Firm-Level Determinants of Export Performance in Kenya's Manufacturing Sector

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Article History

Abstract

Purpose: This study aimed at investigating the firm-level determinants of export performance (export propensity and export intensity) in Kenya's manufacturing sector using firm-level panel data obtained from the World Bank Enterprise Surveys for the periods 2007, 2013 and 2018.

Methodology: The study adopted a quantitative non-experimental research design. The Heckman Two-Stage estimation procedure was employed to jointly establish the firm-level determinants of export propensity and export intensity in Kenya's manufacturing sector.

Findings: Based on the estimation results, firm-level total factor productivity, firm size, human capital, cost of material, electricity cost and foreign ownership had positive and significant effects on firms' export propensity while labor productivity negatively influenced export propensity. Firm age, capital intensity and research did not have significant effects on export propensity. On the other hand, export intensity was positively influenced by firm-level total factor productivity, foreign ownership, firm size, firm age, human capital and research. Labor productivity had a negative effect on firms' export intensity. Whereas the effect of energy cost on export intensity was weakly significant at 10 percent level of significance, there was no significant effect of cost of material on export intensity.

Unique Contribution to Theory, Practice and Policy: Employing the new 'new' trade theory, the study tested the self-selection hypothesis by analyzing the determinants of export propensity and intensity. According to the self-selection hypothesis, one of the key positive determinants of export propensity and export intensity is firm-level total factor productivity. The study findings validated the self-selection hypothesis since the results revealed firm-level total factor productivity as a positive and significant determinant of both export propensity and export intensity for Kenya's manufacturing firms. According to the study's conclusions, the government and enterprises must focus on policies that increase firm-level total factor productivity, firm size, human capital, and research in order to improve firms' export performance.

Keywords: *Export Propensity, Export Intensity, Self-Selection Hypothesis, Total Factor Productivity, Manufacturing Sector*

JEL Classification: F14, D22, D24, L60.

INTRODUCTION

Globally, international trade is vital to economic expansion since it allows international participants to enhance their competitiveness and multiply their output and profits across their domestic borders. Exposing firms to international trade improves their competitiveness, productivity and innovation (Kasahara & Lapham, 2013). Enhancing a country's trade performance has become necessary to improving its economic performance and this requires expanding manufacturing exports, since around 70 per cent of world exports are manufactured (World Bank, 2023). The average percentage of worlds' manufactured goods exported in total merchandise exports over the period 2007-2022 was 67.72 (World Bank, 2023). This is an indication that the manufacturing sector accounts for over two-thirds of the total world exports hence its importance in achieving economic transformation via exports. Over the same period, Sub-Saharan Africa (SSA) and the East African Community (EAC) had an average share of manufactured exports in all exports of 24.54 per cent and 17.46 per cent, respectively. These statistics imply that the share for SSA and EAC is way below the world average hence the need for improvement if the countries in these regions are to industrialize.

Universally, the manufacturing sector contributes significantly to economic growth and development through fostering and maintaining high productivity growth, expanding job possibilities, and boosting national competitiveness via exports alongside other forms of international commerce (KAM, 2022; KCCB, 2021). A vibrant manufacturing sector generates interlinkages with other sectors, promotes industrial revolution and productivity gains hence spurring economic development as evidenced by the Industrial Revolution and the East Asian Miracle (KAM, 2022; Republic of Kenya, 2012). International trade is one way of boosting the performance of the manufacturing sector (Bernard & Jensen, 1999). According to traditional trade theories, international trade boosts specialization within sectors based on comparative advantage leading to welfare gains whereas new trade theory argues that trade yields productivity gains due to increased product variety and economies of scale (Bernard, Jensen, Redding, & Schott, 2007). As such it is imperative to explore the determinants of export performance by firms for proper policy formulation. The study explored two dimensions of export performance, namely export propensity and export intensity. Export propensity refers to whether or not a firm participates in exporting while export intensity represents the share of a firm's exports in its total sales.

The linkage between global commerce and economic performance both at the country and firm level has been a popular subject (Charles & Richard, 2020). Mostly researchers have explored the effect of international trade participation on the firm-level performance, mostly productivity which were commenced by (Bernard, Jensen, & Lawrence, 1995) for US manufacturing industries where exporters outperformed non-exporters in terms of productivity growth. Two hypotheses have been put forth to explain the link between exporting and firm-level productivity: The self-selection hypothesis and the learning-by-exporting hypothesis (Bernard & Jensen, 1999; Bernard, Jensen, Redding, & Schott, 2007). According to the self-selection hypothesis, since there exist additional costs of exportation, only more productive firms participate in exporting activities. As such, firm-level total factor productivity is a key determinant of export performance. On the other hand, the learning-by-exporting implies that once firms start exporting, their performance is enhanced. There exists mixed and inconclusive evidence on the two hypotheses especially for developing countries where the literature is scanty. The current study focused on the self-selection hypothesis by exploring the firm-level

determinants of export performance by manufacturing firms in Kenya using the Heckman two-stage sample selection model.

The Role and Performance of the Manufacturing Sector in Kenya

In Kenya and other developing countries, the manufacturing sector, due to its strong interlinkages with other sectors, has a higher potential and stability for stimulating economic growth and development compared to agriculture and service sectors (KAM, 2019; KAM, 2021). This implies that the development of the manufacturing sector is key to ensuring a stable and sustainable economic growth as emphasized in the *Kenya Vision 2030* whose goal is to create a diverse, robust, and competitive manufacturing industry (Republic of Kenya, 2007). According to the *Kenya Vision 2030*, the manufacturing sector is among the key areas in obtaining an industrialized status as a nation especially through export promotion strategies. Since gaining its independence, Kenya has pursued several policies aimed at promoting international trade. This was witnessed in the 1980s and 1990s where the policy focus shifted from a regime of import-substitution to outward-oriented strategies. The export promotion policies included: Manufacture Under Bond (MUB); Export Compensation Scheme; Export Processing Zones (EPZ); Export Promotion Programme Office (EPPO), Tax Remission for Exports Office (TREO) and National Exports Development and Promotion Strategy (NEDPS) among others (Republic of Kenya, 2012; Republic of Kenya, 2017). Kenya has also prioritized trade promotion especially through national trade commitments at the 'World Trade Organization (WTO), East African Community (EAC), Common Market for East and Southern Africa (COMESA), Tripartite Free Trade Area (TFTA), African Continental Free Trade Area (AfCFTA), East African Community-European Union Economic Partnership Arrangement, African Growth and Opportunity Act (AGOA) among others' (Republic of Kenya, 2017).

Nevertheless, export performance of the manufacturing sector in Kenya, has been below expectations and set targets. The average share of manufactured exports in all exports was about 32.37 per cent for the period 2007-2022 (World Bank, 2023). This share falls short of the targeted 60 per cent as per the National Exports Development and Promotion Strategy (NEDPS) (Republic of Kenya, 2017). Moreover, according to the World Bank Enterprise Survey (WBES) of 2018, the number of manufacturing firms engaging in exporting activities has been decreasing as evidenced by a declining ratio of exporting firms to total firms surveyed from 52 per cent in 2013 to 45 per cent 2018. KAM's 2022-2027 manifesto also aims at increasing exporting activities by manufacturing firms in Kenya so as to boost the performance of the sector. It is therefore important to establish the firm-level determinants of export performance for proper policy guidance.

Statement of the Problem

The Industrial Revolution and the East Asian Miracle are key success stories of how the manufacturing industry contributes significantly to economic development and growth through fostering and maintaining productive growth, expanding job opportunities, and improving nations' competitiveness by trading abroad (KAM, 2021). By 2022, the National Export Development and Promotion Strategy targeted manufactured exports to account for 60 per cent of all exports (Republic of Kenya, 2017). More so, Kenya is committed to various regional and international trade agreements so as to enhance her export performance. However, despite all the government efforts, the set targets have not been achieved given that, Kenya's manufactured exports accounted for 33 per cent of all exports (below the target of 60 per cent)

from 2007 to 2022 on average. Furthermore, based on the WBES data, the share of exporting firms declined from 52 per cent in 2013 to 45 per cent 2018.

Based on these statistics as well as the commendable efforts by the government towards export promotion in the manufacturing sector, for further policy guidance, it is important to analyze the firm level determinants of export performance which the current study pursued. There is scanty literature on the same for Kenya with those available focusing on different contexts as well as exhibiting methodological limitations (Okado, 2013; Bresnaham, Coxhead, Foltz, & Mogues, 2016; Chebor, 2020; Esaku, 2020). This study therefore sought to add to the existing corpus of literature by establishing the firm-level determinants of export propensity and export intensity for Kenya's manufacturing firms using the Heckman Sample Selection model.

LITERATURE REVIEW

Theoretical Review

New Trade and 'New' New Trade Theories

Paul Krugman pioneered a series of international trade models known as New Trade Theory (NTT) in the late 1970s and early 1980s. It is based on the following assumptions: Imperfect markets; economies of scale and product differentiation. It emphasizes the importance of network effects and increasing returns to scale. Contrary to the arguments of the traditional trade models, NTT suggests that international trade primarily occurs between nations that share similar factor endowments, structural characteristics, and levels of development. To describe international commerce, traditional trade models depended on variations in factor endowment or productivity. NTT showed that trade flows between similar countries can be driven by increasing returns, without differences in factor endowments and productivity (Krugman, 1979). Trade enables the nations to take advantage of greater economies of scale. NTT among other contributions describes the possibility of the existence of intra-industry trade. Krugman (1979) enhanced the traditional theories by incorporating imperfect markets, economies of scale and product differentiation in his analysis of trade. As such, exporting firms are able to produce a wide variety of goods for exports due to product differentiation and economies of scale. Hence, according to NTT, regardless of homogenous tastes, technology and factor abundance, countries can engage in trade and boost firm's performance contrary to the opinion of the traditional trade theories.

Melitz (2003) extended Krugman's (1979) model and came up with the 'new' new trade theory (NNTT). NNTT incorporated the aspect of firm level productivity differences and focused more on the firms rather than sectors in understanding the relationship between global trade and business productivity (Melitz, 2003). Since entry in to new export markets is very costly, only efficient firms are able to enter these markets and reap the benefits there of. Industries with a comparative advantage should grow while those with a comparative disadvantage should contract as global trade becomes more liberalized. Some businesses in the same sector struggle to compete internationally, while others succeed based on their attributes. Melitz (2003) incorporated the concept of firm heterogeneity along with the suppositions of scale economies, product differentiation and imperfect competition. Government policies towards promoting free trade would result to shifting funds and market share from less productive to more productive firms. As a result, firm's productivity and performance in general would be boosted through trade and the inefficient and non-productive firms would eventually exit the market. With the reallocation of resources from less productive to more productive firms, there will be

self-selection into export markets by highly productive firms and productivity would increase for exporting firms.

NNTT as well as NTT are improvements of the traditional trade theories since they incorporate the concept of trade among homogeneous countries. More so, they relax the assumptions of the traditional trade theories by incorporating firm heterogeneity, scale economies, product differentiation and imperfect competition in the analysis for improved plausibility. Therefore, the current study borrowed the arguments of the NNT and the NNTT to establish the firm-level determinants of export performance whereby productivity is a key driver for exporting which is in line with the self-selection hypothesis.

Empirical Review

Okado (2013) used firm-level panel data from the manufacturing sector in Kenya to analyze the determinants of export propensity and intensity over the period 1992-2003. The focus of the study was on effects of total factor productivity on export propensity and intensity. These were estimated controlling for exogenous covariates such as location-specific and characteristics of firms, notably firm age and sunk investment. The paper used the Heckman sample selection model in the estimation. The main finding of the study was that export propensity and intensity in Kenya were positively highly responsive to total factor productivity and firm size thus validating the self-selection hypothesis. The study made commendable effort in accounting for sample selection bias in the analysis. The current study borrowed the methodology adopted by the reviewed study while employing a more recent data set to capture current issues.

Fonchamnyo (2014) explored the determinants of export intensity and propensity of manufacturing firms in Cameroon using data obtained from World Bank Investment Climate Survey for the period. A logit model was employed to analyze the determinants of export propensity whereas the determinants of export intensity were analyzed using a tobit model. The explanatory variable of interest for both models were firm size, wage, human capital, firms' turnover, firm age, experience, power outages, capital intensity, new vintage capital and insecurity. The results for export propensity indicated that firm size, human capital, vintage capital, turnover and age positively affected firms' decision to export while capital intensity negatively influenced export propensity. The results for the determinants of export intensity indicated that firm size, human capital, turnover, firm age and experience positively affected export intensity. This study provided evidence on the determinants of export participation for manufacturing firms in Cameroon. Nevertheless, total factor productivity was not incorporated in the analysis. In addition, to cater for sample selection bias, it is appropriate to jointly analyze the determinants of export propensity and intensity using the Heckman sample selection model which the current study did.

Reis and Forte (2016) analyzed the role of industry characteristics on export intensity for Portuguese manufacturing firms. The study utilized panel data obtained from the firms' balance sheets for the period 2008-2010. The study estimated both a pooled OLS and a fixed effect model where by export intensity was the dependent variable and the explanatory variables were capital intensity, research, labor productivity, export orientation and concentration. A set of control variables were used which included firm size, age and year dummies. The results indicated that labor productivity positively affected export intensity while industry concentration levels and export orientation negatively influenced export intensity. Firm size also affected export intensity positively. The use of fixed effect model to analyze the

determinants of export intensity in this case suffered some drawbacks since it does not account for sample selection bias in this subject. Hence sample selection models are more appropriate in this regard which the current study utilized to analyze the determinants of export intensity for Kenya's manufacturing firms while incorporating total factor productivity instead of labor productivity.

Vu et.al (2016) analyzed the link between exporting and productivity of Vietnamese manufacturing firms using firm-level data obtained from the institute of Labor Science and Social Affairs for the period 2005 and 2007. The self-selection hypothesis was tested using a dynamic random effects probit model whereby the export dummy was regressed on its first lag and total factor productivity while controlling for firm age, firm size, capital intensity, trade relationship, average wage, innovation as well as urban and ownership dummies. Based on the results, the coefficients of TFP and the lagged export dummy were positive and statistically significant providing evidence of self-selection hypothesis. Among the control variables, firm size, trade relationship and ownership dummies positively affected export propensity. The reviewed study made commendable effort in addressing the endogeneity bias in this subject by utilizing the dynamic random effects probit model. The current study followed a relatively similar approach with little divergence by employing the Heckman Sample Selection model to address sample selection bias in the Kenyan case.

Krammer et. al (2018) analyzed how firm attributes and institutional environments influence the export performance of emerging economy firms. The study utilized WBES firm-level data for Brazil, Russia, India and China for the period 2015. Export performance was measured using export propensity and export intensity. Institutional environment was represented by: political instability; competition from the informal sector and corruption. Firm attributes were measured by: Skilled workers; managerial expertise and technological capabilities. A set of control variables were incorporated in the analysis such as: firm size; firm age; foreign ownership; public ownership; work force quality as well as country and industry dummies. To account for selection bias, the analysis was conducted using the Heckman two-stage estimation procedure. The results indicated that export propensity was positively influenced by: firm age; firm size; foreign ownership; competition from the informal sector and political instability. On the other hand, firm size, firm age negatively influenced export intensity while technological capabilities and skilled workers positively influences export intensity. The study accounted for the sample selection bias problem by utilizing the Heckman two-stage estimation procedure which the current study adopted in the analysis of the drivers of export performance by firms in Kenya's manufacturing sector.

Chebor (2020) examined the firm-level determinants of growth of exports in Kenya's manufacturing sector using three waves of panel data (2007, 2013 and 2018) from the World bank Enterprise Surveys. The analysis was conducted using the 2SLS technique to cater for possible endogeneity and heterogeneity. The individual firm characteristics analyzed were age, size, innovation, human capital and foreign ownership. The key findings showed that firm size, foreign ownership, skilled human capital and innovation positively affect export intensity. However, total factor productivity was not analyzed under the factors influencing exports yet in literature, according to the self-selection hypothesis, business productivity influences exporting behavior. The current study utilized the same data set and contributed to the existing literature by incorporating total factor productivity in the analysis and utilizing the Heckman Sample Selection model that corrects for sample selection bias.

Kiendrebeogo (2020) tested the self-selection hypotheses using unbalanced panel data of Egyptian manufacturing firms obtained from the World Bank Enterprise Surveys database for the period 2003-2008. The self-selection hypothesis was tested through comparing productivity between exporters and non-exporters in the current period, one year prior to commencement of exporting incorporating control variables using matching techniques. The controls included employment, wage, firm age, research and financial health not forgetting location and industry dummies. The results did not support the self-selection hypothesis in the sense that exporters did not experience total factor productivity improvements prior to entering the foreign markets. The current study employed a different technique (Heckman sample selection model) to test the self-selection hypothesis due to some limitations of matching techniques.

Dong and Zhou (2022) analyzed the moderating effect of firm ownership on the effect of innovation on export performance for Chinese manufacturing firms for the period 2000-2007. The dependent variable was export intensity while the explanatory variable of interest was innovation outputs with foreign ownership and state ownership employed as moderators. A pooled OLS model was estimated whereby export intensity was regressed on innovation, ratio of state owned capital, ratio of foreign owned capital, interaction terms of innovation and the two moderators while controlling for total factor productivity, firm size, firm age, financial leverage, international openness, marketing capability, tangible resources, regional, industry and time dummies. The results indicated that innovation and foreign ownership positively affected export intensity while state ownership negatively affected export intensity. The coefficient of the interaction term between innovation and state ownership was positive while that of innovation and foreign ownership was negative. The other determinants of export intensity were firm size, total factor productivity, international openness, firm age, financial leverage, marketing capability and tangible resources. Nevertheless, analyzing the determinants of export intensity independently using static panel data models does not account for sample selection bias hence the need for sample selection models which the current study utilized.

Camino-Mogro et.al (2023) tested the self-selection hypothesis for Ecuador's manufacturing firms using unbalanced panel data from firms' financial statements and balance sheets for the period 2007-2018. The variables of interest were: gross revenue, total factor productivity, capital stock, foreign intermediates, domestic intermediates, total exports, wages, labor productivity, capital productivity, size, age and export dummy. Region, state and location dummies were also incorporated in the analysis. To test the self-selection hypothesis, the lagged values of total factor productivity were regressed on the current export status while controlling for the aforementioned set of control variables using OLS. From the results it was evident that exporters outperformed non-exporters in all dimensions: total factor productivity; gross revenue; employment; capital stock; total intermediates; wages; labor productivity; capital productivity and age thus supporting the self-selection hypothesis. The study accounted for selection bias using matching techniques. Nevertheless, due to the limitations of matching techniques, the current study used the Heckman sample selection model to establish the determinants of export performance for manufacturing firms in Kenya.

Research Gaps

The reviewed empirical literature reveals that there is limited empirical evidence on the determinants of export performance for manufacturing firms in Kenya yet Kenya is on a manufacturing export-led industrialization path. More so, some studies such as Fonchamnyo (2014), Reis and Forte (2016), Krammer et. al (2018) and Chebor (2020) do not employ total

factor productivity in the analysis yet in literature, total factor productivity is very key when testing the self-selection hypothesis. In addition, total factor productivity is a more suitable indicator of technological progress as opposed to labor productivity. Some of the reviewed studies also suffer from methodological issues whereby the methodologies applied do not cater for sample selection bias in this subject which may lead to unreliable results. The current study therefore explored the determinants of export performance by manufacturing firms in Kenya while incorporating total factor productivity as well as utilizing the Heckman sample selection model to account for sample selection bias as contribution to the literature for Kenya.

METHODOLOGY

Research Design

The study employed a quantitative non-experimental research design to achieve the research objectives.

Theoretical Framework

The study aimed at identifying the firm-level determinants of export propensity and export intensity by Kenya's manufacturing firms. According to New Trade Theory (NNT) and 'New' New Trade Theory (NNTT) alongside empirical evidence, the choice to export is made in light of level of profits derived from export markets (Krugman, 1979; Bernard & Jensen, 1999; Bernard & Wagner, 2001; Melitz, 2003). A firm that seeks to maximize profits bases its decision to export on the degree of anticipated current and future income from exporting (Bernard & Jensen, 1999; Bernard & Wagner, 2001). Let q_{it}^* denote the profit maximizing output level by the firm. Under the one period case with zero entry (sunk) costs, the firm's profits are given as follows:

$$\pi_{it}(X_t, Z_{it}) = p_t . q_{it}^* - c_{it}(X_t, Z_{it}|q_{it}^*) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.1)$$

Where the p_t is the price of exports; $c_{it}(.)$ is the variable production cost of q_{it}^*; X_t denotes exogenous factors affecting firm's profits; Z_{it} represents firm-specific characteristics that might influence export decision such as productivity, firm ownership, firm size, labor composition and product mix. If predicted profits are positive, a firm will export as shown below:

$$Y_{it} = \begin{cases} 1: if \ \pi_{it} \geq 0 \\ 0: if \ \pi_{it} < 0 \end{cases} \quad \ldots \ldots \ldots \ldots \ldots \ldots . \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . . (3.2)$$

Where the firm's export status in period t is Y_{it}. Extending equation (3.1) to multiple periods yields:

$$\pi_{it}(X_t, Z_{it}) = E_t(\sum_{s=t}^{\infty} \delta^{s-t} [p_s . q_{is}^* - c_{is}(X_s, Z_{is}|q_{is}^*)]) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . . \ldots \ldots \ldots (3.3)$$

Where δ denotes the discount rate. The solution to the multiple period case is identical to the one period case as shown in equation (3.2). With the introduction of sunk costs (S), the firm's profits under the single period case are:

$$\tilde{\pi}_{it}(X_t, Z_{it}, Y_{it-1}) = p_t . q_{it}^* - c_{it}(X_t, Z_{it}|q_{it}^*) - S. (1 - Y_{it-1}) \ldots \ldots \ldots \ldots \ldots . \ldots \ldots \ldots \ldots \ldots (3.4)$$

Where Y_{it-1} is the prior period's firm's export status. If the firm was an exporter during the prior period, $(Y_{it-1} = 1)$, it will not incur sunk costs in the current period. Thus, in period t, the firm will optimize from exporting if $\tilde{\pi}_{it} > 0$. Due to sunk costs, the decision to export today by a firm will affect the probability of exporting in the succeeding periods. The firm therefore

chooses a chain of output levels, $\{q_{is}^*\}_{s=t}^{\infty}$, that will optimize the present and discounted future profits:

$$\pi_{it} = E_t\left(\sum_{s=t}^{\infty} \delta^{s-t}[\tilde{\pi}_{is}Y_{is}]\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.5)$$

The value function (V_{it}) is expressed as follows:

$$V_{it} = max\left(\tilde{\pi}_{it}.[q_{it}^* > 0] + \delta E_t(V_{it+1}|q_{it}^*)\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.6)$$

Where $E_t(V_{it+1})$ is the firm's expected value function from exporting in the succeeding period. In period t a firm will find it optimal to export if the current and expected payoffs from exporting outweigh the costs incurred as shown in equation (3.7).

$$p_t.q_{it}^* + \delta[E_t(V_{it+1}|q_{it}^* > 0) - E_t(V_{it+1}|q_{it}^* = 0)] > c_{it} + S.(1 - Y_{it-1}) \ldots\ldots\ldots\ldots (3.7)$$

Let $\hat{\pi}_{it} = p_t.q_{it}^* + \delta[E_t(V_{it+1}|q_{it}^* > 0) - E_t(V_{it+1}|q_{it}^* = 0)] \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.8)$

Thus:

$$Y_{it} = \begin{cases} 1: if \ \hat{\pi}_{it} > c_{it} + S.(1 - Y_{it-1}) \\ 0: \text{Otherwise} \end{cases} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.9)$$

Equation (3.9) implies that a firm will decide to export if it expects positive profits. Based on equation (3.9), and following empirical evidence the decision to export can be presented as follows (Bernard & Jensen, 1999; Bernard & Wagner, 2001):

$$Y_{it} = \begin{cases} 1: if \ \beta X_{it} - S.\ (1 - Y_{it-1}) + \varepsilon_{it} > 0 \\ 0: \text{Otherwise} \end{cases} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.10)$$

Where X_{it} is a vector of business traits that may influence the decision to export such as productivity, firm ownership, firm size, human capital, capital per employee, research and development, firm age and management quality and ε_{it} is the residual. Equation (3.10) can be used to estimate the determinants of export propensity using binary choice models. It can also be modelled to separately estimate the determinants of the export intensity based on the specified firm attributes. Hence the export performance function was generally expressed as:

$$EXPORT_{it} = f(X_{it}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.11)$$

Where $EXPORT_{it}$ is firms' export performance in period t and X_{it} is a vector of firm traits that may influence export behavior such as total factor productivity, firm age, firm size, foreign ownership, capital intensity, research and management quality as used in vast literature (Bernard & Jensen, 1999; Bernard & Wagner, 2001; Bernard, Jensen, Redding, & Schott, 2007; Bigsten & Gebreeyesus, 2009; Camino-Mogro, Ordeñana-Rodríguez, & Vera-Gilces, 2023).

Empirical Model Specification

To explore the determinants of export performance, equation (3.11) can be modelled for a binary dependent variable (export propensity) or a continuous dependent variable (export intensity) and estimating the two models separately. However, since the decision to export and the amount exported by a firm are dependent due to self-selection in to export markets, they cannot be modelled separately (Heckman, 1979; Okado, 2013). More so, export intensity was measured as the share of firms' exports in total sales hence it takes a value between zero and one. Share variables, such as the share of exports in total sales, are common fractional response variables (Wagner, 2001). Employing the Ordinary Least Squares (OLS) technique to analyze

a fractional response variable leads to inconsistent results since the predictions from the model may not lie within the (0,1) interval as well as biased marginal effects (Papke & Wooldridge, 1996; Schwiebert, 2018). This limitation can be overcome using a tobit model or a fractional probit or logit model introduced by Papke and Wooldridge (1996). Papke and Wooldridge (1996) proposed specifying only the conditional mean of the fractional response variable rather than the entire conditional distribution. Let y represent the fractional response variable (export intensity) with x representing the collection of explanatory variables that have a conformable parameter vector β. The conditional mean is thus expressed as:

$$E(y|x) = G[x'\beta] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.12)$$

Where $G[.]$ is a bounded function either a logistic or normal cumulative distribution function. Papke and Wooldridge (2008) put forth a panel data specification of equation (3.12) as follows:

$$E(y_{it}|x_{it}, \alpha_i) = \Phi[x_{it}\beta + \alpha_i] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.13)$$

Where α_i represents the individual specific effect, Φ is a logistic or normal cumulative distribution and the rest of the variables are as defined in equation (3.11).

More so, due to the existence of sunk costs, firms self-select themselves into exporting based on their attributes and this leads to self-selection bias which is not accounted for by the tobit, fractional probit or logit models (Faria, Rebelo, & Gouveia, 2020). More so, since export intensity can only be observed for exporting firms, sample selection bias arises. This implies that, when analyzing the export intensity model, there is need to cater for the fractional nature of the variable as well as selection bias. In his landmark study, Heckman (1979) noted that sample selectivity happens when the choice of participants into the sample under study is non-random. Thus, eliminating non-exporters and assessing export intensity independently using just exporters may result in selectivity bias.

Consider the following model proposed by Heckman (1979) to rectify this sample selection bias:

$$y_{it}^* = x_{it}'\beta + u_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.14)$$

$$z_{it} = 1(w_{it}'\gamma + \varepsilon_{it} > 0) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.15)$$

$$y_{it} = z_{it}y_{it}^* \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.16)$$

Where y_{it}^* denotes a latent dependent variable, z_{it} is an observed binary variable (selection equation) that in this case indicates the export status of the firm i.e. exporters ($z_{it} = 1$) and non-exporters ($z_{it} = 0$) and y_{it} is the observed dependent variable (export intensity in this study) and its observed when $z_{it} > 0$. The observed explanatory variables are presented by vectors x_{it} and w_{it} with corresponding parameters β and γ. The error terms are denoted by μ_{it} and ε_{it} which are assumed to follow a conditional bivariate normal distribution.

Based on equations (3.14) and (3.15), y_{it} is observed when $z_{it} = 1$ and this happens when:

$$\varepsilon_{it} > -w_{it}'\gamma \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.17)$$

The probability that y_{it} is observed is:

$$\Pr(\varepsilon_{it} > -w_{it}'\gamma) = 1 - \Phi(-w_{it}'\gamma) = \Phi(w_{it}'\gamma) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.18)$$

Equation (3.18) holds by symmetry of the standard normal distribution. Where Pr denotes probability and Φ is the cumulative density function of the standard normal distribution.

Given the conditional mean of the observed dependent variable y_{it} as:

$$E(y_{it}|y_{it}\ observed) = E(y_{it}|\ z_{it} = 1) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.19)$$

Substituting equation (3.17) yields:

$$E(y_{it}|y_{it}\ observed) = E(y_{it}|\ \varepsilon_{it} > -w'_{it}\gamma) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.20)$$

Substituting equation (3.14) produces:

$$E(y_{it}|y_{it}\ observed) = x'_{it}\beta + E(\mu_{it}|\varepsilon_{it} > -w'_{it}\gamma) \dots\dots\dots\dots\dots\dots\dots\dots\dots (3.21)$$

$$E(y_{it}|y_{it}\ observed) = x'_{it}\beta + \rho\sigma_\mu \frac{\emptyset(w'_{it}\gamma)}{\Phi(w'_{it}\gamma)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.22)$$

Where ρ is the correlation between the errors of equations (3.14) and (3.15), σ_μ is the variance of the error term in the main equation (3.14), $\emptyset$ is the probability density function of the standard normal distribution and $\frac{\emptyset(w'_{it}\gamma)}{\Phi(w'_{it}\gamma)}$ denotes the inverse Mills ratio (IMR).

The Heckman sample selection model jointly estimates the export participation and export intensity models (3.15) and (3.14), respectively by estimating and incorporating the inverse Mills ratio obtained from equation (3.22) into the regression equation to eliminate bias, resulting in unbiased findings. The Heckman model relies on distributional assumptions of the residuals or imposition of appropriate exclusion restrictions. Satisfaction of either of the two conditions and implementation of the two-step procedure for the Heckman model leads to reliable estimates within the limited interval (0,1) even in the case of fractional response outcome variables (Schwiebert, 2018). The exclusion restriction involves having an additional explanatory variable (instrument) on the selection equation (3.15) which is excluded from the main equation (3.14).

Therefore, the study adopted the Heckman (1979) two-step sample selection model in establishing the determinants of export propensity and export intensity by estimating equations (3.14), (3.15) and (3.16) while incorporating explanatory variables such as total factor productivity, firm age, firm size, foreign ownership, capital intensity, human capital, research and management quality as defined on equation (3.11). In addition, dummy variables for year, industry and region were incorporated in the models to obtain the following empirical models:

$$y^*_{it} = x'_{it}\beta + \delta D_{it} + IMR_{it} + u_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.23)$$

$$z_{it} = 1(w'_{it}\gamma + \theta D_{it} + \varepsilon_{it} > 0) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.24)$$

$$y_{it} = z_{it}y^*_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.25)$$

Where D_{it} is a vector of year, industry and region dummies, IMR_{it} is the inverse mills ratio and the rest of the variables and parameters are as defined in equations (3.14), (3.15) and (3.16). The Heckman two-step sample selection procedure adopted by the study involved estimating equation (3.24) first using a probit model to establish the determinants of export propensity after which the inverse mills ratio (IMR) was computed. The second stage involved estimating equation (3.23) while incorporating the IMR as an explanatory variable to account for the selection bias when establishing the determinants of export intensity.

Data Type, Source and Analysis

The research utilized panel dataset obtained from the World Bank Enterprise Surveys (WBES) for manufacturing firms in Kenya covering the periods 2007, 2013 and 2018. The study performed descriptive analysis so as to understand the characteristics of the study data.

Regression analysis using STATA was conducted to establish the determinants of export performance by manufacturing firms in Kenya.

Diagnostic Tests

Normality Test

Since the study employed the probit model, the relevant variables were tested for normality by checking the distribution of the variables as well as their descriptive statistics such as the standard deviation, skewness and kurtosis. Logarithmic transformation of the variables helped in achieving the normality assumption.

Multicollinearity Test

The multicollinearity test was conducted using the VIF and 1/VIF statistics. VIF values exceeding 10 and 1/VIF values below 0.1 indicate high levels of multicollinearity that needs to be addressed (Kutner, Nachtsheim, & Neter, 2004). Mostly this is addressed by dropping one of each of the highly collinear variables until the problem is solved.

Regression Specification Error Test

To ensure that all the model was correctly specified, the study employed Ramsey regression specification error test (RESET) under the null hypothesis of a correctly specified model (Ramsey, 1969). The model is correctly specified if the probability value of the F-statistic is greater than 0.05 (Ramsey, 1969).

Heteroscedasticity Test

The modified Wald test for group wise heteroscedasticity was employed to check the variance of the residuals under the null hypothesis of homoscedasticity (Greene, 2012). A probability value of the Chi-square statistic greater than 0.05 indicates constant variance (Greene, 2012). In the presence of heteroscedasticity, the robust option can be applied to obtained robust standard errors.

FINDINGS

Descriptive Statistics

This section provides the descriptive statistics for the study variables. The analysis is categorized into two sections. The first section captures the summary statistics for the continuous variables while the tabulation of the discrete variable is presented in the second section.

Summary Statistics for the Continuous Variables

The summary statistics for the continuous variables are presented on Table 1.

Table 1: Summary Statistics for Continuous Variables

Variables	N	Mean	S.D.	Min	Max	Skewness	Kurtosis
Export Intensity	482	0.19	0.30	0	1	1.72	4.74
Total Factor productivity	482	8.40	3.30	0	17.47	-.74	4.96
Material	482	344.84	2146.01	0	36000	12.05	176.11
Energy Cost	482	22.97	171.10	0	3500	17.95	357.68
Firm Size	482	204.17	572.47	0	8000	8.25	93.06
Firm Age	482	32.37	18.7	0	103	.82	3.64
Human Capital	482	23.45	35.67	0	100	1.28	3.03
Labor Productivity	482	5.05	28.51	0	600	19.09	395.67
Capital Intensity	482	12.09	229.00	0	5000	21.53	468.96

Material, Energy Cost, Labor Productivity, Capital Intensity are in Million KShs.

N = Number of Observations; S.D. = Standard deviation; Min = Minimum value and Max = Maximum value.

Source: Author's Computations from WBES Data (2007, 2013, 2018).

Export intensity, measured as the share of a firm's exports in total sales, had a mean value of 0.19 and a standard deviation of 0.3 implying high dispersion from the mean. The mean value of 0.19 implies that the sampled firms in the manufacturing sector exported an average of 19 per cent of their total sales within the study period. This was an indication of low export share for the sampled firms in the sector. Export intensity had a maximum value of 1 (for firms that exported all their sales) and a minimum value of 0 for non-exporters. With reference to a skewness of zero and kurtosis of 3 for a standard normal distribution, based on the skewness and kurtosis of 1.72 and 4.74, respectively, export intensity was positively skewed and mildly leptokurtic.

The average total factor productivity (TFP) for the sampled firms in the sector within the study period was 8.40 with a standard deviation of 3.30 implying low variation from the mean. Total factor productivity was slightly negatively skewed with a value of -0.74 compared to a zero skewness value of a normal distribution. Based on the kurtosis of 4.96, with reference to a value of 3 for a standard normal distribution, TFP was mildly leptokurtic implying that it had a slightly peaked curve. Material and Energy cost had mean values of 344.84 and 22.97 Million Kenya Shillings, respectively. Based on their standard deviations of 2146.01 and 171.10, respectively, they were highly dispersed from their mean values. Their skewness and kurtosis values indicated that they were all leptokurtic and positively skewed.

Firm size, represented by the total number of workers employed by a firm, had a mean value of 204 implying that, on average, the sampled firms employed 204 workers within the study period. Firm size was highly volatile as indicated by a standard deviation of 572.47. For the sampled firms, the largest firm employed 8,000 workers within the study period. With a skewness of 8.25 and a kurtosis of 93.06, firm employment was positively skewed and leptokurtic. The average age of the sampled firms in the sector was 32 years with a standard deviation of 18.70 implying less variability. The oldest firm(s) was 103 years old. The skewness of 0.82 and kurtosis of 3.64 were very close to a normal distribution.

Human capital representing the percentage of full time workers who received formal training had a mean value of 23.45 indicating that, for the sampled firms, only 23.45 per cent of the workers received formal training within the study period, on average. With a standard deviation of 35.61 the variability from the mean was high implying that the level of formal training of

workers differed greatly across firms. Human capital was also moderately skewed (1.28) with a normally peaked curved based on a kurtosis of 3.03. Labor productivity, was on average 5.05 Million Kenya Shillings with a high dispersion form the mean. Based on the skewness (19.09) and kurtosis (395.67) labor productivity curve was positively skewed and leptokurtic. The average capital intensity for the sampled firms in Kenya's manufacturing sector was 12.09 Million Kenya Shillings for the study period with a very high dispersion from the mean. It also exhibited positive skewness and had a highly peaked curve.

Tabulation of the Discrete Variable

Export propensity for the sampled firms in Kenya's manufacturing sector, was presented as a dummy variable = 1 for exporters and 0 for non-exporters. Table 2 presents the statistics for export propensity for the sampled firms within the study period.

Table 2: Export Propensity Statistics

Export Propensity	Frequency	Percent	Cumulative
Non-Exporters	247	51.24	51.24
Exporters	235	48.76	100.00
Total	**482**	**100.00**	

Source: Author's Computations from WBES Data (2007, 2013, 2018)

Table 2 indicates that exporters accounted for 48.76 per cent of the total sampled firms in Kenya's manufacturing sector, on average.

Diagnostic Test Results

Normality Test Results

Apart from total factor productivity, all the variables presented on Table 1 had not been transformed into natural logarithmic form. In order to achieve a reasonably normal distribution, all the variables were transformed into natural logarithmic form.

Multicollinearity Test Results

The results indicated that the model did not suffer from multicollinearity since the VIF values were less than 10 and 1/VIF values were greater than 0.1 for each variable as presented on Table 3.

Table 3: Multicollinearity Test Results on the Determinants of Export Intensity

Variables	VIF	1/VIF
Total Factor Productivity	5.959	.168
Firm Employment	1.659	.603
Firm Age	1.233	.811
Human Capital	1.245	.803
Labor Productivity	7.978	.125
Material	2.165	.462
Energy Cost	2.78	.36
Foreign Ownership	1.113	.898
Mean VIF	2.144	

VIF: Variance Inflation Factor

Source: Author's Computations from Study Data

Ramsey Regression Specification Error Test (RESET) Results

The results indicated that the model was correctly specified since the probability value of the F-statistic was greater than 0.05 as shown on Table 4.

Table 4: Results of the Ramsey Regression Specification Error Test (RESET)

Model	F-statistic	P-value
Determinants of Export Intensity	1.35	0.2601

Source: Author's Computations from Study Data

Heteroscedasticity Test Results

The results indicated the presence of heteroscedasticity given that the probability value of the Chi-square statistic was less than 0.05 as presented on Table 5. This was corrected by computing robust standard errors.

Table 5: Results for Modified Wald Test for Group-Wise Heteroscedasticity

Model	Chi-square statistic	P-value
Determinants of Export Intensity	1.2e+34	0.000

Source: Author's Computations from Study Data

Empirical Results

Results on the Firm-Level Determinants of Export Propensity by Manufacturing Firms in Kenya

The results from estimating the probit model (3.24) are presented on Table 6.

Table 6: Regression Results on the Firm-Level Determinants of Export Propensity in Kenya's Manufacturing Sector

Dependent Variable: Export Propensity

Variables	Estimated Coefficient	P-Value	Marginal Effect	P-Value
Total Factor Productivity (TFP)	0.1790**	0.018	0.0412**	0.014
Firm Size	0.3735***	0.000	0.0861***	0.000
Capital Intensity	-0.0081	0.631	-0.0019	0.630
Firm Age	0.1273	0.300	0.0293	0.296
Human Capital	0.1361***	0.005	0.0314***	0.003
Labor Productivity	-0.1249**	0.025	-0.0288**	0.019
Material	0.0322*	0.066	0.0074*	0.062
Energy Cost	0.0784**	0.012	0.0181***	0.008
Foreign Ownership Dummy (FO)				
Base: Domestic				
Foreign	0.7902**	0.013	0.1822***	0.008
Year Dummy				
Base: 2007				
Year=2013	0.4473*	0.051	0.1033**	0.046
Year=2018	0.0714	0.780	0.0163	0.779
Research Dummy				
Base: Non-Researchers				
Research	0.2843	0.133	0.066	0.130
Industry Dummy				
Base: Other Manufacturing				
Food	-0.1250	0.597	-0.0290	0.596
Textiles and Garments	0.2844	0.317	0.0665	0.311
Chemical, Pharmaceutical, and Plastic	0.5932*	0.052	0.1378**	0.047
Constant	-3.994***	0.000	-	
No. of Observations	471		-	
Wald: Chi^2	64.47***		-	

P-Values in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Source: Authors Computations

Based on the results presented on Table 6, the coefficient for total factor productivity was positive and statistically significant at 5 percent. Therefore, an increase in firm-level total factor productivity increased the probability of a firm becoming an exporter, ceteris paribus. This is because highly productive firms are able to overcome the sunk costs involved in entering foreign markets. The study results support the self-selection hypothesis are in line with vast empirical evidence such as (Okado, 2013; Vu, Holmes, Tran, & Lim, 2016; Camino-Mogro, Ordeñana-Rodríguez, & Vera-Gilces, 2023).

The coefficient of firm size was positive and statistically significant at 1 percent. This implies that an increase in the firm size increased the probability of a firm becoming an exporter, all else being equal. This is because larger firms are able to enjoy economies of scale and have more resources to access better technologies for accessing foreign markets compared to small firms. The study findings support existing empirical evidence including (Fonchamnyo, 2014; Vu, Holmes, Tran, & Lim, 2016; Krammer, Strange, & Lashitew, 2018; Chebor, 2020; Camino-Mogro, Ordeñana-Rodríguez, & Vera-Gilces, 2023).

Human capital, measured as the share of trained workers in a firm, had a positive effect on export propensity as indicated by a positive and statistically significant coefficient. The results implied that an increase in the share of trained workers in a firm led to increased probability of

the firm engaging in exporting, all else being equal. Training of workers improves their skills and capabilities which gives the firm a competitive edge since the workers are able to work and adopt to the modern technologies needed to produce high quality products and enter foreign markets. The results were similar to (Fonchamnyo, 2014).

The coefficient for labor productivity was negative and statistically significant at 5 percent. This meant that an increase in labor productivity reduced the probability of a firm becoming an exporter, all other factors held constant. The literature on this is mixed (Guner, Lee, & Lucius, 2010; Pham, 2015; Reis & Forte, 2016; Jakšić, Erjavec, & Cota, 2019). Economic theory implies that workers are compensated based on their marginal productivity, indicating that salaries are positively connected to labor productivity. An increase in labor marginal productivity raises salary demands, and because this costs the firm money, the firm may end up keeping only a few productive employees thus negatively affecting export propensity.

The cost of material was positively related to export propensity given that the coefficient was positive and statistically significant. This implied that, an increase in the expenditure of materials increased the probability of a firm becoming an exporter, ceteris paribus. This could be attributed to high quality materials required for production of quality exports. Hence, for a firm to become a successful exporter, they have to incur high costs on materials. The results are supported by existing literature (Bas & Strauss-Kahn, 2014; Feng & Swenson, 2016).

Energy cost, measured as the cost of electricity, had a positive and statistically significant coefficient implying that energy cost positively affected export propensity. The results meant that an increase in cost of electricity by the firm, increased the probability of the firm becoming an exporter. This can be explained by the fact that in Kenya, electricity does not have close substitutes and those available may be costly to install. As such, most of the firms may not have a choice rather than bear with the high costs of electricity and find a way to transfer the burden to the consumers. For a firm to produce high quality goods for exports, energy cost is inevitable just as with the case of materials, hence the positive relationship.

Foreign ownership, expressed as a dummy variable had a positive and statistically significant coefficient. This meant that foreign firms had a higher probability of exporting compared to domestic firms. This can be attributed to foreign enterprises' advantages in terms of direct exposure to information and marketing networks regarding international markets, managerial competence, access to more advanced technology, and financial resources in general. These results are consistent with Okado (2013) for Kenya; Chebor (2020) for Kenya and Dong and Zhou (2022) for China. The export propensity of firms was higher in 2013 compared to 2018 as indicated by the positive and statistically significant year dummy. In addition, firms in the Chemical, Pharmaceutical and Plastic had a higher probability of becoming exporters compared to those from other manufacturing based on the industry dummy results.

Results on the Firm-Level Determinants of Export Intensity by Manufacturing Firms in Kenya

The results of the firm-level determinants of export intensity based on the Heckman sample selection model presented on equations (3.23), (3.24) and (3.25) are presented on Table 7. Results from the Tobit and fractional probit models are also presented for comparison purposes.

Table 7: Regression Results on Firm-Level Determinants of Export Intensity in Kenya's Manufacturing Sector

Variables Dependent Variable: Export Intensity	Tobit	P-Value	Fractional Probit	P-Value	Heckman Sample Selection Model	P-Value
			Model			
Total Factor Productivity (TFP)	0.0488***	0.002	0.0904**	0.029	0.0351***	0.005
Foreign Ownership Dummy (FO)						
Base: Domestic						
Foreign	0.7811***	0.000	1.3153**	0.027	0.4281**	0.013
FO*TFP	-0.0702***	0.002	-0.1180*	0.059	-0.0342**	0.048
Firm Size	0.0849***	0.000	0.1472***	0.001	0.0632***	0.002
Firm Age	0.0498	0.114	0.0804	0.263	0.0361**	0.040
Human Capital	0.0347***	0.003	0.0778***	0.004	0.0298***	0.000
Labor Productivity	-0.0252**	0.024	-0.0455	0.114	-0.0197**	0.022
Material	0.0027	0.515	0.0053	0.607	0.0025	0.288
Energy Cost	0.0108	0.140	0.0187	0.268	0.0096*	0.060
Year Dummy						
Base: 2007						
Year=2013	0.1145**	0.049	0.3048**	0.017	0.0996***	0.000
Year=2018	-0.0250	0.703	-0.0313	0.835	-0.0004	0.990
Research Dummy						
Base: Non-Researchers						
Research	0.0594	0.224	0.088	0.474	0.0464*	0.091
Industry Dummy						
Base: Other Manufacturing						
Food	-0.0315	0.605	-0.0056	0.964	-0.0103	0.726
Textiles and Garments	0.0334	0.650	0.0531	0.704	0.0491	0.204
Chemical, Pharmaceutical, and Plastic	0.1001	0.180	0.1191	0.432	0.0756*	0.070
Inverse Mills Ratio	-		-		0.1445**	0.025
Constant	-1.0058***	0.000	-2.9362	0.000	-0.7188***	0.002
No. of Observations	Left-Censored=247 Uncensored=235		482		Left-Censored=247 Uncensored=235	
Wald: Chi^2	148.83***		235.91***		876.54***	
Pseudo R^2	-		0.1863		-	

P-Values in parentheses: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Authors Computations from Study Data

The dependent variable was not transformed into logarithmic form while the independent continuous variables were transformed in natural logarithmic form yielding a level-log model. As such the estimated coefficients were interpreted based on the semi-elasticity model. The results presented on Table 7 were consistent across all the three models in terms of the coefficient signs and to some extend the statistical significance of the coefficients. However, the coefficients had different magnitudes across the models. Above all, the coefficient of the inverse mills ratio in the Heckman model was positive and statistically significant at 5 per cent level of significance indicating presence of sample selection bias thus validating the Heckman sample selection model. Therefore, the discussion of the study findings was based on the results obtained from the two-step Heckman sample selection model.

The coefficient of total factor productivity (TFP) was positive and statistically significant at 1 per cent in the Heckman sample selection model. The coefficient had a value of 0.0351 which implied that a percentage increase in firms' TFP resulted to 0.000351 units increase in firms' export intensity on average, holding all other factors constant. This meant that firms with higher levels of TFP exported a larger share of their total sales hence the need to improve firm-level TFP. The positive effect of TFP on firms' export intensity can be explained by the concept of sunk costs. Since there exist huge entry costs (sunk costs) in to export markets, only more productive firm can overcome these cost and enter international markets (Roberts & Tybout, 1997). Once they enter these markets, if they maintain or improve their productivity levels, the highly productive firms have the capacity to produce and export more compared to the less productive firms. These results are consistent with existing vast empirical evidence on the effect of TFP on export behavior of manufacturing firms such as (Bigsten & Gebreeyesus, 2009; Haidar, 2012; Okado, 2013; Dong, Kokko, & Zhou, 2022; Camino-Mogro, Ordeñana-Rodríguez, & Vera-Gilces, 2023).

The coefficient of foreign ownership was positive and statistically significant. For the Heckman model, the coefficient had a value of 0.4281 which implied that the share of exports in total sales was on average 0.4281 more for foreign owned firms compared to domestic firms all else being equal. This can be associated to superiority of foreign firms in terms of direct access to information and marketing networks regarding foreign markets, managerial expertise, access to superior technology and financial resources in general than enhance their export performance (Krammer, Strange, & Lashitew, 2018; Dong, Kokko, & Zhou, 2022). These results are consistent with Okado (2013) for Kenya; Chebor (2020) for Kenya and Dong and Zhou (2022) for China.

In addition to analyzing the independent effect of foreign ownership and TFP on export intensity, the study incorporated an interaction term between TFP and foreign ownership to capture the moderating effect of foreign ownership on the effect of TFP on export intensity. The results indicated that the coefficient was negative and statistically significant at 5 per cent with a value of -0.0342. This implied that although highly productive and foreign firms independently had a higher share of exports in total sales, the effect of TFP on export intensity was lower for foreign firms compared to domestic firms. As such domestic firms have more room for improvement in terms of enhancing their TFP and export intensity compared to foreign firms. These results are in line with Dong and Zhou (2022) for Chinese manufacturing firms.

In line with existing theoretical and empirical evidence, the coefficient for firm size was positive and statistically significant at 1 per cent. With a value of 0.0632 for the Heckman model, a percentage increase in the number of workers by a firm increased export intensity by 0.000632 units on average, ceteris paribus. This can be associated to the economies of scale advantages that large firms enjoy and are thus able to produce and export a larger share of their sales. More so, large firms are highly capital intensive, can afford advanced technology, possess intangible assets such as patents and goodwill thus enjoy competitive advantage compared to small firms in international markets. These results support existing empirical evidence on the same such as (Fonchamnyo, 2014; Reis & Forte, 2016; Chebor, 2020; Dong, Kokko, & Zhou, 2022; Camino-Mogro, Ordeñana-Rodríguez, & Vera-Gilces, 2023).

The coefficient for firm age was positive and statistically significant at 5 per cent for the Heckman model with a value of 0.0361. This implied that, holding other factors constant, a percentage increase in firm age led to an increase in export intensity by 0.000361 units on

average. This could be associated with the increased experience in the international markets which is directly proportional to the firms' age. Older firms are more experienced hence they have more knowledge and connections regarding the markets thus they may enjoy higher international market shares compared to inexperienced younger firms. As a result, they produce more for exports. The positive relationship between firm age and export intensity corroborates with existing empirical literature (Bernard & Jensen, 1999; Bernard, Jensen, Redding, & Schott, 2007; Bigsten & Gebreeyesus, 2009; Kiendrebeogo, 2020).

The coefficient for human capital was positive and statistically significant at 1 percent. A value of 0.0298 implied that a percentage increase in the share of trained workers in a firm increased export intensity by 0.000298 units, all else being equal. The positive relationship between human capital and export intensity implies that firms possessing exceptional human capital can gain some competitive advantages, which are vital in boosting export performance. The results are in line with (Fonchamnyo, 2014; Mulliqi, Adnett, & Hisarciklilar, 2019; López Rodríguez & Serrano Orellana, 2020; Mubarik, Devadason, & Govindaraju, 2020).

The coefficient for labor productivity was negative and statistically significant at 5 percent significance level with a value of -0.0197. This implied that a percentage increase in labor productivity resulted to 0.000197 units decrease in export intensity. This implied that, in this context, labor productivity was inversely related to the firm's export intensity. The existing literature in this regard is mixed in the sense that the relationship could be either positive or negative and in some cases insignificant (Guner, Lee, & Lucius, 2010; Pham, 2015; Reis & Forte, 2016; Jakšić, Erjavec, & Cota, 2019). The negative effect of labor productivity on export intensity may arise indirectly through wages and employment levels. Economic theory suggests that workers get paid according to their marginal productivity, implying that wages are positively related to labor productivity. An increase in the marginal productivity of labor increases wage demands and since this is a cost to the firm, the firm may end up retaining few productive workers. On the other hand, the study established a positive effect of the number of workers and export intensity which implies that, a reduction in the number of productive workers may in turn reduce export intensity.

Just as in the case of export propensity, energy cost had a positive effect on export intensity. As expected, the coefficient for research was positive pointing towards high export intensity for research oriented firms. However, it was weakly significant at 10 percent significance level. The coefficient had a magnitude of 0.0464 implying that firms that engaged in research and development had a 0.0464 higher share of exports in total sales on average compared to those who did not engage in research, ceteris paribus. Engaging in research activities promotes innovation and inventions which lead to introduction of new or high quality products in the market which are more likely to enter international markets. As a result, research oriented firms become more efficient and competitive thus export a higher share of their sales. These findings support existing empirical evidence on the effect of research and development on export intensity (Rialp-Criado & Komochkova, 2017; Benfratello, Bottasso, & Piccardo, 2022).

The 2013-year dummy coefficient was positive and statistically significant at 1 percent level of significance. With a value of 0.0996 for the Heckman model, in 2013, the firms' share of exports in total sales was 0.0996 more compared to 2007, on average, holding other factors constant. This could be attributed to the economy recovery strategies that were put in place to spur the economy after the 2007-2008 post-election violence in Kenya.

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

Summary

The study sought to establish the firm-level determinants of export propensity and export intensity by manufacturing firm in Kenya. The World Bank Enterprise Survey panel data for the period 2007, 2013 and 2018 was utilized. By employing the Heckman two-step sample selection model, the study findings put forth, total factor productivity, firm size, human capital, material, energy cost and foreign ownership as positive determinants of export propensity. Export propensity was negatively influenced by labor productivity. On the other hand, export intensity was positively affected by total factor productivity, foreign ownership, firm size, firm age, human capital, energy cost and research. Labor productivity negatively influenced export intensity.

Conclusions

The self-selection hypothesis argues that total factor productivity is one of the main determinants of export performance by firms. Based on the study findings, total factor productivity is a key determinant of export performance by manufacturing firms in Kenya. Therefore, the study concludes that the self-selection hypothesis is validated by the study findings. More so, other determinants of export performance include foreign ownership, firm size, firm age, human capital, energy cost, material, research and labor productivity. Hence, to achieve the set targets regarding export promotion in Kenya, the study concludes that it's imperative to keenly focus on these variables at the firm level.

Policy Implications

Based on the study findings, several policy implications can be drawn. First the study identified total factor productivity as a key driver of export performance for Kenya's manufacturing firms. This implies that the government should support manufacturing firms in terms of TFP enhancement. This can be achieved through government support on the invention and adoption of new technologies and investment in human capital. Since new technology is very costly, firms need government support to realize this. The Ministry of Cooperatives and Micro, Small and Medium Enterprises (MSME), the Ministry of Trade, Investments and Industry and the National Treasury and Economic Planning should work together and pool resources aimed at supporting manufacturing firms to invent and adopt new technologies for productivity enhancements. Firms also need skilled workers to work with these new technologies, hence the need to invest in human capital. This can be achieved through training of workers.

Second, the study findings established a positive effect of human capital on firm's export performance in Kenya's manufacturing sector. This meant that training workers was crucial in terms of the firm's performance. Therefore, the government, through the Ministry of Cooperatives and Micro, Small and Medium Enterprises (MSME) Ministry of Education and Ministry of Trade, Investments and Industry needs to ensure that the curriculum involves training workers in the manufacturing sector as well as upgrading their skills to boost the performance of the firms. Third, based on the study findings, foreign-owned firms exhibit better export performance compared to domestic firms. The government should therefore provide a conducive business environment to encourage foreign investors in order to reap these benefits and provide positive spillovers to the domestic firms. More so, domestic firms need more support from the government to overcome the sunk costs involved in successfully penetrating and surviving in international markets.

Fourth, based on the positive effect of firm size on export intensity established by the study, the government, through the Ministry of Cooperatives and Micro, Small and Medium Enterprises (MSME) and Ministry of Trade, Investments and Industry should support MSMEs to grow and graduate into large enterprises so as to reap the benefits and enhance their export performance. Fifth, firm age had a positive effect on export intensity. This implied that, as firms stay longer in operation, they gain more experience and market access and are thus able to export a larger share of their exports. These findings imply that it is important for the government to consider supporting startups and young entrepreneurs to enable them realize their potential over time and succeed. The Ministry of National Treasury and economic Planning, the Ministry of Cooperatives and Micro, Small and Medium Enterprises (MSME) in collaboration with the Ministry of Trade, Investments and Industry should support these young enterprises through various channels like access to finance, adoption of new technology, market access, product quality as well as offering them subsidies and tax exemptions where possible.

Sixth, based on the positive effect of research on export intensity, the government should consider supporting and encouraging firms to participate in research. The government should ensure that the intellectual property rights of inventors and innovators are protected so as to motivate research. Finally, the government should invest more on renewable energy and find other means of cutting down on energy costs so as to provide a business friendly environment for the firms and consumers in general. Firms should also adopt energy efficient technologies so as to minimize their energy costs and remain competitive.

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