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Reaching Up and Reaching Out: The Impact of Competition on Firms' Productivity and Export Decisions

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Abstract

This paper investigates the effect of competition in both the domestic and foreign markets on firm productivity and export decisions using firm level data from 139 countries. Using a Sample Selection Endogenous Treatment (SSET) Poisson model that tackles both the issue of endogenous sample selection and endogenous treatment at the same time, we document robust evidence that strong competition in the domestic market propels firms to be more productive, and rising domestic competition increases firms' propensity to export. However, firms' export intensity, i.e. how much they export, is not directly influenced by competition in the domestic market. Moreover, lower competition in the foreign market increases the propensity of domestic firms to export, enlarging the set of exporting firms to firms with relatively smaller export amount.

Keywords: Productivity; Export Propensity; Export Intensity; Competition; SSET-Poisson Model
JEL: C21, J24, L25,

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1 Introduction

Competition greatly affects firms' performance. In the face of competition firms tend to react differently. Some may downsize, others may exit the market and then some firms may adopt survival tactics in order to remain in business. Over the last couple of decades, countries have become more and more integrated and this has intensified competition among them.[1] The existence of trade agreements between countries, and countries' affiliation to international bodies such as the World Trade Organization (WTO) has contributed to eliminating entry barriers and thus enhanced competition. Chen, Imbs, & Scott (2009) for example stress how openness influences competition. In recent decades, it is believed that the emergence of China in the manufacturing sector has contributed remarkably to the rise in global competition (Abraham & Van Hove, 2011).[2]

It has been well documented that competition in market economies results in the survival of the most efficient firms, whereas the inefficient firms die out resulting in the relocation of scarce resources from the less efficient firms to the most efficient firms (Bergoeing, Loayza, & Repetto, 2004; Poschke, 2010; Kilinç, 2014). In effect, competition drives prices down until they equal the marginal cost. As a result competition is argued to be the bedrock of firm efficiency and innovation.

Competition can positively impact firms, especially if it improves firms' total factor productivity growth (Nickell, 1996). Ahn (2002) stresses that the benefits of competition can be widely expressed in terms of both productive and dynamic efficiency which in a nutshell can be seen as productivity growth through innovations. The benefit of productive efficiency originates from innovations that stimulate productivity such as the introduction of new and improved techniques of production. As this is achieved, fruitful innovations will ultimately cause the level and growth rate of productivity to appreciate, thus achieving "dynamic efficiency" gains.

One of the key strategies opened to firms in their quest to sell more, be more productive and expand their horizons is proceeding to the international market in the form of exports. In entering the export market, one of the most important considerations is the level of product market competition (Melitz, 2003). In this sense, the level of competition prevailing in the foreign market can

[1] See Kahn (2000) and Shangquan (2000) for how integration and globalization affect competition in the world.

[2] This is the case as China has become more or less a "factory of the world" (Abraham & Van Hove, 2011), and has posed acute competition to manufacturing firms across the globe.

determine a domestic firm's entry or not. The foreign market consists of a large number of firms, all competing for a share of the market. With the perceived intense foreign competition, it has been largely argued that in order to survive, a firm's assessment of its capacity in the form of productivity and competitiveness is important (Melitz, 2003; Rodríguez & Rodríguez, 2005; Bernard, Bradford, Redding, & Schott, 2007).

The impact of competition on the firm and its activities has attracted much attention among researchers and policy makers. This is the case as the level of competition can determine the survival of the firms, and the economy as a whole. Despite the increase in interest in this area, specifically under researched is cross country analysis. Due to data availability, the majority of studies have concentrated on the analysis of advanced economies and mostly single country analysis (Nickell, 1996; Nickell et al., 1997; Amato & Amato, 2001; Baghdasaryan & La Cour, 2013; Buccirossi, Ciari, Duso, Spagnolo, & Vitale, 2013; Tang & Wang, 2005). As a result, studies on developing countries are very scarce. More importantly the effect of competition on productivity and other activities of the firm has not reached a consensus either theoretically or empirically (Syverson, 2004; Aghion, Bloom, Blundell, Griffith, & Howitt, 2005; Schmitz, 2005; Schmutzler, 2009; Vives, 2008) and this calls for further and detailed investigations especially with a larger sample size. In our paper, we try to fill this gap in the literature by investigating a larger number of countries (a larger number of firms for that matter) across different regions to examine the impact of competition in both the domestic and foreign markets on firms' productivity and exporting decisions.

The contribution of this study to the literature is manifold. Firstly, we utilize firm level data for a larger number of countries (139 countries with about 68,000 firms) between 2006 and 2016. To the best of our knowledge this is the largest number of countries empirically analysed with respect to the impact of competition on firms. The large sample size is deemed important as with this, we are able to make a constructive conclusion about the global effect of competition.

Secondly, we make a distinction between domestic and foreign competition. As a proxy for domestic competition, we employ the concentration measure, the Herfindahl Index which is widely used in the literature (Baghdasaryan & La Cour, 2013; Cherchye & Verriest, 2015; Valta, 2012; Xu, 2012). For foreign competition though not explored as widely as domestic competition, a handful of the existing studies have employed proxies such as import penetration, tariffs, the

number of foreign competitors in the domestic market and subjective responses of respondents' assessment of foreign competition (Kostevc, 2009; Gorodnichenko, Svejnar & Terrell, 2010; Baghdasaryan & La Cour, 2013). However, measures such as import penetration and the number of foreign competitors in the domestic market do not capture foreign competition prevailing in the foreign market. Regarding exports we believe that competition prevalent in the foreign market is more important than foreign competition in the domestic market. The propensity and intensity of exports can largely be influenced by the prevailing market conditions in the foreign country. We believe that competition in international markets is deemed more paramount in nature for local firms that are considering to export abroad as it will help them devise more informed entry strategies. What products to export and how much to export will be dictated by the prevailing market conditions- of which competition is a major part- in international markets. We argue that multinational firms located in the domestic market should be captured as part of domestic competition. In our measure of domestic competition, we consider all firms operating in the domestic economy, and this includes foreign owned firms as well. Considering foreign competition in international markets will help provide insights to local firms and governments especially in developing economies on how to enhance and sustain their export patterns. Our two measures of foreign competition show the degree of competition that domestic firms may potentially face in international markets. The subjective measure has limitations and is likely to be biased as different firms will have different opinions based on their subjective experiences. Given that the literature does not provide a smoking gun proxy that can capture competition in the foreign market, we construct two proxies based on the concentration measure, the Herfindahl Index. Our measures of foreign competition show the degree of competition that domestic firms may potentially face as they enter the foreign markets. These measurements will be discussed in section three, under data description. Our measurements of competition in the foreign market is in sharp contrast with most of the existing studies that have captured foreign competition as they consider foreign competition prevalent in the domestic market. We therefore contribute to the literature by capturing the impact foreign of competition in the foreign market.

Thirdly, we perform two main analyses- one based on the whole sample (manufacturing and service sectors combined) and the other on the manufacturing sector alone- to ascertain whether there is a difference in the impact of competition. Fourthly, we employ a methodology (Sample

Selection Endogenous Treatment (SSET) Poisson model)) by Bratti & Miranda (2011) that enables us to cater for endogeneity.

We believe the conclusion that we will draw is relevant to the literature as it will shed more light on the argument surrounding the effect of competition on firms' productivity and exporting decisions. The rest of the study shall proceed as follows; in section two we discuss both the relevant theoretical and empirical literature. Section three focuses on the data and methodological framework. Section four presents our empirical results and section five concludes.

2 Literature Review

In this section we review both the theoretical and empirical literature on how competition affects firms' productivity and their export decisions.

2.1 Theoretical Evidence

The issue of whether product market competition is healthy for productivity growth (or other economic activities) of firms has become somewhat ambiguous. The "Darwinian view" (see Porter, 1990) upholds that competition is good for productivity growth as it pushes for innovation which ensures the survival of firms. Nickell, Nicolitsas, & Dryden (1997) argue that product market competition is one of the major three external factors producing enhanced productivity performance of firms. In their study they pinpoint three main ways that competition can be good for the firm. Firstly, a competitive environment will compel managers to work harder so as to stay in business as they will be fired if they are unable to compete. Secondly, through innovations, competition could lead to cost reductions that will eventually improve profits. Thirdly, in a competitive environment, managers also work harder to improve performance as competition could drive their firms out of the market. Regarding the third point, Nickell et al. (1997) suggest that this may occur if firms do not become more productive when they face more competition as they may be unable to meet their cost/financial obligations and this can hasten the tendency for them to be driven out. As a result mangers will tend to always work harder in the face of competition to make their firms more productive.

Similarly, Aghion & Schankerman (2004) show that policies which stimulate competition can potentially drive inefficient firms out of the market, reduce cost for already existing firms and induce the entry of new efficient firms. They show that low-cost firms benefit from increasing competition as this widens their equilibrium market share. In a competitive environment, the

market will send clear signals to firms regarding the kind of products to produce, the quality to choose, and the price to charge.

As the Darwinians regard competition to be good for the firm, in the Schumpeterian view, competition can have adverse effects on firms by deterring innovation. Successful innovators are less profitable when there is more competition in the market, resulting in less motivation for innovation (Aghion et al., 2005). It is monopoly rents that drives firms into investing in research and development (R&D). Competition however erodes the rent (Griffith & Harrison, 2010). Globally, competition policies are basically targeted at curtailing the dominance of single firms (monopoly) or to prevent collusive agreements among firms (Amin, 2011). When firms face little or no competition, they are able to increase their profits and this helps them to expand their production lines and invest in innovative activities. In the face of tough competition, firms may be unable to engage in these activities as higher levels of competition can lead to lower profit levels, as profits are now shared across a larger amount of firms. Therefore, their ability to innovate dwindles. It is argued in other studies that competition can deter productivity. For example Horn, Lang, & Lundgren (1994) argue that intense product market competition reduces managers expected income and therefore reduces their managerial effort, hence reducing productivity. Schiffbauer and Ospina (2010) claim that in an environment of intense competition the expected durability of innovation reduces and this kills the incentive to innovate.

In a typical economy, competition among firms can be viewed from two main strands; i) one emanating from domestic firms, thus domestic firms posing competition among themselves, ii) foreign owned firms (multinational firms) in the domestic market posing competition to locally owned firms in the same market, and foreign firms abroad posing competition to domestic firms from other countries. For the second strand, this may happen in two ways; one is through imports from foreign firms posing competition to domestic firms in the domestic market. The other is domestic firms (exporters) facing competition in foreign markets. A key focus of our paper is to consider the latter form of competition, i.e. domestic firms (exporters) facing competition in foreign markets. Foreign firms enter the domestic market for several reasons; for investment diversification, profitability, access to new markets among other reasons. Competition through innovation (the introduction of new products, and new and better ways of doing things) has been a major tool to achieve these goals especially in economies that already had some firms in the

industries the foreign firms enter. In this regard, Markusen & Venables (1999) point that competition posed by foreign owned firms to local firms crowds out domestic investment. In this case foreign competition in the domestic market will deter local firms from investing in for instance technology or equipment that will enable them to be more productive. Nonetheless Görg and Greenaway (2004) find that local firms may increase investment in cutting edge technology and innovate more when faced with competition from foreign firms. Supporting their study, Schmitz (2005) demonstrates how iron ore producers in the US improved their productivity levels substantially and became more innovative due to competition from Brazilian producers. The description given above pertains to foreign competition in the domestic market, however in the current paper we focus on foreign competition in the foreign market. As far as we are aware we are the first study to investigate the impact foreign of competition in the foreign market and how this type of competition impacts firms' productivity and exporting decisions. This is a significant contribution to the literature.

Often when firms are exposed to a changing competitive environment they improve their productivity to safeguard their survival. It is likely for firms that have their productivity growth enhanced as a result of market competition to generate output growth and improvements in their export performance. In relation to competition, we can summarize the theoretical underpinnings of firms exporting decisions into two main hypotheses; the national champion and the domestic rivalry (Clougherty & Zhang, 2009; Bramati, Gaggero, & Solomon, 2015). The adherents of the national champion basis contend that when competition is low, national firms enjoy economies of scale which helps them increase their profits and also increase their share in the export market (Krugman 1984; Chou, 1986). Our paper finds evidence for the national champion hypothesis. However, the adherents of the domestic rivalry tend to argue that competition is good for firms, as it exerts excessive pressure on domestic firms to innovate and be productive (Sakakibara & Porter, 2001; Hollis, 2003; Clougherty & Zhang, 2009). Firms are then able to increase their market share, profit and export intensity. Porter (1990) supports this by asserting that the international market performance is stimulated by the extent of competition in domestic markets. He argues that excessive competition in the domestic market forces firms to improve the quality of their production and this facilitates the flow of positive externalities to other firms. This helps stimulate the performance of firms participating in international markets. Competition is therefore good for

the firms, and Porter (1990) suggests that firms benefit from strong domestic competition, aggressive suppliers and demanding clients.

In essence, the adherents of the national champion basis postulates a negative relationship between competition and export performance, while those of domestic rivalry basis propose a positive relationship.

Among other things that can influence domestic firms' decision to enter the export market or to increase its export intensity is product market competition. Greenaway, Sousa, & Wakelin (2004) and Poddar (2004) show that domestic firms can become more competitive through competition posed by multinational firms and also spillovers emanting from these firms. They further argue that the presence of the multinational firms stimulates competition among even local firms, and this complements their innovative activities that propels them to venture export markets. Melitz (2003) theoretically examines product market competition in the domestic market as a mechanism through which firms are exposed to trade. Exposure to trade will result in the most efficient firms entering the export market. It is argued that firms that export tend to be larger, more productive, employ more, and pay better wages relative to those that do not export (Davies & Jeppesen, 2015; McCann, 2013). Bernard, Bradford, Redding, & Schott (2007) for example argue that differences even exist between firms capable of exporting and firms which are not. Only the most productive firms are capable of overcoming the costs of venturing export markets. In this regard, Melitz (2003) argues that going into the export market is costly and that firms' decision to export occurs after they observe their productivity. Therefore firms that are able to overcome these fixed costs of exporting tend to be productive (Greenaway et al., 2004).[3] Exporting firms become even more productive in their course of exporting as they can benefit from competition and spillover effects of firms from abroad.[4]

Rodríguez & Rodríguez (2005) argue that firms' capacity to enter the export market calls for a relevant degree of competitiveness. The international markets consisting of a greater number of firms than the domestic market possesses a greater level of competition. As a result firms have to

[3] Some of these costs might include the cost of publicity to gain exposure, creating networks of distribution, expanding infrastructure, researching about the foreign market, meeting consumer demands and preferences among others (Greenaway et al., 2004).

[4] This can be explained within the framework of "learning-by-exporting" hypothesis, where firms that enter the export market gain new knowledge and skills in the export market which helps them to be more productive (Blalock & Gertler, 2004).

be more competitive as they face competition from domestic firms and largely on the international front. In this case, firms that decide to export have foremost assessed their competitiveness in the domestic market and have intensified their competitive advantage in order to survive in the international market.

Empirical studies generally find that domestic competition results in productivity growth. This evidence is supported for example by Nickell et al. (1997) for the UK, Baghdasaryan & La Cour (2013) for Czech Republic, and Kilinç (2014) for Ukraine. Other empirical studies desmonstrate that domestic competion positively impacts firms export decisions (propensity and intensity). Evidence is given by Sakakibara & Porter (2001) using data from Japan, Kostevc (2009) using data from Slovenia, Clougherty & Zhang (2009) using data from19 countries, and Bramati et al. (2015) using data from Belgium. Regarding foreign competition, as Kostevc (2009) finds it to positively influence export growth, Abraham & Van Hove (2011) show that foreign competition from the China negatively affects the export market share of OECD countries.

From the literature explained above it can be inferred competition might be good for both productivity and export performance of firms in three ways; competition propels managers and workers to be more productive, competition will enable more productive firms to increase their market share at the detriment of inefficient firms, and competition propels firms to be innovative; coming up with new products, devising better ways of doing things and also venturing into new markets.

The existing empirical literature considers only a few countries, largely as a result of the availability of data, and have also focused mainly on domestic competition without making a clear distinction between competition in the domestic and foreign markets. In this paper we attempt to fill the gaps in the literature by considering a large sample of countries (139 countries) across the world and we construct two proxies based on the concentration measure, the Herfindahl Index, to capture competition in the foreign market. Our measures of foreign competition show the degree of competition that domestic firms may potentially face as they enter the foreign markets. Our measurements of competition in the foreign market is in sharp contrast with the handful of studies that have captured foreign competition as they consider foreign competition prevalent in the domestic market. Regarding exports, we believe that competition prevalent in the foreign market is more important than foreign competition in the domestic market. This is the case as export

propensity and intensity can largely be sustained by the prevailing market conditions in the foreign country.

3 Data and Methodology

Under this section we describe the data, methodology and variables used in the study.

3.1 Data

We employ data from the World Bank Enterprise Survey to examine the impact of competition on firms' productivity and export decision.[5] This Survey offers a wide collection of economic data on 139 countries. Though the Survey is conducted over the period 2006-2016, it is consistent and harmonized under the World Bank's Global Methodology. As a result, the surveys in the various countries follow a similar layout based on a random stratified sampling we are therefore able to pool the data for our study.[6] The Survey covers all the major two-digit manufacturing industries classified according to the International Standard Industrial Classification (ISIC) revision 3.1. Since the Survey has been conducted in some countries more than once and many others just once, and in different years, our major focus is on countries' latest survey. After cleaning the data we ended up with 68,120 firms made up of 38,719 manufacturing and 29,401 services firms. [7]

In the Survey, firms are asked to indicate their share of sales coming from national or export sales (direct and indirect).[8] We follow Davies & Jeppesen (2015) and McCann (2013) and define a firm as an exporting firm if any of its share of sales comes from export (either directly or indirectly). From this definition, we deduce from the data that the number of nonexporting firms (52,461) exceeds that of exporting firms (15,182).[9] Also, as exporting firms account for 68 percent of the total sales of the number of firms in the data, nonexporting firms account for 32 percent.

[5] https://www.enterprisesurvey.org/portal/elibrary.aspx?libid=14

[6] The World Bank employs strata on firms' size, with the following classifications: less than 20 employees (small firms), between 20 and 99 employees (medium sized firms) and 100 and above (large firms).

[7] The version of the data we are using was last updated on 1 August, 2016. See Appendix A for further notes on the data cleaning process, and Table B.1 in Appendix B for the sampled countries and number of firms covered under each country.

[8] Where direct sales is sales from directly selling to an overseas firm or persons, and indirect sales is selling to another firm in the domestic market which will in turn export.

[9] This is not uncommon as in a typical economy, the number of nonexporting firms usually outnumber exporting firms. Similar pattern is found in Davies & Jeppesen (2015) and McCann (2013).

Graphically, we check whether our data is consistent with the theory, that exporters sell more, pay higher wages, hire more workers and perform better than non-exporters (Aw & Hwang, 1995; Melitz, 2003; McCann, 2013; Araújo & Paz, 2014: Davies & Jeppesen, 2015). Figures 1-3 show kernel density estimates of the log of sales, employment and performance (productivity) between exporters and nonexporters.

Araújo & Paz

Figure 1

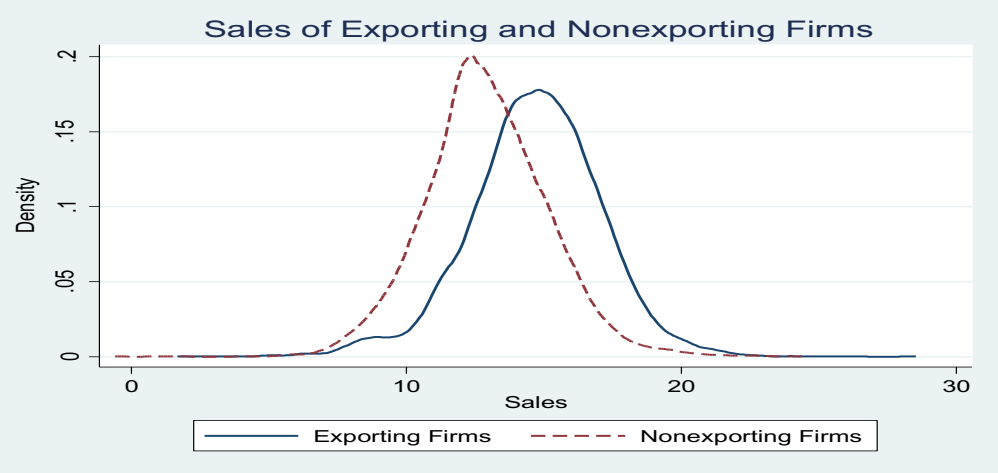
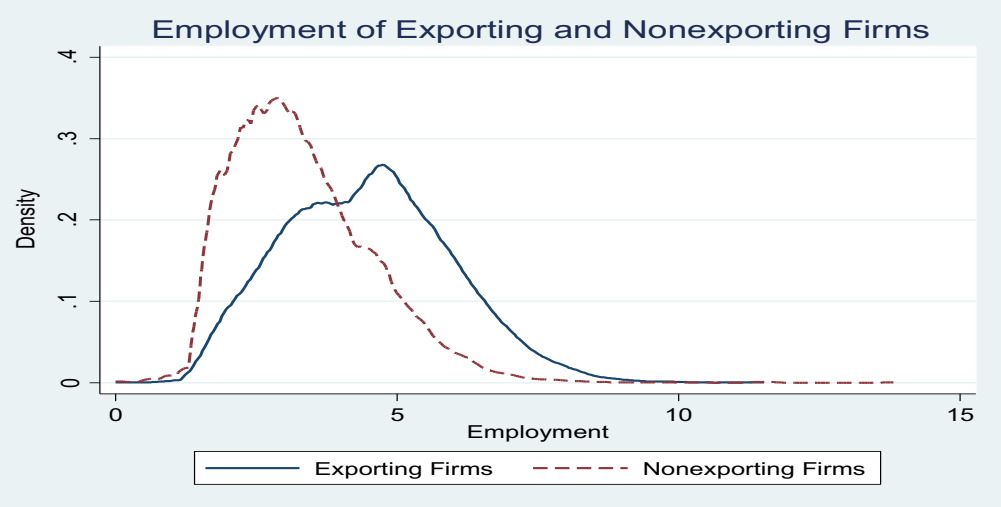
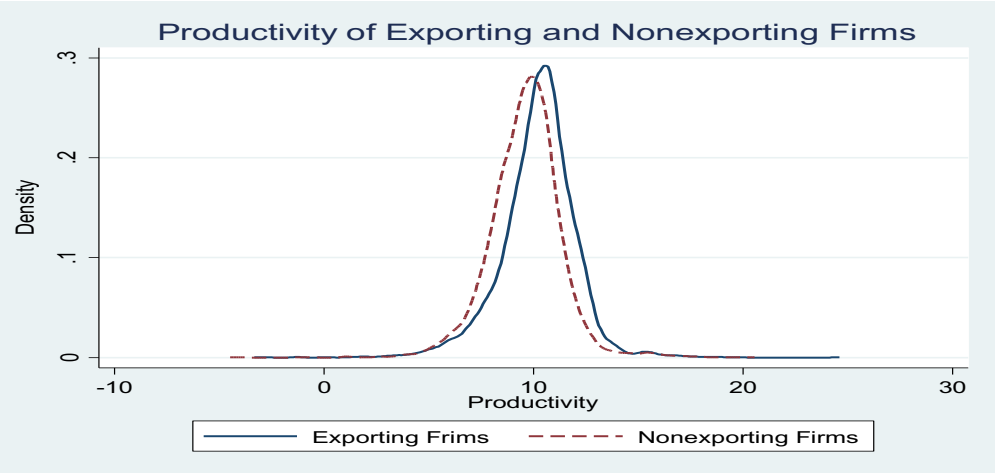


Figure 2



As can be seen and in line with the literature exporting firms sell more (Figure 1) and hire more employees (Figure 2) than that of nonexporting firms. Figure 3 plots the distribution of productivity for exporting and nonexporting firms. The distributions are more closely packed together relative to the previous estimates (Figures 1 and 2).

Figure 3



However it is again shown that the distribution of exporting firms is to the right of nonexporting firms. Essentially the kernel density estimates shown predict that exporting firms perform better.

3.2 Methodology

In estimating the effect of competition on productivity and export decision, we are concerned about the potential endogeneity bias of productivity in the export decision estimations. Productivity is not exogenous with respect to the propensity and intensity of exports. A firm can only export more if it has high productivity, and also exporting firms are more likely to be more productive (Melitz, 2003 ; McCann, 2013: Davies & Jeppesen, 2015). As a result it is largely argued that some productive firms may self-select themselves into the export market (De Loecker, 2007; Wagner, 2002; Bernard and Jensen 1999, Clerides Lach & Tybout, 1998). A number of previous studies have tackled the issue of endogeneity with the use of instrumental variables (Bernard & Jensen, 2004; Van Biesebroeck, 2005). The use of instrumental variables is challenging as it has been argued that many of the instrumental variables used may be either weak, invalid or both (Bazzi & Clemens, 2013). Bound, Jaeger & Baker (1995) argue that the instrumental variables that explain just a little variation of the endogenous variables can produce huge biases in the regression estimates.

In this paper we adopt and follow Bratti & Miranda (2011) Sample Selection Endogenous Treatment (SSET) Poisson model that tackles both the issue of endogenous sample selection and endogenous treatment at the same time.

3.2.1 The Model

Following Bratti and Miranda (2011), we develop a model for an outcome (count) variable y as a function of a dummy variable T (the treatment effect). T is an endogenous treatment if the treatment status is not random, however there are unobservable individual characteristics affecting T that also affect y. In some scenarios, a major data issue may be that a sizable fraction of the surveyed firms did not answer the export question and in that case data are missing not at random. In other instances, the researcher may have dropped some firms, and the selection criteria may be correlated with the outcome or treatment effect. We construct a second dummy that represents a selection rule S, which represents whether a firm exports or not (export propensity). The sample selection is considered potentially endogenous in the case whereby the outcome variable y of a particular firm is missing if the selection dummy (S) is zero and not missing if $S = 1$.

The endogenous treatment is denoted as T, and for our application $T =$ productivity. $T = 1$ if a firm belongs to a high productivity bracket, $T = 0$ otherwise. Since the SSET-Poisson model requires the treatment effect to be binary, we convert our productivity variable into a dummy (high or low productivity) depending on whether a firm is above a certain productivity (T) threshold or not. $T = 1$ if a firm's productivity exceeds the threshold to enter the export market ($T = 1$ if the firm is at the top x percentile of productivity in the country, where x is determined by the percentage of exporting firms in that industry in the country). $T = 0$ if a firm's productivity is below this threshold. We consider this threshold following the argument that productive firms self-select themselves to export.

The endogenous treatment and the endogenous selection dummies are given as;

$$T^* = z'\gamma + v \qquad (1)$$

$$S^* = r'\theta + \delta T + q \quad (2)$$

where $T = 1\ (T* > 0)$, $S = 1(S* > 0)$, and z and r denote a set of explanatory variables comprising the constant term. γ and θ are vectors of coefficients, δ represents the coefficient of the treatment dummy in the sample selection equation, v and q are error terms. Following Bratti and Miranda, we assume that the count y (in our case the intensity of export) is generated according to the conditional cumulative distribution function below;

$$\mathrm{F}(\mathrm{y}|\eta) \equiv \mathrm{P}(\mathrm{y}|\eta) = \begin{cases} not\ defined, & if\ S = 0 \\ \frac{[\mu^{y}\ \exp(-\mu)]}{y!} & if\ S = 1 \end{cases} \quad (3)$$

where

$$\mathrm{y} = \begin{cases} missing & if\ S = 0 \\ 0,1,2,\ldots & if\ S = 1 \end{cases}$$

where $P(.)$ represents the 'probability of', η is a random variable denoting unobserved individual firm heterogeneity, and $\mu \equiv \mathrm{E}[y \mid x, T, \eta]$. A loglinear model is used to specify the conditional mean of y given S, T, and η:

$$\ln(\mu) = x'\alpha + \gamma T + \eta \qquad (4)$$

where x denotes a vector of explanatory variables, α is a vector of conformable coefficients, and γ represents the coefficient of the treatment equation of the main outcome variable y. Correlation among T, S, y is permitted by imposing the following structure on the residuals of (1) and (2),

$$\nu = \lambda_1 \eta + \zeta \qquad (5)$$

$$q = \lambda_2 \eta + \xi \qquad (6)$$

where ζ and ξ are idiosyncratic error terms and λ_1 and λ_2 are free factor loadings to be estimated with the other parameters. For the model to close, the covariates are required to be exogenous and some distributional conditions have to be imposed;

$$D(\eta|\mathrm{x}, \mathrm{z}, \mathrm{r}, \zeta, \xi) = D(\eta) \qquad (C1)$$

$$D(\zeta|\mathrm{x}, \mathrm{z}, \mathrm{r}, \eta) = D(\zeta|\eta) \qquad (C2)$$

$$(\xi|\mathrm{x}, \mathrm{z}, \mathrm{r}, \eta) = D(\xi|\eta) \qquad (C3)$$

$$\zeta \perp \xi|\eta \qquad (C4)$$

where D(.) stands for 'distribution of'. $C1$ denotes the conventional random effects assumption, which requires the unobserved individual heterogeneity term η to be independent of all covariates in the system and as well as of the errors ζ and ξ. Together, $C1 - C3$ ensure the exogeneity of all explanatory variables x, z and r. $C4$ requires the idiosyncratic errors to be independent of each other conditional on η.[10] Essentially the SSET-Poisson model builds a system of equations

[10] Interested readers are referred to Bratti and Miranda (2011) for more details of the SSET Model.

containing equations for the treatment effect (T), the selection dummy (S) and the outcome (y). The model implies the correlations below between the error terms in y, T and S.

$$\rho_{y,T} = \frac{\lambda_1 \sigma_\eta^2}{\sqrt{\sigma_\eta^2(\lambda_1^2 \sigma_\eta^2 + 1)}} \quad (7)$$

$$\rho_{y,S} = \frac{\lambda_2 \sigma_\eta^2}{\sqrt{\sigma_\eta^2(\lambda_2^2 \sigma_\eta^2 + 1)}} \quad (8)$$

$$\rho_{S,T} = \frac{\lambda_1 \lambda_2 \sigma_\eta^2}{\sqrt{(\lambda_1^2 \sigma_\eta^2 + 1)(\lambda_2^2 \sigma_\eta^2 + 1)}} \quad (9)$$

When $\rho_{y,T} = 0$, the treatment dummy, T, is an exogenous variable in the main response equation. In the same vein, if $\rho_{y,S} = 0$, sample selection is exogenous in the main response equation. However, if $\rho_{y,S} \neq 0$, sample selection is endogenous.

In the models we estimate, the vector z in the endogenous treatment equation in (1), contains the following explanatory variables; competition, firm age, firm size, manager experience, ownership, quality certificate and affiliation to a larger firm. The vectors r and x in (2) and (4) contain all the variables in vector z in addition to productivity (T) and the fraction of exporters in an industry. Competition is sub-divided into domestic and foreign competition.[11]

Bratti and Miranda's SSET-Poisson model uses maximum simulated likelihood which enables the model to obtain correct standard errors. At convergence Eicker-Huber-White robust standard errors are computed.

3.3 Variable Description

3.3.1 Dependent Variable

Based on our objective, and the SSET-Poisson model, three dependent variables are employed. The first dependent variable is productivity (T), and the other two based on export decision are export propensity (S) and export intensity (y).

In firm productivity estimations, one of the challenges has been how productivity should be measured. The argument has largely been between the use of labour productivity and other

[11] Description of the variables are given in the next sub-section.

technological efficiency measures such as total factor productivity. However, due to data limitations we are unable to use the latter. We therefore employ the former due to its wide use and also ease of computation given our data (Amin, 2015; Buccirossi et al., 2013; Syverson, 2011). We compute labour productivity as total sales divided by the number of full time employees.[12] As explained earlier, for the productivity variable to fit the SSET-Poisson model, we convert it into a dummy variable; high and low productivity brackets.

We measure firms' export decision in two ways; export propensity and export intensity (Bernard & Jensen, 2004; Bramati et al., 2015; Hiep & Nishijima, 2009; Poddar, 2004; Rodríguez & Rodríguez, 2005). Export propensity (S) is a dummy variable which takes the value 1 if a firm exports and 0 otherwise. Export intensity (y) is computed as the ratio of export sales to total sales, and it measures how much a firm exports. For our paper to fit the SSET-Poisson model, we make the following adjustment; since the outcome variable has to be count data, we convert our export intensity variable to count data by multiplying it by 100 and rounding it up to the nearest whole number.

3.3.2 Explanatory Variables

Our main explanatory variable, competition, is measured in two ways: domestic and foreign competition. As a proxy for domestic competition we employ the Herfindahl Index. This measure remains the widest used proxy for competition in the literature (Baghdasaryan & La Cour, 2013; Cherchye & Verriest, 2015; Clougherty & Zhang, 2009; Giroud & Mueller, 2011; Hadlock & Sonti, 2012; Kostevc, 2009; Valta, 2012; Xu, 2012). The Herfindahl index is an indicator of market concentration of firms and therefore measures the size of a firm relative to its industry or market. The index serves as an indicator of the extent of competition among the firms. The Herfindahl index is constructed as the sum of the squares of the market shares of the firms within an industry.[13] This can be expressed as;

[12] A very precise measure of labour would be the actual number of hours employees have worked rather than the use of the total number of employees (Bartelsman, Haltiwanger, & Scarpetta, 2009). However given our dataset we are unable to control for this and hence we focus on total number of employees.

[13] Ideally the computation of the Herfindahl Index should capture all firms in the industries under consideration in the various countries. However since the dataset we employ does not contain all firms in the various industries, the number of firms is restricted to the limit of our sample as dictated by the dataset. As a result our Herfindahl index measure may not match with the actual measure for the various industries. However with this, we are still able to analyze the dynamics of competition.

$$H = \sum_{i=1}^{N_k} s_{ik}^2 \quad (7)$$

which ranges between 1/N and 1.

where H is the Herfindahl index, s_{ik} is the market share of firm i in industry k, and N_k is the number of firms in industry k in a given country. We use firms' total sales to compute the market share. The index takes account of differences in the sizes of the firms as well as the number of firms in the market. An increase in the index indicates a reduction in competition and a rise in market power, and a decrease in the index indicates a rise in competition and a decrease in market power. If the Herfindahl index is low, it indicates low concentration and a large number of firms within an industry with each firm having a small market share. The Herfindahl index therefore approaches zero in a purely competitive market with many firms. In this case competition tends to be strong. In the case of only one firm in an industry (monopoly), the firm has 100 percent share of the market and has a Herfindahl index of 1.

The normalized Herfindahl index (H^*) is given as;[14]

$$H^* = \frac{\left(H - \frac{1}{N}\right)}{1 - \left(\frac{1}{N}\right)} \quad (7.1)$$

for $N > 1$, H^* ranges from 0 to 1.

where H is the Herfindahl Index and N the number of firms. In our estimations we employ the normalized index.

Regarding foreign competition, we contribute to the literature by constructing two measures of competition (foreigncomHHI and foreignDOT) both based on the Herfindahl Index. For the first measure, foreigncomHHI, we find the share of a firm's sales to the total of sales in the same industry across the world. We compute it as follows;

$$HHI_{k,c}^{foreign} = \sum_{ć} \sum_{j} \left(\frac{sales_{j,k,ć}}{\sum_{c \neq c} \sum_{j(k)} sales_{j,k,ć}}\right)^2 \quad (8)$$

[14] In computing the normalized index, monopolistic firms will have missing values. This is the case as the denominator in (7.1) will be zero. As a result, the number of observations for the Herfindahl index may be greater than that of the normalized index. The case of one firm does not necessarily imply the country in question has only one firm in the industry, but perhaps the Survey covered only one firm in the industry.

where $HHI_{k,c}^{foreign}$ is foreign competition (foreigncomHHI), k is industry, j is foreign firm in the foreign country $ć$. $HHI_{k,c}^{foreign}$ measures the competition firm i in industry k in the domestic country c is likely to face when it goes abroad. When we compute foreign competition that firms in industry k in the domestic country face when they go abroad, we exclude sales of all firms and industries in the domestic country. We sum up all the market share of firm j, in industry k and in country $ć$.

For the second measure of foreign competition (foreignDOT), we use export weight to weight the concentration ratios of trade partners. We compute it as follows;

$$foreignDOT_{i,k} = \sum_j ExportWeight_{c,ć,k} * HHI_{j,k} \quad (9)$$

where $foreignDOT_{i,k}$ is foreign competition, c, $ć$, k are domestic country, foreign country and industry respectively, $HHI_{ć,k}$ is the Herfindahl Index of industry k in country $ć$.

$$ExportWeight_{c,ć,k} = \frac{Export_{c,ć,k}}{TotalExport_{c,k}}$$

$Export_{c,ć,k}$ denotes the export of country c to country $ć$ in industry k, and $TotalExport_{c,k}$ is total exports of country c to the world. The countries used in the computation of this measure of foreign competition are limited by the number of countries in our dataset and the availability of export data. Since we are unable to get industry specific export data, we employed country level export data from the direction of trade (DOT) dataset of the International Monetary Fund (IMF).[15]

For foreign competition though not as widely explored as domestic competition, a handful of the existing studies have employed measures/proxies such as import penetration, tariffs, number of foreign competitors in the domestic market and subjective responses of respondents' assessment of foreign competition (Kostevc, 2009; Gorodnichenko, Svejnar & Terrell, 2010; Baghdasaryan & La Cour, 2013). However, measures such as import penetration and the number of foreign competitors in the market do not capture foreign competition prevailing in the foreign market. Regarding the subjective measure we believe this could be biased as different firms will have different opinions based on their subjective experiences. We construct these two proxies of foreign

[15] In the computation we excluded the following countries as they lacked direction of trade data; Antigua and Barbuda, Bhutan, Botswana, Eritrea, Kosovo, Lesotho, Micronesia, Namibia, South Sudan, Swaziland, Timor-Leste and West Bank and Gaza.

competition (foreigncomHHI and foreignDOT) based on the concentration measure, the Herfindahl Index, to capture foreign competition in the foreign market. Our measures of foreign competition show the degree of competition that domestic firms may potentially face as they enter the foreign markets. As far as we are aware, we are the first study to explicitly consider foreign competition in the foreign market and examine how this type of competition impacts firms' productivity and exporting decisions. This is an important contribution to the literature.

Though a number of studies measuring domestic competition use the Herfindahl Index, a number of criticisms have been leveled against it. For example it has been criticized not to be an appropriate measure of competition in open economies as it only considers market concentration in domestic markets and does not necessarily cater for competition coming from abroad (Álvarez & Campusano, 2014; Kilinç, 2014). We address this limitation by constructing (8) and (9) as measures for foreign competition by adjusting the Herfindahl Index.

Following the criticisms of the Herfindahl Index, the price cost margin (PCM) (Aghion et al., 2005; Nickell, 1996) is proposed to be robust to changes in competition from abroad (Kilinç, 2014). The PCM however has also faced many criticisms.[16] Following these criticisms, Boone (2008) proposed a new measure of competition based on profit cost elasticity that caters for efficiency of firms. We are however unable to use the PCM nor the profit elasticity as our dataset lacks some substantial profit and cost variables required to compute them.

We control for a number of other variables including: firm size computed as the sum of full time permanent and seasonal employees; firm age measured as the difference between the year of survey and the year of establishment of the firm; managers' experience as years of experience in working in the particular sector/industry of the firm by the top manager; quality certificate as a dummy variable which takes the value of 1 if a firm has an internationally recognized quality certificate and zero otherwise; affiliation as a dummy variable equal to 1 if a firm belongs to a larger firm and zero otherwise; fraction of exports measured as the ratio of exporting firms in an industry to the number of firms in the industry (a measure of the effect of agglomeration or spillover); ownership is a dummy variable that indicates whether a firm is foreign owned, domestic

[16] It has been challenged on the basis that it can wrongly state the intensity of competition when there are frictions in the market, and can also generate very high values in the face of strong competition instead of low ones (Boone, 2008; Boone, van Ours, & van der Wiel, 2013; Kilinç, 2014). Besides it is known to provide misleading inferences when the industry is concentrated (Bérubé, Duhamel, & Ershov, 2012; Boone, Ours, & Wiel, 2007; Boone et al., 2013).

(private domestic owners) or state owned. Private domestic owned is used as the baseline group. We define a firm as foreign if at least 10 percent ownership is foreign, and domestic if less than 10 percent is owned by foreigners.[17] However for a particular firm, if the largest owner is the state, then we classify it as a state owned firm.[18]

Apart from the dummy variables and the competition variables, all other variables are logged in the estimations. Tables B.2 and B.3 in Appendix B present summary of the definitions of the variables and their relation with the World Bank Enterprise Survey questionnaire respectively. Since a number of the questions in the survey are in reference to the previous (fiscal) year to the survey year, our definitions and computations of variables follow same. All monetary values are originally quoted in nominal local currency units, we transform the nominal local currency unit values in two ways i) we convert the nominal values into real values by deflating by countries' GDP deflator (in 2010 US Dollar equivalence), ii) we further convert the real local currency values to a common currency (US Dollar) for easy comparison. Data on GDP deflator and exchange rate are sourced from the World Bank's World Development Indicators and the United Nations Statistics Database (UNSTATS). See Appendix A.1 under the data cleaning process for further notes. Tables B.4 and B.5 in Appendix B show the summary statistics and correlation of the variables for the whole sample (manufacturing and services combined).

4 Results and Discussion

In this section we report and discuss the results of the estimations in Tables 1-2. In Table 1, we present results for the whole sample (manufacturing and service sectors combined), and in Table 2, results for the manufacturing sector only. The existing literature tends to focus mainly on the manufacturing sector, therefore we also examine this sector in isolation. The dependent variables in the estimations are productivity (column 2), export propensity (column 3), and export intensity (column 4), respectively. The foreign competition measure we use is the foreigncomHHI.

[17] This definition is given by the World Bank Enterprise Survey.

[18] The choice of these variables are largely informed by theoretical and empirical literature (Álvarez & Campusano, 2014; Amato & Amato, 2001; Amin, 2015; Bernard & Jensen, 2004; Bramati et al., 2015; Cherchye & Verriest, 2015; Gonzalez & Lamanna, 2007; Hiep & Nishijima, 2009; Kostevc, 2009; Poddar, 2004; Schiffbauer & Ospina, 2010).

Table 1: SSET-Poisson Results (Whole Sample)

Variables	Productivity (T)	Export Propensity (S)	Export Intensity (y)
Productivity (T)		0.1230	0.9291***
		(0.0992)	(0.0637)
Domestic Competition	-0.5907***	0.1029***	-0.0303
	(0.0316)	(0.0391)	(0.0408)
Foreign Competition		0.1263***	-0.0615*
		(0.0311)	(0.0345)
Firm Age	-0.0028	0.0218**	-0.1509***
	(0.0096)	(0.0100)	(0.0090)
Firm Size	-0.0667***	0.1905***	0.0852***
	(0.0051)	(0.0054)	(0.0083)
Manager Experience	0.0574***	0.0238**	-0.0183
	(0.0096)	(0.0104)	(0.0114)
Ownership:			
Foreign	-0.0355	0.4950***	0.1010***
	(0.0227)	(0.0205)	(0.0265)
State	-0.7397***	1.1288***	0.2327**
	(0.1215)	(0.1094)	(0.1110)
Export Fraction		0.0516***	0.6649***
		(0.0519)	(0.1154)
Quality Certificate	0.3238***	0.3739***	-0.1408***
	(0.0179)	(0.0176)	(0.0211)
Affiliation	0.2080	0.0695***	0.0130
	(0.0172)	(0.0168)	(0.0185)
Constant	1.3182***	-2.8959***	2.7324***
	(0.0308)	(0.0932)	(0.1477)
Observations	62834	62837	62837
No. of Countries	139	139	139
$\rho_{y,T}$	-0.6980***	(0.0297)	
$\rho_{y,S}$	0.0756	(0.0735)	
$\rho_{S,T}$	-0.0528*	(0.0271)	

Wald chi2(39) = 12298, $Prob > chi2 = 0.0000$

Wald test for $\rho_{y,T} = \rho_{y,S} + \rho_{S,T} = 0$: $chi2(3) = 554.11$, $Prob > chi2 = 0.0000$

NB: *,**, *** denote significance at 10, 5 and 1 percent respectively. Eicker-Huber-White robust standard errors in parenthesis. The foreign competition variables used is foreigncomHHI. The correlation between the errors in the export intensity (y) and the productivity (T) equations, $\rho_{y,T}$, is statistically significant. This implies that T is endogenous with respect to y. The statistically insignificance of $\rho_{y,S}$ implies that S is exogenous with respect to y, indicating sample selection is exogenous. The statistical significance of $\rho_{S,T}$ implies that T turns out to be endogenous with respect to S.

In Tables 1-2, our measure of domestic competition in the productivity equations bears a negative coefficient and it is statistically significant at 1 percent. This is consistent in both the whole and the manufacturing sector samples. Since our measure of domestic competition is a concentration measure (the Herfindahl Index), our results imply that an increase in concentration will lead to a fall in productivity, and also a decrease in concentration will lead to a rise in productivity. Since the Herfindahl Index is inversely associated with competition, a decrease in the Herfindahl Index suggests an increase in competition. In essence, the results imply that an increase in domestic competition is more likely to propel firms to the high productivity bracket. Specifically our results suggest that firms in industries with stronger domestic competition are more likely to be in the high productivity bracket. Competition is therefore good for productivity. In the face of intense competition firms are left with no options than to innovate and become more productive. Our results are consistent with the hypothesis that intense product market competition leads to higher productivity (Baghdasaryan & La Cour, 2013; Buccirossi et al., 2013; Nickell, 1996; Nickell et al., 1997; Tang & Wang, 2005).

In the export propensity equations, the results depict positive and statistically significant estimates for the domestic competition measure in both the whole and manufacturing samples (Tables 1-2). A positive coefficient depicts a highly concentrated market which is an indication of weak competition. Our results therefore imply that low competition in the domestic market makes firms more likely to export. This outcome is largely in line with the national champion hypothesis which hypothesizes that firms are able to export in the midst of low competition in the domestic market (Krugman 1984; Chou, 1986).

Similarly we find the coefficient of our measure of foreign competition (Tables 1-2) to be positive in the export propensity equations, however only statistically significant for the whole sample. This tends to imply that low competition in the foreign market increases the tendency for domestic firms to export. Domestic firms therefore take advantage of the low competition in the foreign market to enter the export market. Largely the results point to the indication that low competition in both the domestic and foreign market increase the likelihood for firms to export.

For the export intensity equations (Tables 1-2) we however find the coefficient of the domestic competition measure to be statistically insignificant in both the whole and manufacturing samples.

Table 2: SSET-Poisson Results (Manufacturing Sample)

Variables	Productivity (T)	Export Propensity (S)	Export Intensity (y)
Productivity (T)		0.0731	0.8905***
		(0.1186)	(0.0722)
Domestic Competition	-0.5567***	0.1559***	-0.0596
	(0.0384)	(0.0483)	(0.0469)
Foreign Competition		0.0343	-0.1430***
		(0.0375)	(0.0375)
Firm Age	0.0499***	0.0145	-0.1742***
	(0.0119)	(0.0123)	(0.0133)
Firm Size	-0.0527***	0.2461***	0.0928***
	(0.0063)	(0.0066)	(0.0117)
Manager Experience	0.0425***	0.0395***	-0.0111
	(0.0119)	(0.0127)	(0.0130)
Ownership:			
Foreign	-0.1139***	0.5066***	0.1052***
	(0.0279)	(0.0257)	(0.0307)
State	-0.5083***	1.0372***	0.1565
	(0.1835)	(0.1527)	(0.1514)
Export Fraction		3.3634***	0.5970***
		(0.0600)	(0.1272)
Quality Certificate	0.4346***	0.3837***	-0.1990***
	(0.0209)	(0.0225)	(0.0240)
Affiliation	-0.0349	0.0876***	0.0129
	(0.0217)	(0.0210)	(0.0212)
Constant	0.9685***	-3.045***	2.9378***
	(0.0404)	(0.1091)	(0.1769)
Observations	35862	35862	35862
No. of Countries	139	139	139
$\rho_{y,T}$	-0.6987***	(0.0340)	
$\rho_{y,S}$	-0.0213	(0.0910)	
$\rho_{S,T}$	0.0149	(0.0376)	

Wald chi2(39) = 9214.7, $Prob > chi2 = 0.0000$

Wald test for $\rho_{y,T} = \rho_{y,S} + \rho_{S,T} = 0$: $chi2(3) = 429.89$, $Prob > chi2 = 0.0000$

NB: *,**, *** denote significance at 10, 5 and 1 percent respectively. Eicker-Huber-White robust standard errors in parenthesis. The foreign competition variables used is foreigncomHHI. The correlation between the errors in the export intensity (y) and the productivity (T) equations, $\rho_{y,T}$, is statistically significant. This implies that T is endogenous with respect to y. The statistically insignificance of $\rho_{y,S}$ implies that S is exogenous with respect to y, indicating sample selection is exogenous. The statistical insignificance of $\rho_{S,T}$ implies that T turns out to be exogenous with respect to S.

The results imply that the intensity at which a firm exports is not influenced by the competition prevalent in the domestic market. We however find negative and statistically significant coefficient for the foreign competition measure. The results therefore suggest that firms exporting to countries with high levels of competition (in their industries) will be able export more. Increases in foreign competition are therefore good for increasing exports. Our results are largely consist with Baghdasaryan & La Cour (2013) and Kostevc (2009).

In the whole and the manufacturing samples, we find the coefficient of productivity in the export propensity equations to be statistically insignificant (Tables 1-2). This implies that belonging to a high productivity bracket does not necessarily increase or decrease the likelihood for firms to export. This is sharply in contrast with the hypothesis that highly productive firms are more likely to export, that is productive firms self-select themselves to the export market. This outcome however may lean support to the other strand of the literature which hypothesizes that firms do not self-select themselves to the export market but rather become highly productive after entering the export market; learning by exporting (Blalock & Gertler, 2004). Considering the competitive nature of the export market, if low productivity firms enter the export market, they will be propelled to be productive to ensure their survival in the market. Largely consistent with the literature (Greenaway and Kneller, 2007), our results suggest that there is a more likelihood for firms in the high productivity bracket to export more. This is the case as we generally find a positive coefficient of productivity in the export intensity equations for both the whole and manufacturing samples (Tables 1-2). The prediction of the results is intuitively appealing as it argues that high productivity firms i) survive in the export market, and ii) intensify exports.

Regarding the other covariates, we find firm size to decrease the likelihood of a firm being in the high productivity bracket for both the whole and manufacturing samples (Table 1-2). This implies that as a firm's size (as measured by the total number of employees) increases, the more likely it is for the firm to be less productive. The reason for this might be that large size firms relative to small size counterparts are more likely to suffer from bureaucratic inefficiencies, improper control of workers and also less worker motivation (Diaz & Sanchez, 2008; Yasuda, 2005). For the export propensity equations, we find consistently significantly positive coefficient for firm size (Tables 1-2), implying that large size firms have high probability of exporting. Similar results are found in the export intensity equations, indicating that with increasing firm size, firms can export more. Our

results for the export propensity and intensity are largely consistent with the literature (Aitken, Hanson, & Harrison, 1997; Bernard & Jensen, 2004; Bramati et al., 2015; Roberts & Tybout, 1997; Rodríguez & Rodríguez, 2005).

In Tables 1-2, consistently we find a positive effect on the fraction of exporters in an industry (export fraction) on export propensity and export intensity in all the estimated models. The proportion of exporters in an industry measures the spill-over effect of other exporting firms in the same industry (Bramati et al., 2015). Our results imply that the more exporters in an industry, the greater the likelihood for other firms in the industry to export, and also export more due to the spill-over effect. The positive spillover effect we find is largely consistent with the literature (see Greenaway and Kneller, 2003; Greenaway, Sousa, & Wakelin, 2004; Bramati et al., 2015).

The coefficient on the affiliation variable is however generally statistically insignificant in the estimations (Tables 1-2), except in the export propensity models of both the whole and manufacturing samples that we find it to be significantly positive. The results indicate that a firm belonging to a larger firm (affiliation) does not have any statistically significant effect on the likelihood for the firm to belong to a high productivity bracket, or even intensify its export (export intensity). However, belonging to a larger firm increases a firm's propensity to export. This we think is plausible in two ways: i) if the larger firm is in a foreign country, then the firm in question may produce to supply the mother firm (company) abroad, ii) if the larger firm is an exporting firm, then the firm in question is more likely to also export. This is in line with the postulation by Bernard & Jensen (2004) that exporting firms are more likely to belong to a larger or multiplant firm.

The coefficient on the quality certificate variable is generally positive in the productivity and export propensity equations for both the whole and manufacturing sample estimations (Tables 1-2). However the coefficient of quality certificate in the export intensity model is significantly negative. The results generally indicate that firms possessing quality certificates are more likely to be highly productive and also more likely to export, however less likely to intensify export. A firm's possession of an internationally quality certificate is an indication that the firm meets some global quality standards, and this sends good signals to existing and potential customers (Tang & Yifan, 2012). This therefore helps boost their productivity and export propensity. It is also expected that such firms will be able to also sell more abroad (Davies & Jeppesen, 2015). However

our results indicate otherwise. We believe that the high cost of acquiring the quality certificate that may translate to the prices may account for this outcome. Since acquiring quality certificate can be costly, producers may shift this cost to prices of their products thereby making prices relatively high. The high prices may form a barrier for consumers and hence reduce the quantity they consume, hence the quantity firms export.

In the estimations (Tables 1-2) for both the whole and manufacturing samples the coefficient on manager experience is statistically positive in the productivity and export propensity equations. The ability of managers to manage well and be innovative has a direct influence on the productivity and the propensity to sell abroad. To export and where to export to are largely managerial decisions. Our result is consistent with Love, Roper, & Zhou (2016). The results however indicate that for both whole and the manufacturing samples, the experience of managers does not affect the intensity of export, this is reflected in the statistically insignificant coefficient of manager experience. This is the case as how much to export may largely be determined by other factors-such as firm's productivity and competition abroad-rather than the manager's experience.

The effect of age produces mixed results just as found in the literature (Bramati et al., 2015; Hiep & Nishijima, 2009; Love et al., 2016; Niringiye & Tuyiragize, 2010; Roberts & Tybout, 1997; Yasuda, 2005). Though in the whole sample (Table 1) we find the coeeficient of age to be statistically insignificant in the productivity equation, it is significantly positive in the manufacturing sample (Table 2). Regarding the export propensity equation, we find the coefficent of age to be positve in the whole sample and statiscally insignificant in the manufacturing sample (Tables 1-2). For export intensity equation, the coefficent of age is largely negative for both whole and manufacturing samples, implying that greater age is seen to generally reduce export intensity. It is expected that older firms may have time to establish and build linkages both home and abroad and that will benefit them in relation to productivity and exports. Older firms may also acquire enough knowledge and experience that will help them improve. However the reason for our mixed effect results may be explained by the fact that matured or aged firms may rely on their past experience, knowledge and old equipment at the expense of current trends, technology and equipment. Relatively younger firms take advantage of the order of the day and may invest more in current and efficient ways of doing things (Love et al., 2016; Niringiye & Tuyiragize, 2010; Yasuda, 2005).

Generally we find that both private foreign and state owned firms are less likely to be in the high productivity bracket relative to private domestic owned firms in the estimations for both the whole and manufacturing samples (Tables 1-2). In essence private domestic owned firms are more likely to be highly productive. It can be the case that the private domestic firms possess some home advantages-such as access to credit, ability to recruit more qualified workers, better understanding of consumer demands, and possession of distributional networks among others- over private foreign owned firms. State owned firms are likely to suffer from inefficiencies that will inhibit its productivity relative to private domestic firms.

A number of studies (Poddar, 2004; Rodríguez & Rodríguez, 2005) suggest that ownership structure of firms matters for the export decisions of the firms; that is, the likelihood to export and how much to export. It is largely upheld that foreign owned firms have high probability of exporting relative to privately domestic and state owned firms. The essence of private foreign owned firms is seen in the advantages of proprietary information, access to marketing/sales networks and adherence to standards. Our results are largely in support of the literature (Aitken et al., 1997; Poddar, 2004; Rodríguez & Rodríguez, 2005) as in the estimated models we find foreign owned firms to be more likely to export and intensify its export relative to privately domestic firms. State owned firms are also generally found to be more likely to export compared with private domestic owned firms. The results of the state owned firms are not surprising as the state runs most of the investment promotion programmes and its own firms are likely to benefit more. With the help of the government, state owned firms can bear more of the cost involved in exporting relative to private domestic owned firms. Though it is more likely for state owned firms to intensify its export in the whole sample estimation, the coefficient of export intensity is found to be statistically insignificant in the manufacturing sample estimation. This can be explained by inefficiencies that can befall state owned firms.

We also perform the analyses using foreignDOT as the foreign competition measure. Using this measure the sampled countries are reduced to 127 countries. Qualitatively the results are consistent with the estimations based on foreigncomHHI.[19]

[19] To preserve space we do not report the results. The results can however be made available upon request.

5 Concluding Remarks

This paper contributes to the continuing debate on the effect of product market competition on firm performance by specifically analyzing the impact of competition (both domestic and foreign) on firm productivity and export decision (export propensity and intensity) for a large cross section of countries using firm-level data from the World Bank Enterprise Survey. We make analyses for a large number of countries and firms (about 68,000 firms in 139 countries), and examine how the effect of competition differ between the whole (manufacturing and services sectors combined), and the manufacturing sector samples. We construct both our domestic and foreign competition measures based on the Herfindahl Index. The methodology (Sample Selection Endogenous Treatment Poisson model) employed in the paper as developed by Bratti and Miranda (2011) is the one that simultaneously caters for endogenous treatment effect and sample selection. For this methodology we adopted, we converted our productivity measure into a dichotomous variable; low and high productivity brackets, and also our outcome variable (export intensity) into a count variable.

Generally we find that strong competition in the domestic market propels firms to be more productive. Hence we find evidence that domestic competition is good for productivity. We also find that low/weak domestic competition increases firms' likelihood to export. Also, domestic competition is generally found not to affect export intensity, implying that how much a firm export is not determined by competition in the domestic market but perhaps competition in the country it is exporting to. Largely, we find low foreign competition to increase the likelihood for firms to export. However, we find high levels of competition in the foreign market to increase export intensity. Domestic firms which have entered a very competitive foreign market have to be more productive and innovative to remain in the market and also to sell. The increase in their productiveness and innovativeness can cause them to sell more in the foreign market. We also control for a number of firm level characteristics including firms' age and size, managers' experience, fraction of export, ownership, firms' affiliation to larger firms, the possession of internationally recognized quality certificate among others and we estimates generally consistent with the literature. The results are largely consistent when we divide the data into whole (manufacturing and services combined) and manufacturing sector samples.

Our results imply that one of the ways to drive firms to be productive in the domestic market is to intensify domestic product market competition. The results further imply that with high competition in the domestic market firms will be motivated to operate domestically, however low competition propels them to move out of the domestic market by exporting to other foreign markets. This is could be the case as the results depict that low competition increases both the propensity to export and also to the intensity of export. It is therefore recommended that competition policies should include those that curtail monopoly and collusive measures by some firms. This will ensure that firms compete fairly and are inspired to innovate to be productive.

Some of the limitations of the paper have been the inability to construct a more robust measure of productivity, such as the total factor productivity using the Olley & Pakes (1996) and Levinsohn & Petrin (2003), which require a dynamic model estimation and some capital and other cost measures which our data substantially lack. Furthermore due to inadequate data availability we were unable to employ other measures of domestic competition such as the price cost margin and Boone index. With availability of data and most especially data on cost variables, future and additional studies can consider these limitations to make the conclusion of the effect of product market competition on a large number of countries as ours more constructive.

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Enterprise Survey (http://www.enterprisesurvey.org), The World Bank.

Appendix A

A.1 Data Cleaning Process

Working with the data from the World Bank Enterprise Survey, we first consider how the variables have been labelled originally. We find evidence of a number of wrong and incorrect entries, like negative values where all values are supposed to be positive, and a great number of outliers in some of the quantitative variables. We therefore proceed by cleaning the data and recoding a number of wrong entries as missing values. Since most of the questions are in reference to the previous (fiscal) year, we drop firms whose year of establishment are the same as year of the survey. Using the sales variable (D2) as a reference point since we use it to compute a number of our variables including; productivity, export intensity and the competition variables, we clean the data further by dropping all observations that have missing, zero or wrong sales entries. Besides we also drop all observations with no or wrong sector/industry names. To get rid of outliers, we further drop the bottom and the highest 3 percentile based on the productivity variable. After this cleaning we end up with a sample size of 68,120 firms (consisting of 38,719 manufacturing and 29,401 services firms in 139 countries). With the cleaning process we lost about 18 and 44 percent of the latest and whole sample (all surveys) data respectively. Since there was no GDP deflator for Myanmar, we used the consumer price index (CPI). For countries such as Cambodia, Lao PDR, Papua New Guinea and Thailand, for the data on GDP deflator we used the closest year to the year of reference if we did not find data for the actual year.

Appendix B

Table B.1. Country, Years of Survey and Number of Firms (2006-2016)

AFR					
Country	Year	Freq.	Country	Year	Freq.
Angola	2010	290	Madagascar	2013	211
Benin	2009	140	Malawi	2014	335
Botswana	2010	230	Mali	2010	224
Burkina Faso	2009	361	Mauritania	2014	96
Burundi	2014	151	Mauritius	2009	368
Cameroon	2009	344	Mozambique	2007	479
Cape Verde	2009	144	Namibia	2014	323
Central African Republic	2011	140	Niger	2009	137
Chad	2009	142	Nigeria	2014	1,900
Congo	2009	112	Rwanda	2011	185
Côte d'Ivoire	2009	499	Senegal	2014	423
DRC	2013	475	Sierra Leone	2009	72
Eritrea	2009	124	South Africa	2007	935
Ethiopia	2015	740	South Sudan	2014	660
Gabon	2009	133	Sudan	2014	245
Gambia	2006	174	Swaziland	2006	302
Ghana	2013	535	Tanzania	2013	367
Guinea	2006	223	Togo	2009	140
Guinea Bissau	2006	155	Uganda	2013	450
Kenya	2013	644	Zambia	2013	623
Lesotho	2009	127	Zimbabwe	2011	590
Liberia	2009	149			
ECA			EAP		
Albania	2013	324	Cambodia	2016	362
Armenia	2013	243	China	2012	2,649
Azerbaijan	2013	247	Fiji	2009	82
Belarus	2013	283	Indonesia	2015	1,315
Bosnia and Herzegovina	2013	295	Lao PDR	2016	355
Bulgaria	2013	271	Malaysia	2015	932
Fyr Macedonia	2013	342	Micronesia	2009	61
Georgia	2013	283	Mongolia	2013	315
Hungary	2013	186	Myanmar	2014	540
Kazakhstan	2013	420	Pap. New Guinea	2015	64
Kosovo	2013	177	Philippines	2015	1,178
Kyrgyz Republic	2013	212	Samoa	2009	75
Moldova	2013	306	Solomon Islands	2015	150
Montenegro	2013	102	Thailand	2016	919
Romania	2013	470	Timor-Leste	2015	124
Serbia	2013	329	Tonga	2009	147
Tajikistan	2013	247	Vanuatu	2009	100
Turkey	2013	805	Vietnam	2015	951
Ukraine	2013	174			
Uzbekistan	2013	363			

Table A.1 (Continued)

LAC			MNA		
Country	Year	Freq.	Country	Year	Freq.
Argentina	2010	946	Djibouti	2013	212
Belize	2010	148	Egypt	2013	2,424
Bolivia	2010	206	Iraq	2011	749
Brazil	2009	1,652	Jordan	2013	548
Colombia	2010	890	Lebanon	2013	465
Costa Rica	2010	428	Morocco	2013	366
Dominica	2010	141	Tunisia	2013	580
Dominican Republic	2010	313	West Bank& Gaza	2013	410
Ecuador	2010	334	Yemen	2013	249
Elsalvador	2010	289	SAR		
Grenada	2010	141	Afghanistan	2014	116
Guatemala	2010	433	Bangladesh	2013	1,381
Guyana	2010	142	Bhutan	2015	242
Honduras	2010	257	India	2014	8,791
Jamaica	2010	317	Nepal	2013	471
Mexico	2010	1,359	Pakistan	2013	558
Nicaragua	2010	286	Sri Lanka	2011	537
Panama	2010	180			
Paraguay	2010	309			
Peru	2010	903			
St Lucia	2010	139			
St Vincent & Grenadines	2010	144			
Suriname	2010	152			
Venezuela	2010	186			
High income: nonOECD			High income: OECD		
Antiguaandbarbuda	2010	133	Chile	2010	940
Bahamas	2010	120	Czech Republic	2013	209
Barbados	2010	116	Estonia	2013	241
Croatia	2013	319	Israel	2013	436
Latvia	2013	265	Poland	2013	361
Lithuania	2013	216	Slovak Republic	2013	171
Russia	2012	2,970	Slovenia	2013	234
StKittsandNevis	2010	128	Sweden	2014	571
TrinidadandTobago	2010	327			
Uruguay	2010	474			

Data Source: World Bank Enterprise Survey (2017)

Table B.2: Variable Description

Variables	Description	Question Code[a]	Source
Domestic Competition	Herfindahl Index based on sales data	D2	World Bank Enterprise Survey
Foreign Competition 1. foreigncomHHI 2. foreignDOT	1. Based on the Herfindahl Index 2. Based on the Herfindahl Index and export data from the IMF direction of trade database.	D2	IMF and World Bank Enterprise Survey
Productivity	Firm's total sales divided by the number of full time employees.	D2, L1, L6	World Bank Enterprise Survey
Export Intensity	The ratio of a firm's export sales to its total sales	D2, D3b, D3c	World Bank Enterprise Survey
Export Propensity	A dummy variable equal to 1 if a firm is an exporter and zero otherwise.	D3b, D3c	World Bank Enterprise Survey
Firm Size	The sum of full time permanent and seasonal employees	L1, L6	World Bank Enterprise Survey
Firm Age	Difference between year of establishment of firm and year of survey.	B5	World Bank Enterprise Survey
Manager's Experience	Number of years the top manager has worked in the sector of the firms	B7	World Bank Enterprise Survey
Fraction of Export	Ratio of export exporting firms in an industry to total firms in the industry	D3b, D3c	World Bank Enterprise Survey
Quality Certificate	A dummy variable equal to 1 if the firm has an international quality certificate.	B8	World Bank Enterprise Survey
Affiliation	A dummy variable equal to 1 if the firm belongs to a larger firm.	A7	World Bank Enterprise Survey
Ownership	A dummy variable indicating whether a firm is foreign owned, private domestic or stated owned.	B2a, B2b, B2c	World Bank Enterprise Survey
Exchange rate	Official exchange rate (LCU per US$, period average)		World Development Indicators (World Bank), United Nations Statistics Database
GDP Deflator	The ratio of GDP in current local currency to GDP in constant local currency		World Development Indicators (World Bank)
Direction of Trade	Export a country to other countries.		International Monetary Fund

Source: Authors' Construct (2017). [a]The question code is in reference to the questionnaire of the World Bank Enterprise Survey. See the questions in Table B.3 below.

Table B.3: Survey Variable and Definition

Code	Definition
A7	Establishment is part of a larger firm?
B2	What percentage of this firm is owned by each of the following? B2a Private domestic individuals, companies or organizations B2b Private foreign individuals, companies or organizations B2c Government/State
B5	In what year did this establishment begin operations in this country?
B7	How many years of experience working in this sector does the top manager have?
B8	Does this establishment have an internationally-recognized quality certificate?
D2	In fiscal year [insert last complete fiscal year], what were this establishment's total annual sales?
D3	In fiscal year [insert last complete fiscal year], what percent of this establishment's sales were: D3b Indirect exports [sold domestically to third party that exports products] D3c Direct exports
L1	At the end of fiscal year [insert last complete fiscal year], how many permanent, full-time employees did this establishment employ?
L6	How many full-time temporary employees did this establishment employ in fiscal year [insert last complete fiscal year]?

Source: World Bank Enterprise Survey (2017)

Table B.4: Summary Statistics (Whole Sample)

Variable	Obs	Mean	Std. Dev.	Min	Max
Productivity	68,120	5.065	1.888	-9.400	19.953
Export Intensity	67,433	0.072	0.212	0.000	1.000
Export Propensity	67,433	0.142	0.350	0.000	1.000
Domestic Comp.	68,016	0.180	0.200	0.000	1.000
foreigncomHHI	68,120	0.255	0.218	0.009	0.971
foreignDOT	65,207	0.088	0.053	0.000	0.541
Firm Age	67,361	2.619	0.808	0.000	5.829
Firm Size	68,120	3.409	1.388	0.000	14.511
Man. Experience	66,905	2.613	0.763	0.000	4.277
Ownership	67,140	2.794	0.606	1.000	3.000
Qual. Certificate	67,118	1.752	0.432	1.000	2.000
Affiliation	66,856	1.805	0.396	1.000	2.000
Fraction of Export	67,433	0.139	0.136	0.000	1.000

Data Source: World Bank Enterprise Survey (2017)

Table B.5: Correlation of Variables (Whole Sample)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Productivity	1.000												
2. Exp. Intensity	0.054	1.000											
3. Export Prop.	0.088	0.809	1.000										
4. Dom Comp	-0.061	-0.016	-0.006	1.000									
5. foreigncomHHI	0.065	-0.057	-0.051	0.009	1.000								
6. foreignDOT	-0.026	0.005	0.024	0.022	0.141	1.000							
7. Firm Age	0.101	0.062	0.113	-0.022	-0.020	0.011	1.000						
8. Firm Size	0.097	0.264	0.293	-0.071	-0.092	-0.017	0.265	1.000					
9. Man. Exp.	0.108	0.047	0.068	0.019	-0.002	0.012	0.414	0.119	1.000				
10. Ownership	-0.115	-0.185	-0.197	-0.065	-0.012	-0.013	-0.020	-0.195	0.011	1.000			
11. Quality Cert	-0.176	-0.184	-0.236	0.061	0.072	0.001	-0.144	-0.392	-0.047	0.141	1.000		
12. Affiliation	-0.120	-0.103	-0.115	0.011	0.008	0.063	-0.083	-0.223	-0.042	0.130	0.154	1.000	
13. Fr. of Export	0.073	0.374	0.397	-0.026	-0.131	0.051	0.147	0.209	0.126	-0.098	-0.161	-0.106	1.000

Data Source: World Bank Enterprise Surveys (2017)

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