explain the export decision. Since firms are heterogeneous these are important to include and because firm characteristics alone have an effect on the probability of exporting, especially characteristics that reflect the firm's general performance, such as size and productivity. Our correlation matrix shows that we do not have any problem with multicollinearity. Most correlations are low and we have no correlations above 0.58.

6. RESULTS

This chapter presents the result obtained from our estimation. Firstly, the results on the average importance of sunk costs of exporting will be presented. Secondly, we will present the average importance of firm characteristics for exporting.

6.1 Results and analysis

In table 5 the elasticity's after the maximum likelihood estimation with the dynamic random effects Probit model is presented for the three subsectors, respectively. Our dependent variable is an export dummy.

Table 5. Elasticity's after dynamic random effect Probit model

Result/Sector	TG	FB	MMC
<i>Average importance of sunk cost of exporting</i>			
Exported last year	0.1580 (0.0567)**	0.2019 (0.0474)**	0.1957 (0.0551)**
Exported two years ago	0.1427 (0.0692)**	0.1058 (0.0682)**	0.1529 (0.0650)**
Exported in initial period	0.0959 (0.0749)**	0.0858 (0.0675)**	0.0323 (0.0616)***
<i>Firm characteristics, t-1</i>			
Ln. Number of employees	0.3178 (0.1717)***	0.5780 (0.2031)***	0.7913 (0.2554)***
Ln. Output per worker	0.6106 (0.5489)**	(-)2.1519 (0.6147)**	0.3581 (0.6410)***
Ln. Capital-labor ratio	0.3969 (0.3656)**	0.7937 (0.3770)**	0.3362 (0.3780)***
Ln. Firm age	0.03820 (0.2559)***	0.0963 (0.2499)***	0.0526 (0.2719)***
Any foreign ownership	(-)0.02446 (0.0333)***	0.0575 (0.0414)**	(-)0.0067 (0.0422)**
Number of observations	722	627	775
RSS	2,39726	1,99994	2,61068
Chi-statistic (H0: all coefficients equal zero)	0.000	0.000	0.000
Log likelihood	-341,56223	-281.03908	-328.59894

Comment: The coefficient values are elasticity's. The numbers in brackets are standard errors robust to heteroskedasticity and intra-firm autocorrelation. RSS is the model log likelihood times (-2). The stars indicate the significance level: *** indicates significance on 1 % level and ** on 5 % level.

The average importance of sunk cost of exporting

As can be seen by the table, all the coefficients for the importance of previous export status are positive and significant at 5% level. The TG sector suffers the least from the importance of sunk costs with 16%. The FB and MMC sectors have a similar importance of sunk cost of around 20%. The average importance of sunk costs is lower than expected when considering the theory, the transport costs of the African region and the comparison with previous findings on more advanced countries. Thus, the findings are in line with our data pattern of

high entries and exits as well as the previous research on the importance of sunk costs for African firms.

If a firm exported two periods ago, a firm in the TG sector has on average 14% larger chance of entering the export market this period, for the FB sector this is 11% and for the MMC sector this is 15%. This supports the hypothesis that the benefit of previous exporting does not wear off too quickly. However, it seems to wear off faster for the FB sector and the slowest for the TG sector. This may suggest that there is a higher degree of persistence in the TG sector. The initial export dummy can show the robustness of the specification. The dummy is economically and statistically significant, and it captures a lot of the persistence effect by showing the relative importance of the initial export decision. For this reason, the dynamic random effects model we use is likely to produce a more reliable result. However, this dummy takes the value of 10% for the TG sector, 9% for the FB sector and 3% for the MMC sector. This shows that, relative to the average importance of sunk costs, initial export does matter, and most so for the TG sector. The importance of previous exporting for the TG sector is 16% and the importance of export in the initial period is 10%. This points to the fact that firms in the TG sector are “born global” and thereby self-selected into the market. The relationship is also quite strong for the FB and MMC sectors. The correlation between the lagged export dummy and the dummy for initial export is 36% which further points to the fact that initial export matters.

The variables for previous export status show that historical export decisions are of importance for the industries decision to export. Thus, as mentioned, compared to previous research on other regions as well as compared to theory on export costs, the results are smaller than expected but according to previous empirical research on Africa, this low importance of sunk costs is a common characteristic among African firms.

Firm characteristics and export decisions

In this part we analyze the effect of the different observable firm characteristics on the propensity to export. The elasticity of the firm characteristics for the probability to export is presented above in table 5. We find that size, productivity and capital intensity are generally more than sunk costs (apart from the FB sectors importance of productivity which is negative). The coefficient on the variable for the number of employees shows that size have a positive and highly significant effect on the probability to export, for all the three sectors.

It is most important for the MMC sector with an elasticity of 79%. For the FB sector the elasticity is 58% and the TG sector has an elasticity of 32%. We know from the data that the TG sector is the sector with the largest size, that the MMC sector has the smallest size and that the FB sector lies in between. We thereby see that the elasticity of size is more important the smaller the firm. This shows the less common characteristic, or the “scarce resource”, shows a value of high importance whereas the abundant resource is not of as great importance.

The elasticity of output per worker is highest for the TG sector with 61%. This suggests that the TG sector may be a relatively labor intensive sector. The FB sector has a negative elasticity of -215% and the MMC sector has a positive elasticity of 36%. We see that for the TG and MMC sector, the elasticity of productivity is larger than the importance of sunk costs. This suggests that the TG and MMC sectors are industries characterized by self-selection in exporting. Since the FB sector has a much larger importance of sunk costs than productivity, this suggests that this sector is highly characterized by learning-by-exporting. The elasticity of the capital labor ratio for the TG sector is 40%, for the FB sector it is 79% and for the MMC sector it is 34%. It is relatively high for all sectors, mostly so for the FB sector which is the sector with the highest capital intensity (average capital-labor ratio of 18000 US\$). The TG sector has the lowest capital intensity (8000 US\$) which again seems to be a relatively high labor intensive sector. The MMC sector lies in between (14000 US\$) and seems to have a fairly equal share of the importance of labor productivity and capital intensity.

The dummy for any foreign ownership is generally quite low for all the three sectors. It has a negative coefficient for the TG sector (-2.4%) and a positive coefficient for the MMC (0.7%) sector and a positive and larger number for the FB (6%) sector. It would be plausible that sectors with larger sized firms may have a higher probability of having any foreign ownership, but it is negative for the TG sector which has the largest sized firms. The negative coefficients could be due to an ambiguous relationship as discussed in chapter 5.2. The largest sector TG may have most FDI and hence the FDI will substitute for export and as a result, for this sector it will look as foreign ownership is not so important, or even is negative, for exports. Further, an explanation could be that some firms may be born global exporters, but once entering the market, they mainly do FDI but are still registered as exporters. The variable firm age for the TG sector shows an elasticity of 4%, the FB sector of

10% and the MMC sector of 5%. The TG sector has the smallest elasticity of age and also the smallest average age of firms (20). The FB sector has the same average age (20) but highest elasticity of age. The MMC sector has the midst elasticity of age and an average age of firm (59). Since the TG sector has the largest sized firms, suffer the least from sunk costs and has the lowest elasticity of age as well as the lowest average age, all points towards that the phenomena “born global” is especially important for the TG sector and that firms in the TG sector decide early whether they are going to be exporters or not.

6.2 Discussion of results

Our result does not say that transport costs are not of importance but that, among African firms, it is easier for a firm to enter the export market compared to firms in more advanced economies. Our results on the importance of sunk costs of exporting are in line with previous empirical findings on Africa. Naude & Matthee (2012) also found that African entries into the export market are relatively high which can explain the low importance of sunk costs. Naude & Matthee (2012) also find that the extent to which each firm exports is low and that this may suggest that the export market is inefficient, despite the high entry. This, and the fact that the number of exits is almost half the number of the entries, may point towards the fact that there may be export hysteresis in the market. However, the low sunk costs can also be due to a bias towards larger firms. Gullstrand (2011) showed that the importance of sunk costs declined with the size of the firm. There is a possibility that our dataset suffers from large firm bias.

Even though we found that the importance of sunk costs is not large it is still a substantial cost of exporting for African firms due to the poor trade facilitation, among other things (Naude & Matthee (2012)). One can look at the trade facilitation measures to get a clearer picture of how the costs may actually be structured. An “Easy of doing business” table of Africa and the world (see Annex) shows that there is a larger cost of exporting for African firms. Their exporting takes longer and they need more documents compared to the world. They also have lower infrastructure for trade, efficiency of border administration and NTBs relative to the world. All of these factors increase the cost of exporting for African firms. Further, in economies with bad trade facilitation, there is a difficulty with domestic production sourcing which makes it hard to get a product approved

and put out on the export market (Kommerskollegium 2012:1, p. 16). The four Sub Saharan African countries examined in this paper export much to the EU and the US (UN COMTRADE). The EU and the US have many applied international private and public standards that give rise to sunk costs for African firms. Additionally, due to the distance it is not so easy is it to have face to face meetings with distributors and know what is needed in order to be able to export (Gullstrand 2011). This may increase the transaction cost that is a form of sunk cost. For firms in Africa the extent of exporting seems to be highly sensitive towards the institutional and regulatory burdens that a firm faces (Van Biesebroeck, 2003, p. 11). It has been found that these burdens combined with high transaction costs can explain the failure of African firms to diversify exports from primary commodities into manufacturing. The reasoning above points towards the case that despite our findings of the low importance of sunk costs, the African market does suffer from other high costs of exporting. There may also be inefficiency among African firms due to the low extent of their exports.

We know that these African firms export mostly outside of Africa from chapter 3. By estimating the importance of sunk costs for firms that export within Africa, we have found that previous exporting decreases the possibility of entering the export market for firms in the FB and MMC sectors and that it slightly increases the probability for the TG sector. For the FB and MMC sector, this suggests that the importance of sunk costs only comes from the international trade barriers outside of Africa, for example from transport costs and international standards. The TG sector is largest in size, exports most of the three sectors within Africa and is the only sector which has a positive importance of sunk cost of exporting within Africa. As found by Muluvi (2011), sunk costs within and outside Africa are different and the general experience gained in the domestic market only increase the likelihood of exporting within Africa and not outside. This may point to the case that a firm is, to some extent, “born global”.

According to Albornaz (2011), export experimentation can take place during a trade liberalization. Africa faced high macroeconomic problems during the period 1992-1995 which had a significant effect on the manufacturing sector’s export. In the middle of the 1980s structural adjustment programmes were introduced by the World Bank and other organizations, with emphasis on macroeconomic reforms, trade liberalization and privatization, and the success of these programs varied (Bigsten et. al (1999), p. 3)).

Albornaz (2011) find that due to the removal of trade barriers, firms start exporting sequentially to surrounding countries, using them as “test grounds” before they know their productivity. Moreover, the low importance of sunk costs suggests that the export market is not suffering from a large degree of persistence, and that it may be relatively efficient. Thus, it may also be the case that the market suffers from sequential inefficient exporting, causing a “quiet export hysteresis”. The African export market seems to differ in its structure compared to the export market in the more advanced countries. This structure could be a post effect of the trade liberalization which could have given rise to the experimental, and not so efficient, exporting. This reasoning is believed plausible when comparing the high entries in the African export market, the low extent of their exports and the low overall export-led growth that Africa is experiencing up to date. Therefore the low importance of sunk costs is not likely to reflect an efficient export market but rather, a certain structure of the market. We have seen a trend of “born global” firms in African manufacturing exports, especially for the TG sector, which also points to the fact that there is not a fair and efficient competition on the export market. Thus, since African firms learn much from exporting it may be positive that many can enter the market despite the evidence of the low extent of their exports. Smaller markets and technological backwardness makes export experience more advantageous. Due to this, Africa has more to gain than other regions from orienting their manufacturing sector towards exporting (Naude & Matthee (2012)). p. 18).

For further research, it would be helpful to study the destination of firm exports and to assess why African firms are experiencing a relatively low importance of sunk costs of exporting. Also, to examine the extent to which firm’s are exporting and to tangle out the main obstacles for export as well as to examine the reasons for why the export market is still relatively inefficient.

7. CONCLUSION

The aim of this paper is to examine the importance of sunk costs of exporting for Sub Saharan African firms. This is done by assessing the importance of past export performance on today's export participation. We reached our result through estimating the decision to export with a binary choice model using a lagged export dummy as an independent variable. By using a firm level panel dataset on firms in manufacturing sectors we find that the average importance of sunk cost of exporting is 16% for firms in the TG sector and 20% for firms in the FB and MMC sectors, respectively. This is lower than expected and generally, we find that the size and productivity of firms is more important than previous exporting experience. This finding is in line with previous research on African firms. We compare the relative importance of sunk costs of exporting for African firms with the results from studies using firm level data on more advanced countries. We see that the African market has a relatively high number of entries in the export market and that firms suffer less from sunk costs. A reason for the low importance of sunk costs could be that previous trade liberalization has created a tendency for experimental exporting. This and the low extent of African firm's export found by previous research, as well as the fact that Africa struggles to increase their export-led growth up to date, are factors that points towards the case that the African export market is inefficient. Future policies need to be applied in favor of African firms on a grass root level by strengthening the infrastructure and production possibilities. International standards of the EU and US must be decreased to allow for firms to broaden their export destinations and to compete efficiently on the export market.

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APPENDIX

Table 6: Mean and standard deviation of variables

Variable	Obs	Mean	Std.	Min	Max
Export dummy (dummy)	3595	.1730181	.3783155	0	1
Export inside Africa (dummy)	2925	.1517949	.3588833	0	1
Export outside Africa (dummy)	2925	.1517949	.3588833	0	1
Ln. Employment	3153	3.160424	1.626727	0	9.472705
Ln. Capital-labor ratio	2984	7.712098	2.150063	1.678247	12.93901
Ln. Output per worker	2960	8.613678	1.403587	2.674364	13.70815
Ln. Firm age	5004	2.640097	.8810783	0	4.61512
Any foreign ownership (dummy)	5865	.1838022	.3873558	0	1

Table 7: Export persistence, Entrants and Exits from the Export market

Export _{t-1}	Export _{t-1}		Total
	0	1	
0	1.924 76.44	593 23.56	2.517 100.00
1	515 13.43	3.319 86.57	3.834 100.00
Total	2.439 38.40	3.912 61.60	6.351 100.00

Table 8: Matrix of correlations for main variables

Correlate	xd	indx	xdlag	xdlag~2	lkllag	lrllag	anyfor~g	fmagelag	lllag
xd	1.0000								
indx	0.2331	1.0000							
xdlag	0.3992	0.3569	1.0000						
xdlaglag2	0.2835	0.5103	0.5005	1.0000					
lkllag	0.2147	0.2368	0.2544	0.2326	1.0000				
lrllag	0.1268	0.1466	0.2040	0.1720	0.5710	1.0000			
anyforlag	0.1492	0.1865	0.2251	0.1838	0.3511	0.2809	1.0000		
fmagelag	0.0427	0.0016	0.0413	0.0113	0.2154	0.1550	0.1422	1.0000	
lllag	0.2413	0.3030	0.3683	0.2980	0.5132	0.3919	0.4480	0.2371	1.0000

Table 9: Trade facilitation measures of African countries and the world.

Trade facilitation measure	Africa	World
Trading across border		
Number of documents for export	8	7
Number of days for export	34	26
Cost to export (USD)	1586	1230
Enabling trade		
Market access		
Tariff and non-tariff barriers	49	59
Proclivity to trade	53	59
Border administration		
Efficiency of customs administration	47	59
Efficiency of import-export procedures	44	55
Transparency of border administration	50	63
Transport and communications infrastructure		
Availability and quality of transport infrastructure	39	52
Availability and quality of transport services	44	55
Availability and use of ICT 's	29	47

Source: Trading across borders from World Bank 2008b, 97-99; enabling trade from World Economic Forum 2008, 16-25.
Comment: The numbers of the enabling trade index have been converted into percentages.