Firm Level Export Dynamics and Market Access Costs: Evidence from Kenya

By

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Abstract

This thesis examines the process through which firms contribute to variation in Kenya's exports and how a shock to market access costs influences firm dynamics of entry, exit and survival in export markets. The analysis draws on several firm level datasets including: a unique and unexplored panel of transaction level data over the period 2004-2013; a recent census of manufacturing firms; and firms' access to a duty exemptions scheme on imported intermediate inputs over the period 2004-2013. The thesis consists of four main chapters in addition to the general introduction and concluding chapters.

The first main chapter (chapter 2) presents the micro level picture of Kenya's exports and unpacks the patterns of export trade for her exporters. The analysis reveals a high degree of exporter heterogeneity in terms of export sales, number of products and number of destinations per exporter as well as a skewed distribution of export sales towards multi-product and multi-destination exporters. A decomposition framework is used to assess the contributions of firm level export adjustments along the extensive and the intensive margins to Kenya's aggregate export growth per year. We find that continuing exporters (firm intensive margin) dominate in contributions to average export growth per year. The contribution of net entry (firm extensive margin) is very small, although at the gross entry level, new entrants outperform exiters.

While the overall growth in exports is dominated by the continuing exporters, their export activity is underpinned by significant churning of destinations and products in export portfolios. In particular, there is a lot of experimentation in added and dropped destinations and products. The final section of the chapter examines the performance difference between manufacturing firms that export compared to non-exporters in Kenya. We find that manufacturing exporters are larger in terms of productivity, use more capital per worker, employ more workers, and pay higher wages compared to non-exporters, which is consistent with the findings in the literature from the rest of the world. This provides evidence in support of the fact that exporters contribute to economic growth and improvement of welfare of their workers.

The second main chapter (chapter 3) examines the patterns of entry, exit and survival of new exporters in foreign markets, along with the factors associated with their survival in export markets. We find that over the period 2005-2013, the average entry, exit and survival rates for the Kenya's exporters in international markets are 41, 38, and 62%, respectively.

These rates are comparable to those documented for exporters in developing countries and represent substantial churning of Kenyan firms through entry and exit from export markets. Looking at the trade characteristics for the exiters, we find that, on average, they are small in export value compared to new entrants and continuing exporters. Furthermore, each cohort of entering firms exhibits a very high exit rate of between 62 and 79% in the first year of entry. Both the proportional hazard approach and panel logit with fixed effects that control for unobserved firm heterogeneity are used in the analysis. Export survival is found to be higher amongst firms with larger product scope; wider geographic scope of exports and larger current export value. This suggests that a firm's own initiative as well as policy interventions to alter these determinants may foster survival and the growth of Kenya's exports.

The broad aim in the third main chapter (chapter 4) is to analyse the effect of a specific market access cost, using fragility of a destination market as an exogenous shock resulting in additional costs of entry into markets in Africa and how this alters firm's export behaviour. In particular, we examine the effect of fragility on a Kenyan firm's decision to export to a given destination market in Africa and the role of firm size in mediating the effect of fragility.

Our empirical strategy controls for endogeneity of destination choice by the firm through firm-destination country fixed effects such that the effect of destination country fragility on a firm's export decision is identified entirely along the time dimension. The analysis reveals that fragility negatively affects a firms' decision to enter a given destination market, reducing Kenya's bilateral trade through the number of firms willing to export to fragile states in Africa. An increase in a firm's size (or productivity) is found to be key mediation to market access costs, including destination fragility for the Kenyan firms. The results show that larger firms are less adversely affected by fragility and are more likely to become multi-destination exporters to the region compared to small exporters. The chapter ends with an assessment of the effect of fragility on Kenya's export trade margins and shows that the overall effect on Kenya's total exports to a given destination country is negative but insignificant. Fragility reduces the number of exporters and products traded but it increases the average export value for the continuing firms. This latter result is driven by pure selection effect as fragility causes exit of firms that are relatively small.

Finally, the fourth main chapter (chapter 5) evaluates the effectiveness of a trade policy incentive provided by the government of Kenya that promotes the use of imported intermediate inputs. Specifically, we examine the performance differences in firm export outcomes for the beneficiaries (treated) relative to the non-beneficiaries (control). Using fixed effects to address potential endogeneity, we find a positive and significant performance premium for the

importer-exporters that import intermediate inputs through the scheme relative to the control group. In particular, the importer-exporters who benefit from the incentive outperform non-beneficiaries in export value and geographic scope of exports, but there is no significant difference in the number of products exported. This result suggests that reducing the costs of inputs can help firms overcome market access costs and potentially expand the destination scope of exports that are in turn, positively correlated with survival of firms in international markets.

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Dedication

To my wife and son, Terry and Kyle Chacha. Keep moving forward with love and work.

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List of Acronyms

AVE	Ad Valorem Equivalent
BEC	Broad Economic Classification
CDF	Cumulative Distribution Function
CES	Constant Elasticity of Substitution
CGE	Computable General Equilibrium
CIF	Cost Insurance and Freight
CIP	Census of Industrial Production
COMESA	Common Market for Eastern and Southern Africa
COW	Correlates of War
CPI	Consumer Price Index
CPIA	Country Policy and Institutional Assessment
EAC	East African Community
EU	European Union
FE	Fixed Effects
FOB	Free On Board
FPD	Firm-Product-Destination
FTA	Free Trade Area
GoK	Government of Kenya
GDP	Gross Domestic Product
HS	Harmonized System
ICRG	International Country Risk Guide
ISIC	International Standard Industrial Classification
ISO	International Organization for Standardization
KAM	Kenya Association of Manufacturers
KM	Kaplan – Meier
KNBS	Kenya National Bureau of Statistics
KRA	Kenya Revenue Authority
LPM	Linear Probability Model
ME	Marginal Effects
MFN	Most Favoured Nation
NAFTA	North American Free Trade Area
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PCA	Principal Component Analysis

PH	Proportional Hazard
PPML	Pseudo Poisson Maximum Likelihood
SITC	Standard International Trade Classifications
SSA	sub-Saharan Africa
TFP	Total Factor Productivity
TRAINS	Trade Analysis Information System
TREO	Tax Remissions for Export Office
WCO	World Customs Organization
WDI	World Development Indicators
WDR	World Development Report
WGI	World Governance Indicators
WITS	World Integrated Trade Solution
WTO	World Trade Organization
US	United States
UK	United Kingdom
VAT	Value Added Tax

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Chapter 1

1. General Introduction

1.1 Background and Motivation

Export of goods and services provides a mechanism through which economies generate gains from trade liberalization and promote economic growth[1]. Trade liberalization induces efficient use of factors of production and allows firms to specialise in products for which they have a comparative advantage, thereby improving their productivity (Bernard et al., 2007; Das, Roberts & Tybout, 2007). It also raises aggregate industry productivity through a re-allocation of production towards more productive firms and increases in within firm productivity (Melitz, 2003; Pavcnik, 2002). In addition, by establishing contact with foreign buyers, exporting induces the adoption of more advanced technology, which in turn, boosts firm productivity (Bustos, 2011; Lileeva & Trefler, 2010).

The interdependence between exporting and productivity improvement has been associated with the rapid economic growth and transformation of economies as attested by the recent successes of China[2]. Emulating this faster and sustained economic growth over a long period of time is a necessary condition for achieving essential goals that people care about in sub-Saharan African (SSA) countries such as poverty reduction, employment creation, quality education, health care and a cohesive citizenry (Feyrer, 2009; Spence, 2008; Frankel & Romer, 1999).

Evidence presented to date suggests that SSA exporters record low performance, especially in manufacturing exports. This is characterized by low participation, low survival rates and high entry and exit rates in export markets (Cadot et al., 2013; Brenton, Cadot & Pierola, 2012). The high exit rates and low performance suggest the presence of high market access costs that prevent firms from surviving and growing in their export markets. An accumulation of additional evidence on trade patterns of firms at the point of export decision may be insightful

[1] The important link between trade liberalization and economic growth has been extensively discussed (Feyrer, 2009; Frankel & Romer, 1999).

[2] Annual GDP growth rate for China was approximately 10.1% per year between 1990 and 2010 (World Bank, 2011).

in guiding precise policy interventions to enhance the performance of SSA firms in international markets.

Recent advances in international trade literature have helped uncover the link between firm heterogeneity in productivity and trade. This research has been motivated by both access to micro level data and the development of new theoretical frameworks to explain a firm's decision to export. Beginning with an influential paper by Bernard, Jensen and Lawrence (1995) for the US, many other country specific studies show that exporting is a rare undertaking among firms, with only a small proportion participating in international trade (Greenaway & Kneller, 2007; Wagner, 2007). At the same time, exporters are different from non-exporters in virtually all performance measures such as value added per worker, total factor productivity, number of employees and wages paid. These differences have been found to be present even before the act of exporting (Bernard & Jensen, 1999) and have led to the development of new trade models featuring firm heterogeneity and trade (Bernard, Redding & Schott, 2003; Melitz, 2003). These models emphasize the importance of firm productivity, which varies across firms, as key in enabling firms to enter and succeed in international markets.

Building on the models of firm heterogeneity and trade, recent empirical studies using product level data have shown that exports are dominated by multi-product and multi-destination exporters (see Bernard et al., 2009 for the US; Lawless, 2009 for Ireland, Eaton et al., 2004 for France; Fernandes et al., 2016 for selected developing countries). Furthermore, within multi-product exporters, export sales are highly skewed across products (Mayer, Melitz & Ottaviano, 2014; Arkolakis & Muendler, 2010). These facts have yielded extensions to the Melitz (2003) model to account for additional features from product level data (Mayer, Melitz & Ottaviano, 2014; Arkolakis & Muendler, 2010; Eckel & Neary, 2010). These extensions maintain that firm productivity is a prerequisite to entry in exporting, but once a firm survives in export markets, its exports expand along both extensive and intensive margins which are, in turn, correlated with improvements in firm productivity (Bernard, Redding & Schott, 2011). This can potentially explain increases in aggregate productivity after trade liberalization[3].

Another set of studies focuses on understanding the decisions by firms to enter a given market and how they evolve in terms of growth in average shipments and the number of products

[3] Researchers using firm level data from developing countries document evidence that exporting can improve productivity of firms (see Van Biesebroeck, 2005 for SSA).

exported (Arkolakis, 2016; Gorg, Kneller & Murakozy, 2008; Das, Roberts & Tybout, 2007; Eaton et al., 2007). Market entry and subsequent addition of products in a destination market among export survivors is a key driver of export growth along the extensive and intensive margins (Amador & Opromolla, 2013; Eaton et al., 2007). These studies document substantial churning and exit of firms from international trade within the first year of entry. These large exits have been positively associated with higher destination market specific costs that include transportation, non-tariff and tariff barriers, fragility and its extreme variant of conflict (Martin, Mayer & Thoenig, 2008; Crozet, Koenig & Rebeyrol, 2007; Acemoglu, Johnson & Robinson, 2005) as well as demand shocks at the destination markets (Arkolakis, 2016; Chaney, 2008). More importantly, the characteristics of exiting firms indicate that they are, on average, very small in their share of export markets (Amador & Opromolla, 2013; Eaton et al., 2007). This suggests that exits are dominated by firms at the margins of zero profit productivity thresholds and they leave export markets upon falling below that threshold.

A final area of research on firm heterogeneity and trade underscores the fact that two-way traders (importer-exporters) perform even better relative to exporters only and non-exporting firms across several firm performance measures (Bernard et al., 2007). Related, a number of papers show that trade liberalization has made it possible for firms to access quality and less expensive intermediate inputs, raising firm productivity (Halpern, Koren & Szeidl, 2015; Kasahara & Rodrigue, 2008; Grossman & Helpman, 1991) and boosting export performance (Feng, Li & Swenson, 2016; Bas & Strauss-Kahn, 2014). Studies using micro level datasets have documented this fact, emphasizing the need for trade policy in developing countries to ease access to imported intermediate goods (Kasahara & Lapham, 2013).

In light of this vast and fast-growing literature on firm heterogeneity and trade, it is surprising that there are very few country specific studies in Africa. This thesis seeks to fill this gap by presenting the behaviour and patterns of exporting firms from Kenya. It examines the entry, exit and survival of new entrants into export markets[4]. It also pays attention to the effect of destination specific entry costs on a firm's decision to export to African markets as well as the effect of access to imported inputs on firm export outcomes.

[4] Exporters mean all observed traders in the customs database. We have no way to identify if an exporter is an actual producer or not.

Like other SSA countries, the government of Kenya (GoK) aspires to exploit the opportunity granted by globalization for its labour-intensive exports. A strong external sector focusing on expanded and value-added exports is viewed as a key driver to the government's growth strategy. The Vision 2030, for example, foresees an economy in which growth emanates from successful exploitation of its geographic location as a market hub for the Eastern and Central Africa (Adam, Collier & Njuguna, 2010; GoK, 2007). However, knowledge on firm level export decisions including adjustments to changes in the trade environment and performance over time is largely absent. This lack of detailed analysis of firm level exporting decisions hampers precise policy strategies to spur export led growth initiatives.

Although a number of studies have examined exporting in Kenya at the firm level (Granér & Isaksson, 2009; Rankin, Soderbom & Teal, 2006), they have relied on sample survey information. Surveys provide detailed information on firm characteristics and are useful in comparing attributes of firms with the findings from the rest of the world. However, they are often plagued by small numbers in their sample. They also miss out on much of the trade action at the firm level because they mostly lack detailed information on products traded and destination of exports.

The use of transactional level data can complement survey based studies by providing a window through which we can observe trade action at the firm level. It provides information on the full population of firms that trade as well as detailed information on products traded over time. It makes it possible to observe adjustments taking place within exporters, such as dropping of products and destinations and reduction in the volume of shipments. These adjustments are economically expected through the engine of creative destruction (Schumpeter, 1942) and in response to shocks in the trade environment (Bernard et al., 2009) but may cause dislocation of firms and re-organization of labour with potential loss of jobs and welfare implications (Spence, 2008). However, transactional level data does not provide much information on other firm characteristics, which is a major weakness.

To date, research on Kenya's export activity has not benefited from access to administrative transaction level data, which is the norm in recent empirical studies in international trade. Our access to transactional level data gives us a chance to present some of the firm level trade patterns and dynamics at the point of export decision in Kenya. In addition, transaction level data allows us to trace the entry, exit and survival of new exporters in international markets.

Information on how long or how short the duration of a trade relationship is for an average exporter may be important from a policy point of view.

Policy makers from almost all countries aim to encourage exports and entry of new exporters. This is usually accompanied by fiscal incentives geared toward promotion of exports and raising the number of new exporters as a performance metric. However, knowledge of how many of these new exporters survive in international markets remains extremely scarce for countries in the SSA and certainly for Kenya. This is surprising given that the length of survival can be considered one of the most comprehensive measures of exporter performance. This thesis makes a contribution to this literature by analysing the patterns and survival of Kenya's new exporters and the factors that determine their probability of survival in export markets.

Market access costs have been found to be persistent and vary across destination markets (Arkolakis, 2016; Chaney, 2008). Destination specific costs of entry can also vary by firm-product, which affects a firm's entry into a destination with the first product and its product scope thereafter (Arkolakis, 2016). What also matters, particularly in the case of Kenya, is fragility of the destination market. Fragility in a destination country can be viewed as an exogenous shock to the fixed costs of entering a given market. This elevates uncertainty regarding the sunk costs for the potential exporters but also may trigger exit of firms due to an increase in operation costs in the affected destination. Understanding the effect of destination fragility on a firm's export decision, including exits and the mechanisms through which firms mediate this effect is important for Kenya, a country that has some extremely fragile neighbours such as Somalia and Southern Sudan. This thesis adds to the literature exploring the role of destination country fragility in curtailing intra-regional trade in Africa.

Application of theory to precise policy interventions to alter firm performance in export markets remains a key goal of research. Indeed, international trade policy has shifted focus from lowering tariffs to facilitating market access (Kee, Nicita & Olarreaga, 2009). Evidence from matched firm-product level data show that access to imported intermediate inputs is critical to enhancing firm productivity (Halpern, Koren & Szeidl, 2015; Kasahara & Rodrigue, 2008) and boosting export performance (Bas & Strauss-Kahn, 2014). A cut in global tariffs has promoted access to a larger variety of higher quality and less expensive inputs, enabling firms to lower their marginal costs and overcome the fixed costs of serving foreign markets (Feng, Li & Swenson, 2016). In addition, most countries go a step further to grant duty exemptions on inputs, to enable firms to use more imported intermediate inputs in their production

processes. However, the evaluation of the effectiveness of these incentive schemes has been scarce, largely due to lack of data. This thesis evaluates the effectiveness of a duty exemptions scheme in facilitating access to imported inputs and its effect on firm export outcomes in Kenya.

1.2 Why Kenya?

Kenya provides an excellent case study for these types of issues for several reasons. Firstly, Kenya has a fairly diversified industrial base within Africa and does not face the natural barrier to trade that inland countries face as it has access to a deep natural harbour at the port of Mombasa. Kenya is therefore, considered a regional hub for trade within Eastern and Central Africa and the main point of entry for products destined to this market (Adam, Collier & Njuguna, 2010).

Secondly, Kenya is a resource scarce economy, which means it does not suffer from the challenges and unique shocks that afflict the management of economies that are rich in natural resources in Africa. This places the country in an excellent position to be a model case study for the behaviour of exporters from countries that are both coastal and resource scarce, whose greatest potential for growth resides in tapping the deep market opportunities granted by globalization (Collier et al., 2009).

Thirdly, Kenya's manufactured exports are largely destined for low income countries in Africa, some of which are considered fragile states such as the Democratic Republic of Congo, Burundi, Somalia and Southern Sudan. This makes the country an excellent case study for the effect of destination country fragility on firm export decisions and firm attributes that mediate the effect of destination fragility. This allows us the opportunity to account for a specific market access cost in exporting to politically fragile countries in Africa, which is very scarce in the international trade literature.

Fourth and finally, this thesis has access to Kenya's new and unique firm level transaction level panel dataset comprising both exports and imports at the product level. It also considers a recent census of manufacturing firms and data on their access to a government incentive program aimed at increasing the use of imported intermediate inputs in production of exports. These datasets grant us a great opportunity to present the micro level picture of exporting decisions for the Kenyan firms in line with the existing literature and to test some of the theoretical

predictions of the new trade models whose empirical tests have been limited by access to data in SSA countries.

1.3 Thesis Objectives

The primary objective of this thesis is to analyse the contribution of firms to Kenya's export growth and examine the role of market access costs in influencing firm export dynamics such as entry, exit and survival in export markets. It also pays attention to the effect of destination fragility-an exogenous shock to fixed costs of entry-on a firm's decision to serve a given country with exports, as well as the effect of access to imported inputs on a firm's export outcomes. There are four specific objectives in this study and each is addressed in a separate chapter in the body of the thesis.

Objective 1

The first objective is to assemble firm level trade data and the census of manufacturing firms in Kenya and document key stylized facts on the trade characteristics of exporters from Kenya. This is done in chapter 2 with three sub-objectives in mind:

- Firstly, to use a new and unexplored transaction level dataset to present a micro level picture of Kenya's exports performance and unpack the within exporter dynamics and the distribution of export trade characteristics among exporters.
- Secondly, to examine the role of firm level export adjustments along the extensive and intensive margins in explaining aggregate growth in exports at the country level. This is done to compare key stylized facts for the Kenyan exporters with the findings in the recent empirical studies using transactional level data from both developed and developing countries.
- Third and finally, to examine the performance differences between exporters and non-exporters for manufacturing firms. This section makes use of a recent census of manufacturers with a wider coverage of firms in Kenya. The findings are expected to complement those from studies using sample surveys on the performance premium of exporters in Kenya.

Objective 2

The second objective is to analyse the entry, exit and survival of new exporters, along with the factors associated with their survival in export markets. This is undertaken in chapter 3 with two sub-objectives:

- Firstly, to examine the entry, exit and survival of new entrants into export markets in Kenya. This is done by tracing the length of time until an exporter ceases to export any product outside the Kenyan border and presenting the hazard rate for the duration of trade.
- Secondly, to evaluate the factors associated with the probability of survival for the new entrants in export markets. This is done in line with the existing literature looking at the firm characteristics that foster sustained export relationships after entry.

Objective 3

The third objective is to analyse the effect of a specific market access cost, using fragility of a destination market as an exogenous shock to costs of entry into markets in Africa and how this alters firms' export decisions. This is undertaken in Chapter 4 of this thesis with three main sub-objectives:

- Firstly, to examine the effect of destination country fragility in Africa on Kenyan exporters' decision to serve that destination with exports.
- Secondly, to examine the role of firm size in the export market in mediating destination country fragility.
- Finally, in line with existing gravity models of trade, to examine the effect of destination country fragility on Kenya's trade margins (extensive and intensive margins).

Objective 4

The fourth objective is to evaluate the effectiveness of the government of Kenya's trade policy incentive scheme that promotes the use of imported intermediate inputs and its effect on firm export outcomes. This is undertaken in Chapter 5 with two sub-objectives in mind:

- Firstly, to examine the effect of access to imported inputs on a firm's export performance. Firm performance outcomes are measured in terms of the export value

per firm, the number of products per firm and the number of destination countries per firm.

- Secondly, to examine whether access to the government's duty exemptions scheme confers any additional gains in terms of exports outcome to the beneficiaries.

1.4 Relevance and Contribution of Thesis

This thesis fits into several strands of international trade literature looking at the behaviour of firms in international trade. Specifically, it is related to the literature on firm heterogeneity and trade (Melitz, 2003; Bernard, Redding & Schott, 2003), the literature on decomposition of the growth of exports into extensive and intensive margins (Amador & Opromolla, 2013; Bernard, Redding & Schott, 2009; Eaton et al., 2007) and the literature on the role of destination country specific entry costs (Chaney, 2008; Araujo & Ornelas, 2007; Rauch & Watson, 2003; Roberts & Tybout, 1997) in determining entry and survival in exports. Finally, it is related to the literature on access to imported inputs and firm outcomes (Kasahara & Rodrigue, 2008; Amiti & Konings, 2007). The following section discusses our additions to this literature.

Firstly, the literature examining firm heterogeneity and trade underscores the interaction between firm productivity and fixed costs of entry to a given destination resulting in selection of a few firms into exporting (Melitz, 2003; Bernard, Redding & Schott, 2003; Bernard & Jensen, 1999; Clerides, Lach & Tybout, 1998). A detailed review of this literature across developed and developing countries shows that exporting is a rare undertaking among firms with only a small proportion participating in international trade (Greenaway & Kneller, 2007; Wagner, 2007). Similar results have been documented for Africa (Matthee et al., 2016; Rankin, Soderbom & Teal, 2006; Van Biesebroeck, 2005; Bigsten et al., 2004) and in Kenya (Granér & Isaksson, 2009; Rankin, Soderbom & Teal, 2006) with remarkable consistency with the findings in studies from the rest of the world. However, all the previous studies on Kenya used sample survey data rather than the entire population of firms, which means their results may suffer from sample selection issues. We complement the findings from the above studies on Kenya with information from a recent census covering the entire population of formal manufacturing firms. This is a unique and richer dataset, granting a complete picture on firm heterogeneity and observed performance differences across manufacturing firms.

Secondly, access to transactional level datasets has made it possible to document additional facts about exporters. For example, multi-destination exporters have been found to be different from single-product exporters (Mayer, Melitz & Ottaviano, 2014; Bernard, Redding & Schott, 2011; Arkolakis & Muendler, 2010; Bernard, Redding & Schott, 2009). This information on exporter heterogeneity is lacking for Kenya, despite availability of a large administrative dataset to allow analysis of the performance differences across exporting firms. This thesis makes use of new and unexplored transactional data for Kenya to present stylized facts for her exporters. We are not aware of any other paper that presents Kenya's exporter trade patterns at the firm-product- and destination level using a longer panel of transaction level dataset.

Thirdly, the literature on the decomposition of firm level trade underscores the important role played by multi-product and multi-destination exporters (Amador & Opromolla, 2013; Bernard, Redding & Schott, 2009) in the year-on-year variation of a country's export growth. At the same time, this literature documents a relatively high exit rate of exporters during their first year of entry (Lejour, 2015; Cadot et al., 2013; Eaton et al., 2007). This suggests that survival of exporters in international markets is a major dimension through which export growth might be sustained. We contribute to this literature by documenting, for the first time, evidence on entry, exit and survival dynamics of new export entrants for Kenya. We also examine firm characteristics that are associated with the probability of survival in export markets for the new entrants.

Fourthly, we extend the literature on the role of destination country specific fixed costs of entry (Arkolakis, 2016; Chaney, 2008; Crozet, Koenig & Rebeyrol, 2007). Specifically, we analyse the effect of a specific market access cost, using fragility of a destination market as an exogenous shock to costs of entry into markets in Africa and how this alters firms' export decisions. Fragility, including its extreme form of conflict, is prevalent in Africa and this may impose negative spillovers on bilateral trade between neighbouring countries by raising the costs of accessing the markets. An increase in destination fragility increases the sunk costs of serving that destination. Furthermore, a breakdown in the market and legal institutions means contracts and formal trade arrangements are not properly enforced. This specific type of market friction in the destination market could be a possible explanation for the low intra-regional trade within SSA (Yeats, 1998).

Until recently, most of the analysis on the effect of fragility has been based on aggregate trade data. While these are useful in capturing the average negative effect of fragility on bilateral

trade (Martin, Mayer & Thoenig, 2008) they miss out on significant adjustments taking place at the firm level. We modify the monopolistic competition model of trade that emphasizes product differentiation and increasing returns to scale to account for fragility as an additional fixed cost of entry to fragile markets in Africa and test the predictions from this model using Kenya's firm level data. We also explore firm's attributes that mediate the effect of destination country fragility on export decisions.

A fifth and final contribution is to examine the effectiveness of enhancing firm export performance by a government incentive that makes imported intermediate inputs more accessible to manufacturing exporters in Kenya. The important role of imported inputs on firm's export outcomes has received significant focus in international trade literature (Halpern, Koren & Szeidl, 2015; Bas & Strauss-Kahn, 2014; Kasahara & Rodrigue, 2008). In addition, most countries grant duty exemptions on imported inputs to encourage use of imported intermediate inputs in firms' production processes. However, the evaluation of the effectiveness of this policy incentive is lacking, largely due to lack of access to data. Using Kenya as a case study, we examine the performance differences in firm export outcomes for the beneficiaries (treated) relative to the non-beneficiaries (control). As such we provide evidence on how trade policy can potentially assist firms to overcome market access costs and enhance export performance and survival in international markets.

1.5 Data and Data Sources for this Study

This section describes the main data used in this thesis and the sources of the same. Firstly, firm transaction level dataset is central to answering all the research objectives set out in this thesis. The transaction data contains both exports and imports over the 2004-2013 period and is obtained from the Kenya Revenue Authority (KRA) through the National Treasury-Kenya[5]. Export transaction data is used across all the four main chapters, while imported intermediate inputs, a subset, of the imports dataset is used in chapter 5. The use of transaction level dataset provides us with information on firm's trade activity (including products exported and countries it interacts with). However, the dataset does not explicitly distinguish between firms,

[5] All the data will be publicly accessible after merging and anonymized to remove firm name and other private information.

exporters, or traders as a unit of analysis which is a major weakness. In this thesis, exporters mean all observed traders in the customs database.

The second most important dataset is the census of manufacturing firms, which was obtained from the Kenya National Bureau of Statistics (KNBS) and was collected in 2010. This dataset is used in chapter two to document underlying characteristics of manufacturing exporters in comparison to non-exporters.

The third dataset contains information on firms' access to the government's duty exemptions scheme over the 2004-2013 period and is obtained from the National Treasury. It is used in chapter 5 of this thesis to examine the effectiveness of the incentive in affecting firm export outcomes. We have provided a detailed brief in the appendix on the manipulations undertaken to put together the database.

Finally, gravity variables are obtained from various sources: GDP, nominal exchange rate, consumer price indices, number of days to import and the number of documents to import are from the World Bank's World Development Indicators (World Bank, 2015); distance, common border, common language and common colonial history are from the CEPII database (Mayer & Zignago, 2011), while data on Worldwide Governance Indicators (WGI) is obtained from the World Bank's database (Kaufmann, Kraay & Mastruzzi, 2011) and used to create a proxy measure of destination country fragility in chapter 4. Detail discussion on preparation of the data is contained in each chapter and in the appendix A.

1.6 Thesis Structure

The rest of this thesis is organized as follows. Chapter 2 presents stylized facts on trade characteristics for exporters behind export flow in Kenya and examines the within exporter adjustment of export portfolio along the extensive and intensive margin associated with changes in aggregate exports at the country level. It also presents the results on the performance differences between exporters and non-exporters manufacturing firms using the most recent census data.

Chapter 3 examines the entry, exit and survival of new exporters to international markets and the factors associated with the probability of survival in international markets. The chapter makes use of both non-parametric and parametric estimation to estimate the probability that an

exporter will exit from international markets against several determining factors selected from the literature.

Chapter 4 extends the new trade literature on the role of destination specific fixed costs of entry into foreign markets. It modifies the monopolistic competition model of trade to incorporate additional costs associated with serving a fragile market with exports and tests the predictions of this model using firm level data of exporters from Kenya. It also examines the firm attributes that help mediate the negative effect of destination fragility.

Chapter 5 examines the effectiveness of enhancing firm export performance through a government incentive that makes imported intermediate inputs more accessible to manufacturing exporters in Kenya. It begins the analysis by looking at how access to imported inputs is associated with firm outcomes in exports and shows that importer-exporters generally outperform non-importers. The chapter then dwells on the population of importer-exporters that get government incentives and assesses if there is a performance premium among the beneficiaries to the scheme.

Chapter 6 draws conclusions from this thesis and discusses policy implications of the results and makes suggestions for future research.

Chapter 2

2. Exploring the Export Trade Patterns for Firms in Kenya and Differences in Performance Outcomes for the Manufacturing Exporters

2.1 Introduction

Recent advances in international trade literature have underscored the important link between firm heterogeneity and trade (Melitz, 2003; Bernard, Redding & Schott, 2003). Over the last three decades, it has become a common stylized fact that multi-product and multi-destination exporters are both prevalent and important drivers of export trade in many countries (Amador & Opromolla, 2013; Bernard, Redding & Schott, 2011; Arkolakis & Muendler, 2010; Eaton, Kortum & Kramarz, 2004). Furthermore, these types of firms exhibit much higher churning in the mix of their products and destinations and the average exports per product-destination in response to changes in the trade environment (Arkolakis, 2016; Mayer, Melitz & Ottaviano, 2014). These adjustments are central to reallocations of economic resources (i.e. labour) within the economy.

Most of the empirical evidence in support of the recent theoretical models of trade is dominated by country case studies from developed and developing countries. With the rapid advancement in international trade theory and growing access to micro-level data, it is surprising that there are very few country specific studies in Africa that look at the behaviour of multi-product and multi-destination exporters and export dynamics. Yet, to understand how policy may influence export participation and performance, it is important to obtain in-depth information about these exporters for any given country.

Trade policy and other fiscal intervention programmes may be useful in influencing exports, but ultimately the decision to start exporting and the mix of export products and destinations is taken at the firm level. Unfortunately, there is limited information on the behaviour of firms at the point of that decision in Kenya. Basic questions such as how many products a firm exports, how many countries with whom it interacts with, the value of exports and their changes over time remain unanswered.

Using a unique panel of transaction level data, this study seeks to fill this empirical gap by presenting the descriptive facts on the behaviour and patterns of exporting firms in Kenya and comparing them with studies in developing and developed economies. We ask three basic questions.

- What are the firm trade characteristics for exporters in Kenya and how do they compare with the empirical evidence from the rest of the world?
- What are the within exporter adjustments in export portfolios associated with changes in aggregate exports at the country level?
- How different are the characteristics of manufacturing exporters relative to non-exporters?

Studying a country's export flows, using transaction based data opens a window to observe exporter behaviour and several choices regarding what and where to export. The ability to observe these firm level activities comes with several policy insights. Firstly, it enables identification of adjustments taking place at the firm level in terms of entry, continuation, and exit from export markets and their effect on aggregate exports. Secondly, it is possible to isolate the role of new firms, new products, and new destinations (extensive margin) from the role of existing firms, existing products and existing destinations (intensive margin) in growth and expansion of exports. This helps to target policy in support of export diversification and export deepening. Thirdly, it is possible to observe the re-organization of firm export activity in response to changes in the trade environment, conditional upon survival.

Kenya makes a suitable case study for these types of questions in the context of SSA countries because of its industrial base, which is fairly diversified within Africa. Furthermore, Kenya is considered a regional hub for trade within Eastern and Central Africa and the main markets for her industrial exports are other low-income countries. It also shares many of the characteristics of low income countries such as exports of primary agricultural products and low technology manufacturing. This paper presents firm-product export activities for exporters from Kenya both as additional descriptive support on the multi-product models and to document region specific facts.

The main contributions of this chapter are three. Firstly, we use new and unexplored transactional data for Kenya to present a micro level picture of Kenya's export performance. We are not aware of any other papers that present Kenya's exporter descriptive facts on exports

at the firm-product- and destination level using a longer panel of transaction level dataset. Secondly, we unpack the 'within exporter dynamics' and adjustment in exports along the intensive and extensive margins in explaining the variation in overall export growth for Kenya. Thirdly, we make use of the census dataset merged with transactional level information to examine differences in firm characteristics for the manufacturing exporters in Kenya. These stylized facts are conducted in the context of the new trade literature on firm heterogeneity and trade and compares them with the latest empirical findings in both developed and developing countries. Our study adds to the very thin literature documenting these facts for the case of SSA countries (Matthee et al., 2016; Fernandes, Freund & Pierola, 2016).

The rest of the chapter is organised as follows: section 2.2 provides an overview of the theoretical and empirical evidence on firm heterogeneity and trade while section 2.3 describes the data used in this chapter and its preparation. The presentation of the micro picture of firm trade patterns is done in section 2.4. This is followed by section 2.5 that discusses the within firm export decisions that drive aggregate export growth. Finally, section 2.6 presents the performance differences between exporter and non-exporter manufacturers in Kenya, while section 2.7 concludes.

2.2 Theory and Empirical Evidence

2.2.1 Theoretical Insights

International trade literature has experienced a surge in studies using micro level datasets. Triggered by a novel paper by Bernard and Jensen (1995) for the US and replicated in many other countries (Greenaway & Kneller, 2007; Wagner, 2007), a common and standard finding is that exporting is a rare undertaking among firms with only a small proportion participating in international trade. At the same time, exporters are different from non-exporters in terms of employing more workers, paying higher wages, higher value added per worker and other performance measures. These differences have been found to be present even before the act of exporting (Bernard & Jensen, 1999).

Melitz (2003) developed a model in which interaction between fixed costs of entry and productivity heterogeneity among firms induces self-selection into an industry. The existence of firms with different labour productivity levels in equilibrium is an outcome of uncertainty

about productivity before an irreversible investment is made. Firms produce a unique horizontally differentiated product for the domestic market if productivity is above some threshold and export if their productivity is above a higher threshold. Entry into the export market requires additional fixed costs and only the most productive firms self-select into exports based on the ability to overcome costs and remain profitable. In this model, a reduction in trade costs results in a re-allocation of labour to high productivity firms, which increases their size and market share; raising the aggregate industry productivity. High profits in export markets pull in new high productivity entrants within the industry, raising the productivity threshold for market entry and at the same time causing marginal productivity exporters to exit. This explains the positive relationship between entry rate and exit rates within an industry, observable in the data (Schwalbach, 1991; Dunne, Roberts & Samuelson, 1988).

The Melitz model is highly flexible and fits the firm level trade stylized facts well, especially for the manufacturing sector. The model has also yielded numerous extensions to capture additional firm level export patterns. However, it has been criticised for being qualitatively consistent with firm-level data but too stylized to explain the same quantitatively. For example, why do some exporters sell so little in export markets despite incurring the fixed cost of entry? (Arkolakis, 2016; Mayer, Melitz & Ottaviano, 2014; Eaton, Kortum & Kramarz, 2011). In addition, Melitz (2003) focuses on firm-level data but with the availability of transaction level datasets, there is additional information on exporter product and destination scope (Arkolakis, 2016; Bernard, Redding & Schott, 2011; Arkolakis & Muendler, 2010).We highlight two ways the model has been extended to explain new facts among multi-product and multi-destination exporters.

To explain the prevalence of multi-destination exporters and their role in export growth, Chaney (2008), show that to profitably export; the exporter must be able to cover the fixed costs of entering a givendestination. Furthemore, the entry costs are shown to vary across markets. The minimum productivity (productivity cut-off) needed to export to a destination is increasing in trade costs (variable and fixed) and exporter's own production costs but is decreasing in the market size and the price level in the destination market. This implies that more productive firms are expected to be present in more markets (i.e. multi-destination exporters). The model also suggests that firms will enter markets in a specific order due to differences in productivity cut-off across markets, but empirical support for this fact has been weak (Eaton, Kortum & Kramarz, 2011; Lawless, 2009).

The Chaney model also predicts that, as firms enter more markets, aggregate export growth will come mostly from adding to sales in existing markets (intensive margin) and not from sales in new markets (extensive margin). This is because, entering and exiting firms that constitute the variation of aggregate exports along the extensive margin have lower productivity and contribute less to growth in aggregate exports relative to continuing exporters. This is especially the case where products exported have a high price elasticity of substitution since the effect of each of the trade margins (extensive and intensive) on aggregate export growth depends on that. He shows that in products with high elasticity of substitution, even if trade costs were to fall due to trade liberalization, the new entrants will only capture a small share of the market relative to their lower cost incumbents (i.e. due to differentials in the marginal costs). However, in products with low elasticity of substitution, each firm is sheltered from competition and new entrants can capture a large market share and contribute more to aggregate export growth. This model framework has relevance to this chapter in providing a basis for the dominance of the firm intensive margin (continuing exporters) over the extensive margin (new and exiting firms) in the variation of a country's aggregate exports if exported products are homogenous such as cereals rather than differentiated products[6].

Arkolakis (2016) extends the Melitz model to explain why a large number of firms export only a small amount of exports in value, despite having incurred fixed costs to enter the market. He does this by considering the effects of endogenous marketing costs in a given destination. In order to reach consumers in a country, firms must pay additional fixed costs for each potential customer to be added. In the equilibrium, he shows that smaller exporters spend less on fixed marketing costs, implying a large number of firms will export small amounts. The model also predicts that smaller exporters will grow faster after a decrease in trade costs because they are able to benefit from scale economies due to improved profitability and gains in market share.

Availability of product information is also used in Bernard et al. (2011) to modify the Melitz model to explain the behaviour of multi-product exporters. The authors develop a multi-product model in which varieties are re-interpreted as products rather than firms. The ability to produce a particular product depends upon both firm and product attributes. These very attributes, again,

[6] See Rauch (1999) for product classification into homogeneous, reference priced and differentiated products. However, we do not test this hypothesis in this thesis.

guide the decision as to whether or not to serve certain export destinations and which products to export. In this model, although productivity is a prerequisite to entry in exporting, once a firm survives, it expands in scope and scale (firm extensive and intensive margin) which are positively correlated with firm characteristics such as productivity. This model can explain increases in aggregate productivity after trade liberalization.

Related, Mayer et al. (2014) built a model of multi-product firms that highlights how competition across market destinations affects both a firm's exported product range and product mix. Using firm level data for French exporters across various destinations, they show that tougher competition in an export destination induces exporters to skew sales towards their best performing products (or core products). That act of change in product mix within the exporting firm is largely driven by the trade environment (globalization) and has implications on firm productivity. The next section summarises empirical evidence related to this chapter.

2.2.2 Empirical Literature

The use of micro level data to examine the behaviour of exporters in the mix of their products and destination has revealed several firm-level trade stylized facts. For developed economies, studies include: Bernard et al. (2007, 2009) and Bernard and Jensen (1999) for the US; Lawless (2009) for Ireland; Eaton et al. (2004) for France; and Cruesen and Lejour (2011) for the Netherlands. Recent studies on developing economies include: Iacovone and Javorcik (2010) for Mexico; Goldberg et al. (2010) for India; Arkolakis and Muendler (2010) for Brazil and Lu (2010) for China. Within Africa, however, there is limited research using micro level data. The exceptions are Cadot et al. (2013) for Malawi, Mali, Senegal and Tanzania; Fernandes et al. (2016) for several developing counties and Matthee et al. (2016) for South Africa. This section reviews some of these studies and highlights a number of key stylized facts on firm trade characteristics.

Firstly, exporting is a rare undertaking by firms across most studies in developed and developing countries[7]. The proportion of manufacturing firms engaged in exporting, relative to the entire population, is 14.6% for the U.S in 1987 (Bernard, Jensen & Lawrence, 1995), 17.4% for France in 1986 (Eaton, Kortum & Kramarz, 2004) and 29.6% for China in 2005 (Lu, 2010).

[7] See Wagner (2007) and Greenaway and Kneller (2007) for a survey of the literature.

More importantly, exporting is associated with a performance premium relative to non-exporting. Bernard and Jensen (1995, 1999) were the first to document this using the US Census data, where they show that exporters were larger, more productive, more capital intensive, more skill intensive and paid higher wages relative to non-exporters, within a narrowly defined industry. These facts have, in turn, lead into numerous empirical works seeking to disentangle whether good firm performance causes exporting (selection channel) or exporting causes good firm performance (learning channel) (see Greenaway & Kneller, 2007; Wagner, 2007 for a review of the literature). Our chapter adds to this literature documenting performance differences between exporters and non-exporters, using a recent Census data for Kenya.

Secondly, while exporters are consistently found to outperform non-exporters, use of transaction level dataset has enabled researchers to document a large degree of heterogeneity within exporters (Arkolakis & Muendler, 2010; Bernard et al., 2009). For example, multi-product exporters differ from single product exporters in that they are more productive, employ more workers and are more capital intensive (see Bernard et al., 2009, 2011 for the US; Goldberg et al. 2010 for India; Arkolakis & Muendler, 2010 for Chile and Matthee et al., 2016 for South Africa). These multi-product exporters tend to dominate exports in both developed and developing countries. In the US, for example, Bernard et al. (2009) find that in 2000, multi-product exporters (firms exporting more than one product) made up 57.8% of the population of exporters and were responsible for 99.6% of exports value.

Similarly, in Portugal, Amador and Opromolla (2013) find that multi-product exporters made up 54.7% of the population but accounted for 91% of the total export value in their sample period 1997-2005. Within SSA, Matthee et al. (2016) find for the case of South Africa that multi-product exporters made up 88.5% of the population of exporters and accounted for 98.8% of export value over the 2010-2013 period. In addition, they exploit the merged firm-transaction data to examine difference within exporters. They find that multi-product exporters were 75.3% larger, had 37% more output per worker, and paid 14% higher wages than single product exporters, but there were no significant differences in capital per worker between the two types of exporters.

Thirdly, multi-destination exporters are fewer compared to single destination exporters but they account for most of total exports in most countries (Matthee et al., 2016; Amador & Opromolla,

2013; Bernard, Redding & Schott, 2009). For example in the US, multi-destination exporters made up 36% of the population and accounted for 96.7% of total exports value in 2000 while in Portugal multi-destination exporters made up 43.3% of the population but accounted for 93.4% of total exports value (Amador & Opromolla, 2013). Matthee et al. (2016) finds for South Africa that multi-destination exporters constituted 72.4% of the population and were responsible for 98.3% of exported value. Furthermore, they find that multi-destination exporters outperform single destination exporters with the former being 79.8% larger in terms of employees, 22.8% more productive per worker, and 21% more capital intensive.

Fourthly, within multi-product exporters, export sales are skewed across products with the top ranked product accounting for up to 75% of export sales for a firm (Mayer, Melitz & Ottaviano, 2014; Arkolakis & Muendler, 2010). Amador and Opromolla (2013) points out that export product mix decision of multi-product exporters is influenced by factors such as own production costs, market entry costs (see also Arkolakis & Muendler, 2010), market structure (see also Mayer et al., 2014) and destination market size. Using transactional dataset for the Portuguese exporters over the 1997-2005 period, they found that for a three products exporter, 75% of its export sales came from the top product while the other two products accounted for the balance of 25%. In Mayer et al. (2014) firms export their top performing product (core product) to more competitive markets. Using cross-sectional data for all French exporters in 2003, they show that tougher competition shifts down the entire distribution of mark-ups across products and induces firms to skew their export sales toward their better performing products, which is in turn associated with changes in firm -level productivity[8].

This is also shown to be the case for the universe of Brazilian exporters in 2000, where Arkolakis and Muendler (2010) find that multi-product exporters dominate markets with their top products but most of their other products (fringe ones) contribute little to overall trade. They show that in every market, a small number of products account for much of a firm's exports. In their model, the existence of local entry costs for each added variety brings about economies of scope for added products within a market. This implies that low-value denominated export sales are largely shipped by multi-product exporters but they account for a small share of firm exports.

[8] When a firm skews its production towards better performing products it also allocates relatively more resources to production of those goods and raises its overall output per worker.

Fifth, the variation of exports across partner countries is driven by the extensive margin, while variation of exports over time is driven by the intensive margin (Amiti & Freund, 2010; Eaton et al., 2007). For example, in Ireland, Lawless (2009) showed that changes in aggregate exports come from changes in exports of the incumbent firms, while the contribution of new entrants and exiters was marginal. In Colombia, Eaton et al. (2007) found that almost all export expansion or contraction came from changes in sales by incumbent firms. They also show that in a typical year, at least one third to one half of all exporters were new, but their contribution to export growth was very small. This was mainly because the majority of new entrants exit within the birth year and their average sales are small relative to the incumbents. Similar results are found by Amador and Opromolla (2013) for Portugal and Amiti and Freund (2010) for China. Fernandes et al. (2016) find for several developing countries that the extensive margin explains about two thirds of the increase in exports, while the intensive margin explains the remaining third.

Sixth and lastly, there is high churning in terms of entry and exit of exporters into international markets, with only a few exporters being able to survive beyond the first year. Using cohort analysis, the literature shows that exporters that survive the first year record strong growth in their export value and increase the number of products and destination countries in their export portfolio (Amador & Opromolla, 2013; Cadot et al., 2013; Albornoz et al., 2012; Creusen & Lejour, 2011; Eaton et al., 2007; Besedeš & Prusa, 2006a). In a seminal contribution, Besedes and Prusa (2006) document for the US that trade relationships typically start small. The median duration of trade is one year. Almost half of all these small relationships end within the birth year. This is contrary to what the prediction from the Melitz-Chaney model would suppose. We would expect that once a firm absorbs sunk costs of entry, it will remain operating in that market long enough to recover the investment made.

Cruesen and Lejour (2011) explain the high entry and exit of Dutch firms in international markets to be a consequence of trial and error (experimentation) in order to obtain experience in exporting. This was also reflected in the volatility of a firm's export product portfolio. The authors found that, in fact, more volatility in product-country entry and exit is associated with a higher survival rate in the export market. Trial and error is also frequent among Argentine exporters where Albernoz et al. (2012) found that exporters start with small foreign deliveries

to test the ground. If exporting turns out to be profitable, it is ramped up along both the intensive and extensive margins.

To summarize, we identify several key stylized facts regarding trade characteristics for firms in the reviewed literature. These include the fact that exporting is an extremely rare undertaking and exporters are different relative to non-exporters; multi-product and multi-destination exporters are prevalent and account for the greater majority of exports across all jurisdictions and export sales are concentrated within products in multi-product exporters. On the export dynamics, the role of continuing exporters, selling continuing products in continuing destinations is far greater than the role of new firms and new product-country in the contribution to aggregate exports growth. Finally, new firms start to export by selling a small amount of goods and, upon surviving the birth year, they grow fast over time and contribute to the overall growth of a nations' exports. We use the Kenyan transaction level dataset to establish the consistency of these facts for exporters from an open sub-Saharan African country relative to the findings from the reviewed literature.

2.3 Data and Sources

This chapter makes use of the firm level transaction dataset focusing on the universe of exporters in Kenya and the census of manufacturing firms. In this section we describe these datasets and use them to present key stylized facts about exporters in Kenya.

2.3.1 Transaction Level Dataset

The transaction level dataset is obtained from the Kenya Revenue Authority (KRA) through the National Treasury. This is a new and unique panel data containing the overall flow of exports at the point of exit from 2004 to 2013. Each transaction contains information on the product being exported at the 8-digit Harmonized System (HS) of product classification, the month of shipment, the destination of shipment, the free on board (FOB) value in Kenya shillings, the quantity and units of measurement and the identity of the exporter.

An exporter in this thesis refers to all traders shipping through Kenya's customs, which might not necessarily be a producing firm but just a trading firm. We aggregate the monthly shipments into annual firm-product-destination (FPD) combinations and calculate the FOB

value in US dollars[9] for each FPD. In addition, to deal with the regular reclassification of the HS, the export data is rebased to the 6-digit level of the 2002 revision of the HS. This is important to avoid attributing product reclassification as either dropping or adding to the export mix. The 6-digit HS product level is considered suitable for analysing trade margins as it is comparable across countries (Matthee et al., 2016) and it does not overstate the extensive margins of trade as may be the case if a finer disaggregated level is adopted (De Lucio et al., 2011). It also does not overstate the intensive margin, as would be the case if a more aggregated level such as 4-digit HS is used.

Table 2.1 reports the average export value per exporter, the number of exporters, the number of 6-digit HS products (HS6), the number of countries and the total export value using the KRA data. For a consistency check against published data, it presents the value of exports (excluding re-exports) by the Kenya National Bureau of Statistics (KNBS) in the second last column. With the exception of 2005 and 2010, the deviations lie within 2% of the KNBS data. The customs data is therefore, reasonably consistent with the published data. It can be noted that, on average, over the sample period 2004 to 2013, 4,602 exporters, shipped 3,378 HS6 products valued at US$ 895,076 to 166 countries worldwide.

Table 2.1: Summary statistics of Kenya's exports over time

	Mean Exports in US$	Standard Dev.	# of Exporters	# of HS6 Products	# of Countries	Total in US$ mn Data	Total US$ mn KNBS	Dev. from KNBS
2004	616,775	3,536,010	3250	3006	179	2,005	2,056	-2.5
2005	686,931	4,193,324	3918	3250	172	2,691	2,899	-7.2
2006	719,102	4,201,505	4580	3439	169	3,293	3,288	0.2
2007	882,964	4,909,878	4722	3539	168	4,169	4,187	-0.4
2008	931,313	6,049,724	4563	3403	159	4,250	4,153	2.3
2009	929,226	5,617,960	4678	3354	157	4,347	4,269	1.8
2010	912,695	5,562,038	4851	3398	160	4,427	4,770	-7.2
2011	1,078,075	6,651,990	5319	3517	166	5,734	5,693	0.7
2012	1,091,542	6,658,711	5175	3456	163	5,649	5,578	1.3
2013	1,102,140	6,318,799	4968	3419	164	5,475	5,280	3.7
2004-2013	895,076	5,369,994	4602	3378	166	4,204	4,217	-0.7

Notes: Computed from the Customs data. Deviations are in % from KNBS data.

The value of exports has increased by approximately 103% over the period, rising from US$ 2,691 million in 2005 to US$ 5,475 million in 2013. This is equivalent to an annual average

9 We use nominal export values in US dollars. Conversion to US$ used end of period exchange rate. Although some studies deflate nominal exports using CPI, we see no inflationary trends in our data and we would like the descriptive to be comparable to published data. Appendix A gives the steps followed to clean and construct the database. The KNBS data is obtained from published Economic Surveys.

growth rate of 11.5%, barring the effect of price and the exchange rate. In particular, growth was strong in the period between 2004 to 2007, after which it faltered over the years 2008 and 2010, perhaps in response to the global financial crisis of 2008, before rebounding from US$ 4.5 billion in 2010 to US$ 5.7 billion in 2011 (26.7%). However, this strong recovery was short-lived as export revenue fell again to US$ 5.5 billion in 2013 (a decline of 3.6% from 2011).

The total number of exporters per year

The total number of exporters per year rose from 3,250 in 2004 to 4,722 in 2007, before declining to 4,563 in 2008. It then recovered to peak at 5,319 in 2011 before dropping again to 4,968 in 2013. Figure 2.1 shows the number of exporters from Kenya per year.

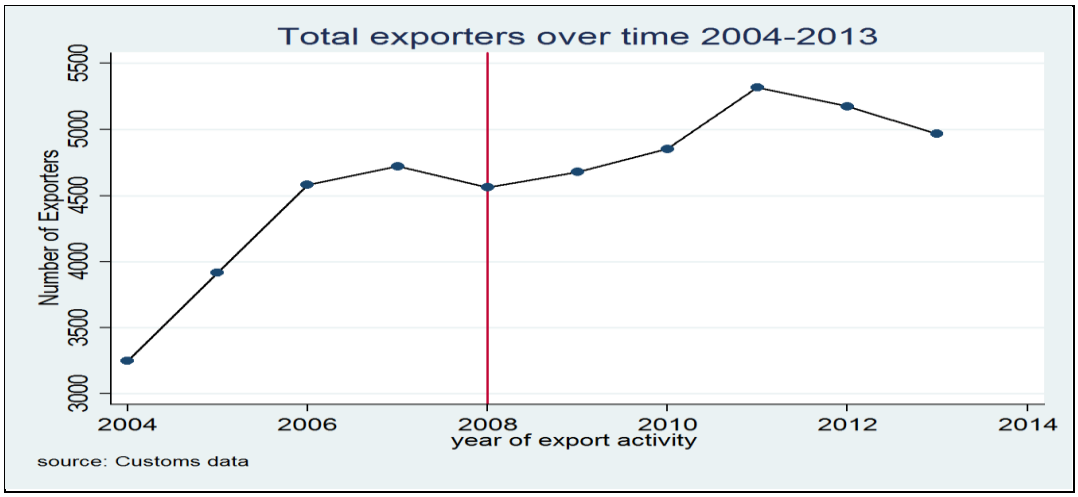


Figure 2.1: The trend in the number of exporters over time.

The aggregate numbers hide firm level entry and exit dynamics that are explored in detail in chapter three of this thesis. Comparing Kenya's population of exporters to other countries in SSA, Fernandes et al. (2016) shows that over the 2006-2008 period, Kenya had on average 5,057 exporters. This placed the country in fourth position after South Africa (21,721), Egypt (8,370) and Morocco (5,429) in their sample that includes 14 SSA countries. The reported average number of exporters by Fernandes et al. (2016) is slightly higher relative to our count of exporters for the three years (2006, 2007, and 2008) equivalent to (4,580, 4,722, and 4,563). We suspect the difference could arise due to different data cleaning schemes used[10]. However,

[10] In this study, we removed re-exports and exports to duty free shops in the cleaning process.

since they only report the average number over three years, we cannot trace the source of this discrepancy to our annual numbers.

The total number of destinations per year

From Table 2.1 the number of destination countries has reduced from 179 countries in 2004 to 157 countries in 2009 before rising again to 164 countries. The average number of destinations served over the sample period is 166 countries. However, this count of destination countries is not that informative. We instead explore the popular destination countries for Kenya's exports. Table 2.2 shows the transition in ranking of the top 15 destinations between 2004 and 2012.

Table 2.2: Transition in the top 15 destinations for exports, 2004 to 2012

Rank	2004	[%]	2012	[%]
1	UK	[13.5]	Uganda	[12.1]
2	Uganda	[10.4]	UK	[8.4]
3	Netherlands	[10.4]	Tanzania	[8.3]
4	Tanzania	[7.1]	Netherlands	[6.4]
5	Pakistan	[7.0]	UAE	[5.5]
6	Egypt	[4.0]	USA	[5.4]
7	Germany	[3.0]	Pakistan	[4.9]
8	DR. Congo	[2.6]	Sudan	[4.8]
9	India	[2.57]	Egypt	[4.4]
10	France	[2.5]	Somalia	[3.8]
11	Sudan	[2.4]	DR. Congo	[3.4]
12	USA	[2.2]	Rwanda	[2.9]
13	Afghanistan	[1.9]	Afghanstan	[2.6]
14	Somalia	[1.7]	Germany	[2.0]
15	Belgium	[1.6]	India	[1.5]

Notes: The rank is based on the share of a destination country's purchase relative to Kenya's total exports for 2004 and 2012, of US$ 2,691 million and US$ 5,649 million, respectively. The shares in % are in the squared brackets.

In terms of the popular destination for Kenya's exports, the top export destination in 2004 was the UK, while in 2012 it was Uganda. As shown in Table 2.2, the top 15 countries account for over 70% of Kenya's total exports for 2004 and 2012 indicating no significant change in aggregate concentration of exports to the top 15 countries. African countries in the list make up approximately 28.2% and 39.7% of the export market in 2004 and 2012, respectively. There are observable changes in geographical composition of exports over the two periods, although most of top 15 are in both periods. For example, the USA has moved up six places, from twelfth in 2004 to sixth in 2012. Other destinations that have moved up in ranking include Sudan,

Somalia, Uganda and Tanzania. Germany has moved down the most places from seventh in 2004 to fourteenth in 2012. Countries such as France and Belgium that were among the top 15 in 2004, have been replaced by the UAE and Rwanda in 2012.

Sectorial break down of exports

Like many non-resource rich countries in SSA, Kenya's industrial structure is dominated by agriculture and agro-based exports and low technology manufacturing exports (Adams et al. 2010). Table 2.3 shows the shares of each sector in overall export revenue for 2005 and 2012.

Table 2.3: Sectorial breakdown of exports for 2005 and 2012

HS-section	2005		2012	
	No. firms	% of value	No. firms	% of value
Live animals	162	12.3	353	5.7
Vegetables	783	28.1	826	21.6
Fats and oils	33	1.9	59	4.7
Food beverages and tobac.	346	29.9	501	35.2
Mineral products	204	9.7	334	6.9
Chemicals	386	6.7	604	9.4
Plastics	251	5.2	477	5.9
Leather	55	1.1	130	0.7
Wood	270	0.3	267	0.3
Pulp and paper	170	0.6	331	1.3
Textile and clothing	578	1.3	206	2.3
Footwear	16	0.3	20	0.1
Stone glass and cement	60	0.3	91	0.2
Jewelry	39	0.4	53	3.0
Base metals	180	1.4	268	2.1
Machinery	228	0.3	466	0.5
Transport Equipments	76	0.2	91	0.1
Optics	34	0.02	47	0.1
Arms	2	0.02	0	0
Miscellaneous	20	0.02	30	0.2
Works of art	25	0.02	21	0
Total	3,918	100	5,175	100

Note: Computed using customs data reduced to 21 sectors out of 2-digit HS classification. The total export value is US$ 2 691.7 million and US$ 5 649.5 million for 2005 and 2012, respectively.

Export value is dominated by processed food, beverages and tobacco sector followed by the vegetables sector in the two periods. The share of processed food, beverages and tobacco exports has increased from 29.9% in 2005 to 35.2% in 2012 while that of vegetables has decreased from 28.1% to 21.6% over the same period. The share of chemicals has increased

from 6.7% to 9.4%, over the two years. Textile and clothing have also risen from a share of 1.3% in 2005 to 2.3% in 2012.

2.3.2 The Census of Formal Manufacturing Firms

The second important dataset in this chapter is the census of manufacturing firms, which is a subset of the Census of Industrial Production (CIP) of 2010. This data was collected by the KNBS between the months of November 2010 to February 2011, with the reference period being 2009 (KNBS, 2013). The completion of the questionnaire was a statutory obligation to the firms, which implies the data may be of good quality. In addition, completed questionnaires were returned appended with financial returns/balance sheets conforming to the 2009/2010 financial year which signals credibility of information provided.

This dataset is a cross-section and covers all formal manufacturing firms in Kenya, estimated at 2,097 firms. It contains information such as the particulars of; economic activities and ownership structure, the number of employees, wages, production and installed capacity, inventories, and sales broken down into domestic and exports, utility expenses (electricity and water), raw material costs, machinery and equipment, land, plant and technology in use, IT infrastructure, date of establishment, district and industry of its main production activity.

We deflated the nominal value using the consumer price index (CPI) for 2010 and converted the value to US$ using the average exchange rate in 2010. This data is then used to compute key firm characteristics of interest such as number of employees (L), value added per worker (VA/L), physical capital (as book value of machinery and equipment), raw materials per worker (rawm/L), wages per worker (wages/L) and real sales per worker (sales/L). The census data are then merged with trade data from the transaction dataset.

The merging of the two datasets was done using the company's name in both the census and the transactional database as a common identifier. Note, since the transaction data is a panel, while the census data is a cross-section, we collapsed the panel data over the 2004-2013 period into a cross-section obtaining the average values for the number of products, the average number of destination markets and the average export value. These variables are then merged into the census dataset, effectively extending the information about exporter's activity beyond just the decision and value exported to the average number of products and average number of countries served.

2.4 Stylized Facts about Exporters in Kenya

Transaction based dataset provides an opportunity to observe a richer picture of trade at the exporter level. In this section, we use the entire population of exporters to investigate trade characteristics for Kenya's exporters.

Stylized fact 1: export outcomes are extremely heterogeneous across exporters

Table 2.4 presents the average number of products, the average number of destinations and the average export value per exporter and their spread around the mean.

Table 2.4: Exporter level summary statistics, selected years and countries

Exporter Level	Kenyan exporters				Comparators in various countries				
	2005	2007	2009	2012	Mali 2006	Senegal 2006	Tanzania 2006	Portugal 2005	Netherlands 2007
Number of products/exporter									
Mean	6.0	7.6	7.3	7.7	2.5	3.1	2.5	4.6	12.2
Median	2.0	2.0	2.0	2.0	2.0	1.0	1.0	2.0	4.0
Standard deviation	14.6	19.5	16.9	21.6	-	-	-	12.2	-
Number of destinations/exporter									
Mean	2.8	2.6	2.6	2.8	3.9	6.8	3.6	2.8	11.0
Median	1.0	1.0	1.0	1.0	2.0	2.0	1.0	1.0	6.0
Standard deviation	3.9	3.5	3.3	3.7	-	-	-	4.9	-
Exports(US$ "000")/exporter									
Mean	686	881	930	1092	-	-	-	€1.4million	-
Median	16	19	17	19	-	-	-	0.0	-
Standard deviation	4188	4898	5620	6661	-	-	-	€17.8million	-

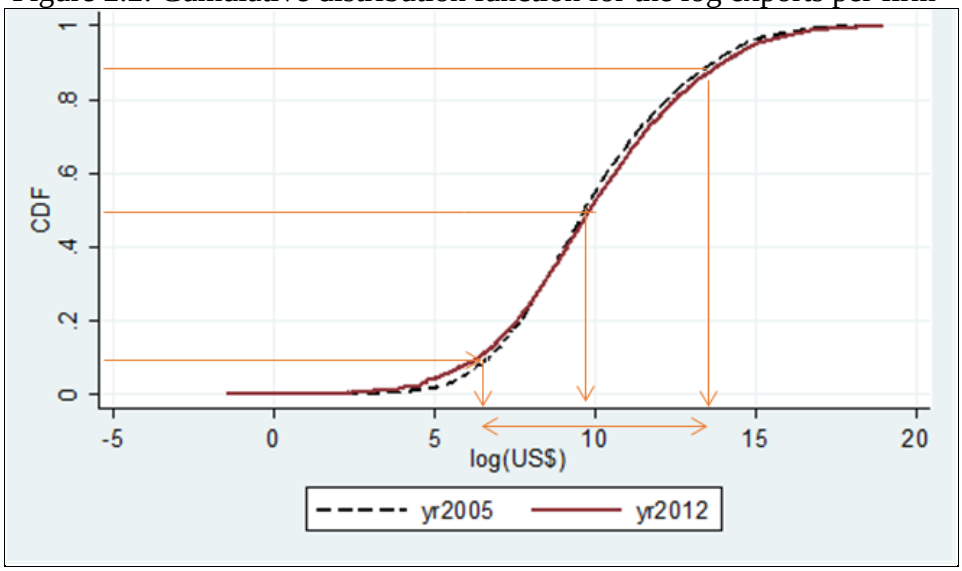
Source: Computed from Customs data. Mali, Senegal, Tanzania, Portugal and Netherlands information is taken from Cadot et al. (2013), Amador and Opromolla (2013) and Cruesen and Lejour (2011).

The export value per exporter

The average export value per exporter increased from US$ 686,000 in 2005 to US$ 1,092,000 in 2012, representing a growth of approximately 59% over the two periods. At the same time, the median export value has also increased from US$ 16,000 in 2005 to US$ 19,000 in 2012, indicating a shift in the entire distribution of export value over time. The difference between the median and the mean, together with the large standard deviation across all the years, provides evidence for exporter heterogeneity in export value. The change in the median export value per firm is minimal compared to changes in the average export value, suggesting that rising average exports per firm is driven by relatively strong growth of larger firms.

To provide further insight into the heterogeneity of export value across firms and over time, Figure 2.2 presents the cumulative distribution function (CDF) for the export value per exporter in 2005 and 2012.

Figure 2.2: Cumulative distribution function for the log exports per firm



Notes: computed from the customs data.

The CDF gives the proportion of exporters with values equal or less than the value given on the horizontal axis. In Figure 2.2 above, 50% of exporters have export value per firm equal to or less than the natural log of 9.68 (or approximately US$ 16,000) in 2005 and the natural log of 9.85 (or US$ 19,000) in 2012[11]. Looking at the distribution of 2012 only we note two key points: firstly, there is enormous heterogeneity in exports value across exporters. For example, the bottom 10% of the population had export value per firm equal to or less than the natural log of 6.25 (or US$ 518) while the top 10% of the population had export value greater than the natural log of 13 (or more than US$ 442,413). Secondly, we see no significant shift in the distribution of export value across exporters over time, although the distribution is twisted suggesting that larger exporters have become even bigger, while smaller exporters have much lower export value.

Overall, there is greater spread of export value per firm indicating that the dispersion is getting bigger over time. This corroborates information from Table 2.4 which shows a small change in the median but a large increase in the mean exports per firm that is driven by strong growth in large firms and the standard deviation has increased in 2012 relative to 2005.

[11] The values are computed by taking the exponent to the natural log values of exports per firm on the x-axis.

Number of products per exporter

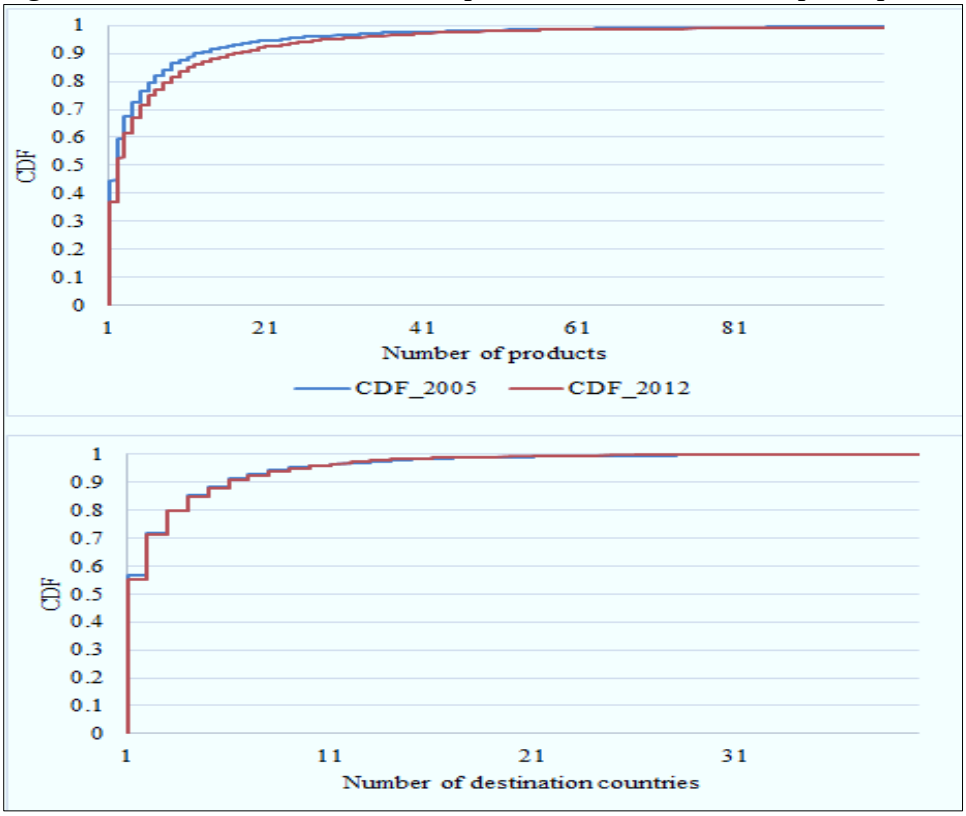
The average number of products per exporter increased from 6.0 in 2005 to 7.7 in 2012 but it also characterised by large outliers. The median number of products per exporter is 2.0 and does not change over time. The standard deviation around the mean is large across all the years, providing evidence of exporter heterogeneity in the number of products.

The average number of products per firm in Kenya is higher compared to 2.5 for Mali, 3.1 for Senegal and 2.5 for Tanzania (see Cadot et al., 2013). It is also higher than 4.6 products for Portugal (Amador & Opromolla, 2013) but it is lower relative to 12.2 products for the Netherlands exporters (see Cruesen & Lejour, 2011). A wider product scope is associated with success in international markets and survival of firms in export. This attribute is explored further in chapter 3 of this thesis.

The number of destination countries per exporter

Also contained in Table 2.4 is information on the number of destination countries per exporter. The mean destination per exporter lies between 2.6 and 2.8 over the selected years but is also characterised by outliers. The median is fixed at one destination country per exporter, indicating that the distribution does not change over time. The average number of destination countries per firm for the Kenyan exporters (2.6-2.8) is lower relative to 3.9 for Mali, 6.8 for Senegal and 3.6 for Tanzania (see Cadot et al., 2013). It is also lower relative to 11.0 destination countries for the Netherlands exporters. This represents a conservative geographic diversification of exports for the Kenyan firms. The distribution of product and destination scope is also presented using CDFs. These are shown in Figure 2.3 below.

Figure 2.3: CDFs for the number of products and destinations per exporter



Notes: Computed from customs data.

The upper panel CDFs show the distribution of the number of products per exporter over the two periods. It shows that 50% of exporters shipped two or less products for both 2005 and 2012. For example, in 2012, over 52% of the population exported 2 products or less while the top 10% of exporters exported 16 or more products. The CDF for the number of destination countries per exporter (the lower panel) has not changed over the two periods. Figure 2.3 shows that over 55% of exporters export only to one destination. However, the top 10% of exporters export to 6 or more destination countries. The findings from the CDFs are consistent with the statistics reported in Table 2.4.

Stylized fact 2: multi-product and multi-destination exporters account for the largest share of export value

To examine the role played by multi-product exporters in expansion of exports in Kenya, we grouped firms according to the number of products they export and calculated their proportion to the population of exporters and the share of export value accounted for by each category in 2005 and 2012. Table 2.5 shows that exporters that ship at least two products made up 55 and 63% of the population of exporters in 2005 and 2012, respectively. These types of exporters accounted for 88% and 84% of export value in 2005 and 2012, respectively. Exporters who

export more than six products (23% and 29% for 2005 and 2012) accounted for approximately 60% and 51% of the export value in 2005 and 2012, indicating that export value is concentrated towards a few multi-product exporters.

Table 2.5:Multi-product exporters, 2005 and 2012

	Number of exporters				Value of exports			
	2005		2012		2005		2012	
Number of products exported	N	% of pop	N	% of pop	US$ mn	% of total	US$ mn	% of total
1	1,751	45	1,917	37	336	12	903	16
2	574	15	811	16	332	12	658	12
3	322	8	454	9	197	7	535	9
4-5	353	9	528	10	208	8	643	11
6-10	433	11	614	12	541	20	638	11
11-19	250	6	400	8	408	15	958	17
20+	235	6	451	9	668	25	1,313	23
Total	**3,918**	**100**	**5,175**	**100**	**2,691**	**100**	**5,649**	**100**

Notes: Pop stands for population of all exporters. N is the number of exporters per category. Exports are in nominal US$ million. % of total gives the share of each group of exporters (N) in total export value for the year.

These results are consistent with findings from other studies. For example, in the US, multi-product exporters made up 57.8% of the population of exporters in 2000 and were responsible for 99.6% of the export value (Bernard et al., 2009) while in Portugal they made up 54.7% of the population, but accounted for 91% of total export value in the sample period between 1997-2005 (Amador & Opromolla, 2013).

The above stylized facts are also reflected among multi-destination exporters. Table 2.6 decomposes exports into single destination exporters and multi-destination exporters. In 2005, a total of 2,221(57%) exporters exported to only one destination and accounted for approximately 5% of total export value. This implies that there were 1,697(43%) multi-product exporters responsible for approximately 95% of total exports. In particular, exceptional performers are those that ship to more than 10 destinations (158 exporters). This group accounted for approximately 57% of total export value in 2005, despite making up only 4% of exporting firms. This relationship is also evident in 2012. Thus, multi-destination exporters account for a large share of Kenya's exports in any year and trade is more concentrated for multi-destination exporter types relative to multi-product types.

Table 2.6: Multi-destination exporters, 2005 and 2012

	Number of exporters				Value of exports			
	2005		2012		2005		2012	
Number of destinations served	N	% of pop	N	% of pop	US$ mn	% of total	US$ mn	% of total
1	2,221	57	2,856	55	131	5	456	8
2	592	15	839	16	133	5	208	4
3	313	8	436	8	105	4	190	3
4-5	339	9	420	8	258	10	670	12
6-10	295	8	407	8	520	19	1,340	24
11-19	114	3	168	3	709	26	1,681	30
20+	44	1	49	1	836	31	1,103	20
Total	**3,918**	**100**	**5,175**	**100**	**2,691**	**100**	**5,649**	**100**

Notes: Computed from customs data. Pop stands for population of all exporters. N gives the number of exporters per category of destinations. Exports are in nominal US$ million. % of total gives the share of each group of exporters (N) in total export value for the year.

This result is also consistent with those found for Portugal by Amador and Opromolla (2013) in which multi-destination exporters made up 43.4% of the population but accounted for approximately 93.4% of total export value. In the US, multi-destination exporters made up 36% of the population of exporters in 2000, but accounted for 96.7% of the total export value, indicating a higher concentration than found for Kenya and Portugal.

Finally, multi-product exporters are not necessarily multi-destination exporters. Table 2.7 separates exporters into four exclusive groups, namely: single product-single destination exporters; single product-multi-destination exporters; multi-product and single destination exporters; and multi-product and multi-destination exporters. The value of exports attributed to each group of exporters is also calculated for 2005 and 2012.

Table 2.7: The distribution of value of exports across exporter types, 2005 and 2012

	Number of exporters				Value of exports			
	2005		2012		2005		2012	
Exporter type	N	% of pop	N	% of pop	US$ mn	% of total	US$ mn	% of total
SP&SD	1 531	39	1 609	31	82	3	290	5
SP&MD	220	6	308	6	254	9	613	11
MP&SD	690	18	1247	24	49	2	166	3
MP&MD	1477	38	2011	39	2 306	86	4 580	81
Total	**3 918**	**100**	**5 175**	**100**	**2 691**	**100**	**5 649**	**100**

Notes: Computed from customs data. SP & SD exports one product to one destination, SP&MD: exports a single product to at least two destinations; MP&SD: export at least two products to a single destination and MP & MD exports at least two products to at least two countries.

Multi-product and multi-destination exporters made up 38% and 39% of the population of exporters in 2005 and 2012, respectively. This type, accounted for approximately 86% and

81% of the export value in 2005 and 2012. Single product and multi-destination exporters made up 6% of exporters in 2005 and 2012 and accounted for 9% and 11% of exports value in 2005 and 2012, respectively. Single product and single destination exporters, together with multi-product and single-destination exporters made up 57% and 55% of the population of exporters in 2005 and 2012 but were responsible for only 5% and 8% of the exports value for 2005 and 2012. This further indicates that exports are highly concentrated among multi-product and multi-destination exporters. Taken together, they confirm that multi-product and multi-destination exporters account for the larger majority of exports for Kenya.

Stylized fact 3: export sales are highly concentrated across products within the export basket of multi-product firms

Recent research has exposed yet another level of heterogeneity within the exporting firms. Looking within exporters, export sales are found to be concentrated in a few products, broadly classified as core to the firms' product lines (Bernard, Redding & Schott, 2011; Arkolakis & Muendler, 2010). This has resulted in development of new models featuring multi-product exporters whose production activities entail production of core and peripheral products (Arkolakis, 2016; Mayer, Melitz & Ottaviano, 2014; Bernard, Redding & Schott, 2011; Eckel & Neary, 2010). Export sales are highly skewed towards a few core products within the export basket of multi-product firms.

To investigate the within firm product concentration for Kenya's exporters, we calculated the share of each product in the total exports for the firm. We then ranked products based on their share in the firms' export basket. The product ranked at the top is classified as the core product, while the rest are classified as fringe (or periphery) products. Table 2.8 shows that the top ranked product across all multi-product firms accounts for between 39% and 79% of the exports sales of exporters in 2005, depending on the total number of products exported. Over the two years, the sales remain concentrated in the top product even for firms that export more than 20 products.

Table 2.8: Top five products and their shares in export sales in 2005/2012

Product	Firm product scope, 2005						
Rank	1	2	3	4-5	6-10	11-19	20+
1	100.0	78.6	72.2	66.9	58.3	48.9	39.2
2		21.4	20.5	19.7	19.5	19.9	15.7
3			7.3	8.4	10.0	10.3	9.6
4				3.9	5.6	6.4	6.2
5+				1.1	6.6	14.5	29.3
	100	100	100	100	100	100	100
Product	Firm product scope, 2012						
Rank	1	2	3	4-5	6-10	11-19	20+
1	100.0	80.1	72.5	65.1	55.6	50.2	39.0
2		19.9	19.4	20.8	20.6	18.5	15.5
3			8.1	8.6	10.1	9.7	9.3
4				4.0	5.9	6.1	6.2
5+				1.5	7.9	15.4	30.0
	100	100	100	100	100	100	100

Notes: Own computation from the Customs data.

Our results are close to that found for Portugal by Amador and Opromolla (2013) which show that, for a three products exporter, 75% of its export sales comes from the top product while the second and third products (fringe products) accounted for 25%. In the case of Kenya, a three-product firm derive 72.2% of its sales revenue from the top product while the fringe products account for the balance (27.8%), with the lowest ranked product accounting for 7.3% of revenue in 2005. The structure is very similar in 2012.

2.5 Intensive and Extensive Margins of Trade

In the previous section, the important role of multi-product and multi-destination exporters was highlighted. These types of exporters make decisions to adjust their products and destinations to serve in response to changes in the trade environment (adjustment along the extensive margin). Equally important is the decision to adjust the sales value to continuing product and destinations (adjustment along the intensive margin). We evaluate the behaviour of Kenyan exporters along these margins and compare the results to existing literature.

The year-on-year growth of aggregate exports is an outcome of the behaviour of firms at the extensive and intensive margins. Following Amador and Opromolla (2013), this can be decomposed into three decisions taken at the firm level. Firstly, firms make decisions to enter and/or exit from international trade (firm extensive margin) while continuing firms decides on

the value of export sales (firm intensive margin). Secondly, within continuing firms, decisions are made to add new or drop existing destinations (destination extensive margin) and to change the value of exports to continuing destinations (destination intensive margin). Thirdly, within continuing destinations, decisions are made by continuing firms to add a new and/or drop an existing product (product extensive margin) and to change the value of exports sales for continuing products (product intensive margin).

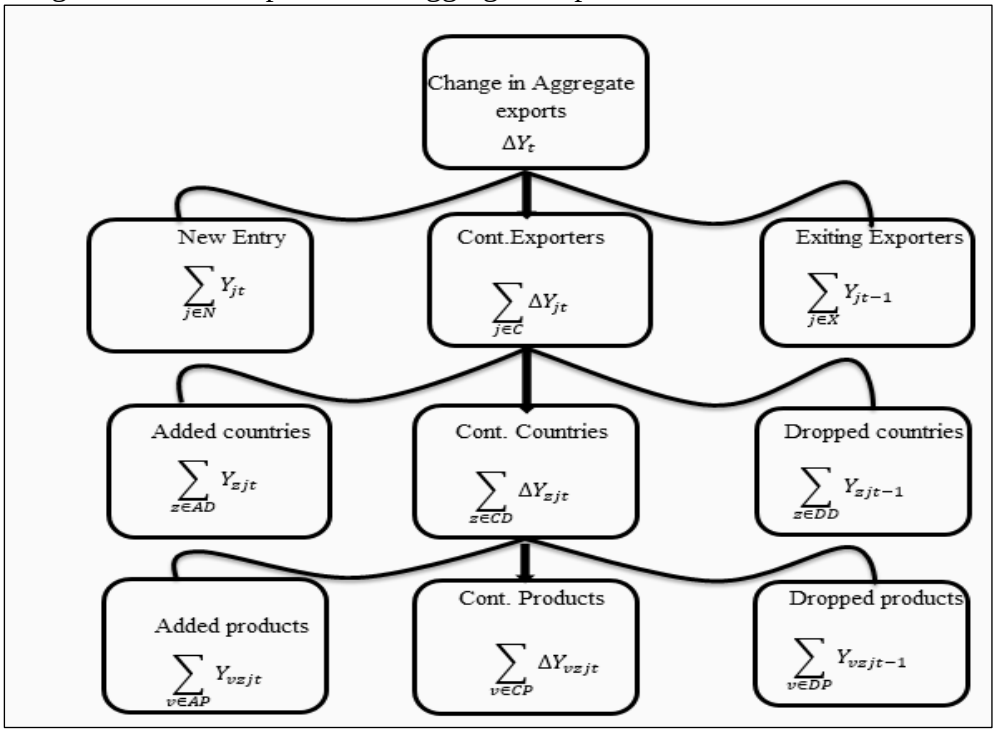
Formally, this decomposition can be presented as follows:

$$\Delta Y_t = \left\{ \sum_{j \in N} Y_{jt} - \sum_{j \in X} Y_{jt-1} \right\} + \sum_{j \in C} \Delta Y_{jt} \qquad (1.)$$

where ΔY_t is the change in aggregate exports from year $t-1$ to year t, and ΔY_{jt} is the change in export value for the continuing firms. N is the sub-set of new entrants in year t , X is the subset of exiters in year $t-1$ and C is the subset of continuing exporters in year t. The parenthesis in equation (1) contains the increase in export value due to new entrants and the decline in export value due to exiters (firm extensive margin). The last term denotes the firm intensive margin and captures changes in export value for the continuing exporters. The extension of the decomposition framework to the next two levels of firm decisions, namely firm-destination and firm-product, follows the same logic[12] and is illustrated in Figure 2.4 below.

[12] See appendix A for a full derivation of the decomposition framework at the three levels.

Figure 2.4: Decomposition of aggregate exports into firm level decisions



Notes: Changes in aggregate exports is an outcome of firm level decisions at three levels. Cont. stands for continuing. The subscripts t stands for time; jt for firm-time; zjt for destination-firm-time and $vzjt$ for product-destination-firm-time. Dividing the change in aggregate exports by the initial value of export in period $t-1$ gives the percentage changes over time.

From Figure 2.4, the second level decomposes the changes in the export value for the continuing exporters in year t, into increases in export value due to added destinations (AD) in year t, the decline due to dropped destination countries (DD) in year $t-1$, and the changes in exports value to continuing destination countries (CD) in year t. Finally, the third level decomposes export value in continuing destination countries in year t into increases in exports value due to added new product (AP) in year t, the decline due to dropped products (DP) in year $t-1$ and the changes in the export value to continuing products (CP) in year t.

Table 2.9 uses this decomposition to analyse annual changes in formal exports over the period 2005-2012.

Table 2.9: Contributions of extensive and intensive margins to total export growth rate (%)

		Firm extensive margin			Intensive margin
	Aggregate Growth(%)	Net(%)	Entrants (%)	Exiters(%)	Continuing (%)
2005-2006	22.3	5.7	6.8	-1.1	16.5
2006-2007	26.6	2.5	4.2	-1.8	24.1
2007-2008	2.0	0.3	2.0	-1.7	1.7
2008-2009	2.2	0.2	1.8	-1.6	2.0
2009-2010	1.8	2.4	3.5	-1.0	-0.6
2010-2011	29.5	0.9	2.6	-1.7	28.6
2011-2012	-1.27	-1.24	2.4	-3.6	-0.03
Average	11.9	1.5	3.3	-1.8	10.3
	Continuing firms (%)	Destination extensive margin			Intensive margin
		Net(%)	Added Dest(%)	Dropped Dest(%)	Cont Dest(%)
2005-2006	16.5	6.3	12.1	-5.8	10.2
2006-2007	24.1	3.0	9.0	-6.0	21.1
2007-2008	1.7	-2.1	4.8	-6.9	3.8
2008-2009	2.0	0.4	4.8	-4.4	1.7
2009-2010	-0.6	1.6	4.9	-3.3	-2.3
2010-2011	28.6	-2.5	6.6	-9.1	31.2
2011-2012	-0.03	-0.17	4.1	-4.3	0.14
Average	10.3	0.9	6.6	-5.7	9.4
		Product extensive margin			Intensive margin
	Continuing dest(%)	Net(%)	Added Prod(%)	Dropped Prod (%)	Cont Prod(%)
2005-2006	10.2	9.3	13.6	-4.3	0.9
2006-2007	21.1	8.2	15.6	-7.4	12.9
2007-2008	3.8	-5.5	5.8	-11.3	9.3
2008-2009	1.7	1.1	4.8	-3.7	0.6
2009-2010	-2.3	-1.9	6.7	-8.6	-0.4
2010-2011	31.2	-0.9	5.5	-6.3	32.0
2011-2012	0.14	1.51	4.8	-3.3	-1.37
Average	9.4	1.7	8.1	-6.4	7.7

Notes: Computed from the customs data. Net margin is obtained by summing up the extensive margin. All values are in % calculated relative to the initial period value.

Stylized fact 4: the intensive margin dominates the year-on-year variation of Kenya's aggregate exports but there is a lot of churning in terms of product and destinations served for the continuing exporters

The Table 2.9 shows that continuing firms dominate in terms of contribution to overall growth in exports per year. The role of net entry is very small. In the following section we discuss briefly the decomposition relative to the findings in related literature[13].

The role of firm intensive and extensive margins in aggregate export growth

The top panel shows the result of disaggregated Kenya's export growth rate into the contribution of continuing firms (intensive margin) and net entrants (extensive margin). We see that over the period 2005-2012, the growth in Kenya's exports stood at 11.9% on average per year. Continuing firms (firm intensive margin) on average accounted for 86.5% (=10.3/11.9) of this growth while the extensive margin (net entry) accounted for only 13.4% (=1.5/11.9). Notice, however, that although net entry plays a small role, gross entry raises exports by 27.7% (=3.3/11.9) while gross exits reduce the same by 15.1% (=1.8/11.9) on average per year.

These results are comparable to Amador and Opromolla (2013) who performs a similar decomposition for Portugal. They find that over the sample period 1997-2005, nominal aggregate export growth in Portugal was 4.4% on average per year. Out of this, the firm intensive margin accounted for 80% (3.1/4.4) of the growth while the extensive margin (net entrants) accounted for 20% (=1.3/4.4). However, in the Portugal's case, gross entry boosted exports by 70.5% (=3.1/4.4) while gross exit reduced it by 40.9% (=1.8/4.4) on average per year. Thus, although the contribution of the net entry is small in both countries, the contribution of gross entrants and gross exits for Portugal is much bigger relative to that of the Kenyan exporters. This divergence in the contribution of gross entrants could be attributed to various factors such as own exporter characteristics, types of products exported (see Chaney, 2008), main destination-market (Arkolakis & Muendler, 2010) among others but we do not explore this further.

[13] Our discussion focuses on average contribution over time, although the decomposition takes into account the yearly contributions of the extensive and intensive as well.

The role of destination churning among continuing exporters

The middle panel of the Table 2.9 shows results of the disaggregation of export growth for the continuing exporters into destination intensive and extensive margins. Over the whole period, the average export growth was 10.3% among continuing firms. We see that 91.3% (=9.4/10.3) of this growth is accounted for by sales in continuing destinations (destination intensive margin) while the balance of 8.7% (=0.9/10.3) is attributed to net added destinations (destination extensive margin). We see that the destination intensive margin accounts for almost all of the growth of exports among continuing firms. This result is also similar to that documented by Amador and Opromolla (2013) for Portugal in which the destination intensive margin is, on average, responsible for 100% (=3.1/3.1) of export growth for the continuing exporters.

While the contribution of net added destinations is small (8.7%), the gross contribution of added destinations and the gross reduction in exports due to dropped destinations among continuing exporters is quite high. We find that the gross added destinations raise exports by 64.1% (=6.6/10.3) while the gross dropped destinations reduce it by 55.3% (=5.7/10.3) on average per year. This suggests that there is a lot of churning and experimentation along the destination market. This is also associated with resource re-allocation within continuing exporters in Kenya as firms experiment and switching destinations for their exports.

The role of product churning among continuing firms-destinations

The lower panel of Table 2.9 show product level decomposition and we can see that over the whole period, the average export growth was 9.4% among continuing firm-destinations combination. Approximately 82% (=7.7/9.4) of this growth is accounted for by the product intensive margin while the balance of 18% (=1.7/9.4) is attributed to net added products (product extensive margin). The net contribution of added products is small, but the level of product churning is extremely high. For example, the gross added products raised export growth for the continuing firm-destination combination by 93.6% (=8.8/9.4) which is higher than the 82% (=7.7/9.4) attributed to continuing products. At the same time, there is an equally large reduction in exports due to gross dropped products equivalent to 68.1% (=6.4/9.4).

These results are also consistent with those found by Amador and Opromolla (2013) for Portugal and Bernard et al. (2011) for the US firms in which firms add and drop products to their export portfolio. Amador and Opromolla (2013) shows that the contribution of net added

products to export growth among continuing firms in Portugal was very small (0.6%). They also show that gross added products raised exports by 103.2% while gross dropped products reduced it by 96.7% on average per year. Thus, we see that gross product churning is higher in Portugal relative to Kenya especially in gross dropped products. This may indicate that the Kenyan economy is less dynamic relative to Portugal, but we did not conduct a rigorous test for this fact.

We conclude this section with two key points. Firstly, the intensive margin dominates in the contribution to year-on-year growth in exports as well as to average export growth over the period considered. This indicates that entering and exiting firms are much smaller in their share of export market relative to continuing exporters for the case of Kenya. Similar evidence has been documented for emerging economies, including in Colombia by Eaton et al. (2007), in South Africa by Matthee et al. (2016) and in Portugal by Amador and Opromolla (2013).

Secondly, continuing exporters, exporting to continuing destinations and shipping continuing products (intensive margin) account for 64.7% (=7.7/11.9) of the average export growth per year for Kenya. Everything else (35.3%) may be attributed to the extensive margin (new firms, new destinations and new products). Thus, while the overall growth in exports is dominated by the continuing exporters, their contribution to growth is underpinned by significant churning in destination and products in export portfolios.

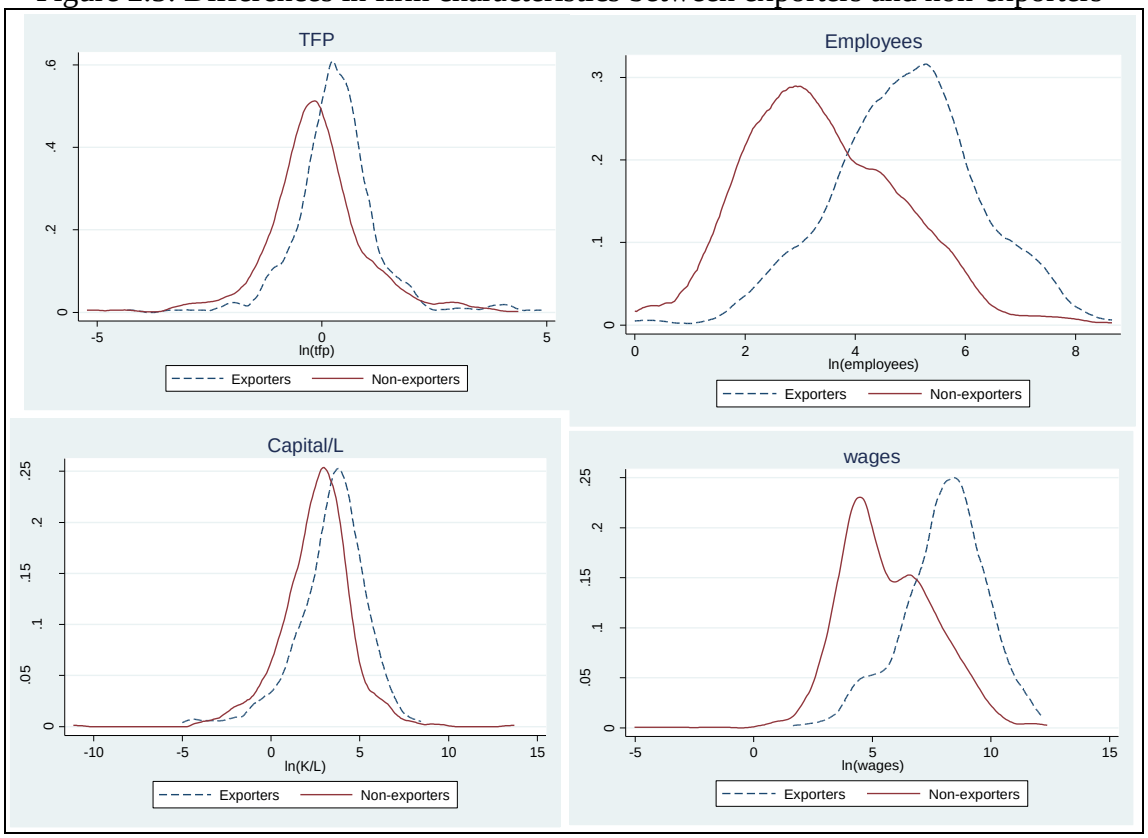
2.6 Heterogeneity in Firm Characteristics for Manufacturers

In section 2.4 and 2.5, we used transaction level data to document a number of stylized facts about all exporters from Kenya. We documented the important role played by multi-product and multi-destination exporters in driving the country's exports and used a decomposition framework to learn on the within firm exports adjustments in response to changes in the trade environment. In this section, we look only at manufacturing firms and document the differences in firm characteristics of manufacturing exporters and non-exporters using a recent census dataset for Kenya. Because the census dataset is a cross-section, we are only able to do this for 2010. We start off with the analysis of the differences in underlying characteristics between exporters and non-exporters for the manufacturers.

Stylized fact 6: manufacturing exporters are larger, more productive, more capital intensive and pay more wages than non-exporters

We use kernel density plots to examine the differences in four key variables: total factor productivity[14] (TFP), size of employees, capital per worker and wages per worker as a proxy for skills intensity. These variables are constructed from the census dataset. We speculate that in line with the existing empirical literature on firm heterogeneity and trade, manufacturing exporters in Kenya have a performance premium over non-exporters across the above performance measures. Figure 2.5 show the difference in firm characteristics using kernel plots.

Figure 2.5: Differences in firm characteristics between exporters and non-exporters



Notes: Differences in total factor productivity (TFP), number of employees, capital per worker and wages. All variables are in logs. The dashed line represents manufacturing exporters, while the solid line represents non-exporters.

The distribution for the exporters lies to the right of the non-exporters in all cases. Exporters are more productive, employ more workers, use more capital per worker and pay higher wages. This result is consistent with the empirical findings from both developed and developing

[14] We obtained total factor productivity estimate using the residuals after a Cobb-Douglas production function of the value added on physical capital and raw materials per worker and other controls.

countries (Granér & Isaksson, 2009; Alvarez & Lopez, 2008; Clerides, Lach & Tybout, 1998; Bernard, Jensen & Lawrence, 1995; Aw & Hwang, 1995).

2.6.1 Regression Analysis of Firm Heterogeneity for the Manufacturers

To distinguish the differences in characteristics between manufacturing exporters and non-exporters, we follow Bernard and Jensen (1999) to estimate the following regression.

$$\ln(S_{idj}) = \gamma_0 + \beta Export\_status_i + \boldsymbol{\gamma d} + \boldsymbol{\lambda j} + \varepsilon_{idj} \qquad (2.)$$

where: S_{idj} is a measure of firm i outcomes such as value added per worker, total factor productivity, capital per worker (capital intensity), number of employees, wages per worker (skills intensity) and sales per worker. The subscripts stand for firm i in district d and in sector j. The sectors represent 2-digit international standard industrial classification (ISIC) rev 3.1 . $Export\_status_i$ is a dummy variable that takes 1, if a firm export and zero otherwise. All these variables are constructed from the census dataset. District and sector fixed effects are included to control for unobserved sector and geographic location effects that may be correlated with firm characteristics but not adequately controlled for in the regression. The coefficient β on export status dummy is expected to be positive and statistically significant in line with the findings in the literature (see Bernard &Jensen, 1999 for the US). Table 2.10 presents the results.

Table 2.10: Exporter premia among manufacturing firms in Kenya, 2010

	Dependent variables					
	(1) VA/L	(2) TFP	(3) K/L	(4) Employees	(5) Wages/L	(6) Sales/L
Export-status	0.3768***	0.3750***	0.7655***	1.2707***	0.5448***	0.7965***
	(0.0779)	(0.0711)	(0.1369)	(0.0731)	(0.0765)	(0.0780)
Constant	0.7437***	0.1174*	2.6949***	3.6741***	2.7861***	5.1741***
	(0.0462)	(0.0630)	(0.1016)	(0.0554)	(0.0683)	(0.0570)
Observations	2,039	1,153	1,153	2,039	1,541	2,039
R-squared	0.0752	0.1293	0.1178	0.3084	0.1808	0.1379
Sector dummy	YES	YES	YES	YES	YES	YES
District dummy	YES	YES	YES	YES	YES	YES

Notes: Each cell contains the result of a separate regression of the log of dependent variable (column 1-6 variables) against the dummy variable- export status, using the 2010, Census data. The coefficient and robust standard errors in the brackets are given. The asterisks denote the level of significance *** p<0.01, ** p<0.05, * p<0.1 for 1%, 5% and 10%, respectively.

Manufacturing exporters have a distinct performance premium relative to their non-exporting counterparts. The exact percentage difference in performance between exporters and non-exporters can be calculated using $(\exp(\beta) - 1) * 100$. The results reveal that exporters are larger in terms of value added per worker (37.7%), total factor productivity (37.5%), capital per worker (76.5%), employment (254.9%), wages per worker (54.5%) and sales per worker (79.7%) relative to their non-exporting peers.

Our results are consistent with previous findings in the literature using Kenyan data. For example, Graner and Isaksson (2009) using a panel data over 1992-1994 find that exporters were 41% more efficient, were 67% more capital intensive and paid higher wages (51%) than non-exporters. Internationally, our results are also comparable to exporter premia estimates in the US manufacturing as reported in Bernard et al. (2007) where exporters are found to employ 2.3 times more workers, are 12% more productive, are 38% more capital intensive and pay 17% higher wages than non-exporters. Bernard and Jensen (1999) explored the sources of these large differentials for the US. They find one clear result, "good plants become exporters" (p.23). The fact that exporters outperform non-exporters in virtually all performance measures is taken as evidence of presence of fixed costs associated with breaking into foreign markets.

Within emerging markets, our results are also close to those found by Matthee et al. (2016) for South African firms in which they find that exporters were 70.8% larger in terms of employment, had 46% more output per worker, paid 27.3% more wages, and were 12.4% more capital intensive relative to non-exporters. In another South African study, Edwards et al. (2016) confirms presence of superior performance characteristics for traders relative to non-traders and finds slightly lower premiums for exporters after controlling for importer and importer-exporter status dummies.

To summarize, this section differs from section 2.4 and 2.5 in that it focuses the analysis on manufacturing exporters only. We find that exporting manufacturers are distinctively different from their non-exporting counterparts. Exporters are larger in terms of value added per worker (37.7%), total factor productivity (37.5%), capital per worker (76.5%), employment (254.9%), wages per worker (54.5%) and sales per worker (79.7%) relative to their non-exporting peers. This fact implies that the new trade theoretical framework is able to explain firm decisions to participate in international trade for Kenya. It also provides evidence in support of the fact that exporters contribute to economic growth and improvement of welfare of their workers.

2.7 Conclusion

This chapter assembles firm transaction level dataset and the recent census of manufacturing firms, which are used to describe the patterns and behaviour of exporters in Kenya in comparison to the performance of firms from the rest of the world. The results are remarkably consistent with the findings from other international studies using transaction level datasets. In particular, the analysis reveals a high degree of exporter heterogeneity in terms of export value, number of products and number of destination countries per exporter.

Further probing the distribution of exports across firms, we find that exports are highly concentrated towards a small number of multi-product and multi-destination exporters. For instance, multi-product and multi-destination exporters in Kenya made up 38% of the population of exporters in 2005 and accounted for approximately 86% of the export value that year. At the same time, export sales are highly skewed across products within the export basket of multi-product firms. For a three-product exporter, for example, up to 72.4% of its export revenue was derived from sales of the top ranked product (or core product) and the balance (27.6%) from the other products (or fringe products) in 2005. This result is driven by the fact that the costs to multi-product exporters for adding varieties in an existing market is low due to the economies of scope (Arkolakis & Muendler, 2010).

The year-on-year growth in Kenya's aggregate exports is driven by decisions at the firm extensive margin (net entrants) and at the firm intensive margin (continuing exporters). A decomposition framework is used to assess the contribution of each of these margins to the aggregate export growth over time. We find that over the period 2005-2012, the average growth rate of Kenya's exports was 11.9% per year. Continuing firms (firm intensive margin) accounted for 86.5% of this growth while the net entry of new exporters (firm extensive margin) accounted for 13.4%. While the contribution of net entry of new exporters is relatively small (13.4%), we find significant contributions at the gross entry and exit of firms (firm churning). For example, over the period 2005-2012, gross entry of new exporters raised exports by 27.7% (=3.3/11.9)% while exit of firms reduced it by 15.1% (=1.8/11.9) on average per year. Thus there is evidence of substantial churning of firms through entry and exit in export markets. In the next chapter, the entry/exit and survival dynamics of new export entrants is explored in more details.

Narrowing down to export growth among continuing firms, we find that over the period 2005-2012, the average export growth was 10.3% for the continuing firms. Out of which, continuing destinations accounted for 91.3% while the net added destinations accounted for 8.7%. While the contribution of latter is small, the gross contribution of added destinations and reduction in exports due to dropped destinations among continuing exporters is quite high. For instance, over the period 2005-2012, the gross added destinations raised exports by 64.1% (=6.6/10.3) while dropped destinations reduced it by 55.3% (=5.7/10.3) on average per year. This suggests that there is a lot of churning and experimentation along the destination market, which may also be associated with resource re-allocation within continuing exporters as they experiment and switch destinations.

We also examined for the continuing firms in continuing destinations, the role of continuing products (product intensive margin) and net added products (product extensive margin) in their export growth. We find that over the period 2005-2012, the average export growth was 9.4% among continuing firm-destinations combination. Approximately 82% (=7.7/9.4) of this growth was accounted for by product intensive margin while the net added products accounted for 18% (=1.7/9.4) on average per year. The net contribution of added products is small but the level of product churning is extremely high. For example, the gross added products raised export growth for the continuing firm-destination combination by 93.6% (=8.8/9.4) which is higher than the 82% attributed to continuing products. At the same time, there is an equally large reduction in exports due to dropped products equivalent to 68.1% (=6.4/9.4) on average per year. Thus, we document significant product churning amongst continuing exporters in Kenya.

Overall, the results reveal that over the period 2005-2012, continuing exporters, exporting to continuing destinations and shipping continuing products (intensive margin) accounted for 64.7% (=7.7/11.9) of the average export growth per year for Kenya. The extensive margin (new firms, new destinations and new products) accounted for 35.3% of the growth rate per year. Thus, while the overall growth in exports is dominated by the continuing exporters, their contribution to growth in exports is underpinned by significant churning in destination-countries and products in export portfolios.

The final section of this chapter examines the performance difference between manufacturing firms that export compared to non-exporters. The analysis reveals that exporters are larger in terms of value added per worker (37.7%), total factor productivity (37.5%), capital per worker

(76.5%), employment (254.9%), skills per worker (54.5%) and sales per worker (79.7%) relative to their non-exporting peers in the same sector and geographic location. This provides evidence in support of the fact that exporters contribute to economic growth and improvement of welfare of their workers.

Chapter 3

3. The Entry, Exit and Survival of New Kenyan Exporters in International Markets: A Survival Analysis

3.1 Introduction

A vast amount of the literature, especially on the economics of industrial organization, has achieved great progress in studying firm entry, exit and survival in a given industry and the factors that determine their survival (Hopenhayn, 1992; Audretsch, 1991; Dunne, Roberts & Samuelson, 1988). In the context of international trade, the equivalent interest is to examine new exporter's entry, exit and survival in international markets (Martincus & Carballo, 2009; Alvarez & Lopez, 2008; Eaton et al., 2007).

Exporters in sub-Saharan African (SSA) countries face far greater constraints in exporting relative to their peers in the developing and developed economies. Cadot et al. (2013) documents export survival patterns for exporters from four SSA countries and finds frequent entry and exit of exporters from foreign markets. In addition, exporter relations had extremely low chances of survival beyond the first year of entry. This may suggest that market access costs for the new entrants are very high, resulting in the majority of firms exiting within the birth year in export markets. However, studies looking at the survival of firms in international markets for SSA countries are very few, largely due to a lack of transaction level dataset with firm level information. We believe the cause of high exits from international markets deserves both research and policy attention to enhance the survival of new entrants into export markets. An accumulation of more country specific case studies on the patterns of entry and exit of firms in international trade and factors associated with survival will provide additional insights in tackling this issue as an in input to trade policy and export led growth strategy in SSA.

In the previous chapter, we found that export growth is driven by continuing firms and that entering and exiting firms contribute very little to the value of export growth. In addition, the decomposition of Kenya's growth in aggregate exports revealed that sales from new entrants were crucial in stabilizing export growth. For example, a shock to the trade environment is associated with a large number of exits (low survival) which reduces exports. At the same time, new entrants export sales contribute to export growth, partly offsetting the decline in export growth due to exiting firms. The aggregate value is a function of the number of firms and the

average value of exports per firm. In this chapter, we are trying to understand the patterns of entry and exit and continuation (survival) of firms in international markets and the factors associated with firm survival in international markets.

The main objective is to examine the patterns of entry/exit and survival of exporters in export markets and factors associated with the probability of survival of new entrants in export markets[15]. We ask two specific questions:

- What are the patterns of entry/exit and survival of Kenyan exporters in international markets?
- What factors are associated with survival of new exporters in international markets?

Exporter entry and exit dynamics from international trade as well as survival and graduation of firms to the continuing status remains critical for most countries. Expanding the number of exporters is important for export diversification, but it may also be crucial to ensure that firms survive in foreign markets for a sustainable export growth strategy.

Information on how long or how short an exporter survives in the international markets may be important from a policy point of view(Amador & Opromolla, 2013; Amiti & Freund, 2010; Alvarez & Lopez, 2008). Policy makers from almost all countries aim to encourage exports and entry of new exporters because exports are a major driver of economic growth and jobs (Adam, Collier & Njuguna, 2010; GoK, 2007). This is sometimes accompanied by fiscal incentives geared toward promotion of exports and raising the number of new exporters as a performance metric. However, knowledge on how many of these new exporters will be able to survive in international markets remains extremely scarce for countries in SSA, and certainly for Kenya. This is surprising given that the length of survival can be considered one of the most comprehensive measures of exporter performance. This chapter seeks to bridge this empirical gap for the case of Kenya.

An export relation is defined as a *firm-year* combination and its survival rate after being contracted is analysed for the case of new exporters. We trace the length of time until a firm (exporter) ceases to export any product outside the Kenyan border, an event we refer to as an exit (or failure). This is made possible by access to a unique panel of transaction data for

[15] Exporters mean all observed traders in the customs database. We have no way to identify if an exporter is an actual producer or not.

Kenya's firm level exports discussed in the previous chapter. We use this data to analyse the patterns of entry/exits and survival of Kenya's new export entrants in foreign markets.

The rest of this chapter is organized as follows: section 3.2 presents the theoretical insights and the stylized facts from empirical literature. This is followed by a presentation of data and the characteristics of entry/exit and survival patterns of exporters in section 3.3. Section 3.4 presents estimation methods, data manipulation to focus on new entrants and a discussion on the explanatory variables used. The empirical analysis and results on the determinants of survival of firms in export markets is presented in section 3.5 while section 3.6 concludes.

3.2 Theory and Empirical Evidence

3.2.1 Theoretical Insights

The new trade theory explains firm internationalisation strategies by focusing the analysis of trade activity at the firm and product level. This research has progressed in two related areas, namely: the role of firm heterogeneity in productivity and trade costs (Bernard, Redding & Schott, 2003; Melitz, 2003) and the role of uncertainty and information asymmetry in breaking into foreign markets (Araujo & Ornelas, 2007; Rauch & Watson, 2003). The two areas are reconcilable by virtue of the presence of sunk costs to exporting, which dictates that only a few firms are able to overcome them and survive in international trade (Bernard & Jensen, 1999; Clerides, Lach & Tybout, 1998; Roberts & Tybout, 1997).

In the models of trade with firm heterogeneity (Bernard et al. 2003; Melitz, 2003), the existence of fixed costs of entry (or trade costs) is key in explaining why more productive firms export while less productive firms sell in domestic markets. Fixed costs of entry into foreign markets play a role similar to sunk costs in models of industry dynamics in closed economies (Alvarez & Lopez, 2008) and explain patterns of entry and exit of firms from international trade.

To elaborate further on the firm's entry and exit problem and how productivity (or size) determines market orientation, the Melitz (2003) model draws a direct link between fixed costs of entry and heterogeneity among firms in productivity. The model assumes that firms are horizontally differentiated by the variety they produce but also by their inherent productivity. More crucially, the presence of fixed costs of entry implies a firm will enter the export market

if its net export profits cover the fixed exporting cost. There are at least three productivity cut-offs in this model. A higher productivity cut-off for profitable exporting, a lower productivity cut-off for firms that obtain zero profits for selling only in the domestic market and the below zero-profit productivity threshold that implies immediate exit of such firms from an industry.

The Melitz (2003) model suggests that only the most productive firms will export, while lower productive firms will not. Firms at the margins of productivity threshold for exporting will have a lower chance of surviving in export markets and may exit upon falling below that threshold. However, the Melitz model does not consider firm's choice of export destination and do not explain exporter dynamics. The latter is particularly problematic given presence of high churning (entry and exit) of firms from international markets observed in the transaction level datasets (Eaton et al., 2007, Amador & Opromolla, 2013).

To account for a firm's choice of destination-country of exports, Chaney (2008) extends the Melitz model and shows that the minimum productivity needed to export to a destination increases with trade costs, own production costs and decreases in the market size and price level in the destination market. One of the key predictions from Chaney's model is that entering and exiting firms will be more marginal in terms of their productivity and will likely contribute less to growth in year-to-year aggregate exports relative to continuing exporters. For instance, if a bilateral trade agreement results in a reduction in trade costs, the model predicts a surge in entry of new exporters, some of whom are low productive types. These low productivity entrants will be severely disadvantaged and will only account for a small share of the market and may exit after discovering their inability to profitably stay in export status. This fact is evidenced by the high level of short lived export status among African exporters, as documented by Brenton et al. (2009) and Cadot et al. (2013).

Recently, a number of models that combine trade with firm heterogeneity and resource allocation efficiency seek to explain exporter dynamics (Araujo et al., 2016; Araujo & Ornelas, 2007; Rauch & Watson, 2003). These models are motivated by empirical evidence that finds a wider variation in firm performance and weak correlation between size and productivity, suggesting that misallocation of resources across firms might be a constraint to growth (Fernandes et al. 2016; Hsieh & Klenow, 2009; Syverson, 2004). In a less distorted market, the most productive firms are expected to grow faster and have a relatively higher survival rate in export markets. However, in an environment where regulatory requirements are burdensome and there are distortions in access to trade facilitation such as credit, this allows less efficient

firms to grow and survival rates of new entrants in international markets will be relatively low (Araujo et al. 2016).

Araujo et al. (2016) develops a model that relates institutions and exporter dynamics in an environment with incomplete information. They argue that weak contracting institutions and lack of export experience cannot be subsumed into fixed cost of entry (as in the Melitz, 2003) because they also affect firms' export volume and exporter survival after entry to foreign markets. They show that stronger institutions and previous experience are essential in neutralizing a potential moral hazard problem created by information frictions. This model underscores the importance of stronger institutions and previous experience in enhancing entry and survival of firms. They test the predictions of their model using a panel of Belgian exporters over the 1995-2008 period.

The results show that an improvement in the quality of institutions in a destination country was associated with an increase in the probability of survival of new export entrants. For example, they show that if China's score in the index of quality of institution rose from -0.25 to 1.74 (the level attributed to Singapore), this was, on average, associated with an increase in the probability of survival of new exporters from Belgium to China by 6.6%. Likewise, they found that if a new exporter with no previous experience, gained the mean experience equivalent to serving 6.9 markets, this was, on average, associated with an increase in the probability of survival by 6.2%. This is consistent with the fact that being an exporter in the previous period has a positive correlation of being a current exporter. Thus, prior exporting experience is important in explaining a plant's exporting status (Das et al, 2007; Roberts & Tybout, 1997).

This chapter is also guided by the theoretical framework featuring trade models with uncertainty and information asymmetry. The two most important studies here are by Rauch and Watson (2003) and Araujo and Ornelas (2007). The behaviour of exporters is summarized in a sequential equilibrium. In the first step, exporters from a home country form a partnership with distributors in a foreign country that has weak institutions and imperfect contract enforcement. Exporters do not know the type of distributors they are dealing with, some of whom care little about the future (impatient). In the second stage, exporters choose an initial volume of goods to be shipped to a distributor.

In Rauch and Watson (2003) buyers search for low cost suppliers and sellers select an optimal investment for production of goods, in light of the possibility of non-payment (due to an

underlying moral hazard problem). The presence of search costs and information asymmetry causes heterogeneous firms to start small in order to test the credibility of their foreign trade partners. The model predicts that trade relationships that start off with a small initial value will have a lower survival rate, the exception being differentiated products. With differentiated products, the prevalence of high search costs to get buyers implies that transactions values tend to start small but have higher survival rates. Most studies use an index developed by Rauch to classify products as either differentiated or homogeneous (Rauch, 1999). A common stylized fact in the literature is that new exporters tend to start small in terms of volume and value of exports. Upon survival of the trade relationship beyond the birth year, exports are ramped up, increasing substantially over time (see Eaton et al. 2007 for Colombia; Amador & Opromolla, 2013 for Portugal).

3.2.2 Empirical Literature

Empirically, there is high churning in terms of entry to and exit of exporters from international markets, with only a few exporters being able to survive beyond the first year. Using cohort analysis, the literature shows that exporters that survive the first year record strong growth in their export value and increase the number of products and destination countries in their export portfolio (Amador & Opromolla, 2013; Cadot et al., 2013; Albornoz et al., 2012; Creusen & Lejour, 2011; Eaton et al., 2007; Besedeš & Prusa, 2006a).

Alvarez and Lopez (2008) study the patterns of entry and exit of Chilean firms in international markets and the determinants of plant turnover. Using a panel data for the manufacturing sector over the 1990-1999 period, their results show several stylized facts amongst Chilean exporters such as differences in entry and exit across industries, variation of entry and exit rates over time and the positive correlation between entry and exit dynamics. They also found that differences in size across firms within narrowly defined industries to be the most important variable that explained differences in plant turnover in international markets. This is consistent with the predictions of the trade models with heterogeneous firms that suggests that entry and exit rates are positively correlated. A reduction in trade cost increases export profitability, which attracts more productive firms to enter international markets generating upward pressure on labour cost. This makes exporting unprofitable for the less productive firms and consider exit as a less costly option.

In a recent cross-country study, Fernandes et al. (2016) document the micro-structure of export sector for 45 countries, allowing them to examine how exporter behaviour varied with country size and stages of development. They show that on average, larger and richer countries had more and larger exporters that contribute to growth in exports along the extensive margin. Related to our chapter, they show that exporter dynamics were also closely related with the stages of development with richer countries experiencing higher entrant survival rates and lower entry and exit rates. This is in line with the predictions from models of allocative efficiency that suggest that resource allocation across firms improves as a country develops and puts in place stronger institutions (Araujo et al., 2016). Their cross-country comparison of entry and exit rates reveals a wide range of magnitude for both developed and developing countries. For example, over the 2006-2008 period, average entry rates ranged from 22% in Brazil to more than 50% in Malawi, Yemen and Tanzania while exit rates, varied from 22% in Bangladesh to 61% in Malawi. At the same time, the survival rates of entrants ranged between 23% in Cameroon and 61% in Bangladesh, suggesting a relatively higher attrition rate of entrants after the first year in export markets.

Exit of firms from international markets is an important dynamic that explains the selection process into exporting. Firms exit when they experience an adverse shock, driving their expected future profits sufficiently low that exit becomes their least costly option (Hopenhayan, 1992). A number of papers show that some firms will enter export markets followed by immediate exit (Albernoz et al. 2012 for Argentina; Freund & Pierola, 2010 for Peru; Cruesen & Lejour, 2011 for the Netherlands). Cruesen and Lejour (2011) explain the high entry and exit of Dutch firms in international markets to be a consequence of trial and error (experimentation) in order to obtain experience in exporting. This was also reflected in the volatility of a firm's export product portfolio. The authors found that, in fact, more volatility in product-country entry and exit is associated with a higher survival rate in the export market.

Trial and error is also frequent among Argentine exporters where Albernoz et al. (2012) found that exporters start with small foreign deliveries to test the ground. If exporting turns out to be profitable, it is ramped up along both the intensive and extensive margins. This is also consistent with the search and match model of Rauch and Watson (2003) that predicts that in presence of search costs and information asymmetry; firms start small in order to test the credibility of their foreign trade partners.

Regarding determinants of survival of exporters in international markets, we start off with the pioneering work of Besedes and Prusa (2006a, 2006b) in which they investigated the duration of trade relations to the US and their determinants at the product level. The trade relation is defined as the length of "product-country relationship" and they examine the time until a country ceases to export a product to the US, an event referred to as a failure. They make use of two panels of U.S import data with the first panel covering the period 1972 to 1988 for imported products classified according to the 7-digit tariff schedule of the US. The second panel covered the period 1989 to 2001, with products classified according to the 10-digit Harmonized System (HS). In their first paper (2006a) they apply the Kaplan-Meier survival function to estimate the duration of the US imports from all countries. The estimated hazard rates show that approximately 33% of export relations die within the first year and by the fifth year, up to 63% of the relationships had ended. They find that trade relations remain extremely short lived with a median length of trade to the US being one year.

In their (2006b) paper they explore the determinants of export survival by testing the theoretical implications of the search model developed by Rauch and Watson (2003). In Rauch and Watson (2003), differentiated products are characterized by high search costs relative to homogeneous goods. This suggests that exporters involved in differentiated products will start small, to learn the credibility of their trading counterparts in importing countries. If the relationship is found credible, the amount and size of shipment increases over time, implying differentiated products register higher survival rates than homogeneous products. To test this fact, they used the Rauch (1999) index of product differentiation to classify products as either homogeneous or differentiated and found that the hazard rate was 23% higher for the former. The initial trade value for a transaction was also found to reduce the hazard rate and thereby enhancing the probability of survival. They also considered the influence of other factors such as market size, multiple spell dummy for multiple entry exporters, and changes in the real exchange rate.

A great contribution of the Besedes and Prusa work is bringing to attention the fact that trade relations were extremely short lived using product-country export patterns and their dynamics and advancing a possible explanation for the low survival of homogeneous relative to differentiated products. However, as pointed out in their (2006a) paper, their data is not able to examine whether dynamics in the choice of products exported, including dropping and addition of products, had an impact on firm survival in international trade. As such, including the firm as the focal point in the analysis of survival in international trade is extremely important. This

is especially critical for developing countries, where entry and exit of firms is relatively high and policy interventions are largely targeted at the firm level.

Nitsch (2009) examines the duration of German's import trade at the 8-digit HS product level from 1995 to 2005. Using several estimation methods such as OLS, logit and Cox proportional hazard, the author found that the probability of survival of a trade relationship is affected by the country characteristics, product type and market structure. Country characteristics were captured by gravity variables such as GDP, GDP per capita, distance, common border, common official language, EU dummy and the differences in nominal exchange rate. His results show that the gravity variables such as GDP and common border are positively associated with the length of the duration of trade, while distance had a negative relation. Common language, membership to the EU and changes in the exchange rates were not statistically significant. In addition, a trade relationship that started off with a larger initial trade value was found to be more enduring.

In a cross-country study, Hess and Persson (2011) analysed the duration of trade of fifteen European Union (EU15) countries imports from 140 countries, covering the period 1962 to 2006. The trade relationship is defined as importer-exporter-product combination. They provide an empirical description of the duration of trade and examine their determinants using discrete-time duration regressions, which allows for controlling unobserved heterogeneity. Their results show the prevalence of short trade durations in line with results found in the US and Germany. In particular, the median duration of EU imports was just about one year, which is consistent with the US results.

On the factors that determine the survival of a trade relation, geographic distance increases the hazard rate (or decreased the chances of survival) while market size (real GDP) lowered the same. Unlike in Nitsch (2009), common language and a common colonial history decreased the hazard rate, while an appreciation of the exporter's real exchange rate increased it. They also found that differentiated products had longer trade relations relative to homogeneous products. A key contribution from their paper is the application of discrete-time duration models such as probit with random effects and logit with fixed effects rather than the popular Cox proportional hazard model. This method is motivated by the fact that it allows for controlling unobserved latent heterogeneity that might lead to biased results, if the assumption of proportional hazards is violated.

Lejour (2015) studied the duration of Netherlands' export relations. The trade relationship is defined as firm-country-product and the study sought to identify factors that determine the success of such a trade relation. In estimating the effects of these factors, he used discrete-time models such as probit and logit with random effects. This is in line with the argument made by Hess and Persson (2011) that the use of standard continuous proportional Cox hazard model may be biased and that the discrete-time model may be the appropriate one as it controls for unobserved heterogeneity. The author's findings show that a higher initial trade value, a large market size and a shorter distance increased the probability of survival. In addition, membership to the EU reduced the hazard rate by as much as 40% compared to trade relationships with non-EU countries.

Furthermore, trade relations with new products had reduced chances of survival by 20-30% relative to new trade relations with familiar products and destinations. Thus, the result appears to suggest that new export relations with new exporting firms survived significantly longer than those with new export products. This point underscores the need to consider the firm in the analysis of the duration of a trade relation. Product churning appears to be more prevalent and to some extent reinforces the ability to survive in international markets (Iacovone & Javorcik, 2010; Gorg, Kneller & Murakozy, 2008). Indeed, this is found to be the case for Kenyan exporters too, as documented in the previous chapter where product addition and dropping (product extensive margin) is the norm and very volatile within continuing exporters (see lower panel of Table 2.9).

In the context of developing countries, Martincus and Carballo (2009) examine for the case of Peru the factors that determine export survival using firm-level data for the whole population of Peruvian new exporters over the period 2000-2006. In particular, they examine whether firm diversification, either in terms of products scale and geographical scope, does matter in influencing survival in international markets. The duration of trade is defined as the time elapsed until a firm's trade flow is interrupted. The authors apply survival analysis to document Peruvian firm's export duration patterns and assessed the role played by diversification in determining these patterns. They considered several firm characteristics such as size, as measured by employment, current exports, initial exports value, and age of the firm as regressors.

Their results show that the median duration of Peruvian firms' export spell was about one year, coinciding perfectly with the median duration in the US, Germany and the EU countries.

Furthermore, the exit rate for the first year of entry was estimated at 54.4 % for the cohort of exporters who entered foreign markets in 2005. In terms of the factors that affect the probability of exit, they considered the extent of diversification, measured by the number of products exported and the number of markets served. The results show that adding a new destination country reduced the hazard rate by approximately 52%, while introducing a new product reduced the hazard rate by 16%. The authors made an initial effort to place exporters at the centre of the analysis, pointing out that previous use of the survival methods in analysing trade duration had focused on product-country level (Hess & Persson, 2011; Nitsch, 2009; Besedeš & Prusa, 2006b; Besedeš & Prusa, 2006a), missing out on the firm characteristics. They extended this literature and applied survival analysis to firm-level trade data.

Brenton et al. (2009) examines the factors associated with low survival rate of developing countries exports flow. They underscore that it is imperative, not only to focus on understanding factors driving entry into exporting but also on the process by which exports are sustained and export flows grow in volume. Like Hess and Persson (2011) they argue that the Cox proportional hazard (PH) models might be biased in the presence of unobserved heterogeneity, a high possibility with export data. For instance, the quality of the management in exporting firms is an unobserved factor. To account for the unobserved heterogeneity, they estimate a discrete time equivalent model to Cox PH model. Their results confirm that cultural and geographic ties between trading partners, as well as market size and exporting experience, played an important role in export survival. Their results also supported the prediction that the hazard rate is lower for export flows with large initial values. A 10% increase in the initial export value was associated with a reduction in the hazard rate by about 0.4%. The hazard rate was found to increase with distance, with a doubling of the distance resulting in a jump in the hazard rate by 44%.

In SSA, Cadot et al. (2013) undertakes the survival analysis of export relationships for four African countries, namely Malawi, Mali, Senegal and Tanzania. Using a detailed transaction level dataset, they explore the determinants of success upon entry into export markets. The success of a trade relationship is defined as survival beyond the first year of a firm-product-destination combination. They estimated the probability of surviving beyond the first year of entry in international trade and included as regressors, the number of firms from a country exporting a certain product to a given destination (a proxy measure for the network effects) and the number of destinations to which a firm exports a product (a proxy measure for the scope of geographic diversification). They also controlled for the number of products that a firm export

to a given destination (a proxy for its product scope in that destination); the number of product-firm combinations active in a given destination and the initial value of an export spell.

Their findings show that the larger the number of other firms selling the same products in the same destination and the greater the firm's geographic scope, the greater probability of surviving beyond the first year. The networks effect reflected positive signalling on the profitability of the sector. This in turn enabled firms to overcome external financing constraints and access to information on regulatory changes and strategies to overcome barriers resulting in sustained trade relationships. In addition, doubling of the initial value of a firm's average export raised the probability of success by 2%.

To summarize, presence of significant costs to accessing foreign markets (Das et al., 2007) means only the most productive firms are able to afford the costs and stay profitable in export markets (Melitz, 2003; Bernard et al., 2003). This fact has been formalized in trade models with heterogeneous firms that emphasize the role of firm size and inherent productivity differences across firms as key in explaining entry to and exit from export markets (Melitz, 2003, Chaney, 2008, Arkolakis, 2016). More recently, access to transactional datasets has enabled researchers to exploit exporter dynamics and the cause of high churning by firms in and out of export markets (Araujo et al., 2016, Araujo & Ornelas, 2007; Eaton et al, 2007; Rauch & Watson, 2003) with an emphasis on the role of stronger institutions and firm experience in similar markets as key in reducing variable costs once an exporter enters a new market.

Regarding the factors that determine the probability of survival of firms in international markets, a number of these emerge from the literature. Firstly, the initial value of a transaction matters for the longevity and stability of a firm's trade relationship (Lejour, 2015; Cadot et al., 2013; Brenton, Cadot & Pierola, 2012; Martincus & Carballo, 2009; Brenton, Saborowski & von Uexkull, 2009; Nitsch, 2009; Besedeš & Prusa, 2006b; Besedeš & Prusa, 2006a). Secondly, in some papers, product differentiation has been positively associated with increased probability of survival (Nitsch, 2009; Martincus & Carballo, 2009; Brenton, Saborowski & von Uexkull, 2009; Besedeš & Prusa, 2006b), while in others it doesn't seem to matter (Lejour, 2015; Alvarez & Lopez, 2008). Given contrasting results, there is still room for further empirical tests on this relationship, especially for an African country.

Thirdly, a number of papers include variables that capture firm characteristics such as exporter ability, age, size of employment, firm's current export value and its network. The number of products shipped and the number of countries served per exporter are used as proxy for firm ability in terms of product and geographic scope (Lejour, 2015; Martincus & Carballo, 2009). The number of exporters exporting a given product to a destination is used as a proxy for the firms' network and information spillovers (Cadot et al., 2013).

Fourth and finally, destination characteristics are captured using the usual gravity type variables such as distance; real GDP, common border, common language, common colonial history, bilateral real exchange rates and regional trade arrangements (Lejour, 2015; Nitsch, 2009). Distance is used as proxy for trade costs, while GDP is used as a proxy measure for the market size and real exchange rate as proxy for relative prices. However, most gravity variables are available at the country level only. To reduce these variables to firm level is not easy. An acceptable strategy in the literature is to capture all time varying gravity regressors by controlling for the year dummy and include country fixed effects to account for time invariant factors not controlled for (Alvarez & Lopez, 2008).

3.3 Patterns of entry, exit and survival of Kenyan firms in export markets

This section contains the dynamic of entry, exit and survival of Kenyan exporters in international markets. We follow Fernandes et al. (2016) to define entry and exit rates, but consider a different measure for the survival rate[16]. The entry rate is defined as the number of exporters in year t not present in year t-1, over the number of exporters in year t (final) while the exit rate is the number of exporters in year t-1 not present in t, over the total number of exporters in year t-1(initial). The survival rate is defined as the number of exporters present in year t-1 and year t, over the number of exporters in year t-1(initial). Table 3.1 presents the count of the total number of firms, the number of exiting firms, the number of new entrants as well as the number of initial firms per year. The right-hand side shows the entry and exit rates as well as the survival rate.

[16] Fernandes et al. (2016) look at the entrant's survival rate, while we look at the average survival rate for the whole population of continuing exporters.

Table 3.1: Dynamics of entry, exit and survival in foreign markets

	initial	exiters	entrants	continue	final	check1	check2	entry rate	exit rate	survival rate
2005	3 223	1 126	1 791	2 097	3 888	0	0	46%	35%	65%
2006	3 888	1 521	2 184	2 367	4 551	0	0	48%	39%	61%
2007	4 551	1 845	1 985	2 706	4 691	0	0	42%	41%	59%
2008	4 691	1 811	1 659	2 880	4 539	0	0	37%	39%	61%
2009	4 539	1 655	1 765	2 884	4 649	0	0	38%	36%	64%
2010	4 649	1 700	1 872	2 949	4 821	0	0	39%	37%	63%
2011	4 821	1 742	2 211	3 079	5 290	0	0	42%	36%	64%
2012	5 290	2 096	1 955	3 194	5 149	0	0	38%	40%	60%
2013	5 149	1 978	1 773	3 171	4 944	0	0	36%	38%	62%
Average					4 725			41%	38%	62%

Notes: Check1=final-entrants+exiters-initial
Check2=final-continue-entrants
entry rate=entrants/final
exit rate=exiters/initial
survival rate=continue/initial

Some interesting patterns of entry to and exit from export markets emerge from this table. The number of final exporters increased from 3,888 in 2005 to 5,290 in 2011 before dropping to 4,944 in 2013[17]. The number of new entrants is greater than the number of exiting firms with the exception being in 2008, 2012 and 2013 where there were more exits relative to entry. The average number of final exporters is approximately 4,725 over the sample period.

The entry rate of firms into export markets ranges from the high of 48% in 2006 to a low of 36% in 2013, with an average entry rate of 41% over the 2005-2013 period. Likewise, the exit rate ranges from the high of 41% in 2007 to a lower of 35% in 2005, with an average exit of 38% over the same horizon. Finally, the survival rate ranges from the high of 65% in 2005 to a low of 59% in 2007, with an average survival rate of 62% over the 2005-2013 period. This is consistent with the rates found in other studies and underscore the fact that entry to and exit from international markets is high, signifying enormous churning and lower survival rates amongst new entrants (Fernandes et al. (2016) for several developing countries; Cadot et al. (2013) for four SSA countries; Martincus & Carballo (2009) for Peru; Alvarez & Lopez, (2008) for Chile). For example, Fernandes et al. (2016) finds for South Africa, an average entry rate of 28% and an exit rate of 26% over the 2006-2008 period. They also find that the average entry and exit rate for developing countries in their sample was 38 and 37%, respectively. Over the same horizon, Kenya's average entry rate is 41% and the average exit rate is 38%, which are very close to the rates reported for developing countries (See Fernandes et al., 2016).

[17] The number of exporters (in the initial column) differs from those in Table 2.1 due to removal of known non-governmental organizations (NGOs) and United Nations.

We also examined the differences in trade characteristics for the firms that enter and/or exit compared to continuing firms. Table 3.2 presents the average value of exports, the number of products and destination-countries per exporter type.

Table 3.2: Trade characteristics of exiters, entrants and continuing exporters, selected years

Year	Variables	Exiters(t-1)	Continuers(t-1)	Entrants(t)	Continuers(t)
2005	Log(Export Value)	8.05	10.74	8.66	11.02
	Number of products	2.16	7.30	2.78	8.58
	Number of countries	1.26	3.85	1.33	4.00
	N	(1,126)	(2,097)	(1,791)	(2,097)
2007	Log(Export Value)	8.41	10.95	8.66	11.14
	Number of products	2.57	9.24	3.45	10.06
	Number of countries	1.31	3.53	1.27	3.55
	N	(1,845)	(2,706)	(1,985)	(2,796)
2009	Log(Export Value)	8.27	10.98	8.40	10.97
	Number of products	2.80	9.77	3.02	9.71
	Number of countries	1.20	3.29	1.28	3.39
	N	(1,655)	(2,884)	(1,765)	(2,884)
2012	Log(Export Value)	8.30	11.09	8.32	11.01
	Number of products	3.14	10.26	3.22	9.87
	Number of countries	1.27	3.59	1.34	3.62
	N	(2,096)	(3,194)	(1,955)	(3,194)

Notes: Continuers are present in year t-1 and year t. Exiters are present in year t-1 but not in year t; while entrants are present in year t but not in year t-1. The number of exporters (N) is in bracket.

Exiting firms are on average smaller in terms of export value, product and destination scope compared to continuing firms. Across all the years, continuing exporters are on average larger compared to entering exporters. Using the export value to illustrate, in 2005 the exiters had an average export value of US$ 3,133 (=exp(8.05)) compared to an average export value of US$ 46,166(=exp(10.74)) for the continuing exporters. Entering firms had an average export value of US$ 5,767.5(=exp(8.66)) compared to US$ 61,083(=exp(11.02)) for the continuing exporters. This suggests that amongst the population of exporters, continuing exporters are larger, followed by entering firms. Exiters are small in terms of their exports (size) by the time they exit export markets.

Our definition of continuers in Table 3.2 does not give us a picture of the proportion of firms that export consistently every year. A simple alternative to observe the number of firms that trade the whole period in our sample is to describe the dataset after setting a panel identifier. An extended pattern of entry and exit is contained in the appendix Table A-1.

Approximately 5.25% of the firms over the sample period 2004-2013, traded all periods (10 years) while 50% of them traded just for a single period. This is consistent with the results from other studies indicating that the median length of trade is about one year (see Besedes & Prusa, 2006a for the US; Hess & Persson, 2011 for several EU countries; Martincus & Carballo, 2009 for Peru).

Next, we examine firm's trade characteristics associated with the length of stay in trade (one year, three years and 10 years). Table 3.3 presents the years of stay in export markets and the average export value (logs), average number of products and countries served per firm.

Table 3.3: Duration of a firm's stay in trade and firm trade characteristics (2004-2013)

Years in trade	Variable	N	Mean	Median	sd	Min	Max
One year	Log(Export value)	8,844	8.01	8.09	2.02	-0.54	17.23
	Number of products		2.52	1.00	4.66	1.00	109
	Number of countries		1.12	1.00	0.72	1.00	42
Three years	Log(Export value)	1,427	9.14	9.14	2.41	-4.24	17
	Number of products		4.06	2.00	7.60	1.00	92
	Number of countries		1.70	1.00	1.74	1.00	18
Five years	Log(Export value)	642	9.76	9.66	2.40	2.29	16.87
	Number of products		6.17	2.00	17.30	1.00	239
	Number of countries		2.05	1.00	2.58	1.00	40
Seven years	Log(Export value)	411	10.31	10.22	2.51	3.66	17.67
	Number of products		8.99	3.00	22.67	1.00	283
	Number of countries		2.60	2.00	3.17	1.00	34
Nine years	Log(Export value)	367	10.88	10.84	2.41	3.17	16.95
	Number of products		10.65	4.00	21.39	1.00	174
	Number of countries		3.33	2.00	4.27	1.00	51
Ten years	Log(Export value)	885	12.74	12.80	2.43	2.31	18.64
	Number of products		12.88	6.00	21.12	1.00	212
	Number of countries		6.04	4.00	6.28	1.00	59
All exporters	Log(Export value)	16,854	8.82	8.68	2.51	-4.24	18.66
	Number of products		4.12	1.00	10.33	1.00	283
	Number of countries		1.70	1.00	2.40	1.00	59

Notes: years in trade stands for consecutive periods of participation in exports. N=number of firms and sd is standard deviation.

The longer an exporter stays in trade, the larger is their average export value in log terms and the wider is their product and destination scope. The average export value for exporters that stay for just one period is approximately US$3,011(=exp (8.01)) while that of an exporter who stays for ten years is US$341,124(= exp (12.74)). This suggests that firms that manage to survive for longer in the international markets are typically few, but they account for the largest share of exports. The average number of products for firms that stay 1 year is 2.5 compared to 12.88 for the firms that stay for 10 years. Finally, the average number of countries served is 1.12 for the firms that trade one year compared to 6.04 for the firms that trade for 10

consecutive years. These trade characteristics are also correlated with exporter size and inherent productivity levels (see Martincus & Carballo, 2009).

Dynamics of entry and exit over time

To further examine the dynamics of exit over time (e.g. the exit rate 1 year after entry) and the characteristics of firms that exit, we make use of a cohort analysis (see Lejour, 2015 for the Netherlands; Martincus & Carballo, 2009 for Peru; Alvarez & Lopez, 2008 for Chile for a similar approach). We focus on a particular birth-year cohort and trace how many of this exit and how many survive after entry between 2005 and 2013. Table 3.4 shows the results.

Table 3.4: Entry and Exit rate for Cohort of Firms, 2005-2013

Number of new exporters by initial year of entry, 2005-2013 (counts)

	2005Entry	2006Entry	2007Entry	2008Entry	2009Entry	2010Entry	2011Entry	2012Entry
2005	1791							
2006	672	2184						
2007	521	746	1985					
2008	451	567	601	1659				
2009	415	496	436	413	1765			
2010	391	456	385	300	446	1872		
2011	373	434	384	277	367	436	2211	
2012	344	383	332	232	307	361	463	1955
2013	317	332	299	212	267	305	340	406

Cummulative exit rate relative to the entry year (%)

	2005Entry	2006Entry	2007Entry	2008Entry	2009Entry	2010Entry	2011Entry	2012Entry
2006	62%							
2007	71%	66%						
2008	75%	74%	70%					
2009	77%	77%	78%	75%				
2010	78%	79%	81%	82%	75%			
2011	79%	80%	81%	83%	79%	77%		
2012	81%	82%	83%	86%	83%	81%	79%	
2013	82%	85%	85%	87%	85%	84%	85%	79%

Exit rate relative to previous period (%)

	2005Entry	2006Entry	2007Entry	2008Entry	2009Entry	2010Entry	2011Entry	2012Entry
2006	62%							
2007	22%	66%						
2008	13%	24%	70%					
2009	8%	13%	27%	75%				
2010	6%	8%	12%	27%	75%			
2011	5%	5%	0%	8%	18%	77%		
2012	8%	12%	14%	16%	16%	17%	79%	
2013	8%	13%	10%	9%	13%	16%	27%	79%

Notes: The upper panel is the number of new exporters by their first year of entry. The middle panel gives the cumulative exit rates relative to the number of entries in the first year, while the lower column gives the exit rate relative to the previous period. The sign is reversed in the calculation of exit rates.

This table tells us some important information: firstly, there is very high exit rate in the first year. Across all eight cohorts, a vast majority of new exporters do not survive beyond the first year. The exit rate in the first year of entry ranges between 62% in 2006 and 79% in 2013. For example, of the 1,791 exporters that began exporting in 2005, only 672 made it to 2006 (representing an exit rate of 62.5%). The high exit rate has also been documented by Cadot et al. (2013) for Mali (42%), Malawi (68%), Senegal (59%) and Tanzania (54%).

Secondly, exit rate diminishes over time and is stable across time cohorts. For example, of the 1,791 exporters that began exporting in 2005, 344 were still around in 2012 out of which 27 exited in 2013, representing a much lower exit rate of 8% relative to the previous year (see the lower panel of the table) as a firm stays longer in export market. This result is consistent with the findings in the literature of diminishing exit rate with length of stay in export market (see Besedes & Prusa, 2006a for the US; Nitsch, 2009 for Germany and Hess and Persson, 2011 for several EU countries). Third and final, the average duration of trade is short across all cohorts. For example, after 3 years 75%-84% of new entry firms don't export (exit), after 5 years 78-87% of new entry firms don't export and after 7 years 85% of new entry firms don't export.

To examine the differences in exit rate for firms that start-off with a large initial trade value versus those that start-off small, we created a dummy variable equal to one if an exporter's initial export value is equal or greater than the median size of the initial trade value for the cohort of exporters that began to export in 2005. In accordance to the reviewed literature, we expect that firms with an initial export value that is above the median value exhibits lower exit rate relative to firms that starts off with an initial export value that is below the median.

Likewise, we classified firms based on whether or not they are involved in exporting products that are considered differentiated according to the Rauch index (Rauch, 1999). In our data, there are some exporters that are multiple product exporters, making it hard to reduce the product type variable to the exporter level. To go around this, we calculated the average share of each 6-digit HS product in a firm's total exports every year and pooled across all years to obtain the top ranked product. The top ranked product is used to assign an exporter as either dealing in a homogeneous or a differentiated product. This makes sense because the top ranked product accounts for the majority of exports for most exporters both in the literature (Arkolakis, 2016; Amador & Opromolla, 2013) and as observed in chapter 2 of this thesis. Table 3.5 presents the cumulative exit rates for firms according to their initial size (on the left-hand part) and according to firms' product type (on the right-hand side).

Table 3.5: Exit rates and firm characteristics-cohort of firms that entered in 2005

	Size of initial fob export value			Rauch Product classification		
Year	Below median	Above median	Total	Homogeneous	Differentiated	Total
2005	1219	572	1791	1267	331	1598
2006	176	496	672	395	174	569
2007	152	369	521	303	134	437
2008	121	330	451	273	110	383
2009	111	304	415	246	102	348
2010	94	297	391	237	96	333
2011	97	276	373	230	90	320
2012	90	254	344	214	83	297
2013	77	240	317	197	75	272
	Cumulative exit rate(%)			Cumulative exit rate(%)		
Year	Below median	Above median	Total	Homogeneous	Differentiated	Total
2005	--	--	--	--	--	--
2006	86%	13%	62%	69%	47%	64%
2007	88%	35%	71%	76%	60%	73%
2008	90%	42%	75%	78%	67%	76%
2009	91%	47%	77%	81%	69%	78%
2010	92%	48%	78%	81%	71%	79%
2011	92%	52%	79%	82%	73%	80%
2012	93%	56%	81%	83%	75%	81%
2013	94%	58%	82%	84%	77%	83%

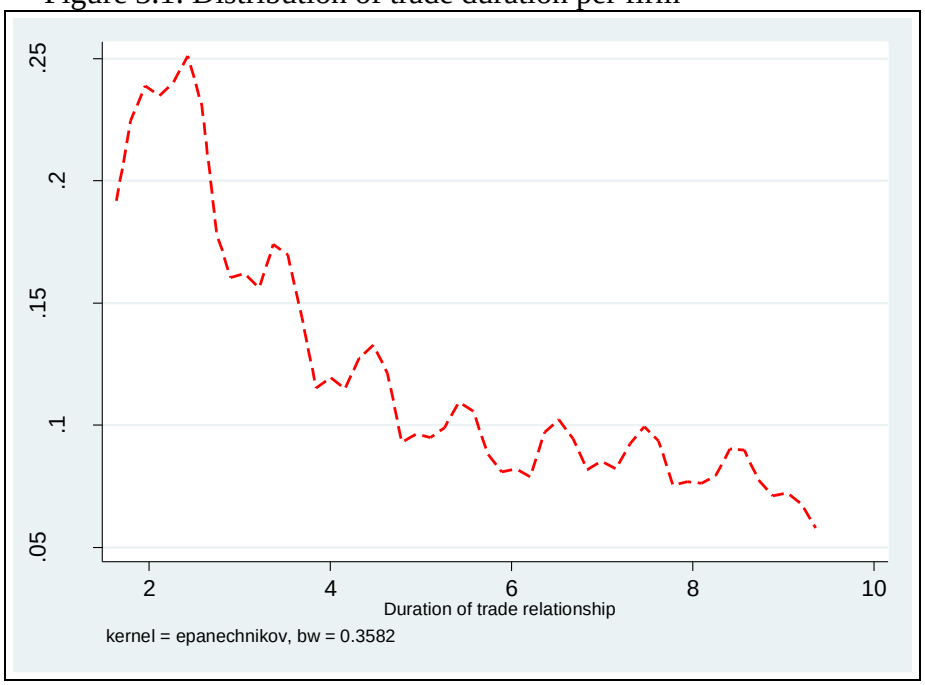
Notes: Left hand part of the table indicates the cumulative exit rate according to firms' initial value of export in the first year of entry. The right-hand part gives the cumulative exit rate according to the main product of the exporter. The sample for the product classification is 1,598, due to lack of classification of all products using the Rauch index.

The results confirm the common findings in the literature that cumulative exit rate for small sized exporters is higher relative to large sized exporters (see Lejour, 2015; Martincus & Carballo, 2009; Besedes & Prusa, 2006a). For example, the exit rate after the first year of entry is 86% for small exporters compared to just 13% for firms that start off with a large initial export value. After 9 years of stay in trade, 94% of small sized exporters exit compared to 58% of the large exporters. Similarly, exporters involved in differentiated products have lower cumulative exit rate (77%) relative to the firms involved in homogeneous exports (84%). This is also consistent with the findings in the literature (Nitsch, 2009; Brenton et al., 2009; Besedes & Prusa, 2006b).

Duration of Trade

A trade duration (Spell duration) is defined in this chapter, as the length of time of uninterrupted flow of exports per exporter after entry. We use exporter-year observed trade relationships to track the length of time until a firm ceases to export any product outside the Kenyan border. This chapter focuses on the time an exporter remains active in the international market regardless of the number of countries served[18]. All that matter is the ability to stay in the export status over time after entry or re-entry into exporting after 2005. Figure 3.1 presents the kernel density distribution of export spells among new exporters, 2005 to 2013[19].

Figure 3.1: Distribution of trade duration per firm



Source: Own computation from Customs database. Most exporters have only one-year trade spell. This plot only considers two or more years of trade spell.

The distribution of trade duration is skewed to the right, indicating heterogeneity in the length of survival of export relations among exporters. Most exporters have approximately one year of uninterrupted export flows, while a small number of exporters have eight to nine years. The longest observable duration in our sample is nine years, with right censoring, while the minimum is one year. The modal and median length of trade duration is one year for Kenya

[18] A number of studies use firm-product-destination-year trade duration (see Lejour, 2015; Cadot et al., 2013). Our definition uses only firm-year duration of trade. This has the advantage of avoiding a lot of noise in product and destination churning that is common in trade data (see Gorg et al., 2008).

[19] We restrict to export spells that are equal or greater than two years, although export spells that are one year constitute the mode.

which is consistent with findings in the empirical literature (see Lejour, 2015 for the Netherlands; Nitsch, 2009 for Germany; Besedes & Prusa, 2006a for the US). Trade relations remain extremely short lived with the median length of trade being one year.

To summarise, over the period 2005-2013, the average entry, exit, and survival rates for the Kenya's exporters in international markets are 39%, 36% and 59%, respectively. This is consistent with the rates found in other studies in the literature and indicates enormous churning of entry and exit of exporters. Looking at the trade characteristics of exporters, exiters are on average smaller in value compared to both new entrants and continuing exporters. Furthermore, each cohort of entering firms exhibits a very high exit rate (62-79%) within the first year but the exit rate diminishes over time. This suggests that survival of exporters in international markets is the key to a sustained export growth in any country. In the next section, we focus in examining econometrically, the determinants of survival of Kenya's new entrants to the international markets.

3.4 Estimation Strategy and Data

3.4.1 Estimation Methods

Analysing the time to the occurrence of an event is conducted using survival analysis. The time to failure of an event is a non-negative real value (Cleves, 2008) which means, estimation using ordinary least squares (OLS) may result in prediction of negative time values to the occurrence of an event. In addition, the OLS assumption of normality of the error term is violated and there is both left and right censoring[20] in the duration data, requiring use of alternative estimation techniques other than OLS. Survival analysis takes into account the challenges associated with duration data. They account for the evolution of the exit risk and its determinants over time (Martincus & Carballo, 2009). The survivor function $S(t)$ is defined as:

$$\mathrm{S}_i(t) = \mathrm{P}(T \geq t) = 1 - F_i(t) \qquad (3.)$$

[20] Left censoring-Trade relationships that are observed at the start of the sample period (i.e. 2004 in our case) and last until completion of the spell, the actual duration of that relationship is not known because the time from inception of the spell to the start of the study period is unknown (see Kiefer, 1988:647). Right censoring-the end of the study sample period (i.e. 2013) interrupts trade spells that are still in progress.

where $T \geq 0$ denote the duration of export relations and has same distribution in the population of all new exporters and t is a particular value of trade duration (T). The survivor function gives the probability that the duration of trade relations (T) equals or exceeds the value t (i.e. the compliment of the probability distribution of duration F(t)). Alternatively, the distribution of the duration of trade may be specified in terms of a hazard function as:

$$h_i(t) = \frac{\lim_{\Delta t \to 0} P\,(t \leq T \langle t + \Delta t | T \geq t \rangle)}{\Delta t} = f_i(t)/S_i(t) \qquad (4.)$$

where $h_i(t)$ is the hazard (instantaneous) rate at which trade relations end at duration $t + \Delta t$, given that they last until t. $P(t \leq T \langle t + \Delta t | T \geq t \rangle)$ is the probability that an export relation fails(stops) in the interval $(t + \Delta t)$.

Equation (4) can be estimated using non-parametric estimates for the probability that an export relation ends in the interval $(t + \Delta t)$. This is done using the Kaplan-Meier (KM) survival function estimator. The KM product limit estimator is specified as:

$$S_i(t) = \prod_{t_i \leq t} \frac{n_i - d_i}{n_i} \qquad (5.)$$

where n_i denotes the number of subjects at risk of failure at time t_i and d_i denotes the number of observed failures. The non-parametric estimator gives us a rough guess of the shape of the raw survival probability (or hazard rate), before including any explanatory variables. This is a graph with a series of declining horizontal steps that approaches the true survival function for the population in question. The area under the survivor function provides the mean length of stay of a firm in the export market.

The influence of explanatory variables on the distribution of trade durations depends on the specification used. Previous studies, seeking to explain the factors that determine trade durations (Nitsch, 2009; Martincus & Carballo, 2009; Besedeš & Prusa, 2006b; Besedeš & Prusa, 2006a) use the continuous time proportional hazard model specified as:

$$h_i(t, \boldsymbol{X_i}) = h_0(t) Exp(\boldsymbol{X_i}' \boldsymbol{\beta_x}) \qquad (6.)$$

where: $h_i(t, \mathbf{X_i})$ =The hazard rate (the risk of failure) of a firm's export spell i, and h is the probability that the relationship fails in period $t + 1$, having survived to period t. $h_0(t)$ = represents the baseline hazard that depends only on time at risk; $\exp(\mathbf{X_i}'\boldsymbol{\beta_x})$= is an exponential

part that depends on firm characteristics; $\mathbf{X_i}'$=the vector of covariates for the firm and $\boldsymbol{\beta_x}$ = a vector of coefficients to be estimated.

Under this model, the effect of the explanatory variables is simply to multiply the hazard function by a scale factor. As such, there is a parallel shift (proportional) of the baseline hazard which is estimated for all exporters whose export relation survives up to a particular period (Kiefer, 1988; Cox, 1972). Equation (6) is interpreted as the hazard (risk of failure) a firm's export duration (trade spell) faces as being a function of the hazard every other exporter faces (baseline hazard), modified by specific firm characteristics. The maximum likelihood function is specified as:

$$\mathrm{L}\{\beta|(t_{1,}X_1),\dots,(t_{n,}X_n)\} = \prod_{i=1}^{n} S(t_i|X_{i,}\beta) * \mathrm{h}(t_i|X_i,\beta) \tag{7.}$$

where t (t=1,2, …, n) is the analysis time representing the probability that an exporter i 's fails in t+1, having survived up to time t. The probability density function of $\boldsymbol{t_i}$ is given as $f(t_i) = S(t_i) * h(t_i)$. The idea behind the maximum likelihood estimation is that, given a set of observations (t=1,2,3, …, n), the best estimate of β is the one that maximizes the probability of observing that particular data. Taking the logarithm transformation of equation (7) we obtain the log likelihood function in equation (8) below:

$$\mathrm{LnL} = \sum_{t=1}\sum_{i=1}[y_i \ln(h_i) + (1-y_i)\ln(1-h_i)] \tag{8.}$$

where y_i is a dummy variable equal to 1 if the export relation fails and zero otherwise. We estimate equation (8) semi-parametrically using the partial–likelihood approach proposed by Cox (1972). Under this technique, the equation is estimated maximizing the partial likelihood function with respect to the vector of coefficients without the need to specify the functional form of the baseline hazard. This approach has the advantage of avoiding potential mis-specification of the baseline hazard function but relies crucially on the assumption that the hazard rate is proportional. This assumption can be tested using Schoenfeld residuals (Schoenfeld, 1983), with the null that the hazard rate is proportional. If rejected, adoption of discrete choice models such as panel logit is used (Lejour, 2015). The logit is specified as:

$$\Pr(\mathrm{y}_{it} = 1|\mathrm{X}_{it},\varepsilon_{it}) = \theta(\mathrm{X}'_{it}\beta + \mu_t + \alpha_i + \omega_{it}) \tag{9.}$$

where y_{it} is equal to 1, if a firm fails (exit export market) and zero otherwise. X_{it} is a vector of firm characteristics. μ_t is the time fixed effects that controls for yearly shocks common to all firms and α_i is a firm specific fixed effects, while ω_{it} is a random error term. θ is a logistic CDF and we estimate the model using panel LPM and logit with fixed effects. The next section discusses measurements of key variables and challenges associated with modelling duration data.

3.4.2 Measurement of Explanatory Variables

This chapter uses the transaction level dataset described in chapter two. One of the best attributes of this dataset is the ability to observe new entrants into the export database, their growth dynamics in exports and the number of products and destinations served over time. Below, we discuss the construction of variables used in the estimation.

Trade duration (Spell duration)

Using exporter-year trade relationships for the firms that started to export for the first time in 2005-2013, we can trace the length of time until a firm (exporter) ceases to export, an event constituting a failure (or an exit). This event is used to create a dummy variable equal to one, if a firm exits from exporting and zero otherwise. Our definition of exit entails a complete end to export activity by the firm. This has the advantage of avoiding a lot of noise in short durations if a dimension such as firm-product, or firm-destination is used (see Lejour, 2015 for the analysis of survival of firm-product-destination). This way, we emphasize on firm survival in export generally as in Martincus and Carballo (2009), regardless of the length of time that a firm trades a product and/or serves a destination. This restriction is also informed by the literature that argues that in some cases dropping of products and switching of destinations are associated with survival of firms in exports market (see Mayer et al., 2014; Iacovone & Javorcik, 2010; Gorg et al., 2008).

Initial export value (Initial fobvalue)

The initial value of a trade relationship is used as a proxy for the level of confidence the exporter originally had in the profitability of that relation (Lejour, 2015; Brenton, Saborowski & von Uexkull, 2009; Besedeš & Prusa, 2006a). As such, this variable is expected to have negative and statistically significant relations with the hazard rate, which enhances survival probability. To construct this variable, we rely on the fact that we can precisely observe the

first year an exporter started to export in the customs database and determine its annual monetary value. The initial value is calculated as a firm's total exports in the first year of entry in US dollars. The logarithmic transformation of this variable is included as a regressor and captures the differences in survival for firms that entered in the same year but with different initial amounts.

Current export values (Export value)

The use of initial value to capture the size of the firm in the first year of entry is very common in the literature. However, the initial value is normally dropped once we consider fixed effects estimations. As an alternative, we use current export value as a proxy for the firm's size in export market (see Martincus & Carballo, 2009). As noted in the stylized facts, the average export value for the exiting exporters is very small compared to the continuing and entering exporters (see Table 3.3). This suggests that the size of an exporter measured by the current export value determines the probability of failure at some point in future. The logarithmic transformation of this variable is included as a regressor.

Differentiated product dummy

We follow the literature to construct and control for the type of product an exporter deals in, using the Rauch (1999) conservative product classification index to classify products as either homogeneous or differentiated. The Rauch[21] classification groups traded commodities at both the 3-and 4-digit Standard International Trade Classifications (SITC) rev.2 levels according to differentiated goods (n), reference priced goods (r) and goods traded on an organized exchange (w). The combination of reference priced goods and goods traded on an organized exchange constitutes the homogeneous product classification in this chapter.

The product type dummy is equal to 1 if the product is classified as differentiated and zero otherwise. In our data, there are some exporters that are multiple product exporters, making it hard to reduce the product type variable to the exporter level. To go around this challenge, we calculated the average share of each 6-digit HS product in a firm's total exports every year to obtain the top ranked product. The top ranked product is used to classify an exporter as either dealing in a homogeneous or a differentiated[22] product in a given year. This makes sense because the top ranked product accounts for the majority of exports for most exporters both in

[21] http://tradesift.com/about-ts/productGroups/Pg-rauch.aspx.
[22] In this approach, differentiation may also be viewed as proxied by diversification.

the literature (Arkolakis, 2016; Amador & Opromolla, 2013) and as observed in chapter 2 of this thesis. We expect the dummy variable to have a negative and significant relationship with the hazard rate, implying that it enhances the probability of survival of a firm in export markets.

Number of products and number of destination countries per exporter

The number of products shipped per exporter is used as proxy for firm ability in terms of product scope. It is computed as the count of all 6-digit HS products exported by an exporter in a given year. Similarly, the number of destination countries served by an exporter is used as proxy for firm ability in terms of its geographical scope (Martincus & Carballo, 2009). It is computed as the count of all destination countries served by an exporter in a given year.

In the absence of panel data information on firm characteristics such as employment, capital, and total output, we use the number of products and the number of countries served per exporter as proxy for firm ability. There is a basis in the literature for using these variables. Firstly, from a portfolio perspective, if the correlation of firm's sales across destinations is not perfect, then a large product scale in sales over these countries will result in more stable export total sales and this may be expected to boost survival. Secondly, the heterogeneous firm trade models (Arkolakis & Muendler, 2010; Chaney, 2008) underscore the fact that only more productive firms are able to afford paying fixed costs of entry to many export destinations. This is because adding a new destination country requires incurring destination specific fixed costs and holding a wider geographical scope reflects high productivity. Thus, an increase in the number of destination countries served by an exporter is associated with a reduction of the probability of exit from export markets.

Controlling for firm network (avg number of firms-sameHS6)

We constructed two different proxy measures for firm network. The first measure is the average number of firms exporting similar products (HS6) to any destination. This variable constitutes a narrow measure of firm's network. Firms exporting similar products to the same destination can be considered competitors. At the same time, there is a lot of signalling effect and learning from the fortunes of other exporters, including potential for new profit (Eaton et al., 2012). A second proxy is the average number of firms belonging to the same sector and exporting to any destination. Sector is defined as 2 digits harmonized system (HS2) for product classification. This is used in the literature to capture foreign market specific intra industry spillovers

(Choquette & Meinen, 2015). By the nature of construction, these variables are correlated and are included in a separate regression.

Common Market for Eastern and Southern Africa (COMESA)

Targeting a specific market may be important for survival (Lejour, 2015). The COMESA regional trade block absorbs up to 52% of Kenya's industrial exports (KNBS, 2014) and may be important for exporter survival. We assign a firm to COMESA as the main market depending on the share of her exports to this trade block. This is done in steps. In step 1 we classify destination countries using COMESA membership status. Step 2 calculates the total exports by firm, year and COMESA dummy and obtains a firm's total exports per year. Step 3 computes the share of a firm's export to COMESA as a ratio to total firm exports. In step 4 we compute the average share of COMESA in a firm's export over time. In step 5, if the share is equal to 1, then a firm's main market in period t is COMESA, if the share is 0, then the main market is rest of the world, and anything in-between means the main market is both. In step 6 we create a COMESA dummy=1, if COMESA is the main market and zero otherwise. We expect the COMESA dummy to have a negative and significant relation with the hazard rate.

Table 3.6 presents the key summary statistics for the main product, exporter and destination characteristics included as explanatory variables in the analysis.

Table 3.6: Summary statistics of the key variables (first year of entry 2005-2013)

Variable	N	Mean	sd	Min	Max
Failure dummy	28,103	0.4	0.5	0.0	1.0
Spell duration	28,103	4.1	2.8	1.0	9.0
Log(Initial fobvalue)	20,938	8.8	2.3	-0.5	17.7
Log(Export value)	28,103	9.2	2.5	-1.5	18.3
Rauch(1=differentiated)	25,881	0.2	0.4	0.0	1.0
Number of products	28,103	5.2	13.3	1.0	299
Number of countries	28,103	1.8	2.2	1.0	65.0
Avg.number of firms-sameHS6	28,103	20.8	44.0	1.0	319
Avg.number of firms-same Sector	28,103	132.8	107.6	1.0	424
COMESA (=1, Comesa main market)	28,103	0.6	0.5	0.0	1.0

Notes: Computed from custom data for firm-year export relationships, 2005-2013. This excludes left censored data (i.e. 2004) for which we are blind to when the relationship started.

The above data excludes left censored trade relationship and focus the analysis on the cohort of new entrants after 2004. The reported statistics allows us to check if we have any outliers. A variable is considered an outlier if it is greater or less than its $\text{mean} \pm 3$ standard deviation.

The number of products and the number of countries per exporter shows evidence of outlier observations. In addition, two variables deserve a brief discussion, namely the spell duration and the failure dummy (=1). The mean spell duration is 4.1 years with a standard deviation of 2.8 years. The failure dummy is an indicator equal to 1, if a firm exits (fails) and zero otherwise. It is also possible to switch between a failure and a non- failed state. This reflects exporters who record multiple spells in the trade data as discussed below.

3.4.3 Dealing with multiple spells exporters

In the export dataset there are some exporters that enter export markets some years, continue for several years in that status and exit for one or more years before re-appearing. The presence of multiple spells exporters means, two or more events of interest (failure=1) can occur to the same exporter. In this case, failure times may be correlated within firms where the first failure is likely to be followed by a second failure (Martincus & Carballo, 2009; Lin & Wei, 1989), which implies the critical assumption that trade durations are independent over time conditional on observed covariates will be violated.

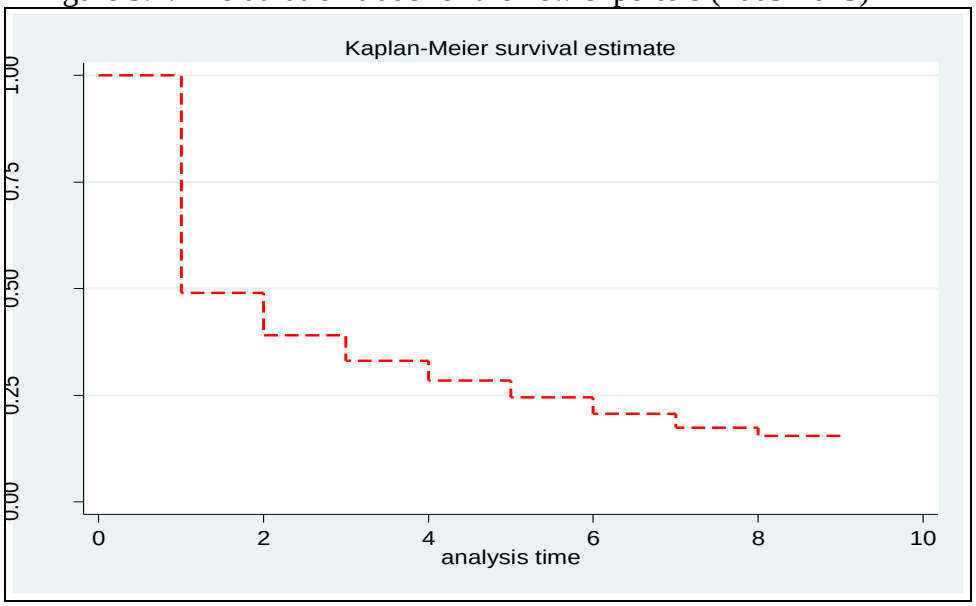
There are several ways in the literature to control for multiple spells. One may estimate the model without explicitly modelling the dependencies in trade durations and then correct the covariance matrix to account for the within exporter correlations as in Lin and Wei (1989) and Martincus and Carballo (2009). Some papers treat multiple spells as independent events and control for high order spells using a dummy variable, as in Besedes and Prusa (2006b) and Lejour (2015), while some consider dropping exporters with multiple spells altogether from the analysis (Brenton et al., 2012). Like in Martincus and Carballo (2009) and Lejour (2015), we correct the covariance matrix to account for the within exporter correlations by clustering of standard errors on the firm level. We also check the robustness of our results by excluding variables with multiple spells. In addition, for the cohort of exporters that started in 2005, for a total of 317 exporters (see Table 3.4), the failure event had not occurred by the end time in the sample. These types of exporters are right censored. In practice, there is also left censoring but in our case, left censoring is not a problem because we focus the analysis on the cohort of new entrants after 2004. The survival analysis methods have inbuilt routine for correcting for right censoring as well as for ties in trade spell length (Cleves, 2008).

3.5 Results and Discussion

3.5.1 Non-Parametric Results

We start off by presenting the non-parametric estimates for the probability of a firm exiting (failure) in period $t+1$ having survived through period t. The non-parametric estimator gives us a rough guess of the shape of the raw hazard rate, before considering the effects of any explanatory variables. The survival function is a series of declining horizontal steps graph and the area under the curve provides the mean duration of stay in export markets for a firm. Figure 3.2 show the Kaplan-Meier survival estimates for the duration of active trade for the population of exporters that started to export in 2005 or thereafter.

Figure 3.2: The duration trade for the new exporters (2005-2013)



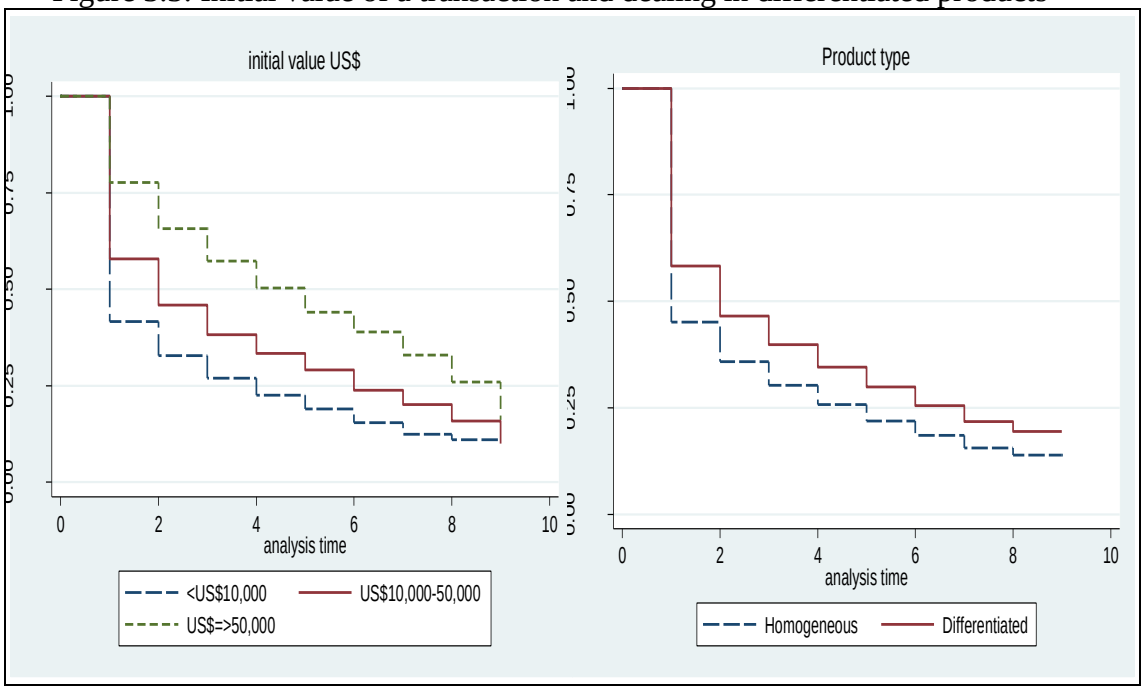
Notes: The y-axis is in probability scale. The x-axis contains the duration of active trade. The graph is a series of declining steps showing declining hazard rate (or increasing survival) as export spell grow older.

From the graph, approximately 52% of new exporter's trade relationships end within the first year of entry, while approximately 75% fail within the first five years of entry. Overall, the hazard rate falls as export spells grow older. Kenya's export relations experience a steeper death rate within the first year of entry compared to 33% in the US (Besedes & Prusa, 2006a).

Differences in survival depending on the initial value and product type

Figure 3.3 presents KM survival estimates for different categories of the initial value of a transaction, as well as whether the product is classified as differentiated or homogeneous. It can be observed that exporters whose initial transaction is large (greater than US$50,000) have a better chance of surviving in the international markets relative to those whose initial value is below US$ 10,000. Furthermore, exporters exporting differentiated products have a better chance of surviving compared to those who export homogenous products. These results are quite standard in the survival literature (Nitsch, 2009; Brenton, Saborowski & von Uexkull, 2009; Besedeš & Prusa, 2006a).

Figure 3.3: Initial value of a transaction and dealing in differentiated products



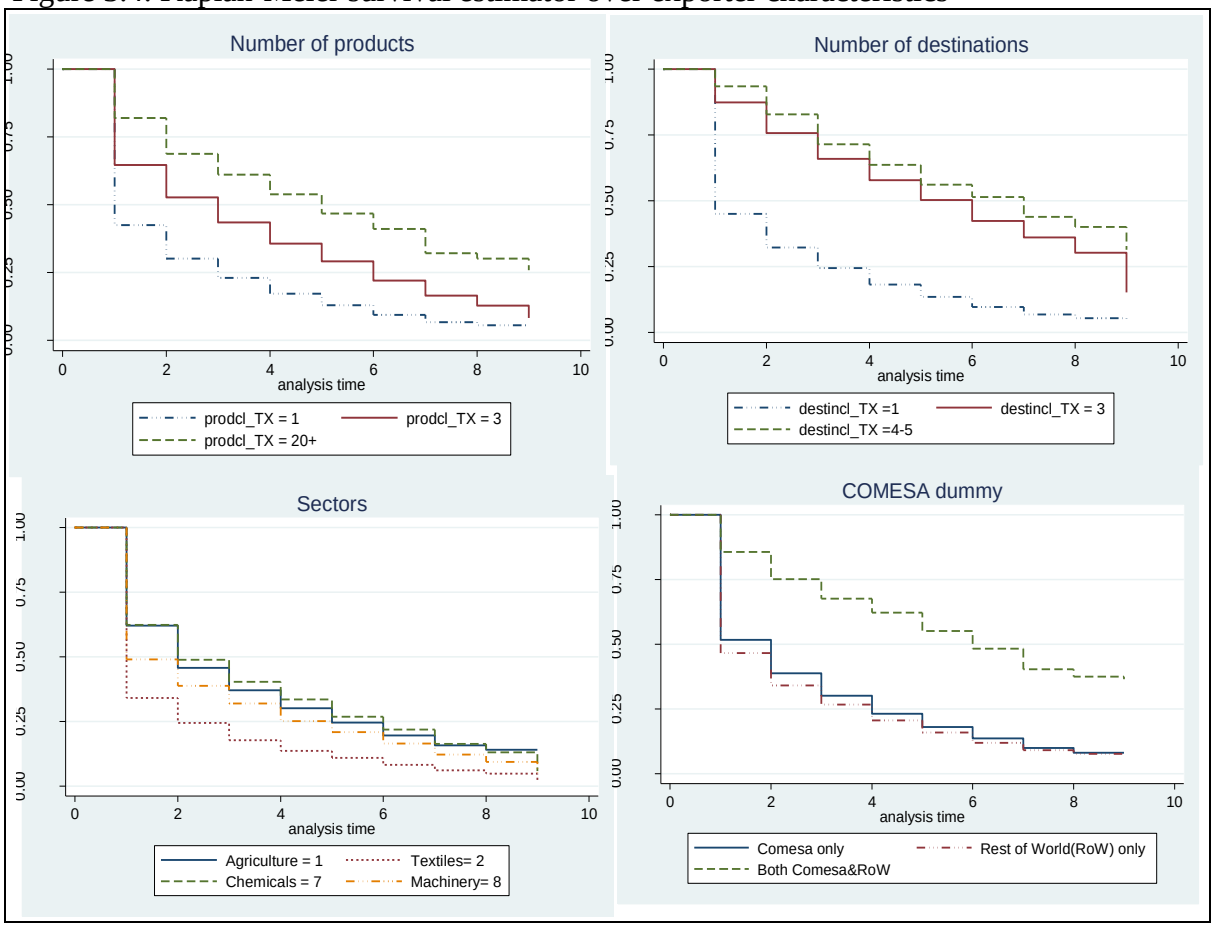
Notes: The y-axis is in probability scale. The x-axis contains the duration of active trade. The graph is a series of declining steps showing declining hazard rate (or increasing survival) as export spell grow older. Graphed over all new entrants between 2005 and 2013.

Differences in survival across exporter characteristics

We also explore differences in survival across exporter characteristics such as the number of products, the number of destinations served, the main sector of exporter and whether or not the exporter mainly serves the COMESA market. Figure 3.4 summarises the KM survival estimates over each of these variables. In the first quadrant, exporters with a single product have a low chance of survival relative to those with three to twenty products. The exit rate for exporters that sell twenty or more products is approximately 23% compared to 59% for the single product exporters in their respective first year of entry.

In the second quadrant, there is high exit rate in the first period if a firm starts off with one destination-country compared to a firm that starts off with three or more destination countries. The third quadrant shows that exporters belonging to the chemicals sector[23] have a lower exit rate relative to the other sectors and finally the fourth quadrant shows that exporting to both COMESA and rest of the world is associated with a lower exit rate relative to exporting to rest of the world only. We suspect this is perhaps due to high cost of entry in the latter markets but may also be due to differences in underlying firm characteristics. These issues are however outside the scope of this chapter.

Figure 3.4: Kaplan-Meier survival estimator over exporter characteristics



Notes: The y-axis is in probability scale. The x-axis contains the duration of active trade. The graph is a series of declining steps showing declining hazard rate (or increasing survival) as export spell grow older. prodcl_TX means the category of the number of products exported by a firm. destncl_TX stands for the category of the number of destination countries served. Sectors are constructed from the 2-digit HS product classes and we present Agriculture, Textiles, Chemicals, and Machinery for clarity, although the shapes of other sectors are similar.

[23] We assigned firms into eight broad sectors depending on the top ranked product in their export mix over the whole period.

The next section uses the semi-parametric proportional hazard model to estimate the factors that determine the probability of exit of a firm from international markets.

3.5.2 Regression Analysis

We estimate equation (8) using the Cox proportional hazard (PH) method. A negative coefficient means that an increase in the explanatory variable reduces the hazard rate (exit rate) and enhances the probability of survival. The results in Table 3.7 show that the Cox PH model yields a qualitatively expected relationship between the hazard rate and the firm characteristics considered.

Table 3.7: Baseline regression: Cox Proportional Hazard (PH)

Dependent variables:	Pr(fail=1|t+1)	Pr(fail=1|t+1)	Pr(fail=1|t+1)	Pr(fail=1|t+1)
	Cox-PH	Cox-PH	Cox-PH	Cox-PH
	(1)	(2)	(3)	(4)
Firm characteristics				
Log(Initial fobvalue(i))	-0.0563***	-0.0554***		
	(0.00436)	(0.00438)		
Log(Export value(t))			-0.0614***	-0.0611***
			(0.00459)	(0.00457)
Rauch(=1, if differentiated(t))	-0.0228	-0.0302	-0.0123	-0.0107
	(0.0262)	(0.0263)	(0.0264)	(0.0263)
Log(Number of products(t))	-0.0675***	-0.0675***	-0.0667***	-0.0660***
	(0.0123)	(0.0123)	(0.0124)	(0.0124)
Log(Number of countries(t))	-0.666***	-0.668***	-0.656***	-0.662***
	(0.0382)	(0.0382)	(0.0356)	(0.0355)
COMESA (=1, main market(t))	-0.0743***	-0.0690***	-0.0861***	-0.0555***
	(0.0184)	(0.0186)	(0.0194)	(0.0206)
Firm Networks				
Log(avg.number of firms-sameHS6(t))		-0.0133**	-0.0102	
		(0.00638)	(0.00653)	
Log(avg.number of firms-same sector(t))				-0.0360***
				(0.00742)
Year FE	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES
Observations	10,656	10,656	12,151	12,151
Log likelihood ratio	-70022	-70021	-79341	-79334
No. of firm clusters	10656	10656	11177	11177
No. of time at risk	22057	22057	28680	28680
No. of failures	8218	8218	9216	9216

Notes: All estimations are obtained using the Cox PH method where the dependent variable is the probability of exit (failure) in period t+1, having survived through period t. All continuous variables are in logs. The standard errors are clustered at the firm level. The asterisks indicate the level of significance *** p<0.01, ** p<0.05, * p<0.1.

In column (1), a higher initial value of export, a larger number of products and destination countries served per firm are associated with a reduction in the probability that a firm exits (fails) having survived to date. Targeting the COMESA market is also associated with a reduction in the probability of exit (or improved chances of survival). All these variables are found to be significant at 1% level. The coefficient on differentiated product dummy is not significant.

Column (2) adds the average number of firms exporting similar HS6 products to any destination as a control for the firm's network effects. This variable constitutes a narrow measure of firm's network. Firms exporting similar products can be considered competitors but at the same time, there is a lot of signalling effect and learning from the fortunes of other exporters, including potential for new profit (Eaton et al., 2012; Amador & Opromolla, 2013; Cadot et al., 2013). The coefficient on this variable is negative and significant at 5% level, suggesting that an increase in the number of firms exporting similar HS6 products is associated with a reduction in the probability of exit (or an improvement in survival rate).

The use of initial value of exports in the initial year of entry as a measure of size of the transaction and confidence of a deal is very common in the survival literature (Lejour, 2015; Cadot et al., 2013; Brenton, Cadot & Pierola, 2012; Martincus & Carballo, 2009; Brenton, Saborowski & von Uexkull, 2009; Nitsch, 2009; Besedeš & Prusa, 2006b; Besedeš & Prusa, 2006a). What also matters is the size of current period export value (see Martincus & Carballo, 2009). As noted in the stylized facts, the average export value for the exiting exporters is very small compared to the continuing and entering exporters (see Table 3.3). This suggests that the size of an exporter measured by the current export value determines the probability of failure some point in future. Column (3) replaces the initial value of exports in the first year of entry with the current export value. We find a strong negative coefficient, suggesting that a higher export value in the current period is associated with a reduction in the probability of exit (failure).

Column (4) considers a second proxy for firm's network-the average number of firms belonging to the same sector and exporting to any destination. This is used in the literature to capture foreign market specific intra industry spillovers (Choquette & Meinen, 2015). We find a negative and significant effect of this variable on the probability of exit. Current export value, a larger product and destination scope and targeting COMESA market are also associated with lower probability of exit.

The validity of the proportional hazard result relies on a key assumption that the hazard rate is proportional (Brenton et al., 2009). We used the Schoenfeld (1983) residuals, a post estimation test after the Cox PH regression, to test for the null that the hazard rate is proportional (Hess & Persson, 2011; Martincus & Carballo, 2009). This test is conducted on the results of column (4) in Table 3.7 but they hold even in other estimations. The test follows a chi-square distribution and from the global test in Table 3.8, the null is strongly rejected at a 1% level of significance.

Table 3.8: Testing the proportionality of hazard assumption-Schoenfeld residuals test

	rho	chi2	df	Prob>chi2
Log(Export value)	-0.0134	1.130	1	0.288
Rauch(=1, product differentiated)	0.00098	0.0100	1	0.936
COMESA (=1, main market)	0.0228	3.660	1	0.055
Log(Number of products)	0.0493	21.57	1	0.000
Log(Number of countries)	0.00754	0.380	1	0.539
Log(avg.number of firms-same sector)	0.00123	0.0100	1	0.924
Global test		61.12	21	0.000

Notes: A post-estimation test computed after the Cox PH regression.

With the rejection of the assumption of proportionality in the hazard rate, the Cox PH results may not be valid. Thus, we consider using discrete choice model specified in equation (9) to model the probability of exit (failure) conditional on firm characteristics.

Table 3.9 reports the results from the linear probability model-LPM (columns 1-2) together with results from the logit with fixed effects (columns 2-4).

Table 3.9: The probability that a relationship fails: panel estimation

Dependent variables:	Pr(fail=1|X)	Pr(fail=1|X)	Pr(fail=1|X)	Pr(fail=1|X)
	LPM-FE	LPM-FE	LOGIT-FE	LOGIT-FE
	(1)	(2)	(3)	(4)
Log(Export value(t))	-0.0170***	-0.0172***	-0.0116***	-0.0106***
	(0.00308)	(0.00308)	(0.00404)	(0.00395)
Rauch(=1, if differentiated(t))	-0.00872	-0.00880	-0.0123	-0.0118
	(0.0166)	(0.0166)	(0.0161)	(0.0147)
Log(Number of products(t))	-0.0180***	-0.0183***	-0.0142**	-0.0131**
	(0.00611)	(0.00612)	(0.00654)	(0.00610)
Log(Number of countries(t))	-0.0315***	-0.0307***	-0.0392***	-0.0352***
	(0.00962)	(0.00966)	(0.0133)	(0.0129)
COMESA (=1, main market(t))	0.0178	0.0147	0.0206	0.0158
	(0.0149)	(0.0150)	(0.0155)	(0.0148)
Log(avg.number of firms-sameHS6(t))	-0.00353		-8.91e-05	
	(0.00591)		(0.00491)	
Log(avg.number of firms-same sector(t))		0.00344		0.00546
		(0.00718)		(0.00544)
Observations	25,881	25,881	6,658	6,658
Number of groups(id)	12844	12844	2,169	2,169
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Notes: All estimations are obtained from a panel regression of the dummy=1, if the relationship ends against observable firm characteristics. All continuous variables are in logs. Columns (2-4) result is the average marginal effect computed at the mean. The logit sample is small because only firms whose trade status change are included in the regression. The asterisk indicates the level of significance *** p<0.01, ** p<0.05, * p<0.1.

Column (1) examines for within the firm over time, how changes in its observable characteristics affects its probability of exit from export markets. The coefficient on current export value, the number of products, and the number of destination countries per exporter have a negative and significant relationship with the probability of exit. The coefficient on current export value suggests that a 10% increase in this variable is, on average, associated with a 0.17% reduction in the probability of exit, while a similar increase in the number of products exported per firm is associated with a reduction in the probability of exit by 0.18%. Similarly, the coefficient on the number of destinations suggests that a 10% increase in this variable is, on average, associated with a reduction in the probability of exit by 0.32%.

The coefficient on differentiated product dummy, COMESA dummy and the narrow measure of networks are not significant. Column (2) results controls for the second proxy of firm networks but this variable is also not significant and the coefficients in the rest of the covariates remains very close to those discussed in column (1).

The LPM model suffers from three key weaknesses: the marginal effects are always constant regardless of the level of an explanatory variable; the standard errors are biased as a result of heteroscedasticity and may lead to predicted probabilities that are not bound within a unit interval (Soderbom et al., 2014); (Horrace & Oaxaca, 2006). Despite these well-known challenges with the LPM, the method remains common in the literature especially because of its ease to interpret and when there are complications with non-linear models, such as the use of panel with fixed effects (Horrace & Oaxaca, 2006; Klaassen & Magnus, 2001). Horrace and Oaxaca (2006) show that the LPM results are consistent if the proportion of predicted probabilities, which lie outside the unit interval is small. In our estimation, the proportion of predicted probabilities that lie outside the unit interval is in fact zero. It is also standard to compare results from the LPM and other non-linear models such as the logit and probit.

Column (3), therefore, presents the average marginal effects (ME) computed at the mean after a panel logit with fixed effects. This estimation assumes that unobserved firm effects are correlated with observed heterogeneity and uses a within transformation to eliminate the unobserved time invariant factors that affect the probability of exit(failure) but are not controlled for (Lejour, 2015). The ME on firm's export value shows that a 10% increase in this variable, is on average, associated with a reduction in the probability that an export entrant exits from foreign markets by 0.12%, ceteris paribus.

There is a negative and significant relationship between the number of products exported by an exporter and the predicted probability of exit (failure) from export markets. A 10% increase in this variable, is on average, associated with a reduction in the probability of exit (failure) of the new entrants by 0.14%. Firms with a large product scope, therefore, have a better chance of surviving in international markets. A key explanation for this result is based on the intrinsic benefit of export diversification at the firm level. A large product scope, sold across various destination countries, results in more stable export sales with positive knock-on effects to survival in export markets.

The number of destination countries served by an exporter has a negative and significant relationship with the probability of exit (failure). A 10% increase in the number of destination countries served is, on average, associated with a reduction in the probability of exit (failure) by 0.35%, holding everything else constant. This is consistent with the theoretical framework proposed in Chaney (2008) that only more productive firms are able to afford paying the fixed costs of entry to many export destinations. Adding a new destination country requires incurring

destination specific fixed costs and holding a wider geographical scope reflects high productivity. Thus, an increase in the number of countries to which an exporter trades, is on average, associated with better chances of survival.

A number of papers document the importance of attaining multi-destination exporter status as an attribute that helps in adjustment to global shocks in the trade environment. Cadot et al. (2013) reports a coefficient of 0.125 for four SSA countries; Martincus and Carballo, (2009) finds a coefficient of -0.564 for Peru; while Hess and Persson (2011) find a coefficient of -0.1531 for the EU firms. Adding one more destination for a firms' product represents a substantial move and has a greater impact on survival compared to adding a product.

Dealing in differentiated product bundles has a negative relationship with the probability of exit but the relationship is not statistically significant, once we control for firm fixed effects. In the empirical literature, several papers using country-product level data find that product differentiation enhances the probability of survival (Nitsch, 2009; Martincus & Carballo, 2009; Brenton, Saborowski & von Uexkull, 2009; Besedeš & Prusa, 2006b), while other studies using firm-product data finds that this doesn't seem to matter (Lejour, 2015; Alvarez & Lopez, 2008). The coefficients on COMESA dummy and measures of firm network are also not significant. Column (4) results controls for the second proxy for firm's network. This variable is found to be insignificant and the rest of the results are qualitatively similar to results discussed in column (3).

3.5.3 Robustness Tests

We consider a couple of robustness tests to the above results. Firstly, we exclude exporters with multiple export spells. The presence of multiple spells [24]means two or more events of interest (failure) can occur to the same exporter. In this case, failure times may be correlated within firms where the first failure is likely to be followed by a second failure (Martincus & Carballo, 2009). We follow an approach suggested by Brenton et al. (2012) to exclude exporters with multiple spells. The results for this estimation are shown in Table 3.10.

[24]Exporters who enter export markets, continue for several years in that status and exit for one or more years before re-appearing.

Table 3.10: Robustness to exclusion of multiple spells

Dependent variables:	Pr(fail=1|X)	Pr(fail=1|X)
	LPM-FE	LPM-FE
	(1)	(2)
Log(Export value(t))	-0.0286***	-0.0290***
	(0.00489)	(0.00488)
Rauch(=1, if differentiated(t))	-0.0130	-0.0130
	(0.0248)	(0.0248)
Log(Number of products(t))	-0.0173**	-0.0176**
	(0.00861)	(0.00863)
Log(Number of countries(t))	-0.0422***	-0.0410***
	(0.0132)	(0.0133)
COMESA (=1, main market(t))	0.0367	0.0331
	(0.0233)	(0.0234)
Log(avg.number of firms-sameHS6(t))	-0.00661	
	(0.00969)	
Log(avg.number of firms-same sector(t))		0.00322
		(0.0118)
Observations	19,347	19,347
R-Squared	0.822	0.822
Number of groups(id)	10877	10877
Firm FE	YES	YES
Year FE	YES	YES

Notes: All estimations are obtained from a panel regression of the dummy=1, if a firm exit. All continuous variables are in logs. Robust standard errors in bracket. The asterisk indicates the level of significance *** p<0.01, ** p<0.05, * p<0.1.

We rely on LPM with FE since the LPM results are very similar to the ME calculated at the mean after panel logit with fixed effects. It can be observed that excluding exporters with multiple spells leads to consistent results on the relationship between the explanatory variables and the probability of exit (failure) of a firm. For example, column (1) shows that a 10% increase in the value of exports is on average associated with a reduction in the probability of exit of new entrants from export markets by 0.286%, holding all other factors constant.

An increase in the number of products exported by 10% is also associated with a reduction in the probability of exit (failure) by 0.17%. A similar increase in the number of destination countries served is associated with a decrease in the probability of exit (failure) by 0.422%. Comparing these results with those obtained in column (1) of Table 3.9 we find a larger effect on the export value of (-0.0286) relative to (-0.017), a lower effect on the number of product of (-0.0173) compared to (-0.018) and a higher effect on destination scope of (-0.0422) compared to (-0.0315). However, the results are qualitatively similar. The coefficient on the

COMESA dummy, differentiated product dummy and the measure of firm's network are not significant. Column (2) results are qualitatively similar to column (1).

Secondly, we modify the number of products and the number of countries such that they enter the regression as categorical variables rather than as continuous. This presents a clear relationship between product-destination scope per firm and the firm's probability of exit (failure) from export markets. Table 3.11 shows the results.

Table 3.11: Robustness to alternative measurement of product and countries

Dependent variables:	Pr(fail=1|X)	Pr(fail=1|X)
	LPM-FE	LPM-FE
	(1)	(2)
Log(Export value(t))	-0.0289***	-0.0293***
	(0.00493)	(0.00492)
Rauch(=1, if differentiated(t))	-0.0133	-0.0132
	(0.0253)	(0.0252)
Number of products 2	-0.0169	-0.0170
	(0.0184)	(0.0185)
Number of products 3	-0.0224	-0.0230
	(0.0231)	(0.0231)
Number of products 4-5	-0.0326	-0.0333
	(0.0229)	(0.0229)
Number of products 6-10	-0.0349	-0.0360
	(0.0239)	(0.0239)
Number of products 11-19	-0.0455	-0.0464*
	(0.0277)	(0.0278)
Number of products 20+	-0.0625*	-0.0629*
	(0.0328)	(0.0328)
Number of destinations 2	-0.0108	-0.0105
	(0.0160)	(0.0160)
Number of destinations 3	-0.0439**	-0.0430**
	(0.0197)	(0.0197)
Number of destinations 4-5	-0.0578***	-0.0565**
	(0.0219)	(0.0219)
Number of destinations 6-12	-0.113***	-0.110***
	(0.0285)	(0.0286)
COMESA (=1, Comesa main market)	0.0399	0.0364
	(0.0245)	(0.0246)
Log(avg.number of firms-sameHS6(t))	-0.00718	
	(0.00985)	
Log(avg.number of firms-same sector(t))		0.00217
		(0.0119)
Observations	19,155	19,155
R-Squared	0.822	0.822
Firm FE	YES	YES
Year FE	YES	YES

Notes: All estimations are obtained from a panel regression of the dummy=1, if a firm exit against observable firm characteristics. All continuous variables are in logs. Robust standard errors in bracket. The asterisk indicates the level of significance *** p<0.01, ** p<0.05, * p<0.1.

Column (1) results show that an increase in the export value for an exporter by 10% is on average associated with a decrease in the probability of exit by 0.29%, holding all other factors constant. The results on product scope show that a firm that changes from being a single product exporter into being a multi-product exporter experiences a decrease in its probability

of exit (failure). The probability of exit (failure) is lower by 0.63 percentage point for exporters of 20 or more products relative to periods when they were single product exporters.

These results are broadly consistent with our baseline regression in Table 3.9 and underscore the importance of transitioning from a single-product into a multi-product exporter for survival in foreign markets. Likewise, the larger the number of destination countries served by an exporter the higher the chances of surviving in export markets relative to a single destination exporter. In particular, the differences in probability of exit(failure) is lower by 4.4 percentage points for a three destination countries exporter, 5.8 percentage points lower for a 4 - 5 destination countries exporters, and 11.3 percentage points lower for an exporter to 6-12 destination countries relative to periods when they were single destination exporters.

3.6 Conclusion

This chapter examines the patterns of entry, exit and survival of new exporters in foreign markets, along with the factors associated with their survival in export markets. We find that over the period 2005-2013, the average entry, exit and survival rates for the Kenya's exporters in international markets are 39, 36, and 59%, respectively. These rates are comparable to those documented for exporters in developing countries and represents enormous churning of firms through entry and exit in export markets. Looking at the trade characteristics for the exiters, we find that on average they are small in export value compared to new entrants and continuing exporters. Furthermore, each cohort of entering firms exhibits a very high exit rate of between 62 and 79%, within the first year of entry. This suggests that there are significant market access costs that make exporting less profitable for the less productive firms and selects exit as less costly option.

On the factors associated with the probability of exit (failure), we make use of the fixed effects regression that exploits for the within the firm over time, how changes in firm characteristics affects its probability of exit from international markets. We find that the probability of exit is lower amongst firms with a higher current export value, larger product scope and wider geographic scope of exports. In particular, a 10% increase in the firms export value, is on average associated with a 0.12% reduction in the probability of exit. A similar increase in the number of products exported is associated with a reduction in the probability of exit (failure) from export markets by 0.14%. A key explanation for this result is based on the intrinsic benefit of export diversification at the firm level. A large product scope, sold across various destination

countries, results in more stable export sales with positive knock-on effects to survival in international markets.

Similarly, an increase in the number of destination countries served by a firm is, on average, associated with better chances of survival. Our results show that an increase in this variable by 10% is, on average, associated with a reduction in the probability of exit (failure) by 0.35%. Adding a new destination country requires incurring destination specific fixed costs and holding a wider geographical scope reflects high productivity and has a greater impact on survival, compared to adding a product.

Finally, we find no significant difference in the probability of exit (failure) between firms that mainly target the COMESA regional block and those that target the rest of the world only. This result suggests that although there may be entry advantages, in terms of lower market access costs to the COMESA market relative to rest of the world, these advantages do not guarantee survival, once we control for the firm fixed effects. We also do not find a significant relationship between firm's proxy measures for networks and the probability of exit (failure).

At this point, a recap of what we are doing may be necessary. The decomposition of Kenya's year-on-year aggregate growth in exports in chapter two revealed an important role for new entrants. Export sales from these types of firms are crucial for stabilization of exports during a slump period because it offsets the negative effect from a decline in export sales from the exiting firms, for the case of Kenya. At the same time in chapter three, a lot of the new entrants (62-79%) exit within the first year of stay in international markets. We speculated that high market access costs at the destination markets might be behind the high exit rates. In chapter 4 we try to understand how a specific market access cost affects firms' export decisions and generate observable exits in the data.

Chapter 4

4. Exporting to Fragile States in Africa: Firm Level Evidence*

4.1 Introduction

Market access costs have been found to be persistent and varying across destination markets (Arkolakis, 2016; Chaney, 2008). Destination specific costs of entry can also vary by firm-product which affects a firm's entry into a destination with the first product and its product scope thereafter (Arkolakis, 2016). What also matters, particularly in the case of Kenya, is fragility of the destination market. Fragility in a destination market can be viewed as a set of exogenous shocks to the fixed costs of entering that market. Fragility elevates uncertainty regarding the sunk costs of entry for the potential exporters and could trigger exit of firms due to an increase in operational costs. Understanding the effect of destination fragility on a firm's export decisions and the mechanisms through which firms mediate this effect is important for trade within sub-Saharan African (SSA) countries. This is particularly important for Kenya, a country that has some extremely fragile neighbours such as Somalia and Southern Sudan.

Destination country fragility is a multi-dimensional concept and hard to define and measure precisely[25]. There is no globally accepted definition of fragility and nations do not like this label (Chauvet & Collier, 2008). Chauvet and Collier (2008) provide an economic definition of the concept to constitute a low-income country in which economic policies, institutions and governance are so poor that growth is highly unlikely. Our definition follows the World Bank's Development Report on Conflict, Insecurity and Development (WDR)(World Bank, 2011), in which fragile situations are defined as "periods when states or institutions lack the capacity, accountability or legitimacy to mediate relations between citizen groups and between citizens and the state, making them vulnerable to violence" (p.18). Examples of the indices used in the literature to measure this phenomenon include the Worldwide Governance Indicators (WGI) (Kaufmann, Kraay & Mastruzzi, 2011); the Country Policy and Institutional Assessment

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[25] Despite the challenge of definition and measurement, fragility remains a common feature among countries in Africa, across the various proxies and indicators used to measure this phenomenon.

(CPIA) Indices (World Bank, 2015); the International Country Risk Guide (ICRG) index (PRS Group, 2011) and the Fragile States Indices (Messner, 2005).

There are numerous studies that have investigated the economic consequences of spatial diffusion of fragility and its extreme version of conflict on neighbouring countries (Qureshi, 2013; Murdoch & Sandler, 2004; Collier & Hoeffler, 2004; Fearon & Laitin, 2003; Sambanis, 2001). They document large negative spillovers of fragility on neighbouring states. One potential channel through which fragility hinders economic growth is in the reduction of bilateral trade between neighbouring countries (Martin, Mayer & Thoenig, 2008). This chapter adds to the literature exploring the role of destination country fragility in curtailing bilateral trade in Africa.

The overall objective is to examine the effect of destination country fragility on a firm's decision to export to a given destination-country in Africa, along with firm attributes that mediate this effect. Specifically, we ask the following research questions:

- What is the effect of destination country fragility in Africa on Kenyan exporter's decision to maintain an export relationship with that country?
- What firm attributes mediate the effect of destination fragility?
- What is the effect of destination country fragility on Kenya's export trade margins to Africa?

In addressing the above questions, this chapter contributes to existing literature in two main ways. Firstly, existing models in the new trade literature currently provide little insight into how fragile situations in a destination market affect a firm's export decision. By working with a frictionless environment that permits efficient allocation of resources across and within firms, the Melitz (2003) model and related extensions may fail to take into account the market conditions in destinations that are important for SSA countries exporters.

We extend and simplify a monopolistic competition model of trade in an approach closely related to Crozet et al. (2007) to account for a specific type of market access cost, namely fragility of a destination country and evaluate its effect on the firm's decision to serve a given destination in Africa with exports. We test the hypothesis from this model using Kenya's firm level transaction data. In addition, we evaluate the role of firm size in mediating the effect of destination fragility.

Secondly, a study on the effect of destination country fragility on firm export behaviour is extremely important for SSA countries. Although a marginalized topic in international trade and treated sometimes as an indirect/or a hidden tax on trade (Blomberg & Hess, 2006; Anderson & Marcouiller, 2002) fragility combined with other factors such as poor infrastructure and border clearance plays a part in explaining low bilateral trade among neighbouring countries and may be a source of low intra-African regional trade (Martin, Mayer & Thoenig, 2008; Yeats, 1998). Yeats (1998) argues that the potential for intra-African trade is yet to be fully exploited, especially in food products. This is puzzling despite popular embracing of regional integration initiatives by governments as a core part of trade policy in Africa (Carrere, 2004).

Literature exploring the role of destination fragility in curtailing bilateral trade is, in our view, relatively scarce. A number of studies using gravity models of trade and cross-country level datasets have found that fragility and its extreme version of conflict, affects bilateral trade negatively (Glick & Taylor, 2010; Mansfield & Bronson, 1997; Pollins, 1989). Yet, another set of papers, also deploying gravity, finds a negative but insignificant relationship (Mansfield & Pevehouse, 2000; Penubarti & Ward, 2000; Morrow, Siverson & Tabares, 1998). This leaves the debate on the effect of fragility on bilateral trade inconclusive.

A common weakness in cross-country studies is in the level of their analysis of the effect of fragility, which is based on aggregate trade data. While this conveys useful information on the average effects of fragility on trade, it conceals the potential for richer adjustments taking place at the firm and product level, such as the entry and exit of exporters from a given destination and the reduction of the number of products and volume of shipments due to destination fragility. Understanding these adjustments is essential for targeted policy intervention. In addition, we now know that aggregate export flow is dominated by large firms (Bernard & Jensen, 1999). This firm heterogeneity requires analysis at the firm level to understand the effect of fragility on firm entry, exit and export performance. Studies looking at the effect of fragility on firm level export decisions are very few in the international trade literature (Crozet, Koenig & Rebeyrol, 2007). This chapter adds to this literature.

The rest of this chapter is organized as follows. Section 4.2 reviews related literature while section 4.3 discusses the theoretical model, estimation strategy and describes the dataset. The discussion of our empirical results is done in section 4.4 and section 4.5 concludes.

4.2 Theory and Empirical Evidence

The Melitz (2003) model provides theoretical insight into the behaviour of firms breaking into international trade in light of sunk costs of entry. As noted in chapter 2, the author developed a model that explains the interaction between fixed costs of entry and heterogeneity in productivity across firms that induces self-selection into an industry. Firms produce a unique horizontally differentiated product for the domestic market if productivity is above some threshold and export if their productivity is above a higher threshold. Entry into the export market requires additional fixed costs and only the most productive firms self-select into exports because of their ability to overcome costs of entry.

The Melitz model is flexible and closely explains firm level export behaviour in both developed and developing economies. However, the model has been criticized by Crozet et al. (2007) for not accounting for significant market frictions in trading with fragile and insecure countries. They show that insecurity affects firms differently, resulting in disruption of the belief that firms largely self-select into exporting based on their productivity levels only. These authors argue that insecurity, unlike other trade barriers (i.e. tariffs) does not affect all firms in a similar way. This is because incidents such as corruption, loss of sales proceeds and abdication on contracts affects firms in a random way, introducing another level of heterogeneity across firms in the same industry.

Crozet et al. (2007) modify the basic Melitz model to incorporate insecurity. They show that ex-ante, insecurity affects all firms since all of them face the same risk. However, ex-post some of the firms are not affected. Only a random subset of firms is subject to predation while others are lucky and export without misfortune. In addition, a high level of insecurity may dissuade unlucky productive firms from exporting, while some lucky unproductive ones may succeed. There are two testable hypotheses in this framework. Firstly, the prevalence of insecurity will decrease bilateral exports by reducing the number of exporters. Secondly, insecurity in a market may dissuade unlucky productive firms from exporting to that destination while some lucky unproductive ones may succeed in exporting to insecure markets.

The authors test the predictions from their model using individual French firm level export data to more than 100 destinations together with data on International Country Risk Guide (ICRG) as a proxy for insecurity. The coefficient on the political insecurity variable is found to be negative and significant. A 10% increase in the ICRG index for a country reduces the

probability that a French firm export to this destination by 0.53%. They also found that firm productivity positively influenced the probability that a firm would export. They interacted firm productivity and a dummy for high risk countries and found a negative and statistically significant coefficient. This indicated that a higher firm productivity level had a less predominant role on the probability of exporting to insecure markets than to the more secure ones. Their results suggested that insecurity in the destination market induces some randomness into export success, diluting the role of firm productivity differences as key in enabling firms to break into foreign markets.

Numerous studies estimate gravity type models on both pooled and panel country level trade datasets. In most of these, a dummy variable indicating the presence of fragility and its extreme version of conflict is used to capture its impact on bilateral trade. This variable is often complemented by a set of traditional gravity variables such as GDP, geographic distance, common border, common colonial history, common language, preferential trade arrangements among others. The leading studies include, Pollins (1989), Mansfield and Bronson (1997), Anderson and Marcouiller (2002), Blomberg and Hess (2006), Martin et al. (2008) and Glick and Taylor (2010) all of which find strong negative effects of fragility on bilateral trade.

Mansfield and Bronson (1997) examined the effects of fragility on bilateral trade flows. They used a modified gravity regression to estimate the effect of fragility, alliances, preferential trade arrangements and other gravity variables on bilateral trade, over the period 1960-1990. To address the simultaneity concerns in gravity equation, they controlled for the country and year fixed effects. The presence of fragility is captured by a dummy variable equal to 1, if a trade partner is fragile and zero otherwise. Their results show that fragility substantially reduced trade by as much as 6.5 times between countries that are fragile (in conflict) relative to non-fragile countries (countries not in conflict).

In a different approach, Anderson and Marcouiller (2002) use a structural model to estimate the impact of corruption and imperfect contract enforcement on international trade. They found a reduction in import demand with insecurity acting as a hidden tax on trade. Related, Blomberg and Hess (2006) broaden the concept of fragility and its impact on bilateral trade by obtaining a synthetic measure of violence through factor analysis that includes terrorism, external war, revolutions and inter-ethnic fighting. They find that the presence of fragility is equivalent to a 30% tariff on trade, which is larger than conventional tariff barriers.

Martin et al. (2008) build a theoretical framework that combines game theory and a standard new trade theory to explain the effects of fragility on bilateral trade. The key hypothesis in their model is that the absence of peace disrupts trade and therefore puts trade gains at risk. They test this using a gravity model of trade. They address the simultaneity concerns in the gravity regression by controlling for the country-pair fixed effects and time effects (Anderson & Van Wincoop, 2003). Their findings show that in both the traditional gravity and the theoretical gravity by Anderson and Van Wincoop (2003), the impact of fragility (conflict) was negative and significant. For example, during a conflict, trade fell by about 22% relative to the traditional gravity predictions.

Glick and Taylor (2010) examined the effects of fragility on bilateral trade for almost all countries (172) with a large sample of data over the period 1870-1997. Using the gravity model, they estimated contemporaneous and lagged effects of fragility on trade after controlling for other traditional determinants of trade. Measures of fragility (conflict) are constructed from the database on militarized interstate disputes collected by the correlates of war project (COW) at the University of Michigan. This dataset codes the level of hostility reached in a given country's conflict with an opposing state, where 2 =threat of force, 3=display of force, 4=use of force and 5=war. They create a war dummy variable equal to 1 for conflicts with hostility of either level 4 or 5 and zero otherwise. Their results show that trade between two adversaries at war falls by over 80% relative to peacetime level. They also show that trade was still low by 42% below the pre-conflict level five years after cessation of conflict and 21% after eight years.

In conclusion, the recent new trade theory models provide invaluable insights into the behaviour of firms breaking into foreign markets with exports. Intuitively, destination fragility raises trade costs (Martin, Mayer & Thoenig, 2008) but does not affect all exporters in a way similar to a tariff increase (Crozet, Koenig & Rebeyrol, 2007). A common weakness in cross-country studies is in the level of their analysis of the effect of fragility, which is based on aggregate trade data. While this conveys useful information on the average effects of fragility on trade, it conceals the potential for richer adjustments taking place at the firm and product level, such as the entry and exit of exporters from a given destination and the reduction of the number of products and volume of shipments due to destination fragility.

Studies looking at the effect of fragility on firm level export decisions are very few in the international trade literature (Crozet, Koenig & Rebeyrol, 2007) and to our knowledge none in SSA. The empirical test for the prediction of Crozet et al. (2007) model is applied to France-a

developed country. On the contrary, we look at Kenya, a country that neighbours some of the most fragile states such as Somalia and South Sudan. Furthermore, a lot of fragile states are in Africa and since we know from the gravity model of trade that neighbouring countries are likely to trade more, we believe Kenyan firms are more likely to trade with fragile states. Kenya trades with several countries considered fragile such as Burundi, Somalia, Sudan, South Sudan and Democratic Republic of Congo. This provides a suitable setting to test the effect of destination fragility on firms' export decision.

4.3 Theoretical Framework and Estimation Strategy

4.3.1 The Model

We adopt a framework developed by Crozet et al. (2007) with modifications to account for destination country fragility and how this impacts a firm's decision to serve a given destination in Africa. The model environment is for a world of two countries, home (H) and foreign (F) with consumers in each country seeking to maximize utility. Each of the consumers has one unit of labour and a single share of a perfectly diversified portfolio of all firms (domestic and foreign) in the two-country world. Profits earned by firms are repatriated as dividends in terms of a homogenous good 1 which is also the numeraire.

Consumer utility and demand functions

The consumers in both countries share an identical two-tier utility function. In the first tier, a Cobb Douglas function form captures the substitution of consumption between good 1 (the numeraire) and varieties of good 2 (a horizontally differentiated variety). In the second tier, a constant elasticity of substitution (CES) form represents the substitution of consumption among varieties of good 2. Consumer utility is given as:

$$U = Q_1^{\mu_1} \left[\int_i^n q_i^{\frac{\sigma-1}{\sigma}} di \right]^{\left(\frac{\sigma}{\sigma-1}\right)(1-\mu_1)} \tag{10.}$$

where Q_1 and $Q_2 = \int_i^n q_i^{\frac{\sigma-1}{\sigma}} di$ are consumption of good 1 and composite good 2. $\sigma(>1)$ is the constant elasticity of substitution (CES) between varieties of good 2. μ_1 and $(1-\mu_1)$ are shares of each good and must sum to unity. n is the number of varieties of good 2.

Consumers in country f ∈ [H F] earn income Y_f, of which, a share $(1 - \mu_1 = \mu_2)$ is spent on varieties of good 2. From the consumption function of good 2, we can obtain its dual, which yields the perfect competition price index for the good as:

$$P_f = \left[\int_i^n {p_{if}}^{1-\sigma}\, di\right]^{\frac{1}{1-\sigma}} \tag{11.}$$

where p_{if} is the price of variety i in country $f \in [H\ F]$. Total expenditure of good 2 in country $f \in [H\ F]$ is given by $\mu_2 Y_f P_f$. Applying Shephard's lemma on equation (11) yields individual demand function for varieties of good 2, supplied by firms from country $f \in [H\ F]$ as (see appendix B):

$$q_{if} = \mu_2\, {p_{if}}^{-\sigma}\, Y_f\, {P_f}^{\sigma-1} \tag{12.}$$

Firm technology and profit maximisation

Good 1 is produced using constant returns to scale technology under a perfect competition market structure. It uses one unit of labour per unit of output and is freely traded across the countries. Differences in endowments between countries are sufficiently small to ensure that good 1 is always produced in both countries and as such, the sector establishes the wages in both countries; equal 1. Good 2 has a continuum of differentiated varieties produced under increasing returns to scale technology (Melitz, 2003).

$$TC = {F_f}^D + \frac{q_{if}}{\varphi_i} \tag{13.}$$

where ${F_f}^D$ is the fixed costs of entry in the domestic market; $\frac{q_{if}}{\varphi_i}$ is the variable cost that depends wholly on firm's productivity draw φ_i after paying the fixed costs. They then decide whether or not to export. Exporting good 2 is costly. Firstly, there are iceberg trade costs, which imply that $\tau > 1$ units of goods have to be shipped from home (H) to ensure that one unit arrives in foreign market (F). Secondly, to enter the export market $f \in [H\ F]$, each firm must pay a fixed cost (${F_f}^X$) to export. The fixed costs cover basic market research, identifying distributors, adjusting to foreign standards, among others. We assume, for simplicity, that these fixed costs are known with certainty to the potential exporter.

Incorporating additional costs to export to fragile states

Assuming an export destination market is fragile, there are additional costs associated to serving this market. Risks may include delays in delivery, hardened border control, hijacking, lost sales proceeds, and abdication of contracts, among others. Firms must factor these risks in their decision to serve fragile markets. Each firm has an exogenous probability$(1-\alpha)$ of being affected by fragility once they decide to export to a fragile state.

Let this additional cost be specified as $\beta {F_f}^X (\beta > 0)$ such that the total fixed costs to export to a fragile state becomes[26]:

$$(1+\beta){F_f}^X \tag{14.}$$

The probability α and the payment β characterises the risks in a fragile market.

Profits and firms-selection

Focusing on home (H) exporters selling to a foreign (F) market[27], firm i profit is the sum of domestic and foreign profit.

$$\pi_i(\varphi_i) = \pi_{iH}(\varphi_i) + \pi_{iF}(\varphi_i) \tag{15.a}$$

$$= \left(p_{iH}q_{iH} - \frac{q_{iH}}{\varphi_i} - {F_{iH}}^D\right) + \begin{cases} \left(p_{iF}q_{iF} - \frac{\tau q_{iF}}{\varphi_i} - {F_{iH}}^X - \beta {F_{iH}}^X\right) \\ \left(p_{iF}q_{iF} - \frac{\tau q_{iF}}{\varphi_i} - {F_{iH}}^X\right) \end{cases} \tag{15.b}$$

where q_{iH} and q_{iF} is the domestic and foreign demand functions as defined in equation (12), φ_i is the firm's productivity draw,τ is the variable trade costs, ${F_{iH}}^D$ and ${F_{iH}}^X$ are the firm's fixed costs for entering domestic and foreign markets, respectively.

The firm's foreign profit is split into two such that if a firm is hit by fragility shock, its profit is $(p_{iF}q_{iF} - \frac{\tau q_{iF}}{\varphi_i} - {F_{iH}}^X - \beta {F_{iH}}^X)$ and $(p_{iF}q_{iF} - \frac{\tau q_{iF}}{\varphi_i} - {F_{iH}}^X)$ if not affected by the shock. The probability of not experiencing fragility shock is given by α while the probability of being hit by the shock is $(1-\alpha)$.

The model assumes single period (i.e. not modelled over time) and fragility costs are per period (not once off). Furthermore, the model allows for segmented markets given the assumption of

[26] Note, in this chapter, fragility is assumed to be an additional fixed cost of entry to a fragile state for simplicity.

[27] The same applies for exporters from the foreign (F) market selling to home (H) market.

constant marginal costs (MC). This means we can classify markets by their fragility rank or costs.

Price is the mark-up over marginal costs and with monopolistic competition firms equate marginal revenue (MR) to marginal cots (MC) such that the optimal price is:

$$p_{if} = \tau \frac{\sigma}{\sigma - 1} \frac{1}{\varphi_i} \tag{16.}$$

Using equation (16) we can rewrite the profit function for the exporters, setting τ =1 to obtain the free on board (fob) price in the domestic market.

Profit obtained by selling at domestic market

Output sold in domestic market is:

$$q_{iH} = \mu_2 \left(\frac{\sigma}{\sigma - 1} \frac{1}{\varphi_i} \right)^{-\sigma} Y_H {P_H}^{\sigma-1}$$

Substituting the domestic demand function in the profit function and re-arranging, we obtain the zero-profit productivity cut-off to produce in the domestic market (see appendix B).

$$\pi_{iH}(\varphi_i) = p_{iH} q_{iH} - \frac{q_{iH}}{\varphi_i} - {F_H}^D \tag{17.a}$$

$$\pi_{iH}(\varphi_i) = \frac{\mu_2}{\sigma} Y_H {P_H}^{\sigma-1} \left(\frac{\sigma}{\sigma - 1} \right)^{1-\sigma} \left(\frac{1}{\varphi_i} \right)^{1-\sigma} - {F_H}^D \geq 0$$

$$\pi_{iH}(\varphi_i) \geq 0 \iff \frac{\mu_2}{\sigma} Y_H {P_H}^{\sigma-1} \left(\frac{\sigma}{\sigma - 1} \right)^{1-\sigma} \left(\frac{1}{\varphi_i} \right)^{1-\sigma} \geq {F_H}^D \tag{17.b}$$

$$\varphi_i \geq \varphi_{DH} = \lambda_1 \left[\frac{{F_H}^D}{Y_H {P_H}^{\sigma-1}} \right]^{\frac{1}{\sigma-1}} \tag{17.c}$$

where: $\lambda_1 = \left[\frac{\sigma}{\mu_2} \right]^{\frac{1}{\sigma-1}} \left(\frac{\sigma}{\sigma-1} \right)$ and φ_{DH} is the cut-off productivity to produce in the domestic market.

The order of decisions at the firm level is as follows: Firstly, a firm observes φ_i from a draw of firm productivity distribution $G(\varphi)$ and decides whether to produce for the domestic market or not. The firm will produce so long as its productivity φ_i is greater than the cut-off productivity (in equation 17.c). Firms with productivity less than φ_{DH} are not active in the domestic market.

Secondly, exporting entails a two-stage decision: (i) a firm decide whether or not to enter into exporting. To export, a firm has to incur fixed cost of ${F_{iH}}^{X}$ with certainty; (ii) then the firm decides whether or not to continue subject to fragility shock. If hit by a shock, they will incur additional fixed cost equivalent to $\beta {F_{iH}}^{X}$. Firms only know of fragility costs after paying certain fixed costs. A firm will enter so longer as expected profit $\pi_{iF} \geq 0$, such that (see appendix B for detailed derivation):

$$\pi_{iF} = \alpha\left(p_{iF}q_{iF} - \frac{\tau q_{iF}}{\varphi_i} - {F_{iH}}^{X}\right) + (1-\alpha)(p_{iF}q_{iF} - \frac{\tau q_{iF}}{\varphi_i} - {F_{iH}}^{X} - \beta {F_{iH}}^{X}) \geq 0 \quad (18.a)$$

$$\varphi_i \geq \overline{\varphi_{XH}} = \lambda_1 \left[\frac{{F_H}^{X} + (1-\alpha)\beta {F_H}^{X}}{Y_F}\right]^{\frac{1}{\sigma-1}} \frac{\tau}{P_F} \quad (18.b)$$

All firms from (H) with a productivity threshold greater than $\overline{\varphi_{XH}}$ try to export. The productivity threshold is increasing in the fixed costs of entry, the probability of being hit by fragility shock and the additional payments to serve a fragile market. It is also increasing in the iceberg trade costs and decreasing in the aggregate price level and in the foreign market GDP. We may expect three outcomes from equation (18.b): (i) higher ${F_{iH}}^{X}$ imply fewer firms export and only most productive try to export; (ii) higher probability of exposure to shock $(1-\alpha)$ implies fewer firms enter; and (iii) higher cost of fragility shock $\beta {F_{iH}}^{X}$ means fewer exporters enter. This leads to the following testable hypothesis:

H1: An increase in destination country fragility has a negative effect on the decision to serve that market with exports.

The hard assumption implicit in this hypothesis is that the β and $(1-\alpha)$ are not negatively correlated. In general, we would expect β and $(1-\alpha)$ to be positively correlated. Equation (18.b) gives information about decision to export. Post decision will depend on whether firms experience fragility shock or not. Thus, fragility raises productivity cut-off for firms to try exporting (equation 18.b) but also reduces the association between productivity and exporting as some productive firms whose φ_i exceeds the threshold ($\varphi_i \geq \overline{\varphi_{XH}}$) don't export if they are affected by the shock. The size of the firm plays a significant role in overcoming costs associated with fragility. This leads us to the following testable hypothesis:

H2: An increase in exporter's size (productivity) enables firms to overcome fragility costs and continue to serve a given destination.

Hypothesis (1) and (2) captures the main results in this chapter.

Destination fragility and bilateral exports

The effect of fragility in this model is through the fixed costs of entry. This means optimal exports are unchanged, assuming destination demand is held constant, for firms that continue to export. We follow Bernard et al. (2009) to decompose the value of exports between the home country and a foreign fragile country in period t into the unique number of exporters, the number of exported products, the density[28] term that measures the number of firm-product observations for which trade to a given country is positive and the average export value per firm.

$$X_{HF} = N_{HF} V_{HF} D_{HF} \bar{x}_{HF} \qquad (19.)$$

where X_{HF} is the bilateral exports between home (H) and foreign (F), N_{HF} is the number of exporters, V_{HF} is the number of exported products, D_{HF} is the density term and $\bar{x}_{HF}$ is the average export value per firm. The average export value per firm captures the change in the bilateral trade through the intensive margin, while firms, products and density terms capture the changes in bilateral trade through the extensive margin. An increase in destination country fragility has a negative relationship with the value of exports to that destination[29]. This drop in export flow is an outcome of the reduced number of exporters and the number of exported products to a fragile destination. This leads us to the following hypothesis:

H3: An increase in destination country fragility has a negative effect on the home country's exports through the extensive margin (number of exporters and products)

4.3.2 Estimation Methods

Destination fragility and decision to export

To test hypothesis (1) and (2) empirically, we compute the probability that firm i maintains an export status to a destination j, conditional on annual specific costs arising from destination country fragility, firm attributes and destination market characteristics. This probability is an increasing function of firm productivity (size) and a decreasing function of the level of

[28] Since firms generally are active in a small subset of the overall number of products exported by Kenya, we need an additional term in the decomposition to account for the density of trade (i.e. the fraction of all possible firm-product combinations for Kenya for which trade is positive).

[29] See Crozet et al.(2007) for a formal derivation.

destination fragility. The average effect of fragility and size can be estimated using a binary choice model as:

$$Pr\left[Exp_{ijt} = 1\middle|\mathbf{X}\right] = \beta_0 + \beta_1(lnfragility_{jt-1}) + \beta_2(\ln Size_{ijt-1}) + \beta_3(lnfragility_{jt-1})(\ln Size_{ijt-1}) + (\boldsymbol{X_{jt-1}}'\boldsymbol{\beta}) + \boldsymbol{\delta_t} + \boldsymbol{\delta_{ij}} + \varepsilon_{ijt} \quad (20.)$$

where the subscripts have been changed such that i represents an exporter from home country (H) exporting to a foreign (F) country j in period t. Exp_{ijt} is a dummy variable equal to 1, if an exporter i has positive exports to destination j and zero otherwise. $\boldsymbol{\delta_t}$ and $\boldsymbol{\delta_{ij}}$ are the year, firm-destination country fixed effects.

The main explanatory variables include destination fragility (-), size of a firm in export market (+), the interaction of fragility and size (+) and destination country gravity variables such as market size (+), days to import (-), documents to import (-) and real exchange rate [30](+). β_1 is expected to be negative capturing the negative effects of both β and $(1-\alpha)$ on export participation. β_2 is expected to be positive in line with the role of firm size (or productivity) in export participation while β_3 is the coefficient on the interaction term between destination fragility and size. This is expected to be positive if large firms are less adversely affected by fragility relative to small firms. We estimate equation (20) over the sample period 2004-2013.

There is a concern that exporter's destination choice could reflect other time invariant characteristics of the destination that is not adequately controlled for with gravity variables. Our empirical strategy controls for this potential endogeneity through firm-destination country fixed effects, such that the effect of destination fragility on a firm's export decision is identified entirely along the time dimension within each firm-destination combination.

Destination fragility and total exports

Finally, to test hypothesis 3, we estimate the following panel regression.

$$\boldsymbol{Exp_{jt}} = \gamma_0 + \boldsymbol{\gamma} fragility_{jt-1} + \left(\boldsymbol{X'_{jt-1}}\boldsymbol{\beta}\right) + \boldsymbol{\delta_t} + \boldsymbol{\delta_j} + \vartheta_{jt} \quad (21.)$$

The dependent variable $\boldsymbol{Exp_{jt}}$ is a vector of the number of exporters, the number of products, the density term that captures the number of firm-product observations for which trade to a given country is positive and the average export value per firm between Kenya and a given African market j in period t. The number of exporters, the number of products and the density

[30] A rise represents a depreciation of the Kenya shilling against a foreign currency.

term captures the extensive margin of trade (Bernard et al., 2009), while the average export per firm captures the intensive margin of trade from Kenya to each African destination j over the period 2004-2013.

The main explanatory variables are destination country fragility and a vector $\boldsymbol{X}'$ containing gravity variables such as market size, real exchange rate, days to import, documents to import, common official language, common border, common colonial history and distance. We expect $\boldsymbol{\gamma}$ to be negative and significant for the number of exporters and the number of products but positive with respect to density term.

The relationship between fragility and the average export value per firm is ambiguous (see Crozet et al., 2007). In brief, the authors argue that at low level of fragility, the effect on the average export value per firm is driven by pure selection effect as fragility causes exit of exporters that are less efficient relative to the average productivity exporters, rising average exports per firm. At a higher level of fragility, however, fragility may cause exit of exporters that are more productive than the average productivity exporters resulting in a reduction of in the average exports per firm.

We estimate equation (21) using the Pseudo Poisson Maximum Likelihood (PPML) proposed by Silva and Tenreyro (2006). The PPML method is able to account for the zero trade flows that are frequent in the trade matrix. In addition, the PPML provides a consistent estimate of non-linear gravity model and is consistent with the recent theoretical gravity model that requires inclusion of fixed effects by exporter and by importer (Anderson and Van Wincoop, 2003). However, in our case since the exporter is just Kenya, we only consider destination country fixed effect (i.e. importers from Africa). According to Silva and Tenreyro (2006), the PPML estimator is consistent and can do well in a variety of circumstances. The estimator does not assume normality of the residuals and it is valid with general forms of heteroscedasticity that characterizes export data.

4.3.3 Data and Measurement of Key Variables

Transaction level dataset

This chapter makes use of the export transaction level dataset described in chapter 2 and in the appendix A. A crucial attribute of this dataset is the ability to observe the final destination of

shipment of exports. In this chapter, we restrict the data to exports to Africa only. We utilise this restricted dataset to identify the destination choice for exporters from Kenya to Africa and how these choices are affected by destination country fragility. The dataset is also used to compute proxies for firm trade characteristics to each destination country, such as export value per firm, the number of products, the size of a firm in a given destination-measured in terms of lagged export value per firm, the number of firms exporting to a given destination-country and the number of positive firm-product relationship to a given destination-country (density). The data also allows a disaggregation of Kenya's exports to a given country into extensive (number of firms, products, and density) and intensive (the average export value per firm) margins.

Destination country fragility

Destination country fragility is a multi-dimensional concept and complex to measure with precision. As pointed out in the introduction, we follow the World Development Report Conflict, Insecurity and Development by the World Bank (2011) to define fragility as periods when states or institutions lack the capacity, accountability or legitimacy to mediate relations between citizen groups and between citizens and the state, making them vulnerable to violence. From this definition, we require objective measurement of *periods when states lack the capacity, accountability or legitimacy to mediate relations* (World Bank, 2011:18). One popular set of indicators that closely reflects this definition is the Worldwide Governance Indicators (WGI) compiled by Kaufmann et al. (2011).

Kaufmann et al. (2011:222) defines governance as "the traditions and institutions by which authority in a country is exercised. This includes (a) the process by which governments are selected, monitored and replaced; (b) the capacity of the government to effectively formulate and implement sound policies; and (c) the respect of citizens and the state for the institutions that govern economic and social interactions." Within each component, the authors develop two indicators that measure that aspect. Table 4.1 presents the three components and associated pair of indicators. It also shows which indicator goes into calculating our proxy fragility index (political risk versus business risk) using the Principal Component Analysis (PCA) method.

Table 4.1: Worldwide Governance Indicators and allocation to risk type in PCA

Component	Indicators	Included in PCA
(a) The process by which governments are selected, monitored and replaced.	(i) Voice and accountability	Political risk
	(ii) Political stability and absence of violence/terrorism	Political risk
(b) The capacity of government to effectively formulate and implement sound policies.	(i) Government effectiveness	Business risk
	(ii) Regulatory quality	Business risk
(c) The respect of citizens and the state for the institutions that govern economic and social interactions.	(i) Rule of law	Political risk
	(ii) Control of corruption	Business risk

Notes: obtained from Kaufmann et al. (2011).

Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, freedom of expression and media, while political stability and absence of violence/terrorism captures perceptions of the likelihood that the government will be overthrown (Kaufmann et al., 2011:222).

Government effectiveness captures perceptions of quality of public services, the degree of its independence from political pressures, policy formulation and implementation and the credibility of the government's commitment to policies. Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulation that permit and promote private sector development (Kaufmann et al., 2011:222).

The rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, the quality of contract enforcement, property rights and the courts as well as the likelihood of crime and violence. Finally, control of corruption captures perceptions of the extent to which public power is exercised for private gain (Kaufmann et al., 2011:222).

The WGI database provides annual country ranking on each of the six indicators defined by Kaufmann et al. (2011). Each indicator is measured on a scale of -2.5 to 2.5 (worst to best performers) and they are highly correlated. The advantage with the WGI dataset is that it provides us with a wide coverage for all African countries, approximately 51 countries. The available time series is also able to match perfectly the sample period (2004-2013) in the transaction data, allowing us to make use of panel estimations. The indicators also broadly

capture the definition of fragility situations espoused in the WDR document (World Bank, 2011).

We follow Blomberg and Hess (2006) and use the Principal Component Analysis (PCA) method to obtain an average fragility indicator from the underlying six indicators of governance. Of the six indicators, we needed judgement on the indicators that most closely reflect the multi-dimensional concept of fragility defined in this chapter. Consequently, we created three average indicators. The first index is a composite index obtained as an amalgam of all the six WGI indicators. The index ranges from -0.91 (less fragile) to 1.83 (most fragile) for the African countries in our sample. Furthermore, to be able to take log transformation of the fragility index, we performed a transformation of the index from a negative to positive scale to a positive scale ranging from 0 to 100[31].

The second index captures political risk and is made up of voice and accountability, political stability and rule of law as inputs into the PCA. We are of the view that these indictors capture periods when states lack the capacity, accountability or legitimacy to mediate relations. The third and final index captures fragility of business environment and includes regulatory quality, government effectiveness and control of corruption. This index is viewed as closely reflecting business environment risks in the destination country. Appendix B contains the average fragility index for 51 African countries. We provide brief details in appendix B on how the PCA method is used to obtain the fragility indices.

Measurement of other key variables

Exporter serves destination $j(Exp_{ijt})$

This is a binary variable taking 1, if a firm exports to destination j in period t and zero otherwise over the period 2004 to 2013.

Firm's size in export market (Size)

A firm's size in export market is measured as a lagged value of its exports to that destination country. This variable is used as a proxy for the firm's size in export market (see Martincus &

[31] This transformation is done in stata using $gen\ n\_`v' = ((100-0)/(r(max)-r(min))) * (`v' - r(max)) + 100$, where v is the WGI index that is scaled between -2.5 and 2.5, and n_v is the new transformed index on a scale of 0 to 100. The log(fragility) variable is created as $\log\left(\frac{1}{n\_v+1}\right)$ such that an increase in governance score reduces a destination fragility.

Carballo, 2009). The logarithmic transformation of a firm's lagged export value to a given destination is included as a regressor in equation (20).

Kenya's trade margins to a given destination

Kenya's export to each destination country in period t is decomposed into the unique number of firms, the unique number of products traded with the destination, the density term (that measures the number of firm-product observations for which trade to that destination is positive) and the average value of exports per firm as in Bernard et al. (2009). The number of firms, the number of products and the density term constitutes the extensive margin, while the average value of exports per firm constitutes the intensive margin. These margins are used as dependent variables in estimation of equation (21).

Market size and other gravity variables

We used destination country GDP at 2005 constant prices (gdp_cons) as proxy for market size, real exchange rate as a proxy for relative competitiveness and days to import a container in a given destination market, as well as the number documents required to import. These variables are obtained from the world development indicators (WDI) of the World Bank over the sample period 2004-2013. The real exchange rate is measured as Ksh to 1 unit of the destination j currency multiplied by the ratio of consumer price index (CPI) of destination j to Kenya's CPI such that a rise reflects a depreciation of the Kenyan shilling. We included common border, common language, common colonial history, and distance between Nairobi and the capital city of the partner country as controls, although these falls away when destination fixed effects are included. These time invariant variables are obtained from CEPII database. Table 4.2 contains the summary statistics for the variables of interest.

Table 4.2: Summary Statistics for the key variables

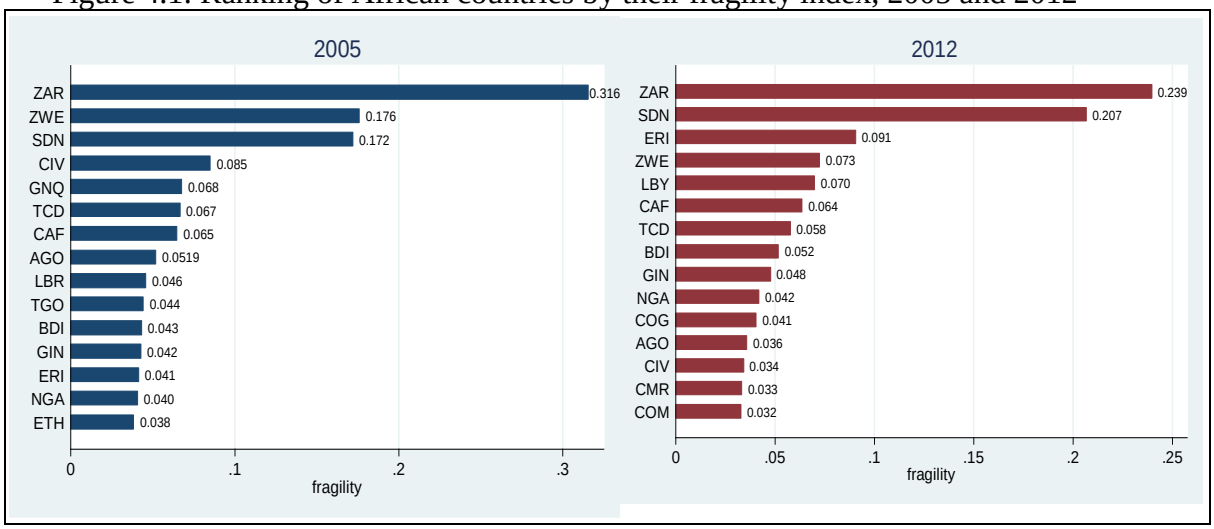
Variable	N	mean	sd	min	max
Exp_ ijt	4,345,836	0.01	0.12	0.00	1.00
Log(fragility_all)	4,345,836	-3.58	0.70	-4.62	0.00
Log(fragility_pol)	4,345,836	-3.67	0.64	-4.62	0.00
Log(fragility_buss)	4,345,836	-3.52	0.72	-4.62	0.00
Log(size)	4,345,836	8.87	2.36	0.00	18.23
Log(gdp cons)	4,327,878	22.70	1.55	18.74	26.50
Log(real exchange rate)	4,166,256	-0.17	2.30	-5.43	4.62
Log(days_import)	4,345,836	3.56	0.48	2.20	4.62
Log(doc_import)	4,166,256	2.17	0.29	1.61	3.04
Log(distance)	4,345,836	7.97	0.63	5.66	8.84
Common border	4,345,836	0.08	0.28	0.00	1.00
Common language	4,345,836	0.43	0.50	0.00	1.00
Common colony	4,345,836	0.33	0.47	0.00	1.00

Source: Customs dataset, WDI and CEPII database. Exp_ijt is a dummy variable equal to one if a firm exports to a given destination country in Africa. fragility_all is the composite index, fragility_pol is the political risk index while fragility_buss is the business environment risk.

4.3.4 Stylized Facts

In this section, we present observable features in our dataset on the relationship between exporters' trade activity and destination country fragility. We start off by exploring the relative differences in fragility across countries and changes in fragility within African countries over time. Figure 4.1 shows the ranking of the top 15 most fragile African countries, together with their fragility index in 2005 and 2012.

Figure 4.1: Ranking of African countries by their fragility index, 2005 and 2012



Notes: ZAR: DR Congo, ZWE: Zimbabwe, SDN: Sudan, CIV: Cote d'Ivoire, GNQ: Equatorial Guinea, TCD: Chad, CAF: Central African, AGO: Angola, LBR: Liberia, TGO: Togo, BDI: Burundi, GIN: Guinea, ERI: Eritrea, NGA: Nigeria, ETH: Ethiopia, CMR: Cameroon and COM: Comoros. Fragility ranges between -0.033(less fragile) to 0.32(most fragile).

We observe that the top seven fragile states in 2005[DR Congo (ZAR), Zimbabwe (ZWE), Sudan (SDN), Cote d'Ivoire (CIV), Equatorial Guinea (GNQ), Chad (TCD) and Central African Republic (CAR)] account for the top 5 slots in the ranking of fragile states in 2012 [DR Congo, Sudan, Zimbabwe, and CAR]. This implies that changes in the relative ranking of countries are very small among the top 15 fragile states.

Within countries, however, there is more variation in fragility score over time. For example, in Zimbabwe the fragility index decreased from 0.18 in 2005 to 0.073 in 2012 (58.5%), while it rose in Sudan from 0.172 in 2005 to 0.206 in 2012 (19.7%). In Cote d'Ivoire the index dropped significantly from 0.085 in 2005 to 0.034 in 2012 (59.7%).

To examine the importance of fragile states in Kenya's exports to the region, Table 4.3 presents Kenya's top 15 export destinations in Africa and each destination country's fragility index, in 2005 and 2012.

Table 4.3: Top 15 export destinations and the respective fragility index, 2005 and 2012

	2005			2012		
Rank	Country	share of export	ln(fragility_jt)	Country	share of export	ln(fragility_jt)
1	Uganda	0.31	-3.734	Uganda	0.28	-3.812
2	Tanzania	0.20	-3.933	Tanzania	0.19	-3.917
3	Egypt	0.10	-3.903	Sudan	0.11	-1.577
4	DR Congo	0.08	-1.153	Egypt	0.10	-3.665
5	Sudan	0.06	-1.759	DR Congo	0.08	-1.429
6	Rwanda	0.05	-3.444	Rwanda	0.07	-4.104
7	Zambia	0.03	-3.815	Zambia	0.03	-4.080
8	Ethiopia	0.03	-3.257	Burundi	0.02	-2.960
9	Burundi	0.03	-3.139	Malawi	0.02	-3.984
10	South Africa	0.03	-4.440	Ethiopia	0.02	-3.473
11	Malawi	0.02	-3.933	Nigeria	0.01	-3.171
12	Nigeria	0.01	-3.201	South Africa	0.01	-4.328
13	Eritrea	0.01	-3.180	Zimbabwe	0.01	-2.623
14	Mozambique	0.01	-3.967	Mauritius	0.01	-4.615
15	Mauritius	0.01	-4.568	Djibout	0.01	-3.730
		0.97			0.97	

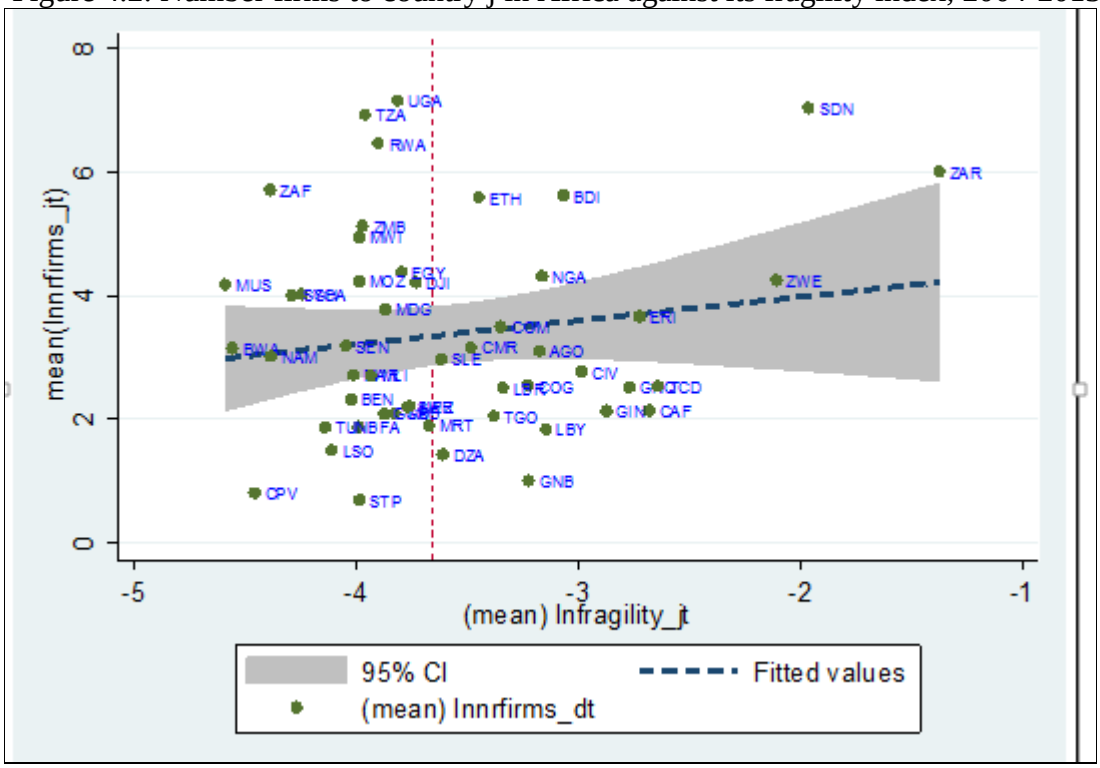
Notes: The share of exports is calculated as a ratio of Kenya's exports to destination j relative to its total exports to Africa in 2005 and 2012. Fragility ranges between -4.62(less fragile) to -1.15(most fragile) on a log scale. The value of exports to Africa is US$ 1,130 million and US$ 2,400 million, respectively for 2005 and 2012.

It can be observed that the top 15 destinations account for over 97% of Kenya's exports to Africa in 2005 and 2012. Uganda, Tanzania, Rwanda, and Burundi accounts for approximately 59% of Kenya's exports to Africa, which is an indicator of the importance of the EAC trade block. Among the top 5 export destinations in 2005, DR Congo and Sudan had high fragility

indexes of 0.316(=exp(-1.153)) and 0.172(=exp(-1.759)), respectively. These positions are maintained in 2012.

In the theoretical formulation, the main channel through which fragility in the destination country affects exports is in the reduction of the number of firms that export to a given fragile destination. Thus, variation in Kenya's exports to any given destination is expected to come largely from the firm extensive margin. Figure 4.2 presents a scatter plot of the average number of firms exporting to a given destination against destination country average fragility index over the sample period.

Figure 4.2: Number firms to country j in Africa against its fragility index, 2004-2013

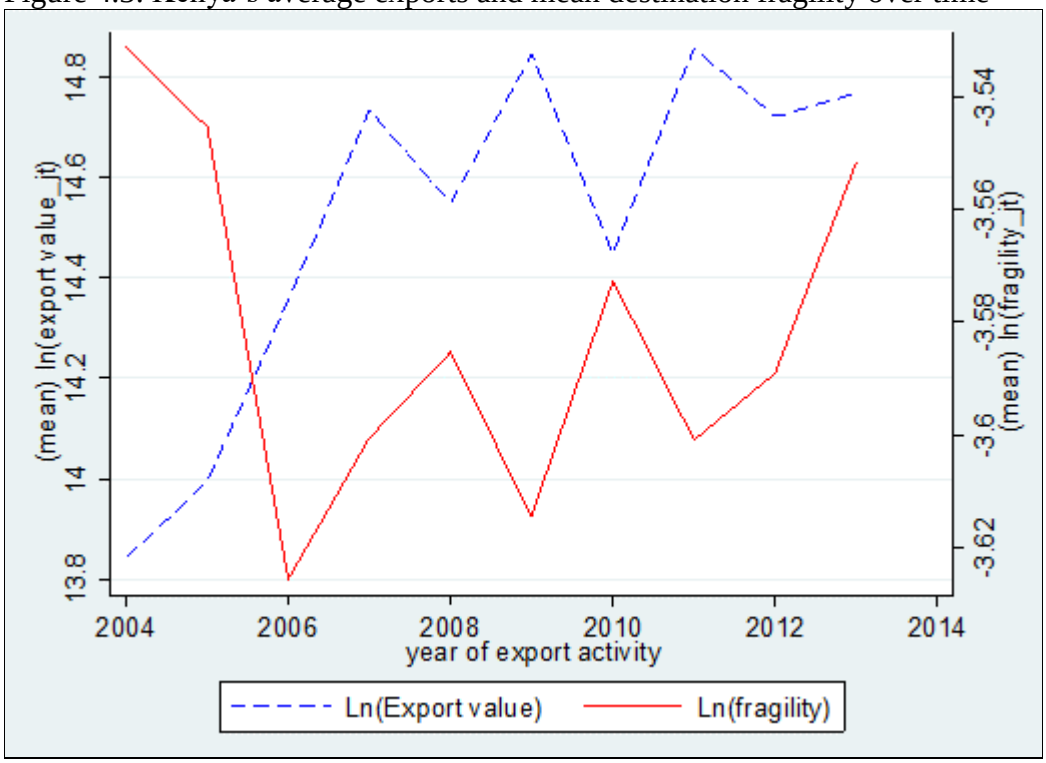


Notes: The vertical dashed line represent the mean lnfragility (fragility all in logs) equal to -3.66. Countries on the right are highly fragile states, while countries on the left are less fragile. lnnrfirms_dt is the number of exporters (in logs) from Kenya to a given country in Africa.

The linear fit (horizontal dashed line) with a 95% level of confidence interval implies that if destination countries were drawn repeatedly, 95% of the observed number of exporters will fall on the line and within its confidence interval. The data suggests that looking across destination countries, we do not see that Kenya exports less to highly fragile countries compared to less fragile ones. This reflects the particular geographic location of Kenya, where it is surrounded by a number of fragile countries. Other factors such as proximity also affect Kenya's geographic pattern of exports.

An alternative to observe how a given change in average fragility index affects Kenya's average exports value is to explore the time dimension. Figure 4.3 shows a time plot of the average export value across all destination countries over time relative to the mean destination fragility over time.

Figure 4.3: Kenya's average exports and mean destination fragility over time

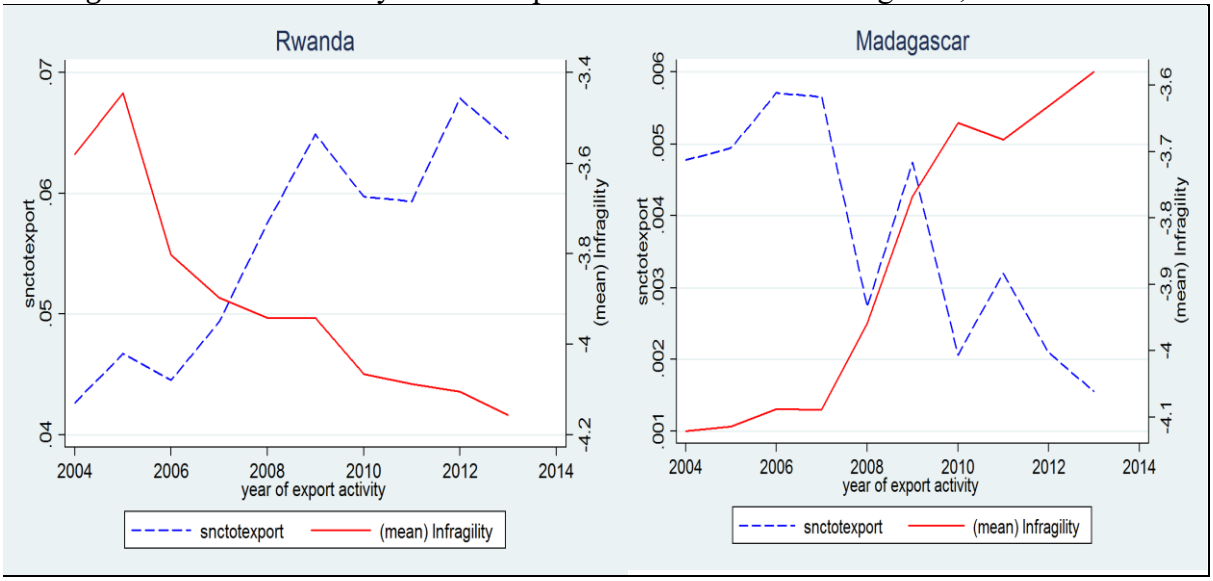


Notes: Left-hand y-axis is the mean ln (export value) i.e Kenya's average export value across all destinations countries in Africa and over time. On the right-hand side is the mean ln (fragility) which is the average fragility in the destination country over time.

It can be observed that in years when average destination fragility drops, the average exports across countries increased. Similarly, in years when the average fragility rose, the average exports across countries dropped. Thus, it is clear that, there is a negative relationship between average exports and average destination country fragility over time.

We also plotted the share of exports from Kenya to Rwanda and Madagascar that have experienced opposite shock in their fragility index. The share is calculated as the ratio of exports to Rwanda (or Madagascar) relative to Kenya's exports to the African continent. Figure 4.4 shows the time series plot of the share of Kenya's exports to Rwanda and Madagascar.

Figure 4.4: Share of Kenya's total exports to Rwanda and Madagascar, 2004-2013



Notes: Left-hand y-axis is the share of exports to Rwanda and Madagascar in Kenya's total exports to Africa. On the right-hand side is the mean fragility (in logs) for the respective countries.

In Rwanda, the fragility index has dropped while in Madagascar, the index has increased over time. The share of Kenya's exports to Rwanda has increased over-time as the destination country's fragility has dropped. In Madagascar, the share of Kenya's exports to that destination country has decreased as its fragility increases over time. The negative relationship between destination fragility and exports is clear in the two examples.

In summary, the data suggests that looking over time, there is a negative effect of fragility on Kenya's exports to African countries. This effect can be identified more precisely along the time dimension, rather than across countries. Identification across countries is further complicated by potential omitted variables. In the next section, we present econometrics results.

4.5 Empirical Results

4.5.1 Destination Country Fragility and Firm's Export Status

We estimate the effects of destination country fragility on the probability of a firm serving a given destination in Africa over the sample period 2004-2013. Table 4.4 presents the results of our baseline regression in equation (20).

Table 4.4: Firm's export status to a given destination

Dependent variable:	Firm's export status to country j (exp_ijt>0)				
	(1)	(2)	(3)	(4)	(5)
	LPM	LPM	LPM	LOGIT	LOGIT_ME
L.Log(fragility)	0.0102***	-0.0011**	-0.0205***	-0.1426***	-0.0031***
	(0.0002)	(0.0005)	(0.0041)	(0.0280)	(0.0011)
L.Log (gdp_cons)	0.0045***	0.0085***	0.0718***	0.4699***	0.0102***
	(0.0000)	(0.0007)	(0.0156)	(0.1060)	(0.0005)
L.Log(real exchange rate)	0.0007***	0.0012	0.0072	0.0310	0.0007
	(0.0000)	(0.0009)	(0.0101)	(0.0661)	(0.0015)
L.Log(days_import)	0.0024***	-0.0077***	-0.0305***	-0.1697***	-0.0037**
	(0.0002)	(0.0008)	(0.0079)	(0.0514)	(0.0015)
L.Log(doc_import)	-0.0102***	-0.0047***	-0.0021	-0.0189	-0.0004
	(0.0003)	(0.0008)	(0.0082)	(0.0546)	(0.0012)
Observations	3,483,852	3,483,852	203,278	192,138	192,138
Number of groups	8,979	8,979	22,673	21,366	21,366
R-squared	0.1189	0.1293	0.2601	--	--
Year dummy	YES	YES	YES	YES	YES
Firm FE	YES	YES	NO	NO	NO
Destination dummy	NO	YES	NO	NO	NO
Firm-Destination FE	NO	NO	YES	YES	YES
Other gravity controls*	YES	NO	--	--	--
F-Statistics/LR Chi2(12)	3234	1076	84.54	1159	1159

Notes: The dependent variable is a dummy equal to 1, if an exporter exports to destination j in t. The main explanatory variable is destination fragility and other gravity type variables. All continuous variables are logged and lagged by one-time period (t-1). The logit drops 11,167 observations because of all positive or all negative outcomes. *Other gravity controls include distance, distance squared, common border, common language and common colony. Asterisk denotes level of significance (***p<0.01, **p<0.05, and *p<0.1). Robust standard errors in brackets.

Column (1) results are obtained after controlling for year and firm fixed effects. The coefficient on fragility is identified by the within firm variation in exports across destinations. We find a positive and significant result on fragility, suggesting that an increase in destination fragility is associated with an increase in the probability that an exporter serves that destination. This result is contrary to our expectation that an increase in fragility reduces the likelihood of a firm

exporting to that country. Market size of the destination country (gdp_cons), the real exchange rate and documents required to import (doc_import) have the expected signs and are significant. However, days to import (days_import) a container into the destination market, has a positive relationship with the probability of serving a given destination in Africa.

The positive signs on fragility and days to import could be reflecting other time invariant characteristics at the destination level that are not adequately controlled for by the included gravity variables. To addresses this potential bias arising from omitted variables, column (2) results add destination country dummy to account for all time invariant destination characteristics (observed and unobserved). We find that the sign on fragility changes to negative and is significant at 5% level. These results show that a 10% increase in destination fragility, is on average, associated with 0.011% reduction in the probability that a firm exports to that destination country. All the gravity variables (gdp-cons, real exchange rate, days_import and doc_import) have the expected signs and with the exception of the real exchange rate, all of them are significant.

Although the results in column (2) give us expected signs and most coefficients are significant, the magnitude of the effect is very small. As pointed earlier, the effect of fragility can be identified more precisely along the time dimension, rather than across countries. Column (3) results include firm-destination country fixed effects, such that the effect of destination country fragility on export status is identified entirely along the time dimension within each firm-destination combination. Notice also that in this estimation, the sample size is reduced because firm-destination combination with no trade in any of the years or those that trade in all years are omitted. This specification allows us to examine within each firm-destination over time, how a change in destination fragility affects export participation within a firm to that destination country.

We find that the sign on fragility remains negative and significant and the magnitude of the effect is larger relative to the results in column (2). The results show that an increase in destination fragility by 10% is, on average, associated with a reduction in the probability that a firm serves that destination by 0.21%, holding everything else constant. To illustrate the magnitude of the effect, let us assume that a destination country moves from the 25^{th} percentiles in fragility of (-3.989) to the 75^{th} percentiles (-3.199) on a log scale while all other variables are held constant at the mean. Our result show that the probability of a Kenyan firm exporting to the 25^{th} percentiles fragility country is 0.2588 but it is 0.2426 for the 75^{th} percentiles, such

that a deterioration in the fragility rank is, on average, associated with a 6.25% (=(0.2426/0.2588)-1*100) decrease in the probability that a firm exports to that market.

Market size (gdp_cons), real exchange rate, number of days to import (days_import) and documents to import in the destination country (doc_import), have the expected signs but the exchange rate is not statistically significant. An increase in the destination market real GDP by 10% is associated with an increase in the probability that a firm serves that market with exports by 0.72%, holding all other factors constant. An increase in the market size is expected to attract more firms in serving that destination, just as predicted by the gravity model of trade. An increase in days to import by 10% is, on average, associated with a reduction in the probability of exporting to that market by 0.31%. The real exchange rate and documents to import are not significant.

The LPM suffers from three main weaknesses. The marginal effects are always constant regardless of the level of an explanatory variable; the standard errors are heteroscedastic and may lead to predicted probabilities that are not bound to the unit interval. However, the method remains common in the literature because it is easy to interpret and works well around the means of the explanatory variables where the focus is in knowing the average partial effect. Horrace and Oaxaca (2006) shows that the LPM results are consistent provided the proportion of predicted probabilities that lies outside the unit interval is small. In our estimation, none of the predicted probabilities lies outside the unit interval and we report heteroscedasticity robust standard errors. We attempt to deal with the problem of constant marginal effects by considering some interaction terms in the next section.

To complement the results obtained using the LPM, we also estimated a panel logit with firm-destination fixed effects in column (4). While this method ensures that predicted probabilities fall within the unit interval and the marginal effects (ME) are not constant, the computation of the average marginal effects is complicated because the firm-country fixed effects are not estimated (Cameron & Trevedi, 2009: 630; Barrera-Gomez & Basagana, 2015 for similar arguments). The most important point to note is that the signs remain consistent across both the LPM and logit models. Column (5) shows the marginal effects computed after setting the firm-destination country FE equal to 0 but this can be non-representative evaluation and may underestimate the ME. Indeed, the ME computed at the mean after logit with fixed effects are small compared to the LPM results (OLS). They indicate that a 10% change in destination

fragility is associated with a reduction in the probability of serving a given destination by 0.03%.

4.5.2 The Role of Firm's Size and Exports to Fragile States

Large firms are more likely to afford additional costs to export into fragile states relative to smaller ones. This means including an interaction term between size and fragility will allows us to observe the effect of size in overcoming costs associated with exporting to destination countries in Africa that are fragile and sustaining export status. We extend the results in Table 4.4 and control for firm's size in export market and its interaction with destination country fragility. Table 4.5 shows the results.

Table 4.5: Firm's size and export status to a given destination country

Dependent variable:	Firm's export status to country j (exp_ijt>0)	
	(1)	(2)
L.Log(fragility)	-0.0179***	-0.0194***
	(0.0040)	(0.0040)
L.Log(size)	0.0175***	0.0200***
	(0.0003)	(0.0010)
(L.Log(fragility))(L.Log(size))		0.0008***
		(0.0003)
L.Log (gdp_cons)	0.0491***	0.0494***
	(0.0152)	(0.0152)
L.Log(real exchange rate)	0.0037	0.0038
	(0.0099)	(0.0099)
L.Log(days_import)	-0.0121	-0.0116
	(0.0078)	(0.0078)
L.Log(doc_import)	-0.0131	-0.0147*
	(0.0081)	(0.0081)
Observations	203,278	203,278
Number of groups	22,673	22,673
R-squared	0.2789	0.2789
Year dummy	YES	YES
Firm-Destination FE	YES	YES
F-Statistics/LR Chi2(13)	346.2	323.4

Notes: The dependent variable is a dummy equal to 1, if an exporter exports to destination j in t. The main explanatory variable is destination fragility and size. All continuous variables are in logs and lagged by one-time period (t-1). All results obtained from OLS with firm-destination country fixed effects. Asterisk denotes level of significance (***p<0.01, **p<0.05, and *p<0.1). Robust standard errors in brackets.

Column (1) adds lagged total value of exports of firm *i* as proxy for size of a firm in export markets (size) as a control. The sign on destination fragility remains negative and significant. The results show that size is an additional factor explaining the probability of exporting to a

given country consistent with the findings in the literature that show large firms are more likely to be multi-destination exporters (Chaney, 2008; Bernard et al., 2009, 2011). In particular, a 10% increase in the size of a firm is, on average, associated with 0.175% increase in the probability to export to a given destination market.

To assess whether size mediate the effect of fragility, column (2) adds an interaction term between destination fragility and size. The coefficient on interaction term is positive and significant. Note also that the sign on fragility and size remain negative and positive, respectively as in column (1). The positive coefficient on the interaction term shows that larger firms are less adversely affected by fragility than smaller firms. To see how fragility effect on probability of exporting to a given country changes as the size of a firm increases, let us assume that a firm's size moves from the 10th to the 90th percentiles (in log scale, this is a movement from 7.764 to 15.922). The average effect of a 10% increase in fragility on the probability to export is -0.132% for a firm size at the 10th percentiles while it is -0.067% for a firm size at the 90th percentiles[32]. This shows that the effect of fragility decreases with the size of the firm which is in line with the key predictions of models of firm heterogeneity and trade regarding the important role of firm size (or productivity) in overcoming fixed costs of entry in export markets (Melitz, 2003; Bernard et al., 2003; Chaney, 2008). Large and productive firms can afford additional costs to export to fragile markets and sustain export relationships.

4.5.3 Destination Country Fragility and Home Country Export Margins

We follow Bernard et al. (2009) to decompose Kenya's exports across destination countries into extensive and intensive margins[33]. We then examine the effect of destination country fragility on Kenya's export margins by regressing the extensive (number of exporters, number of products, and the density of trade) and intensive (the average export value per firm) margins

[32]The partial derivative of the probability to export with respect to fragility is $\frac{\partial pr}{\partial fragility} = -0.0194 + 0.0008 * \ln(size)$. Size is taken at the 10th percentiles and 90th percentiles for the sample of firms used in the estimation.

[33] $X_{jt} = N_{jt}V_{jt}D_{jt}\bar{x}_{jt}$ where X_{jt} is the overall exports to destination j in Africa; N_{jt} is the number of trading exporters, V_{jt} is the number of traded products; D_{jt} is the density term and $\bar{x}_{jt}$ is the average export value per firm (intensive term). If one takes a log transformation of the equation and regress the right-hand side variables (trade margins) against total export value, the sum of the coefficients on all four sub-components should add up to unity indicating a full decomposition. We have done the decomposition and is available if requested.

against destination country fragility[34]. A key concern in the literature[35] is that the exact relationship between bilateral exports and fragility could bidirectional. That is, trade may depend on fragility, but the occurrence of fragility may also depend on trade relationships between countries. Our estimation uses explanatory variables with a lag of one period. This strategy cannot eliminate endogeneity concerns totally but by using key explanatory variables pre-determined in the previous period may reduce this bias (Glick & Taylor, 2010).

We estimate equation (21) using the PPML method with destination-country dummies. The PPML method has the ability to account for the zero trade flows and the estimator does not assume normality of the residuals (Silva & Tenreyro, 2006). It is also valid with general forms of heteroscedasticity that characterizes export data. The PPML is an exponential model, which means we can interpret the effect of explanatory variables in a straight forward way, just as in OLS. Firstly, all the dependent variables are in levels rather than in logs, which means we retain the zeros in the estimation without adding ones to compute the logs as in the OLS and FE estimations. Secondly, coefficients of explanatory variables that are in logs are interpreted as simple elasticities. Table 4.6 presents the regression results.

[34] Note that Table 4.5 results are from a firm-year level estimate while Table 4.6 contains results from a country-year level regression.

[35] A large body of literature in political science addresses the question of how the probability of fragility and conflict depends on various measures of economic interdependence, including trade openness (see Barbieri, 2002; Mansfield & Pavehouse, 2000).

Table 4.6: Kenya's export trade margins and destination fragility

Dependent variables:	Firms	Products	Density	Av.value	Tot.value
	PPML	PPML	PPML	PPML	PPML
	(1)	(2)	(3)	(4)	(5)
L.Log(fragility)	-0.2328**	-0.2679	0.3114*	0.8625***	-0.0265
	(0.1004)	(0.1704)	(0.1877)	(0.3100)	(0.1133)
L.Log(gdp_cons)	-0.1220	-0.3548	-0.0268	-0.7614	0.1069
	(0.1955)	(0.3301)	(0.6992)	(0.4788)	(0.4905)
L.Log(days_import)	-0.1391*	0.0066	-0.0360	-0.4146	-0.2266*
	(0.0764)	(0.1039)	(0.3184)	(0.2831)	(0.1325)
L.Log(doc_import)	0.1363	0.1057	-0.6679	0.4959	0.1319
	(0.1194)	(0.1488)	(0.5127)	(0.3341)	(0.1540)
L.Log(real exchange rate)	0.1040	-0.5471**	-0.6741	0.0605	0.6175***
	(0.1727)	(0.2617)	(0.4508)	(0.5772)	(0.1526)
Constant	12.82***	9.001***	-10.33**	16.54***	28.65***
	(2.0951)	(3.3033)	(5.2012)	(4.7406)	(3.6781)
Observations	388	388	388	388	388
R-squared	0.9951	0.9870	0.6359	0.9301	0.9964
Other gravity controls	YES	YES	YES	YES	YES
Year dummy	YES	YES	YES	YES	YES
Destination-country dummy	YES	YES	YES	YES	YES

Notes: The dependent variables are the number of firms, the number of exporters, the density term, the average export value (Av.value) per firm and Kenya' total export value (Tot.value) to a given African country. The explanatory variables are the destination country fragility and other gravity controls and are in logs and lagged by one period. We control for the year and destination country fixed effects. Asterisk denotes level of significance (***p<0.01, **p<0.05, and *p<0.1) and the standard errors are clustered on destination-country level.

The results in column (1) show that the effect of destination fragility on the number of exporters is negative and significant at the 5% level. This suggests that a 10% increase in destination fragility is, on average, associated with a 2.3% decrease in the number of exporters to that destination-country. This result is qualitatively similar but smaller compared to that found by Crozet et al. (2007) for France. In their study they estimate a tobit regression of the log of the number of French firms exporting to a given country per year (over 1986-1992) on the destination country's insecurity index. They found that a 10% increase in the destination country's insecurity index reduced the number of exporting firms to that destination by 4.8%. Amongst all the time varying gravity controls, only the number of days (days_import) it takes to import in a destination country is significant at 10% level, suggesting that an increase in this variable reduces the number of exporters from Kenya to that destination.

Column (2) results are obtained from a regression of the number of exported products to a given destination country against fragility and other controls. The results reveal a negative but insignificant effect of destination fragility on the number of products exported. In column (3) we regress the density variable against destination fragility. According to Bernard et al.

(2009:488) the density variable measures the number of firm-product observations for which trade to a given destination is positive. It ranges from a minimum of $\{\frac{1}{firms}; \frac{1}{products}\}$ to unity as the number of observations approaches the multiple of firms to products.

Since firms are generally active in only a small subset of the overall number of products traded, density is typically negatively correlated with the numbers of trading firms and the number of traded products. A large value (i.e. near unity) for the term implies very few firms and products from Kenya to a given destination. For example, if only one firm exports one product to Sao Tome and Principe, then the density will take a value of 1. However, if two firms export two products to that country, this will amount to a density value equal to one half. As such, the density term is expected to be positively correlated with destination fragility. The results show that there is indeed a positive and significant relationship between density of trade to a given destination and destination fragility. An increase in destination fragility by 10% is, on average, associated with a 3.1% increase in the density term, implying a reduction in the firm-products observations to a given destination.

Column (4) shows that fragility has a positive and significant effect on the average export value per firm to a given destination country in Africa. An increase in destination fragility by 10% is, on average, associated with an 8.6% increase in the mean export value per firm to that destination country. This result is driven by pure selection effect as fragility causes exit of exporters that are less efficient relative to the average productivity exporters. As firms exit, the sample of exporters change and so does the average value. Our results differ from those found by Crozet et al. (2007) for France, where an increase in the destination insecurity index had no significant effect on the mean exports (intensive margin) per firm. They explain this fact to be driven by the fact that insecurity in the destination country caused exit of both small and unlucky large exporters.

Finally, in column (5), we examine the effect of destination fragility on Kenya's total export values to a given destination country in Africa. This specification is similar to most gravity equations in the literature considering the overall effect of destination fragility on bilateral exports (Glick & Taylor, 2010; Martin, Mayer & Thoenig, 2008; Mansfield & Bronson, 1997; Pollins, 1989). The results reveal a negative but insignificant coefficient on destination fragility. This result is not surprising, since we already know that new entrants and exiting firms are on average very small in their share of export market (see Chapter 3). Fragility affects mainly the entry and exit decisions for the small firms (the extensive margin) resulting in a

change in the sample of firms that actively participate in exports. These changes in the sample of firms implies the average export value per firm to that destination country necessarily increases due to pure selection effect (i.e. large firms continue to export) but the effect on Kenya's total export value is not significant.

4.5.4 Exploring the channel through which fragility affects export participation

This section looks at each indicator that went into the creation of the composite fragility index through the PCA method. The aim is to unpack the role of each included variables in PCA and split fragility into two components, namely political risk and business risk. This is to allow for differentiated effects and determine the channel through which fragility affects firm level export participation. We re-run equation (20) where each of the six indicators from the WGI compiled by Kaufmann et al. (2011) is used as an explanatory variable in a separate regression. The results are shown in Table 4.7.

Table 4.7: Firm's export status to a given destination and other proxies for fragility

Dependent variable:	Firm export status to j (exp_ijt>0)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L.Log(fragility)	-0.0194***						
	(0.0040)						
(L.Log(fragility))(L.Log(size))	0.0008***						
	(0.0003)						
L.Log(voice & account_vac)		0.0039					
		(0.0102)					
(L.Log(voice & account_vac)) (L.Log(size))		0.0022***					
		(0.0005)					
L.Log(regulatory quality_rq)			-0.0674***				
			(0.0101)				
(L.Log(regulatory quality_rq)) (L.Log(size))			0.0014*				
			(0.0008)				
L.Log(rule of law_rol)				-0.0059			
				(0.0064)			
(L.Log(rule of law_rol)) (L.Log(size))				0.0018***			
				(0.0005)			
L.Log(political stability_pse)					-0.0149***		
					(0.0023)		
(L.Log(political stability_pse)) (L.Log(size))					0.0001		
					(0.0003)		
L.Log(government effect_ge)						-0.0124***	
						(0.0044)	
(L.Log(government effect_ge)) (L.Log(size))						-0.0002	
						(0.0004)	
L.Log(control of corruption_coc)							-0.0257***
							(0.0050)
(L.Log(control of corruption_coc)) (L.Log(size))							0.0009**
							(0.0005)
L.Log(size)	0.0200***	0.0256***	0.0231***	0.0239***	0.0180***	0.0168***	0.0206***
	(0.0010)	(0.0019)	(0.0029)	(0.0017)	(0.0010)	(0.0014)	(0.0016)
The coefficients on all proxies of fragility at common size of the firm							
At the 10th percentiles (7.764)	-0.0132	0.0209	-0.0565	0.0081	-0.0141	-0.0139	-0.0187
At the 90th percentiles (15.922)	-0.0067	0.0389	-0.0451	0.0227	-0.0133	-0.0156	-0.0114
Observations	203,278	203,278	203,278	203,278	203,278	203,278	203,278
R-squared	0.2789	0.2789	0.2790	0.2789	0.2790	0.2789	0.2789
Other controls	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
Firm-Country FE	YES	YES	YES	YES	YES	YES	YES
F-Statistics	323.4	322.4	325.1	322.2	324.8	322.2	323.4

Notes: The dependent variable is the probability that a firm maintains an export status to destination j. Each of the six indicators in the WGI from Kaufmann et al. (2011) is used as an explanatory variable in a separate LPM regression with time and firm-country fixed effects. Other controls include GDP, days to import, documents to import, and the real exchange rate. Asterisk denotes level of significance (*** p<0.01, ** p<0.05, * p<0.1). Robust standard errors are in brackets.

Column (1) contains results for our preferred measure, which is the composite index obtained through the PCA method. The coefficient on fragility is negative and significant (-0.0194), suggesting that a 10% increase in this variable is, on average, associated with 0.19% reduction in the probability that a firm exports to that destination. Column (2) shows results for voice and accountability and surprisingly this is positive (0.0039) but insignificant. Column (3) presents the coefficient on regulatory quality. We find a negative and significant coefficient equal to -0.0674 on regulatory quality, suggesting a significant role of this indicator in the composite index.

Column (4) shows the effect of rule of law, which is negative and insignificant with coefficient equal to -0.0059. The effect of political stability and absence of violence/terrorism (column 5) shows a negative and significant coefficient equal to -0.0149, while column (6) presents the coefficient on government effectiveness (-0.0124) which is negative and significant. Finally, column (7) shows the effect of control of corruption indicator (-0.0257), which is negative and significant.

The coefficient on each of the proxy indicator is conditional on firm size. To allow comparison across all of them, we plugged in the respective coefficient on each proxy for the 10^{th} and 90^{th} percentiles size firm. We see that at the 10^{th} percentiles size firm, the coefficient on the composite index (fragility_all) is -0.0132 which is close to the coefficient on regulatory quality (-0.0565), political stability and absence of terrorism (-0.0141), government effectiveness (-0.0139) and control of corruption (-0.0187). The sign on voice and accountability and rule of law goes the opposite direction but both variables are not statistically significant. The results remain similar at the 90^{th} percentile firm size. Overall, they suggest that the negative effect (-0.0194) attached to the composite fragility index in our results, is mainly driven by five indicators: regulatory quality; political stability and absence of terrorism; government effectiveness and control of corruption (-0.0257).

Next, we created two additional indicators of destination country fragility from the WGI using PCA. The first one included voice and accountability, political stability and rule of law as inputs into the PCA method to generate an average political risk index (fragility_pol). We are of the view that this political risk indictor captures "periods when states lack the capacity, accountability or legitimacy to mediate relations" (World Bank, 2011:18). The second index includes regulatory quality, government effectiveness and control of corruption. This index is viewed as closely reflecting business environment risks in the destination country (fragility_buss). We compare these two channels for possible insights into the negative effect of aggregate fragility on export participation. In particular, we would like to assess how the political risk and business risk indices perform once we include them in the same regression. Table 4.8 shows the result.

Table 4.8: Effect of fragility based on all three indices computed using PCA

Dependent variable:	Firm export status to j (exp_ijt>0)			
	Composite fragility	Political risk	Business risk	2&3
	(1)	(2)	(3)	(4)
L.Log(fragility_all)	-0.0194***			
	(0.0040)			
(L.Log(fragility_all))(L.Log(size))	0.0008***			
	(0.0003)			
L.Log(fragility_pol)		-0.0084**		-0.0072*
		(0.0037)		(0.0039)
(L.Log(fragility_pol))(L.Log(size))		0.0011***		0.0035***
		(0.0003)		(0.0006)
L.Log(fragility_buss)			-0.0350***	-0.0262***
			(0.0052)	(0.0055)
(L.Log(fragility_buss))(L.Log(size))			0.0005	-0.0032***
			(0.0004)	(0.0008)
L.Log(size)	0.0200***	0.0213***	0.0191***	0.0179***
	(0.0010)	(0.0011)	(0.0014)	(0.0014)
Observations	203,278	203,278	203,278	203,278
Number of groups	22673	22673	22673	22673
R-squared	0.2789	0.2789	0.2790	0.2792
Other controls	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Firm-Country FE	YES	YES	YES	YES

Notes: The dependent variable is the probability that a firm export to destination j. The proxy for destination country fragility: fragility _all (a composite of all WGI); fragility_pol (political risk) and fragility_buss (business risk). All explanatory variables are in logs and are lagged by one period. Other controls include GDP, days to import, documents to import, and the real exchange rate. Results are obtained using LPM with firm-destination country FE. Asterisk denotes level of significance (*** p<0.01, ** p<0.05, * p<0.1).

We can observe that all measures of fragility in the destination market have a negative and significant relationship with the probability that a firm export to a given country. The coefficient on the composite index (fragility_all) is -0.0194, while the coefficient on political risk (fragility_pol) is -0.0084 and that on business risk (fragility_buss) is -0.0350. This indicates that business risk has the strongest effect on the probability that a firm exports to a given country, followed by the composite index. The negative effect of political risk is very small, although significant at 5% level. These results suggest that the composite fragility index is largely capturing business fragility rather than political fragility.

In column (4) we include both political and business fragility in the same regression. Both political and business fragility remain negative, but the magnitude of the effect is large on the business fragility. The coefficient on business fragility is equal to -0.0262 and is significant at 1% level, while the coefficient on political fragility is 0.0072 and significant at 10% level. The

interaction term between size and fragility_buss is negative and significant suggesting that the effect of size diminishes at very high level of state fragility. The results show that an increase in both political and business fragility have a significant effect on the probability of firm exporting to a given country in Africa. However, the magnitude of the effect is larger for business risks relative to political risks. This finding is interesting and calls for differentiated policy interventions to enhance the probability of exporting from Kenya to the African market.

Finally, there is a concern that our results may be driven by the WGI by Kaufmann et al. (2011) used as proxy for destination country fragility. To test the robustness of our results to alternative measurements of fragility, we follow Crozet et al. (2007) and use the International Country Risk Guide (ICRG)[36] as proxy for fragility (PRS Group, 2011). Table 4.9 shows the results.

Table 4.9: Robustness to alternative measurement of fragility using ICRG Index

Dependent variable:	Firm's export status to j (exp_ijt>0)	
	(1)	(2)
L.Log(fragility_ICRG)	-0.1056***	-0.1022***
	(0.0295)	(0.0292)
L.Log(size)		0.0176***
		(0.0030)
(L.Log(fragility_ICRG))(L.Log(size))		0.0009
		(0.0008)
L.Log (gdp_cons)	0.0892***	0.0640***
	(0.0217)	(0.0214)
L.Log(real exchange rate)	-0.0310**	-0.0252*
	(0.0149)	(0.0148)
L.Log(days_import)	0.0255**	0.0369***
	(0.0112)	(0.0110)
L.Log(doc_import)	-0.0465***	-0.0561***
	(0.0123)	(0.0121)
Observations	138,051	138,051
Number of groups	17305	17305
R-squared	0.2559	0.2686
Year FE	YES	YES
Firm-Destination FE	YES	YES

Notes: The dependent variable is the probability that a firm export to destination j. The proxy for destination country fragility is the ICRG obtained from the PRS Group website. Other controls include GDP, real exchange rate, days to import, documents to import and the proxy measure for firm network. All explanatory variables enter with a one period lag. Asterisk denotes level of significance (*** p<0.01, ** p<0.05, * p<0.1).

[36] There is a positive and significant correlation equal to 0.8415 between the ICRG political stability index and our fragility measure.

The ICRG indices provide a total score on political stability across countries and the availability of this variable matches the sample period of 2004-2013. However, the data is only available for 32 countries in Africa, which means we lose some observations. The index measures political stability along dimensions such as socioeconomic conditions, democracy, ethnic tensions and military conflicts and determinants of business climate. It ranges from 0 (very unstable) to 100 (most stable), which means to measure fragility we must use an inverse of the index. An increase in the score translates to a decrease in fragility in a destination country.

Column (1) results show that fragility negatively affects the probability of a Kenyan firm exporting to a given destination country in Africa. A 10% increase in fragility is associated with a 1.1% reduction in the probability of exporting. This result is qualitatively similar to that obtained in our baseline regression in Table 4.4 column (3) although the magnitude of the effect is now stronger. Column (2) includes size and its interaction with fragility as controls. The results show a negative and significant coefficient on fragility. Size also has a positive and significant effect, but the interaction term is not significant. This result is also qualitatively similar with our findings in Table 4.5 column (2). Overall, the sign on the coefficients on the destination country fragility remains negative and statistically significant. Size has positive effects on the probability of exporting. This suggests that our baseline results are robust to the alternative choice of measuring destination country fragility.

4.6 Conclusion

This chapter analyses the effect of a specific market access cost, using fragility of a destination market as an exogenous shock resulting in additional costs of entry into markets in Africa and how this alters firm's export behaviour. In particular, we examine the effect of fragility on a Kenyan firm's decision to export to a given destination market in Africa and mechanisms through which firms mediate the effect of fragility. Our empirical strategy controls for endogeneity of destination choice by the firm through firm-destination country fixed effects such that the effect of destination country fragility on a firm's export decision is identified entirely along the time dimension.

The results reveal a negative and significant effect of destination country fragility on the probability of a Kenyan firm exporting to a given destination in Africa. An increase in

destination fragility by 10% is, on average, associated with a reduction in the probability that a firm exports that destination by 0.21%, holding everything else constant. To illustrate the magnitude of the effect, let us assume that a destination country moves from the 25th percentiles in fragility (-3.989) to the 75th percentiles (-3.199) on a log scale while all other variables are held constant at the mean. Our results show that the probability of a Kenyan firm exporting to the 25th percentiles fragility country is 0.2588 but it is 0.2426 for the 75th percentiles, such that a deterioration in the destination's fragility rank is, on average, associated with a 6.25% (= (0.2426/0.2588)-1*100) decrease in the probability that a firm exports to that market.

Regarding the size of a firm in its export market, we find that larger firms are more likely to become multi-destination exporters to the African region. In particular, a 10% increase in the size of a firm is, on average, associated with 0.175% increase in the probability that a Kenyan firm exports to a given destination market in Africa. Furthermore, the result on the interaction term of firm size with fragility show that larger firms are less adversely affected by destination fragility than smaller ones. For instance, the average effect of a 10% increase in fragility on the likelihood of exporting is -0.132% for a firm size at the 10th percentiles while it is -0.067% for a firm size at the 90th percentiles. This shows that the effect of fragility decreases with the size of the firm which is in line with the key predictions of models of firm heterogeneity and trade that emphasizes the role of firm size (or productivity) in overcoming fixed costs of entry in export markets (Chaney, 2008; Melitz, 2003; Bernard, Redding & Schott, 2003). Large and productive firms can afford additional costs to export to fragile markets and sustain export relationships.

The chapter closes with an assessment of the effect of destination country fragility on Kenya's trade margins and shows that the main channel through which fragility affects bilateral trade is in the reduction of the number of exporters. The gravity estimation shows that a 10% increase in destination fragility is, on average, associated with a 2.3% reduction in the number of exporters, a 2.6% reduction in the number of products and a 3.1% increase in the density term. These results translate to an overall reduction in bilateral trade along the extensive margin by 1.8% (= -2.3-2.6+3.1). This result provides evidence in support of the fact that fragility affects mainly the entry and exit decisions for the small firms.

On the effect of destination fragility on average export value per firm (intensive margin), we find a positive and significant effect. An increase in destination fragility by 10% is, on average, associated with 8.6% increase in the mean export value per firm to that destination country.

This result is driven by pure selection effect as fragility causes exit of exporters that are less efficient relative to the average productivity exporters. As firms exit, the sample of firms change and so does the average export value. Finally, on the effect of destination fragility on Kenya's total exports to a given destination, we find a negative but insignificant effect. Fragility affects mainly the entry and exit decisions for the small firms (the extensive margin) resulting in a change in the sample of firms that actively participate in exports. These changes in the sample of firms implies the average export value per firm to that destination country necessarily increases due to pure selection effect (i.e. large firms continue to export) but the effect on Kenya's total export value is not significant.

Overall, these findings accord with the main hypothesis set out in the chapter in which the effect of destination fragility on exports is mainly through the extensive margin (reducing the number of exporters). Furthermore, an increase in destination fragility (or market access costs) is associated with a high exit rate, documented in chapter three and low survival probabilities in international markets. The results from this chapter, suggests that destination fragility negatively affects bilateral trade between Kenya and fragile African states, although the effect is not significant. A careful scrutiny of the channel through which destination fragility affects firm export participation, showed that business risks rather than political risks provide the greatest hurdle. This may call for differentiated policies to address the business risks and political risks associated with exporting within the African continent.

More recently, international trade policy has emphasized the need to facilitate market access (Kee, Nicita & Olarreaga, 2009). In the next and final main chapter, we examine the role trade policy could play in reducing market access costs and potentially influencing firm level export outcomes. This is done by evaluating the effectiveness of a government's incentive scheme that promotes the use of imported intermediate inputs. Kenya grants full duty exemptions on imported intermediate inputs that are used in the production of goods for export. We examine whether firms that benefit from the scheme perform better in terms of export outcomes relative to non-beneficiaries.

Chapter 5

5. Imported Inputs, Government Support and Performance of Manufacturing Exporters

5.1 Introduction

Access to imported intermediate inputs has been hailed as critical in enhancing firm productivity and performance in exports. Indeed, this is perhaps the greatest gain by countries through globalization. A cut in global tariffs has promoted access to a larger variety of higher quality and less expensive inputs, enabling firms to lower their marginal costs and overcome the fixed costs of serving foreign markets (Feng, Li & Swenson, 2016). In addition, most countries go a step further and grant duty relief and exemptions to exporters to enable them to use more imported intermediate inputs in their production processes.

Duty relief and exemption schemes allow certain goods to be imported duty free provided they are used in the production of goods for export or are in transit for re-export (Thomas & Nash, 1991). These schemes ensure that imported intermediate goods which will undergo further manufacturing and later be exported are not required to pay duty that would otherwise apply if they are imported for domestic consumption or production for domestic market. As such, they provide manufacturing exporters with imported inputs at world prices. This is necessary to increase their competitiveness in foreign markets and leverage technology embedded in imported inputs to produce new products for export.

The main objective of this chapter is to examine the effect of imported intermediate inputs on a firm's export performance and to evaluate the effectiveness of the government of Kenya's duty exemption scheme in providing access to imported inputs and altering the firm's export performance. Specifically, we ask two questions:

- What is the effect of increased access to imported inputs on firms' export performance?
- Does access to duty exemptions confer additional gains to beneficiaries in terms of export outcomes?

These questions are important for the manufacturing sector in Sub-Saharan African (SSA) countries for two reasons. Firstly, access to imported inputs has been shown to raise firm total

factor productivity (Halpern, Koren & Szeidl, 2015; Kasahara & Rodrigue, 2008), which in turn, boosts export performance (Bas & Strauss-Kahn, 2014). Firms in developing countries have been found to be less productive relative to their counterpart in the developed economies (Tybout, 2000). Access to imported inputs could potentially raise the average productivity for firms in SSA. Secondly, access to quality and less expensive imported inputs lowers the production costs and the fixed costs of entry in export markets (Feng, Li & Swenson, 2016). Africa is remote as a large number of countries are landlocked. This means firms in these countries already faces higher transportation costs for accessing inputs. These points underscore the need for trade policy in SSA countries to ease access to imported inputs (Kasahara & Lapman, 2013).

Duty drawback schemes and tax exemptions on imported raw materials and capital goods are a popular tool used to promote use of imported intermediate inputs, although implementation has remained complex and inefficient in developing countries (Clarke, 2005; Collier & Gunning, 1999). Given the scarcity of public resources, ascertaining the effectiveness of this scheme in affecting firm export outcomes is central to the current chapter.

The Kenyan duty drawback and value added tax (VAT) exemptions on imported intermediate inputs was established in July 2002 and is administered by the Tax Remission for Export Office (henceforth TREO) at the National Treasury. This programme grants full duty remissions and VAT exemptions to eligible importers of inputs. At the same time, under the Kenyan VAT law, exports are zero rated. As a result, all exporters are eligible for VAT refunds. This applies to all exporters whether eligible for TREO or not. This chapter focuses only on duty remission and VAT exemptions granted to eligible firms under TREO. This sub-set of firms constitutes the sample that is treated by the TREO policy incentive. The rest of this chapter is organized as follows: section 5.2 review related literature, section 5.3 contains the theoretical framework. The empirical results are presented in section 5.4 and section 5.5 concludes.

5.2 Related Literature

Access to a large variety of affordable and potentially high quality intermediate inputs is a known channel through which trade liberalization may influence firm productivity and promote economic growth (Kugler & Verhoogen, 2012; Grossman & Helpman, 1991; Rivera-Batiz & Romer, 1991; Markusen, 1989; Ethier, 1982). Combining differentiated imported inputs yields productivity gains that are more than the sum of full products (Ethier, 1982). This efficiency

gain is an outcome of a greater division of labour and the complementarity gain from imperfect substitution across intermediate inputs.

Trade in intermediates provides an avenue for diffusion and adoption of new technology (Halpern, Koren & Szeidl, 2015; Kugler & Verhoogen, 2012; Amiti & Konings, 2007; Muendler, 2004). Evidence for this has been found for firms in Chile by Kasahara and Rodrigue (2008), in Hungary by Halpern et al. (2015), in Indonesia by Amiti and Konings (2007), in France by Bas and Strauss-Kahn, 2014 and in Brazil by Muendler (2004). Imported inputs affects firm export outcomes through a rise in firm productivity, in what is known as the *indirect channel* in the literature (Bas & Strauss-Kahn, 2014; Bas, 2012).

In addition to the indirect channel, a small but growing body of literature is pursuing the *direct channel*, through which imported intermediate inputs affect firm's performance, especially in export markets (Edwards, Sanfilippo & Sundaram, 2016; Feng, Li & Swenson, 2016; Damijan, Konings & Polanec, 2014; Kasahara & Lapham, 2013). In particular, there is significant revenue and cost complementarity between final exports and imported inputs. Cost complementarity in importing and exporting has been shown to generate a cost saving gain of between 7% and 26% per period, for fixed costs of entry for importer-exporter firms in Chile (Kasahara & Lapman, 2013).

Bas and Strauss-Kahn (2014) investigate the role of imported inputs in enhancing firm productivity and export scope using firm level database of imports at the 6 -digit HS product level for France over the 1996-2005 period. On the latter, they examined the effect of changes in the use of imported inputs on export scope. Export scope is measured as the number of exported varieties to the EU by a firm in period (t). The authors go a step further and explain the direct and indirect channels through which imported inputs affect export patterns. They show that access to more varieties of imported inputs leads to an increase in firm profit by partly increasing its productivity but also by lowering its input prices. Access to imported inputs also makes it possible to produce varieties that correspond adequately to foreign market needs, lowering the fixed costs of entry.

Imported intermediate inputs make available high quality inputs which also translate to production of high quality products that fetch a better price in the international markets (Amiti & Khandelwal, 2013; Goldberg et al., 2010; Verhoogen, 2008). A strong but common assumption in the literature is that developed countries produce goods with a high technology

or quality content and are in general more expensive relative to inputs sourced from developing and low-income countries (Feng, Li & Swenson, 2016).

Feng et al. (2016) estimates the causal effect of increased imported intermediate inputs on firm export outcomes for exporters in China. Their findings show that an increase in firm imports of intermediate inputs by 1% resulted in a 1.65% increase in export value per firm. The strongest effect of imported inputs on export value was observed amongst firms that were initially non-exporters (2.1%), although the effect on firms that were already exporting was also large (1.2%). In Argentina, Bas (2012) examined whether enhanced access to imported intermediate inputs positively impacted the probability of local firms entering the export market or expanding their existing export offerings. They show evidence to suggest that firms in industries that experienced the largest reductions in input tariffs recorded the greatest increase in the share of participation in the export market.

In the context of SSA, very few studies have looked at how access to imported inputs affects the performance of firms in exports. Edwards et al. (2016) examine, for South African firms, whether importation of a large variety of inputs from a broad range of source countries was associated with better firm outcomes, including exporting. They find that imports affected exports through the *indirect channel* (firm productivity) and the *direct channel*. An increase in variety of imported inputs used in production positively raised firm total factor productivity (TFP). TFP in turn is positively associated with both export value and export variety. The direct channel is reflected by the coefficient on lagged import variety. They find a positive but insignificant relation between lagged imported varieties and export value but a positive and significant relation with the number of products exported after controlling for the indirect channel using firm's TFP.

This study is the first we have found for a SSA country and serves as a useful benchmark to this paper. In Edwards et al. (2016), to reduce the bias arising from potential reverse causality, they include explanatory variables with a one period lag. This strategy is, however, costly in terms of lost observations in their estimation. We take advantage of the relatively longer panel data for Kenya to further explore the impact of imported intermediate inputs on export performance for another SSA country.

Our chapter is also related to the literature examining the impact of duty relief and drawbacks on the performance of exports (Chi-Chur, Eden & Wusheng, 2006; Clarke, 2005; Ianchovichina, 2004; Chao, Chou & Eden, 2001; Panagariya, 1992). Duty relief and drawbacks

received great attention in the past after they became central to the trade policies recommendation from multilateral agencies such as the World Bank (Thomas et al., 1990; Clarke, 2005). Although many countries in Africa offer exporters duty drawback schemes and tax rebates as part of their trade policy, their application has often been hampered by difficulties in implementation resulting in high transaction costs (Clarke, 2005).

A very important framework for assessing the welfare impact of inputs tariff and duty drawback schemes is provided in Panagariya (1992). In his framework, the author shows that a tariff on the input unaccompanied by duty drawbacks on exports works like a production tax at different rates on goods using the input. The effect of such a tariff on welfare is ambiguous even if the tariffs on final imports are lowered to maintain constant revenue. Furthermore, an increase in tariffs on inputs complemented by full duty drawbacks are welfare improving up to a point, provided that final goods exhibit substitutability with respect to each other in production and consumption.

Empirical testing of the Panagariya's framework is done using a computable general equilibrium. For example, Ianchovichina (2004) applies a multi-region, general equilibrium model to the case of China, a country in which duty exemptions have been an essential part of its export processing system. After accounting for duty exemptions on imports for production of China's exports, she obtained a lower but more accurate impact of China's WTO accession on export performance. She shows that studies that did not account for duty exemptions led to an overstatement of the impact of WTO accession on China's exports flow.

China provides another context for assessing the impact of duty relief and drawbacks. Chao et al. (2001) studies export duty rebates and export performance for Chinese exporters. They noted that, at a time when East Asia was undergoing a severe financial crisis in 1997, China's neighbouring countries devalued their currencies aggressively to enhance the competitiveness of their firms. China instead, raised export tax rebates for several products. This incentive helped China's products retain a competitive edge on world markets, far better than the outcomes in neighbouring countries that devalued currencies. To examine the effect of tax rebates on China's exports, they estimated a long-run equilibrium export demand equation in which real exports were specified as a function of relative foreign income, relative goods prices, exchange rate volatility, and the amount of tax rebate. This estimation was based on annual data for the period 1985 to 1998 and used an error correction mechanism to obtain the long-run and the short-run relationships between real exports, foreign incomes and tax export

rebates. They found that export tax rebate had a positive and significant effect on China's total exports. In particular, they estimated a long-run elasticity for export rebates equal to 0.344 and a short-run effect of 0.140. They concluded that export tax rebate was key in the promotion of China's exports.

Chi-Chur et al. (2006) examines the effect of import duty drawbacks and value added tax rebate policies on exports, sectoral output and overall welfare for China. They used a computable general equilibrium (CGE) model to test for this effect based on a scenario of experiments that increased tax rebates. The basic channel in their model is that an increase in tax rebates lowers the costs of using foreign intermediates. This renders favourable factor substitution and output effects resulting in increased demand for imports. Thus, tax rebates promote the exportable sector, but this might harm the domestic intermediate goods sector. Several simulations show that a reduction in tariff rates on inputs (or increase in tax rebates) led to an expansion of export processing and a slight contraction of domestic production in most industries.

Our paper differs from Chi-Chur et al. (2006) in that we look at partial equilibrium and do not deal with the effect on domestic import competing sectors. The CGE models play a separate and important objective for assessing the overall welfare impact of the duty and tax exemptions policy. Our focus, however, is to examine the differences in performance between importer-exporters that benefit from the policy initiative relative to those that do not benefit. This narrow focus allows us to test the effectiveness of the policy at the firm level.

5.3 Theoretical Framework

5.3.1 The Model

We analyse how access to imported intermediate inputs directly affects a firm's export performance. A reduction in import tariffs together with duty remissions on imported intermediates is expected to boost firm export performance. To help us grasp the framework, we consider a standard profit maximization problem in which a firm seeks to maximize profits in her export market[37].

$$Max\pi_1 = r(Q_x) - c(Q_x) \qquad (22.)$$

[37] We assume that the domestic and export markets are separable.

Where r and c are firm revenue and cost that are a function of the quantity Q_x, exported. The firm's production function is specified as:

$$Q_x = f(L, K, M) \tag{23.}$$

Where output produced depends on the firm's choice of labour (L), capital (K) and the level of intermediate inputs (M). M is in turn split into domestic and foreign intermediates ($M \in [M_d, M_f]$).

Furthermore, there are both fixed and marginal costs for acquiring each variety of imported intermediate inputs (Halpern et al., 2015). However, following a global reduction in import tariffs, together with a duty and VAT remissions programme under TREO, the cost for obtaining intermediate inputs from each source country has dropped. This may motivate increased export volume but also an increase in the number of countries and products exported by the beneficiary firms. The changes in the cost of acquiring imported intermediate inputs may affect the input mix chosen due to the possibility of substituting imported intermediate against domestic inputs (Feng et al., 2016) as the firm seeks to minimise its total operation cost. As a result, the literature shows that increased use of imported intermediate inputs will positively alter the performance of firms in exports (Kasahara & Rodrigue, 2008; Kasahara & Lapman, 2013).

The provision of duty remission programmes plays a separate role, namely to provide imported intermediate inputs at world prices. This is important to enable firms to gain export price competitiveness in foreign markets. Returning exporters to their free trade prices is necessary, given the implicit tax on their exports if they pay input tariffs. To elaborate, we derive the net subsidy (implicit tax) granted to the import competing (export) sector and indicate the role played by TREO in reversing the implicit tax that the exporting sector may face. We combine equation (22) and (23) and rewrite the firm's profit maximization problem using the dual of the production function as:

$$\pi_1 = pQ_x(1 + \tau_Q) - [wL + mM(1 + \tau_M) + rK] \tag{24.}$$

where: $p,\ Q_x\ and\ \tau_Q$ are the world price, quantity sold and output tariff rate on the product. $w\ and\ L$ is wage and labour used in the production process; $m,\ M\ and\ \tau_M$ are the

world price, quantity and input tariff rate on the intermediate inputs and $r\ and\ K$ are the rental rate and capital with rK reflecting the costs of capital services[38]. In a free trade environment with no tariffs, the profit function can be re-written as:

$$\pi_0 = pQ_x - [wL + mM + rK] \quad (25.)$$

Subtracting equation (25) from equation (24) yields the tariff protection granted to the import competing sector as:

$$S = pQ_x\tau_Q - [mM\tau_M] \quad (26.)$$

Dividing both sides of equation (26) by the product sales, the tariff protection relative to total sales revenue is given as:

$$s = \tau_Q - [\propto_m \tau_M] \quad (27.)$$

where: $\propto_m$ is the cost share of intermediate inputs. For the import competing sector, the output tariff rate is usually large than the input tariff, i.e. $\tau_Q \geq \tau_M$. However, if the product is exported it amounts to an implicit tax since $\tau_Q = 0$.

$$s = -[\propto_m \tau_M] \quad (28.)$$

A programme such as TREO is put in place to remove this by setting $\tau_M = 0$ through a duty remission scheme on imported intermediate inputs. The implicit tax is not a concern in an economy with lower tariffs on inputs. As such, the gains in being a TREO beneficiary will fall as tariffs on inputs falls. Notice also that the implicit tax is higher if $\propto_m$ is close to 1. That is, tax is high the larger the cost share of imported intermediate inputs.

5.3.2 A Case Study of Kenya

As indicated earlier, the empirical section uses Kenya as a case study to test the effectiveness of duty remissions and waiver of other taxes such as VAT on imported inputs. This case study is chosen purely due to the availability of data. Very briefly, the Kenyan programme grants full duty and VAT exemptions on imported inputs to eligible firms, making it easier for us to abstract from the need for partial duty drawback and political economy behind the final tariff

[38] To simplify, we assume that K is not importable. See Goldberg et al (2010) for India, where they talk of importation of K playing an important role. This framework also assumes perfect substitutability of domestic and imported inputs.

and export tax rebate rates on intermediate goods (Cadot, de Melo & Olarreaga, 2003). Information on duty and VAT taxes exempted is compiled and administered by the Tax Remission for Export Office (TREO) at the National Treasury together with an audit unit at the Customs Services Department of the KRA.

To be eligible for duty remission and VAT exemption, a firm submits an application to the committee through the Kenya Association of Manufacturers (KAM). The committee is comprised of the National Treasury, Ministry of Trade and Industry, Kenya Revenue Authority, Kenya Bureau of Standards, Kenya Sugar Board, Fresh Produce Exporters Association of Kenya and Kenya Association of Manufacturers. It approves for gazetting only the applications that meet the requirements of the regulations to the Commissioner of Customs Services contained in the *Legal Notice No. 129 of 19/7/2002*.

The requirements include being a member of the KAM, submission of t a detailed actual production plan, giving the input-output ratio, any wastes and by-products. They are also required to reconcile the duty exempt imports with goods produced and exported after exportation or within nine months of exemption approval or otherwise re-export, apply for a rollover or pay the applicable taxes. Exemptions are granted against a performance bond to the value of the duties exempted. A critical attribute to this incentive is that, once approved, it stays valid for at least nine months and does not get regularly revised as the firm varies its output and export activity.

How does this waiver benefit the eligible firms? It does in two ways. Firstly, the beneficiaries obtain full exemption on duty and VAT on imported inputs, before the same are imported. This is a huge gain in costs of sourcing inputs relative to non-beneficiaries. Secondly, the non-beneficiary importers pay duty and VAT. VAT is refundable after launch of a claim proving that products were exported. This is normal, but they suffer a huge cost in held up working capital because VAT refund systems tend to be slow and subject to rigorous audits. The beneficiaries under TREO have none of this problem, which means they derive an operational advantage relative to non-beneficiaries.

Secondly, the magnitude of the gain from TREO depends on the level of input tariffs. As partner state in the East African Community (EAC) Kenya's applied Most Favoured Nation (MFN) tariff rates are in line with the East African Community Common External Tariffs since January 2005. Table 5.1 provides a description of the MFN tariffs profile for Kenya.

Table 5.1: Kenya's Most Favoured Nation (Ad valorem Equivalent) Tariffs, selected years

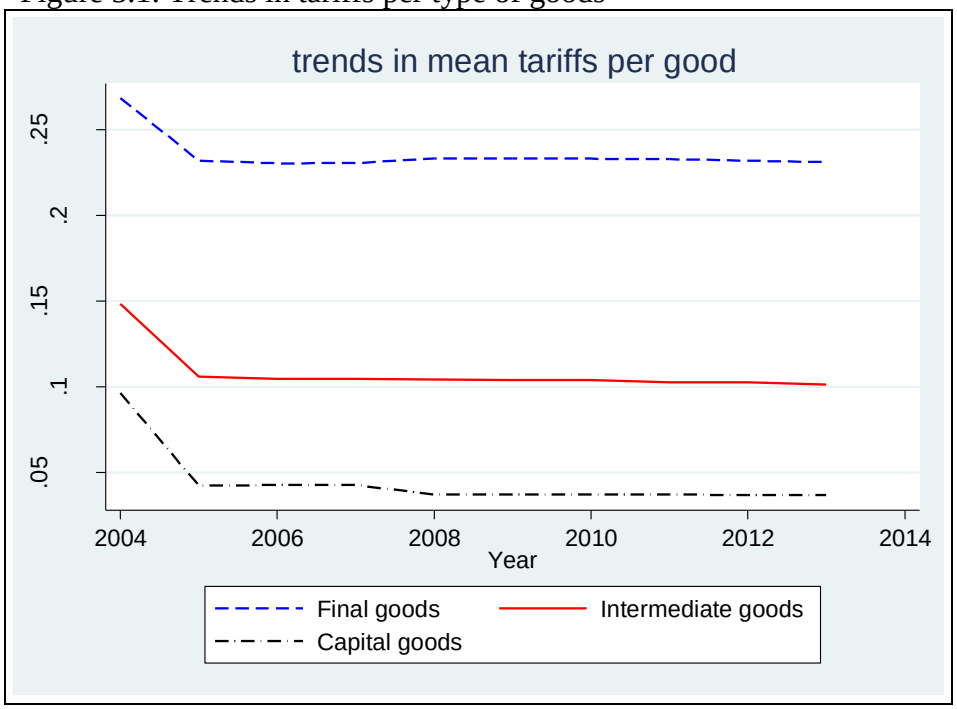
HS-Section	Description	2004		2005		2010		2012	
		Mean(AVE)	Sd(AVE)	Mean(AVE)	Sd(AVE)	Mean(AVE)	Sd(AVE)	Mean(AVE)	Sd(AVE)
1	Live animals	24.1	15.20	25.6	9.7	25.5	9.5	25.4	8.9
2	Vegetables	22.4	13.21	17.5	9.9	18.2	9.9	18.4	9.5
3	Fats & oils	17.2	11.49	13.9	10.5	13.5	10.6	13.6	10.3
4	Food,bev. & tobacc.	24.8	14.41	23.7	14.4	23.9	14.5	24.0	14.6
5	Mineral products	10.8	8.142	6.2	8.5	5.2	8.1	4.8	7.5
6	Chemicals	9.8	9.58	3.0	7.2	3.0	7.4	3.0	7.3
7	Plastics	14.6	11.02	10.6	9.9	10.6	10.0	10.7	10.0
8	Leather	16.5	5.83	14.1	8.1	14.3	8.1	14.3	8.1
9	Wood	20.8	12.09	18.4	10.2	17.7	10.2	17.6	10.3
10	Pulp & paper	22.3	15.52	15.8	10.8	15.4	10.9	15.3	11.0
11	Textile & clothing	25.4	7.82	20.9	9.1	20.8	9.3	20.7	9.2
12	Footwear	30.6	6.70	22.9	5.3	22.7	5.5	23.2	5.0
13	Stone, glass, cement	18.3	7.30	17.7	9.0	17.5	9.2	17.1	9.3
14	Jewelry	20.4	5.69	23.6	5.7	23.6	5.8	23.6	5.8
15	Base metals	16.7	11.06	10.3	9.1	10.1	9.1	9.8	9.2
16	Machinery	10.3	9.66	6.7	9.1	6.2	8.8	6.1	8.8
17	Transport & Equip.	14.8	13.48	7.1	9.7	7.3	10.0	7.1	10.0
18	Optics	9.9	7.82	4.0	6.9	3.4	6.7	3.3	6.7
19	Arms	14.5	2.18	25.0	0.0	25.0	0.0	25.0	0.0
20	Miscellaneous	20.4	6.94	23.4	4.9	23.2	5.3	22.7	6.0
21	Works of art	15.0	0	25.0	0.0	25.0	0.0	25.0	0.0
	Mean	16.8		12.87		12.72		12.94	
	Sd	12.2		11.91		12.00		12.12	
	Min	0.0		0		0		0	
	Max	100		100		100		100	
	#HS8 lines	5886		5423		5260		5442	

Notes: Ad valorem tariffs are obtained from World Integrated Trade Solution (WITS) TRAINS database and own computation. Sectors created by reducing HS 2-digit classification into 21 sectors. Mean (AVE) stands for average ad valorem tariffs, while Sd (AVE) is the respective standard deviation. The bottom panel contains the country's annual average AVE tariffs. Computed using the simple average for MFN tariffs.

The table shows simple average tariffs across 21 sectors over time. The most protected sector in 2004 was footwear at a rate of 30.6% while chemicals drew the lowest tariff of 9.8%. Across all sectors (except live animals, arms, miscellaneous, and works of art) tariffs dropped in 2005 and have broadly remained stable over time. In 2012, live animals remain on average the most protected at a rate of 25.4%, while chemicals have the lowest rate of 3.0%. The standard deviation around the mean is high (2-digit in some cases) signalling high dispersion of tariffs within a sector.

The bottom panel provides the average tariff for Kenya over time, which has reduced from 16.8% in 2004 to 12.72% in 2010 before a slight increase to 12.94% in 2012. The standard deviation is also very high. The minimum tariff is zero while the maximum is at 100%.

Figure 5.1: Trends in tariffs per type of goods



Notes: Ad valorem tariffs are obtained from WITS' TRAINS database and own computation. Products are classified into final, intermediate and capital goods using the United Nations' Broad Economic Classification (BEC) on end use. Mean (AVE) stands for average ad valorem tariffs. Computed using the simple average for MFN tariffs.

Figure 5.1 presents the average ad valorem tariff rates on final goods, capital goods and intermediate goods. It can be observed that there is only action on tariff changes from 2004 to 2005. The average tariff on intermediate goods has decreased from an average rate of 15% in 2004 to around 10% in 2012. At this level, tariffs are still reasonably high suggesting that firms that are able to take-up TREO obtain a saving on the cost of imported inputs. The trend in the import tariff is not that important after 2005, rather, it is the level that matters. But there is also variation across sectors and overtime within a sector. This is important, as it allows us to identify the effect of TREO (or tariffs) on export outcomes, while controlling for time and firm fixed effects (Bigsten et al., 2004).

5.3.3 Estimation Strategy

The Effect of Imported Inputs on Firm Export Performance

Our empirical approach for studying the effect of imported intermediate inputs on the performance of firms in exports is to regress measures of firm export performance on indicators of firm's import of inputs. We expect that exporters that use imported inputs have a performance advantage relative to those that do not (Edwards, Sanfilippo & Sundaram, 2016; Pierola, Fernandes & Farole, 2015; Bas & Strauss-Kahn, 2014; Bas, 2012). This estimation

strategy was initially proposed by Bernard and Jensen (1999) in studying the productivity advantage for exporters relative to non-exporters in the US. We estimate the following regression.

$$\boldsymbol{Y_{it}} = \beta_0 + \beta_1 \boldsymbol{M_{it-1}} + \mu_t + \alpha_i + \varepsilon_{it} \qquad (29.)$$

where $\boldsymbol{Y_{it}}$ contains indicators of export performance (i.e. real exports value, number of products and destination countries served) per firm i at period t. $\boldsymbol{M_{it}}$ contains indicators of firm imports of inputs i.e. a dummy variable equal to 1, if exporter imports inputs (importer-exporter dummy) and log value of imported inputs. We control for firm fixed effects (α_i) and year effects (μ_t) to account, respectively, for the time invariant omitted firm characteristics, as well as time varying aggregate macro factors that may influence export performance but are common across all exporters, such as business cycles. It is also common in the literature to include industry/sector by year fixed effects to deal with industry specific trends such as changes in global competition that may affect the performance of exporters (Pierola, Fernandes & Farole, 2015; Bas, 2012). The regression results of this specification are presented in section 5.4.1 of this chapter.

Export Performance Premia for Importer-Exporters that access TREO

The second question of the chapter focuses on analysing the effect of TREO on firm's export outcomes. To examine this, we estimate an extended version of equation (29) that includes TREO dummy and other firm import characteristics as explanatory variables.

$$\boldsymbol{Y_{it}} = \beta_1 \boldsymbol{M_{it-1}} + \beta_2 TREOdummy_{it-1} + (\boldsymbol{X_{it-1}}'\beta) + \vartheta_{it} \qquad (30.)$$

where Y_{it} and M_{it} are defined as in equation (29). TREO is a dummy variable equal 1 if a firm imports inputs under TREO scheme and zero otherwise. $\boldsymbol{X_{it-1}}$ a vector of other firm trade characteristics such as duty as a share of imported inputs[39] (henceforth duty/value of imported inputs) and a set of interaction terms between firm import characteristics and TREO dummy, while $\vartheta_{it} = \mu_t + \alpha_i + \varepsilon_{it}$. We expect $\beta_1 > 0 \; and \; \beta_2 > 0$; β_2 capture the average effect of TREO on firm's export performance. The regression results from this formulation are presented in section 5.4.2.

[39] Given import value per firm-product and Ad valorem tariff at the product level, we calculated the value of tariffs relative to the value of imports.

Addressing the Endogeneity Concerns

A key concern in the above framework is that we have a selected sample, both in the choice to use TREO and the decision to import intermediate inputs. Although TREO eligibility is properly anchored in the law and access is equal for all qualifying firms that meet the legal requirements, some eligible firms may fail to take up the incentive. Indeed, our preliminary examination of access rate indicates that between 8% and 13% of the population of importer-exporters have accessed the scheme over the sample period (see appendix C). This low access rate could be a result of unobserved factors such as inability to afford the bond equivalent to the duty and tax remissions being applied for or simply a way to avoid the bureaucratic procedures associated with access. It is possible, therefore, that the firms that access TREO are a selected group, creating a potential endogeneity problem. Our agreeably imperfect tool to reduce this concern is to include year and firm fixed effects and lagged explanatory variables.

The lack of information on firm covariates on pre-entry to TREO, means we cannot use a strategy such as propensity score matching to deal with selection bias to TREO (Lechner, 2002; Dehejia & Wahba, 2002; Smith & Todd, 2001). As a consequence, we assess the robustness of TREO premia using firm fixed effects estimates based on three sub-samples of firms in our data.

In chapter 2, a key fact on export patterns in Kenya revealed that a majority of exporters are very small. It is the top 10% of firms that accounts for the largest share of annual total exports. This is not unique to Kenya, but in fact a common stylized fact in transaction level data in both developed and developing countries (Fernandes, Freund & Pierola, 2016; Matthee et al., 2016; Bernard & Jensen, 1999). Using this fact, we classified firms into three sub groups based on their average export values over the entire sample (2004-2013). Firms are defined as small if their exports over the entire sample period falls below the 75^{th} percentile, medium sized if their exports fall between the 75^{th} and 90^{th} percentiles and large if their exports fall among the top 10%. We then regressed firm export outcomes on TREO dummy and other controls to assess the robustness of TREO premia across the three sub-samples. The results are shown in section 5.4.3 of this chapter.

The second selection of firms into use of imported intermediate inputs may also be a cause for concern regarding which firms are in the sample. A common solution in the literature is an

instrumental variable (IV) strategy that makes use of the average input tariff rate as an instrument for the imported intermediate inputs. We follow Bas and Strauss-Kahn (2014) and use the average firm level tariffs.

Why is the average firm level tariff a good instrument? A good instrument should be able to sufficiently explain the variation in the endogenous variable (firm imported inputs) but not the variation in firm's export outcomes. If, however, tariffs across industries depend on expected exports and lobbying by exporters then this may lead to a spurious correlation between changes in exports and tariffs. Fortunately, starting in 2005, Kenya's tariffs have been set at the EAC level following entry into force of the EAC Common External Tariffs on 1st January 2005. This then suggests that lobbying power of industrialists to alter trade policy might not be at play. In the first stage, we regress:

$$\ln(M_{it-1}) = \alpha_0 + \alpha_1 \ln(tariff_{it-3}) + \alpha_2 \ln(M_{it-3}) + I_t + I_i + \vartheta_{it} \qquad (31.)$$

where $tariff_{it-3}$ is the average tariff rate per firm and the main instrumental variable. We also control for the lagged value of imported inputs M_{it-3}, time and firm fixed effects. The predicted value from equation (31) is then used to instrument for the potentially endogenous M_{it-1} in the estimation of the impact of TREO in equation (30). The results for the first stage regression are contained in the appendix C.

5.3.4 Data

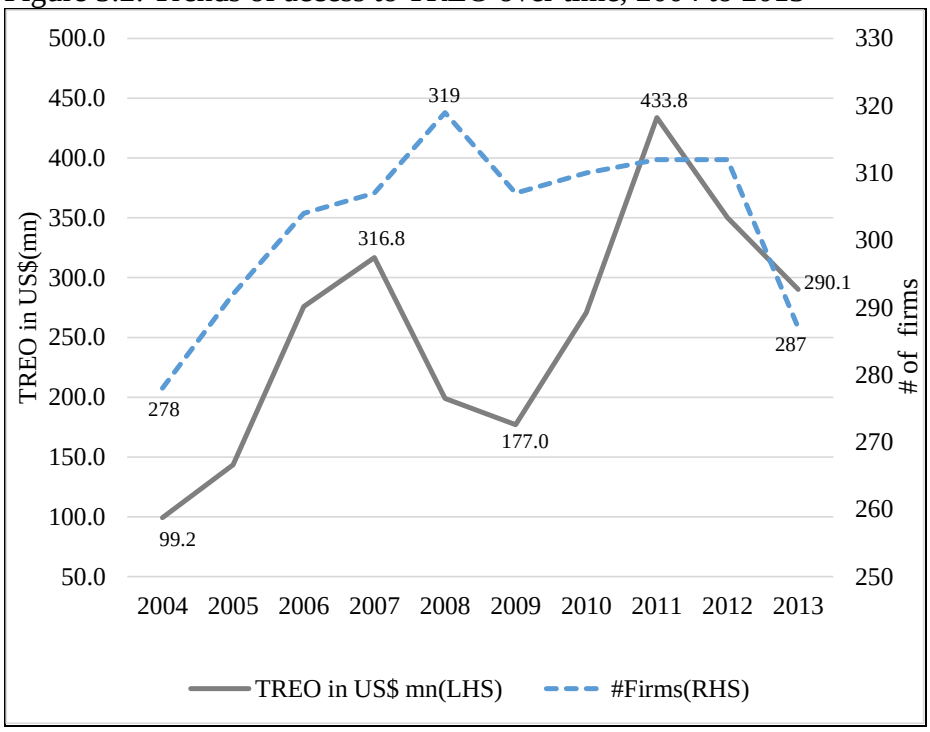
Data description

This chapter utilises the product level transaction data for Kenya's exporters and importers obtained from the Customs Service Department of the KRA, through the National Treasury. The data is aggregated to annual flow of exports and imports per firm and ranges between 2004 and 2013. It contains information on the product being exported (or imported) at the eight-digit HS product classification, the identity of the firm, the destination of exports (and origin of imports), the free on board (FoB) value for exports and the Cost Insurance and Freight (CIF) value for imports and the quantity being exported or imported. It also shows the duty to be paid (or waived) on imports, which enables us to calculate the average tariff rate per product-firm in a year.

To classify imports into intermediate, capital and final goods, we follow the recent literature (Feng et al., 2016; Bas, 2012; Pierola et al., 2015) and use the United Nations' Broad Economic Classification (BEC)[40] to identify imports that are of intermediate nature based on end use classification. The rest of the analysis on imports in this chapter is therefore limited to imported intermediate goods. This data set enables us to calculate the average tariff per firm, total firm expenditure on imported intermediate goods, and the variety of imported inputs. The intermediate goods subset of import data is merged to the export transaction database using a common firm identifier to obtain a subset of exporters that demand foreign intermediate inputs. This group of exporters are henceforth known as *importer-exporters*.

Data on access to TREO is obtained from the National Treasury-Kenya, for the sample period of 2004 to 2013. This is a unique panel data containing information on the name of the firm, the CIF value of imports per 8-digit HS product, duty and VAT to be paid (and hence waived under TREO) and the date the approval was granted. Figure 5.2 shows the access trends and the amount of duty and taxes waived under TREO over time.

Figure 5.2: Trends of access to TREO over time, 2004 to 2013



Notes: The TREO amount spent on the programme in US$ million is on the left-hand scale, while the numbers of beneficiaries are on the right hand scale.

[40] We use the BEC classification as provided by the United Nations and concord the BEC categories to the 6 digit HS products imported by firms. http://unstats.un.org/unsd/BEC%20classification.htm.

The duty remissions and value added tax rebates are a fiscal incentive that is budgeted for by the National Treasury every financial year. The revenue agency (KRA) has a target on revenue collected from duties and VAT on imports and exemptions erode the tax base. This means that the Treasury must budget and spend money on these exemptions through some transfer to KRA. It is, in many cases, a book entry for the case of duty and an actual expenditure on VAT refunds. The trend in expenditure on the duty remissions and VAT exemptions under TREO exhibits large swings over time. The number of beneficiaries increased from 278 firms in 2004 to 319 firms in 2008 before dropping to 287 in 2013. The number of beneficiaries does not necessarily imply exporters. Indirect exporters are also eligible to participate in the programme. Our analysis uses only direct exporters' access information to identify treated firms. As may be observed, the number of TREO beneficiaries dropped significantly from 310 in 2012 to 287 in 2013.

The waived amount of duty under the program has also experienced large swings around the trend. Starting with a value of US$ 99 million in 2004, the amount increased to US$ 317 million in 2007 before falling to US$ 177 million in 2009. It then rebounded and surged to US$ 434 million in 2011 before dropping to US$ 290 million in 2013. This large swing is, in part, a reflection of the slowdown in demand for imported intermediate inputs by the manufacturers and may also be related to the recent poor performance in exports, a global phenomenon that has seen the collapse of trade since 2011 (Constantinescu, Mattoo & Ruta, 2015). We also note that the amount of TREO expenditure dropped drastically from US$434 million in 2011 to US$290 million in 2013. The drop in both the access level and the amount of expenditure is in line with a change in the VAT law that started in the financial year 2012/2013 that exempted VAT on most of the imported inputs to reduce the backlog on the VAT refund system that was viewed to be substantially holding back working capital for exporters.

Using the firm name and year, we matched TREO access dataset to exporters in the transaction database. The merger between the two databases was close to perfect with only a few observations (0.2%) from the TREO database not being able to match the transaction database (see appendix C). The matched exporting firms are identified as TREO beneficiaries while the unmatched in the exporter database forms the non-beneficiaries. Table 5.2 provides summary statistics for the key variables used in the estimation of results. Details on the construction of the variables are contained in appendix C.

Table 5.2: Summary statistics of the key variables

variable	N	mean	sd	min	max
Log(Export value)	45,753	5.33	2.84	-8.66	14.42
Number of products	45,753	6.95	16.81	1.00	523.00
Number of countries	45,753	2.69	3.70	1.00	65.00
Log(value of imported inputs)	20,179	11.14	2.85	-2.00	19.10
Importer-exporter dummy	45,753	0.44	0.50	0.00	1.00
TREO dummy	45,753	0.05	0.22	0.00	1.00
Log(TREO value)	2,362	11.25	2.59	-4.91	18.53
Log(duty/value of imported inputs)	20,179	0.09	0.08	0.00	0.69
Average tariff per firm(avg tariff)	20,179	10.94	7.63	0.00	100.00
Number of imported varieties	20,179	24.73	53.31	0.00	1,410.00

Notes: constructed from customs database and TREO database

Table 5.2 shows that the numbers of firm-year observations over the 10-year period are equal to 45,753. The average number of products and number of countries served per exporter in a year is approximately 6.9 and 2.7, respectively. The number of firm-year observation for importer-exporters is 20,179. Out of these, about 2,362 firm-year observations (or 11.7%) have used TREO over the sample period.

5.3.5 Stylized Facts

Quality of merger between exporters and importers of intermediate inputs

The number of firm-year observations that export only is approximately 25,574 (55.9%), while the number of firm-year observations for importer-exporters is approximately 20,179 (44.1%). Table 5.3 presents the number of exporters per year split into firms that export only and those that import and export. It also includes the share of both firms in total exporters in a given year. For example, in 2004 there were approximately 3,224 exporting firms. Out of which 1,649 (51.2%) were exporters only and 1,575 (48.8%) were importer exporters.

Table 5.3: The number and share of exporters and importer-exporters (2004-2013)

Year	Exporters only	Importer-exporters	Total
2004	1,649	1,575	3,224
	(51.2)	(48.9)	(100)
2005	2139	1751	3,890
	(54.9)	(45.1)	(100)
2006	2,690	1,864	4,554
	(59.0)	(41.0)	(100)
2007	2,798	1,893	4,691
	(59.6)	(40.4)	(100)
2008	2,630	1,909	4,539
	(57.9)	(42.1)	(100)
2009	2,598	2,051	4,649
	(55.9)	(44.1)	(100)
2010	2,656	2,165	4,821
	(55.1)	(44.9)	(100)
2011	2,948	2342	5,290
	(55.7)	(44.3)	(100)
2012	2780	2369	5,149
	(54.0)	(46.0)	(100)
2013	2,687	2,259	4,946
	(54.3)	(45.7)	(100)
Total	25 574	20 179	45,753
	(55.9)	(44.1)	(100)

Notes: The total number of firm-year observations for the exports database is 45753. Out of which 20,179 observations (44.1%) constitutes the firm-year observations for firms that import intermediate goods for use in the production of exports and 25,574 (55.9%) observations constitute activity for exporters only. In each year and category, the first value is the number of firms, while the second is the share on firms in total exporters.

Two-sample t- test with equal variances

We make use of the two-sample t-test to assess the differences in means in the value of exports between importer-exporters and exporters only and the differences in means for the importer-exporters who use TREO relative to those that do not access TREO. The t-test statistics are calculated using $t = \frac{\bar{X}_T - \bar{X}_C}{SE(\bar{X}_T - \bar{X}_C)}$ where: $\bar{X}_T - \bar{X}_C$ is the difference between group means and SE is the standard errors. Table 5.4 show these results.

Table 5.4: Differences in means of export value across exporter type

	2005	2007	2009	2011	2013
Exporter type	Export value(logs)				
Importer-exporters	6.47	6.47	6.19	5.93	5.85
N	*(1,751)*	*(1,893)*	*(2,051)*	*(2,342)*	*(2,259)*
Exporters only	4.86	4.96	4.76	4.44	4.47
N	*(2,139)*	*(2,798)*	*(2,598)*	*(2,948)*	*(2,687)*
Differences	*1.60*	*1.51*	*1.42*	*1.48*	*1.38*
Std.Err	0.08	0.08	0.08	0.08	0.08
t-statistics	19.47	19.23	17.59	18.86	16.71
Importer-Exporter type	Export value(logs)				
TREO	9.71	9.91	9.64	9.43	9.30
N	*(210)*	*(204)*	*(202)*	*(192)*	*(176)*
Non-TREO	6.02	6.06	5.81	5.62	5.56
N	*(1,541)*	*(1,689)*	*(1,849)*	*(2,150)*	*(2,083)*
Differences	*3.69*	*3.85*	*3.83*	*3.81*	*3.74*
Std.Err	0.19	0.19	0.20	0.21	0.22
t-statistics	19.64	20.38	19.15	17.82	16.68

Notes: The exporter type is either importer-exporter or exporter only. Among importer-exporter we have TREO users and non-TREO users. The t-statistics indicates that differences in means for the number of products are statistically significant across the years. N represents the number of firms in each category for the selected time period.

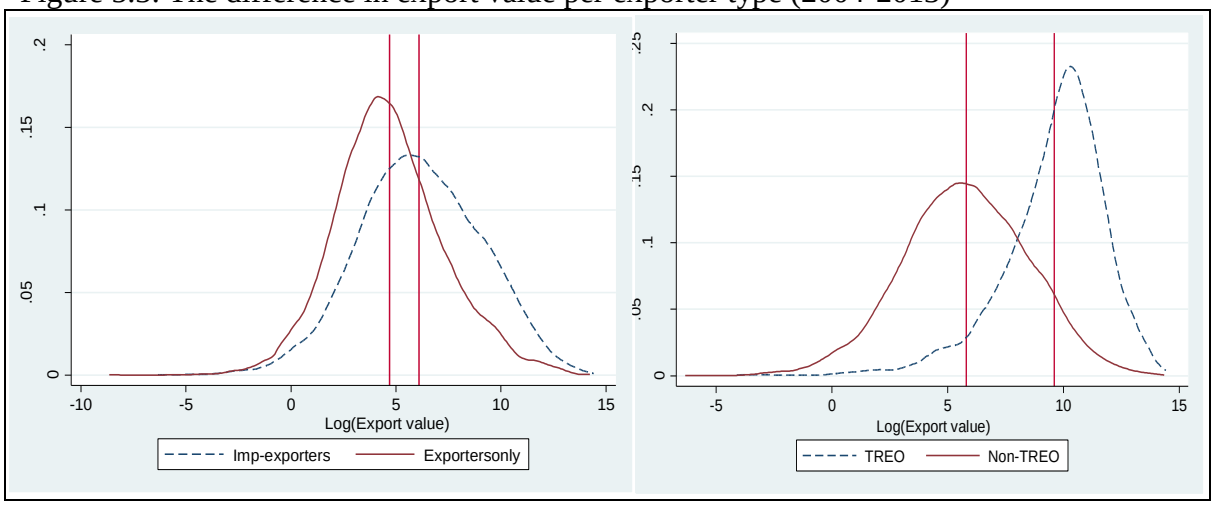
In 2005, the mean export value for the importer-exporters was 6.47 in log values compared to 4.86 for exporters only. This represents a difference in the mean of 1.61 and is statistically significant. Across all the years, importer-exporters are larger in mean log-value relative to exporters only. This is in line with the findings in the literature that shows that exporters that use imported inputs perform better in value of exports relative to those that never import (Bas & Strauss-Khan, 2014; Feng et al., 2016).

Amongst importer-exporters, firms that use TREO have a large average export value compared to those that do not use TREO. For example, in 2005, the average export value for TREO beneficiaries is 9.71 log values compared to 6.03 for non-TREO users. This translates to a difference in the mean of 3.69 and is statistically significant. This also provides evidence to suggest that TREO beneficiaries are potentially very different from non-beneficiaries, which is may be an indicator of the selection into treatment.

The difference in means shown in Table 5.4 represents comparison in only a single moment, namely the mean. We now use a kernel density plot to examine the differences in export value for the different types of exporters. Figure 5.3 shows the results. The kernel density on the left plots the distribution of exports over the sample period comparing the distribution for importer-

exporters relative to exporters only. The distribution for the importer-exporters is to the right of the exporters only indicating that it stochastically dominates the latter. The average log export for the importer-exporters is 6.1 relative to 4.7 for exporters only. The kernel density plot on the right compares the distribution of export sales for the importer-exporter who are beneficiaries to TREO relative to non-TREO ones. The distribution for the TREO beneficiaries lies to the right with the mean value in logs of 9.6 compared to 5.8 for the non-TREO firms, suggesting that the former performs better across the entire distribution.

Figure 5.3: The difference in export value per exporter type (2004-2013)



Notes: kernel density plot for the log of firm exports over the sample period. The average exports in logs for the importer-exporter is 6.1 relative to 4.7 for exporters only. The average exports in logs for the importer-exporter-TREO is 9.6 relative to 5.8 for the importer-exporter-Non-TREO.

Differences in mean products and mean destination countries across exporter types

Product and destination scope per exporter forms another set of export outcomes of interest in this chapter. Access to imported inputs has been shown to be associated with product diversification (Goldberg et al., 2010 for India) and enable firms to export to new destinations (Feng et al., 2016; Bas &Strauss-Kahn, 2014). We start-off with the differences in the number of products per exporter type. Table 5.5 presents the results on difference in means of the number of products per exporter.

Table 5.5: differences in the average number of products, across exporter types

Exporter type	2005	2007	2009	2011	2013
	Products				
Importer-exporters	8.61	9.83	9.35	9.73	9.06
N	*(1,751)*	*(1,893)*	*(2,051)*	*(2,342)*	*(2,259)*
Exporters only	3.70	5.52	5.45	5.62	5.71
N	*(2,139)*	*(2,798)*	*(2,598)*	*(2,948)*	*(2,687)*
Differences	*4.91*	*4.31*	*3.90*	*4.12*	*3.35*
Std.Err	0.46	0.52	0.49	0.48	0.52
t-statistics	10.67	8.32	7.97	8.49	6.44
Importer-Exporter type	Products				
TREO	11.57	10.75	10.08	10.25	9.80
N	*(210)*	*(204)*	*(202)*	*(192)*	*(176)*
Non-TREO	8.21	9.72	9.27	9.69	9.00
N	*(1,541)*	*(1,689)*	*(1,849)*	*(2,150)*	*(2,083)*
Differences	*3.36*	*1.03*	*0.81*	*0.56*	*0.80*
Std.Err	1.35	1.60	1.43	1.44	1.70
t-statistics	2.48	0.64	0.57	0.39	0.47

Notes: The exporter type is either importer-exporter or exporter only. Among importer-exporter we have TREO users and non-TREO users. The t-statistics indicates that differences in means of exports are statistically significant across the years. Importer-exporter firms outperforms exporters only, while importer-exporters that benefit from TREO performs even better, relative to those who do not. N represents the number of firms in each category for the selected time period.

In 2005, the mean number of products per importer-exporters was 8.61 compared to 3.70 for exporters only. The difference in means is 4.91 products and is statistically significant. Across all the years, importer-exporters are larger in the average products relative to exporters only. Amongst importer-exporters, those that source imported inputs through TREO have higher average number of product relative to non-TREO users, although these differences are not statistically significant.

Table 5.6 shows that the mean number of destination-countries per exporter ranges from a low of 3.42 (in 2009) to a high of 3.85 (in 2005). Over the same period the mean number of destination-countries for exporters only was 1.9. This indicates that importer-exporters have on average more number of destination countries relative to exporters only. The differences are statistically significant, across all the selected years. Looking amongst importer-exporters, firms that access TREO had an average number of destination countries of between 7.31 in 2009 and 8.16 in 2013, while firms that never access TREO had an average number of countries of 4.3 in 2009 and 4.94 in 2013. Again, we can observe that the difference in the number of

destination countries between TREO firms and non-TREO firms is large and significant, across all the selected years.

Table 5.6: differences in the average number of destinations per firm

	2005	2007	2009	2011	2013
Exporter type	Destination-countries				
Importer-exporters	3.85	3.61	3.42	3.53	3.60
N	*(1,751)*	*(1,893)*	*(2,051)*	*(2,342)*	*(2,259)*
Exporters only	1.90	1.90	1.93	1.99	2.16
N	*(2,139)*	*(2,798)*	*(2,598)*	*(2,948)*	*(2,687)*
Differences	*1.95*	*1.71*	*1.49*	*1.54*	*1.44*
Std.Err	0.12	0.10	0.10	0.10	0.11
t-statistics	15.75	16.56	15.36	15.90	12.77
Importer-Exporter type	Destination-countries				
TREO	7.73	7.79	7.31	7.74	8.16
N	*(210)*	*(204)*	*(202)*	*(192)*	*(176)*
Non-TREO	3.32	3.10	3.00	3.16	3.22
N	*(1,541)*	*(1,689)*	*(1,849)*	*(2,150)*	*(2,083)*
Differences	*4.41*	*4.69*	*4.31*	*4.58*	*4.94*
Std.Err	0.34	0.32	0.29	0.30	0.35
t-statistics	12.89	14.49	15.02	15.18	14.26

Notes: The exporter type is either importer-exporter or exporter only. Among importer-exporter we have TREO users and non-TREO users. The t-statistics indicates that differences in means for the number of destination-countries are statistically significant across the years. N represents the number of firms in each category for the selected time period.

5.4 Empirical Results

5.4.1 The Effect of Imported Inputs on Firm Export Performance

We start off by regressing our measures of export performance on indicators of firm's import of intermediate inputs as specified in equation (29). The regression results are shown in Table 5.7 below:

Table 5.7: Export performance differences between importer-exporters and exporters only

Dependent variables:	Log(Export value)	Log(Products)	Log(Countries)
	(1)	(2)	(3)
L.Importer-exporter dummy	0.256***	0.155***	0.093***
	(0.046)	(0.024)	(0.016)
Constant	5.891***	1.253***	0.794***
	(0.041)	(0.021)	(0.014)
Observations	25,331	25,331	25,331
R-squared	0.833	0.756	0.794
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
F-Statistics	37.35	12.09	9.704
Number of id	7011	7011	7011

Notes: The dependent variables include export value, number of products, and number of countries per firm. The explanatory variable is a dummy equal 1 if an exporter imports intermediate goods and zero otherwise. All continuous variables are in logs and the explanatory variables enter with a lag of one period. All estimations include year and firm fixed effects. Robust standard errors in the parentheses and all coefficients are significant at 1% level.

Columns (1-3) show the fixed effects regression of export outcomes (i.e. export value, number of products and countries per firm) against the importer-exporter dummy. The results show that, holding everything constant, importer-exporters are on average 29.2% larger in total export values; have 16.8% more products and 9.7% more destination countries relative to periods when they were exporters only[41].

These results are qualitatively similar to those found in other countries (Pierola et al., 2015 for Peru; Bas, 2012 for Argentina; Bas & Strauss-Kahn, 2014 for France). For example, Pierola et al. (2015) finds for Peru that importer-exporters were 55% larger in total export values and had on average one additional destination country compared to exporters only. Our results, together with others in the literature, suggests that there is a large and significant performance premium on exports outcome in favour of exporters that import intermediate inputs relative to those that never imports.

Within importer-exporters, we also find positive and significant correlation between firm export outcomes and imported inputs. Table 5.8 presents the results of a regression of firm's total export values, number of products, and number of destination countries against value of imported inputs.

[41] This % is calculated as $\exp(\beta) - 1) * 100$, where β is the estimated coefficient. Comparison is relative to the firm itself over-time.

Table 5.8: Imported inputs and export performance within importer-exporters

Dependent variables:	Log(Export value)	Log(Products)	Log(Countries)
	(1)	(2)	(3)
L.Log(value of imported inputs)	0.115***	0.047***	0.037***
	(0.014)	(0.007)	(0.005)
Constant	5.796***	1.269***	0.786***
	(0.103)	(0.051)	(0.034)
Observations	14,019	14,019	14,019
R-squared	0.833	0.749	0.806
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
F-Statistics	16.66	11.70	13.51
Number of id	3616	3616	3616

Notes: The dependent variables include export value, number of products, and number of destination countries per firm. The explanatory variable is the value of imported inputs. All continuous variables are in logs and the explanatory variable enters with a lag of one period. All estimations include year and firm fixed effects. Robust standard errors in the parentheses and all coefficients are significant at 1% level.

The results show that an increase in the value of imported inputs by 10% is, on average, associated with an increase in total export values per firm by 1.2%, an increase in the number of products by 0.5% and an increase in the number of countries served by 0.4% for the importer-exporter in the sample. The results provide evidence of stronger export performance in terms of included export outcomes for exporting firms that import relatively more inputs.

Comparing our results to existing literature, Edwards et al. (2016) finds a slightly higher effect on export value for South African manufacturing firms, where they show that a 10% increase in value of imported inputs is associated with an increase of 3.8% on total export values per firm. Feng et al. (2016) finds that a 10% increase in firm's imported inputs was associated with an increase in the firm export value by 16.5% for the Chinese exporters. Pierola et al. (2015) finds for Peru exporters that a 10% increase in value of imported inputs was associated with a 0.54% increase in total export value per firm and a 0.0098% increase in the number of destination countries. Thus, the magnitude of impact varies quite substantially and appears to be country specific. Our estimated effects lie within the ranges found in the literature.

5.4.2 Export Performance Premia for the Exporters that access TREO

The second question is central to this chapter, in which we analyse the effect of duty exemptions on imported inputs (under TREO) to firms' export outcomes. We start with a

preliminary analysis where we estimate equation (30) to obtain export performance premia for the beneficiaries of the programme relative to exporters only. Table 5.9 presents the regression results.

Table 5.9: Differences in exports value among exporter types

Dependent variable:	Log(Export value)		
	(1)	(2)	(3)
	OLS	FE	FE
L.Importer-exporter dummy	0.732***	0.250***	0.232***
	(0.033)	(0.047)	(0.047)
L.TREO dummy	3.340***	0.412***	
	(0.049)	(0.066)	
(L.Importer-exporter dummy)(L.TREO dummy)			0.386***
			(0.069)
Constant	5.895***	5.865***	5.882***
	(0.057)	(0.041)	(0.041)
Observations	25,331	25,331	25,331
R-squared	0.148	0.833	0.833
Year FE	YES	YES	YES
Firm FE	NO	YES	YES
F-Statistics	614.5	37.56	37.40
Number of id	--	7011	7011

Notes: The dependent variable is the export value per firm in period (t). The explanatory variables are the importer-exporter dummy; TREO dummy, the interaction term between importer-exporter dummy and the TREO dummy. All explanatory variables are lagged by one period. Estimation includes year and firm fixed effects. Robust standard errors in bracket and asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

To interpret column (1) results we make use of firms that are exporters only (importer-exporter dummy=0) as the base category and compare the performance of importer-exporters (i.e. both TREO and non-TREO) against this group. The results show that firms that import and export (importer-exporter dummy=1) are on average 107.9% larger in total export values relative to exporters only. Likewise, the coefficient on TREO dummy is positive and significant, suggesting that importer-exporters that import inputs under TREO are on average 27.2 times larger in total export values relative to exporters only.

The huge performance difference between importer-exporters and exporters only may just be reflecting several unobserved time invariant firm characteristics that are not controlled for in the OLS regression. The fixed effects regression is able to account for all time invariant firm characteristics by removing their effect that could potentially bias the OLS results. The fixed effects results are shown in column (2) and we see that the coefficients on both importer-

exporter and TREO dummies remain positive and significant at 1% level but are much smaller relative to the OLS results. The results show that importer-exporters are on average 28.4% larger in export value compared to periods when they were exporters only (i.e. importer-exporter=0). This effect is 3.8 times lower than that captured in the OLS results, suggesting that the latter was biased upwards, perhaps due to omitted variables. Column (2) results also shows that amongst firms that import and export (i.e. importer-exporter dummy=1), those that access TREO (TREO dummy=1) are on average 50.9% larger in export value compared to their pre-TREO export level. This is also a major reduction in the TREO performance premia picked up in the OLS[42].

Controlling for the firm fixed effects (FE) is crucial for our purpose because it allows us to account for certain types of time invariant omitted variables. However, FE is also susceptible to attenuation bias from measurement errors (Angrist & Pischke, 2008). For example, access to TREO might not be properly recorded or some firms that are exporters only might actually be accessing TREO. To evaluate the extent of the latter, column (3) results are obtained from fixed effects with an interaction term of importer-exporter dummy with TREO dummy such that the effect of TREO is restricted only to firms that import and export (i.e. where importer-exporter=1, TREO dummy=1 and zero otherwise). We find that the coefficients on the importer-exporter dummy and the interaction terms are both positive and significant at 1% level and are not very different from the results in column (2). The coefficient on the importer-exporter dummy show that firms that import and exports are on average 26.1% larger in export value relative to periods when they were exporters only. Similarly, the interaction term shows that importer-exporters that import inputs under TREO are on average 47.1% larger in export value relative to periods prior to accessing TREO. Thus, TREO confers a large performance gain in export value for firms that start to import under the scheme.

Besides the level effect, we also checked if access to TREO affects the associated between the amount of imported inputs and exports. To investigate this fact, we re-run equation (30) including as regressors the value of imported inputs, TREO dummy, and duty/value of imported inputs and interaction terms. This estimation is only possible for firms that import intermediate inputs over the sample period 2004-2013. Table 5.10 show the results.

[42] Subsequent regressions in the remaining part of our results use fixed effects, unless indicated otherwise.

Table 5.10: Performance in total export values among importer-exporters

Dependent variable:	Log(Export value)			
	(1)	(2)	(3)	(4)
L.Log(value of imported inputs)	0.111***	0.112***		
	(0.014)	(0.015)		
L.TREO dummy	0.389***	0.450**	0.443***	0.412***
	(0.073)	(0.183)	(0.074)	(0.077)
(L.Log(value of imported inputs))(L.TREO dummy)		-0.007		
		(0.019)		
L.(Log(duty/value of imported inputs))			-0.802**	-0.872**
			(0.315)	(0.350)
(L.Log(duty/value of imported inputs))(L.TREO dummy)				0.500
				(0.583)
Observations	14,017	14,017	14,017	14,017
R-squared	0.834	0.834	0.832	0.832
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
F-Statistics	18.32	17.27	13.57	12.35
Number of id	3616	3616	3616	3616

Notes: The dependent variable is the export value per firm in period (t). The explanatory variables are the value of imported inputs; TREO dummy, duty/ value of imported inputs and interactions terms with TREO dummy. All explanatory variables are lagged by one period. We control for the year and firm fixed effects. Robust standard errors in bracket and asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

Column (1) results are obtained from a fixed effect regression of export value on value of imported inputs and TREO dummy. The TREO dummy captures the performance advantage for exporters that import inputs through the scheme. We can see that the results indicate that a 10% increase in value of imported inputs, is on average, associated with 1.11% increase in total export values per firm that import and export relative to periods when these firms were exporters only. Firms that change their status from non-TREO to TREO (TREO dummy=1) experience a raise (a level change) in their export value by 47.6% compared to their pre-TREO export level. This is a significant level increase in export value for the beneficiaries of TREO, suggesting the incentive has a large economic effect.

The TREO dummy captures the cost saving involved in the procurement of imported inputs for firms that suddenly take-up the incentive. We speculate that this saving could be used to buy more imported inputs. To test if access to TREO affects the association between value of imported inputs and exports, column (2) includes an interaction term of imported inputs with TREO dummy. This specification requires that if TREO affects the association, the interaction term should be positive and significant. We find that the coefficient on the interaction term is negative and insignificant, suggesting TREO does not affect the association between imports

and exports. Overall, the results obtained in column (1) hold showing that an increase in imported inputs by 10% is, on average, associated with 1.12% increase in export value. Surprisingly, the level effect of TREO is now larger indicating that importer-exporters that take up TREO experience a 57% change in the level of their export value compared to their pre-TREO level of exports.

Column (3) provides an alternative specification where we regress export value on the ratio of duty to value of imported inputs. To motivate this specification, we follow (Irwin, 1998) who suggests that given an ad valorem tariff rate and the value of imports one can calculate the duty liable to each firm based on all unique inputs imported. This variable captures roughly the duty burden to an importer-exporter and we expect it to have a negative correlation with a firm's export value. We find that a 10% increase in duty/value of imported inputs is, on average, associated with 8.0% reduction in the export value per firm. A firm that switches from non-TREO to TREO experiences a raise in its export value by 55.7% relative to its pre-TREO level of exports.

The magnitude of the gain from TREO depends on the level of input tariffs. This suggests that an interaction of duty/value of imported inputs with TREO dummy should be positive and significant, capturing the fact that the effect of duty on export value depends on whether an importer-exporter is a TREO beneficiary or not. Column (4) controls for this interaction term and finds a positive but insignificant effect. A change in the firm's status from non-TREO to TREO is, on average, associated with 50.9% change in export value, reflecting a significant economic effect for increased access to the incentive by importers of inputs.

Next, we examine the performance differences in the number of products exported per firm (firm-product extensive margin). All estimations are obtained from a fixed effects regression with year and firm effects. Table 5.11 shows the regression results.

Table 5.11: Differences in performance in number of products exported

Dependent variable:	Log(Number of products)		
	(1)	(2)	(3)
L.Log(value of imported inputs)	0.047***	0.046***	0.015*
	(0.007)	(0.007)	(0.008)
L.TREO dummy	0.016	-0.019	-0.043
	(0.039)	(0.101)	(0.100)
(L.Log(value of imported inputs))(L.TREO dummy)		0.004	0.006
		(0.011)	(0.011)
L.Log(number of imported varieties)			0.139***
			(0.017)
Observations	14,017	14,017	14,017
R-squared	0.749	0.749	0.751
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
F-Statistics	10.57	9.749	14.13
Number of id	3616	3616	3616

Notes: The dependent variable is the number of products per firm in period (t). In column (1) the explanatory variables are importer-exporter dummy and its interaction with TREO dummy, while in column (2-4) it is the value of imported inputs, TREO dummy, duty/value of imported inputs, interaction terms with TREO dummy and the number of variety of imported inputs. All explanatory variables are lagged by one period. Robust standard errors in bracket and asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

Looking within importer-exporters, columns (1-3) results are obtained using a fixed effects regression of the number of products against value of imported inputs, TREO dummy and the interaction term. In column (1) we see that the coefficient on the value of imported inputs is positive and significant at 1% level. This suggests that an increase in this variable by 10% is, on average, associated with an increase in the number of products exported by 0.47%, holding all other factors constant. The coefficient on TREO dummy is positive but not significant, indicating that a switch in the firm's status from non-TREO to TREO is not associated with a change in the firm's number of products exported. This also confirms results in descriptive statistics presented in Table 5.5.

Column (2) includes an interaction term of value of imported inputs with TREO dummy to check whether access to TREO affects the association between imported inputs and a firm's product scope. The coefficient on the interaction term is positive but not significant, suggesting that TREO does not alter the association of imported inputs and a firm's product scope. The results of other variables remain broadly consistent except the flipping of the sign on TREO dummy.

The challenge with results in columns (1-2) is that we are not yet able to identify the channel through which access to imported inputs increases a firm's product scope. Now, column (3) adds one additional control, namely the number of varieties imported. According to a study by Goldberg et al. (2010) for India, lower input tariffs led to an expansion in the firm's product scope through availability of imported inputs. They were able to separate the price effect due to lowering of input tariffs from a variety effect due to access to a large scope of imported inputs. The latter channel is found to account for almost two thirds of the improvement in firm performance in India.

Based on the above, we included the number of varieties imported constructed following Feng et al. (2016) where an imported input variety is defined as HS6 product-country pairs. This variable is necessarily larger than the number of HS6 products produced and exported by a firm. To give an example, let us assume that a firm produces "blue jeans for export" and imports inputs to produce the jeans. Let one of these inputs be a unique item, "buttons". The firm can import "buttons" from the US, Canada, China, or South Africa. The "blue jeans" will be a final export product, while the imported inputs varieties count will be four (product-country pairs).

This variable is expected to capture the variety channel (Feng, Li & Swenson, 2016; Pierola, Fernandes & Farole, 2015). The results show that a 10% increase in the number of imported varieties is, on average, associated with a 1.39% increase in the number of product exported, holding all other factors constant. This result is qualitative comparable to that found by Feng et al. (2016) for China using an instrumental variable approach and controlling for the firm and year fixed effects. They show that a one-unit increase in the number of imported varieties (where varieties are a count of unique items at the country-product level) was on average associated with a 0.494 unit increase in the number of exported products amongst Chinese exporters.

This result suggests that access to a large variety of imported inputs makes it possible for importer-exporters to expand their export product scope. Notice that by including the number of varieties imported, the coefficient on value of imported inputs drops from 0.046 to 0.015, suggesting that a 10% increase in the value of imported inputs is now, on average, associated with 0.15% increase in a firm's product scope. This suggests that the number of varieties imported is a significant channel through which product scope can be expanded.

Finally, we examine the performance differences in the number of destination countries in firms' export portfolio (firm-destination extensive margin). Table 5.12 shows the fixed effects regression results.

Table 5.12: Differences in performance in the number of destination countries

Dependent variable:	Log(Number of countries)		
	(1)	(2)	(3)
L.Log(value of imported inputs)	0.036***	0.036***	0.021***
	(0.005)	(0.005)	(0.005)
L.TREO dummy	0.102***	0.120	0.109
	(0.031)	(0.094)	(0.094)
(L.Log(value of imported inputs))(L.TREO dummy)		-0.002	-0.001
		(0.010)	(0.010)
L.Log(number of imported varieties)			0.065***
			(0.011)
Observations	14,017	14,017	14,017
R-squared	0.806	0.806	0.807
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
F-Statistics	13.33	12.12	13.85
Number of id	3616	3616	3616

Notes: The dependent variable is the number of destination countries per firm in period (t). In column (1) the explanatory variables are importer-exporter dummy and its interaction with TREO dummy, while in column (2-4) it is the value of imported inputs, TREO dummy, duty/value of imported inputs, interaction terms with TREO dummy and the number of variety of imported inputs. All explanatory variables are lagged by one period. Robust standard errors in bracket and asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

We see that within importer-exporters, column (1) results show that a 10% increase in the value of imported inputs is on average associated with 0.36% increase in the number of destination countries served, ceteris paribus. The coefficient on TREO dummy indicates that importer-exporters that import inputs through TREO have, on average, 10.2% more destination countries in their export portfolio relative to their pre-TREO level of destination countries. This is a significant performance premium amongst firms that access TREO.

Column (2) adds an interaction term between the value of imported inputs and TREO dummy in an attempt to learn whether access to TREO affects the association between the value of imported inputs and the firm's destination scope. The coefficient on this term is negative and not significant. In addition, the TREO dummy is no longer significant. We conclude that there is no evidence that access to TREO affects the association between imported inputs and the firm's destination scope.

Finally, in column (3) we control for the number of varieties imported. The coefficient on the value of imported inputs remains positive and significant, suggesting that a 10% increase in this variable is, on average, associated with an increase in the number of destination countries served by 0.21%. The coefficient on TREO dummy indicate that access to TREO raises the number of destination countries served per TREO firm by 10.9% relative to the level prior to accessing TREO, but this is not statistically significant.

The coefficient on the number of imported varieties is positive and significant at 1% level, suggesting that an increase in the number of imported varieties by 10% is, on average, associated with a 0.65% increase in the number of destination countries served. This result is qualitatively similar to that found by Pierola et al. (2015) for Peru using a fixed effects regression and controlling for the year and firm effects. In their case, a 10% increase in the number of imported varieties (where varieties are counted as product country pairs as we do), was on average associated with a 0.0603% increase in the number of destination countries served for the Peruvian exporters. This suggests that access to a large variety of imported inputs makes it possible to break into new markets, possibly by easing both fixed costs of entry and per period costs to serving foreign markets.

5.4.3 Differential effect of TREO export outcomes per sub-sample

We are worried that the lack of significance in the TREO dummy in the fixed effects estimation could reflect sample selection issues that are not adequately addressed. By including firm fixed effects, we are confident that any effect of time invariant firm characteristics not controlled for in our regression is removed, helping us to overcome the bias associated with omitted variables (Angrist & Pischke, 2008). As indicated earlier, fixed effects are also susceptible to attenuation bias. Thus, by opting for fixed effects, we trade omitted variable bias concerns for a conservative estimate on the effect of TREO. That is, we are willing to accept attenuated coefficients, if there are any measurement errors in our data.

To address selection into TREO, data limitations and especially the lack of information on covariates in the pre-treatment period means a deft technique such as propensity score methods is not feasible (Smith & Todd, 2001). We are also at the moment not aware of a suitable instrument to employ that determines selection to the scheme but not the firm's export outcome. Taking into account these issues, we prod further to assess the robustness of the effect of TREO

on export outcomes, not for the entire sample but subjectively created sub-samples. We regressed firm export outcomes on TREO dummy and other controls within each of the three sub-samples. Table 5.13 shows the regression results for exports.

Table 5.13: differential effect of TREO on export value by sub-samples

Dependent variable:	Log(Export value)		
	(1) small	(2) medium	(3) large
L.Log(value of imported inputs)	-0.016	0.054**	0.172***
	(0.051)	(0.024)	(0.019)
L.TREO dummy	-3.825***	0.170	0.714***
	(0.365)	(0.917)	(0.180)
(L.Log(value of imported inputs))(L.TREO dummy)	0.580***	0.017	-0.040**
	(0.061)	(0.116)	(0.019)
Constant	3.403***	4.821***	7.008***
	(0.286)	(0.163)	(0.155)
Observations	2,229	4,441	7,347
R-squared	0.637	0.412	0.734
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
F-Statistics	2762	5.913	17.88
Number of id	1175	1232	1209

Notes: The dependent variable is the log of export value per firm in period (t). The explanatory variables are log of value of imported inputs, TREO dummy and the interaction term and enter the regression with a one period lag. All estimations are from a fixed effects regression on a separate sub-sample. Robust standard errors in bracket and asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

In column (1) we present the fixed effects results for the small firms defined as those whose total export value over the whole sample period is less than the 75th percentiles. We can see that the coefficient on TREO dummy is negative and significant, while the coefficient on the interaction term of TREO with value of imported inputs is positive and significant. The result suggests that for a small firm, the benefit for accessing TREO is dependent on the amount of imported inputs. For a firm with an average log value of imported inputs equal to 11.14 (see Table 5.2), this is associated with 15.2 times increase in the firm's export value[43]. The coefficient on value of imported inputs is not significant.

Column (2) results are for the medium sized firms, defined as those that lie between the 75th to 90th percentiles in total export value over the sample period. Here, the coefficient on TREO

[43] Calculated as $\exp\left(-3.826 + 0.580 * \overline{Log(value\ of\ imported\ inputs)}\right) - 1 * 100$.

dummy is positive but not significant. Similarly, the interaction term is positive but insignificant. The results suggest that TREO has no effect on export value for the medium sized firms. However, we see that the coefficient on imported inputs is positive and significant; suggesting that importation of inputs is associated with an increase in export value for the medium sized firms.

Finally, column (3) presents fixed effects results for the large firms defined as the top 10% exporters over the entire sample period. The results are very interesting. We find that for the large firms, TREO dummy is positive and significant, suggesting that a large firm that access TREO experience a level increase in its exports. This increase is dependent on the value of imported inputs such that a firm with an average log value of imported input equivalent to 11.14, experiences a raise in export value equal to 29.4%. A negative term on the interaction term between the value of imported inputs and TREO dummy suggests that the effect of TREO diminishes as import level rises. This result suggests that there is some threshold level of imported inputs that lead firms to increase their export values. This will be considered for future research in this area.

Overall, we find a strong and positive effect of TREO on export value for the small and large firms but not for the medium sized ones. These results, suggests that the effect of TREO along the intensive margin is large. The results on product and destination scope (or the firm extensive margin) did not change from what is presented previously in Table 5.11 and Table 5.12. Considering that we have already presented a lot of tables, these results output are not presented here but are available on request.

5.4.4 Controlling for the potential endogenous imported inputs

The results reported in Table 5.10 may be biased due to selection of firms into use of imported inputs. We follow Bas and Strauss-Kahn (2014) in the use of average input tariffs per firm as an instrument. Input tariffs are calculated at the firm level as an average of all tariffs on six-digit HS products that a firm imports for use in its final production process in period (t).

A good instrument should be able to sufficiently explain the variation in the potentially endogenous variable (firm's imported inputs) but not the variation in firm's export outcomes. We show in the appendix C, using a bivariate regression, that there is no correlation between

the instrumental variable and firm's export outcomes. Using a two stage least squares regression where, in the first step, we regress the value of imported inputs on the average tariffs per firm and lagged value of imported inputs (see appendix C), the predicted value of imported inputs (t-1) from the first step regression is included as the main regressor in equation (30). This strategy also allows us to calculate the interaction term of the predicted imported value of inputs with the TREO dummy (Wooldridge, 2002). The results in Table 5.14 are obtained using a panel regression with firm and year fixed effects. Since the value of imported inputs is estimated from the first step regression, the standard errors are bootstrapped to account for this fact.

Table 5.14: Access to TREO, imported inputs and firm export margins

Dependent variables:	Log(Export value)	Log(Products)	Log(Countries)
	(1)	(2)	(3)
L.Log(value of imported inputs)	0.074***	0.031***	0.011
	(0.027)	(0.012)	(0.009)
L.TREO dummy	0.359	0.266	0.267*
	(0.324)	(0.194)	(0.140)
(L.Log(value of imported inputs))(L.TREO dummy)	-0.009	-0.024	-0.016
	(0.033)	(0.021)	(0.016)
Constant	6.454***	1.542***	1.085***
	(0.214)	(0.095)	(0.072)
Observations	7,060	7,060	7,060
R-squared	0.873	0.787	0.838
Number of id	1,875	1,875	1,875
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
N_reps	100	100	100

Notes: The dependent variables are the export value, number of products and number of countries. The explanatory variables are the value of imported inputs, TREO dummy and the interaction term between value of imported inputs and TREO dummy and are lagged by one period. The sample size falls due incorporation of value of imported inputs (lagged three periods) as an internal instrument in the first step regression. Estimation includes year and firm effects. The instrumental variables are input tariffs and imported inputs lagged three periods. Bootstrapped standard errors in the parentheses and asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

The regression results are for the sub-sample of exporters that import inputs for use in the production of their final exports. Column (1) results shows that a 10% increase in imported inputs is, on average, associated with an increase in the firm's export value by 0.74%. TREO dummy is positive but not significant, while the interaction term is negative and insignificant. Comparing these results with the FE results presented in Table 5.10 column (2), the coefficients on value of imported inputs and TREO dummy are smaller for the IV. TREO dummy is in fact not significant for the IV case.

Column (2) results show that a 10% increase in the value of imported inputs is, on average, associated with an increase in a firm's product scope by 0.31%. TREO dummy and its interaction term are not significant. Comparing this with the FE results in Table 5.11 column (2) we also find that the IV coefficient on value of imported inputs is small relative to the fixed effects. The coefficient on TREO dummy is now positive but not significant, while in Table 5.11 it is negative and insignificant. The interaction term is not significant.

Finally, column (3) shows that imported inputs has no significant relationship with the number of destination countries served per firm. This is contrary to the findings using fixed effects results in column (2) of Table 5.12. The TREO dummy is positive and significant suggesting that a firm that access TREO experiences an increase in the number of destination countries served by 30.6% relative to its pre-TREO performance.

Overall, both the fixed effects and the IV results are consistent with findings in the previous section indicating that firms that import and export are on average large in export value and have more product and destination countries in their export portfolio relative to exporters only. The marginal effects uncovered in the IV regression, are smaller relative to fixed effects regression, casting doubt on the validity of the instrument that was expected to address the likely attenuation bias in the fixed effects results. Furthermore, the coefficient on TREO dummy is not statistically significant on its effect on export value and product scope per firm. This also suggests that the IV results may not be valid. We conclude that the current IV strategy does not address the likely attenuation bias in our FE estimations.

5.5 Conclusion

We evaluate the effectiveness of a popular trade policy incentive scheme in enabling firms to overcome costs of market access and spurring export performance at the firm level. This is done by examining the effect of increased access to imported intermediate inputs on a firm's export outcomes and how access to duty exemptions under TREO affects export outcomes for the beneficiary firms.

Using both firm and time fixed effects regressions as well as instrumental variables approach to address potential endogeneity, our empirical results reveal a positive and significant

performance premium for the exporters who import intermediate inputs relative to those who never import. In particular, importer-exporters are, on average, 29.2% larger in total export values, have 16.8% more products and 9.7% more destination countries relative to exporters only. Looking within firms that import and export an increase in the value of imported inputs by 10% is, on average, associated with an increase in total export values per firm by 1.2%, an increase in the number of products by 0.5% and an increase in the number of destination countries served by 0.4%. These results provide evidence of stronger export performance for firms that import inputs and export. Access to imported inputs may results in cost complementarity between imported inputs and exported products that generate a saving in market access costs and increase profitability of exports. It also makes it possible to produce export varieties that meet foreign market needs, lowering the fixed costs of entry (Feng et al., 2016; Bas &Strauss-Kahn, 2014).

On the effectiveness of a government duty remissions scheme (TREO), we find that importer-exporters that access TREO incentive, have a significant performance premium over non-TREO importer-exporters on export value and geographic diversification of exports but not on product scope. On export value, the importer-exporters that access TREO are, on average, 47.1% larger relative to their performance prior to accessing TREO. This represents a significant level effect of the incentive, suggesting that there is a substantial economic gain in expanding access to TREO for more importer-exporters. Accessing TREO represents a cost saving in procurement of imported inputs for firms that take-up the incentive and this is reflected through a level increase in their export value. In addition, aware of the likely differential effects of TREO based on the size of the firm, we segmented our sample into three sub-samples using export values to create the sub-samples. This enabled us to examine the differential effects of TREO on small, medium and larger firms using fixed effects regressions. Our results revealed a strong and positive effect of TREO on export value for the small and large firms but not for the medium sized firms.

On the product scope, we find no significant performance premia for firms that access TREO relative to their pre-TREO product scope. This result suggests that access to TREO confers no significant advantage in product scope before and after accessing TREO. This makes intuitive sense because importing is associated with access to a large variety of new intermediate goods that can be combined to produce new products to be exported. Thus, being able to import intermediate inputs confer an advantage to importer-exporters relative to exporters only.

However, TREO does not discriminate on certain types of imported inputs and has no effect on product differences between importer-exporters that use TREO and those that do not.

Regarding geographic diversification, our results shows that a 10% increase in the value of imported inputs is, on average, associated with 0.36% increase in the number of destination countries served. Importer-exporters that access TREO have, on average, 10.2% more destination countries in their export portfolio relative to their pre-TREO periods. Overall, access to TREO is on average, associated with an increase in export value and the number of destination countries relative to their pre-TREO performance levels. Considering that, in chapter three, we found that a wider geographic scope is associated with higher chances of survival in international markets, then expanding access to TREO may be crucial for overcoming market access costs that causes many firms to exit export markets.

We conclude with a word of caution on the interpretation of the results in this chapter. The central concern in the analysis is the potential endogeneity problems as a result of selection of firms both into being importer-exporter and into TREO scheme. On the first selection, we used an instrumental variable strategy and control for firm fixed effects giving us the lower bound estimate of the impact of access to imported inputs. On selection to the incentive scheme, our strategy is to use fixed effects regression that gives us the effect of TREO within a firm that suddenly take up TREO. This strategy allows us to control for any potential omitted firm characteristics but not selection into treatment. As such, our results on the effect of TREO are only assessed in the context of performance differences within a firm over-time. Future research could explore the use of instrumental variables if a suitable one is identified to tackle selection into the scheme.

Chapter 6

6. General Conclusion and Policy Implications

6.1 Summary of Key Findings

This thesis analyses the contribution of exporting firms to Kenya's export growth over the 2004-2013 period. The analysis draws on several firm level datasets including: a unique and unexplored panel of transaction level data over the period 2004-2013; a recent census of manufacturing firms; and firms' access to a duty exemptions scheme on imported intermediate inputs over the period 2004-2013. These datasets enable us to document, for the first time, the micro level picture of firm export decisions in Kenya and examine the role of market access costs in influencing firm export dynamics such as entry, exit and survival in export markets.

The study is comprised of four main chapters. In chapter 2, we assemble the data and describe the patterns and behaviour of exporters in Kenya in comparison to the performance of firms from the rest of the world. The results are remarkably consistent with the findings from other international studies using transaction level datasets. In particular, the analysis reveals a high degree of exporter heterogeneity in terms of export value, number of products and number of destination countries per exporter.

Further probing the distribution of exports across firms, we find that exports are highly concentrated towards a small number of multi-product and multi-destination exporters. For instance, multi-product and multi-destination exporters in Kenya made up 38% of the population of exporters in 2005 and accounted for approximately 86% of the export value that year. At the same time, export sales are highly skewed across products within the export basket of multi-product firms. For a three-product exporter, for example, up to 72.4% of its export revenue was derived from sales of the top ranked product (or core product) and the balance (27.6%) from the other products (or fringe products) in 2005. This result is driven by the fact that the costs to multi-product exporters for adding varieties in an existing market is low due to the economies of scope (Arkolakis & Muendler, 2010).

The year-on-year growth in Kenya's aggregate exports is driven by decisions at the firm extensive margin (net entry) and at the firm intensive margin (continuing exporters). A

decomposition framework is used to assess the contribution of each of these margins to the aggregate export growth rate over time. We find that over the period 2005-2012, the average growth rate of Kenya's exports was 11.9% per year. Continuing firms (firm intensive margin) accounted for 86.5% of this growth while the net entry of new exporters (firm extensive margin) accounted for 13.4%. While the contribution of net entry of new exporters (firm extensive margin) is relatively small (13.4%), we find significant contributions at the gross entry and exit of exporters (exporter churning). For example, over the period 2005-2012, gross entry of new exporters raised exports by 27.7% (=3.3/11.9) while exit reduced it by 15.1% (=1.8/11.9) on average per year. Thus, there is evidence of substantial churning of firms through entry and exit from export markets.

Narrowing down to export growth among continuing firms, we document very interesting patterns in the selection of firms into destination countries and products exported. For example, along the destination dimension, destination intensive margin (export to continuing destinations) accounted for 91.3% of the average growth in exports over the period 2005-2012, while the net added destinations accounted for 8.7%. However, the gross contribution of added destinations and reduction in exports due to dropped destinations among continuing exporters is quite high, suggesting that there is a lot of churning and experimentation across destination markets.

Overall, the results reveal that over the period 2005-2012, continuing exporters, exporting to continuing destinations and shipping continuing products (intensive margin) accounted for 64.7% of the average export growth per year for Kenya. The extensive margin (new firms, new destinations and new products) accounted for 35.3% of the growth rate per year. In addition, while the overall growth in exports is dominated by the continuing exporters, their export activity is underpinned by significant churning in destination-countries and products in their export portfolios.

The final section of this chapter examines the performance difference between manufacturing firms that export compared to non-exporters. The analysis reveals that exporters are larger in terms of value added per worker (37.7%), total factor productivity (37.5%), capital per worker (76.5%), employment (254.9%), skills per worker (54.5%) and sales per worker (79.7%) relative to their non-exporting peers. This provides evidence in support of the fact that exporters contribute to economic growth and improvement of welfare of their workers.

Chapter 3 examines the patterns of entry, exit and survival of new exporters in foreign markets, along with the factors associated with their survival in export markets. We find that over the period 2005-2013, the average entry, exit and survival rates for the Kenya's exporters in international markets are 41, 38, and 62%, respectively. These rates are comparable to those documented for exporters in developing countries (Fernandes et al., 2016) and represents enormous churning of Kenyan firms through entry and exit in export markets. Looking at the trade characteristics for the exiters, we find that on average, they are small in export value compared to new entrants and continuing exporters. Furthermore, each cohort of entering firms exhibits a very high exit rate of between 62 and 79% in the first year of entry. This suggests that there are significant market access costs that make exporting less profitable for the low productive firms and choose to exit as a less costly option.

On the factors associated with the probability of exit (failure), we use fixed effect regression that exploits for the within the firm over time, how changes in firm characteristics affect its probability of exit from international markets. We find that the probability of exit is lower amongst firms with a higher current export value, larger product scope and wider geographic scope of exports. In particular, a 10% increase in the firms export value is, on average, associated with a 0.12% reduction in the probability of exit. A similar increase in the number of products exported is associated with a reduction in the probability of exit (failure) from export markets by 0.14%. A key explanation for this result is based on the intrinsic benefit of export diversification at the firm level. A large product scope, sold across various destination countries, results in more stable export sales with positive knock-on effects to survival in international markets.

Similarly, an increase in the number of destination countries served by a firm is, on average, associated with better chances of survival. Our results show that an increase in this variable by 10% is, on average, associated with a reduction in the probability of exit (failure) by 0.35%. Adding a new destination country requires incurring destination specific fixed costs and holding a wider geographical scope reflects high productivity (Chaney, 2008) and has a greater impact on survival.

To recap, the decomposition of Kenya's aggregate growth in exports in chapter 2 revealed a significant role played by continuing exporters in export growth. We saw that the role of net entrants (the extensive margin) was relatively small, although at the gross entry level, new exporters outperform exiters in contributions to growth in exports. The entry, exit as well as

survival of firms in international markets is a central issue in chapter 3. Here, we find that a lot of the new entrants (62-79%) exit just after the first year in international markets and that the probability of exit is lower amongst firms with a higher current export value, larger product scope and wider geographic scope of exports. We attribute these firm export behaviours to underlying firm productivity and ability to overcome market access costs at the export destination and survive in international markets.

Now, in chapter 4, we try to understand how a specific market access cost affects firms' export decisions and generates observable exits in the data. We analyse the effect of a specific market access cost, using fragility of a destination market as an exogenous shock resulting in additional costs of entry into markets in Africa and how this alters firm's export behaviour. In particular, we examine the effect of fragility on a firm's decision to serve a given market with exports and the role of firm size in mediating the effect of fragility. Our empirical strategy controls for endogeneity of destination choice by the firm through firm-destination country fixed effects such that the effect of destination country fragility on a firm's export decision is identified entirely along the time dimension.

The results reveal a negative and significant effect of destination country fragility on the probability of a Kenyan firm exporting to a given destination in Africa. An increase in destination fragility by 10% is, on average, associated with a reduction in the probability that a firm exports to that destination by 0.21%, holding everything else constant. To illustrate the magnitude of the effect, let us assume that a destination country moves from the 25^{th} percentiles in fragility (-3.989) to the 75^{th} percentiles (-3.199) on a log scale while all other variables are held constant at the mean. Our results show that the probability of a Kenyan firm exporting to the 25^{th} percentiles fragility country is 0.2588 but it is 0.2426 for the 75^{th} percentiles, such that a deterioration in the destination's fragility rank is, on average, associated with a 6.25% decrease in the probability that a Kenyan firm exports to that market.

Regarding the role of a firm's size, we find that larger firms are more likely to become multi-destination exporters to the African region. In particular, a 10% increase in the size of a firm is, on average, associated with 0.175% increase in the probability that a Kenyan firm exports to a given destination market in Africa. Furthermore, the result on the interaction term between firm size and fragility show that larger firms are less adversely affected by destination fragility than smaller ones. For instance, the average effect of a 10% increase in fragility on the likelihood of exporting is -0.132% for a firm size at the 10^{th} percentiles while it is -0.067% for

a firm size at the 90th percentiles. This shows that the effect of fragility decreases with the size of the firm which is in line with the key predictions of models of firm heterogeneity and trade that emphasizes the role of firm size (or productivity) in overcoming fixed costs of entry in export markets (Melitz, 2003; Bernard et al., 2003; Chaney, 2008). Large and productive firms can afford additional costs to export to fragile markets and sustain export relationships.

The chapter closes with an assessment of the effect of destination country fragility on Kenya's trade margins and shows that the main channel through which fragility affects bilateral trade is in the reduction of the number of exporters. The gravity estimation shows that a 10% increase in destination fragility is, on average, associated with a 2.3% reduction in the number of exporters, a 2.6% reduction in the number of products and a 3.1% increase in the density term. These results translate to an overall reduction in bilateral trade along the extensive margin by 1.8%, providing evidence in support of the fact that fragility affects mainly the entry and exit decisions for the small firms in exporting.

On the effect of destination fragility on average export value per firm (intensive margin), we find a positive and significant effect. An increase in destination fragility by 10% is, on average, associated with an 8.6% increase in the mean export value per firm to that destination country. This result is driven by a pure selection effect as fragility causes exit of exporters that are less efficient relative to the average productivity exporters. Finally, on the effect of destination fragility on Kenya's total exports to a given destination, we find a negative but insignificant effect. We believe that this result is driven by the fact that fragility affects mainly the entry and exit decisions for the small firms (the extensive margin) resulting in a change in the sample of firms that actively participate in exports. These changes in the sample of firms implies the average export value per firm to that destination country necessarily increases due to selection effect (i.e. large firms continue to export) but the effect on Kenya's total export value to that destination is not significant.

Overall, these findings accord with the main hypothesis set out in the chapter 4 in which the effect of destination fragility on exports is mainly through the extensive margin (reducing the number of exporters). Furthermore, an increase in destination fragility (or market access costs) is associated with a high exit rate, documented in chapter 3 and low survival probabilities in international markets. A careful scrutiny of the channel through which destination fragility affects firm export participation, showed that business risks rather than political risks provide

the greatest hurdle. This may call for differentiated policies to address the business risks and political risks associated with exporting within the African continent.

Finally, in chapter 5 we evaluate the effectiveness of a popular trade policy incentive scheme in enabling firms to overcome market access costs and spurring export performance at the firm level. This is done by examining the effect of increased access to imported intermediate inputs on a firm's export outcomes and how access to duty exemptions under TREO affects export outcomes for the beneficiary firms.

Using both firm and time fixed effects regressions as well as instrumental variables approach to address potential endogeneity, our empirical results reveal a positive and significant performance premium for the exporters who import intermediate inputs relative to those who never import. In particular, importer-exporters are, on average, 29.2% larger in total export values, have 16.8% more products and 9.7% more destination countries relative to exporters only. Looking within firms that import and export an increase in the value of imported inputs by 10% is, on average, associated with an increase in total export values per firm by 1.2%, an increase in the number of products by 0.5% and an increase in the number of destination countries served by 0.4%. These results provide evidence of stronger export performance for firms that import inputs and export. Access to imported inputs may result in cost complementarity between imported inputs and exported products that generate a saving in market access costs and increase profitability of exports. It also makes it possible to produce export varieties that meet foreign market needs, lowering the fixed costs of entry (Feng et al., 2016; Bas &Strauss-Kahn, 2014).

On the effectiveness of a government duty remissions scheme (TREO), we find that importer-exporters that access TREO incentive, have a significant performance premium over non-TREO importer-exporters on export value and geographic diversification of exports but not on product scope. On export value, the importer-exporters that access TREO are, on average, 47.1% larger relative to their performance prior to accessing TREO. This represents a significant level effect of the incentive, suggesting that there is a substantial economic gain in expanding access to TREO for more importer-exporters. Accessing TREO represents a cost saving in procurement of imported inputs for firms that take-up the incentive and this is reflected through a level increase in their export value. In addition, aware of the likely differential effects of TREO based on the size of the firm, we segmented our sample into three sub-samples using export values to create the sub-samples. This enabled us to examine the

differential effects of TREO on small, medium and large firms using fixed effects regressions. Our results revealed a strong and positive effect of TREO on export value for the small and large firms but not for the medium sized firms.

On the product scope, we find no significant performance premia for firms that access TREO relative to their pre-TREO product scope. This result suggests that access to TREO confers no significant advantage in product scope before and after accessing TREO. This makes intuitive sense because importing is associated with access to a large variety of new intermediate goods that can be combined to produce new products to be exported. Thus, being able to import intermediate inputs confers an advantage to importer-exporters relative to exporters only. However, TREO does not discriminate on certain types of imported inputs and has no effect on product differences between importer-exporters that use TREO and those that do not.

Regarding geographic diversification, our results show that a 10% increase in the value of imported inputs is, on average, associated with 0.36% increase in the number of destination countries served. Importer-exporters that access TREO have, on average, 10.2% more destination countries in their export portfolio relative to their pre-TREO periods. Overall, access to TREO is on average, associated with an increase in export value and the number of destination countries relative to their pre-TREO performance levels. Considering that, in chapter three, we found that a wider geographic scope is associated with higher chances of survival in international markets, then expanding access to TREO may be crucial for overcoming market access costs that cause many firms to exit export markets.

6.2 Policy Implications of the Findings

The results from this thesis help us understand how decisions at the firm level shape the aggregate export trade outcomes for Kenya. Studying a country's export flows, using transaction based data opens a window to observe exporter behaviour and several choices regarding what and where to export. The ability to observe these firm level activities comes with several policy insights. For example, it may enable identification of adjustments taking place at the firm level in terms of entry, continuation, and exit from export markets and their effect on aggregate exports. It is also possible to isolate the role of new firms, new products, and new destinations (extensive margin) from the role of existing firms, existing products and

existing destinations (intensive margin) in growth and expansion of exports. This may help to target policy in support of diversification and deepening of exports.

While the results from this thesis are specific to Kenya, they do not deviate substantially from the findings in the related literature and may be generalised to other SSA countries that share common characteristics with Kenya, such as being resource scarce and coastal, having abundant labour resource and low technology manufactures exports. The following are the key policy implications that may be drawn from our results.

Firstly, the decomposition of Kenya's year-on-year growth of aggregate exports in chapter two revealed that the continuing firms drive this growth, accounting for up to 64.7% of the variation of the average export growth per year. The extensive margin (new firms, new destinations and new products) accounted for 35.3% of the growth rate per year. In addition, while the overall growth in exports is dominated by the continuing exporters, their export activity is underpinned by significant churning in destination-countries and products in their export portfolios. Thus, both entry and survival of firms in international trade could potentially be a key objective of trade policy. At the same time in chapter three, a lot of new entrants (62-79%) exit just after the first year, suggesting that *market access costs* might be too high, causing high exit rates. This study emphasizes the need to raise firm size (productivity) to overcome market access costs and survive in export markets. There is scope for policy to leverage the results from this thesis to launch future intervention programmes targeting to raise firm productivity. Such programmes should be accompanied by a properly controlled study to identify the impact of the programme.

Secondly, the effect of destination fragility on bilateral trade is always negative and it is transmitted mainly through reduction of the number of exporters to a given fragile state. The intensification of political diplomacy to restore good governance and the establishment of a business environment that supports private sector growth is naturally our first recommendation, which is incidentally, not new. More importantly, our results show that raising firm level productivity (or size) is associated with a reduction in the negative effect of fragility on the probability of serving a given market. This implies targeted interventions aimed at raising firm level productivity are also essential.

Thirdly, access to imported intermediate inputs is associated with an indirect increase in firm productivity that in turn boosts export performance. Our results suggest that this is a potential

avenue for the expansion of firm level exports along both the intensive and extensive margins. More importantly, we found that a policy programme such as duty exemptions makes intermediate inputs more accessible to firms which is associated with better export performance for the beneficiaries of the incentive, although ascertaining causality was complicated due to self-selection concerns.

6.3 Limitations and Suggestions for Further Research

There are a number of limitations in this study that we would like to highlight. We present these by chapter. In chapter 2 we used transaction level data to document a number of stylized facts about all exporters from Kenya. We highlighted the important role played by multi-product and multi-destination exporters in driving the country's exports. We also showed that the firm intensive margin plays a significant role in the year-on-year variation of the growth of Kenya's exports. However, we had little to say about the characteristics of the firms behind the observed trade patterns, save for a brief snap shot of some of these characteristics using a recent census data.

The results from this study can be improved with access to a panel of firm characteristics. This will enable one to determine ex-ante (before entry into exporting) the differences in firm productivity and how firm productivity is influenced by participating in exports (Bernard & Jensen, 1999). There are two options to bridge this data gap. Researchers could engage with the Kenya Revenue Authority (KRA) to match customs statistics to annual income returns data. This option will yield a panel of formal firms with information on both trade and firm characteristics at a minimum cost. This study did not manage to access information on income returns. Secondly, the census dataset could be updated with a regular annual survey, targeting large firms. A framework for this option exists and the module could be expanded to capture all the information gathered through the census questionnaire.

In addition, our results on firm adjustments along the intensive and extensive margins are purely derived from a measurement approach and should not be interpreted as causal. This is not a problem per se, as several studies have pursued this approach (Eaton et al., 2007; Amador & Opromolla, 2013) and it is quite informative. However, the decomposition is unconditional to other factors that might affect firm level trade margins. For a causal interpretation, a common approach used in the literature is to identify an episode such as the global financial crisis and

its shock on the trade environment and identify precisely how firms responded. This approach is outside the scope of this study. We simply do not have knowledge of an episode to help us identify a causal relationship.

The transactional level data used in Chapter 2 comes in monthly frequency, which is a valuable and (quite) rare advantage. However, we aggregated monthly shipments into annual flows to answer specific research questions in this thesis. In future, exploitation of the monthly data could be pursued. Infra-annual data could provide precious information to compute the contribution of entries and exits to total exports, and the dynamics of new exporters. Indeed, evidence based on yearly data are likely to be strongly biased by the fact that firms starting to export later in the calendar year are not expected to export large amount in their first year (Bernard et al., 2017; Bekes et al., 2017). Information on monthly shipments is typically something that might be interesting to exploit in the case of a developing country, which is subject to more frequent economic shocks and rapid transformation. Besides, other avenues of research could be explored, such as the seasonality of trade or exporters' response to changes in world commodity prices.

In chapter 3 we make use of the panel LPM and logit with fixed effects to model the probability of failure against a set of firm characteristics. This estimation eliminates the time invariant firm characteristics, which reduces the bias associated with time invariant omitted variables. The nature of transaction level data, however, implies that we are basing our analysis on a selected sample, i.e. customs data covers only exporters. This implies that the estimated results on the determinants of the probability of survival are only valid for current and active exporters. Even so, it is still possible that our results are afflicted by time varying unobserved firm characteristics. The current study could therefore be extended by controlling for as many firm characteristics as possible. In particular, our study lacks a panel of firm characteristics such as total factor productivity or number of employees, to merge into the transaction dataset. Finally, there is scope to further explore the product and destination diversification of export portfolios. For example, it would be interesting to see if the added products per firm are within the same sector or across sectors. Likewise, the added countries per firm could be split into those that are culturally distant from Kenya versus those that are not. These issues remain unaddressed in the current chapter.

In chapter 4 we analyse the effect of destination fragility on a firm’s decision to serve a given market in Africa with exports. This paper adopts a model that extend the current monopolistic

competition models of trade to account for destination country fragility as an exogenous shock to costs of entry into markets in Africa. The empirical test of this model faces a number of challenges. Firstly, there are potential endogeneity concerns arising from measurement error in the fragility variable. Unfortunately, we do not find in the literature a known instrumental variable for destination country fragility. Our hope is that by controlling for time invariant firm-destination country omitted variables and lagged key explanatory variables, we reduce this bias. Future work could explore better measures of destination fragility and a suitable instrumental variable to instrument for the same[44]. Nevertheless, our results confirm most of the predictions set out in theoretical framework and is robust to alternative measurement of destination country fragility.

Secondly, as is the case in the previous chapters, we also lack a panel of firm characteristics for Kenya's producing firms to complement the transaction level data used in this chapter. This means we are not able to separately identify the impact of fragility on either producing firms or trading firms. By using export data, we generalize the effect on all firms regardless of whether they are producing or trading firms only. This may be extended by examining the effect on producers, separate from traders.

Finally, in chapter 5, the central concern in the analysis is the potential endogeneity problems as a result of selection of firms both into being importer-exporter and into the incentive scheme. On the first selection, we used an instrumental variable strategy and control for firm fixed effects giving us the lower bound estimate of the impact of access to imported inputs. The instrumental variable used is the average firm level tariff rate as suggested by Bas and Strauss-Kahn (2014).

There is a major concern that the regression results on effectiveness of TREO is driven by firm's self-selection into the scheme. For example, given the costs of applying and complying with TREO conditions: (a) more efficient, and (b) larger firms are more likely to make use of the facility. The consequence is that the estimated coefficient on TREO will be biased upwards due to this selection effect. We do not have variables for productivity or size. We attempt to address this concerns as follows. First, we included firm fixed effects to control for time invariant firm characteristics associated with selection of firms into TREO. This would cover managerial efficiency, stable productivity levels among others. While this deals with a cross-

[44] In future, the monthly frequency of the data could be exploited to observe the frequency of the shipments. It is conceivable that firms facing greater insecurity in an export market may prefer to reduce the frequency of their transactions in order to group their exports on larger shipments - or vice versa (Bekes et al.2017).

firm selection, it does not deal with within-firm selection. The inclusion of firm fixed effects implies that the results are driven by the transition of firms into and out of TREO. However, if this transition is driven by time varying characteristics (changes in productivity, size, etc.) then the estimates will still be biased, which is a limitation deserving acknowledgement.

Second, we included lagged import variables. Our concern is that firms simultaneously start importing and adopt TREO in response to an increase in demand. This really deals with endogeneity of importing and adoption of TREO (rather than selection effects), but it would help reduce some of the selection bias. Third and final, we split the sample into large, medium and small firms. As theory and literature shows (Fernandes, Freund & Pierola, 2016; Matthee et al., 2016; Bernard & Jensen, 1999) exporting is correlated with productivity and firm size. By categorising firms by size, we hope to reduce the potential selection bias associated with larger more efficient firms selecting into TREO.

There is a possibility to address self-selection into TREO through propensity score matching if additional data becomes available. However, the current data limitations, especially the lack of information on firm covariates in the pre-treatment period means a deft technique such as propensity score method is not feasible. Future research could also explore the use of an instrumental variable if a suitable one is identified.

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Appendix A: Data Cleaning and Database Construction

Database Construction: Exports database

This section complements information provided in chapter 2 of this thesis. We explain in detail the preparation of data used in this thesis. We start off with the export database followed by the census of manufacturing firms.

Monthly exports by destination and product category are obtained from the Customs Services Department Statistics database in KRA. The database contains the global flow of all exports from January 2004 to December 2013. Exporters ship products, in one or more product categories, at the 8-digit HS product classification. The most elementary unit of observation is "the value exported each month by a Kenyan exporter at 8-digit HS product classification to each destination country". We follow previous literature in omitting destinations that are not countries (i.e. those not elsewhere classified such as export flow into aircraft and ship stores, export processing zones and duty-free shops). The elimination of these transactions means disaggregated export data may fall short of what is published by the Kenya National Bureau of Statistics (KNBS). This cleaning results in the loss of a small number of observations (about 4%) relative to the total number of observations over the whole sample period.

Dealing with origin of exports and re-exports

An export is defined as a transaction that involves a true ownership change accompanied by compensation and that originates from Kenya. This paper excludes re-exports, goods returned for repairs and exports meant for neighbouring landlocked countries, such as Uganda, South Sudan and DR. Congo that use Kenya's port to export. The ability to identify the origin of an export is captured in the Customs database, using the variable "origin" which is a two-digit ISO code for the country where the export originates. This restriction leads to yet another loss of observations, which are technically not Kenyan exports (estimated at 10%) over the entire sample period.

Dealing with export flow to Sudan (South Sudan) in 2012 and 2013

As early as 2012, South-Sudan was preparing for a separation from the larger Sudan. This gave the country an ISO2 code of "SS" and was adopted for use in the Kenyan customs statistics. However, most of the transactions between Kenya and Sudan (South Sudan) were entered with

the correct ISO2 code but were attributed to Serbia as the destination country. This resulted in a big jump in Kenya's export to Serbia and a requisite drop in exports to Sudan (including South-Sudan). After consultation with an officer from KRA familiar with customs statistics, I corrected for this by renaming the destination country for 2012 exports Sudan rather than Serbia. This yielded a consistent flow of exports to Sudan and Serbia similar to historical flows. In 2013, South Sudan became independent and export flow from Kenya into South-Sudan and Sudan were recorded separately. However, to make comparisons with historical export flow, we added up the value of exports to the two countries for 2013 and attributed it to the original Sudan.

Assigning a unique firm identifier

In the customs database, it is possible to identify the exporter by name. This information was used to generate random number exporter identifiers to maintain confidentiality of the data. Using firm names to obtain a unique identifier poses a challenge as any change in the name (i.e. capital for the first letter or not, spacing, or ltd instead of ending with limited) will be reflected in a new firm identification. The study takes comfort in the fact that the name entry rule and customs declaration require that the names be entered as per the official registration with the company's registry. However, one cannot rule out human error in the recording of names. The study undertook a visual check for at least a sub-set of the data to verify how the names are recorded and whether there are suspect changes.

Aggregating "firm-product-destination" flow of exports into annual flow

The flow of firm-product-destination export was aggregated from monthly flows to annual flows. For example, in 2012 exporter id number 02, exported 66 pieces of a product code "68052000" (HS8) described as "on base of paper or paper board only" valued at Ksh.382,912 to Rwanda. It is preferable to work with annual flows rather than monthly ones to go around data challenges associated with high frequency such as seasonality and differences in the numbers of working days per month.

Incorporating external files on destination and product characteristics

Firstly, the Customs database uses 2-digit International Organization for Standardization (ISO) combination to designate the final destination of exports. We make use of the concordance

provided by the World Integrated Trade Solution (WITS)[45] to map the 2-digit country ISO codes to 3-digit country ISO codes. This is important to enable merging with the World Development Indicators (WDI) from the World Bank for information such as income classification of countries, GDP, nominal exchange rate, consumer price indices and other gravity variables (distance and common language) from the CEPII website.

Product mapping from HS8 to HS6 product classification

The baseline analysis of the mix of products exported by a firm is conducted at the 6-digit HS product classification. The first six-digit (HS6) for Kenya's 8-digit HS (HS8) product classification correspond to the HS6 system product classification of the World Customs Organization (WCO). However, the HS, created in 1988, has since been revised four times (1st January 1996, 1st January 2002, 1st January 2007 and 1st January 2012). Since the sample period in the data runs from 2004 to 2013, it is important to take into account these revisions to avoid attributing product reclassification as either dropping or adding to the export mix. To do that, we adjusted Kenya's HS8 product classification to HS6 for 2002 using crosswalks (concordances) obtained from WITS website. The HS6 level product classification in 2002 was used as the product count baseline for the analysis. Table A-1 presents counts of Kenya's exported product lines.

Table A-1: Counts of products and destinations over time

year	HS 8-digit	HS 6_digit	HS 4_digit	HS 2_digit	Destinations
2004	3317	3006	1039	97	177
2005	3538	3251	1074	96	173
2006	3563	3439	1087	96	167
2007	3787	3537	1099	95	169
2008	3596	3402	1091	96	158
2009	3539	3354	1078	96	155
2010	3603	3398	1081	96	160
2011	3730	3517	1094	96	166
2012	3719	3456	1087	96	162
2013	3664	3418	1083	96	165
2004 -2013	3606	3378	1081	96	165

Notes: computed from Customs Services data. Product counts for Kenya at various HS level and destination count.

Lastly, we incorporated a set of product classification facilitated by correspondence of HS products to both the Standard International Trade Classifications (SITC) and International

[45] wits.worldbank.org/WITS/wits/WITSHELP/Content/Codes/Country_Codes.htm.

Standard Industrial Classification (ISIC). The 2-digit HS product was used to create 8-broad sectors as shown in Table A-2 below.

Table A-2: Classification of HS2 into broad economic sectors

Sector	Name	HS chapters included	Total
1	Agriculture, meat, dairy & seafood	HS 01-10, 12-14	14
2	Textiles, apparel, leather & footware	HS 41-42, 50-65	18
3	Extractive industries	HS 25-27,68-71	7
4	Other industries	HS 37, 43, 49, 66-67,90-99	15
5	Iron, steel & other metals	HS 26,72-83	12
6	Food, beverages, tobacco, wood & paper	HS 11,15-24,44-48	16
7	Chemicals, plastics & rubber	HS 28-36, 38-40	12
8	Machinery, electronics & transportation equipments	HS 84-89	6

Source: Own computation from the customs data

A framework to decompose Kenya's aggregate export growth

In the first step, the change in Kenya's aggregate exports is made up of the contribution of a sub-set of new exporters, exiting exporters and continuing exporters. Let this be Eq (a)

$$\Delta Y_t = \left\{ \sum_{j \in N} Y_{jt} - \sum_{j \in X} Y_{jt-1} \right\} + \sum_{j \in C} \Delta Y_{jt}$$

Where ΔY_t is the change in Kenya's exports from year t-1 to year t, ΔY_{jt} is the change in exports for the continuing firms. N is the sub-set of new exporters, X is the subset of exiting exporters and C is the subset of continuing exporters. Step 2 focuses on the continuing firms' change in exports and breaks it up into added destinations (AD), dropped destinations (DD) and continuing destinations (CD). This yields the following equation (b), where z is a destination subscript.

$$\sum_{j \in C} \Delta Y_{jt} = \left\{ \sum_{z \in AD} Y_{zjt} - \sum_{z \in DD} Y_{zjt-1} \right\} + \sum_{z \in CD} \Delta Y_{zjt}$$

Step 3, uses the continuing destinations for the continuing firms and decompose it into, added products (AP), dropped products (DP) and continuing products (CP). This gives the following equation (c), where v is a variety subscript.

$$\sum_{z\in CD} \Delta Y_{zjt} = \left\{ \sum_{v\in AP} Y_{vzjt} - \sum_{v\in DP} Y_{vzjt-1} \right\} + \sum_{v\in CP} \Delta Y_{vzjt}$$

Substitute (c) into (b) to obtain equation (d) below.

$$\sum_{j\in C} \Delta Y_{jt} = \left\{ \sum_{z\in AD} Y_{zjt} - \sum_{z\in DD} Y_{zjt-1} \right\} + \left\{ \sum_{v\in AP} Y_{vzjt} - \sum_{v\in DP} Y_{vzjt-1} \right\} + \sum_{v\in CP} \Delta Y_{vzjt}$$

And, finally substitute (d) into (a) to obtain the final decomposition equation as:

$$\Delta Y_t = \left\{ \sum_{j\in N} Y_{jt} - \sum_{j\in X} Y_{jt-1} \right\} + \left\{ \sum_{z\in AD} Y_{zjt} - \sum_{z\in DD} Y_{zjt-1} \right\} + \left\{ \sum_{v\in AP} Y_{vzjt} - \sum_{v\in DP} Y_{vzjt-1} \right\} + \sum_{v\in CP} \Delta Y_{vzjt}$$

The percentage change in total export is obtained by dividing each term in the above equation by the export value in the base year, *t-1*.

Table A-1: extended patterns of entry and exits

id	1,	2,	...,	16907	n	=	16854		
year	2004,	2005,	...,	2013	T	=	10		
Delta(year)	=	1	year						
Span(year)	=	10	periods						
(id*year	uniquely	identifies	each	observation)					
Distribution	of	T i	min	5%	25%	50%	75%	95%	max
			1	1	1	1	3	10	10
Freq.	Percent	Cum.	Pattern						
1203	7.140	7.140	1						
1047	6.210	13.35	.....1..						
967	5.740	19.09	.....1.						
929	5.510	24.60	..1.....						
902	5.350	29.95	.1.....						
885	5.250	35.20	1111111111						
874	5.190	40.39	...1.....						
796	4.720	45.11	.....1...						
725	4.300	49.41	....1....						
719	4.270	53.68	....1.....						
682	4.050	57.73	1.....						
406	2.410	60.13	11						
258	1.530	61.66	111						
219	1.300	62.96	11.....						
205	1.220	64.18	.....11.						
191	1.130	65.31	1111						
173	1.030	66.34	...11.....						
172	1.020	67.36	..11.....						
164	0.970	68.33	111.....						
163	0.970	69.30	.11.....						
161	0.960	70.26	.111111111						
157	0.930	71.19	11111						
147	0.870	72.06	..11111111						
144	0.850	72.91	...1111111						
133	0.790	73.70	....11....						
130	0.770	74.47	.....11...						
126	0.750	75.22	.....11..						
98	0.580	75.80	111111						
82	0.490	76.29	.....1.1						
82	0.490	76.78	.....111.						
72	0.430	77.20	.....111..						
69	0.410	77.61	..111.....						
68	0.400	78.02	1.1.....						
67	0.400	78.41	1111.....						
59	0.350	78.76	11111111..						
57	0.340	79.10	.111.....						
55	0.330	79.43	11111.....						
53	0.310	79.74	11111111.						
52	0.310	80.05	...111....						
52	0.310	80.36	111111....						
47	0.280	80.64	.....1.1.						
47	0.280	80.92	....111...						
46	0.270	81.19	.....1.1..						
41	0.240	81.43	.....1.11						
38	0.230	81.66	..1111....						
37	0.220	81.88	.....11.1						
37	0.220	82.10	.....1..1.						
37	0.220	82.32	...1.1....						
36	0.210	82.53	.....1..1						
36	0.210	82.75	.....1111.						
2908	17.25	100	(other	patterns)					
16854	100	XXXXXXXXX							

Notes: 50% of all firms are once off-exporters.

Appendix B: Additional Tables and Mathematical Derivation

Export share and designation country fragility index

Table B-1: Export share and destination fragility index (mean values 2004-2013)

Rank	ISO3	Country	Share of export	Mean(lnfragility)
1	UGA	Uganda	0.29	-3.812
2	TZA	Tanzania	0.19	-3.959
4	EGY	Egypt	0.10	-3.795
4	SDN	Sudan	0.09	-1.961
5	ZAR	DR Congo	0.07	-1.373
6	RWA	Rwanda	0.06	-3.902
7	ZMB	Zambia	0.04	-3.972
9	ETH	Ethiopia	0.03	-3.448
9	BDI	Burundi	0.03	-3.067
10	ZAF	South Africa	0.02	-4.388
10	MWI	Malawi	0.02	-3.986
12	NGA	Nigeria	0.01	-3.164
14	DJI	Djibouti	0.01	-3.732
14	MUS	Mauritius	0.01	-4.588
15	MOZ	Mozambique	0.01	-3.986
18	MDG	Madagascar	0.004	-3.869
18	GHA	Ghana	0.003	-4.244
19	COM	Comoros	0.003	-3.349
19	ZWE	Zimbabwe	0.004	-2.106
19	ERI	Eritrea	0.004	-2.724
21	SYC	Sychelles	0.002	-4.289
22	AGO	Angola	0.002	-3.175
24	MAR	Morocco	0.001	-4.015
27	CIV	Cote d'voire	0.001	-2.986
30	MLI	Mali	0.001	-3.935
31	SEN	Senegal	0.001	-4.047
31	CMR	Cameroon	0.001	-3.483
31	SLE	Sierra Leone	0.0004	-3.617
32	GIN	Guinea	0.001	-2.874
33	LBR	Liberia	0.001	-3.338
33	BWA	Botswana	0.0004	-4.557
34	BEN	Benin	0.0003	-4.023
34	TCD	Chad	0.0003	-2.639
34	NER	Niger	0.0004	-3.762
35	NAM	Namibia	0.0003	-4.384
36	STP	Sao Tome- Princ.	0.0001	-3.984
37	BFA	Bukina Fasso	0.0003	-3.992
37	COG	Congo, Brazz.	0.0003	-3.226
37	TUN	Tunisia	0.0004	-4.141
37	CAF	Central Africa	0.0002	-2.682
37	LBY	Libya	0.0002	-3.143
38	MRT	Mauritania	0.0002	-3.672
38	GMB	Gambia	0.0002	-3.874
39	TGO	Togo	0.0002	-3.380
39	GAB	Gabon	0.0002	-3.824
40	GNQ	Equatorial Guinea	0.0001	-2.770
41	DZA	Algeria	0.0004	-3.609
42	LSO	Lesotho	0.0001	-4.108
42	SWZ	Swaziland	0.0001	-3.768
46	CPV	Cape Vade	0.00004	-4.457
47	GNB	Guinea-Bissau	0.00002	-3.223

Notes: The data is restricted to exports to Africa from Kenya over the sample period 2004-2013. The rank is based on export share ascribed to a country, over the sample period.

A brief of the Principal Component Analysis (PCA) Method

We made use of the PCA method to obtain the average governance index from the six indicators. The following section presents the steps implemented to obtain the average index. We start off by looking at the correlation among the six WGI indictors and found them to be highly correlated, with the correlation ranging from 0.78 to 1. The average governance index for country j from each of the six indictors of governance: voice and accountability (vac), regulatory quality (rq), rule of law (rol), political stability and absence of terrorism (pse), government effectiveness (ge) and control of corruption (coc) is specified as:

$$Gov\_index_{jt} = \alpha_1 \text{vac}_{jt} + \alpha_2 \text{rq}_{jt} + \alpha_3 \text{rol}_{jt} + \alpha_4 \text{pse}_{jt} + \alpha_5 \text{ge}_{jt} + \alpha_6 \text{coc}_{jt} + \vartheta_{jt}$$

The PCA factor analysis results are presented in Table B-2 below:

Table B-2: The PCA factor analysis results

```
Factor analysis/correlation                    Number of obs    =  2,030
Method: principal-component factors    Retained factors =   1
Rotation: (unrotated)                  Number of params =   6
--------------------------------------------------------------------------
  Factor  |  Eigenvalue   Difference        Proportion   Cumulative
----------+---------------------------------------------------------------
  Factor1 |  5.08689      4.65252          0.8478       0.8478
  Factor2 |  0.43437      0.16129          0.0724       0.9202
  Factor3 |  0.27308      0.15744          0.0455       0.9657
  Factor4 |  0.11564      0.06831          0.0193       0.9850
  Factor5 |  0.04733      0.00465          0.0079       0.9929
  Factor6 |  0.04268            .          0.0071       1.0000
LR test: indep. vs. saturated:chi2(15) = 1.8e+04 Prob>chi2 = 0.0000
```

The eigenvalues give the total variance accounted for by each of the six factors. The Kaiser criterion suggests that we retain those factors with eigenvalues equal or higher than one. This implies that only factor1 should be kept as it accounts for 84.8% of the variation in the total variance. The model optimally selected factor1, which is our average governance index.

Detailed mathematical derivations under chapter four

Using Shephard's lemma and derivative property of expenditure function.

$$E(P) = \mu_2 Y_f P_f$$

$$\frac{\partial E(P)}{\partial p_{if}} = \frac{\partial E(P)}{\partial P_f}\frac{\partial P_f}{\partial p_{if}}$$

$$\frac{\partial E(P)}{\partial P_f} = \mu_2 Y_f$$

$$\frac{\partial P_f}{\partial p_{if}} = \left[\int_i^n {p_{if}}^{1-\sigma}\, di\right]^{\frac{1}{1-\sigma}-1} {p_{if}}^{-\sigma}$$

$$\frac{\partial E(P)}{\partial p_{if}} = \mu_2 Y_f \left[\int_i^n {p_{if}}^{1-\sigma}\, di\right]^{\frac{\sigma}{1-\sigma}} {p_{if}}^{-\sigma} = P_f q_{if}$$

$$\frac{\partial E(P)}{\partial p_{if}} = \mu_2 Y_f {P_f}^{\sigma}\, {p_{if}}^{-\sigma} = P_f q_{if}$$

Solve to obtain individual demand function for varieties of good 2 in Equation (12) as:

$$q_{if} = \mu_2 Y_f {P_f}^{\sigma-1}\, {p_{if}}^{-\sigma}$$

Price is simply mark-up over marginal costs and with monopolistic competition, firms equate MR to MC.

$$MR = MC$$

$$\frac{MR}{p_{if}} = 1 - \frac{1}{\sigma} = \left(\frac{\sigma-1}{\sigma}\right)$$

$$MC = \frac{\partial TC}{\partial q_{if}} = \frac{\tau}{\varphi_i}$$

Solve to obtain the optimal price in Equation (16) as:

$$p_{if} = \tau\left(\frac{\sigma}{\sigma-1}\right)\frac{1}{\varphi_i}$$

Profit obtained in the domestic market: set τ =1 to obtain the fob price $p_{iH} = \left(\frac{\sigma}{\sigma-1}\right)\frac{1}{\varphi_i}$.

$$\pi_{iH}(\varphi_i) = p_{iH}q_{iH} - \frac{q_{iH}}{\varphi_i} - {F_H}^D \geq 0$$

$$= q_{iH}\left(\frac{1}{\varphi_i}\right)\left(\frac{\sigma}{\sigma-1} - 1\right) \geq {F_H}^D$$

$$= \frac{q_{iH}}{\sigma}\left(\frac{1}{\varphi_i}\right)\left(\frac{\sigma}{\sigma-1}\right) \geq {F_H}^D$$

But $q_{iH} = \mu_2\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\left(\frac{1}{\varphi_i}\right)^{-\sigma} Y_H\, {P_H}^{\sigma-1}$ such that:

$$= \frac{\mu_2}{\sigma}\, Y_H\, {P_H}^{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\left(\frac{1}{\varphi_i}\right)^{1-\sigma} \geq {F_H}^D$$

$$= \frac{\mu_2}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\left(\frac{1}{\varphi_i}\right)^{1-\sigma} \geq \left[\frac{{F_H}^D}{Y_H\, {P_H}^{\sigma-1}}\right]$$

$$= \left[\frac{\mu_2}{\sigma}\right]^{\frac{1}{1-\sigma}}\left(\frac{\sigma}{\sigma-1}\right)\left(\frac{1}{\varphi_i}\right) \geq \left[\frac{{F_H}^D}{Y_H\, {P_H}^{\sigma-1}}\right]^{\frac{1}{1-\sigma}}$$

Solve for φ_i such that:

$$\varphi_i \geq \varphi_{DH} = \lambda_1 \left[\frac{{F_H}^D}{Y_H \, {P_H}^{\sigma-1}} \right]^{\frac{1}{\sigma-1}}$$

Where $\lambda_1 = \left[\frac{\sigma}{\mu_2}\right]^{\frac{1}{\sigma-1}} \left(\frac{\sigma}{\sigma-1}\right)$ and φ_{DH} is the productivity threshold to produce in the domestic market. This is the expression on equation (17)

To obtain equation (18), assume that a firm decides to export if profit from exporting is positive.

$$\pi_{iF} = \alpha \left(p_{iF} q_{iF} - \frac{\tau q_{iF}}{\varphi_i} - {F_{iH}}^X \right) + (1-\alpha)(p_{iF} q_{iF} - \frac{\tau q_{iF}}{\varphi_i} - {F_{iH}}^X - \beta {F_{iH}}^X) \geq 0$$

$$q_{iF} \left(p_{iF} - \frac{\tau}{\varphi_i} \right) \geq (1 + \beta - \alpha\beta) {F_{iH}}^X)$$

but $p_{iF} = \tau \frac{\sigma}{\sigma-1} \frac{1}{\varphi_i}$ from (Eq.16)

$$q_{iF} \left(\frac{\sigma}{\sigma-1} \frac{\tau}{\varphi_i} - \frac{\tau}{\varphi_i} \right) \geq (1 + \beta - \alpha\beta) {F_{iH}}^X)$$

$$\frac{q_{iF}}{\sigma} \left(\frac{\sigma}{\sigma-1} \frac{\tau}{\varphi_i} \right) \geq (1 + \beta - \alpha\beta) {F_{iH}}^X)$$

but $q_{iF} = \mu_2 \, {p_{iF}}^{-\sigma} \, Y_F \, {P_F}^{\sigma-1}$ from (Eq.12)

$$\frac{\mu_2}{\sigma} \, Y_F \, {P_F}^{\sigma-1} \left(\frac{\sigma}{\sigma-1} \frac{\tau}{\varphi_i} \right)^{-\sigma} \left(\frac{\sigma}{\sigma-1} \frac{\tau}{\varphi_i} \right) \geq (1 + \beta - \alpha\beta) {F_{iH}}^X)$$

$$\left[\frac{\mu_2}{\sigma}\right]^{\frac{1}{1-\sigma}} \left(\frac{\sigma}{\sigma-1}\right) \left(\frac{1}{\varphi_i}\right) \geq \left[\frac{(1 + \beta - \alpha\beta) {F_{iH}}^X)}{Y_F} \right]^{\frac{1}{1-\sigma}} \frac{P_F}{\tau}$$

let $\lambda_1 = \left[\frac{\sigma}{\mu_2}\right]^{\frac{1}{\sigma-1}} \left(\frac{\sigma}{\sigma-1}\right)$ such that:

$$\varphi_i \geq \overline{\varphi_{XH}} = \lambda_1 \left[\frac{{F_H}^X + (1-\alpha)\beta {F_H}^X}{Y_F} \right]^{\frac{1}{\sigma-1}} \frac{\tau}{P_F}$$

This is the expression in equation (18)

Appendix C: Merging Imports Intermediates to Export Transaction and Access to Duty Exemptions

Number of beneficiaries and amount of duty waived, 2004-2013

Table C-1 contains the number of firms that have utilised duty and VAT exemptions over time and the amount of duty and VAT waived. The data include all indirect and direct exporters that import intermediate inputs under the program.

Table C-1: number of beneficiaries and TREO remissions (million US$) per year

year	#firms	US$(mn)
2004	278	99.2
2005	292	143.6
2006	304	275.8
2007	307	316.8
2008	319	199.0
2009	307	177.0
2010	310	270.8
2011	312	433.8
2012	312	350.2
2013	287	290.1

Note: computed from TREO database.

Merger of TREO data to exports database

Table C-2 represent the quality of merger of TREO database to export transaction level database. Most of the beneficiaries under TREO are exporters, unmatched TREO represents indirect exporters who are also eligible but not direct exporters. They represent a very small proportion (0.2%).

Table C-2: Merger of TREO database to Exporter's transaction database

	2004		2006		2012	
	#obs	mean(log TREO)	#obs	mean(log TREO)	#obs	mean(log TREO)
Unmatched TREO	47	15.28725	50	15.64252	85	16.06664
Matched TREO	4,665	16.15008	4,697	16.40777	5,090	16.91685
Diff		-0.86283		-0.76525		-0.85021

Note: The differences in the mean of log (TREO) between matched and unmatched are statistically significant, in favour of the matched category.

Merging outcomes of exports transaction database and imported inputs data

Table C-3 presents the merging results between exports transaction database and the intermediate imports data. The total number of firm-year observations for the exports database is 45753. Out of which 20,205 observations (44.2%) are matched perfectly with imports information. This constitutes the firm-year observations for firms that import intermediate goods for use in the production of exports.

Table C-3: Merger of exporter database with importer database

Year	Exporter d.base	Importer d.base	both d.base	Total
2004	1,649	4,794	1,575	8,018
	20.6	59.8	19.6	100
2005	2,136	4,503	1,754	8,393
	25.5	53.7	20.9	100
2006	2,687	4,410	1,867	8,964
	30.0	49.2	20.8	100
2007	2,793	4,689	1,898	9,380
	29.8	50.0	20.2	100
2008	2,628	4,638	1,911	9,177
	28.6	50.5	20.8	100
2009	2,594	5,420	2,055	10,069
	25.8	53.8	20.4	100
2010	2,655	6,452	2,166	11,273
	23.6	57.2	19.2	100
2011	2,946	6,780	2,344	12,070
	24.4	56.2	19.4	100
2012	2,775	7,663	2,374	12,812
	21.7	59.8	18.5	100
2013	2,685	7,940	2,261	12,886
	20.8	61.6	17.6	100
Total	25,548	57,289	20,205	103,042
	24.8	55.6	19.6	100

Note: Merging of exporter database to importers database (intermediate goods imports only).

Tests for validity of average tariffs per firm as an instrument for imported inputs

Table C-4 shows that there is no correlation between firm export outcomes and average tariff rates per firm lagged three periods. This result is obtained through a bivariate regression of each export outcomes on average tariff rates and controlling for time and firm fixed effects.

Table C-4: Correlation between exporter outcomes and firm tariff rates

Dependent variables:	Log(Exports)	Log(#products)	Log(#countries)
	(1)	(2)	(3)
L3.lnavg_tariff	-0.006	0.010	0.001
	(0.031)	(0.018)	(0.013)
Constant	6.690***	1.643***	1.079***
	(0.081)	(0.046)	(0.032)
Observations	8,365	8,365	8,365
R-squared	0.871	0.788	0.839
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
F-Statistics	14.29	8.003	4.430
Number of id	2442	2442	2442

The results are not statistically significant, implying that firm's average tariff rate is not correlated with export outcomes for the firm. Table C-5 presents results from the first stage of an IV regression.

Table C-5: First stage regression of the IV estimations

Dependent variable	lnimp_ inputs (t-1)	# varieties_all (t-1)	# varieties_HI (t-1)	#varieties_Mid&LI (t-1)
	(1)	(2)	(3)	(4)
L3.lnavg_tariff	-0.046**	-0.029***	-0.009	-0.012
	(0.022)	(0.010)	(0.008)	(0.009)
L3.lnimp_inputs	0.840***			
	(0.009)			
L3.#Varieties_all		0.861***		
		(0.007)		
L3.#Varieties_HI			0.980***	
			(0.003)	
L3.#Varieties_Mid&LI				0.092***
				(0.028)
Constant	1.331***	0.591***	0.124***	1.243***
	(0.103)	(0.036)	(0.021)	(0.041)
Observations	7,070	7,070	7,070	7,070
R-squared	0.743	0.723	0.925	0.971
Year FE	YES	YES	YES	YES
Firm FE	NO	NO	NO	YES
Sector FE	YES	YES	YES	NO
F-statistics	1051	2207	15123	9.665

Notes: Dependent variables are lagged once. The IV are firm input tariffs and imported inputs (value and varieties) and are lagged 3 periods. Input tariffs are calculated at firm level as an average of all tariffs on HS6 intermediate products imported by a firm in a period t. All variables are in logs. Robust standard errors in the parentheses *** p<0.01, ** p<0.05, * p<0.1

The F-statistics from the first stage regression indicate that the instrumental variables are not weak in explaining the variation in the potential endogenous imported inputs.

Construction of key variables under chapter5 from the dataset

Firm exports (Export value)

This is the real export value per firm in a given period (t). It is constructed as a summation of the annual fob export sales value of all 6 digits HS products classification sold by an exporter in a given year in US$. It is deflated using Kenya's aggregate export price index to remove the effects of export price changes.

Number of products and countries

The number of products is the count of all six-digit HS products exported by the firm in period t. It represents firm's extensive margins of trade expansion in period t .The number of countries is the count of all destination countries served by the firm in period t. It represents firm's geographic diversification of exports in period t.

$TREO$ dummy

This is a binary variable equal to one if the importer-exporter type of firm is a beneficiary to TREO and zero otherwise. The access rate for the importer-exporters is low relative to the trend in the beneficiaries shown in Table C-6.

Table C-6: Access rate to TREO over the sample period

	Imp-exporter_TREO		
Year	0	1	total
2004	1377	198	1575
2005	1544	210	1754
2006	1655	212	1867
2007	1694	204	1898
2008	1705	206	1911
2009	1852	202	2054
2010	1975	191	2166
2011	2151	192	2343
2012	2185	190	2375
2013	2084	176	2260
Total	18,222	1,981	20,203
	access rate		
Year	0	1	total
2004	0.87	0.13	1.00
2005	0.88	0.12	1.00
2006	0.89	0.11	1.00
2007	0.89	0.11	1.00
2008	0.89	0.11	1.00
2009	0.90	0.10	1.00
2010	0.91	0.09	1.00
2011	0.92	0.08	1.00
2012	0.92	0.08	1.00
2013	0.92	0.08	1.00

Notes: Number of importer-exporters, 2004 to 2013 is shown on the total column. Only about 10% of the population uses TREO, as shown on column (3). The number of firms is close to the entire census of manufacturing firms in Kenya that stands at 2,097 in 2010/11.

Firm's imported inputs ($impinputs\_us$)

This is calculated as the sum of annual CIF value for each of the 6-digit HS intermediate goods imported by the firm in a given year in US$. The variable captures the exact expenditure by firms on imported inputs. Related, we also created a variable that captures the number of varieties *(#varieties imported)* imported, which count all the 6-digit HS product-country pair per importer. This is in line with the definition adopted by Feng et al. (2016) and Broda and Weinstein (2006) in which a variety is defined as a product-county pair.

Firm average input tariffs(avg_tariff)

Firm average input tariffs are calculated as an average of all tariffs on HS6 products that a firm import for use in its final production process in period (*t).* The import database records all duty and VAT amount per product imported. It also indicates whether that amount is payable or waived under TREO for the eligible firms. In the first step, we calculate the applicable tariff rate per product as the ratio of liable duty to the CIF import value of the product. In the second step, we calculate the firm level tariffs in period (t) as an average across all the 6 digits, HS products imported as intermediate inputs. We follow previous literature in using the firm level average tariff to instrument for imported inputs that is considered endogenous in the literature (Bas & Strauss Kahn, 2014).