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EXPLAINING EXPORT DURATION IN KENYA

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Abstract
This study establishes the hazard rate of exports from Kenya and identifies factors that explain the duration of exports using a discrete-time random effects logit regression model. A difference-in-differences estimator is used to assess the effects of AGOA. Export data between Kenya and 176 partners over 21 years (1995–2016) is used. We find that first-year survival rate is 39%. The median duration of Kenya's exports is 1 year. AGOA enhances export survival, especially for apparels. COMESA also increases export survival but EAC has a dampening effect, even in SSA region. Differentiated products unlike capital-intensive products improve export survival.
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Keywords: Export duration, export survival, intensive margin of trade, discrete-time models

1. INTRODUCTION

Trade survival is a relatively new concept in international trade literature whose interest is rapidly growing. Mainstream international trade theory[1] assumes that trade will persist once established and for this reason often focuses on either trade creation or extensive margin. Extensive margin is where a country expands exports by introducing a new product in a new market, introducing an existing product in a new market or introducing a new product in an existing market (Fugazza and Molina, 2016). In contrast, intensive margin[2] entails maintaining and increasing existing exports with existing partners, hence export survival. Evidence suggests that developing countries perform well at the extensive margin than at the intensive margin (Besedeš and Prusa, 2011; Brenton *et al.*, 2012). Their poor performance at the intensive margin makes them poor exporters than developed countries (Brenton *et al.*, 2012).

Export survival is the consecutive number of years/months in which a country exports nonzero values of a product to a trading partner (Brenton *et al.*, 2012). It was first discovered by Besedeš and Prusa (2006a; 2006b) and Sabuhoro, Larue and Gervais (2006) in the context of international trade. Afterwards, a strand of product-level and lately firm-level studies have emerged. They affirm that trade is short-lived in most countries thereby justifying the need to study export survival, especially in liberalised economies

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1 These are traditional theories of Absolute Advantage, Comparative Advantage and Hecksher-Ohlin.
2 Definition of intensive margin is borrowed from Besedeš and Prusa (2006a) and Brenton *et al.* (2012).

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Table 1. Duration of Kenyan exports to Sub-Saharan Africa and the world (mirror data of HS-6 digit codes)

	Sub-Saharan Africa			World	
Spell	**Period (years)**	**Survival rate after 1st year (%)**	**Survival rate at end period (%)**	**Survival rate after 1st year (%)**	**Survival rate at end period (%)**
1997–2016	20	47	32	42	26
2000–2016	17	40	26	35	21
2006–2016	11	39	24	35	21
2010–2016	7	32	24	33	24

Source: World Integrated Trade Solutions (2019).

like Kenya. From a policymaking perspective, it is important to determine export duration and to explore factors that influence survival of exports. Once these factors are identified, policy interventions can be used to improve the conditions of potential exporters. Raising export survival rates can also deepen existing relationships thereby enhancing export growth. Therefore, raising export survival rates in Kenya to the levels observed in other regions can produce fairly large increases in exports over the long run (Besedeš and Prusa, 2011). Since studies have established a strong positive association between export development, especially for manufacturers and accelerated growth in incomes, longer export survival is likely to trigger economic growth gains.

Different cohorts of export relationships between Kenya and sub-Saharan Africa (SSA), and the World,[3] suggest that survival of Kenyan exports is low and declining with the length of spell (see Table 1). Longer spells have a higher first-year and end-year survival rates indicating the importance of exporting experience. On average, 39.5% and 36% of exports from Kenya to SSA and the World, respectively, survive beyond their first year. These rates are close to those established by export survival studies in Kenya which range between 20% and 48% (Cebeci *et al.*, 2012; Kinuthia, 2014; Fernandes *et al.*, 2016; Chacha and Edwards, 2017). The average export survival at the end of a spell is 26.5% for exports to SSA and 23% to the World. However, this rate can fall to as low as 10% by the thirteenth year (Kinuthia, 2014).

What explains this trend? A review of previous work in Section 3 identifies various determinants of survival including product-specific factors (homogeneous or differentiated) and exporter/importer-specific factors (market size, distance, trade agreements, experience, language, colonial history, exchange rates, fixed and sunk entry costs, quality of institutions, value chain addition, servitisation, time zone[4] and financial development). Although previous studies have assessed the influence of regional trading blocs and reciprocal agreements on trade survival, non-reciprocal agreements (such as AGOA) have not been analysed in Kenya.

[3] SSA is chosen because it is the main market of exports from Kenya. Comparison is made with the world which comprises of other countries that are major and minor export markets for Kenya.
[4] Bista and Tomasik (2017) established that time zones have no effect on the intensive margin but negatively affect the extensive margin.

The current study builds on Kinuthia (2014) and Chacha and Edwards (2017)[5] by examining the role of non-reciprocal trade agreements *i.e.* AGOA (African Growth and Opportunity Act) in export survival. The most outstanding non-reciprocal agreement for Kenya is AGOA, which was initiated in 2000. Although available evidence indicates that AGOA has enhanced textile and apparel exports from Kenya (Condon and Stern, 2011), it is not clear whether this agreement has had any impact on export survival. It important to have this demarcation because export survival varies with the type of economic integration agreement (Türkcan and Saygılı, 2018).

This study also builds on previous export survival literature on Kenya by assessing the effect of factor intensity of a product on survival. Of the two studies in Kenya, only Chacha and Edwards (2017) incorporate differentiated or homogenous products in their study. They find that differentiated other than homogenous products enhnance export survival in Kenya. Whereas this is insightful, we introduce capital/labour intensity. Kenya predominantly exports agricultural products which are labour intensive. Therefore, we evaluate its effect on survival.

The other basis of this study is econometric. Non-reciprocal trade agreements such as AGOA tend to be endogenous due to selection bias (eligible countries have to meet certain conditions) and unobserved heterogeneity. As a remedy, studies such as Frazer and Van Biesebroeck (2010), Edwards and Lawrence (2016), and Fernandes *et al.* (2019) have applied the triple difference-in-differences (DiD) approach to study the effect of AGOA on African exports. We apply this approach on export survival, which to our knowledge has not been done before.[6] Besides using the DiD approach, we also apply a discrete-time survival model. This model is preferred over continuous-time survival model of Cox (1972)[7].

This study determines the hazard rate of exports from Kenya ceasing and identifies the factors that explain Kenya's export duration. The main focus is on the influence of non-reciprocal trade agreements. We find that export survival is enhanced by reciprocal trade arrangements (particularly COMESA) and non-reciprocal trade agreements (specifically AGOA). Apparel exports under AGOA also have a positive effect. Trading under COMESA enhances survival of overall exports and also survival of exports to SSA markets. However, trading under EAC has a dampening effect on overall exports and also survival of exports to SSA markets. Differentiated products increase export survival but capital-intensive products have a negative effect.

[5] This study is closely related to Kinuthia (2014) because it uses country-level data. Chacha and Edwards (2017) study survival in Kenya but use Customs-transactions data. These are the only Kenya-specific export survival studies known to the authors. However, other studies such as Besedeš and Prusa (2006b), Kamuganga (2012), Fugazza and Molina (2016) and Carrère and Strauss-Kahn (2017) include Kenya in their panel.

[6] We thank the anonymous Reviewer for suggesting the DiD approach and capital/labour intensity of products.

[7] Refer to Hess and Persson (2012) for a detailed explanation. Other country-level studies that have applied discrete-time models are; Fugazza and Molina (2016), and Türkcan and Saygili (2018; 2019). Firm-level studies include; Fu and Wu (2014), Inui et al. (2017), Mohammed (2018) and Zhu *et al.* (2019).

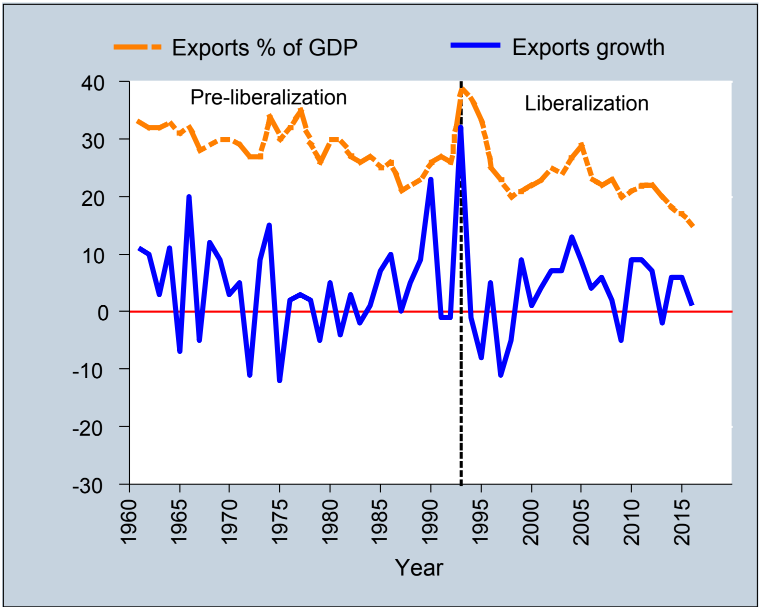

Figure 1. Export growth and share of Exports in GDP in Kenya
Source: World Bank data (2019).

The remaining part of this paper is organised as follows. Section 2 provides some statistics on exports in Kenya. Section 3 reviews both theoretical and empirical literature and identifies knowledge gaps. Section 4 outlines the methodology and data sources. Empirical analysis and interpretation of the findings is the subject matter of Section 5. Section 6 concludes the study and draws policy implications.

2. THE TREND IN EXPORTS

The export sector in Kenya has undergone various policy regimes. They include a protectionist import substitution regime (1963–1979), Structural Adjustment Programs (1981–1992) and liberalisation since 1993 (Wacziarg and Welch, 2008; Nyaga, 2015; ROK, 2017). The sector is currently guided by the National Trade Policy that was enacted in 2017. Since the advent of the liberalisation policy, Kenya has joined the World Trade Organization (WTO), joined 4 regional trading blocs and 2 Free Trade Area agreements, established 36 bilateral trade agreements, joined 2 Non-Reciprocal Preferential Trade Agreements and adopted various export promotion strategies (ROK, 2017). Kenya was among the first countries to sign and ratify the African Continental Free Trade Area (AfCFTA) in 2018 (Abrego *et al.*, 2019).

Despite the various export promotion efforts, Kenya's overall export performance has been dismal as per Fig. 1. The share of exports to GDP has stagnated at around 20% in recent years although it stayed above 30% in the 1960s, 1970s, 1980s and early 1990s and even peaked at 39% in 1993. Additionally, the growth of exports has often been below 10% and recent years of 2013 and 2016 have experienced growth rates that are less than 1%.

Apart from dismal export performance, the survival of Kenya's exports is also low. Kinuthia (2014) and Chacha and Edwards (2017) find the survival rate after the first year of trading is 20% and 48%, respectively. This study finds that the survival rate after the year of trading is 39% with less than 5% of relationships surviving to the twenty-first year.

3. LITERATURE REVIEW

3.1 Theoretical Literature

The incorporation of duration in trade literature is recent because mainstream trade theories of Absolute Advantage, Comparative Advantage and Heckscher–Ohlin (factor endowment) are ignorant of the duration of a trade relationship. They mainly focus on trade creation or the extensive margin thereby explaining why countries trade (Geda, 2012) and not how long trade relations last.

The new trade theory of Vernon's (1966) Product Cycle, explains how a product is initially introduced and is produced by highly skilled labour in an advanced country. As the product matures and acquires mass acceptance, it becomes standardised where it can be produced by mass production techniques and less skilled labour. Hence, comparative advantage in a product shifts from the advanced nation that originally introduces it to a less advanced nation, where labour is relatively cheaper. Thereafter, the advanced country either develops a better version of the product or abandons it. Therefore, this theory explains duration in the transition of the product through innovation, level of development of a country and cost of production. However, it fails to explain short-lived relationships that often occur in practice where countries trade for few years (Besedeš and Prusa, 2006b; Hess and Persson, 2011).

The search and matching theory explains duration of a trade relationship in three phases; searching/matching, deepening/investing and abandoning/ re-matching. As discussed by Rauch and Watson (2003), before trading, buyers from developed countries search for suppliers in developing countries. Thereafter, the supplier starts by exporting small quantities but their relationship with buyers is based on whether they will be reliable. The amount of exports will only persist and increase if the supplier is deemed reliable by the buyer. In contrast, the relationship ends if the supplier is deemed unreliable and as result, the buyer searches for another partner. Depending on the period taken, short-lived relations can occur if a supplier is rejected prior to any transaction with the buyer (Besedeš, 2008). Nevertheless, the following issues arise from this theory: search costs, magnitude of export volume at the start of a trade relationship and information asymmetry.

The product switching theory that was developed by Bernard *et al.* (2010)[8] predicts that firms launch or discontinue exporting products in foreign markets mainly due to demand. Product switching occurs for products that receive negative demand shocks, while products with a positive demand shock continue to be traded. Hence, droping or adding a product is determined by characteristics of the firm, firm–destination and firm–product attributes. This possibility of product turn-over and introduction in a foreign market accounts for duration in trade.

[8] Timoshenko (2015) has advanced this model.

3.2 Empirical Literature

The seminal study by Besedeš and Prusa (2006a; 2006b) uses two US import datasets. The first dataset spans from 1972 to 1988 (7-digit Tariff Schedule), while the second is from 1989 to 2001 (10-digit HS). The median exporting period to the US is found to be between two and four years. This short-lived period has been revised to one year (Besedeš, 2008). Nevertheless, exports from countries in the South survive less than those from Northern countries. From the Cox proportional hazard model, Besedeš and Prusa (2006a; 2006b) find that differentiated products survive longer than homogenous products, survival beyond the first-year increases incidence of survival and larger initial transactions increase survival. They also find that maintaining low transportation costs, high GDP, high tariffs and currency depreciation improves trade survival. Using the same dataset, Besedeš (2008) tests the search cost theory and finds that search costs and reliability of sellers determine duration of exports.

A related study by Nitsch (2009) in Germany confirms the product-specific results of Besedeš and Prusa (2006a; 2006b). Furthermore, standard gravity variables such as market size, distance to German and per capita income are found to reduce seizure of hazard rates. A common border and a common language also increase survival. Brenton *et al.* (2010) notes that sharing a common border is slightly positive for low-income countries, while PTAs between low-income countries decreases survival. This was interpreted to mean that low-income countries were yet to fully benefit from trading among themselves. Exchange rate depreciation of the exporter, size of trading partners, regional exporting experience, trading in differentiated goods and previous trading relationships increase survival rates. Whereas Nitsch (2009) uses data from 1995 to 2005, Brenton *et al.* (2010) use data from 1985 to 2005 for 82 exporting countries and 53 importing countries. Notably, Brenton *et al.* (2010) is among the few preliminary studies that use a discrete-time survival model, specifically the Prentice–Gloeckler model of 1978 to deal with the problem of unobserved heterogeneity.

The concept of fixed costs in survival studies is introduced by Fugazza *et al.* (2016). Estimating a discrete-time probit random effects model and an augmented Cox model on 10 years (1995–2004) of bilateral trade data across 96 countries including Kenya, they find fixed costs, whether sunk or per period, have an effect on the duration of trade. The augmented Cox model accommodates non-proportionality, which is a common problem of continuous-time models.

The study by Carrère and Strauss-Kahn (2017) on export survival in 114 developing countries that export to OECD countries provides some insights into exporting experience. Prior experience with OECD countries is only helpful in the first two years although it generally does not matter where an exporter acquires their experience. Survival is also directly affected by the size and competition within the OECD market since more competition increases the chances of survival. This study uses 5-digit-level SITC data from 1962 to 2010.

Studies on Africa also offer additional insights on export duration. According to Kamuganga (2012), African exports survive for a median of 1 year. Using HS 6-digit-level data from 49 African countries over the period 1995–2009, the study establishes a positive impact of intra-Africa regional trade co-operation on exports survival. Common markets and custom unions are found to catalyse survival, while PTAs in line with other findings *inter alia* (Brenton *et al.*, 2010) have a negative effect on survival. Perhaps these

PTAs have remained dysfunctional due to never ending negotiations. Other factors that enhance survival include financial development, GDP size, market experience, foreign direct investment and quality of export institutions.

Firm-level studies also support many of the product-level empirical findings. Using firm export data from Mali, Malawi, Senegal and Tanzania, Cadot *et al.* (2013) test the determinants of survival beyond the first year. They find that survival is high when firms from a specific country export homogenous products to the same market. A related study by Mohammed (2018) on Ghanaian Manufacturing firms between 1991 and 1998 agree with forecasts of gravity variables (firm age, firm size and initial transaction level) but clues to a possibly ignored factor that exports of final products survive less than non-final products. Overall, the median duration of Ghanaian exporters is 5–6 years. Zambia's exporters hardly survive past the second year in foreign markets (Banda and Simumba, 2013).

Methodologically, earlier studies on duration applied continuous time models rather than discrete-time models. Starting with Hess and Person (2012), discrete-time models have been a norm in recent export duration studies (see Görg *et al.*, 2012; Besedeš, 2013; Görg and Spaliara, 2014; Fu and Wu, 2014; Fugazza and McLaren, 2014; Córcoles *et al.*, 2015; Gullstrand and Persson, 2015; Inui *et al.*, 2017; Chacha and Edwards, 2017; Cui and Liu, 2018; Lemessa *et al.*, 2018; Peterson *et al.*, 2018; Türkcan and Saygili, 2018; Goya and Zahler, 2019; Zhu *et al.*, 2019). Using the original data by Besedeš and Prusa (2006b), Hess and Person (2012) conclude that discrete-time models are more efficient than continuous-time models due to three reasons. First, they handle tied durations of trade that occur when trading relationships halt at the same time; second, they deal with unobserved heterogeneity (frailty); and third, they ignore the assumption of proportional hazards which assumes that the effects of explanatory variables on the hazard rate is constant over time. Fundamentally, discrete-time models should be used because trade data are recorded in a discrete form such as years. Therefore, the following models are preferred: probit, logit, pareto or clog-log which is a discrete-time version of the continuous-time Cox model (Cameron and Trivedi, 2005).

Export duration literature is scarce in Kenya. Though a few studies have included Kenya in their panel (see Besedeš and Prusa, 2006b; Kamuganga, 2012; Fugazza and Molina, 2016; Carrère and Straus-Kahn, 2017), only Kinuthia (2014) and Chacha and Edwards (2017) have conducted exclusive studies on Kenya. The former uses macro-level data, while the latter uses micro-level data (Customs-transactions data). Using bilateral export data from Kenya to 221 countries between 1995 and 2010, Kinuthia (2014) finds that only a fifth of Kenya's exports survive past the first year and 10% remain resolute to the thirteenth year. Cox regression results reveal that Kenya's membership to EAC and COMESA does not have any statistically significant effect. Chacha and Edwards (2017) use a panel logit with random and fixed effect and affirm that COMESA's effect is positive but insignificant. However, Chacha and Edwards (2017) do not consider EAC and both studies (Kinuthia, 2014; Chacha and Edwards, 2017) ignore non-reciprocal trade agreements yet some studies (Condon and Stern, 2011; Fernandes et al., 2019) show that AGOA has enhanced textile and apparel exports from Kenya.

Other determinants based on Kinuthia (2014) are as follows. Infrastructure-related trade costs like shipping logistics, cost of exports and time to export are statistically significant. Macroeconomic indicators captured by financial depth and FDI inflows have a positive effect on survival, while appreciated exchange rates reduce survival. Market liberalisation and all indicators of good governance except corruption also reduce hazard rates. A surprising result was that a high level of corruption increased export survival rates in Kenya. This indicates that corruption "greases" entry and survival as established by Dreher and Gassebner (2013).

4. METHODOLOGY

4.1 Econometric Model

As hitherto mentioned, we apply a discrete-time duration model. We start with a lifetable estimator because it is suited to deal with survival data that are in interval form. Let intervals of time be $d_j = \left(t_j, t_{j+1}\right)$ for j = 1,…, J and t_j is the start of the interval, while t_{j+1} is the end of interval. Subsequently, let f_j represent the number of failures observed in interval d_j, c_j represent the number of censored spell endings observed in interval d_j, R_j represent the number at risk of failure at start of the interval and r_j as the adjusted number at risk of exit at midpoint of the interval (Jenkins, 2005). r_j is represented as follows:

$$r_j = R_j - \frac{d_j}{2} \tag{1}$$

Therefore, the corresponding lifetable estimator discrete-time survival function is given by:

$$\hat{S}\left(j\right) = \Pr\left(T > j\right) = \prod_{k=1}^{j}\left(1 - \frac{d_k}{r_k}\right) = \prod_{k=1}^{j}\left(1 - h_k\right) \tag{2}$$

where T is the duration of exporting before death of a spell and h_k is the hazard rate in the interval d_j. Estimating equation 2 will yield the survival rate of exports from Kenya.

To assess the impact of covariates on the hazard rate, we specify a logit hazard model with random effects (equation 3):

$$h\left(x_{ik}\right) = Pr\left(T_i \left\langle t_{j+1} \right| T_i > t_j\right) = \Lambda\left(\beta \text{Ineffect}_t * \text{USA} * \text{Product}_p + x_{ik}^{'}\delta + \gamma k + v_i\right) \tag{3}$$

where β is the coefficient of the interaction term $\text{Ineffect}_t * \text{USA} * \text{Product}_p$. Ineffect_t is a dummy variable indicating the period before (below 2001) and after AGOA implementation (after 2000). USA is a dummy variable indicating 1 if the trading partner is USA and 0 otherwise. Product_p is a dummy variable with 1 indicating that a product is AGOA eligible and 0 otherwise. Eligible products can be found on the official AGOA website (https://agoa.info/about-agoa/products.html). Since the three variables are related to AGOA, β becomes the DiD estimator. This approach was recommended by Frazer and Van Biesebroeck (2010) and has been applied by studies such as Edwards and Lawrence (2016) and Fernandes et al. (2019).

x_{ik} is a vector of other explanatory variables and δ is a vector of parameters to be estimated. The specific independent variables used in this study are discussed in Section 4.2.

A positive (negative) coefficient indicates a positive (negative) effect on the hazard rate. Conversely, a positive (negative) coefficient has a negative (positive) effect on the survival rate. γk is a baseline hazard rate that is a function of (interval) time. It allows the hazard rate to vary across periods. v_i is a Gaussian distribution random effects indicator that deals with the problem of unobserved heterogeneity (frailty). Including random effects in discrete-time models makes the choice of heterogeneity distribution trivial (Hess and Person, 2012). Nevertheless, similar to Chacha and Edwards (2017), it is important to perform a Hausman test to establish whether the fixed effects or random effects method is appropriate.

Equation 3 can be expressed as a log-likelihood function for a binary panel regression as specified in equation 4:

$$logL = \sum_{i=1}^{n} \sum_{k=1}^{j} \left[y_{ik} log \left(h_{ik} \right) + \left(1 - y_{ik} \right) log \left(1 - h_{ik} \right) \right] \tag{4}$$

where L is an expression of likelihood for the whole sample, in our case countries from $i = 1, \ldots, n$, while k is time interval in terms of spell from $k = 1, \ldots, j$. y_{ik} is a binary dependent variable, which takes the value 1 if spell i is observed to cease during the kth time interval, and zero otherwise. h_{ik} is the hazard rate whose functional form has been specified in equation 3.

All left-censored observations are excluded as is the norm in duration studies. This means that instead of using data for 1995, we use 1996 as the starting year. Conversely, we use data for 2016, which is our final year. Completed spells are recorded as they are. A spell measures the length of time in years it takes to start and end a relationship. If after some time another relationship starts, then it is considered as a second spell and so on. This hints at the problem of handling multiple spells. This study handles multiple spells by creating a multiple spell dummy. Besedeš and Prusa (2006a; 2006b), Brenton *et al.* (2010), Fugazza and Molina (2016) and Carrère and Straus-Kahn (2017) apply the same approach.

4.2 Data and variables

Product level data ranging from 1995 to 2016 is used in this study. Product-level data are used because of the unavailability of firm-level data spanning the study's period.[9] The choice of this period is also because of data availability of variables that are shown in Table A1. Variables are divided into seven major categories comprising trade flow, export cost, macroeconomic factors, institutions, market access factors, product characteristics and trade agreements.

Trade flow data are obtained from the World Integrated Trade Solution (WITS) database for 2019. We use Harmonized System (HS-6 digit) bilateral import data reported by Kenya's partners.[10] Import data are used because it is more accurate than that reported by

[9] Both the World Bank (Exporter Dynamics Database) and Chacha and Edwards (2017) use firm level from the Customs Transactions records of the Kenya Revenue Authority. However, the period of their data spans 2006–2014 and 2004–2013, respectively.

[10] See Table A3 for a listing of the sampled countries.

exporters, especially for developing countries (Brenton *et al.*, 2010; Carrère and Straus-Kahn, 2017). More so, widely used trade databases such as UNComtrade and WITS lack bilateral export records for Kenya for a number of years. For instance, 2011, 2012 and 2013 (Fernandes et al., 2019). Trade flow data are used to compute the failure dummy depending on whether a year had positive trade flows or not.

It is expected that a high cost of exporting increases seizure of hazard rates thereby lowering survival (Kamuganga, 2012). We use distance between Kenya's capital (Nairobi) and the capital of a trading partner to proxy the cost of exporting. Besedeš and Prusa (2006b), Brenton, Saborowski and Uexkull (2010) and Türkcan and Saygılı (2018) have done the same.

Macroeconomic factors are represented by the GDP, exchange rate and financial development of the importer. The GDP of the importer is included to measure the size of the trading partner. Exchange rate is measured in US Dollars. Exchange rate is included to capture the effect of foreign price on export survival. A depreciation of the exchange rate in the importing country is expected to decrease Kenya's export survival. Financial development is the supply of domestic credit from the financial sector to various sectors of the economy except to the central government. It is expected to increase survival rates of exports (Besedeš et al., 2014; Jaud *et al.*, 2015).

The variable on institutions is derived from six indicators of the Worldwide Governance Index (Kaufmann *et al.*, 2011) using the principal component analysis (PCA) approach. The original indicators include; government effectiveness, regulatory quality, voice and accountability, rule of law, control of corruption and political stability and absence of violence in the importing country. The indices range from −2.5 to 2.5 where −2.5 indicates a weak score (poor performance), while 2.5 indicates a strong/good performance. These indicators had a high correlation (at least 0.74) among them, prompting us to conduct a PCA in order to avoid the problem of multicollinearity. Good institutions are expected to increase export survival (Kinuthia, 2014).

Trade agreements are captured by three dummies representing EAC, COMESA and AGOA. For EAC and COMESA,[11] the variable is coded 1 if the trading partner is part of the agreement and zero otherwise. As for AGOA, we only consider USA as the trading partner. The variable is coded 1 if a product has been exported to USA is under AGOA since 2001. This is the difference-in-differences estimator that assesses the effect of AGOA on exports from Kenya. Chacha and Edwards (2017) and Kinuthia (2014) find that the effect of EAC and COMESA on export survival is positive but insignificant. The effect of AGOA is assessed by the current study.

Market access factors are presented by colony, common language and contiguity. All these factors are dummies and they are expected to enhance export survival because they enhance commercial partnerships (Fugazza and Molina, 2016).

Product characteristics entail descriptions of products by their level of differentiation and capital intensity. A product is classified as differentiated following Rauch (1999) criteria. Conversely, we use Schott (2004) to categorise goods as being capital intensive or labour intensive. Both differentiated and capital-intensive goods are expected to enhance export survival (Besedeš and Prusa, 2006b).

[11] See Table A2 for list of countries and their respective periods.

5. EMPIRICAL RESULTS

Fig. 2 presents the distribution of the value of Kenya's exports at product level. Over a third of Kenya's exports are valued below USD 1,000. The value of 58% of exports from Kenya does not exceed USD 5,000. About 12% of products exported from Kenya exceed USD 100,000 making Kenya a unique exporter since all exports are from SSA are expected to be below USD 100,000 at product level (Kamuganga, 2012).

From Fig. 3, the survival rate of exports from Kenya after the first year of trading is 39% then 24% in the second year and less than 10% after the sixth year. About 95% of export relationships die by the twenty-first year. This result indicates that Kenya's exports survive longer in their first year than the African average of 36% (Kamuganga, 2012). The median export period in Kenya is 1 year, while the mean export period is 2.2 years.

Fig. 4 shows duration of exports from Kenya by type of agreement, region, types of product and factor intensity of the product. Exports from Kenya have a higher survival rate after the first year of trading in the EAC market than in COMESA and AGOA markets. The survival rate in EAC after the first year of trading is about 51% followed by COMESA at 39% and AGOA at 35%. Nevertheless, survival in AGOA markets surpasses that of COMESA after the seventh year. In terms of region, Kenya's exports survive highest in the SSA region followed by Europe and Central Asia, North America and the Rest of the World, respectively. These regional disparities cease after the eleventh period where survival in SSA, ECA and NA converge. Regarding the type of product and factor intensity of the product, homogenous and labour-intensive products have a higher survival rate than differentiated and capital-intensive products. This can be attributed to the fact that the country's top export products are agricultural and less mechanised goods. Nevertheless, these discrepancies decline from the twelfth period meaning that experience increases Kenya's potential of exporting capital-intensive and differentiated products.

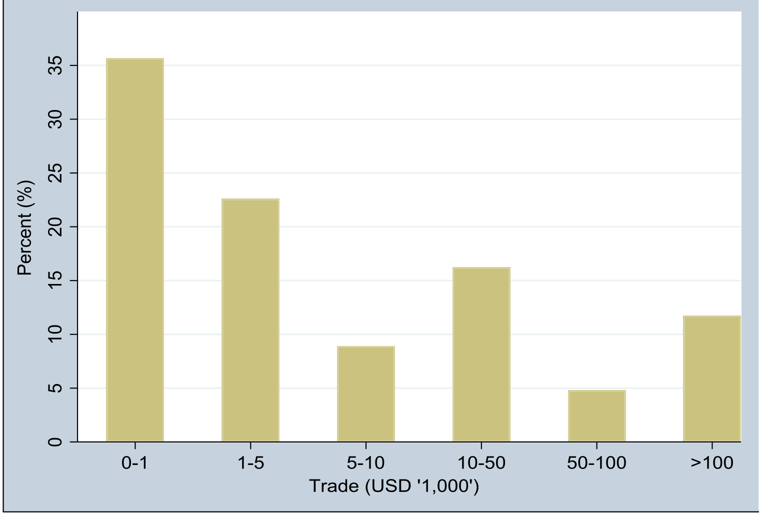

Figure 2. Histogram of export values from Kenya in USD "1,000"
Source: WITS (2019).

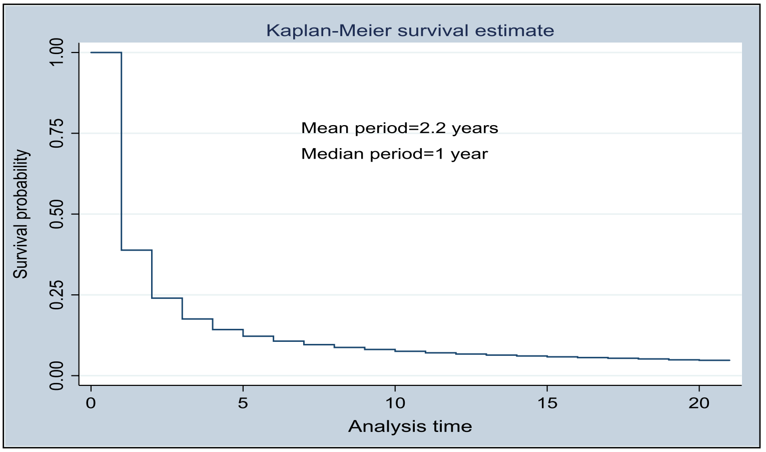

Figure 3. Export Duration for all exports
Source: Authors' computation.

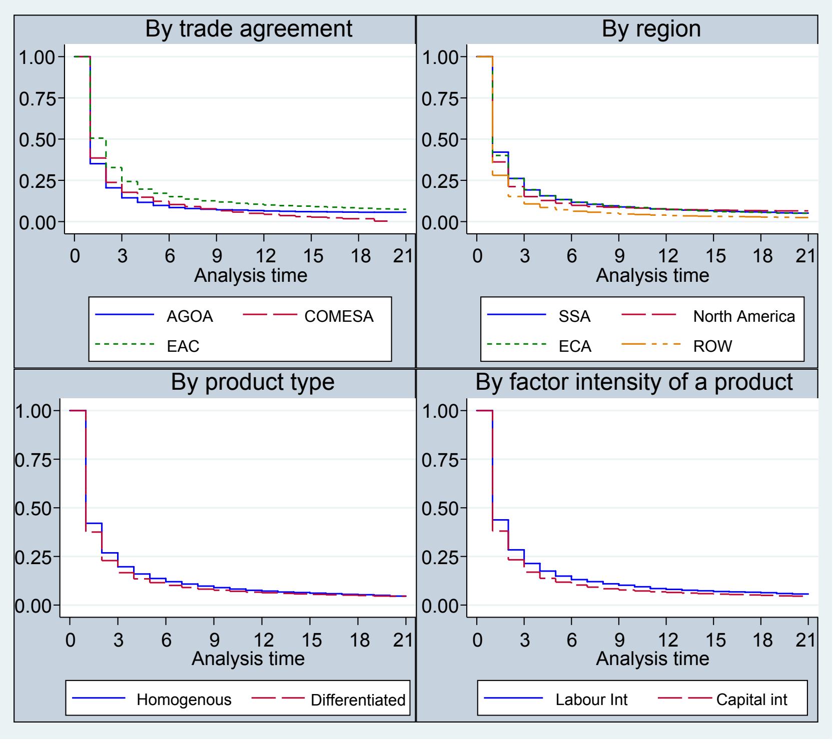

Figure 4. Duration of Kenya's exports by agreement, region, product type and factor intensity of a product
Source: Authors' computation.

Prior to analysing a regression model, a Hausman test was conducted to determine the appropriate model between logit fixed and logit random effects. The null hypothesis assumes that the difference in coefficients is not systematic (random effects) (Hausman, 1978). The test recommended a random effects model (p-value = 1.000). Therefore, results of the logit regression model with random effects are presented in Tables 2 and 3.

The dependent variable is the probability of failure, in that a spell ends. A positive sign on a coefficient indicates an increase in the hazard rate (failure of an export relationship), while a negative coefficient signifies an increase in survival of an export relationship. Duration interval-specific dummies are included to allow the baseline hazard rate to vary over periods (Jenkins, 2008). Equally, year, multiple spell and destination country fixed effects are introduced to account for endogeneity.

Model 1 is the baseline regression. It shows that export survival in Kenya is determined by cost of trading (distance), common language and border, colonial history, GDP, financial development, institutions, capital-intensive and differentiated products and membership in EAC and COMESA. Contrary to Chacha and Edwards (2017) and Kinuthia (2014) who find EAC and COMESA membership positive but statistically insignificant, we find the effects of these trade agreements on export survival to be significant but with opposing effects. COMESA enhances survival, while EAC reduces it. This result is insightful in twofold. First, a bigger market provides an opportunity for market diversification and high demand. COMESA is a bigger than the EAC market. Subsequently, exporting under the AfCFTA is likely to increase survival of Kenya's exports in the SSA region because it is a big market (Abrego *et al.*, 2019). Second, COMESA and EAC markets are more of substitutes than compliments. This means that policy overlaps from one trade agreement to another need to be considered. Or else trade diversion is incipient.

AGOA has a positive but insignificant effect on export survival (Model 1). However, this result is sensitive to the type of product and destination fixed effects. Model 2 considers apparel exports under AGOA. Results are similar to Model 1 except that AGOA is positive and significant. This indicates that AGOA not only increases export flows of apparels from Kenya to USA (Fernandes *et al.*, 2019) but also their survival. Model 3 is similar to Model 1 but without destination fixed effects. The effect of AGOA is positive and significant. In general, AGOA is beneficial because it exposes exporters from Kenya to USA which is a large and dynamic market where competition is stiff.

Models 1–3 indicate that capital-intensive commodities reduce export survival in Kenya but differentiated products have a positive effect. The result of capital intensity means that it is beneficial for Kenya to export labour-intensive commodities where it possesses a comparative advantage.

Kaplan–Meier survival estimates in Fig. 4 show that export survival differs by region (SSA, Europe, North America and ROW), trade agreement (EAC, COMESA and AGOA), factor intensity of a product (capital or labour intensive) and type of a product (differentiated or homogenous). To gather more insight into these differences in export survival, we examine the drivers of export survival within these parameters (see models 4–7 in Table 2 and models 1–3 in Table 3). Survival of exports to SSA is significantly increased by institutions, exchange rate appreciation, differentiated products and COMESA membership. Exporting to EAC markets significantly reduces export survival in SSA (Model 4). This adverse effect implies that trading among homogenous partners may weaken the capacity of the partners to trade in SSA markets. For Kenya, these results

Table 2. Regression results for export duration in Kenya

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Variables	**ALL**	**ALL_APP**	**ALL**	**SSA**	**NA**	**ECA**	**ROW**
Distance	20.77***	20.74***	0.61***	14.32***	−171.39***	−0.84	0.61
	(3.234)	(3.230)	(0.026)	(3.645)	(44.980)	(2.011)	(0.935)
Common language	22.21***	22.17***	−0.08***	5.88***	–	−0.66	5.10***
	(3.436)	(3.432)	(0.028)	(1.392)	–	(1.078)	(1.838)
Colony	−29.49***	−29.47***	0.24***	–	–	–	–
	(4.272)	(4.267)	(0.066)	–	–	–	–
Contiguity	26.04***	26.00***	0.61***	19.40***	–	–	–
	(4.186)	(4.181)	(0.035)	(4.829)	–	–	–
GDP	0.40***	0.40***	−0.13***	0.35***	2.21***	0.10	0.27**
	(0.051)	(0.051)	(0.008)	(0.074)	(0.489)	(0.203)	(0.132)
Financial development	0.00**	0.00**	−0.00***	0.01***	0.00	0.00*	0.00
	(0.001)	(0.001)	(0.000)	(0.003)	(0.005)	(0.002)	(0.002)
Institutions	−0.05*	−0.05*	−0.00	−0.15***	0.26	0.03	−0.37***
	(0.031)	(0.031)	(0.009)	(0.039)	(0.351)	(0.142)	(0.070)
Exchange rate	0.02	0.02	−0.03***	−0.26***	2.44**	−0.14	0.46***
	(0.041)	(0.041)	(0.006)	(0.064)	(0.950)	(0.176)	(0.168)
Capital intensive	0.39***	0.39***	0.44***	0.02	0.76***	1.04***	0.89***
	(0.028)	(0.028)	(0.028)	(0.035)	(0.169)	(0.089)	(0.063)
Differentiated products	−0.05**	−0.05**	−0.07***	−0.06**	−0.59***	−0.27***	0.12**
	(0.022)	(0.022)	(0.023)	(0.026)	(0.166)	(0.088)	(0.058)
EAC	0.22***	0.22***	0.01	0.22***	–	–	–
	(0.038)	(0.038)	(0.031)	(0.042)	–	–	–
AGOA	−0.12	−1.20***	−0.16**	–	−0.21	–	–
	(0.116)	(0.147)	(0.073)	–	(0.149)	–	–
COMESA	−0.44***	-0.44***	−0.25***	−0.58***	–	–	1.20*
	(0.078)	(0.078)	(0.027)	(0.083)	–	–	(0.722)
Constant	−186.28***	−186.11***	0.04	−119.19***	1,545.79***	5.41	−14.01
	(27.630)	(27.595)	(0.874)	(28.536)	(409.667)	(20.157)	(8.643)
Year effects	Yes	Yes	Yes	Yes	No	Yes	Yes
Spell effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination effects	Yes	Yes	No	Yes	No	Yes	Yes
Observations	142,097	142,097	142,628	105,276	4,908	11,803	19,931
Number of products	43,503	43,503	44,032	25,905	1,699	5,351	10,548
Log likelihood ratio	−75,396.429	−75,362.877	−76,213.84	−55,518.481	−2,742.0007	−6,492.0648	−10,134.372
Prob > χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: SSA refers to Sub-Saharan Africa; NA refers to North America; ECA refers to Europe and Central Asia; ROW refers to rest of the world; EAC refers to East African Community, COMESA refers to Common Market for Eastern and Central Africa. Standard errors are in parentheses. AGOA equation is not included because there is no variability in the data since it represents exports to only one country, the United States.

***Statistical significance at 1%; **statistical significance at 5%; *statistical significance at 10%.

Source: Authors' computation.

Table 3. Regression results for export duration in Kenya by agreement and product type

	Dependent variable: Pr. (Failure = 1|x)		
	(1)	(2)	(3)
Variables	**COMESA**	**Capital intensive**	**Differentiated**
Distance	12.09***	0.69***	0.62***
	(4.333)	(0.029)	(0.030)
Common language	−1.11	−0.14***	−0.14***
	(0.871)	(0.031)	(0.032)
Colony	–	0.23***	0.23***
		(0.071)	(0.072)
Contiguity	17.71***	0.60***	0.55***
	(5.919)	(0.038)	(0.041)
GDP	0.53***	−0.12***	−0.12***
	(0.107)	(0.009)	(0.009)
Financial Development	0.01**	−0.00***	−0.00***
	(0.005)	(0.000)	(0.000)
Institutions	−0.28***	−0.02*	−0.02*
	(0.048)	(0.010)	(0.010)
Exchange rate	−0.47***	−0.03***	−0.04***
	(0.101)	(0.006)	(0.007)
Capital intensive	0.01	–	0.51***
	(0.045)	–	(0.041)
Differentiated product	−0.03	−0.08***	–
	(0.031)	(0.026)	–
EAC	0.19***	0.02	0.01
	(0.059)	(0.033)	(0.036)
AGOA	–	−0.23***	−0.17**
	–	(0.078)	(0.079)
COMESA	–	−0.26***	−0.24***
	–	(0.029)	(0.031)
Constant	−100.07***	−0.65	0.33
	(32.588)	(0.932)	(1.107)
Year effects	Yes	Yes	Yes
Spell effects	Yes	Yes	Yes
Period effects	Yes	Yes	Yes
Destination effects	Yes	No	No
Observations	68,370	124,182	110,743
Number of products	17,424	38,302	34,538
Log likelihood ratio	−36,167.616	−65,553.113	−58,563.03
Prob > χ^2	0.0000	0.0000	0.0000

Note: SSA refers to Sub-Saharan Africa; NA refers to North America; ECA refers to Europe and Central Asia; ROW refers to rest of the world; EAC refers to East African Community, COMESA refers to Common Market for Eastern and Central Africa. Standard errors are in parentheses. AGOA equation is not included because there is no variability in the data since it represents exports to only one country, the United States. COMESA equation is preferred over EAC because it has more destinations.

***Statistical significance at 1%; **statistical significance at 5%; *statistical significance at 10%.

Source: Authors' computation.

suggest that it is more beneficial to export to COMESA countries than EAC countries because the former reduces survival of exports from Kenya. Fundamentally, COMESA provides an opportunity for market diversification and high demand.

Results from model 5 show that Kenya's membership in AGOA increases potential of export survival in North American markets. This is because it is positive and insignificant. Capital-intensive products reduce survival in North American markets possibly due to competition and trade barriers. Differentiated products significantly increase survival in North America. Model 6 shows that financial development, capital-intensive and differentiated products significantly determine exports to Europe and Central Asia. Contrary to all regions, both differentiated products and capital-intensive products reduce survival in the Rest of the World. Kenya's membership into COMESA is significantly and negatively correlated with survival of exports to ROW. This is attributed to the effect of competition.

Model 1 in Table 3 indicates that survival of exports to COMESA are explained by the cost of trading (distance), common border, GDP, financial development, institutions, exchange rate and EAC membership. Participation in the EAC market dampens survival of exports to COMESA markets. Implying EAC and COMESA markets could be substituting each other.

According to Models 2 and 3, AGOA and COMESA markets significantly increase export survival of differentiated and capital-intensive products. The COMESA result affirms the fact that African markets are the major recipients of manufactured products from Kenya. As for AGOA, it is beneficial to enhance the capital intensity and level of differentiation of eligible products. Other determinants of differentiated and capital-intensive products are relatively similar. Export survival of these products increases when the importer's language is similar to that of Kenya, has a higher GDP, better institutions and appreciated exchange rate. Differentiating capital-intensive goods boosts their survival (Model 2) but increasing the capital intensity of differentiated goods decreases their survival (Model 3). Other factors that are important to the survival of these products are; cost of trading (distance), contiguity and colonial history.

6. CONCLUSION

The main objective of this study was twofold. First, the study sought to determine the duration of exports from Kenya. Second, the study sought to examine the factors that explain the duration of exports in Kenya, by mainly focusing on the influence of non-reciprocal trade agreements, capital intensity of a product and its level of differentiation. The study uses disaggregated data to establish factors that affect survival of exports to different regions, trade agreements, factor intensity of products and their level of heterogeneity. Annual HS-6 digit product export data from Kenya to 176 partners between 1995 and 2016 is used.

Our results confirm previous findings, which conclude that trade duration is short. The median duration of Kenyan exports is one year, while the mean is about two years. The survival rate after the first year of trading is 39% then 24% in the second year and less than 10% after the sixth year. About 95% of export relationships die by the twenty-first year. First-year survival is highest in the EAC market (51%) followed by COMESA (39%) and 35% for AGOA. In terms of region, Kenya's exports have a highest survival in the SSA region followed by Europe and Central Asia, North America and the Rest of the World, respectively. Regarding the type of product and factor intensity of the product, homogenous and labour-intensive products have a higher survival rate than differentiated and capital-intensive products. However, these disparities reduce with time as exporters gain experience.

Based on the Hausman test, we estimate a discrete-time logit model with random effects. A triple difference-in-differences estimation is conducted to assess the effect of AGOA on export survival. The overall result indicates that AGOA has increased exports survival from Kenya. Especially when destination fixed effects are ignored and apparel products are considered. COMESA is positively and significantly correlated with export survival, while EAC has a significant and negative effect on export survival. In terms of policy, Kenya stands to gain by expanding the current scope of products allowed under AGOA, especially their levels of capital intensity and differentiation.

We also found that survival of exports to SSA is potentially enhanced by regional exporting experience gained in COMESA but dampened by trading under EAC. This finding implies that it is more beneficial for Kenya to trade under COMESA than under EAC if the intention is to boost the survival of exports, especially to SSA. Consequently, trading under a bigger market like AfCFTA is likely to improve survival of Kenya's exports.

On the basis of these findings, we recommend that future duration studies should consider other non-reciprocal agreements like Everything but Arms (EBA) on beneficiaries. Also demarcating trade agreements such EAC into Customs Union and Common Market as done by Türkcan and Saygılı (2018). Future studies should also consider the depth and quality of trade agreements that Kenya engages in as done by Degiovanni *et al.* (2017) and Türkcan and Saygılı (2018). This gives more insights to policy makers other than the use of a dummy to capture membership in a trade agreement. Econometrically, forthcoming studies should apply a flexible link function which Hess *et al.* (2016) show rectifies most biases of discrete-time models. Alternatives of DiD such as propensity score matching (PSM) and synthetic control approach (SCA) should be explored in the context of export survival. Sorgho and Tharakan (2019) have assessed the effect of AGOA and EBA using PSM approach, while Kassa and Coulibaly (2019) have used SCA to study the effect of AGOA on eligible countries. With the availability of firm-level data like the World Bank's Exporter Dynamics Database, more studies, besides Chacha and Edwards (2017), should approach this subject from a micro-perspective. A firm is the unit of an economy that engages in international trade and more insights that are relevant to trade policy can be obtained from firm-level analysis.

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APPENDIX

Table A1. Variable definition, measurement and source

Variable type	Variable name	Variable description	Source
Trade flow	Trade flow	HS-6 digit level data 1995–2016	WITS (2019)
Export cost	Distance	Log of distance in kilometres between Nairobi (Kenya's capital city) and capital cities of trading partners	CEPII (2019)
Macroeconomic factors	GDP (Importer)	Log of GDP of importer in US$	WDI (2019)
	Exchange rate	Official Exchange rates in (US$) of importer	WDI (2019)
	Financial development	Domestic credit provided by financial sector (% of GDP) in the importing country	WDI (2019)
Institutions	Institutions	PCA for six indicators (voice and accountability, political instability, government effectiveness, regulation, rule of law and corruption)	Author's computation
Trade Agreements	EAC	A dummy variable taking a value of 1 if a country is a member of EAC, and 0 otherwise	Author's computation
	COMESA	A dummy variable taking a value of 1 if a country is a member of COMESA, and 0 otherwise	Author's computation
	AGOA	A dummy variable taking a value of 1 if a product is exported to the US under AGOA and 0 otherwise. It should be after year 2000	Author's computation
Market access	Colony	A dummy variable taking a value of 1 if countries share a colonial history and 0 otherwise	CEPII (2019)
	Common language	A dummy variable taking a value of 1 if countries share an official language and 0 otherwise	CEPII (2019)
	Contiguity	A dummy variable taking a value of 1 if countries share a border and 0 otherwise.	CEPII (2019)
Product characteristic	Product differentiation	A dummy variable taking a value of 1 if a product is differentiated and if it is homogeneous	Rauch (1999)
	Capital intensity	A dummy variable taking a value of 1 if a product is capital intensive and 0 if it is labour intensive	Schott (2004)

Table A2. EAC and COMESA membership

EAC	COMESA	
Burundi (2007–2016)	Angola (1995–2007)	Mauritius
Rwanda (2008–2016)	Burundi (1995–2016)	Seychelles (2001–2016)
Tanzania (2000–2016)	Comoros (1995–2016)	Sudan (1995–2016)
Uganda (2000–2016)	Congo, Rep (1995–2016)	Malawi (1995–2016)
South Sudan (2016)	Djibouti (1995–2016)	Rwanda (1995–2016)
	Egypt (1995–2016)	Uganda (1995–2016)
	Eritrea (1995–2016)	Swaziland (1995–2016)
	Ethiopia (1995–2016)	Zambia (1995–2016)
	South Sudan (2016)	Zimbabwe (1995–2016)
	Madagascar (1995–2016)	Tanzania (1995–1999)

Time periods used in the study are in parenthesis.

Note: Years used per agreement are in parenthesis.

Source: COMESA (2019).

Table A3. List of countries

Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belgium-Luxembourg, Belize, Benin, Bermuda, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Central African Republic, Chile, China, Colombia, Comoros, Congo Republic, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Djibouti, Dominica, Dominican Republic, East Timor, Ecuador, Egypt, El Salvador, Eritrea, Estonia, Ethiopia (excluding Eritrea), Fiji, Finland, France, French Polynesia, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Greenland, Grenada, Guatemala, Guinea, Guyana, Honduras, Hong Kong China, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Korea Republic, Kuwait, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Lesotho, Lithuania, Macao, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Micronesia, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Caledonia, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russian Federation, Rwanda, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia and Montenegro, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, South Africa, Spain, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, South Sudan, Sudan, Swaziland, Sweden, Switzerland, Syria, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, Uruguay, USA, Vanuatu, Venezuela, Viet Nam, Yemen, Zambia, Zimbabwe

Source: Own computation.