ESSAYS ON KENYA'S SERVICE EXPORTS

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DECLARATION

I declare that this thesis is my original work and has not been submitted for the award of a degree in any other university or institution.

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This thesis has been submitted for examination with our approval as university supervisors.

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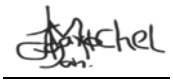
Signature:  Date: July 22, 2022

Dr. Michael Ndwiga

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DEDICATION

To my grandparents, Frisika and Eliud (deceased) Omuse, thank you for shaping my childhood. To Madam Rebecca of Chwele Boys, my nursery school teacher, for introducing me to the world of academia. To my wife, parents, siblings, cousin Ian Watua, aunties Janet Omuse and Serah Watua for their tremendous support. To my last-born sister, Siti Maria, you went too early without celebrating this triumph but I am certain that you are resting in a better place. Finally, to all athletes, especially sprinters, continue breaking world records. I will be an active participant after this Ph.D.

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LIST OF ABBREVIATIONS AND ACRONYMS

AfCFTA	African Continental Free Trade Area
ARDL	Autoregressive Distributed Lag
CLOG-LOG	Complementary Log-Log
CLRM	Classical Linear Regression Model
CM	Common Markets
COMESA	Common Market for Eastern and Southern Africa
COMME	Communication Service Exports
COVID-19	Corona Virus Disease 2019
CU	Customs Unions
EAC	East African Community
EBPOPS	Extended Balance of Payments Services Classification
EIA	Economic Integration Agreements
FDI	Foreign Direct Investment
FTA	Free Trade Area
GATS	General Agreement on Trade in Services
GDP	Gross Domestic Product
GPML	Gamma Pseudo-Maximum Likelihood
ICT	Information Communication Technology
OBS	Other Business Services
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PPML	Poisson Pseudo-Maximum Likelihood
PTA	Preferential Trade Area
R&D	Research and Development
REER	Real Exchange Rate
SSA	Sub-Saharan Africa
STRI	Services Trade Restrictiveness Index

TRANS	Transport Service Exports
TRAVELE	Travel Service Exports
TSE	Total Service Exports
TZD	Time Zone Differences
WDI	World Development Indicators
WTO	World Trade Organization
ZA	Zivot-Andrews
ZIP	Zero-Inflated Poisson

ABSTRACT

Trade in services is a crucial part of international trade in Kenya. About half of the country's total exports are services. The country has a trade surplus in services and is the fifth largest exporter of services in the African continent after Egypt, South Africa, Morocco, and Tunisia. Kenya also has a comparative advantage in services, specifically financial, government, travel, transport, telecommunications, and computer and information. With the declining percentage of goods in total exports, it is increasingly important to establish how Kenya could leverage the growth of the service exports to boost export and economic growth. This thesis attempts to answer this question in three ways, presented as essays (chapters). The first essay (chapter two) is on the drivers of service exports from Kenya. This was mainly to identify domestic factors that boost exports of services from Kenya. Using time-series data dated 1975 to 2017, the study analysed eight autoregressive distributed lag (ARDL) models for traditional services (transport, travel, and government services), modern services (financial and insurance, and communication), and composite services (total, traditional and modern). The results show that exports of services are influenced by the global demand of services, goods exports, human capital, real exchange rate, institutional quality, financial advancement, and infrastructure. However, these variables had varied effects, in the short-term and long-term, across categories of services except for merchandise exports, whose long-run effect was positive for all the services. The second essay (chapter three) is on the role of differences in time zone on bilateral service exports from Kenya. Using bilateral exports data from Kenya to 176 countries for the period from 1995 to 2019, the study analysed ten models using the Poisson pseudo-maximum likelihood (PPML) estimator of the gravity model. Results reveal that the differences in time zones between Kenya and partner countries is significantly positive in technology-sensitive service exports and significantly negative for construction, financial, and government service exports. Further analysis reveals that the effect of differences in time zones on services is non-linear and sensitive to trade facilitation indicators. Therefore, attracting Foreign Direct Investors in technology-sensitive sectors should be encouraged through appropriate policy. Traders in these sectors can also create networks with foreign firms. In addition, reducing regulations, forming service-specific trade agreements, and enhancing infrastructure that aids in communication should be encouraged. The third essay (chapter four) is on the influence of trade agreements on Kenya's services export survival. Kenya has actively pursued bilateral and multilateral trade agreements since liberalizing in 1993. This

approach expands market access of firms and products from Kenya, but it does not guarantee the sustainability of exports in those markets, which is vital to the growth of exports in the long term. To ascertain the factors that affect the survival of service exports, this study relies bilateral service exports data from Kenya to 176 countries dated 1995 to 2019. Results reveal that about 86% of Kenya's service exports survive beyond the first year of trading and about 61% of them are traded for 25 years. Probit regression results indicate that the General Agreement on Trade in Services (GATS), a service-specific trade agreement and the variable of interest, reduced the survival of service exports from Kenya by 0.78%. At the category level, GATS only increased the survival of construction and government services. GATS also reduced the survival of Kenya's exports to Africa. Still, when the quality of institutions is improved and regulations of the service sector are reduced, they affect survival positively and significantly. In terms of policy, boosting trade in goods should be encouraged at the domestic level. Maintaining a stable exchange rate should also be prioritized, but liberalization should be sector-specific. Human capital development, the financial sector, and infrastructure should also be pursued. At the bilateral level, the government can pursue policies that attract Foreign Direct Investors and improve the quality of institutions, particularly regulations that deal with bilateral trade in services. The government should also prioritize improving infrastructure that aids in communication. The survival of service exports can be boosted by pursuing policies that enhance trade in services. Maintaining a stable macroeconomy – especially targeting the Gross Domestic Product (GDP) and exchange rate – and enhancing the capacity of firms to diversify their services and markets and overall experience in foreign markets should also be encouraged.

CHAPTER ONE: INTRODUCTION

1.1 Background

Trade in services has emerged as a crucial element of international trade. Exports of services started featuring prominently in international trade, especially after the World Trade Organization (WTO) ratified the General Agreement on Trade in Services (GATS) in the Uruguay Round talks in 1995. Services are described as per the modes of supply or in a disaggregated classification. Scholars identify four modes of supplying services (see Adlung and Mattoo, 2008; Maurer, Magdeleine, and Lanz, 2016; Maurer, 2020 and WTO, 2022). The first mode refers to exchange across borders where a service is enjoyed in a country other than the country where it has been produced, such as telemedical services offered by a doctor to a patient in a different country. The second mode is the consumption of service overseas. For such a transaction, the consumer migrates to the supplier's country for tourism, medical care, or education. The third mode refers to the commercial presence of a foreign entity such as a hotel, bank, or hospital that provides services in the territory of the consumer. The fourth mode involves a natural person moving to a different country for a period of time to deliver consultancy services. A new mode is under consideration (Mode 5), and it comprises services embedded in traded goods (Cernat et al., 2014; Lodefalk, 2014; Antimiani and Cernat, 2018).

The International Monetary Fund (IMF) sorts exports of services into one- to three-digit level classifications (Loungani, Mishra, Papageorgiou, and Wang, 2017). The one-digit level classification carries twelve (12) major sectors of exports of services. These are in turn sub-classified into twenty-seven (27) sectors at the two-digit level and sixty-six (36) sectors at the three-digit level. For instance, travel services exist at a one-digit level. They are further classified as business or personal services at a two-digit level. At the three-digit level, business services can be for acquiring commodities by border, seasonal, and other short-term works. Personal services can be for education and health purposes *inter alia*. Hence, this sub-classification facilitates analysis at a disaggregated level similar to the Harmonized System or the Standard International Trade Classification for goods.

At present, services make up about a quarter of total trade in the world (Maurer, Magdeleine, and Lanz, 2016; Loungani et al., 2017; Choi and Park, 2018). Goods exports have traditionally

dominated international trade. However, since the 1980s, global growth in exports of services has exceeded exports of goods (Mattoo and Stern, 2008; Mashayekhi, 2019; Morikawa, 2019).

Europe and Central Asia take up over 50% of total exports of services, followed by North America (Loungani et al., 2017; UNCTAD, 2017; Mashayekhi, 2019; Chaitoo, 2020). Since 1980, the exports of services from South Asia, the Arab World, Latin America, and the Caribbean have varied between 1.8% and 6%. From the year 2010, it's come up to about 5%. Sub-Saharan Africa (SSA) takes up the smallest portion of global services trade, with a share that oscillates from 1.3% to 2%.

Worldwide, the United States of America (USA) has been the highest service exporter since 1980. Then the United Kingdom (UK), Germany, and France are next in that order. China and India are among the top ten service exporters, while Brazil and Egypt make it to the top thirty (Loungani et al., 2017; UNCTAD, 2017; Mashayekhi, 2019; Chaitoo, 2020). Recent years have seen emerging economies, including India, Korea, China, Singapore, and Hong Kong, grow enormously in service exports. The most significant types of service exports are traditional services, for example, transport and travel. Exports of modern services such as financial, telecommunication, and computer and information technology have progressively grown since the year 1990 in developed and developing countries (Loungani et al., 2017; UNCTAD, 2017).

In Africa, the biggest services exporter is Egypt, followed by South Africa, Morocco, Tunisia, and Kenya, as displayed in Figure 1.1. In SSA, after South Africa, Kenya is the second biggest services exporter. After Kenya, there is Nigeria, Mauritius, and Tanzania in that order. Kenya's exports of services make up one-quarter of South Africa's service exports. They make up 9% of services exports from SSA and 5% of services exports from Africa. Only exports from nine countries are higher than Africa's average, which is $0.76 billion. These countries are Egypt, South Africa, Morocco, Tunisia, Algeria, Kenya, Nigeria, Mauritius, and Tanzania. Cumulatively, these countries make up about 76% of services exports from Africa.

Even though travel and transport stand out among service exports from Sub-Sahara and the entire African continent, service exports in the computer and information, financial and

telecommunication sectors have grown consistently in the past few years (UNCTAD, 2017; Hoekman, 2018; Ayoki, 2018). Additionally, Dihel et al. (2012), Dihel and Goswami (2016), and Ayoki (2018) also demonstrate that intra-African services trade has substantially improved.

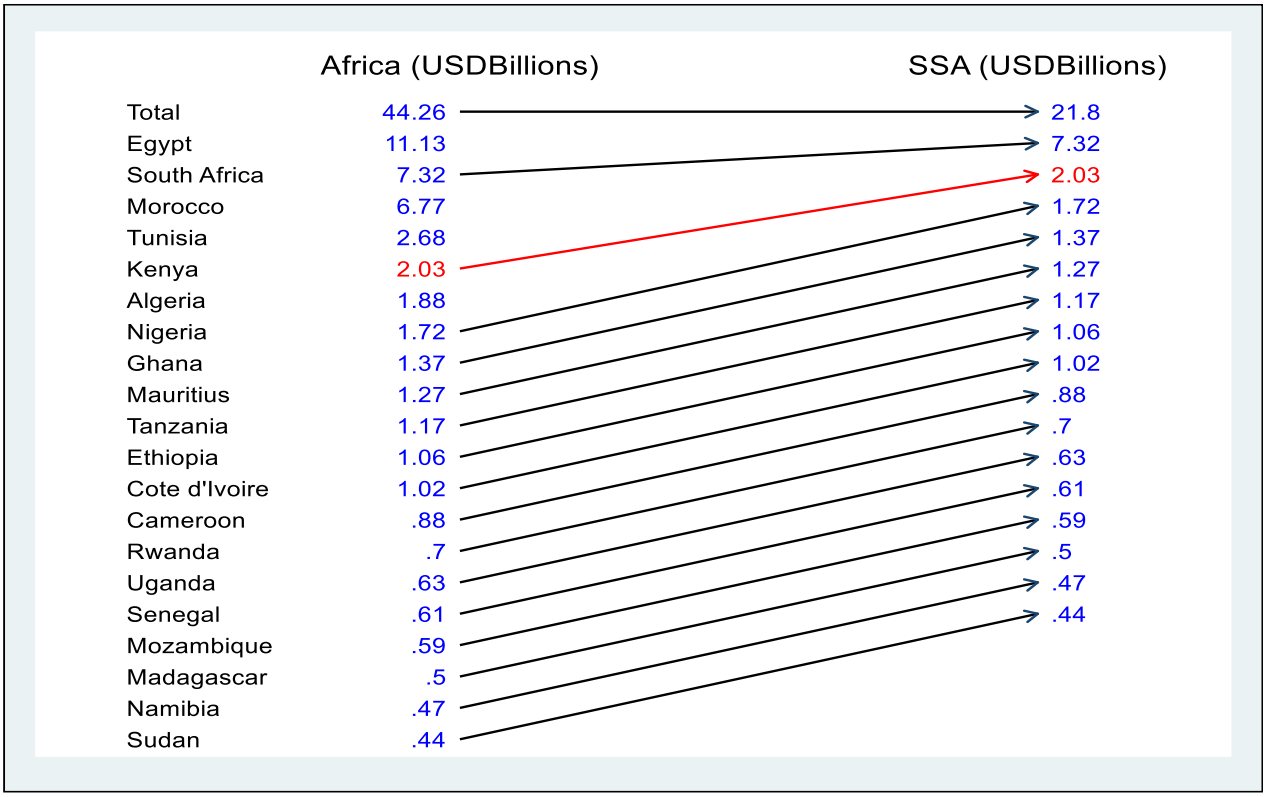

Figure 1.1: Top twenty service exporting countries in Africa, 1975-2020

Source: Author's computation from World Bank (2022) data

1.1.1 Service exports from Kenya

Trend, Composition, and Destination

Kenya's goods exports have frequently surpassed services exports as shown in Table 1.1. However, services exports have steadily risen from a share of about 27% in the 1970s to 47% and 45% in the 1990s and 2010-2019, respectively. The substantial growth in the 1990s is linked to the pursuit of trade liberalization, particularly from 1993, when Kenya is projected to have fully liberalized (Wacziarg and Welch, 2008). As a result, the value of service exports is currently twenty-one times more than in 1975, while that of goods exports is about nine times more. Therefore, the growth of service exports has doubled that of goods during the past four decades.

In addition, the total value of services exports for the first time in the 2010-2019 period, went over US$ 20 billion.

Table 1.1 also shows that Kenya exports more services than it imports. The gap between exports of services and imports has broadened over time. This fact provides two inferences. First, Kenya is definitely an outlier since the rest of SSA exports fewer services than it imports (Ayoki, 2018; Visser, 2019). Secondly, Kenya is characterised by a robust local service sector that requires minimal contribution from overseas. The output from the sector accounted for slightly above 56% of the Gross Domestic Product (GDP) in 2009 (Goswami, Mattoo, and Sáez, 2012). In addition, the service sector contributes the highest value addition to Kenya's GDP and has also experienced stellar growth in the recent past. Kenya's service sector has also provided more jobs as compared to agricultural and manufacturing sectors (Dihel et al., 2012; Dihel and Goswami, 2016; World Bank, 2018; Rodrik, 2018).

Table 1.1: Trend of goods and service exports and imports in Kenya, 1975-2019

Period	Exports				Imports	
	Goods		Services		Goods	Services
	Value (US$, Billion)	Share	Value (US$, Billion)	Share	Value (US$, Billion)	
1975-1979	4.867	73%	1.813	27%	6.000	1.704
1980-1989	10.950	63%	6.477	37%	16.305	4.534
1990-1999	18.161	53%	16.290	47%	43.063	10.317
2000-2009	31.572	62%	19.350	38%	58.070	11.987
2010-2019	58.798	56%	47.604	45%	150.792	29.054

Source: Author's computation from World Bank (2022) data

Figure 1.2 shows that the transport and travel sectors contribute the most significant share of services exports from Kenya, as shown in Figure 1.2. Transport service percentage has risen the fastest from the 1990s. Kenya also exports a significant amount of government services, such as services provided by embassies and consulates as well as military agencies and units. The increase in telecommunication, computer and information services, and financial services exports from 2010 is noteworthy. These data indicate that local expertise in technology and innovation in Kenya is suitable for exporting such services (Dihel et al., 2012). The internet's contribution to Kenya's

GDP is the highest in Africa at 2.9% (Økland, 2019)[1]. Financial services have been boosted by innovations such as M-PESA, a mobile money application (Ngui and Kimuyu, 2018; Økland, 2019; WTO, 2019). Other exports of services from Kenya include maintenance and repair services; personal, cultural, and recreational services; charges such as royalties for the use of intellectual property; and insurance and pension.

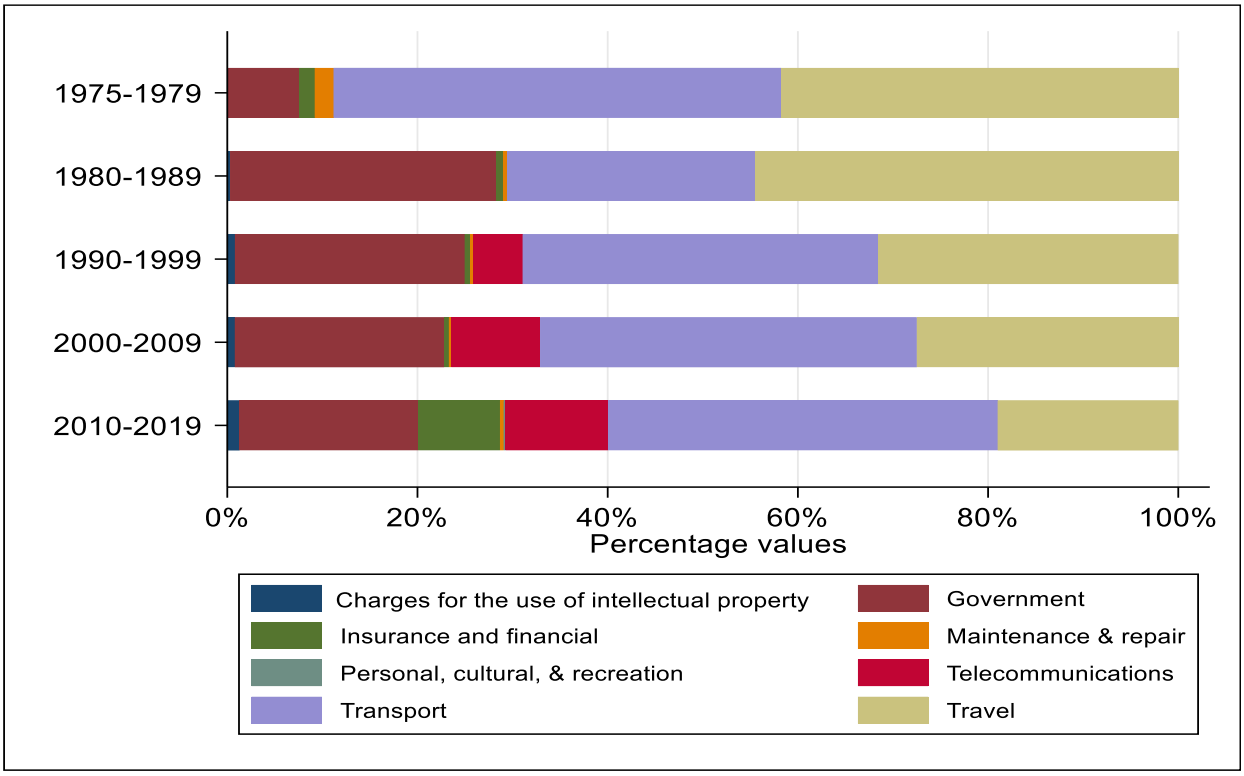

Figure 1.2: Kenya's service exports at one-digit level classification, 1975-2019

Source: Author's computation from WTO (2022) database

Micro-level evidence from Dihel and Goswami (2016) shows that over 35% of service exports from Kenya constitute professional services. Cross-border services followed by natural persons moving to other countries are the most prominent service exports. In the latter are engineering, architectural, auditing and accountancy services. On the other hand, commercial presence and consumption services are the least exported (Dihel et al., 2012).

[1] See Mureithi (2017) for a historical review of digital revolution in Kenya since 1990.

Service exports from Kenya serve many markets. As shown in Table 1.2, the USA and the UK are the top two importers of total services from Kenya. They contribute approximately a third of exports of services from Kenya. They are followed closely by Germany, France, Netherlands, and Italy, in that order. Generally, Europe, the USA, India, and China are the main markets for Kenya's service exports. Uganda, Egypt, Tanzania, Nigeria, and South Africa - in that order, make the top African markets for Kenya's services exports. They are ranked between positions 16 and 27 and all combined contribute to 6% of the total exports of services from Kenya. The USA and UK still import many services from Kenya except for construction services as indicated in Table 2. Japan and Hong Kong are critical buyers of Kenya's financial and insurance services. Compared to other services, intra-African trade is strong in construction services, where Nigeria, Angola, Ethiopia, Egypt, and Mauritius rank among the leading export services destinations.

Table 1.2: Leading destinations of service exports from Kenya, 1995 to 2019

Total	**Transport**	**Travel**	**Insurance**	**Finance**	**Communication**	**Construction**	**Government**	**Personal**
USA	USA	UK	USA	USA	UK	UAE	USA	UK
UK	UK	USA	UK	UK	USA	Austria	UK	USA
Germany	Germany	Germany	UAE	Luxembourg	Ghana	Mauritius	Saudi Arabia	Spain
France	Japan	France	Italy	Japan	Netherlands	Nigeria	Egypt	France
Netherlands	Netherlands	Switzerland	Switzerland	France	Germany	Angola	France	Netherlands
Italy	France	Italy	Canada	Germany	Switzerland	UK	India	Austria
Switzerland	India	Netherlands	Japan	Bermuda	Ireland	Saudi Arabia	Netherlands	Japan
Japan	UAE	China	Netherlands	Ghana	Austria	Egypt	Germany	Italy
India	Italy	India	France	Netherlands	India	Belgium	Qatar	Germany
China	Switzerland	Saudi Arabia	Germany	Hong Kong	France	Ethiopia	UAE	Switzerland

Source: Author's computation from OECD-WTO Balanced Trade in Services (BaTIS) database (Liberatore and Wettstein, 2021)

Dihel et al. (2012) study data collected in a survey of 52 firms and found that the East African Community (EAC) is the chief importer of Kenya's exports of professional services, especially education, legal, architectural, health, accounting, engineering, and insurance services. Using the

same dataset, Dihel and Goswami (2015) find that Kenyan health and education services exports are growing by establishing branches of universities[2] and hospitals in neighbouring countries.

Competitiveness of Kenya's Service Exports

Balassa's Revealed Comparative Advantage (BRCA) index is used to quantify service exports competitiveness in Kenya in Table 1.3. BRCA is computed by taking the percentage of a specific service in the country's total exports and dividing that by the percentage of the service in total global exports (Balassa, 1965). Thus, a BRCA value of more than one shows comparative advantage in the export of the service and conversely for comparative disadvantage.

Table 1.3: BRCA by service export from Kenya, 1975-2014

Service exported	**1975-1979**	**1980-1989**	**1990-1999**	**2000-2009**	**2010-2014**
Transport	2.377	1.991	5.356	3.734	5.122
Travel	2.546	3.304	3.343	1.970	1.795
Financial and insurance	1.240	0.446	0.314	0.098	1.045
Telecommunications, computer, and information	-	-	4.841	2.045	2.582
Government	1.250	8.270	21.429	21.411	26.848
Maintenance and repair	12.264	2.691	1.043	0.508	0.600
Personal, cultural, and recreational	-	-	0.000	0.000	0.000
Charges for the use of intellectual property	-	0.206	0.596	0.238	0.371

Source: Author's computation from Loungani et al. (2017) and World Development Indicators (WDI) (2022) data

According to Table 1.3, between 1975 and 1999, Kenya had a comparative advantage in exporting travel, transport, government, and maintenance and repair services. This was mainly induced by the existing physical infrastructure and trade liberalization policy in 1993 (Wacziarg and Welch, 2008). The advantage in maintenance and repair was, however, lost in 2000, never to be regained. This finding means that Kenya's maintenance and repair services supply has withered at the expense of modern services such as financial, insurance, and pension exports, whose competitiveness improved from 2010. This result is credited to rising innovation via mobile money

[2] Most of these branches have so far been closed (see Nation (2017) for examples).

transfer that has boosted financial service exports and insurance (Ngui and Kimuyu, 2018; Økland, 2019). The country gained a comparative advantage in telecommunications, computer, and information services exports in 1990 and has maintained it ever since. This gain is driven by technological advancement in which Kenya is ranked position 13 in the continent and 138 in the world in ICT development (ITU, 2019).

Then again, the country has constantly suffered a comparative disadvantage with regard to the monies charged for intellectual property use and exports of personal, cultural, and recreational services. These services have remained untradeable due to barriers, particularly on the movement of people, since they fall under the fourth mode of supplying services (Loungani et al., 2017). This mode of service delivery is highly regulated compared to other modes (Borchert, Gootiiz, and Mattoo, 2014; Fiorini and Hoekman, 2018).

Trade Agreements and Restrictions in Service Export Regimes in Kenya

Before 1995, goods stood out the most in Kenya's export schedules. Over the years, Kenya has experienced five key export regimes (Majune and Mwania, 2020). The first was the import-substitution regime (1963-1979), followed by the Structural Adjustment Policies (SAPs) (1980-1992). The import-substitution policy was against imports while SAPs advocated for exports of goods. During these export regimes, Kenya entered four trade agreements: General Agreement on Tariffs and Trade (GATT) (1964); EAC (1967-1977); Preferential Trade Area (PTA) (1981) and the Intergovernmental Authority on Drought and Development (IGADD) (1986) (Majune and Mwania, 2020).

Economic liberalization and export-promoting policies characterised the period 1993 to 2002 (Wacziarg and Welch, 2008; Majune and Mwania, 2020). During this period, exports of both goods and services were encouraged. In 1995, GATS was ratified, and Kenya also joined the WTO. Kenya entered the Indian Ocean RIM Association (IORA) in 1997, the African Growth and Opportunity Act (AGOA) in 2001, the new EAC in 1999, the Common Market for Eastern and Southern Africa (COMESA, which replaced PTA) in 1994, and the Intergovernmental Authority on Development (IGAD which replaced IGADD) in 1996. The next export policy is associated with the Economic Recovery Strategy for Wealth and Employment Creation (ERS) (2003-2007).

With ERS in place, Kenya set up a National Export Strategy in 2004 and signed the EAC Customs Union in 2005.

Vision 2030 and the National Trade Policy of 2017 laid the foundation for the fifth export regime. During this regime, services exports have been advanced by means of trade agreements and legislation. Kenya is now working on implementing service-specific commitments within the WTO, as well as regional and preferential market agreements including EAC, COMESA, the Economic Partnership Agreements (EPAs), which were endorsed in 2016, and the African Continental Free Trade Area (AfCFTA), whose operations started in January 2021 (refer to Table 1.4 for the status of negotiations on services trade across agreements which Kenya is a member).

Table 1.4: Status of negotiations on service-specific policy areas in EAC, COMESA, and AfCFTA

Policy	**EAC**	**COMESA**	**AfCFTA**
Competition policy	Yes	Yes	Yes
Countervailing measures	No	Yes	Yes
State Trading Enterprises	No	No	Yes
GATS	Yes	Yes	Yes
Intellectual Property Rights	No	No	Yes
Investment policy	Yes	Yes	Yes
Labour market regulations	Yes	Yes	No
Education and training	Yes	Yes	Yes
Cultural cooperation	Yes	Yes	Yes
Research and technology	Yes	Yes	Yes

Source: Author's computation from Hofmann et al. (2017; 2019)

Locally, services are usually subject to more regulation than goods because, unlike goods whose tariff obstacle is obvious, identification, quantification and rationalisation of restrictions on services is hinged on the understanding of the regulatory framework (Francois and Hoekman, 2010; Borchert, Gootiiz, and Mattoo, 2014; Fiorini and Hoekman, 2018; Borchert, Magdeleine, Marchetti and Mattoo, 2020). Kenya has liberalized most of its service sectors - professional services, transportation, telecommunications, and banking and insurance (Balistreri et al., 2009, 2015). The indices of Services Trade Restrictions by sector - for 2008-2011 and 2016 - are

presented in Figure 1.3. The score ranges from 0 to 100[3]. 0 denotes that the sector is open, 12.5 means the sector is open with minor transparency issues, 25 means a sector has minor restrictions, 50 means a sector has no restrictions (whether major or minor), 75 denotes a sector is mainly closed with minimal chance of entering and setting up operations. At the same time, 100 indicates a sector is wholly closed (Borchert et al., 2020). The overall score in 2016 was 46.9, down from 48.8 in the 2008-2011 period. This score indicates that the service sector slightly opened over time, but it neither has major nor minor restrictions. Distribution (retail) services are the least restricted, followed by telecommunications, financial, and transport. Professional services are highly regulated, with a score of over 70/100 in both periods. These services range from accounting to auditing and legal services and fall within the broad category of Mode 4 that is highly regulated as relative to other modes as it entails distinct border measures such as visas, work permits and quotas (Shingal, 2022).

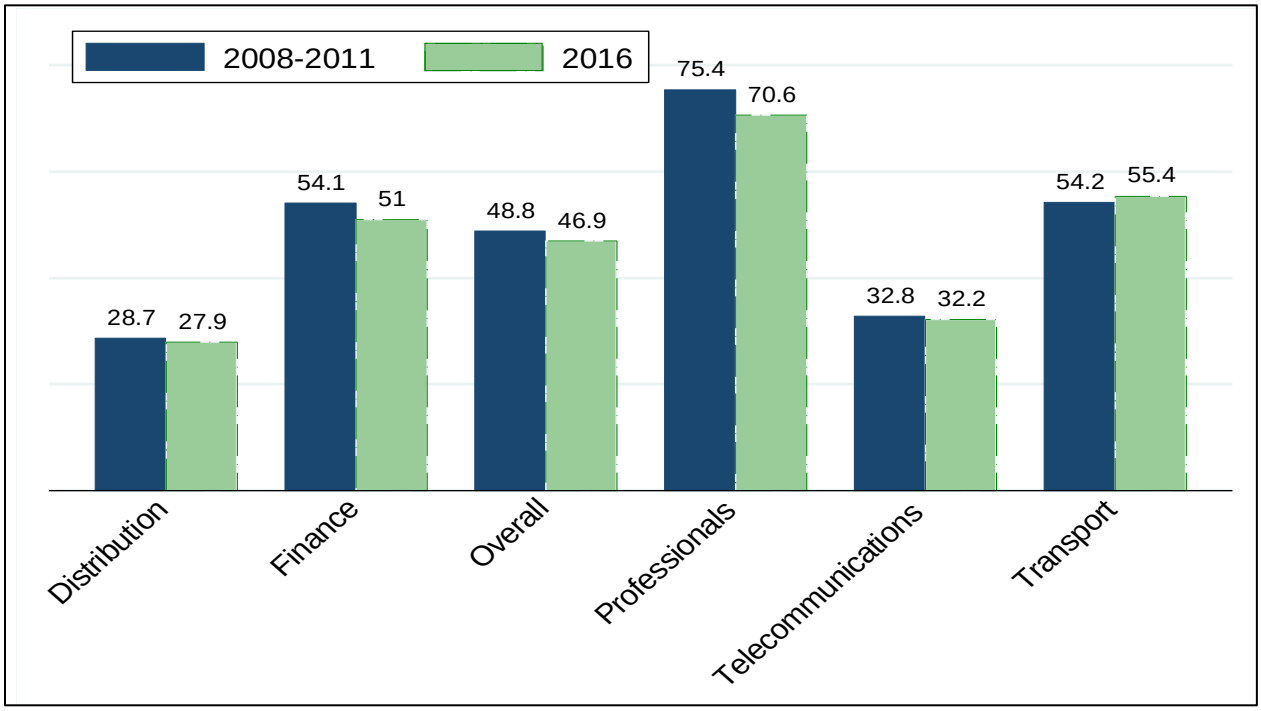

Figure 1.3: Service Trade Restriction Index by Sector in Kenya

Source: Author's computation from Service Trade Restrictions Indicators (STRI) database

[3] Services Trade Restrictions Index (STRI) is a weighted arithmetic average of four main policy categories - conditions on market entry, conditions on operations, measures affecting competition, and regulatory environment and administrative procedures that are measured from 0 to 100 for 5 major service sectors and their respective 23 sub-sectors (Borchert et al., 2020).

1.2 Problem statement

Recent trends indicate that services are becoming more central to Kenya's exports. They contribute to nearly half of Kenya's overall exports and are also competitive, more so in travel, transport, government services, financial, telecommunications, computers, and information. In addition, exports in services exceed services imports resulting in a trade surplus. In comparison, the percentage of goods in Kenya's cumulative exports has dropped in recent years. Also, Kenya has experienced dismal growth in overall exports and hardly exceeds 10%, and it contracted to -6.8% in 2017 (Majune, Moyi and Gathiaka, 2020).

This is unanticipated given the various export promotion strategies that the government has adopted over the recent years. The National Trade Policy of 2017 and the third Medium-Term Plan 2018-2022 outline several export advancement strategies (ROK, 2017; 2018). However, these schemes primarily focus on trade in goods. Literature also mainly concentrates on exports of goods (Söderbom and Teal, 2003; Were and Kayizzi-Mugerwa, 2009; Kinuthia, 2017; Chacha et al., 2017; Majune et al., 2020; Türkcan, Majune and Moyi, 2022), leaving a huge gap in studies on exports of services. The few studies that examine exports of services include Dihel et al. (2012) and Balistreri et al. (2009, 2015), who utilise firm-level data. Others are Ikiara, Nyandemo, and Ikiara (2008), Serletis (2014), Khanna et al. (2016), and Kodi (2016), who make use of macro-level data. All these studies make use of descriptive statistical analysis with the exception of Kodi (2016) and Balistreri et al. (2009, 2015). Kodi (2016) uses Ordinary Least Squares (OLS) regression whereas Balistreri et al. (2009, 2015) make use of a Computable General Equilibrium (CGE) approach.

However, these studies do not give answers to some critical queries. First, while factors that determine overall exports of services are identified by Kodi (2016), the study ignores the factors that determine the export of different services. Kenya's services exports are varied (viz., transport and travel, telecommunications, computer, business, financial services, and professional services, information services,) and so it is imperative to establish the factors that determine of every type of service that is exported. Since the trend and competitiveness of each service are distinct, their determinants are also likely to be unique. Therefore, it is essential to disaggregate service exports

in analysing their determinants. Some scholars (Sahoo and Dash, 2017) have demonstrated that in India, exports of traditional services (transport and travel) have determining factors that are different from those of modern services (insurance, financial, business, software and communication services).

Balistreri et al. (2009), using the CGE estimation method, forecast the influence of liberalizing business service providers (by local and foreign) on consumption and GDP growth. This study is advanced by Balistreri et al. (2015), who assess how preferential trade agreements (from Europe and Africa) affect business services providers in Kenya. Though these studies are informative and shed light on possible outcomes of when the service sector has been liberalized, they do not consider other essential factors (such as infrastructure) that affect services in Kenya. Also, they do not capture other services, including government services.

Secondly, studies have not determined the drivers of Kenya's bilateral exports in services. In section 1.1.1, we see that Kenya exports its services to many market destinations, the largest of them being North America, Europe, and Asia (India and China). The markets are situated in different time zones. The difference in time zone is a determinant of bilateral trade that is often ignored in trade literature, yet it can hinder or boost international trade (Kandilov and Grennes, 2012). Coordination and real-time communication among businesses can be hampered if the regular working hours of trading partners do not coincide. Production and delivery of services can also be affected by "jet lag" if business travellers have to move from East to West and thus take time to adjust to fatigue from travelling. Conversely, time zone differences can enhance trade if the production process can be fragmented into stages such that one stage is started in one country and completed in another country. The transmission of instructions from one stage to another is facilitated by the communication network in the two countries as it is assumed that work is best executed during the daytime and the time zones are non-overlapping. Unlike goods, services are best suited for this arrangement due to their nature of intangibility and the possibility of disintegration.

Third, the duration and survival of services exports from Kenya have neither been extensively investigated nor documented. Besedeš and Prusa (2006a, b) and Sabuhoro, Larue, and Gervais

(2006) first came up with this concept in international trade literature by showing that most export relationships are short-lived. This has also been studied in Kenya's goods exports (Kinuthia, 2014; Chacha and Edwards, 2017; Majune et al., 2020; Türkcan, Majune and Moyi, 2022) but not yet for services exports. Therefore, this study seeks to evaluate services exports survival, particularly how Economic Integration Agreements (EIAs) impact the survival of services exports given the current trade negotiations on trade in services (Hoekman and Njinkeu, 2017; Simo, 2020). Generally, a high survival rate increases long-run export growth and deepens existing trade relationships (Brenton et al., 2010; Besedeš and Prusa, 2011).

1.3 Research questions

The general research question of this study was how are exports of services from Kenya performing? The specific questions were:

1) What drives service exports from Kenya?
2) How do differences in time zones affect bilateral service exports from Kenya?
3) How do trade agreements affect the survival of service exports from Kenya?

1.4 Objectives

The main objective of this study was to describe the performance of the various types of service exports from Kenya. The specific objectives were:

1) To determine the drivers of service exports from Kenya.
2) To determine the impact of differences in time zones on bilateral service exports from Kenya.
3) To analyse the impact of trade agreements on the survival of service exports from Kenya.

1.5 Significance of the Study

This essay aims to be helpful to academics and policymakers in the country. With diminishing exports of goods as observed in recent years and the ongoing domestic deindustrialization, exports of services could improve Kenya's balance of payments (BOP) account. Exports of services have grown consistently (see Table 1.1). Identifying the determinants of the growth and measures for sustaining the trend would benefit academics, researchers, and policymakers.

By identifying the supply-side factors that affect exports of the various services from Kenya, this study will aid policymaking in various government ministries and the Export Promotion Council. The determinants of bilateral service exports could help formulate demand-side policies. By means of this approach, we shall identify macroeconomic factors of the destination markets that influence the uptake of services from Kenya. In particular, time zone differences will inform businesses (Foreign Direct Investors) on strategies of cutting costs. For instance, businesses can decide to use subsidiaries when the cost of trading arising from time zone differences is high. Understanding the level and causes of export survival will be vital towards improving the long-term export growth (Besedeš and Prusa, 2006a, b; Brenton, Saborowski and Uexkull, 2010) by the government. Demonstrating how trade agreements affect export survival will inform the government's domestic trade policy on trade in services. Overall, this thesis will provide stylized facts on the trade of services from Kenya to the rest of the world.

1.6 Organisation of the Study

The remainder of the thesis is ordered into four chapters. Each chapter is an essay in line with the respective objectives except the last chapter, which concludes the thesis. Chapter Two is the first essay which is on the drivers of service exports from Kenya. Chapter Three is the second essay and establishes the determinants of bilateral service exports from Kenya. It dwells deeply on the role of differences in time zones in service exports. Chapter four is the third essay, and it establishes the effect of trade agreements on Kenya's services export survival. Chapter five is the last, and it concludes the thesis and offers policy implications.

CHAPTER TWO: DRIVERS OF SERVICE EXPORTS FROM KENYA[4]

Abstract

Kenya is grappling with low export growth rates, yet it has a surplus in service trade and is the second top exporter of services in Sub-Saharan Africa. Hence, there is a need to explore this untapped economic potential in services by establishing domestic factors that boost their exports. This study investigates the drivers of traditional (transport, travel, and government services), modern (financial and insurance, and communication), and composite (total, traditional and modern) service exports in Kenya. We estimate eight ARDL models for each aforementioned service using time series data sourced from the World Development Indicators database for the period 1975-2017. Results reveal that total exports of services are influenced by world demand, goods exports, financial development, human capital, institutions, Real Exchange Rate, and infrastructure. We make five major insights at the disaggregated level. First, exports of goods improve exports of all services in the long-run. Second, world demand, which signals external shocks, affects traditional services positively. As for modern services, the effect is positive in the short-term but not in the long-term. Third, the J-curve effect is evident in travel, transport, insurance, financial, and communication services. Fourth, institutions are a short-run phenomenon since none of the services is significantly affected by them in the long-run. Fifth, human capital, financial development, and infrastructure improve most services in the long term, but the effect is negative in the short term. For possible policy changes, we recommend the promotion of merchandise exports as it improves exports of all services. Other policy instruments vary across services.

Keywords: Service exports, ARDL model, Kenya

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2.0 Introduction

Kenya has emerged as a powerhouse in the export of services, mainly in the neighbouring countries and far-off markets. The service sector has more employees and contributes more to the domestic GDP than the agricultural and manufacturing sectors (Dihel et al., 2012; World Bank, 2018; Simo, 2020). Externally, Kenya ranks second after South Africa in service exports in Sub-Saharan Africa (SSA) (Ayoki, 2018). Services currently take up 49% of total exports, nearly double the global rate of 25% (Loungani et al., 2017; Ayoki, 2018).

Travel and transport services are the highest service exports from Kenya as shown in Figure 1.2. They accounted for 89% of service exports in the 1970s but have since dropped to 60% in the 2010-2019 period. Travel is either for personal (tourism) or business purposes (Mbithi and Chekwoti, 2014; Loungani et al., 2017). Transport entails sea, air, road, postal, and courier services. The share of government service exports is also noteworthy. On average, government services have accounted for over 20% of service exports from Kenya from 1975-2019. Government services constitute services offered by consulates and embassies and military units and agencies (Loungani et al., 2017).

The share of telecommunication, computer, and information service exports has increased substantially since 1990. Financial and insurance service exports have also grown markedly. Before 2010, the share of financial and insurance exports in service exports was about 1% but has since grown to 8.6% in the 2010-2019 period. This growth is possibly a spill over effect of enhanced financial inclusion that has been boosted by mobile money apps such as M-PESA (Ngui and Kimuyu, 2018; WTO, 2019). Other service exports from Kenya are personal, cultural, and recreational services, maintenance and repair, and royalties charged for intellectual property usage.

Kenya is competitive in transport, travel, and government services exports (see Table 1.3). The comparative advantage of these exports peaked in the 1990s following economic and political liberalization[5]. The competitiveness in the export of financial and insurance services has been

[5] Majune and Mwania (2020) indicate that Kenya has experienced five major trade regimes. However, liberalization started in 1993.

improving since 2010[6]. The country has been gaining a comparative advantage in telecommunications, computer, and information service exports. Kenya should maintain its road and communication infrastructure in good condition while closely watching its international image to maintain this comparative advantage. However, the country's competitiveness in maintenance and repair service export has been declining. In addition, for a long time, Kenya has suffered a comparative disadvantage in personal, cultural, and recreational, and charges for the use of intellectual property service exports. These areas need attention if Kenya is to maintain her comparative advantage in service exports, possibly through improving the road infrastructure, internet connectivity, strengthening trade agreements, and increasing participation in international trade fairs to market Kenya's services.

2.1.1 Problem statement

Services are heterogeneous variables with different compositions, trends, and competitiveness. Therefore, their determinants are also different. Failure to distinguish the determinants is likely to lead to errors in policy formulation (La, Patterson, and Styles, 2005; Kandilov and Grennes, 2010). Sahoo and Dash (2017) show that traditional services (transport and travel) and modern services (communication, insurance, financial, business and software services) have different determinants in India[7]. They find that total service exports are determined by human capital, financial development, infrastructure stock, Foreign Direct Investment (FDI) inflow, Research and Development (R&D) expenditure, institutions, real exchange rate, world demand for service exports, and manufacturing exports. Endowment factors highly affect modern services, including financial development, human capital (tertiary-level education), telecommunication density, R&D expenditure, and institutions. Real exchange rate, world demand for service exports, and manufacturing exports also enhance modern service exports. Infrastructure development (energy, telecommunication, and transportation network) is the primary determinant of traditional service exports. Other vital factors are world demand for service exports, human capital, real exchange rate, and manufacturing exports.

[6] Kenya was the only top exporter of services in Africa that enjoyed a comparative advantage in financial services exports in 2016 (Were and Odongo, 2019).

[7] Sahoo and Dash (2014; 2017) do not cover exports of government services, and maintenance and repair in their study.

In Kenya, a handful of studies have examined service exports. They include Dihel et al. (2012) and Balistreri et al. (2009, 2015), using firm-level data. Macro-level studies include Ikiara, Nyandemo and Ikiara (2008), Serletis (2014), Khanna et al. (2016), and Kodi (2016). These studies use descriptive analysis except Kodi (2016) and Balistreri et al. (2009, 2015). Kodi (2016) uses Ordinary Least Squares (OLS) regression whereas Balistreri et al. (2009, 2015) utilise a Computable General Equilibrium (CGE) approach. However, both papers cover a few services and ignore some essential factors that determine the export of services. For instance, Kodi (2016) only establishes determinants of total service exports. Balistreri et al. (2009, 2015) explain the effect of liberalization on the service sector but ignore factors such as financial development that affect service exports from Kenya. They do not also cover other services, such as government services. This study examined determinants of total service exports from Kenya, distinguishing between traditional and modern export services using time series data from 1975 to 2017. The data was sourced from the Balance of Payments Manual 6 database of the International Monetary Fund.

2.1.2 Research questions

The general research question in this chapter was what drives Kenya's exports of services. The specific questions were:

1) What drives Kenya's traditional services exports (transport, travel, and government services)?
2) What drives Kenya's modern services exports (financial and insurance, and communication and information)?

2.1.3 Objectives

The main objective of this chapter was to explain the drivers of Kenya's exports of services. The specific objectives were:

1) To determine the drivers of Kenya's traditional service exports (transport and travel, and government services).
2) To determine the drivers of modern service exports (financial and insurance, and communication and information) from Kenya.

2.1.4 Significance of the study

It is imperative to establish drivers of service exports for two reasons. First, our results will benefit government policymakers since we identify domestic factors that affect traditional service exports versus modern service exports from Kenya. These factors act as policy instruments for boosting exports of specific services. Second, the study findings also benefit current and potential service traders in the various service export sectors. Lastly, this study increases stylized facts on the export of services from Kenya and Africa at large. This output generally advances knowledge on service exports.

2.1.5 Organisation of the study

The remainders of the chapter is organised as follows. Section 2.2 reviews theoretical and empirical literature, Section 2.3 explains the methodology while section 2.4 presents the results and discusses them. Section 2.5 concludes the chapter and proposes some policy recommendations.

2.2 Literature review

2.2.1 Theoretical literature review

Services can be traded in the open market (Hindley and Smith, 1984; Bhagwati, 1984; Deardorff, 1985) but cannot be explained theoretically since they have underdeveloped trade theories (Ahmad, Kaliappan, and Ismail, 2017; Fazio, 2021). Therefore, theories devised to describe goods trade could be employed to explain international services trade, with some modifications to account for non-transportability and the intangibility of services. For example, the perfect competition assumption could be married to David Ricardo's comparative advantage theory to explain services (Sapir and Winter, 1994; Miroudot, 2017). The comparative advantage theory is an advancement of Adam Smith's absolute advantage theory. Smith assumes that countries export goods and services with which they possess absolute advantage (produce with less labour cost) and import those commodities with which they have whose have absolute disadvantage (labour cost is high).

Conversely, Ricardo's theory forecasts that a nation may enjoy an absolute advantage over a trade partner by producing specific commodities. However, the two nations could still trade as a result of related opportunity costs, that is, their comparative production costs. This situation is ultimately depicted by differences in labour productivity and technology, which apply to services (Miroudot, 2017; Fazio, 2021).

The Heckscher-Ohlin or H-O theory postulates that the difference in countries' factor endowments gives rise to international goods trade (in this case, services trade). A country is going to export a good (or service) that employs a production factor that is more abundant within its borders than within its trading partners' borders and import when it is vice versa (Geda, 2012). In the case of services, it is crucial to establish whether the service is capital or labour intensive (Francois, 1990; Nyahoho, 2010). Apart from real factor endowments (capital and labour), an endowment can also be the form of domestic institutions' quality (Sauvé and Roy, 2016). This theory is appropriate to this study since we want to determine the particular supply-side factors (specific to Kenya) that encourage exports of different services from Kenya.

From the 1960s to the early 1990s, New Trade Theories (NTT) have been put forward to explain trade by the use of technological gaps (Posner, 1961; Vernon, 1966), differentiation of products, and imperfect competition (Dixit and Stiglitz, 1977; Krugman, 1979; Lancaster, 1980; Krugman, 1980; Helpman, 1981; Brander and Krugman, 1983; Krugman, 1991). Technological theories predict that developing countries like Kenya initially import products (services) because of their low levels of technology. They later become exporters after adopting the technology and exploiting their low-cost labour for mass production. Imperfect competition and product differentiation predict trade through economies of scale, the need for various products (services), and imperfect market structures. New New Trade Theories (NNTT) explain these factors from a firm-level perspective. Among the seminal models are those by Bernard and Jensen (1995, 1999), Melitz (2003), and Yeaple (2005). Through the NTT and NNTT, concepts like service export through offshoring have become common since firms in different countries sub-contract to one another (Francois and Hoekman, 2010; Chiquiar, Tobal, and Yslas, 2019).

Theoretical models can also explain the export of services. They are categorized into two main branches: Kaldorian and Schumpeterian approaches (Romero and McCombie, 2018). The Kaldorian approach starts with the traditional export demand function by Houthakker and Magee (1969) and later Goldstein and Khan (1978). As stated by this model, a country's exports are affected by its international competitiveness and the amount of global demand for its output. The international competitiveness of a country is worked out as the ratio of the price of an export commodity it produces to the foreign price of a similar commodity – both valued in a common currency. World demand positively affects a country’s exports, but its services’ exports will be reduced as its international competitiveness grows.

Bahmani-Oskooee's (1986) model introduces effective rates of exchange (units of foreign currency per unit of domestic currency) to world demand and international competitiveness. It is assumed that when the domestic currency depreciates, exports increase. However, this effect can be asymmetric as per the model by Bahmani-Oskooee and Fariditavana (2016). The model presents the rate of exchange as having positive and negative effects within a non-linear autoregressive distributed lag (ARDL) framework. Other right-hand variables of this model are world demand

and exporter's income. Accordingly, currency depreciation can initially reduce exports but increase them later, leading to a J-curve condition (Magee, 1973).

The Schumpeterian export demand function is mainly associated with Fagerberg (1988). The model introduces supply-side factors of productive and technological capacity as determinants of export performance (Romero and McCombie, 2018). In terms of services, this model assumes that improving domestic production capacity and technology enhances the delivery and quality of exports. The model by Romero and McCombie (2018) combines the Kaldorian and Schumpeterian approaches. Hence, the export demand function includes not only productivity but also world demand and its international competitiveness. Variables affect exports as predicted in original models.

Santos-Paulino and Thirlwall's (2004) model makes use of a dummy that represents trade liberalization and export duties. While the latter affects exports negatively, the former has a positive effect. Also, since export duties are more applicable to goods, they are eliminated for services. Gani and Clemes's (2013) model breaks down how the domestic business environment affects trade in six factors. Such factors as the cost of doing business, enforcement of contracts, resolution of disputes, and safeguarding of property rights tend to reduce services exports. Other factors such as the strength of legal systems and the spread of internet connectivity have been found to boost exports in services.

2.2.2 Empirical literature review

Empirical literature on country-specific drivers of services exports from various economies is reviewed in this section. For instance, in their linear ARDL model analysis, Sahoo and Dash (2017) find that both demand and supply-side factors, including human capital; expenditure on R&D; foreign direct investment (FDI); financial sector development; merchandise exports; global demand; and real exchange rate, have added to the success of total exports of services from India. However, Sahoo (2018) shows that when a nonlinear ARDL model is applied, India's aggregate services exports are only impacted by FDI inflows in the long-run, thereby justifying this study's consideration of asymmetries/nonlinearities in its methodology. In the case of the Nigerian economy, where there exists an over-dependence on oil exports, Mkpado (2013) explains that total

exportable services can be increased through higher domestic capital expenditure by the government, improved road network, increased inward FDI, and improved agricultural credit schemes. As for Kenya, Kodi (2016) finds that aggregate services exports are only determined by merchandise exports and exchange rate depreciation, with FDI, the portion of services in the GDP, liberalization, terms of trade, and human capital recording insignificant impacts. However, the study utilizes the Ordinary Least Squares (OLS) technique and fails to perform co-integration tests given evidence of the existence of a unit-root test, suggesting the study's regression results were biased (Greene, 2018).

At a disaggregated services level, Sahoo and Dash (2014) employ a linear ARDL model and explain that modern services (such as software, communication, business, insurance, and financial services), which are the main services exports from India, are influenced by supply-side factors like financial development, human capital, physical infrastructure stocks, and broadband telephone density along with goods exports. In addition, world demand for services and the exchange rate influence insurance and finance. Lindemane, Purins, and Rutitis (2012) equally find that Latvian financial services exports are driven by technology and financial development along with FDI inflows, infrastructure, direct and indirect taxes, and corruption. However, Sahoo, Babu, and Dash (2019) report insignificant long-run impacts of real exchange movements on Indian modern services exports both in their linear and nonlinear ARDL model analyses.

Software services exports, for which India is the top exporter globally, are positively impacted by GDP growth; world demand; exchange rate; trade liberalization; R&D expenditure; and an abundant supply of cheap labour from the population aged 30-39 according to Chitgupi (2019) and Malik and Velan (2020). Chitgupi (2019) applied a Two-Stage Least Squares (TSLS) estimation technique to panel data from 45 countries, after which India-specific results were calculated. Malik and Velan (2020) analysed a linear ARDL model. Eichengreen and Gupta (2013a) equally find that liberalization reforms and overall economic development determine India's information-technology-related (IT) services exports, along with FDI inflows. Goswami, Mattoo, and Sáez (2012) emphasize that India's success in software services exports, even over its regional counterpart Malaysia which has a significantly higher internet penetration, is due to its high concentration of highly qualified human capital. Furthermore, the Indian government

circumvented the technological hurdle by establishing special economic regimes such as software technology parks (STPs) or IT parks.

Traditional services exports (transport, travel, and government services) are more sensitive to physical infrastructure and institutions such as customs and border management than modern services exports. These factors have constituted Malaysia's comparative advantage in international trade in traditional services like travel and health tourism, as well as in goods (Goswami, Mattoo and Sáez, 2012). Additionally, Chile's high-quality infrastructure, institutions, and endowments demonstrably favour its transport services exports along with merchandise exports despite the country's limited human resource pool and low English proficiency levels (Goswami, Mattoo and Sáez, 2012). On the other hand, counter-terrorist institutions are found by Buigut and Amendah (2016) to be determinants of tourism exports from Kenya, while Karimi, Khan, and Karamelikli (2019) show that exchange-rate volatilities asymmetrically influence tourist arrivals in Malaysia for the long term.

Positive and significant long-term results from the linear ARDL model analysis by Sahoo, Babu, and Dash (2019) expand the evidence of the interconnection between goods exports and traditional services exports, likely due to the necessity of transportation, travel, and communication services in the international goods trade. Various studies additionally find that embassies and consulates, as government services exports, promote the mother country's export trade (Rose, 2007; Ferguson and Forslid, 2019; Visser, 2019; Bagir, 2020). We also infer from these studies that trade agreements and institutions drive government services exports. Other such exports, namely military services and equipment, are determined by institutions of democracy and security alliances, political stability, and military expenditure (Asongu and Nnanna, 2019; Fuhrmann, 2008).

Several factors mentioned earlier, including global demand, real exchange rate, and technological innovation, significantly impact traditional exportable services, albeit less than modern services exports, and even insignificantly in the case of financial development, R&D expenditure, and FDI (Sahoo and Dash, 2017). Therefore, in terms of uniqueness, modern services exports can be summarised as being highly skill and labour-intensive, highly absorptive of FDI and technology,

and highly demand-sensitive. On the other hand, traditional services exports are highly absorbent of physical infrastructure, highly interconnected with goods exports, and highly dependent on institutions.

2.2.3 Overview of reviewed literature

Our theoretical and empirical literature review clarifies that the theory on services' trade is still emerging. Empirical evidence shows that services are heterogeneous and are characterised by different determinants. For example, traditional exports of services (transport and travel) are influenced by manufacturing exports, global demand for services, real exchange rate, and infrastructure stocks. On the other hand, human capital is an essential determinant of modern services (software, business, and financial services) exports besides world demand, real exchange rate, goods exports, and endowment factors (financial development, telecommunication density, FDI inflow, R&D expenditure, and institutions). In Kenya, only Kodi (2016) has established the determinants of service exports. However, the author fails to cover categories of other services. Therefore, the current study advances existing knowledge by establishing determinants of traditional services (transport, travel, and government services), modern services (financial and insurance, and communication), and composite services (total, traditional and modern).

2.3 Methodology

2.3.1 Theoretical framework in modeling service exports

To model service exports, we start with the basic neoclassical maximization approach. A consumer in a foreign country is assumed to maximize utility from consuming two services, an imported service, x_1, and domestic service, x_2, subject to a budget constraint as follows:

$Max\ u = (x_1 x_2)$ …… *1*

Subject to

$p_1 x_1 + p_2 x_2 = y$ …… *2*

Where $p_1$and p_2 are prices of services 1 and 2, respectively, while y is income.

The Lagrangian equation based on equations 1 and 2 is:

$L = x_1 x_2 - \theta(p_1 x_1 + p_2 x_2 - y)$ …… 3

The first-order conditions for maximizing utility in equation 1 are as follows:

$\partial L/_{\partial x_1} = x_2 - \theta p_1 = 0$ …… 4

$\partial L/_{\partial x_2} = x_1 - \theta p_2 = 0$ …… 5

$\partial L/_{\partial \theta} = p_1 x_1 + p_2 x_2 - y = 0$ …… 6

From the first-order conditions, the import demand function for x_1 is:

$x_1 = (P_1, P_2, y)$…… 7

In international trade, the demand function for imports is determined by price and other non-price factors depending on whether it follows a Kaldorian or Schumpeterian function. The Kaldorian function assumes that price competitiveness and foreign income determine the demand for imports. In this case, demand for an imported service x_1 is presented as follows:

$X_1 = \alpha \left(\frac{EP_f}{P}\right)^{\beta} Y^{\varepsilon}$ …… 8

The service imports, income, and prices in equation 8 are considered at the aggregate rather than individual level. E is the exchange rate, P_f is foreign price and P is the domestic price of the

exported service. The ratio of prices in parenthesis is the relative price that measures the competitiveness of prices. α is a constant presenting autonomous import, β is the price elasticity of demand ($\beta < 0$), Y is the income of the importing country and ε is the income elasticity of demand ($\varepsilon > 0$).

The Schumpeterian function introduces supply-side constraints into the import demand function. It is assumed that suppliers (exporters) are impacted by their production and technological capacity in the domestic economy. Production capacity determines the volume of output for export, while technological capacity determines the quality of the output produced. This is represented as follows:

$$\frac{X_1}{Y} = \alpha \left(\frac{EP_f}{P}\right)^{\beta} \left(\frac{T}{T_f}\right)^{\mu} C^{\sigma} \quad \text{..... 9}$$

Where T and T_f represent technological capacity in the domestic and foreign country, respectively, and μ is the technological elasticity of demand for imports ($\mu > 0$). C is the productive capacity which measures the capacity of meeting the growing demand for imports, while σ is its elasticity ($\sigma > 0$).

Romero and McCombie (2018) combine the Kaldorian and Schumpeterian approaches as follows:

$$X_1 = \alpha \left(\frac{EP_f}{P}\right)^{\beta} \left(\frac{N}{N_f}\right)^{\mu} C^{\sigma} Y^{\varepsilon} \quad \text{..... 10}$$

As before, the ratio of prices measures price competitiveness. N denotes non-price competitiveness in the domestic market, which arises from the technological capacity (T) and other factors other than technological competitiveness (Z). Hence, $N = Z^{\pi} T^{\delta}$. It can be proved that equation 10 collapses to the Kaldorian function (equation 8) when both the technological and productive capacity elasticities are missing ($\mu = \sigma = 0$). Equation 10 becomes Schumpeterian (equation 9) upon assuming fixed income elasticity ($\varepsilon = 1$), positive elasticity of non-price competitiveness ($\mu > 0$), constant technological competitiveness ($\delta = 1$), and no non-technological competitiveness ($\pi = 0$).

Since C measures the productive capacity of producing export commodities, it can be influenced by several factors in the domestic economy. For example, trade liberalization and domestic business environment (see Santos-Paulino and Thirlwall (2004) and Gani and Clemes (2013)). Trade liberalization boosts domestic productive capacity because it facilitates the entry of foreign direct investors with spillover effects on the local economy with regards to the transfer of technology and knowledge of innovation. The local business environment is captured by the level of internet connectivity, the cost of doing business, dispute resolution, protection of property rights, contract enforcement, and integrity of legal systems. Therefore, it is vital to the operation of businesses.

2.3.2 Analytical models of service exports

The analytical model entailed log-linearizing equation 10. Following related papers such as Eichengreen and Gupta (2013a) and Sahoo and Dash (2014, 2017), the final analytical model was as follows:

$$Service_{it} = \beta_0 + \beta_j X_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots .. \; 11$$

$Service_{it}$ represents export of service i at time t. In our case, eight categories of services were considered ($i = 8$). X_{it} is a vector of independent variables determining each service export. β_0 is an intercept while β_j is a vector of coefficients to be estimated. ε_{it} is the error term with usual assumptions and $j = 1 \ldots$ n.

2.3.3 Data and description of variables

Services data used in the study was sourced from the Extended Balance of Payments Services Classification 6 (EBOPS6) database of the International Monetary Fund (see Loungani et al., 2017) for the period 1975 to 2017. This period was selected because it had complete data for most of the variables under study. We considered the following services: traditional, modern, transport, travel, government, financial and insurance, communication and information services, and the total of all the services.

The covariates were similar in all equations and they were classified as either demand-side or supply-side factors following related studies. Supply factors were endowments in human capital,

infrastructure, institutions, goods exports, and financial development. Demand-side factors were real exchange rates and world demand. Table 2.1 describes variables and shows their measurement and sources.

Table 2.1: Variable name, measurement and source

Variable	Measurement	Source
Dependent variables		
Total service exports	Ratio of all service exports (in US$) to GDP (in US$ current prices)	WDI
Traditional services	Ratio of the sum of travel, transport, and government service exports (in US$) to GDP (in US$ current prices)	WDI
Travel services	Ratio of all travel exports (in US$) to GDP (in US$ current prices)	WDI
Transport services	Ratio of all transport exports (in US$) to GDP (in US$ current prices)	WDI
Government services	Ratio of all government services exports (in US$) to GDP (in US$ current Prices)	WDI
Modern services	Ratio of the sum of insurance and financial, and ICT exports (in US$) to GDP (in US$ current prices)	WDI
Insurance and financial	Ratio of all insurance and financial exports (in US$) to GDP (in US$ Current prices)	WDI
ICT	Ratio of all ICT exports (in US$) to GDP (in US$ current prices)	WDI
Independent variables		
World demand	Ratio of world imports of a specific service (excluding Kenya's) and world GDP (excluding Kenya's)	WDI
Real exchange rate	Kenya shilling's real exchange rate to US$	Darvas (2012) database
Goods exports	Ratio of goods exports (in US$) to GDP (in US$ current prices)	WDI
Institutional quality	Index ranging from 0 to 3. 0 means no elections, 1 means single-party elections, 2 means multi-party autocratic elections, and 3 means multi-party democratic elections	Bjørnskov and Rode (2020)[8]

[8] See http://www.christianbjoernskov.com/bjoernskovrodedata/ for data.

Human capital	Ratio of expenditure on tertiary education (Kshs) to GDP (Kshs)	Several Economic Surveys from Kenya for expenditure and WDI for GDP
Infrastructure	Natural logarithm of the average indicators of infrastructure: air transport, freight (million ton-km), fixed telephone subscriptions (per 100 people), electric power consumption (kWh per capita), energy use (kg of oil equivalent per capita), and mobile cellular subscriptions (per 100 people)	WDI
Financial Development	Average of four indicators of financial development: Domestic credit to the private sector (% of GDP), Domestic credit provided by financial sector (% of GDP), Domestic credit to the private sector by banks (% of GDP), and Broad money (% of GDP)	WDI

Source: Author

2.4 Results and discussion

2.4.1 Descriptive statistics

Figure 2.1 graphically plots ratios of total, traditional and modern service exports to GDP in Kenya and the world. All services from Kenya peaked in 1993 when the country was projected to have liberalized. All service exports from Kenya fluctuated over time, but global service exports trended upward from 1987. Traditional and modern service exports had a downward trend before 1987. Econometrically, the trend of these variables suggests that most of them are likely to have a unit root. They exhibit both upward and downward trends, which are erratic. Furthermore, all variables depict signs of structural breaks: single (for instance, in traditional and modern world service exports in 1987) or multiple (in all Kenyan service exports). In section 2.4.2 we formally tested for unit root and structural breaks using three tests, namely, the Augmented Dickey-Fuller (ADF) test, Phillips-Perron (PP) test, and Zivot-Andrews (ZA) test. The first two tests sought to ascertain the presence of unit root, while the last test was to establish the presence or otherwise of unit root and structural break(s).

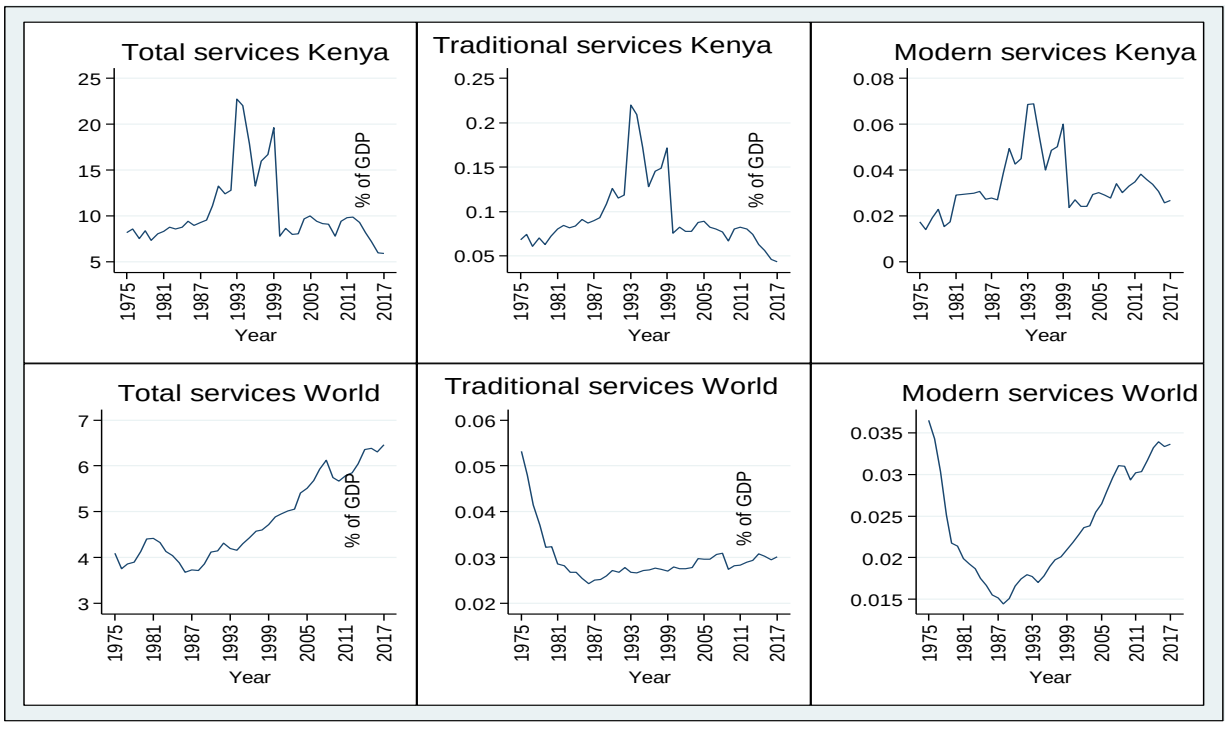


Figure 2.1: Movement of modern and traditional service exports from Kenya and globally, 1975-2017

Source: Author

Figure A.1 in the appendix graphically plots service exports for Kenya and the world at a disaggregated level. Whereas all service exports from Kenya fluctuated, only financial and insurance services had an upward trend in later years. Travel, information communication and technology, and financial and insurance service exports had an upward trend in later years at the global level. Transport and government service exports declined in later years. Kenya's goods exports, real exchange rate, tertiary expenditure, infrastructure expenditure, and financial development fluctuated over time. Institutional quality improved over the period.

On average, service exports accounted for about 10.51% of Kenya's GDP between 1975 and 2017, as shown in Table 2.2. Services' contribution to GDP globally was about 5%. This contribution is half of Kenya's percentage, meaning that services were more important to the economy of Kenya than globally. The maximum contribution of total service exports to GDP in Kenya over the period was about 23% which was over 3.5 times the maximum of the world average contribution in the same regard. Traditional service exports contributed more to GDP than modern services both in Kenya and the world. All services were positively skewed. However, the ratio of modern service exports to GDP in Kenya was mesokurtic since its kurtosis coefficient was almost three. This means that it is symmetric and almost displays a normal distribution.

Table 2.2: Summary statistics of service exports from Kenya and the world, 1975-2017 (US$ millions)

Service	N	Mean	Median	Std. Dev.	Min	Max	Skewness	Kurtosis
				Kenya				
Total	43	10.51	9.20	3.99	5.90	22.77	1.73	5.22
Traditional	43	0.10	0.08	0.04	0.04	0.22	1.62	5.21
Modern	43	0.03	0.03	0.01	0.01	0.07	1.12	3.98
				World				
Total	43	4.81	4.44	0.88	3.69	6.46	0.50	1.83
Traditional	43	0.03	0.03	0.01	0.02	0.05	2.82	11.05
Modern	43	0.02	0.02	0.01	0.01	0.04	0.32	1.71

Source: Author

Table 2.3 shows summary statistics of service exports at a disaggregated level in the world and Kenya. It is worth noting that world values for service exports are part of independent variables as they proxy world demand as described in Table 2.1. Other independent variables such as goods

exports are based on Kenya. We find that transport service exports had the highest contribution to GDP in Kenya. On the other hand, information communication and technology service exports had the highest contribution to GDP at the world level. Among independent variables, the average share of goods exports to GDP was 16.28%. The average real exchange rate was 93.29% while that of tertiary expenditure as a ratio of GDP was 1.18%. The mean values for institutions, financial development, and infrastructure was 2.12, 29.5%, and 141.87, respectively.

Table 2.3: Summary statistics of service exports from Kenya and the world (US$ millions), and independent variables, 1975-2017

Variable	**N**	**Mean**	**Median**	**Std. Dev.**	**Min**	**Max**	**Skewness**	**Kurtosis**
Service (Kenya)								
Travel	43	3.33	3.09	1.44	1.13	6.46	0.38	2.15
Transport	43	3.81	3.28	1.87	2.02	9.45	1.69	5.14
Government	43	2.36	2.14	1.30	0.28	6.08	0.87	3.96
Ins. & Fin.	43	0.16	0.08	0.19	0.02	0.75	1.75	4.73
ICT	43	3.20	2.90	1.30	1.27	6.81	1.19	4.06
Independent variables								
Service (World)								
Travel	43	1.36	1.36	0.20	1.01	1.98	0.68	4.33
Transport	43	1.45	1.32	0.39	1.15	3.13	2.91	11.67
Government	43	0.16	0.14	0.06	0.09	0.28	0.48	1.77
Ins &Fin	43	0.33	0.30	0.13	0.17	0.53	0.38	1.63
ICT	43	2.05	1.92	0.55	1.27	3.31	0.47	2.10
Other variables (Kenya)								
Goods exports	43	16.28	14.54	6.35	7.35	40.61	2.14	8.56
REER	43	93.29	90.20	19.28	58.59	144.93	0.92	3.68
Tertiary expenditure	43	1.18	1.09	0.31	0.74	2.07	1.08	3.83
Institutions	43	2.12	2.00	0.91	1.00	3.00	-0.23	1.29
Financial development	43	29.50	28.48	4.52	21.89	39.05	0.44	2.35
Infrastructure	43	141.87	124.66	31.89	110.22	209.37	0.84	2.05

Note: Services (world) represent world demand for different services. Other variables (Kenya) are Kenya-specific factors.

Source: Author

2.4.2 Regression results and discussion

2.4.2.1 Unit root test results

We tested for non-stationarity or the existence of unit root in all variables. If standard estimation methods are applied on non-stationary variables, the results are spurious and unreliable. Spurious results arise when a series depicts a false long-term relationship between variables without justification. We used three unit-root tests viz., Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Zivot-Andrews (ZA). The ZA test was applied as a confirmatory test of ADF and PP since it tests for the presence of both unit root and structural break. All tests assumed the constant and trend as restrictions. The results are presented in Tables 2.4 and 2.5.

All ratios of service exports to GDP in Kenya were non-stationary at level but stationary after the first difference, as shown in Table 2.4. They had structural breaks in 1994, around the time Kenya opened up to economic liberalization (Wacziarg and Welch, 2008). At the global level, the ratios of traditional and modern service exports to GDP were stationary at level and first difference. The ratio of total service exports to GDP is non-stationary at level using the ADF and PP test but stationary under the ZA test. Nonetheless, all tests indicated that the ratio of total service exports to GDP was stationary at first difference.

Table 2.5 shows the results of unit root and structural break tests for respective services and covariates. Apart from the ratio of financial and insurance service exports in GDP, all other service exports from Kenya had a structural break around 1993 when Kenya opened up to economic liberalization (Wacziarg and Welch, 2008). The ratio of Financial and insurance service exports in GDP had a structural break in 2008 that coincided with the global financial crisis of 2008/2009. Ratios of service export to GDP in the world experienced structural breaks in the 1970s and 1980s, meaning that Kenya's service revolution lagged behind the global one. Variables such as institutions, financial development, and infrastructure had structural breaks past the year 2000 (at level).

Table 2.4 and Table 2.5 indicate that variables used in this study had a mixed order of integration at level *(I (0))* and order one *(I (1))* upon first differencing. According to Greene (2018), this was a sufficient condition for the presence of cointegration. The ARDL bound test was used to establish

cointegration among the variables. ARDL bound test, as developed by Pesaran, Shin, and Smith (2001), is a good test when variables have structural breaks and *I (0)* and *I (1)* orders of integration (Sahoo and Dash, 2014; Sahoo, 2018). In addition, the approach may correct endogeneity by including lagged values of the dependent variable in the model (Sahoo, Babu, and Dash, 2019; Malik and Velan, 2020).

Table 2.4: Unit root test results of service exports from Kenya and the world

Variable	**ADF Coeff.**		**PP Coeff.**		**ZA Coeff.**	
	I (0)	***I (1)***	***I (0)***	***I (1)***	***I (0)***	***I (1)***
			Kenya			
Total	-2.055	-6.936*	-2.235	-6.936*	-3.918(1994)	-5.522*(1991)
Traditional	-1.881	-6.836*	-2.030	-6.836*	-4.091(1994)	-5.437*(1990)
Modern	-2.308	-6.976*	-2.338	-6.976*	-3.739(1994)	-5.356*(2001)
			World			
Total	-1.849	-4.128**	-2.108	-5.234*	-4.722**(1989)	-5.352*(1984)
Traditional	-4.536*	-4.615*	-10.297*	-4.615*	-7.728*(1976)	-4.888**(1981)
Modern	-4.880*	-3.864**	-5.815*	-2.623***	-4.880**(1977)	-5.172*(1981)

*Note: World represents world demand for total, traditional and modern services that are independent variables. *, **, *** indicates 1%, 5% and 10% significance level. The years when the structural break occurred are shown in parenthesis for the ZA test. I (0) means at level while I (1) is at first difference.*

Source: Source: Author

Table 2.5: Unit root test results for categories of service exports from Kenya and the world, and other covariates

Variable	ADF		PP		ZA	
	I (0)	*I (1)*	*I (0)*	*I (1)*	*I (0)*	*I (1)*
Service (Kenya)						
Travel	-1.938	-6.679*	-1.950	-6.679*	-4.093(1992)	-5.847*(2001)
Transport	-2.304	-6.975*	-2.494	-6.975*	-3.374(1995)	-7.151(1994)
Government	-2.141	-6.149*	-1.919	-6.149*	-3.320(1994)	-6.392*(2001)
Ins & Fin	-0.644	-5.123*	-0.433	-5.123*	-3.809(2008)	-5.731*(2010)
ICT	-2.212	-7.000*	-2.212	-7.000*	-4.052(1994)	-6.818*(1995)
Service (World)						
Travel	-3.350***	-7.400*	-4.098*	-7.356*	-4.404(1982)	-4.947*(1986)
Transport	-5.406*	-4.302*	-8.646*	-4.302*	-8.711*(1975)	-6.793*(1982)
Government	-2.294	-5.533*	-2.508	-5.533*	-4.552**(2000)	-6.217*(1985)
Ins & Fin	-2.222	-6.040*	-2.651	-6.040*	-3.091(1983)	-6.698*(2005)
ICT	-5.250*	-3.284***	-5.830*	-3.381***	-6.105*(1989)	-6.096*(1983)
Other variables (Kenya)						
Goods exports	-3.764**	-6.325*	-3.485***	-6.325*	-6.869*(1993)	-7.027*(1995)
REER	-0.169	-7.159*	-0.356	-7.159*	-3.102(1993)	-7.900*(1982)
Tertiary expenditure	-2.015	-4.300*	-2.432	-8.256*	-2.848(1988)	-8.339*(1997)
Institutions	-1.727	-6.510*	-1.848	-6.510*	-3.079(2003)	-6.993*(1991)
Financial development	-3.567**	-7.408*	-3.589**	-7.428*	-3.781(2007)	-8.044*(2016)
Infrastructure	-1.028	-5.439*	-1.124	-5.439*	-4.195(2004)	-5.469*(2006)

*Note: Services (world) represent world demand for different services. Other variables (Kenya) are Kenya-specific factors. *, **, *** indicates 1%, 5% and 10% significance level. The years when a structural break occurred are shown in parenthesis for the ZA test. I (0) means at level while I (1) is at first difference.*

Source: Author

From Table 2.6, all variables were cointegrated since their respective F statistics were more significant than the critical values at a 1% significance level. We arrived at a similar conclusion when services were disaggregated in Table 2.7.

Table 2.6: ARDL Bounds test results of service exports from Kenya

Dependent variable	F-Statistic	Inference
Total services	9.449*	Reject the null hypothesis. Variables are cointegrated
Traditional	9.378*	Reject the null hypothesis. Variables are cointegrated
Modern services	5.223*	Reject the null hypothesis. Variables are cointegrated

*Note: *, **, *** indicates 1%, 5% and 10% significance level. Upper bound values are 3.35 for 10%, 3.79 for 5% and 4.68 for 1%. Null hypothesis assumes no cointegration.*

Source: Author

Table 2.7: ARDL Bounds test results of service exports variables from Kenya

Dependent variable	F-Statistic	Inference
Travel services	23.771*	Reject the null hypothesis. Variables are cointegrated
Transport services	7.732*	Reject the null hypothesis. Variables are cointegrated
Government services	12.264*	Reject the null hypothesis. Variables are cointegrated
Ins & Fin services	5.160*	Reject the null hypothesis. Variables are cointegrated
ICT services	9.670*	Reject the null hypothesis. Variables are cointegrated

*Note: *, **, *** indicates 1%, 5% and 10% significance level. Upper bound values are 3.35 for 10%, 3.79 for 5% and 4.68 for 1%. Null hypothesis assumes no cointegration.*

Source: Author

Having established the presence of cointegration and hence the relationship among the variables in the long-term, we estimated an ARDL model to identify determinants of different types of service exports. As earlier indicated, this approach is suitable, compared to OLS, for cases where variables have structural breaks and endogeneity as it includes lagged values of the dependent variable (Sahoo and Dash, 2014; Sahoo, 2018; Sahoo, Babu, and Dash, 2019). The results are shown in Tables 2.8, 2.9, and 2.10.

2.4.2.2 ARDL regression results of determinants of service exports from Kenya

The service exports were analysed in two ways, excluding the collinear variable in each case. The first case had all variables except infrastructure while the second excluded financial development.

Infrastructure was highly correlated with financial development, as shown in Figure A.2 in the appendix, thus separating the two variables in estimations.

1. Determinants of total service exports from Kenya

Table 2.8 presents ARDL estimation results for determinants of total service exports from Kenya. The Error Correction Term (ECM) coefficient in model 1 was negative and significant. Thus, a short-run total service export shock corrected 67% of disequilibrium in the first year and it took about 1.5 years to correct the disequilibrium.

World demand for total service exports, which measured the external shock, had a positive effect in both the short term and long term as per Model 1. However, the effect was only significant in the short-run, as in Sahoo (2018) for India. The effect of changes in the global economy or major import markets on exports of services in Kenya was short-lived. A 1% rise in goods exports significantly increased total exports of services by 0.7% in the long-run. Therefore, merchandise exports complemented the export of services. Kodi (2016), and Sahoo et al. (2017), and Eichengreen et al. (2013a) find similar results in Kenya and India, respectively.

Human capital, estimated as the ratio of tertiary education expenditure to GDP, had a significant and positive coefficient in its influence on exports of services in the long-term. It had the highest coefficient in the long-run (5.9%), meaning that skill development was vital for services exports. Ideally, services tend to be skill-intensive, and therefore the quality of human capital matters (Hoekman, 2018). Nonetheless, the effect of human capital was negative and significant for the short-run, implying that it took time for educated people to impact exports of services. Similarly, financial development had a significant but opposite effect in the long-term (positive) and short-term (negative). The beneficial effect of financial development on service exports was not instant but long-term. The exchange rate had a negative and statistically significant effect on total service exports in the long-run. When the real exchange rate appreciates by 1%, it leads to an approximately 0.2% decline in total service exports. The short-run effect was positive and significant, indicating that the Marshall-Lerner condition or the J-curve effect occurred in Kenya. The condition states that the balance of trade will first deteriorate following currency depreciation but improve with time (Magee, 1973).

Table 2.8: Long-run ARDL estimation results of total service exports from Kenya

	Total service exports			
	Model 1		**Model 2**	
	Long-Run results			
	Coeff.	**Std. Error**	**Coeff.**	**Std. Error**
World demand	0.688	(2.431)	-0.373	(5.537)
Goods exports	0.698*	(0.125)	1.063**	(0.413)
REER	-0.193**	(0.0807)	-0.343	(0.258)
Human capital	5.924*	(1.905)	-0.337	(4.413)
Institutional quality	-2.829	(1.958)	-10.78	(9.659)
Financial development	1.279*	(0.259)	-	-
Infrastructure	-	-	67.23***	(37.86)
	Short-Run results			
Lagged total service exports	-		-0.532*	(0.159)
World demand	5.028**	(2.084)	4.654**	(1.678)
Goods exports	-0.0118	(0.116)	0.0121	(0.0923)
REER	0.166*	(0.0507)	-	-
Human capital	-5.166*	(1.429)	-2.762***	(1.403)
Institutional quality	0.353	(1.880)	4.797*	(1.565)
Financial development	-0.674*	(0.180)	-	-
Infrastructure	-	-	-	-
Constant	-16.16**	(6.256)	-100.9*	(16.93)
ECM term	-0.670*	(0.145)	-0.356***	(0.183)
Observations	39		39	
R^2	0.959		0.931	
Model specification	(1,3,4,2,2,3,4)		(4,1,4,0,4,2,0)	

*Note: * indicates the level of significance. * $p < 0.01$, ** $p < 0.05$, *** $p < 0.10$. The lag of dependent variables is included as specified by ARDL models and the model specification. The model specification indicates the optimum number of lags for each variable in the ARDL model.*
Source: Author

When infrastructure was introduced in Model 2 of Table 2.8, the ECM term was reduced to 35.6% from 67%, suggesting that short-run corrections were less robust when infrastructure was introduced. Fewer variables were significant in the long-run when infrastructure was introduced in model 2. Nevertheless, the effect of both infrastructure and goods exports on service exports is positive and significant in the long-term. The coefficients of world demand, human capital, and institutional quality were significant in explaining service exports in the short-run. Democracy, as captured by institutional quality, enhanced exports of services from Kenya. Intuitively, democratic

freedoms, as seen in elections, boost service exports (Goswami, Mattoo, and Sáez, 2012; Beverelli, Fiorini, and Hoekman, 2017; Briggs and Sheehan, 2019) in the short-run.

2. Determinants of traditional service exports from Kenya

Table 2.9 presents ARDL results for traditional service exports and other service export categories, viz., travel, transport, and government services. The ECM coefficient for traditional service exports in Model 1 was negative and significant. Therefore, the model converges from the short-term to the long-term at a speed of 82% per year.

A rise in global demand for aggregate traditional services significantly increased traditional service exports in the short-term but reduced it in the long-term. Specifically, a 1% increase in world demand for traditional services decreased traditional service exports by 5.1% in the long-run and increased it by about 9.2% in the short-run. Exporting merchandise significantly improved exports of traditional services in the long-term period. The effect was negative in the short-run. In the long-term, goods exports pulled exports of traditional services such that the two were complementary in supply. The real exchange rate did not significantly impact exports of traditional services both in the short-term and long-term.

Human capital, which is proxied by the ratio of tertiary education expenditure to GDP, significantly increased traditional exports of service in the long-term but not in the short-term. This suggested that the importance of human capital to exports of traditional services only grew over time. Improving the quality of institutions significantly increased exports of traditional services in the short-term. The long-term effect was negative and insignificant. Financial advancement had a positive but insignificant effect on exports of traditional services in the long-run.

Model 2 introduced infrastructure as a determinant of traditional service exports. The ECM coefficient declined to 73%, down from 82%. This drop meant that convergence from the short-term to the long-term was slower when infrastructure was considered instead of when it was ignored in the model for traditional service exports (Model 1). A rise in world demand for traditional service exports reduced exports of traditional services in the long-term but not in the short-term. Other variables maintained their signs as in Model 1 except financial development,

which was not considered in model 2. Though insignificant, the effect of infrastructure was negative in the long-term and positive in the short-term.

Since the determinants of traditional service exports are likely to differ at a disaggregated level, the following sections present factors that drove the exports of travel, transport, and government services from Kenya over the period under consideration.

a) Determinants of travel exports from Kenya

The ECM coefficient for travel exports in Model 1 was negative and significant. Therefore, the model adjusts to the long-run at the speed of 59% per annum.

Increased global demand for travel services improved the demand for travel services in Kenya, in the short-term and long-term, by 2.851% and 14.14%, respectively. Compared to other services, the world imports of travel services is the highest (Loungani et al., 2017) and could imply that Kenya is bound to benefit from this rise in demand. This result also explains Kenya's comparative advantage in tourism and why the country is among the top export destinations in Africa (Mbithi and Chekwoti, 2014; Were and Odongo, 2019). Similar results were established by Wamboye, Nyaronga and Sergi (2020), where the income of tourists improved demand for tourism in Tanzania. A 1% rise in merchandise led to an increase in travel service exports by 0.2% in the long-term. By their nature, travel exports entail the movement of people for tourism or commercial purposes. Hence, this result means that tourism and business visits increase exports of goods.

Other significant variables in explaining travel exports in the long-term were real exchange rate and financial development. A rise in the exchange rate increased travel exports in the long-term, and the effect was also significant in the short-term, albeit negative. Whereas this depicted presence of the J-curve effect (a currency depreciation initially having a negative effect on trade deficit but adjust to a positive effect in the long term), it also meant that tourists and people who visit Kenya for business purposes were cautious of the exchange rate fluctuations. Financial development improved travel exports in the short-term but not in the long-term, suggesting that access to credit is more critical for businesses in the travel sector at the start of their operations.

Human capital and institutional quality negatively impacted exports of travel services in the short-term but not in the long-term. Human capital was likely to be more relevant with regard to advanced services such as communication services rather than traditional services for instance travel (Sahoo and Dash, 2017). The result on institutional quality implied that democracy does not entirely boost travel exports. Some restrictions are necessary and it could be the reason movement of people is highly restricted (Francois and Hoekman, 2010; Borchert, Gootiiz, and Mattoo, 2014; Fiorini and Hoekman, 2018; Benz, Ferencz and Nordås, 2020).

In Model 2, infrastructure was introduced as a determinant of travel service exports. The ECM coefficient increased to 80.2%, up from 59%, meaning that short-run shocks were cleared faster when infrastructure was considered instead of when it was ignored (as in Model 1). The coefficient of infrastructure in the estimation of determinants of travel service exports was significant and positive in the short-term but negative in the long-term. Amenities such as roads and hotels/conference centres improve travel service exports in the short-term, but over-supply could be counterproductive in the long term. The signs of goods exports and institutional quality are akin to the Model 1 in the long-run. Unlike in model 1, human capital is positive and statistically significant in the long-term, meaning that skilled labour is vital for the growth of exports of travel services. This outcome could indicate that higher education training in the hospitality industry produces the necessary personnel to work in the travel service export sector.

b) Determinants of transport service exports from Kenya

The ECM coefficient for transport exports in Model 1 was negative and significant. The model with transport service exports converged from the short-term to the long-term at the speed of 62.4% per annum.

Global demand for exports of transport services had a positive and significant coefficient in the short-term, but no effect in the long-term. This outcome meant that globalization increased demand for transport services in the short-run, but Kenya lost out because of competition *inter alia*, over time. Goods exports and human capital had a positive and significant effect on transport exports

in the long-term. Thus, the more goods Kenya exported, the better it positioned itself to export transport services. Equally, investing in tertiary education boosted transport exports in the long-run. Financial development significantly enhanced the export of transport services in the short-run only. The real exchange rate did not affect exports of transport services, whether in the short or long-term periods. Institutional quality was unimportant in exports of transport services in the long-term.

When infrastructure was introduced as a possible explanatory variable in the transport service exports, Model 2, the ECM term declined by over a half, from 62.4% to 30.5%. Hence, the transport service exports model converged slowly to the long-run, in the presence of infrastructure. As expected, infrastructure significantly increased exports of transport services in the long-run. Sahoo and Dash (2017) indicate that the quality of infrastructure mainly impacts traditional services such as transport services. Other significant variables that were found to affect transport service exports include goods exports (long-run period), real exchange rate (both short and long-term periods), and institutional quality in the short-term. The results on institutional quality implied that strategies such as customs and border management for sea transport to air transport, including postal and courier services, should be liberalized as suggested by Goswami, Mattoo, and Sáez (2012).

c) Determinants of government services exports from Kenya

The ECM coefficient for government service exports in Model 1 was negative and significant. This meant the model adjusted from the short-term to the long-term at a speed of 59.1% per annum.

Exports of government services were significantly affected by global demand for government services, merchandise exports, and human capital in the long-run. Global demand for both government services and goods exports had a positive influence. This meant that the network effect of good exports (Egger, Francois, and Nelson, 2017) ensured that Kenya was able to, for instance, provide embassy services where it exported goods (Rose, 2007; Ferguson and Forslid, 2019; Visser, 2019; Bagir, 2020). The effect of exports of goods on government services exports was also positive and significant in the short-term. Then again, globalization which was proxied by world demand for government services had a negative and significant effect on government

services exports in the short-run. Hence, external shocks had a significant effect on the export of government services. Human capital is significant for exports of government services. The effect is negative in the long-term but positive in the short-term.

In the short run, institutional quality had a positive effect on government service exports. Thus, democracy provides an opportunity to strengthen existing bilateral relations and create new ones (Fuhrmann, 2008; Rose, 2007; Pamp, Dendorfer and Thurner, 2018; Asongu and Nnanna 2019), albeit only in the short term. However, business interests override democratic considerations in the long term. When the real exchange rate appreciated, exports of government services reduced, but the effect was only statistically significant in the short-run. Financial advancement had no significant effect on government exports both in the long and short-term.

In Model 2, infrastructure was introduced as an additional explanatory variable of government service exports. The ECM coefficient surged to 85.6%, implying that the model adjusts to the long-run faster when infrastructure is considered. However, infrastructure had no direct or significant effect on government service exports. Similar to Model 1, goods exports positively affect exports of government services in the long-term. The real exchange rate had a negative effect on government service exports in the long-term. Institutional quality was only statistically significant in explaining the exports of government services in the short-term. Hence, the boost of democracy on government service exports is short-lived. World demand, human capital, and financial development did not affect government services exports upon introduction of infrastructure variable.

3. Determinants of modern service exports

Table 2.10 presents ARDL results for modern service exports (Model 1 and 2) together with the applicable categories- insurance and financial, and information and communication technology services.

a) Determinants of modern service exports

The ECM coefficient for modern service exports in Model 1 is negative and significant. This implies that the model converges from the short-term to the long-term at a speed of 97.7%.

A 1% increase in world demand for modern services significantly increases exports of modern services from Kenya by 3.9% in the short-term. In the long-term, an increase in world demand for modern services reduces Kenya's modern services exports by 2.5%. Thus, an external shock characterised by an increase in world demand is only beneficial in the short-run. Goods exports significantly increase exports of modern services in the long-term. The same result has been established in India (Sahoo and Dash, 2014; 2017), and it means that goods exports complement modern service exports. In addition, an appreciation of the local currency increases modern services exports.

Human capital affected exports of modern services from Kenya significantly. A 1% raise in the ratio of expenditure in tertiary education to GDP raised modern services exports by 0.02% in the long-term However, the effect was negative in the short-term, possibly due to the time it takes to absorb human capital in the export market. The quality of institutions raised the exports of modern services in the short run. Financial development significantly and positively boosted the export performance of trade in modern services in the long-run. Therefore, access to finance was critical to exports of modern services as firms have access to credit that cushions them against entry costs in foreign markets (Jiang et al., 2021).

Model 2 introduces infrastructure to the modern service exports equation. The ECM term declines from 97.7% to 60.8%, implying that the model with infrastructure converges from the short-term to the long-term slower than when infrastructure is missing. Infrastructure as expected has a positive effect on modern exports of services in the long-run, although it is not significant. Goods exports and human capital are the only significant in the long-run. Global demand for modern service, real exchange rate, institutions, and human capital are significant in the short-run period.

b) Determinants of insurance and financial exports

The ECM coefficient for insurance and financial exports in Model 1 is negative and significant. The adjustment speed from the short-term to the long-term is 65.6% per year.

A rise in world demand for insurance and financial services by 1% reduces insurance and financial service exports from Kenya by about 2% in the long-run. This finding can be understood to mean that external economic shocks such as the global financial crisis of 2008/2009 and the current Coronavirus pandemic (COVID-19) are likely to reduce financial flows. For example, major international lenders' cancellation and/or reduction of credit limits for banks in Africa have risen during the COVID-19 period (Afreximbank, 2021). In addition, businesses have also struggled to access credit facilities as financial institutions have cut their lending during the pandemic (Demir and Javorcik, 2020).

A rise in the real exchange rate significantly affects insurance and financial services exports, which is positive in the long-term and negative in the short-term. The significance of the exchange rate - in the short-term and long-term - has also been found by Bahmani-Oskooee and Karamelikli (2021) who employ a non-linear ARDL on insurance and financial services exports from the US to six trading partners between the third quarter of 2003 and the fourth quarter of 2019. Human capital had a positive and significant effect in the long-term. According to Sahoo and Dash (2014), tertiary education enhances insurance and financial exports. The magnitude of the human capital coefficient in the insurance and financial services exports model is highest among modern service exports. This outcome affirms the importance of human capital on insurance and financial services that have been found in Lithuania (Covaci and Moldovan, 2015) and India (Sahoo and Dash, 2014, 2017; Eichengreen and Gupta, 2013a). The quality of institutions had a negative and significant effect on insurance and financial services exports in the short-term. Since the quality of institutions is determined by the strength of democracy, this result implies that restrictions are critical for the insurance and financial service sectors. In the long-run, financial development is vital for exports of insurance and financial services as it increases capacity to offer credit to other external markets.

In Model 2, where infrastructure is counted in as an additional explanatory variable, the ECM coefficient was 0.658, a figure slightly higher than in model 1, where infrastructure was excluded. This infers that the adjustment speed from the short-term to the long-term is 65.8%. The effect of infrastructure on insurance and financial exports in Kenya is positive and significant and positive in the long-term. However, the effect is negative and significant in the short-term, which means that it takes time to realize the positive effects of infrastructure on insurance and financial exports

in Kenya. World demand for insurance and financial services significantly affected exports of insurance and financial services. The effect was positive in the short-term but negative in the long-term. Exports of goods enhanced insurance and financial exports of services in the short-run, suggesting that the two complement one another. The real exchange rate had a J-curve effect on insurance and financial exports by being negative in the short-term and positive in the long-term. Human capital had a negative and significant effect on insurance and financial exports in the short-run.

c) **Determinants of information and communication technology service exports**

The ECM coefficient for ICT service exports in Model 1 is negative and significant. Hence, the model converges to the long-run at a speed of 88% per year.

World demand for ICT services significantly impacted exports of ICT services from Kenya. However, the effect was only positive in the short-run. Thus, a shock in the external sector such as increased demand for these services is likely to improve demand for ICT services from Kenya only in the short-run[9]. A percentage rise in goods exports increased ICT exports of services by 0.27% in the long-term. Real exchange rate appreciation significantly and positively affected ICT exports of services in the long-run.

When human capital rose by 1%, ICT service exports increased by 1.2%. This confirms Goswami, Mattoo and Sáez (2012) and Sahoo and Dash's (2014, 2017) assertion that human capital endowment is vital for software and communication service exports as experienced in India. In the short-run, the quality of institutions was beneficial to ICT service exports. The long-run coefficient of financial development on ICT services exports was the highest among modern service exports. This result is possible because of the high capital required to set up an ICT company (Mureithi, 2017). Hence, a robust financial sector boots access to finance by firms in the communication sector.

[9] This implies that the current rise in digital trading arising from COVID-19 (Banga, 2020) could only be active in the short-run.

When infrastructure is added among the explanatory variables in estimating determinants of ICT service exports (Model 2), the ECM coefficient indicates that the speed of adjustment to the long-term is 77.6%. Infrastructure, financial development, exchange rate appreciation, and goods exports improved ICT service exports in the long-term. The coefficient of financial development was the highest across all models, reiterating the importance of access to credit to the ICT sector. In the short-run, world demand for ICT services, institutional quality, and human capital growth significantly increased exports of ICT services. Goods exports, real exchange rate appreciation, and infrastructure development all had negative and significant effects on exports of ICT services in Kenya.

Table 2.9: Long-run ARDL estimation results of traditional, travel, transport, and government service exports from Kenya, 1975-2017

	Traditional service exports		Travel service exports		Transport service exports		Government service exports	
	Model 1: Coeff.	**Model 2: Coeff.**	**Model 1: Coeff.**	**Model 2: Coeff.**	**Model 1: Coeff.**	**Model 2: Coeff.**	**Model 1: Coeff.**	**Model 2: Coeff.**
				Long-Run results				
World demand	-5.100**	-4.591	14.14**	5.727***	-2.606	1.197	2.627*	0.780
	(1.844)	(3.191)	(5.387)	(2.460)	(1.781)	(3.321)	(0.690)	(1.534)
Goods exports	0.00843*	0.00742*	0.203**	0.273*	0.509*	0.717**	0.281*	0.322*
	(0.00116)	(0.00176)	(0.0653)	(0.0723)	(0.130)	(0.298)	(0.0637)	(0.0749)
REER	-0.000321	-0.000437	0.0663***	0.0907	0.0375	-0.216***	-0.0143	-0.123**
	(0.000397)	(0.000610)	(0.0323)	(0.0555)	(0.0392)	(0.108)	(0.0122)	(0.0487)
Human capital	0.0462*	0.0792*	-2.008	3.759**	2.279**	-0.717	-1.883*	-0.794
	(0.0126)	(0.0240)	(1.238)	(1.339)	(1.034)	(1.894)	(0.445)	(1.014)
Institutions	-0.00734	0.0237**	-0.188	-1.103*	0.527	-1.078	0.0545	0.0693
	(0.00798)	(0.00957)	(0.220)	(0.303)	(0.597)	(0.997)	(0.0712)	(0.155)
Financial development	0.00424	-	-0.713**	-	0.0166	-	0.687	-
	(0.00251)	-	(0.271)	-	(0.191)	-	(0.664)	-
Infrastructure	-	-0.0329	-	-0.0858**	-	0.178***	-	0.0815
	-	(0.0227)	-	(0.0361)	-	(0.0886)	-	(0.0500)
				Short-Run results				
Lagged dependent variable	-	-	0.458*	0.217**	-	-0.467*	-	0.376**
	-	-	(0.0809)	(0.0710)	-	(0.125)	-	(0.154)
World demand	9.241*	4.982**	2.851**	1.895**	9.017*	-	-5.190*	-0.832
	(2.790)	(2.247)	(0.930)	(0.608)	(2.395)	-	(1.565)	(2.444)
Goods exports	-0.00190**	-0.00267**	0.00361	-0.160*	-0.110***	-	0.0870*	-0.0888
	(0.000725)	(0.00119)	(0.0486)	(0.0375)	(0.0599)	-	(0.0268)	(0.0555)
REER	0.000326	-0.000594	-0.0868*	-0.134**	-0.0127	0.0617**	-0.0440*	0.0324
	(0.000484)	(0.000574)	(0.0179)	(0.0426)	(0.0344)	(0.0224)	(0.0145)	(0.0222)
Human capital	-0.0215***	-0.0462*	-0.514**	-2.209*	-0.712	-	1.779*	0.984***
	(0.0109)	(0.0136)	(0.206)	(0.542)	(0.566)	-	(0.426)	(0.436)
Institutions	0.0381**	0.0128	-0.980**	0.413	-	1.138***	-0.0209	-0.0459
	(0.0136)	(0.0211)	(0.387)	(0.285)	-	(0.562)	(0.0410)	(0.102)
Financial development	-0.00383**	-	0.320*	-	0.203***	-	-	-0.0388
	(0.00169)	-	(0.0823)	-	(0.106)	-	-	(0.0418)

Infrastructur	-	0.0139	-	0.0359*	-	-	-	-
e	-	(0.0164)	-	(0.0102)	-	-	-	-
Constant	-0.0252	0.0210	-2.167	15.89*	-5.417	3.080	-47.17*	-13.40
	(0.0613)	(0.0521)	(1.765)	(4.307)	(4.363)	(2.871)	(13.96)	(43.47)
ECM term	-0.817*	-0.730*	-0.590*	-0.802*	-0.624*	-0.305**	-0.591*	-0.856*
	(0.123)	(0.243)	(0.145)	(0.122)	(0.128)	(0.120)	(0.0981)	(0.202)
Observations	39	39	39	39	39	39	39	39
R^2	0.929	0.908	0.990	0.990	0.940	0.885	0.868	0.963
Model specification	(1,1,4,2,2,2,4)	(1,1,4,1,4,3,2)	(4,4,4,4,2,4,3)	(3,4,4,4,4,2,4)	(1,1,4,4,0,3,4)	(4,0,0,2,2,0,0)	(1,1,2,1,4,2,0)	(2,3,4,2,4,4,4)

*Note: Standard errors in parentheses. * Shows level of significance where * $p < 0.01$, ** $p < 0.05$, *** $p < 0.10$. The lag of dependent variables is included as specified by ARDL models and the model specification. The model specification indicates the optimum number of lags for each variable in the ARDL model.*

Source: Author

Table 2.10: Long-run ARDL estimation results of modern, insurance and financial, and ICT services, 1975-2017

	Modern service exports		Insurance and financial service exports		Communication service exports	
	Model 1: Coeff.	**Model 2: Coeff.**	**Model 1: Coeff.**	**Model 2: Coeff.**	**Model 1: Coeff.**	**Model 2: Coeff.**
Long-Run results						
World demand	-2.525*	-1.402	-2.147*	-1.414***	-3.416**	2.956
	(0.830)	(1.299)	(0.535)	(0.630)	(0.985)	(4.153)
Goods exports	0.00169**	0.00238*	0.00378	0.00162	0.274*	0.558***
	(0.000588)	(0.000798)	(0.00292)	(0.00546)	(0.0707)	(0.267)
REER	0.000470**	0.000263	0.0166*	0.0195*	0.0978**	0.0795**
	(0.000188)	(0.000299)	(0.00315)	(0.00463)	(0.0325)	(0.0278)
Human capital	0.0243*	0.0440**	0.270*	0.00958	1.200**	-2.378
	(0.00592)	(0.0161)	(0.0883)	(0.00922)	(0.465)	(1.973)
Institutional quality	0.00266	0.000174	0.00492	-	-0.177	-
	(0.00584)	(0.00182)	(0.00930)	-	(0.0946)	-
Financial development	0.00128**	-	0.489*	0.652*	2.811*	3.023**
	(0.000481)	-	(0.113)	(0.125)	(0.624)	(0.840)
Infrastructure	-	0.0288	-	0.547**	-	2.265***
	-	(0.0438)	-	(0.192)	-	(1.007)
Short-Run results						
Lag for dependent variable	0.561**	-0.238***	0.392**	-0.728**	-0.412	-0.410
	(0.233)	(0.124)	(0.175)	(0.301)	(0.333)	(0.426)
World demand	3.903**	3.458*	-	0.959**	9.943*	7.721*
	(1.333)	(1.132)	-	(0.377)	(1.524)	(1.217)
Goods exports	-0.000653	0.000665	-	0.00752**	-0.0396	-0.257*
	(0.000762)	(0.000437)	-	(0.00310)	(0.0738)	(0.0603)
REER	-	-0.000359**	-0.00852*	-0.0123*	-0.0427	-0.104*
	-	(0.000154)	(0.00225)	(0.00279)	(0.0286)	(0.0245)
Institutional quality	0.0182**	-0.00279*	-0.198*	0.00117	1.250***	3.851*
	(0.00711)	(0.000809)	(0.0672)	(0.00586)	(0.544)	(0.921)
Financial development	-	-	-	-	0.304*	-
	-	-	-	-	(0.0807)	-
Infrastructure	-	-	-	-0.714*	-	-2.345**
	-	-	-	(0.117)	-	(0.707)

Human capital	-0.0219*	-0.0289*	-0.209*	-0.217**	0.0403	1.722***
	(0.00700)	(0.00536)	(0.0596)	(0.0774)	(0.536)	(0.822)
Constant	-0.0565**	-0.111	-1.312*	-1.558*	-4.638	-15.00*
	(0.0216)	(0.132)	(0.253)	(0.433)	(2.559)	(3.333)
ECM term	-0.977*	-0.608*	-0.656*	-0.658*	-0.880**	-0.776***
	(0.211)	(0.117)	(0.157)	(0.186)	(0.258)	(0.368)
N	39	39	39	39	39	39
R^2	0.926	0.894	0.634	0.965	0.987	0.990
Model specification	(3,4,4,0,4,0,4)	(4,1,1,1,4,2,0)	(3,0,0,1,2,2,0)	(4,3,4,3,3,4,4)	(3,4,4,4,4,4,3)	(4,3,4,4,4,4,3)

*Note: Standard errors in parentheses. * Shows level of significance where * $p < 0.01$, ** $p < 0.05$, *** $p < 0.10$. The lag of dependent variables is included as specified by ARDL models and the model specification. The model specification indicates the optimum number of lags for each variable in the ARDL model.*

Source: Author

2.4.2.3 Post-estimation diagnostic tests results

Four post-estimation diagnostic tests were carried out to establish the suitability of our estimated model. They were: the Autoregressive Conditional Heteroskedasticity (ARCH) test to establish the presence or otherwise of heteroskedasticity, the Breusch-Godfrey LM (BG-LM) test to establish the existence or otherwise of serial autocorrelation, the Cumulative sum (CUSUM) test for parameter stability, and the Shapiro-Wilk (S-W) test to establish normality of the residuals.

The null hypothesis of the ARCH test assumes the absence of heteroskedasticity, while the alternative assumes its presence. As for the Breusch-Godfrey LM test, the null hypothesis postulates no serial autocorrelation while the alternative assumes its presence. The null hypothesis of the CUSUM test assumes no structural breaks, and thus, parameters are stable. Lastly, the null hypothesis of the Shapiro-Wilk test assumes the normality of residuals. This means that residuals of respective ARDL models must be obtained to conduct this study. All tests rely on the p-values to make inferences except for the CUSUM test, which compares the test statistic with critical values at 1%, 5%, and 10% significance levels. The respective results are presented in Table 2.11.

Table 2.11: Post-estimation test results

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Test	**Total**	**Traditional**	**Modern**	**Travel**	**Transport**	**Government**	**Insurance and financial**	**ICT**
BG LM	0.0153	0.0137	0.3991	0.0675	0.4746	0.2622	0.0305	0.0065
ARCH	0.4785	0.4253	0.5876	0.0383	0.9422	0.1501	0.0191	0.1374
S-W	0.61096	0.94599	0.43359	0.33179	0.06512	0.77698	0.41280	0.29799
CUSUM	0.3578	0.4037	0.4431	0.5586	0.6094	0.7547	0.6285	0.5313

Note: CUSUM critical values are: 1.1430 for 1% significance level, 0.9479 for 5% significance level, and 0.850 for 10% significance level.

Source: Author

The Breusch-Godfrey LM test results in Table 2.11 indicate the absence of serial correlation across all models (1 to 7) except for ICT services. This is because it is the only model whose p-value is greater than 10%. Thus, we expect our results for exports of ICT services to be affected by the problem of autocorrelation. Results of the ARCH test reveal the absence of heteroskedasticity

across models 1 to 8. The p-value on insurance and financial services, 0.0191, was the least, but less than the 5% critical value of 0.05. Therefore, the null hypothesis of homoskedasticity was not rejected. Shapiro-Wilk test showed p-values of residuals of all models lead to the conclusion that all models (1 to 8) were normally distributed. Residuals of the transport service exports model were significant at 10% level, while inference was made at 1% for all other models. The CUSUM test results revealed stability of all models (1 to 8) at a 1% significance level. All the test statistics were below the 1% critical point of 1.1430.

2.5 Summary, conclusions and implications

2.5.1 Summary of the study

This paper sought to explain the drivers of exports of services from Kenya. This aim was motivated by Kenya's superior performance in the service sector. The sector accounted for about 47% of the GDP in Kenya between 2006 and 2019. Kenya was also second after South Africa in Sub-Saharan Africa's services exports between 2006 and 2016 (Ayoki, 2018). Since the country pursued export-led growth (ROK, 2007, 2017, 2018), this study sought reasons for Kenya's above-average performance in service exports using time series data from 1975-2017. The study distinguished traditional service exports (transport, travel, and government) from modern service exports (financial and insurance, and communication and information) and analysed eight different models. Following the import demand function by Romero and McCombie (2018), supply and demand factors were mixed to determine the drivers of exports of the different services. The factors affecting the supply-side that were considered were Kenya's endowment in infrastructure, human capital, institutional quality, financial development, and merchandise exports. Factors from the demand-side that were considered were real exchange rate and world demand for each service.

Preliminary inspection of data was achieved using graphs and summary statistics. Unit root tests revealed that the study variables were mixed in terms of order of integration, order zero (I (0)) and one (I (1)). Based on these results, the study further tested for cointegration using the ADRL Bounds test approach. The results confirmed cointegration in all eight models. The analysis then proceeded to use the ARDL approach, which was more appropriate given the variables were (I (0) and I (1)) (Pesaran, Shin and Smith, 2001; Sahoo and Dash, 2017). ARDL approach also corrected the problem of endogeneity by including lagged values of the dependent variable on the right-hand side of each of the eight models (Sahoo, Babu, and Dash, 2019; Malik and Velan, 2020).

Total service exports were found to be influenced by the global demand for services, goods exports, real exchange rate, human capital, institutional quality, financial development, and infrastructure. In the short run, global demand for services had a positive and significant effect, but not in the long-term. Thus, the effects of globalization on service exports are short-term and cannot be sustained into the future. There is a need to exploit this advantage to the fullest while it lasts. The exports of goods were found to complement service exports, particularly in the long-

run. Thus, goods and services are jointly supplied in the world market. Promotional campaigns should, therefore, be jointly rather than sectorally pursued as is currently the practice.

Fluctuations in the real exchange rate were found to affect service exports in a J-curve pattern. Currency depreciation led to deterioration in the balance of trade, but the situation improved with time, as observed by Magee (1973). This was evident in travel, transport, insurance, communication, and financial services. The effect of human capital development on service exports was negative in the short-term but positive in the long-term. It takes time before investments in human capital exert a positive effect on the export of services. Institutional quality as proxied by democratic elections improved service exports, especially modern services of ICT and transport but only in the short-run. Business interests override democratic considerations in the long-run. The effect of financial developments on exports of services was adverse in the short-term, but positive in the long-term. Thus, whereas access to credit by businesses is essential, its benefits are felt by businesses after some time. Infrastructure growth positively affected service exports in the long-run, meaning that building both physical (such as roads) and soft infrastructure (such as the internet) boosts service exports.

The results on total service exports regarding its determinants corroborate findings in other countries. For instance, Nigeria (Mkpado, 2013) and India (Sahoo and Dash, 2014; Sahoo and Dash, 2017; Sahoo, 2018; Sahoo, Babu, and Dash, 2019). However, the effect of the explanatory variables is heterogeneous across services by sign, magnitude, and significance level. Comparing traditional and modern services, the positive effect of goods exports on service exports in the long-run period was more prominent in traditional services. Regarding specific services, we found that the effect of goods exports on services was highest on transport services followed by communication services and government services. World demand for respective services, which was taken to be an external shock, had a positive effect on traditional services, specifically on travel, transport, and government service exports. The effect was highest in travel exports meaning that sanctions such as travel advisories against visiting Kenya are a negative blow on this form of service export. Furthermore, world demand for respective modern services positively affected exports of modern services (composite, insurance and financial, and ICT services) but only in the short-term. The effect was negative in the long-term. This implies that modern services are

susceptible to shocks and persistent shocks, whether positive or negative, have an overall negative shock in the long-run, possibly due to the low capacity of supplying these services under extreme circumstances.

2.5.2 Policy implications

Some important recommendations concerning policy and implications for government policymakers, current and potential service traders and scholars (students and researchers) can be derived from the findings of this study. Cross-cutting policies should target to improve the exports of goods since they also improve exports of all services. Therefore, the government should enhance export promotion policies for goods that have spill-over effects on services. The policy should also target a stable exchange rate whose effect is high in transport, travel, and communication sectors. Development of human capital, financial sector, and infrastructure should be pursued. Nevertheless, this should be done in stages - preferably using medium-term plans - since their overall positive effect occurs in the long-run.

Liberalization, which was proxied by the level of democracy, should be sector-specific. It should be encouraged in the transport sector, government services sector, and communication sector. Opening the transport and communication sectors ensures that more firms from Kenya can engage in international trade of these services. Liberalization of government services can be done through trade agreements that facilitate the inauguration of embassies and consulates. On the other hand, regulating travel, insurance, and financial sectors is vital because they can attract negative externalities such as terrorists.

There is need for entry of more firms in the insurance, financial, and communication sectors which are susceptible to external shocks. Hence, the entry of more players should be encouraged by the provision of credit to start-ups and the creation of innovation hubs that boost innovative ideas. In the case of Kenya, this should be enhanced by the government since Kenya has one of the highest number of innovation hubs in Africa (Mureithi, 2017; Ngui and Kimuyu, 2018).

2.5.3 Areas for further research

Given the escalating discussions on the role of services and structural transformation in the internal and external economies, future studies can, for instance, study the contribution of services towards

the growth and development of the economy (Eichengreen and Gupta, 2013b; Bohn, Brakman, and Dietzenbacher, 2018; Sermcheep, 2019) and manufacturing sector performance, often called servicification (Lodefalk, 2014; Aiginger and Rodrik, 2020; Pattnayak and Chadha, 2022), in Kenya. Forthcoming studies can also endeavour to establish the determinants of Kenya's comparative advantage in services. For instance, works by Cunha and Forte (2017) and Seyoum (2007) in developing countries. Exploring Kenya's comparative advantage in service exports identifies the main ingredients in maintaining the advantage and sheds light on how to reverse the comparative disadvantage experienced in some service exports.

CHAPTER THREE: THE ROLE OF TIME ZONE DIFFERENCES ON BILATERAL SERVICE FLOWS FROM KENYA[10]

Abstract

This study investigates the effect of the time zone differences on service exports from Kenya. Using bilateral service exports data from Kenya to 176 countries for the period 1995-2019, we analyse the Poisson Pseudo-Maximum Likelihood estimator of the gravity model for total, travel, transport, computer and information, construction, financial, insurance, government, other business services, and personal, cultural, and recreational services. Results reveal that the time zone differences between Kenya and partner countries are significantly positive in technology-sensitive service exports: computer and information and other business services. The effect is significantly negative for construction, financial, and government service exports. Further analysis shows that these results are robust when an alternative model is employed and overlapping workday hours are used. We also find that the influence that time zone differences have on services is non-linear and sensitive to trade facilitation indicators. Attracting FDI in technology-sensitive sectors should be encouraged through trade fairs and trade policies that enhance the network of firms in these sectors. The government can also pursue strategic investment in communication infrastructure which is crucial to the transfer of services.

Keywords: Trade in Services, Time Zone Difference, Kenya

[10] Accepted in in the Journal of African Development on 3rd August 2022.

3.0 Introduction

This chapter investigates the influence of time zone differences on bilateral service flows from Kenya. Technological development, internet penetration, and trade liberalization have been attributed to the rise in service trade (van der Marel and Shepherd, 2013a). However, it is unclear what factors determine trade in services across regions, service categories, or the appropriate models to study service trade. Therefore, the gravity model[11] has been employed to study the role of specific factors on bilateral trade in services, for instance, the role of trade agreements and policies (Park and Park, 2011; Guillin, 2013; Egger and Shingal, 2017; Mukherjee, 2018).

Studies on service exports in Kenya and the Sub-Saharan Africa region are few, partly due to limited data that is available. Since data on bilateral services trade is growing, this study contributes to literature in this line. This study builds upon three strands of studies. First, studies that link time zone differences to bilateral services trade. Time zone differences affect international trade negatively in what is often called the "synchronisation effect" or positively in what is termed as the "continuity effect" (Head, Mayer, and Reis, 2009). The "synchronisation effect" arises from the East-West (longitudinal) distance where the regular working hours of trading partners do not overlap (are non-overlapping), and hence coordination and real-time communication is hampered. The "synchronisation effect" is also depicted through "jet lag" which affects business travellers as they move from East to West, as they take time to adjust to fatigue from travelling.

The "continuity effect" arises from exploiting internet and communication networks to transfer instructions and fragment the production process between parties whose time zones do not match. It is assumed that each party will work during their standard daytime working hours, but the business will operate around the clock. This arrangement hastens the production process and is cheaper than if one party works at night to complete the process (Mandal and Prasad, 2020). The communication network also substitutes the need for face-to-face interaction associated with longitudinal or latitudinal (North-South) distances (Christen, 2017)[12]. Unlike goods, services are

[11] It is the most common tool of analysis for bilateral trade and it is also applicable to services (Kimura and Lee, 2006; Ceglowski, 2006; Head et al., 2009; Anderson et al., 2014; Anderson et al., 2018).

[12] For instance, the ongoing Coronavirus (COVID-19) pandemic has necessitated digitalization of processes due to measures such as workplace closure that has forced people to work remotely, especially in the service sector (Faraj, Renno, and Bhardwaj, 2021).

best suited for this arrangement due to their nature of intangibility and the possibility of disintegration. Nonetheless, the "continuity effect" favours technology-sensitive services for example computer, and communication services instead of transportation and tourism that might require business partners to physically meet (Head et al., 2009; Dettmer, 2014; Christen, 2017).

Figure 3.1 shows the share of total service exports and average time zone difference between Kenya and trading partners (by continent) between 1995 and 2019. We observe that Europe is by far the highest importer of services from Kenya with a share of 44.8%. It is followed by Asia and North America, which import 23.5% and 18.4% of Kenya's total services, respectively. This corroborates our initial finding in Table 2, where the USA and several European and Asian countries dominated the list of top markets for most services exported from Kenya. Africa is the fourth importer of services from Kenya, accounting for 10.9% of the share. Oceania and South America are the least importers of services from Kenya, comprising 1.7% and 0.7% of total services, respectively. Figure 3.1 also shows that Europe, Kenya's top market for services, has an average time zone difference of approximately 1.7 hours with Kenya. Asia has a mean time zone difference of 2.5 hours with Kenya, while North America's is 7.9 hours on average. Oceania has the highest time zone differences with Kenya (8.4 hours), while the least mean variation in time zone is 1.7 hours with Europe. This suggests that Kenya exports services to various markets situated in diverse time zones.

The second strand on which we build our work relates to studies that establish determinants of exports of various services. Determinants of aggregate services can obscure factors that affect exports of specific services, thereby affecting sound policy formulation (Francois and Hoekman, 2010; Kandilov and Grennes, 2010; Hellmanzik and Schmitz, 2016). For instance, sharing a common language between trading partners enhances travel, transportation, communication, and other business services, but it has no significant effect on construction, financial, and insurance services (Hellmanzik and Schmitz, 2016). For this reason, we focus on determinants of nine disaggregated service exports, viz., travel/tourism; transport; other business services (OBS); computer and information; construction; insurance; financial; government services; and personal, cultural, and recreational services. We also examine determinants of total service exports for comparison. Our focus captures all modes of supplying services as defined under GATS. They

include cross-border trade (Mode 1) such as financial services; consumption abroad (Mode 2) such as travel services; commercial presence (Mode 3) such as government services; and natural persons (Mode 4) such as in construction services (WTO, 2022).

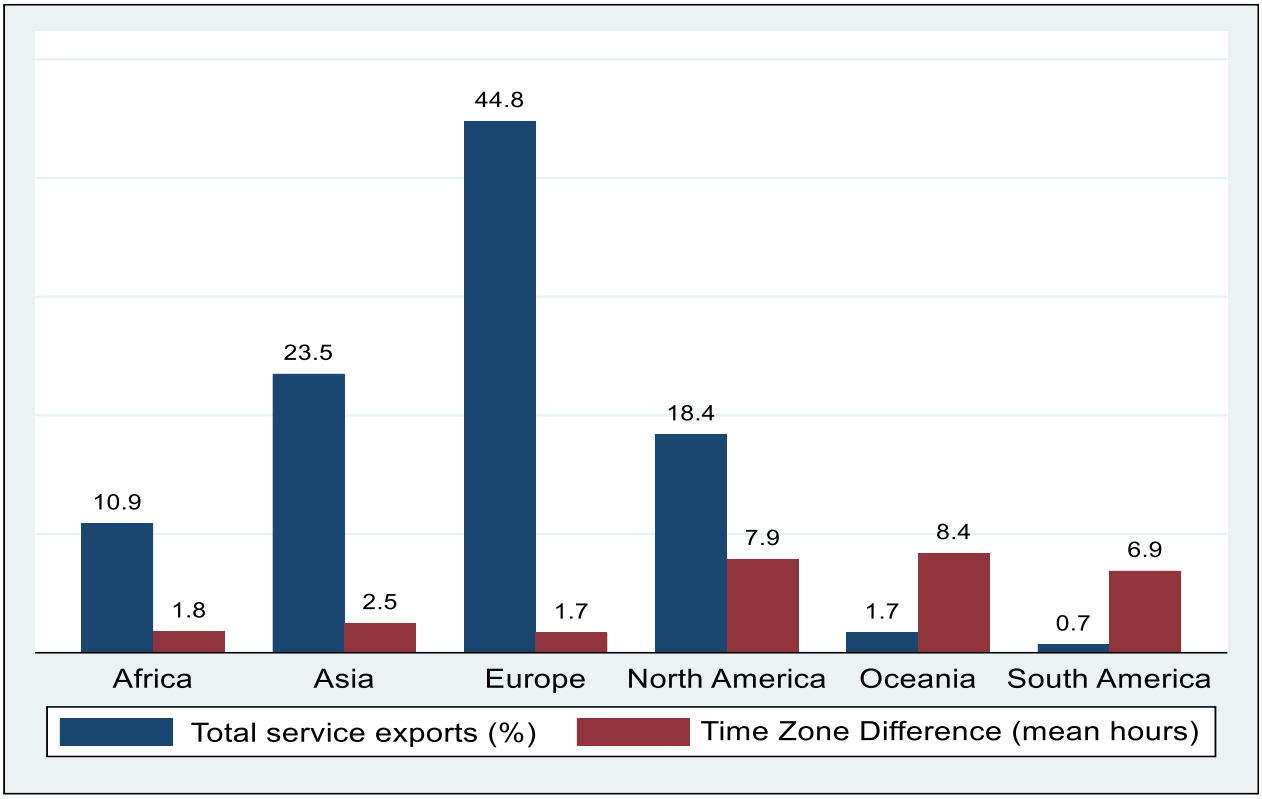


Figure 3.1: Kenya's total service exports and time zone difference by region (average, 1995-2019)

Source: Author's computation from OECD-WTO database (for total services) and Centre d'Etudes Prospectives et d'Informations Internationales database (CEPII) for time zone differences)

The third strand of studies that we followed was on identifying appropriate econometric models for estimating service exports. The gravity model was considered in this regard. Initial concerns about the gravity model were about its poor theoretical background (Yotov et al., 2017; Baier and Standaert, 2020). As a result, a raft of gravity models that are consistent with theory have been advanced over time, beginning with Anderson (1979), whose model is founded on monopolistic competition (also Anderson and Van Wincoop, 2003). The gravity model was later derived following various theories of international trade: Hecksher-Ohlin (Bergstrand, 1985; Deardorff, 1998), Ricardian (Eaton and Kortum, 2002), and heterogenous firm (Chaney, 2008; Helpman et

al., 2008; Navas, Serti and Tomasi, 2020)[13]. Another concern in gravity modelling has been on the appropriate estimator. Heteroscedasticity and zero trade flows, which are common in-service exports, have been addressed using the Poisson pseudo-maximum likelihood (PPML) estimator, which has proved to be more appropriate than the Ordinary Least Squares (Silva and Tenreyro, 2006; 2011; Yotov et al., 2017). However, PPML is likely to be susceptible to problems of over and under dispersion leading to inefficient estimators (Martínez-Zarzoso, 2013; Dadakas, Kor and Fargher, 2020)[14]. Following recommendations by Burger et al. (2009), Krisztin and Fischer (2015) and, Martin and Pham (2020), the Zero-Inflated Poisson (ZIP) model offers robust analysis.

3.1.1 Problem statement

Besides distance, transaction costs of firms that trade internationally are also captured by time zone differences. Time zone differences can hinder or boost international trade. Coordination and real-time communication among businesses can be hampered if the regular working hours of trading partners do not coincide. Production and delivery of services can also be affected by "jet lag" if business travellers have to move from East to West and thus take time to adjust to fatigue from travelling. Conversely, time zone differences can enhance trade if the production process can be fragmented into stages such that one stage is started in one country and completed in another country. The transmission of instructions from one stage to another is facilitated by the communication network in the two countries as it is assumed that work is best executed during the daytime and the time zones are non-overlapping. Unlike goods, services are best suited for this arrangement due to their nature of intangibility and the possibility of disintegration.

Kenya exports a variety of services to international markets. The top destinations are situated in diverse regions whose time zones are non-overlapping. At the same time, the level of technology and innovation in Kenya is growing as the country has the highest contribution of the internet to GDP in Africa (Dihel et al., 2012; Økland, 2019). This outcome signals an improvement in communication infrastructure, which is crucial for trade in services. Being a country that seeks to

[13] Refer to Head and Mayer (2014), Yotov et al. (2017), Baier, Kerr and Yotov (2018), Martin (2020) and Baier and Standaert (2020) for analysis of more models.
[14] This is interpreted with caution since Silva and Tenreyro (2011) prove that PPML is not susceptible to equi-dispersion problem.

improve its exports and Foreign Direct Investment (FDI)[15] (ROK, 2007; 2017), this scenario begs an explanation of how time zone differences affect service exports from Kenya.

This question has not been addressed in Kenya. Instead, studies on services in Kenya have focused on describing the trend, composition, and destination of service exports (Balistreri et al., 2009, 2015; Ikiara et al., 2008; Dihel et al., 2012; Serletis, 2014; Khanna et al., 2016 and Kodi, 2016). Therefore, our paper aims to enrich existing literature on factors influencing bilateral services (total and disaggregated levels) in Kenya between 1995 and 2019. We concentrate on establishing the effect of time zone difference and its interaction with indicators of trade facilitation. The study of facilitation of trade is becoming popular among scholars and policymakers given that extensive evidence shows that enhancing trade facilitation increases trade performance for goods and services (Portugal-Perez and Wilson, 2012; Martí et al. 2014; van der Marel and Shepherd, 2020; Türkcan and Majune, 2022).

2.1.2 Research questions

The overall research question of this chapter was what drives bilateral service exports from Kenya? The specific questions were:

1. How do time zone differences affect Kenya's total bilateral service exports?
2. How do time zone differences affect Kenya's disaggregated bilateral service exports?
3. How does the interaction between time zone differences and trade facilitation affect Kenya's bilateral service exports (total and disaggregated)?

3.1.3 Objectives

The main objective of this chapter was to explain the drivers of bilateral service exports from Kenya. The specific objectives were:

1. To determine the effect of time zone differences on Kenya's total bilateral exports of services.
2. To determine the effect of time zone differences on Kenya's disaggregated bilateral exports of services.

[15] Assuming that time zone difference has a "continuity effect", foreign firms, whose headquarters are located in different time zones can open branches in Kenya and exploit the existing communication infrastructure to sustain the production process.

3. To determine the effect of interacting time zone differences with trade facilitation on Kenya's bilateral service exports (total and disaggregated).

3.1.4 Significance of the study

Factors affecting bilateral exports of services suggest policies that target the demand-side. Differences in time zones assist businesses (Foreign Direct Investment) to cut trading costs. A firm could move their services offshore by putting up a foreign subsidiary or get into partnerships with companies abroad. Ultimately, the effect of the difference in time zones informs the location of these firms. Since Kenya has abundant labour (compared to capital), it can establish a niche in delivering services to distant markets. Our results also inform government policy on foreign investors, especially those located in markets with a considerable time difference from Kenya. Given that we incorporate trade facilitation in our analysis, government policy-makers and investors can use our recommendations to engage in informed trade transactions across varied services. In general, our study puts forward stylized facts on trading services from Kenya internationally, thereby benefiting researchers.

3.1.5 Organisation of the study

The rest of this chapter is organised as follows. Section 3.2 reviews literature. Section 3.3 explains the methodology while section 3.4 presents the results and discusses them. Section 3.5 concludes the study and offers some recommendations of policy.

3.2 Literature review

3.2.1 Theoretical literature review

Trade in services has a weak but developing theoretical foundation. Therefore, to explain services, scholars make use of goods-specific trade theories. According to Geda (2012), David Ricardo theorises the cause of trade to be differences in comparative advantages between countries. The productivity levels of trading countries determine the comparative advantage. Models developed to explain services trade based on the David Ricardo's theory include those by Van der Marel (2012) and van der Marel and Shepherd (2013b). According to Sauvé and Roy (2016), the Heckscher-Ohlin (H-O) theory explains trade between countries as a result of dissimilarities in relative factor endowments, i.e., real factor endowments, domestic institutions integrity, or institutions within the local labour market. Krugman (1979; 1980) argues that increasing returns to scale enables producers to differentiate products, and more variety in products causes trade between countries.

The theories mentioned explain trade by taste, technology, or endowment. Time as a variable is a recent consideration and has often been incorporated in theoretical models. A study by Marjit (2007) posits a seminal model, which the author bases on a framework of the Ricardian theory of comparative advantage where we observe two small countries that are symmetric technologically and resources-wise but are in two time zones and have labour as the sole factor of production. These countries offer two different services, one a regular service and the other a time-zone-reliant service. The two countries offshore the time-zone-reliant service between them. One country produces during the day (when night comes in the partner country), then the partner country continues the production process when it is daytime there. The service is a process that gets completed in one day – taking up 24 hours – and gets sold on the second day. The two countries save time - since the process would normally take two working days (daytime) if it were being carried out in only one country. Thus, the trade partners save on trade costs and effectively possess a comparative advantage over other countries that produce the same service.

Kikuchi (2009) introduces communication networks as a way of building on Marjit's model. Kikuchi proposes a setup with three countries - two countries that are symmetric compared to the rest of the world as the third country. The setup is also characterised by monopolistic competition

and labour as the sole factor of production. A homogenous commodity and a time-zone-reliant commodity are produced, where the latter is produced by means of intermediate business services. In this setup, monopolistically competitive firms supply business services in two consecutive stages, where each stage requires one working day, i.e., 12 hours of daytime. Thus, to produce a business service, one country would take two working days. Yet, a country could make the most of the time zone difference and offshore one stage of the business service to the other country, so that one country specializes in stage one of production and the other one in the second stage. Therefore, the two countries have to incur costs to facilitate communications and enable them to transact. Though labour is not mobile across these two countries, there exists a mobility of labour that is virtual and made possible by means of communication technology to enable foreign workers to work during home workers' night-time and vice versa. Hence, with such a setup, countries can benefit from services trade when costs of communication are fairly low. The gain in efficiency that they enjoy is high as a result of specialization that cuts the costs of labour.

Kikuchi and Iwasa (2010) posit a model that assumes two countries that are symmetric and are located in time zones that do not overlap. In this setup, two types of services are produced based on a framework by Dixit and Stiglitz (1977). The monopolistically competitive sector produces differentiated services whereas the perfectly competitive sector produces homogenous services. It is assumed that completing a differentiated service takes one working day. So, after completing the service, a firm will have to wait overnight to sell the service the following day in the local market. Alternatively, the firm could make use of its communication infrastructure to instantly deliver and sell the service in the other country where it will be daytime and incur an international delivery cost. Kikuchi and Van Long (2010) put forward a similar model.

Matsuoka and Fukushima (2010) propose a model with shift-working. Given that an operation takes one full day, i.e., 24 hours, a domestic producer could choose to provide a service that is differentiated either in two working days (when only day workers are employed) or in one day if the firm employs night-shift workers as well. For the latter, the firm will have to pay higher costs employing the nightshift workers due to the reduced utility of working during the night-time

(Nakanishi, 2019)[16]. But a firm could avoid the higher labour cost by making use of a partner country's day-shift workers where the two countries enjoy a non-overlapping time zone.

A model by Nakanishi and Van Long (2015) demonstrates the influence that the differences in time zones exert on a Heckscher-Ohlin-Samuelson setup. The model postulates two different countries (Home and Foreign) in two time zones, producing two different services or goods (A and B), by means of three factors of production (land, capital, and labour). Capital is specific to good A whose production occurs at night and daytime. Land is specific to good B whose production only occurs during the day while labour is in A and B. Only labour is mobile across countries of the three factors. The model evaluates a situation where countries are similar in size and also when the Home country is bigger and enjoys more factor endowments than the Foreign country.

In both cases, the model predicts that virtual trading of labour via communication networks increases night-time production of good A and the overall production of the time-bound good A compared to when countries do not trade. In addition, the two countries will enjoy a comparative advantage over the Rest of the World in producing good A. This is also proved in the model by Kikuchi and Van Long (2011). The same conclusion is made by models which assume imperfectly competitive markets such as Marjit, Mandal, and Nakanishi (2020).

3.2.2 Empirical literature review

Stein and Daude (2007), among the seminal studies on the effect of time zone differences and trade, find that time zone differences negatively affect bilateral FDI stock from 17 Organization for Economic Co-operation and Development (OECD) source countries to 58 host countries between 1997 and 1999. The study estimates a gravity model using Tobit and Ordinary Least Squares (OLS) techniques. Hattari and Rajan (2012) confirm this negative relationship by analysing bilateral FDI flows to developing Asia countries using an augmented gravity model for data ranging from 1990 to 2005. They find that distance has a greater impact on FDI flows from non-Asia-Pacific countries within the OECD than from developing Asian economies. However, this distance effect disappears when the time zone difference is controlled for.

[16] Workers prefer resting during the night (Nakanishi, 2019).

Christen (2017) analyses the effect of differences in time zones on outward affiliate sales from the United States of America (USA), confirming the determining role of both longitudinal and latitudinal distance in international services transactions. Further, the study clarifies that the time zone difference between the USA and partner countries has varied impacts depending on the number of hours. In particular, 1-2 hour difference does not significantly influence affiliate sales compared to zero hourly difference, whereas 5-hour and 9-11 hour differences significantly raise transaction costs, thus encouraging USA's bilateral services trade through affiliates. This fact especially applies to information-intensive services such as professional, scientific, and technical services, with little need for affiliate firms in sectors involved with online information exchange such as insurance and finance.

Dettmer (2014) confirms sector-specific responses to distance and time zone differences, with a "continuity effect" in the trade of specialised business services such as accounting, auditing, and business and management consulting across non-overlapping time zones. However, trade in other business services (for instance, leasing, advertising, and legal) and commercial services (for example, construction, communication, and insurance) across long cross-border distances experience a "synchronisation effect." The study further shows that inadequate access to ICT networks limits time zones' "continuity effect" if more than a 9-hour difference exists.

Head, Mayer, and Reis (2009) find a downward trend in trading costs within the markets for services and goods exports, with a positively significant relationship between geographical distance and bilateral goods trade. However, after sectoral disaggregation, they confirm that "synchronisation effects" persist in most bilateral services trade, including offshore-able services like call centres. Therefore, they conclude that foreign service workers do not pose a significant threat to local service workers in developed economies, though their competition is likely to rise given the abovementioned trend. However, Hellmanzik and Schmitz (2016) discover that bilateral web page hyperlinks, which they term virtual proximity, can allow for international information flows that promote bilateral services trade and mitigate adverse distance effects, particularly in ICT-related sectors.

Most of the studies above assess the "synchronisation" and "continuity effects" of time zone differences on ICT-related services, but their impacts on total services remain unclear. On the one hand, some studies find a "continuity effect" when using a PPML algorithm on a gravity model. In particular, Kandilov and Grennes (2010) report an approximately 30% increase in total service trade levels with every 1-hour increase in time zone difference. Their robustness checks using alternative econometric techniques like OLS and Gamma pseudo-maximum likelihood (GPML) produce similar results. However, they note that the trend is non-linear since every additional hour past the eighth-hour mark adversely affects aggregate service trade levels. Tomasik (2013) similarly finds a "continuity effect" in aggregate service exports but a "synchronisation effect" in bilateral manufacturing trade. On the other hand, Kandilov and Grennes (2012) analyse a gravity model using both OLS and PPML estimators and find a pronounced "synchronisation effect" for exporters and importers with low skills-endowment. These varying conclusions, likely due to imprecise aggregate findings, warrant a disaggregation of service sectors in our analysis of bilateral trade flows from Kenya.

The present study reviews some empirical literature on the effect of differences in time zone on bilateral trade in specific service sectors, such as construction. Hellmanzik and Schmitz (2016) categorise them among transformation services that alter the condition of goods. Their PPML and Instrumental Variables (IV) approaches report a highly significant and negative distance effect on construction services, just as on margin services which involve physical shipments. They also show that technology has a minimal mitigating impact with regard to construction and government services. Nordås and Rouzet (2017) analyse bilateral trade data from OECD countries and report negative time zone differences effect on construction services. However, Mukherjee (2018) distinguishes between the use of construction services for intermediate purposes such as advisory input and final consumption such as with architectural designs. The study estimates an augmented gravity model using the PPML technique and shows that time zone differences positively affect intermediate usage of construction services but negatively affect final consumption usage.

Various studies unanimously find a negative relationship between differences in time zone and international trade in travel/tourism and transport services due to the cost-inducing impact of geographical distance, the lack of cultural proximity, and "jet lag" (Hellmanzik and Schmitz, 2016; Mukherjee, 2018; Czaika and Neumayer, 2020). While distance negatively and significantly affects all sub-sectors of transport services, time zone differences specifically influence air, maritime, rail, and courier services positively (Nordas and Rouzet, 2017). Communication, government, personal, cultural, and recreational services (such as audiovisual services) are negatively affected by time zone differences, as shown by Hellmanzik and Schmitz (2016).

Aside from distance and time zone difference, the literature reveals that other factors determine bilateral service flows (total and heterogeneous), such as trade and investment barriers, GDP, GDP per capita, shared language, religious similarity, common border, virtual proximity, shared legal origins, colonial relationships, common currency, trade agreements, market size, population characteristics, institutional quality, conflict, democracy, terrorism, manufacturing FDI, goods trade, number of people who migrate from the country that is exporting to the country that is importing (bilateral migrants), landlockedness, natural disasters, ICT access, and real exchange rate (see Head et al., 2009; Nordås and Rouzet, 2017; Hellmanzik and Schmitz, 2016; Czaika and Neumayer, 2020; Freund and Weinhold, 2002; Kimura and Lee, 2006; Egger and Shingal, 2017; McKay and Tekleselassie, 2018; Mitra et al., 2018; Mukherjee, 2018; Álvarez et al., 2018; Xu and Kouwoaye, 2019; Didier, 2020; Nordås, 2020; Cheng, 2021; Khachaturian and Oliver, 2022; Dong et al., 2022; Shingal, 2022; Reverdy, 2022).

Most studies find GDP and GDP per capita of the importing countries and of the exporting countries to have a positive effect on total and disaggregate services (Kimura and Lee, 2006; Hellmanzik and Schmitz, 2016; Nordås and Rouzet, 2017; McKay and Tekleselassie, 2018; Mukherjee, 2018; Cheng, 2021). Sharing a colonial relationship, common currency, common border have positive effects on trade in services but common language and religion have mixed effects (Head, Mayer, and Reis, 2009; Dettmer, 2014; McKay and Tekleselassie, 2018). Trade restrictions, terrorism, and conflict impact service exports negatively (Nordås and Rouzet, 2017; Mitra, Pham, and Bandyopadhyay, 2018; Mukherjee, 2018; Ferracane and van der Marel, 2019;

Khalid, Okafor and Aziz, 2020; Didier, 2020; van der Marel and Shepherd, 2020; Khachaturian and Oliver, 2022; Dong et al., 2022; Shingal, 2022; Reverdy, 2022).

The impact that trade agreements have on services trade varies by the type of agreement. Regional Trade Agreements are primarily positive (Kimura and Lee, 2006; Park and Park, 2011; van der Marel and Shepherd, 2013a; Guillin, 2013; Nordås and Rouzet, 2017; Álvarez et al., 2018), but they can be negative when regions are considered (Chang and Lai, 2011). Customs Unions are mostly positive and insignificant (Guillin, 2013). Free Trade Agreements and European Union membership have mixed effects (van der Marel and Shepherd, 2013a; Dettmer, 2014; Hellmanzik and Schmitz, 2016; Mitra, Pham, and Bandyopadhyay, 2018; Nordås, 2020; Oesingmann, 2022; Khachaturian and Oliver, 2022). WTO membership boosts travel exports (McKay and Tekleselassie, 2018) as the Euro and the Schengen Agreement boost the volume of air cargo flows. Preferential Trade Agreements have mixed effects (Guillin, 2013) while the Eurasian economic union (EAEU) did not have a statistically significant effect on most services (such as legal and telecommunication) except for business and management consulting, and freight transport export and import services in Kazakhstan (Zhunussova and Dulambayeva, 2022).

Population of the importer has a mixed effect on exports of services (Freund and Weinhold, 2002; Kimura and Lee, 2006; Hellmanzik and Schmitz, 2016; Braymen and Briggs, 2017; McKay and Tekleselassie, 2018; Mukherjee, 2018). This result indicates that demand for services in the destination market is determined by other factors apart from the population. Conversely, the exporting country's population has a positive effect on exports of services (Chang and Lai, 2011; Braymen and Briggs, 2017; Mukherjee, 2018). This signals that domestic demand for services and the production capacity of the domestic economy are essential for services.

A few studies on bilateral services trade have incorporated exchange rates. According to Culiuc (2014), the real exchange rate of the exporting country affects tourism positively, but that of the destination has a negative effect. According to Mukherjee (2018), bilateral real exchange rates significantly decrease total business services, computer and related services, post and telecommunication services, construction, transport and storage services. The effect is positive for

financial intermediation and Research and Development services. The exchange rate volatility negatively affects exports of bilateral education services (Braymen and Briggs, 2017).

According to Álvarez et al. (2018), control of corruption, government effectiveness, the rule of law and political stability – of the destination country - significantly enhance service exports. Voice and accountability have a positive but insignificant effect. ICT access, mainly internet penetration, increases exports of services ranging from total services to transport, communication, financial, computer, government services, and audio-visual services (Freund and Weinhold, 2002; 2004; Hellmanzik and Schmitz, 2015; 2016; Kneller and Timmis, 2016; Kaimann and Del Bono, 2020; Tee, Tham and Kam, 2020; Luong and Nguyen, 2021). Nonetheless, internet penetration is likely to affect travel and insurance services negatively when the exporting country and importing country, respectively, improve their internet access (Hellmanzik and Schmitz, 2016).

Some studies expound on the interrelationship between international goods and services trade (Egger, Francois, and Nelson, 2017; Park and Park, 2011). Specifically, an increase in goods exports also increases services exports, and vice versa, due to general regional trade agreements (Park and Park, 2011). In fact, Egger, Francois, and Nelson (2017) find that multilateral goods trade networks, due to preferential trade agreements, have a superior stimulating impact on bilateral services trade volume than the actual volume of goods traded. All the same, the authors report positively significant effects of bilateral goods trade volume on services exports.

Xu and Kouwoaye (2019) uniquely focus on the impact of economically disruptive natural disasters, such as earthquakes, on the international service trade. They estimate a structural gravity model using PPML and OLS techniques and find that large natural disasters can lower services exports from the affected country by 2% to 3% on average. They mainly observe this negative effect in capital and knowledge-intensive service sectors like transport and communication. On the other hand, however, the demand for services imports may rise due to the internal disruptions but may be impeded by damaged trade infrastructure. Baldwin and Tomiura (2020) and Barkas, Honeck and Rubio (2020) explain that the COVID-19 global pandemic has similarly hampered services exports due to strict containment measures that have disrupted trade, travel, and economic activity.

A large urban population with a large number of internet users promotes audio-visual imports such as movies and music (Hellmanzik and Shmitz, 2015), while Masood (2019) shows that high levels of digital piracy hamper the international trade of audio-visual services. Bouvatier (2014) examines the factors that affect the bilateral trade of financial services and finds that while differing bank capital requirements exert an insignificant influence, heterogeneous private monitoring systems negatively impact the sector. Other factors such as discrimination against foreign providers and capital control regulations are also significant determinants of bilateral financial service trade. In addition, burdensome visa requirements and having few migrants from the source country who are living in the destination country significantly hamper international tourism (Czaika and Neumayer, 2020). However, a moderate level of military spending as a share of GDP enhances international tourism attractiveness by signaling security in cases of armed conflict (Khalid, Okafor, and Aziz, 2020).

3.2.3 Overview of reviewed literature

Theoretical models are instrumental in the illustration of the relationship between differences in the time zone and bilateral service trade - particularly those by Marjit (2007), Kikuchi (2009), Kikuchi and Iwasa (2010), Matsuoka and Fukushima (2010), Kikuchi and Van Long (2011), Nakanishi and Van Long (2015), and Marjit, Mandal, and Nakanishi (2020). The models mainly predict a “continuity effect,” where time zone differences enhance trade between countries by allowing for a 24-hour work process. In contrast, however, empirical evidence shows that this effect is not guaranteed and is heterogeneous among various service sectors. For this reason, the present study sectorally disaggregates services to evaluate the impact of time zone difference on not only the total bilateral services trade but also on the bilateral trade of travel/tourism, transport, computer and information, construction, financial, insurance, government, personal, cultural, recreational, and other business services.

3.3 Methodology

3.3.1 Theoretical framework

The theoretical framework of this study was borrowed from Nakanishi and van Long (2015). It is based on a Heckscher-Ohlin-Samuelson set up with two countries, Home (H) and Foreign (F), two sectors (X and Y), and three factors of production (capital, labour, and land). The countries are presumed to be situated in time zones that are non-overlapping and are 12 hours apart. Hence, F experiences night-time (N) when H has day-time (D). Sector X is the service sector whose production is determined by capital and labour, i.e., $X = F(K, L)$ for H and $X^* = F(K^* L^*)$ for F where * means foreign country. Sector X has day and night production, meaning that X is a vector of X^D, X^{D*}, X^N and X^{N*}. Sector Y is a traditional goods sector that only relies on labour and land as factors of production, $Y = F(L, Z)$ where Z is land. This sector is assumed to be active during the daytime only since its processes are not transferable as in the service sector. Labour is mobile between the two countries, but capital and land are assumed immobile. In particular, labour in sector X is assumed to be tradable internationally through communication networks, provided that countries trade freely.

Letting $\lambda = \frac{L}{L+L^*} = \frac{K}{K+K^*} = \frac{Z}{Z+Z^*}$ to represent the size of a country, we infer that countries are identical in size (considering factor endowment) if $\lambda = \frac{1}{2}$. Country H is bigger than country F if $\frac{1}{2} < \lambda < 1$. There is autarky if $\lambda = 1$. These scenarios are presented in Figure 3.2.

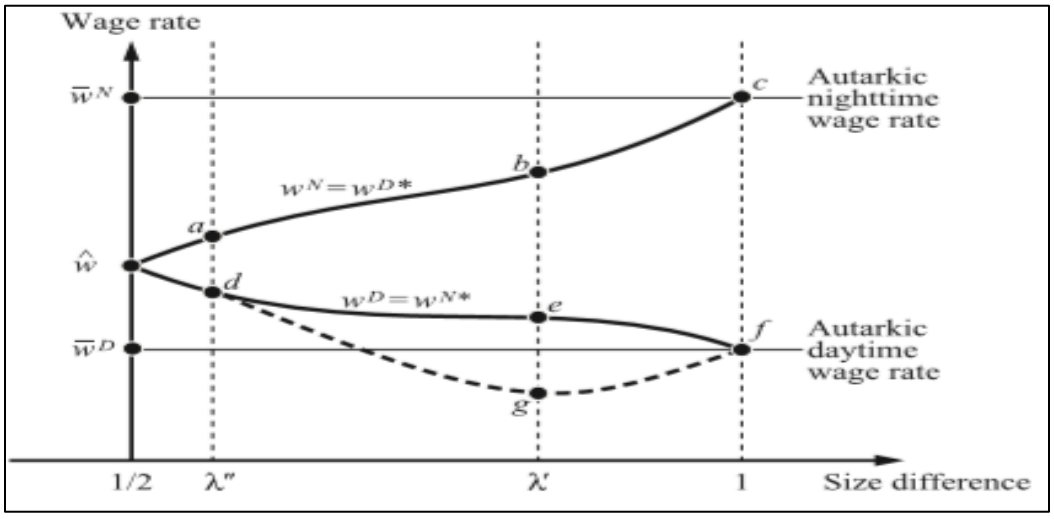


Figure 3.2: Effects of communication networks on wages with varied country sizes

Source: Nakanishi and Van Long (2015)

Starting with a case where the two countries of the same size $\left(\lambda = \frac{1}{2}\right)$, labour in both countries earns a wage but the night shift wage (w^N) is higher than that of the day (w^D) because of the disutility of working at night. Wages are assumed to be a function of λ, that is $w^D(\lambda)$ and $w^N(\lambda)$. Less labour is willing to work at night, implying that $L^N < L^D$. Night and daytime wages under autarky are $\overline{w}^N$ and $\overline{w}^D$ respectively. However, the former is assumed to be higher than the latter for night-shift work to occur. Alternatively, night-shift work could be avoided if labour is virtually transferrable between the two countries using communication networks. In such a case, H can import labour from F virtually and vice versa. This ensures that the delivery process is faster and production costs of X are minimized since daytime labour is cheaper than night-time labour. Communication costs are considered part of a firm's operational investment/capital and are identical in both countries.

As presented in the first vertical line of Figure 3.2, corresponding to $\lambda = \frac{1}{2}$, wages in both countries converge to a common wage rate $(\widehat{w})$. Daytime wages $(\overline{w}^D)$ rise to $\widehat{w}$ while night-time wages $(\overline{w}^N)$ decrease to $\widehat{w}$. The overall effect is that production in sector X expands as a result of reduced production costs. Nakanishi and Van Long (2015) and Kikuchi and Van Long (2011) show that both countries acquire a comparative advantage in sector X. They also show that the rate of renting capital increases and the land rent decrease as employment and output decline in sector Y.

The second case considers H being larger than F $(\frac{1}{2} < \lambda < 1)$ though with identical factor endowment ratios. Assuming first that H has both night and day-time labour, since the small country, F, cannot meet its night-time demand, then $w^N > w^D$ still holds. Second, if labour in country F works in the daytime only but can provide labour to H during H's night-time through communication networks, country F's labour is paid an equivalent of H's night-time wage $(w^{D*} = w^N)$. Third, if H provides night-time labour to F with its daytime labour, $w^{N*} = w^D$. All three situations are presented in Figure 3.2.

The fourth assumption is that $w^N(\lambda)$ monotonically increases in size (λ) as per line $\widehat{w}abc$ in Figure 3.2. It rises from $\widehat{w}$ to point c where $\lambda = 1$. $w^D(\lambda)$ diminishes in λ but it may or may not end below the autarkic wage rate of $\overline{w}^D$. For instance, line $\widehat{w}def$ declines but ends up above $\overline{w}^D$ and $\widehat{w}dgf$,

which goes below $\overline{w}^D$ for some large λ. Nakanishi and Van Long (2015) term the first case as normal while the latter is extreme. Notably, the extreme case doesn't occur when λ is close to $\frac{1}{2}$. Lastly, wage differentials in the night-time and daytime increase as the home country expand in size.

We first consider the reaction of wages and overall production in H when labour services are traded via communication networks. From Figure 3.2, $\overline{w}^N$ declines to b since F's daytime labour can be used during H's night-time. Hence, as X^N increases, $\overline{w}^D$ rises to e in a normal case or decreases to g in an extreme case. This reduces the total daytime production of X. It also decreases Y's production if the normal case occurs. Nevertheless, the overall production of X ($X^N + X^D$) increases, exhibiting the benefits of exploiting the difference in time zones in trade.

As for F, which is small, liberalization of labour services through communication networks raises daytime wage rate from $\overline{w}^D$ to b since they can sell their labour during H's nighttime. The same is paid in F's daytime for sectors X and Y. Nonetheless, the day-time production of both X and Y declines. The night-time wage rate declines to points e or g when it is normal or extreme but production of X increases due to availability of labour from H. The overall effect is that total day and night-time production of X increases while that of Y declines. Once again, Nakanishi and van Long (2015) and Kikuchi and van Long (2011) have proved that both countries acquire a comparative advantage in service X if labour services are liberalized through communication networks.

3.3.2 Analytical model

The gravity model was used to assess the effect of time zone differences on bilateral service flows. Specifically, the Anderson and van Wincoop (2003) version which accounts for the multilateral resistance terms (the domestic and external costs associated with other markets that affect trade between two countries). Equation 12 presents the model:

$$T_{ab} = \frac{Y_a Y_b}{Y}\left(\frac{t_{ab}}{\pi_a P_b}\right)^{1-\sigma} \quad \text{..... 12}$$

Where T_{ab} represents the trade flows between countries *a* and *b* in terms of value. Y_a is the GDP of country *a* and Y_b is the GDP for country *b*. π_a is the outward multilateral resistance term (the cost associated with all possible export markets when country *a* exports to *b*) while P_b is the inward multilateral resistance term (the cost associated with other import markets when country *a* imports from *b). Y* is the world GDP and t_{ab} is the bilateral trading cost.

Taking the natural logarithm on both sides of equation 12 yields:

$lnT_{ab} = lnY_a + lnY_b - lnY + (1-\sigma)lnt_{ab} + (\sigma-1)ln\pi_a + (\sigma-1)lnP_b$ *13*

Equation 13 can be re-written to include fixed effects for country *a* (origin) and country *b* (destination) as follows: $O_a = lnY_a + (\sigma-1)ln\pi_a$ and $D_b = lnY_b + (\sigma-1)lnP_b$. Equation 13 becomes:

$lnT_{ab} = O_a + D_b - lnY + (1-\sigma)lnt_{ab}$ *14*

where $t_{ab} = \beta_0 + \beta_1 ln(time\_zone\_difference)_{ab} + \beta_2 \ln(Distance)_{ab} + \varepsilon_{ab}$ because time zone differences and distances are proxies for costs of bilateral trade. O_a and D_b are the multilateral resistance terms (origin and destination fixed-effects) while ε_{ab} is the error term.

Equation 14 can be generalised as follows:

$lnT_{ab} = ln\gamma + \alpha lnY_a + \beta lnY_b - \delta InD_{ab} + \theta Z_{ab} + ln\varepsilon_{ab}$ *15*

where, as before, T_{ab} is trade flow between country *a* and *b*, Y_a and Y_b are GDPs for countries *a* and *b* respectively, and ε_{ab} is the error term. D_{ab} is distance between the two countries. Z_{ab} includes additional covariates (time zone difference, depending on if the trading countries have a common language and colonial relationship, bilateral goods exports from Kenya, financial development, exchange rate, and occurrence of a natural disaster in a partner country) together with multilateral resistance terms. $\gamma, \alpha, \beta \; and \; \theta$ are parameters to be estimated.

Equation 15 is an OLS model, and it is endemic to two econometric problems, as illustrated by Silva and Tenreyro (2006; 2011). Firstly, upon log-linearization, it omits zero trade value given that the natural logarithm of zero is undefined. Secondly, the heteroscedastic error term results in biased parameter estimates.

Silva and Tenreyro (2006: 2011) developed an alternative approach, the PPML estimator, to correct these limitations. The PPML estimator assumes that the dependent variable (export flow) is either a count or a non-negative integer (Cameron and Trivedi, 2005). The model presentation is as below:

$\sum_{ab}[T_{ab} - exp\ (ln\gamma + \alpha lnY_a + \beta lnY_b - \delta InD_{ab} + \theta Z_{ab} + ln\varepsilon_{ab})]X_{ab} = 0$ …..…. 16

where $X_{ab} = [1, lnY_a, lnY_b, InD_{ab}, Z_{ab}]$ and parameters $ln\gamma, \alpha, \beta, \delta\ and\ \theta$ are arrived at by running a Poisson regression model of service exports (total and disaggregates) on X_{ab}. Trade flow values don't need to be integers or follow a Poisson distribution to obtain consistent estimates. Instead, a conditional mean needs to be precisely specified since the PPML estimator doesn't control for heteroscedasticity entirely as inferences are dependent on the White robust covariance matrix estimator (Kandilov and Grennes, 2010), i.e., $E(T_{ab}|X_{ab}) = \exp\ (ln\gamma + \alpha lnY_a + \beta lnY_b - \delta InD_{ab} + \theta Z_{ab} + ln\varepsilon_{ab})$.

In addition to controlling for zero trade values and problems of heteroscedasticity, the PPML estimator is widely available in numerous econometric software such as Stata which is used in this study. More so, the approach evades Jensen's inequality bias. Jensen's inequality occurs where the expected value of the natural log of a random variable differs from the log of its expected value (Silva and Tenreyro, 2006). The main implication of this concept is that the coefficients of log-linear models, estimated by OLS, are highly biased, especially in the presence of heteroscedasticity (Silva and Tenreyro, 2006).

Whereas the PPML estimator controlled for this bias, it might[17] have suffered from the problem of equidispersion, which assumes identical mean and variance of the dependent variable. However, the variance often exceeds the mean. Failure to rectify this problem results in consistent but inefficient coefficients of the estimated dependent variable (Cameron and Trivedi, 2005).

Therefore, this study utilised an alternative estimator - the Zero-Inflated Poisson (ZIP) model. This model has been used to forecast gravity models accurately (Burger et al., 2009; Krisztin and Fischer, 2015; Martin and Pham, 2020). Furthermore, since we analyse several models (depending

[17] We cautiously assume equi-dispersion affects PPML because Silva et al. (2011; 2015) have proved that it is not a major problem in PPML models. More information can be found from http://personal.lse.ac.uk/tenreyro/LGW.html.

on the service category), the ZIP model is appropriate since some types of services have many zeros (see Table B.1). The ZIP model is broken down into two parts: the zero-inflation part, which estimates the probability that a flow of bilateral trade is zero or positive as per the first section of equation 17.

$$Prob[T_{ab}|X_{ab}, N_{ab}] = \begin{cases} \emptyset_{ab}(N_{ab}) + [1 - \emptyset_{ab}(N_{ab})]\, exp(-X_{ab}\vartheta) & T_{ab} = 0 \\ [1 - \emptyset_{ab}(N_{ab})]\frac{exp(-X_{ab}\vartheta)X_{ab}\vartheta^{T_{ab}}}{T_{ab}!} & T_{ab} > 0 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 17$$

The second part, which is the negative binomial, establishes a non-zero probability where trade flows are greater than zero with their respective covariates. This is the lower part of equation 17. N_{ab} in equation 17 is a vector of independent variables that define the probability of getting extra zeros, $\emptyset_{ab} \in [0,1]$. Following Cameron and Trivedi (2005), $\emptyset_{ab}(N_{ab})$ is modeled as a logit model.

We ultimately estimated ten equations in our empirical analysis. The equations are distinguishable based on the dependent variable - total services; transport; travel; financial; computer and information; government; construction; insurance; other business services; and personal, cultural, and recreational services. Equation 18 is a representation of the respective equations with covariates which are explained in Table 3.1.

$$Service_{ijtk} = f(GDP_{it}, GDP_{jt}, D_{ij}, TZD_{ij}, CL_{ij}, CN_{ij}, Goods_{ijt}, FD_{jt}, NDis_{jt}, ExR_{jt}) \quad \ldots\ldots\ldots \quad 18$$

where i is Kenya, j is importer, t is time and k is a category of service (total and nine categories). Other terms are explained in Table 3.1.

Data on bilateral services trade is obtained from the Extended Balance of Payments Services (EBOPS) of 2002 and 2010. EBOPS 2002 is hosted by OECD, and it ranges from 1995 to 2012. EBOPS 2010 is hosted by the World Trade Organization (WTO), and it ranges from 2013 to 2019. Therefore, we merge the two datasets to form one database for bilateral service trade ranging from 1995 to 2019. To ensure data accuracy, we rely on data on imports as reported by Kenya's trade partners[18]. This practice is often recommended, especially where the exporter is a developing country (Brenton et al., 2010; Carrère and Strauss-Kahn, 2017). EBOPS data has also been used

[18] Balanced values are used.

by recent studies such as Xu and Kouwoaye (2019), El-Sahli (2020), Nordås (2018; 2020), Fu et al. (2020), Maurer (2020), Visagie and Turok (2021), Tajoli et al. (2021), Xiong and Sun (2022) and Benz, Jaax and Yotov (2022).

Data for explanatory variables is from several sources. The GDP for Kenya (GDP_{it}) and partner's GDP (GDP_{jt}), level of financial development (FD_{jt}), and percentage change in the real exchange rate (ExR_{jt}) are sourced from the World Bank's World Development Indicators (WDI) database. Kenya's GDP shows the domestic production capacity of services while the partner's GDP signals foreign demand for Kenya's services. Financial development is calculated using the Principal Component Analysis (PCA) approach for four indicators: domestic credit to the private sector (% of GDP), domestic credit provided by financial sector (% of GDP), domestic credit to the private sector by banks (% of GDP), and broad money (% of GDP). It has been shown by Ma and Xie (2019) and Cea et al. (2022) that the level of financial development in a destination country enhances export volumes of foreign firms which have access to external credit. When the exchange rate rises, it indicates currency appreciation in the destination country, which is expected to reduce service exports from Kenya.

Geographical characteristics - distance (latitudinal and longitudinal) and time zone difference - are included to capture transactions costs related to real-time interactions in service delivery. The distance between Nairobi, Kenya's capital, and capitals of partner countries (D_{ij}) is decomposed into latitudinal (North-South) and longitudinal (East-West) distance following Stein and Daude (2007) and Christen (2017)[19]. Latitudinal distance is the great circle distance in kilometres (km) from ($Latitude_{Nairobi}, Longitude_{Nairobi}$) to ($Latitude_{Partner\ capital}, Longitude_{Partner\ capital}$) holding the longitude constant at one of the two capitals. The longitudinal distance is calculated in three stages. First, by holding Nairobi's latitude constant and, secondly, by holding the latitude of the destination country's city constant. Third, the longitudinal distance is the average distance from

[19] Failure to distinguish between latitudinal and longitudinal distance can overestimate the distance effect (Stein and Daude, 2007).

the two steps[20]. Data for longitudes and latitudes is from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).

Time zone difference (TZD_{ij}) is the absolute value of the time difference between Nairobi and the major capitals of partner countries. An average time difference is calculated for countries that have multiple time zones. For instance, the time difference between Nairobi and Kinshasa is 2 hours and 1 hour with Lubumbashi, yet the two cities are located in the Democratic Republic of the Congo (DRC). We find an average, 1.5 hours, to establish a time zone difference between Kenya and the DRC. Data for time zone differences is from the World Clock (https://www.timeanddate.com/worldclock/).

Common language (CL_{ij}) and colonial links (CN_{ij}) are included to represent the effect of cultural and historical ties on transaction costs. Their data is from CEPII. Data for bilateral trade in goods ($Goods_{ijt}$) is also sourced from CEPII, and it is incorporated to show the potential of a network effect where goods boost trade in services (Egger, Francois and Nelson, 2017). Natural disaster ($NDis_{jt}$) – defined as a dummy variable for the occurrence of a natural disaster in a partner country where one means the disaster resulted in over 1,000 total deaths and injuries, over 100,000 affected people, and over USD 1 billion worth of damages, and zero otherwise (Xu and Kouwoaye, 2019) – is gotten from the EM-DAT database. Natural disasters reduce exports, primarily services such as travel and transport, which have been the most adversely affected by the ongoing Coronavirus (COVID-19) pandemic (WTO, 2021; Ando and Hayakawa, 2022). A comprehensive depiction of variables is in Table 3.1.

[20] This can be illustrated as follows. Distance from step one arises from the following coordinates ($Latitude_{Nairobi}, Longitude_{Nairobi}$) to ($Latitude_{Nairobi}, Longitude_{Partner\ capital}$) while that for step two is from ($Latitude_{Partner\ capital}, Longitude_{Nairobi}$) to ($Latitude_{Partner\ capital}, Longitude_{Partner\ capital}$). $Longitudinal\ distance = \frac{(Step\ 1 + Step\ 2)}{2}$ in kms.

Table 3.1: Variable definition, measurement, and source

Variable	Description	Source
Dependent variables		
Total services	Includes total bilateral flows of services (USD millions)	OECD/WTO
Travel services	Includes business and personal (tourism) travel services (USD millions)	OECD/WTO
Transport services	Includes sea, air and road transport services (USD millions)	OECD/WTO
Financial services	Includes explicitly charged financial services, and financial intermediation services (USD millions)	OECD/WTO
Insurance services	Includes direct insurance, auxiliary insurance services and reinsurance (USD millions)	OECD/WTO
Computer and information services	Includes computer software and telecommunication services (USD millions)	OECD/WTO
Other business services	Includes legal, research and development services (USD millions)	OECD/WTO
Government services	Includes services by embassies and consulate, military units and agencies, and other government services (USD millions)	OECD/WTO
Construction services	Includes construction services (USD millions)	OECD/WTO
Personal, cultural, and recreational services	Includes audio-visual and related services, and other personal, cultural, and recreational services (USD millions)	OECD/WTO
Independent variables		
Time Zone Differences	Difference in hours between Kenya's capital (Nairobi) and partner's capital	World Clock
Latitudinal distance	Great circle distance (North-South) in kilometres (km) from Nairobi to destination's capital	CEPII database
Longitudinal distance	East-West distance between Nairobi and destination's capital	CEPII database
Common language	Dummy if a country has a common language with Kenya	CEPII database
Colony	Dummy if a country has a colonial relationship with Kenya	CEPII database
Goods	Bilateral trade in goods between Kenya and trade partners (USD millions)	CEPII database
GDP Kenya	Natural logarithm of GDP (Current) (USD millions) for Kenya	WDI
GDP partner	Natural logarithm of GDP (Current) (USD millions) of an importer	WDI
Financial development	Principal Component Analysis for Domestic credit to the private sector (% of GDP), Domestic credit provided by financial sector (% of GDP),	WDI

	Domestic credit to the private sector by banks (% of GDP), and Broad money (% of GDP)	
Natural disaster	Dummy variable for the occurrence of a natural disaster in a partner country where one means the disaster resulted in over 1,000 total deaths and injuries, over 100,000 affected people, and over USD 1 billion worth of damages, and zero otherwise	EM-DAT database
Exchange rate	Partner's real exchange rate in USD	WDI

Note: The approach of calculating natural disasters was borrowed from Xu and Kouwoaye (2019)

Source: Author

3.4 Results and discussion

3.4.1 Descriptive statistics

This section contains descriptive statistics of our variables. First, we present summary statistics for services in Figure 3.3 and later those of covariates in Table 3.2.

Figure 3.3 shows the range plot with capped spikes indicating the minimum and maximum values per service. The figure also shows the mean of each service as a scatter point. Total service exports ranged from US$ 0.002 million to US$ 904.3 million during the study period (1995-2019), with a mean of US$ 16.11 million. USA was the primary recipient, accounting for 17% of Kenya's total services exports, followed by the UK, whose share was 14%. Other top ten importers were Germany, France, Netherlands, Italy, Switzerland, Japan, India, and China. Cumulatively, about 59% of service exports from Kenya were to these top ten importers. In terms of geographical regions, Europe was the leading importer of services from Kenya (45%), followed by Asia (23%) and North America (18%). Africa was the fourth region with a share of 11% while Oceania and South America accounted for 1.7% and 0.7% respectively.

At the categorical level, Figure 3.3 shows that travel, transport and government had a maximum export value of at least US$ 265 million respectively. The mean export of travel services was US$ 6.52 million. The mean of transport services was US$ 6.46 million and US$ 1.34 million for government services which include services offered by agencies, military units as well as consulates and embassies. Of the remaining services, only other business services had a maximum export value of over US$ 90 million and a mean of at least US$ 1.45 million. Other business services include legal, research, and development services. As shown in Table 2, the USA and the UK are the leading importers of most services from Kenya. Intra-African trade is only strong for construction services where countries such as Mauritius and Ethiopia feature among the top ten destinations. In general, all variables had a minimum value of zero, apart from total services, and averages of most services were not far from their respective minimum values, thus indicating the possibility of many zeros.

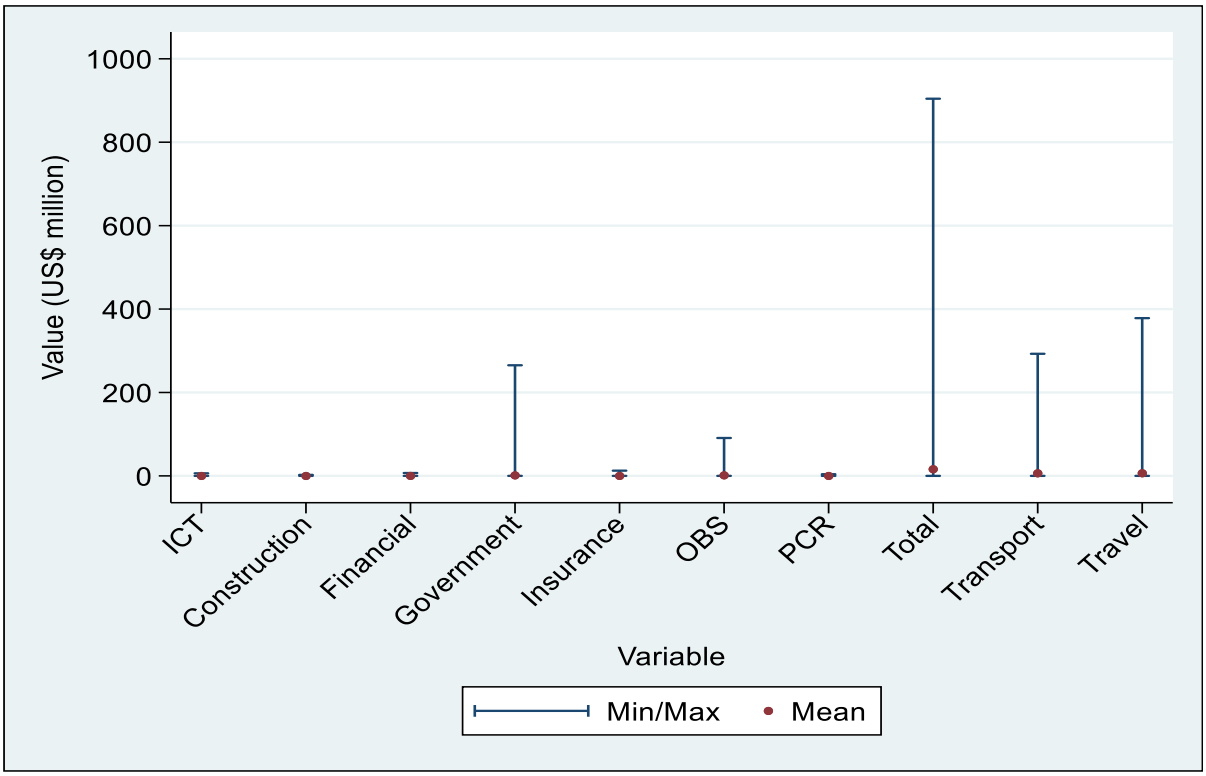


Figure 3.3: Summary statistics for service exports in Kenya

Note: *ICT means computer and information services, OBS stands for other business services, while PCR means personal, cultural, and recreational services.*

Source: Author's computation

Table B.1 in the Appendix supports this notion by revealing that all services (apart from total services) have incidences of zero trade values. Construction, Computer, and information, and Personal, cultural, and recreational services have the highest rates of zeros. Other business services have the fewest records of zeros followed by transport, travel and government services respectively. Nearly a half of total services exports are less than US$ 1 million. The presence of many zero values in our services justifies our use of count data models in econometric analysis (see section 3.4.2).

Table 3.2 presents summary statistics of independent variables. The first row indicates that the average GDP for Kenya between 1995 and 2019 was approximately US$ 37 billion. This is over eight times lower than that of all importers (US$ 320 billion). The mean longitudinal and latitudinal distances between Kenya and destination countries are 5,220 kilometers and 2,942 kilometers,

respectively. Time zone difference, which is our variable of interest, has a mean of about 3.4 hours. The maximum and minimum time zone variations are 10 and 0 hours, respectively. Most neighbouring countries like Uganda and Tanzania fall within the latter time zone category.

On average, nearly a third of importers share an official language and have some colonial linkage with Kenya. The mean export of goods from Kenya to all trading partners between 1995 and 2019 was US$ 20 million. This is about US$ 4 million above services, accounting for 56% of total goods and services exports. Most goods were exported to Africa (38%), followed by Europe (35%), Asia (16%), North America (10%), and Oceania and South America, whose share was less than 1% between 1995 and 2019. This indicates that intra-Africa trade in goods from Kenya is more potent than that of services. Uganda, the UK, Netherlands, USA, and Tanzania were the top five importers of goods from Kenya between 1995 and 2019, respectively.

Table 3.2 also shows that the average exchange rate in Kenya's importers between 1995 and 2019 was US$ 1.034. To determine what effect financial development has on services trade, we constructed an indicator using Principal Component Analysis (PCA) method. Following related studies (Sahoo and Dash, 2014; 2017), we developed the financial development index from domestic credit to the private sector by banks (% of GDP), broad money (% of GDP), domestic credit provided by the financial sector (% of GDP) and domestic credit to the private sector (% of GDP). These variables were highly correlated among themselves (above 0.75), prompting us to conduct a PCA. The mean for the financial development index is close to zero, meaning that importers of Kenya's services neither have highly developed financial systems nor less developed ones. The last row of Table 3.2 indicates that 19% of Kenya's importers faced natural calamities between 1995 and 2019. These are natural disasters that either led to over 1,000 total deaths and injuries or affected over 100,000 people and caused over US$ 1 billion worth of damages.

Table 3.2: Summary statistics of services and independent variables

Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
GDP Kenya (US$ billion)	43,190	37.170	26.090	9.046	95.500
GDP importer (US$ billion)	42,440	320.000	1340.000	0.058	21400.000
Longitudinal distance (km)	43,191	5220.043	4451.317	52.755	15318.13
Latitudinal distance (km)	43,191	2942.345	1880.078	71.874	7258.48
Time Zone Difference (hours)	43,190	3.422	2.791	0.000	10.000
Common language	43,190	0.309	0.462	0.000	1.000
Colonial relationship	43,190	0.288	0.453	0.000	1.000
Goods	43,196	19.880	70.410	0.000	777.900
Exchange rate	43,196	1.034	19.76	0.000	868.1
Financial Development	43,196	0.000	1.681	-2.576	10.370
Disaster	43,196	0.192	0.394	0.000	1.000

Source: Author's computation

3.4.1.2 Correlation analysis between different trade services and time zones

Correlation shows the relationship between two variables and the strength and direction of that relationship. This section describes the correlation between time zone differences, our target variable, and categories of services. This assessment is vital as it predicts the results of the regression (see section 3.4.2).

According to Figure 3.4, total service exports from Kenya have a positive correlation (correlation coefficient (r)= 0.001) with time zone differences. This indicates that a "continuity effect" exists in total service exports in Kenya. Given that services are heterogenous, we also established the correlation between time zone difference and respective services. Computer and information, construction, other business services, transportation, and personal, cultural and recreational services negatively correlate. The magnitude of the correlation coefficient is highest for construction services (-0.1) and least for transport services (-0.003). The results of computer and information services are startling since these services are prone to use ICT and in turn, expected to be positively impacted by the difference in time zones (Head, Mayer and Reis, 2009). Financial (r=0.03), government (r=0.04), insurance (r=0.06) and travel (r=0.01) services are positively correlated with time zone differences.

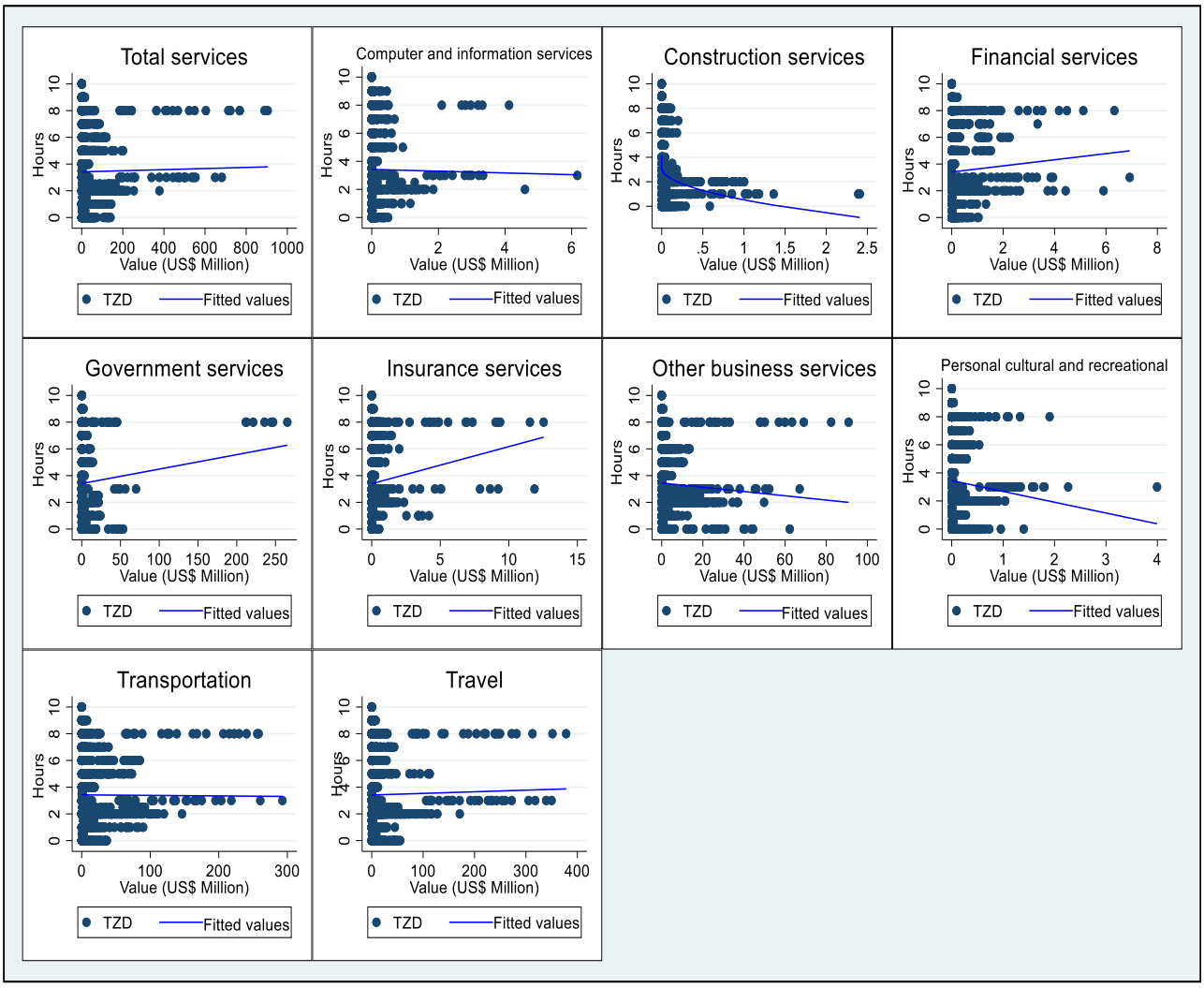


Figure 3.4: Correlation between service sectors and time zone difference

Source: Author's computation

3.4.2 Regression analysis and discussion

3.4.2.1 Time zone difference effects on services exports from Kenya

Column 1 of Table 3.3 indicates that the coefficient of time zone differences is negative but not statistically significant. This outcome implies that the time difference between Kenya and partner countries does not affect total services. Similar results have been found by Kandilov and Grennes (2010) when considering all services and Dettmer (2014) for all commercial services.

Given that the effect of the difference in time zones is heterogeneous among services (Christen, 2017), we next test its effect on nine categories of services. Columns 2 and 3 show that the time

difference between Kenya and its trading partners has no statistically significant effect on travel and transport exports, respectively. Instead, the time zone difference has a "continuity effect" on computer and information exports (column 4) and exports of other business services (column 9). Taking the coefficients of 0.290 (computer and information) and 0.430 (other business services), in substantive terms, these elasticities imply an average effect of 33.6%[21] and 53.7% more computer and information exports and other business services exports, from Kenya to a partner country, per hour time difference respectively.

The "continuity effect" in computer and information services and other business services has also been established by Kandilov and Grennes (2010) for Central and Eastern Europe countries and Dettmer (2014) for 27 OECD countries. This means that both services are ICT-intensive and have a high likelihood of around-the-clock clearance, which can be done from daytimes of different time zones.

The "synchronisation effect" dominates the exports of construction, financial and government services whose coefficients are statistically significant. The effect is highest in construction exports which reduce by approximately 24% due to a 1 hour time difference followed by government services (23%) and financial services (13%). The "jet lag" effect and other costs related to travelling to offer services in the destination country are prevalent in construction and government services, contributing to the negative effect when time zone differences exist. The "synchronisation effect" of financial exports is unexpected and could be influenced by the high regulation in the sector (Borchert et al., 2020; Benz et al., 2020) that offsets the expected advantage in delivering financial services digitally. Insurance, and personal, cultural, and recreational services have a "continuity effect" that is not statistically significant (columns 8 and 10).

3.4.2.2 Effects of other covariates on services exports from Kenya

The other explanatory variables align with expectations with a few exceptions, as reported in Table 3.3. Kenya's GDP largely has a positive effect on most service exports as expected. The GDP of importers also has a positive and significant effect on most service exports from Kenya, implying

[21] This percentage is calculated by transforming the estimated coefficient as follows: $[exp(\beta_i) - 1] \times 100 = [exp(0.290) - 1] \times 100 = 33.6$.

that growth in external demand is vital for services exported from Kenya. Latitudinal and longitudinal distances are significant across most services. Nonetheless, the latitudinal distance has a negative effect while longitudinal distance has a positive effect except for other business services. Sharing a common language enhances travel, financial, and government services while having colonial links boosts exports of computer and information, construction, and other business services.

The analysis in Table 3.3 also supports the hypothesis that exporting goods enormously improves services exports. The estimated coefficient is positive and significant across all services with a higher magnitude for construction and other business services. Financial development is also positive and significant across most services (except construction which has a negative sign), implying that access to credit from the destination market is vital for service exports. A natural disaster in an importing country reduces exports of services from Kenya. Particularly travel services whose coefficient is significant at 5%. This result corroborates the finding by WTO (2021) that the COVID-19 pandemic worst-hit travel services in 2020. The coefficient of the percentage change in the real exchange rate in Table 3.3 is statistically significant for most services and is correctly signed.

Table 3.3: Baseline PPML gravity model estimation for services in Kenya

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total	**Travel**	**Transport**	**ICT**	**Construction**	**Financial**	**Government**	**Insurance**	**OBS**	**PCR**
Time Zone Differences	-0.008	-0.117	0.013	0.290*	-0.269**	-0.136*	-0.263**	0.041	0.430**	0.106
	(0.075)	(0.110)	(0.061)	(0.159)	(0.116)	(0.081)	(0.122)	(0.131)	(0.207)	(0.161)
GDP Kenya	0.181	0.590***	0.177***	0.114	-0.813***	0.564	1.486***	1.853	-0.631**	0.114
	(0.146)	(0.081)	(0.057)	(0.576)	(0.162)	(0.366)	(0.103)	(6.930)	(0.315)	(0.844)
GDP importer	0.463***	0.487***	0.433***	0.458***	0.054	0.307***	0.594***	0.351***	0.427***	0.506***
	(0.037)	(0.046)	(0.045)	(0.109)	(0.162)	(0.094)	(0.110)	(0.092)	(0.105)	(0.114)
Latitudinal Distance	-0.358***	-0.349***	-0.365***	-0.079	0.366	0.207	-0.419*	-0.096	-0.330*	-0.483***
	(0.078)	(0.086)	(0.103)	(0.163)	(0.299)	(0.245)	(0.237)	(0.137)	(0.200)	(0.148)
Longitudinal Distance	0.158	0.203***	0.289***	0.454**	0.535**	0.630***	0.279***	0.606***	-0.420*	-0.224
	(0.100)	(0.076)	(0.081)	(0.199)	(0.245)	(0.175)	(0.107)	(0.147)	(0.248)	(0.190)
Goods	0.355***	0.378***	0.348***	0.193**	0.548***	0.171*	0.258***	0.381***	0.392***	0.258***
	(0.040)	(0.040)	(0.063)	(0.077)	(0.102)	(0.101)	(0.078)	(0.084)	(0.077)	(0.087)
Common language	0.138	0.388***	-0.049	-0.063	-0.670	0.642**	0.531***	0.188	-0.363	0.049
	(0.100)	(0.134)	(0.132)	(0.253)	(0.476)	(0.306)	(0.184)	(0.264)	(0.291)	(0.319)
Colony	0.138	0.032	0.134	1.159***	1.394***	0.324	-0.087	0.504	0.661**	-0.283
	(0.134)	(0.148)	(0.152)	(0.402)	(0.498)	(0.368)	(0.267)	(0.397)	(0.336)	(0.426)
Financial Development	0.128***	0.109***	0.148***	0.005	-0.149*	0.073	-0.006	0.081***	0.191***	0.196***
	(0.032)	(0.031)	(0.045)	(0.055)	(0.089)	(0.057)	(0.057)	(0.029)	(0.068)	(0.061)
Disaster	-0.082	-0.142*	-0.113	-0.094	-0.465	-0.171	0.273	-0.079	0.009	-0.151
	(0.071)	(0.080)	(0.081)	(0.201)	(0.357)	(0.150)	(0.208)	(0.158)	(0.117)	(0.114)
Exchange rate	-0.048**	-0.064**	-0.038	-0.224**	-0.036	-0.156**	-0.112***	-0.098***	0.025	-0.095
	(0.021)	(0.030)	(0.025)	(0.088)	(0.063)	(0.062)	(0.037)	(0.036)	(0.049)	(0.068)
Constant	-12.007***	-20.830***	-13.135***	-27.867**	-2.191	-27.207***	-37.222***	-50.951	0.364	-21.248
	(2.605)	(1.434)	(1.248)	(11.987)	(2.980)	(7.418)	(2.126)	(125.902)	(6.393)	(14.207)
Observations	2919	2919	2919	2919	2919	2919	2919	2919	2919	2919
R-squared	0.976	0.974	0.937	0.863	0.345	0.714	0.981	0.967	0.853	0.832
Pseudo log-	-8303.080	-4786.458	-5789.268	-240.772	-208.849	-532.950	-2101.497	-419.055	-2788.212	-240.350

likelihood										
Importer-time fixed effects	✓	✓	✓	✓	×	×	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	×	✓	✓	✓	✓	✓

*Note: Standard errors are in parentheses. * Represents level of significance as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. ICT means computer and information services, OBS stands for other business services while PCR means personal, cultural, and recreational services.*

Source: Author

3.4.2.3 Robustness checks

This section performs additional regression analyses to establish if our results will change with regard to these variations: consideration of hourly time intervals; review of overlapping working hours; interaction between trade facilitation measures and time zone difference; and an alternative econometric model.

a) Consideration of hourly time intervals

Time difference is classified as dummy variables from 0-hour interval to 10-hour difference[22] to explore the probable presence of non-linear effects of time zones and give a threshold of the length of time difference per service category in this section. A similar exercise has been done by Stein and Daude (2007), Tomasik (2013), and Christen (2017), who establish a non-linear time zone difference effect on service exports. Figure 3.5 displays the estimated marginal effects and respective confidence intervals at a 95% of confidence. The zero-hour time difference is used as the reference category.

The coefficient plots for hourly time intervals on total services are negative except for the 10-hour time difference as displayed in the first quadrant of Figure 3.5. This finding indicates that the "synchronisation effect" dominates total service exports in Kenya. Further analysis shows that the coefficients are significant at the 1-hour, 5-hour, 6-hour, 9-hour, and 10-hour time differences. The second top quadrant of Figure 3.5 shows that travel service exports are negative and significant when the time difference is one hour. Transport service exports experience a statistically significant "synchronisation effect" when the time difference is between four and ten hours as per the third top quadrant of Figure 3.5.

The fourth top quadrant of Figure 3.5 reveals that computer and information services have a "continuity effect" across time zone intervals. However, this is only significant for the 2- and 3-hour-time intervals. The "synchronisation effect" dominates exports of construction services, especially at the 3-hour, 5-hour, 6-hour, 8-hour, and 9-hour time difference, where coefficients are statistically significant. The coefficients of time difference on financial services and government

[22] Continous time zone differences are rounded off to the next hour.

services are negative and significant from the 4-hour difference for financial exports and between the 1-hour and 9-hour difference for government services.

The bottom quadrant shows that the time zone difference positively affects other business services, particularly at the 2-hour and 3-hour time differences, which are statistically significant. Personal, cultural, and recreational services are dominated by the "synchronisation effect" (significant at the 1-hour, 4-hour, 5-hour and 9-hour differences) but have a "continuity effect" at the 10-hour difference. Overall, the time-zone difference effect is non-linear as the effect is not statistically significant across all time intervals across services[23]. There is also a threshold for the "continuity effect": between 2- and 3-hour time difference for ICT-intensive services (computer and information services and other business services) and a 10-hour difference for total and personal, cultural, and recreational services.

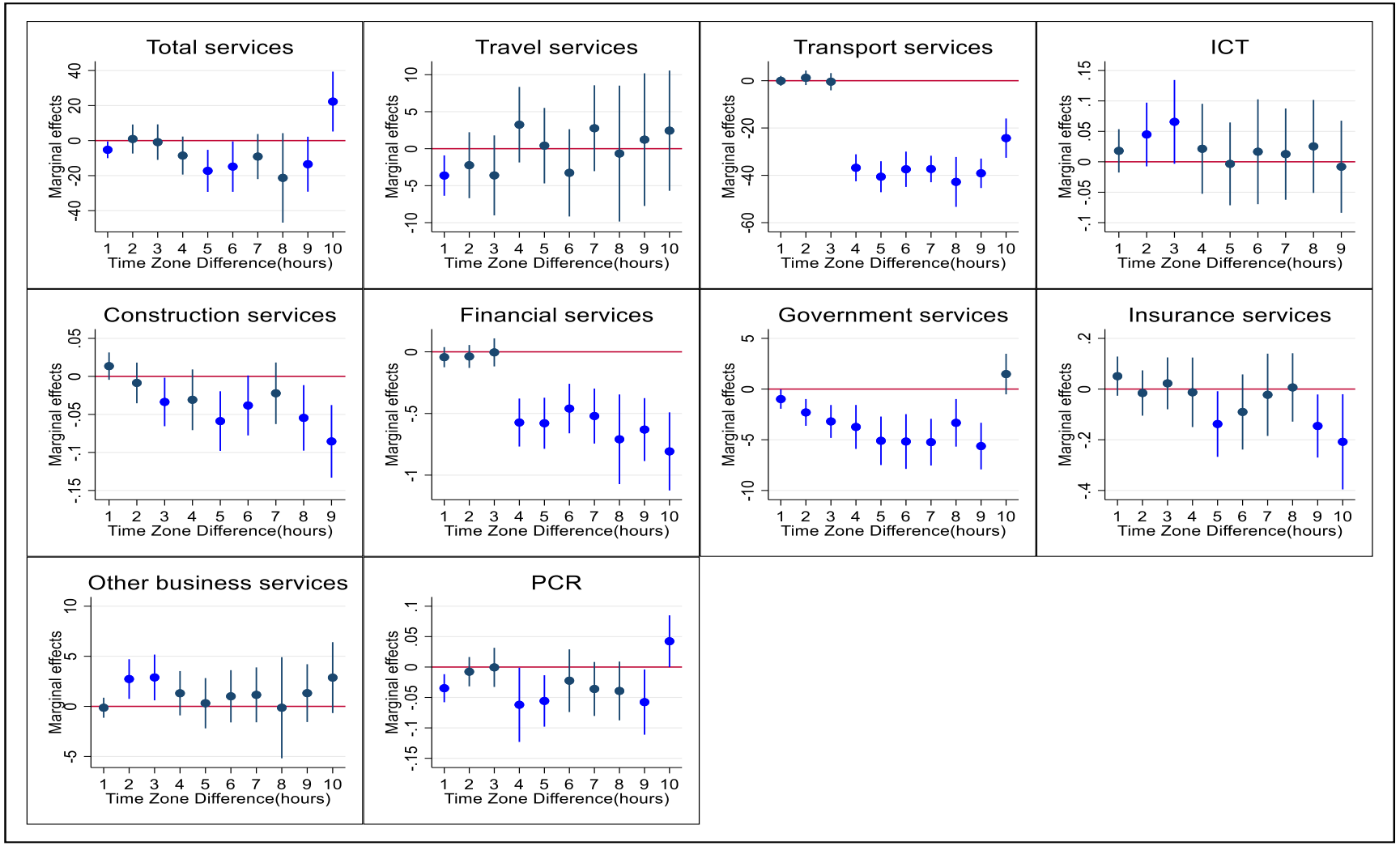
b) Consideration of overlapping workday hours

Following Stein and Daude (2007), Tomasik (2013), and Christen (2017), we use the number of daily overlap hours, assuming an 8-hour office workday (9:00 am – 5.00 pm) between Kenya and a partner, in this section. Since a significant difference in the time zone could be equivalent to a small number of overlap hours[24], the sign of the coefficients is expected to be opposite of the baseline results in Table 3.3. As before, year-fixed effects and importer-time fixed effects are included to control for possible endogeneity. Table 3.4 displays results with the overlapping workday hours.

Table 3.4 shows that the coefficient of overlapping business hours is significant for computer and information services, construction, government, and other business services (similar to the baseline results). The signs are also as expected, and the overlap in business hours improves exports of services whose possibility of virtual delivery is low such as construction services. The signs and significance levels of the other variables remain unchanged compared to the baseline model.

[23] The results are robust even when we exclude Europe, Kenya's top service importing region (these results are available on request).

[24] For example, a 7-hour time difference means Kenya and the destination country have one overlapping workday hour. Time differences exceeding 8 hours are equivalent to zero overlapping workday hours.



Note: Time zone differences are dummies ranging from zero hours to ten hours. Zero hours are used as the reference category. ICT means computer and information services, while PCR means personal, cultural, and recreational services. The circles indicate the regression coefficients, and the spikes indicate their 95% confidence interval bands. Blue spikes and circles mean a coefficient is significant at 1%, 5%, or 10% level.

Figure 3.5: Confidence intervals of marginal effects per hourly time zone difference

Table 3.4: PPML regression analysis for services by trade when overlapping working hours are considered

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total	Travel	Transport	ICT	Construction	Financial	Government	Insurance	OBS	Personal
GDP Kenya	0.187	0.594***	0.176***	0.095	-0.815***	0.560	1.492***	0.697	-0.901***	0.108
	(0.156)	(0.082)	(0.057)	(0.575)	(0.162)	(0.366)	(0.104)	(7.545)	(0.118)	(0.843)
GDP importer	0.463***	0.489***	0.433***	0.458***	0.054	0.305***	0.594***	0.350***	0.421***	0.505***
	(0.037)	(0.046)	(0.044)	(0.107)	(0.161)	(0.095)	(0.109)	(0.090)	(0.105)	(0.114)
Latitudinal Distance	-0.357***	-0.348***	-0.365***	-0.075	0.367	0.206	-0.420*	-0.102	-0.327*	-0.482***
	(0.078)	(0.086)	(0.103)	(0.159)	(0.299)	(0.247)	(0.237)	(0.137)	(0.198)	(0.147)
Longitudinal Distance	0.160	0.214***	0.287***	0.383**	0.534**	0.582***	0.289***	0.578***	-0.437*	-0.228
	(0.102)	(0.077)	(0.081)	(0.195)	(0.246)	(0.170)	(0.108)	(0.155)	(0.254)	(0.197)
Overlapping hours	0.011	0.136	-0.016	-0.381**	0.271**	0.118	0.280**	-0.075	-0.463**	-0.114
	(0.081)	(0.113)	(0.069)	(0.193)	(0.119)	(0.087)	(0.127)	(0.151)	(0.227)	(0.179)
Goods	0.355***	0.378***	0.348***	0.192**	0.549***	0.175*	0.257***	0.381***	0.395***	0.259***
	(0.040)	(0.040)	(0.063)	(0.076)	(0.102)	(0.101)	(0.077)	(0.084)	(0.077)	(0.087)
Common language	0.140	0.400***	-0.051	-0.109	-0.669	0.622**	0.542***	0.166	-0.373	0.044
	(0.100)	(0.133)	(0.133)	(0.264)	(0.476)	(0.305)	(0.186)	(0.270)	(0.289)	(0.322)
Colony	0.137	0.028	0.135	1.193***	1.396***	0.343	-0.089	0.518	0.663**	-0.283
	(0.134)	(0.148)	(0.152)	(0.413)	(0.498)	(0.376)	(0.266)	(0.396)	(0.335)	(0.427)
Financial Development	0.128***	0.110***	0.148***	0.006	-0.148*	0.075	-0.005	0.082***	0.187***	0.195***
	(0.032)	(0.031)	(0.045)	(0.054)	(0.088)	(0.056)	(0.057)	(0.029)	(0.069)	(0.061)
Disaster	-0.083	-0.143*	-0.112	-0.097	-0.464	-0.171	0.273	-0.074	0.011	-0.152
	(0.071)	(0.080)	(0.080)	(0.200)	(0.357)	(0.149)	(0.208)	(0.157)	(0.116)	(0.115)
Exchange rate	-0.048**	-0.063**	-0.038	-0.223***	-0.036	-0.153**	-0.111***	-0.099***	0.024	-0.095
	(0.021)	(0.030)	(0.025)	(0.084)	(0.063)	(0.062)	(0.037)	(0.036)	(0.048)	(0.068)
Constant	-12.187***	-21.953***	-12.995***	-24.284**	-4.345	-27.746***	-39.507***	-29.219	9.092**	-20.323
	(3.311)	(1.657)	(1.418)	(11.775)	(3.420)	(7.349)	(2.418)	(138.107)	(3.630)	(14.079)
Observations	2919	2919	2919	2919	2919	2919	2919	2919	2919	2919
R-squared	0.976	0.974	0.937	0.867	0.346	0.714	0.981	0.967	0.854	0.832
Pseudo log-likelihood	-8302.882	-4781.488	-5789.139	-240.313	-208.903	-533.708	-2099.791	-418.991	-2784.47	-240.346

Importer-time fixed effects	✓	✓	✓	✓	×	×	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	×	✓	✓	✓	✓	✓

*Note: Standard errors are in parentheses. * Represents level of significance as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. ICT means computer and information services, OBS stands for other business services while PCR means personal, cultural, and recreational services.*

Source: Author

c) Interaction of trade facilitation measures with time zone differences

Trade facilitation is classified into two components: "hard" logistics, which is about the quality of relevant physical ICT infrastructure, and "soft" logistics, which is about regulations and procedures. The "hard" component is represented by the mobile subscriptions and the level of internet access in the destination country. Data for mobile subscriptions - mobile cellular subscriptions (per 100 people) - is obtained from the WDI database. Data for internet access - the share of individuals using the internet in a country - is obtained from WDI.

"Soft" indicators of trade facilitation comprise the presence of a General Agreement on Trade in Services (GATS), quality of institutions, and Services Trade Restrictiveness Indices (STRI) in the partner country. GATS is a service-specific trade agreement that the WTO ratified in 1995. It is expected that trading with a country that is a signatory of GATS improves exports as the agreement reduces impediments to bilateral trade in services. The integrity of institutions was computed using the PCA method, which produced a single index from all six factors of the World Governance Indicators (Kaufmann et al., 2011). The flow of services from Kenya to partner countries is expected to increase when the quality of institutions improves in the destination. Data for GATS was obtained from Hofmann et al. (2017; 2019), while that of quality of institutions was from the World Governance Indicators database.

Related studies - Benz et al. (2020), van der Marel and Shepherd (2020), and Nordås (2020) - have applied STRI to proxy for trade facilitation. It is expected that an increase in the index in the destination, which implies more restrictions, reduces Kenya's service exports to the importer country. Nonetheless, only 54 countries had STRI records in our database, which massively reduced the number of observations in our data, as shown in Table 3.5. Data was modified in the following steps to obtain an indicator for STRI by service and trading partner. First, we found a simple average of STRI across services and destinations for the years 2008-2011 and 2016. The 54 countries either had data for 2008-2011 or 2016. Since this was shorter than our period (1995-2019), we calculated a single indicator (by service and country) to signify STRI. Hence, STRI is time-invariant in our study. Second, we filled STRI scores for records for service sectors that lacked STRI records. The original STRI data only had records for financial, computer and information, transport, and other business services. In filling our data, we matched STRI records

for insurance services with those of financial services since these services are closely related. Records for travel services were matched with those of transport services, while the remaining services were matched with the overall STRI score of a country.

Besides GATS, all the five trade facilitation indicators were first converted to natural logarithm before interacting them with time zone differences. The first part of Table 3.5 displays the results of the interaction term between "soft" trade facilitation indicators and differences in time zones. The results reveal that the interaction between GATS and time zone difference is positive and significant across most services (total, transport, computer and information, construction, government, insurance, other business services, and personal, cultural, and recreational services). The magnitude of the coefficient is largest for computer and information, and transport services, respectively. Our results generally imply that service exporters from Kenya can take advantage of the difference in time zones to trade their services in destinations with a service-specific trade agreement such as GATS.

The second row of the first part of Table 3.5 shows a positive effect of differences in time zones when services are exported to countries with better institutions. The magnitude of the coefficient is largest for government and total services. The last row under soft trade facilitation indicators shows that coefficients of the interaction term between time zone difference and STRI are negative and statistically significant for most services. The magnitude of the coefficient is largest for other business services, computer and information services, and financial services, respectively, suggesting that the greatest impact of barriers and differences in time zones is on modern services and not traditional services such as travel services.

Trading with countries that are in different time zones and having better internet access significantly increases exports of most modern services (insurance, financial, and other business services). This is expected since these services are prone to use the internet and benefit more from time zone differences (Dettmer, 2014; Christen, 2017; Nakanishi, 2019). Mobile phone subscription density significantly increases exports of most services when countries have different time zones, as shown by the last row of hard trade facilitation indicators in Table 3. The elasticity is highest for personal, cultural, and recreational services implying that exports of these services

benefit more from an improvement in communication infrastructure. Other services which significantly benefit from the simultaneous rise in mobile phone subscription and time zone differences are travel, computer and information, financial, insurance, and other business services.

d) Alternative econometric model

Next, we estimated a Zero-Inflated Poisson (ZIP) model as a robustness check of our PPML results in Table 3.3. ZIP has been shown to accurately predict gravity models, especially in the presence of frequent zero flows (Burger et al., 2009; Martin and Pham, 2020). Similar to the PPML model, the importer-time fixed effects and year-fixed effects were included to correct for endogeneity and account for the gravity model's multilateral resistance terms. Respective results are presented in Table 3.6 in the Appendix.

The signs of the coefficients of the ZIP model are qualitatively similar to those of the PPML model. Also, more variables are significant in the ZIP model since it has smaller standard errors than PPML. Time zone difference, our variable of interest, has a statistically significant "synchronisation effect" on travel, construction, financial, and government service exports. The "continuity effect" is significantly present in other business services and computer and information services exports. The PPML model is relatively robust, and its results are reliable.

Table 3.5: PPML regression analysis for services by trade facilitation indicator

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total	**Travel**	**Transport**	**ICT**	**Construction**	**Financial**	**Government**	**Insurance**	**OBS**	**PCR**
					Soft trade facilitation indicators					
Time Zone Difference*GATS	0.908**	1.560	3.221***	3.426***	0.637*	1.261	2.531***	2.167***	2.124**	2.612***
	(0.385)	(0.990)	(0.864)	(0.823)	(0.380)	(0.915)	(0.746)	(0.762)	(1.051)	(0.559)
Time Zone Difference*Institutions	0.056***	0.029*	0.002	0.036	0.044**	0.027**	0.048**	0.028*	0.020	-0.005
	(0.016)	(0.016)	(0.016)	(0.023)	(0.022)	(0.013)	(0.022)	(0.016)	(0.014)	(0.016)
Time Zone Difference*STRI	-0.076*	-0.095**	-0.004	-0.147*	-0.084***	-0.102***	-0.013	-0.056	-0.112***	-0.013
	(0.039)	(0.042)	(0.076)	(0.087)	(0.029)	(0.034)	(0.039)	(0.045)	(0.032)	(0.104)
					Hard trade facilitation indicators					
Time Zone Difference *Internet	0.225	-0.044	0.569*	0.897	0.085	0.260***	0.368**	0.485***	0.271***	0.303
	(0.161)	(0.086)	(0.340)	(0.740)	(0.158)	(0.043)	(0.178)	(0.144)	(0.073)	(0.286)
Time Zone Difference*Mobile subscriptions	0.447	1.241**	0.500	1.412*	-0.088	1.275***	0.163	0.796**	1.142**	1.647***
	(0.287)	(0.615)	(0.446)	(0.752)	(0.098)	(0.463)	(0.497)	(0.397)	(0.517)	(0.608)
Constant	2.288***	-0.886	-5.385	-6.669	-2.686***	-7.493***	-1.713	-6.789***	-3.702	-19.745
	(0.652)	(2.290)	(8.126)	(7.417)	(0.489)	(2.035)	(1.686)	(1.800)	(2.316)	(13.108)
Observations	1222	1221	1222	1222	1222	1221	1221	1221	1221	1221
R-squared	0.130	0.225	0.393	0.546	0.038	0.177	0.036	0.104	0.247	0.460
Pseudo log-likelihood	-45090.408	-19803.461	-12621.173	-257.417	-136.327	-520.860	-7513.244	-702.925	-4919.932	-250.968
Importer-time fixed effects	×	×	✓	✓	×	×	×	×	×	✓
Year fixed effects	✓	✓	✓	✓	×	×	×	×	×	✓

*Note: Standard errors are in parentheses. * Represents level of significance as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. ICT means computer and information services; OBS stands for other business services while PCR means personal, cultural, and recreational services.*

Source: Author

Table 3.6: ZIP gravity regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Total	**Travel**	**Transport**	**ICT**	**Construction**	**Financial**	**Government**	**Insurance**	**OBS**	**PCR**
Time Zone Difference	-0.008	-0.117***	0.013	0.290***	-0.269***	-0.136***	-0.263***	0.041	0.430***	0.106
	(0.022)	(0.031)	(0.023)	(0.068)	(0.045)	(0.035)	(0.048)	(0.053)	(0.058)	(0.068)
GDP Kenya	1.025	0.540	1.315	0.092	-0.813***	0.564	1.958	0.978	1.400	1.098
	(1.768)	(3.232)	(2.529)	(5.244)	(0.084)	(7.833)	(3.768)	(4.208)	(4.355)	(5.275)
GDP importer	0.463***	0.487***	0.433***	0.458***	0.054	0.307***	0.594***	0.351***	0.427***	0.506***
	(0.014)	(0.019)	(0.018)	(0.055)	(0.065)	(0.042)	(0.048)	(0.042)	(0.036)	(0.053)
Latitudinal Distance	-0.358***	-0.349***	-0.365***	-0.079	0.366***	0.207**	-0.419***	-0.096*	-0.330***	-0.483***
	(0.027)	(0.030)	(0.040)	(0.080)	(0.105)	(0.100)	(0.091)	(0.055)	(0.059)	(0.072)
Longitudinal Distance	0.158***	0.203***	0.289***	0.454***	0.535***	0.630***	0.279***	0.606***	-0.420***	-0.224**
	(0.027)	(0.029)	(0.031)	(0.101)	(0.105)	(0.079)	(0.044)	(0.060)	(0.069)	(0.100)
Goods	0.355***	0.378***	0.348***	0.193***	0.548***	0.171***	0.258***	0.381***	0.392***	0.258***
	(0.013)	(0.015)	(0.020)	(0.039)	(0.050)	(0.041)	(0.035)	(0.034)	(0.027)	(0.039)
Common language	0.138***	0.388***	-0.049	-0.063	-0.670***	0.642***	0.531***	0.188*	-0.363***	0.049
	(0.039)	(0.049)	(0.051)	(0.125)	(0.200)	(0.116)	(0.078)	(0.109)	(0.087)	(0.148)
Colony	0.138***	0.032	0.134***	1.159***	1.394***	0.324**	-0.087	0.504***	0.661***	-0.283
	(0.043)	(0.051)	(0.050)	(0.171)	(0.190)	(0.145)	(0.109)	(0.170)	(0.098)	(0.200)
Financial Development	0.128***	0.109***	0.148***	0.005	-0.149***	0.073***	-0.006	0.081***	0.191***	0.196***
	(0.013)	(0.012)	(0.019)	(0.028)	(0.034)	(0.023)	(0.027)	(0.019)	(0.022)	(0.027)
Disaster	-0.082**	-0.142***	-0.113*	-0.094	-0.465***	-0.171	0.273**	-0.079	0.009	-0.151
	(0.042)	(0.055)	(0.059)	(0.200)	(0.176)	(0.116)	(0.109)	(0.102)	(0.114)	(0.135)
Exchange rate	-0.048***	-0.064***	-0.038***	-0.224***	-0.036	-0.156***	-0.112***	-0.098***	0.025*	-0.095***
	(0.008)	(0.010)	(0.010)	(0.038)	(0.024)	(0.024)	(0.016)	(0.016)	(0.015)	(0.033)
Constant	-27.384	-22.240	-33.319	-27.480	-2.191	-27.207	-44.222	-37.536	-36.851	-21.163
	(32.864)	(60.180)	(46.970)	(97.251)	(1.820)	(142.985)	(70.259)	(78.318)	(81.295)	(98.302)
Observations	2919	2919	2919	2919	2919	2919	2919	2919	2919	2919
Log pseudolikelihood	-8303.080	-4786.458	-5789.268	-240.772	-208.849	-532.950	-2101.497	-419.055	-2788.212	-240.350

Importer-time fixed effects	✓	✓	✓	✓	×	×	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓	×	✓	✓	✓	✓	✓

*Note: Standard errors are in parentheses. * Represents level of significance as follows: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. ICT means computer and information services, OBS stands for other business services while PCR means personal, cultural, and recreational services.*

Source: Author

3.5 Summary, conclusions and implications

3.5.1 Summary of the study

This essay sought to study the effect of differences in time zones on Kenya's bilateral service exports (total and nine categories of services). Ideally, time zone differences can increase ("continuity effect") or reduce exports ("synchronisation effect"). Trading firms in different countries can acquire a comparative advantage in producing and delivering a certain service if they experience a "continuity effect." This was the primary concern of this study, given that most of Kenya's top importers are located in different time zones. For instance, North America, the third top destination for services from Kenya, has at least a seven-hour difference from Kenya's capital city, Nairobi.

Data of bilateral exports of services from Kenya to 176 countries for the period between 1995 and 2019 was used. Besides total services, we also considered travel/tourism, transport, computer and information, construction, financial, insurance, government services, other business services (OBS), and Personal, cultural, and recreational services. Preliminary inspection of the data showed that total service exports worth US$ 16.11 million were exported throughout the study period. The USA and the UK were the leading importers. Other top importers were Germany, France, Netherlands, Italy, Switzerland, Japan, India, and China. Travel and transport services were the highest among the sub-categories, while construction services were the least exported.

The average time zone difference for the entire period was roughly 3.4 hours with a minimum and maximum of 0 hours and 10 hours, respectively. Other covariates were Kenya's GDP, importer's GDP, distance, exchange rate, financial development, bilateral goods trade, and dummies for a common language, colonial relationship, and disaster.

PPML regression results reveal that the time zone differences between Kenya and partner countries are significantly positive in ICT intensive service exports: computer and information and other business services. In terms of elasticities, the results indicate that 33.6% and 53.7% more computer and information, and other business services are exported from Kenya to partner countries per hour time difference, respectively. Time zone differences had a negative and significant effect on construction, financial, and government service exports.

Further analysis shows that these results are robust when an alternative model is employed and overlapping workday hours are used. We also find that the effect of differences in time zones on services is non-linear as it is not statistically significant across all time intervals across services. There is also a threshold for the "continuity effect": between 2- and 3-hour time difference for computer and information services and other business services and 10-hour difference for total and personal, cultural, and recreational services. The "synchronisation effect" does not have a threshold. In addition, the effect of differences in time zones on Kenya's service exports is sensitive to "soft" (GATS, quality of institutions, and STRI) and "hard" (mobile subscriptions and level of internet access) indicators of trade facilitation.

We found that the interaction between GATS and time zone differences is positive and significant across most services (total, transport, computer and information, construction, government, insurance, other business services, and personal, cultural, and recreational services). We also found a positive effect of differences in time zone when services are exported to countries with better institutions, while on the contrary, the interaction between STRI and time zone differences was negative, implying that restrictions harm service exports. Trading with countries in different time zones and having better internet access significantly increases exports of most modern services (insurance, financial, and other business services). Personal, cultural, and recreational, travel, computer and information, financial, insurance, and other business services significantly improve when the mobile phone subscription density grows for partners that are located in different time zones.

3.5.2 Policy implications

Stakeholders such as the government policymakers, current and potential service traders, and scholars (students and researchers) can benefit from our findings as follows. Foremost, the finding that time zone differences significantly improve ICT intensive exports of services - computer and information and other business services - means that traders in these sectors can take advantage of overseas markets. This can be done by creating networks with their foreign partners in the respective service sectors.

The government can also pursue policies that attract Foreign Direct Investors to Kenya, especially

for the aforementioned sectors, which have a "continuity effect." These firms could utilise their differences in time zones and abundant labour to deliver or produce their services. Another issue of policy concern for the government is improving the state of trade facilitation. Our results have shown that restrictions significantly reduce exports of most services. Therefore, reducing barriers to trade is paramount for the success of the service sector. This can be done by improving the quality of institutions, particularly regulations that deal with bilateral trade in services such as those on the movement of labour. The government should also prioritize improving access to infrastructure that aids in communication, such as cell phone signal boosters.

Lastly, trade agreements that target services should be promoted if the government would like to boost exports of services from Kenya. By their nature, trade agreements boost trade by reducing trade barriers. In the case of services, most of the trade facilitation indicators that have been covered in this study can be improved under a trade agreement. For instance, ongoing discussions on services trade under the African Continental Free Trade Area (AfCFTA) whose operations started in January 2021. Commitments have so far been made in five priority sectors (travel, transport, finance, business, and communication) while schedules on specific commitments for seven sectors (education, construction, distribution, environment, health and social, recreational and cultural, and other services) are under review (Mold and Mangeni, 2022).

3.5.3 Areas for further research

Future researchers can advance our study in three ways. First, in line with Marjit et al. (2020), E-commerce should further be explored in terms of its delivery (has both virtual and physical) and implications on tax and fiscal policy. Second, forthcoming works should study how disasters and uncertainty affect different service sectors—for instance, the current global threat of COVID-19. Motivation can be sought from papers by Xu and Kouwoaye (2019), Didier (2020), and Minondo (2021). Lastly, studies can use alternative models to forecast the influence of covariates on bilateral trade in services. For example, the World Bank (2020) has applied the CGE model to predict the effect of AfCFTA on services exports.

CHAPTER FOUR: TRADE AGREEMENTS AND SURVIVAL OF SERVICE EXPORTS FROM KENYA[25]

Abstract

This essay investigates the effect of GATS, a service-specific trade agreement, on the survival of service exports from Kenya. Kenya has actively pursued bilateral and multilateral trade agreements since liberalizing in 1993. This approach expands market access of firms and products from Kenya, but it does not guarantee the sustainability of exports in those markets, which is vital to the growth of exports in the long term. To the effect of GATS on the survival of service exports, this study relies on bilateral service exports from Kenya to 176 countries between 1995 and 2019. Services are classified at a 1-digit level: travel, transport, computer and information, construction, financial, insurance, government, other business, and personal, cultural, and recreational services. Kaplan–Meier survival analysis is employed to describe the survival rate over time while the discrete-time probit model with random effects shows the effect of covariates on the survival of service exports. We find that about 86% of exports of services from Kenya survive longer than the first year of trading. Nearly 70% last for a decade, 68% exist until the 15th year and about 61% of services are traded during the entire period of the study (25 years). The mean and median period of exporting services in Kenya is 16 years and 19 years, respectively. Nonetheless, these survival rates and periods differ by service. Meanwhile, regression results reveal that GATS reduces the survival of service exports by 0.78%. At the category level, GATS only increases the survival of construction and government services. GATS also reduces the survival of Kenya's exports to Africa when geographical regions are considered. However, GATS boosts the survival of services when it is interacted with the quality of institutions and the Services Trade Restrictiveness Index (STRI). Accordingly, reducing regulations and general improvement of the quality of institutions through legislation can help countries reap the benefits of a service-specific trade agreement fully.

Keywords: Trade Agreements, Export Survival, Service Exports, Kenya

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4.0 Introduction

Trade agreements are primarily meant to enhance market access by reducing entry barriers in foreign markets (Baier, Bergstrand, and Feng, 2014; Cyrus, 2021). As a result, countries ratify trade agreements to improve their export volumes and ultimately grow their economies (Ossa, 2015). Most agreements liberalizing goods are well defined. However, those under services are often limited and do not guarantee significant liberalization (Fiorini and Hoekman, 2018; Lee, 2019) because the sector is highly regulated (Borchert et al., 2014, 2020). Nevertheless, liberalization of the services sector is fast becoming inevitable (Hoekman and Njinkeu, 2017), starting with the General Agreement on Trade in Services (GATS) that was enacted in 1995.

Like most developing countries, Kenya has pursued trade agreements to raise its exports and economic growth (ROK, 2017; Majune and Mwania, 2020). The tenacity of signing trade agreements has particularly increased after 1993 which is recognized as Kenya's moment of complete economic liberalization (Wacziarg and Welch, 2008). For instance, Kenya joined the World Trade Organization (WTO) in 1995, subsequently establishing 36 bilateral agreements of trade (ROK, 2017; Majune and Mwania, 2020) and became one of the first countries to sign and ratify the African Continental Free Trade Area (Abrego et al., 2020).

Comparing the pursuit of trade agreements to export performance, we deduce from Figure 4.1 that Kenya's total exports (goods and services) have performed dismally, especially under the liberalization policy, whose growth is not so different from the prior period. The highest growth was in 1993 (31.5%) but it has seldom surpassed 10% since then. This state of affairs is unexpected, given that the country aims at attaining middle-income status by 2030 (ROK, 2007, 2018). Hence, there is a need to review Kenya's trade policy, which is done in two ways in this study.

First, increasing attention on trade in services. According to Figure 4.1, services have often grown faster than goods under the liberalization era. Kenya is also ranked among the five highest service exporters in Africa (see Figure 1.1). It has a comparative advantage in exporting services (see Table 1.3) and is part of a unique group of African countries whose share of services in total exports is over 30% (Hoffman, Mckenna, and Sáez, 2019). It also has a robust domestic services

sector (Balistreri, Jensen, and Tarr, 2015; Ngui and Kimuyu, 2018). These facts show Kenya's potential in exporting services, and they call for a shift in trade discourse that has largely focused on goods.

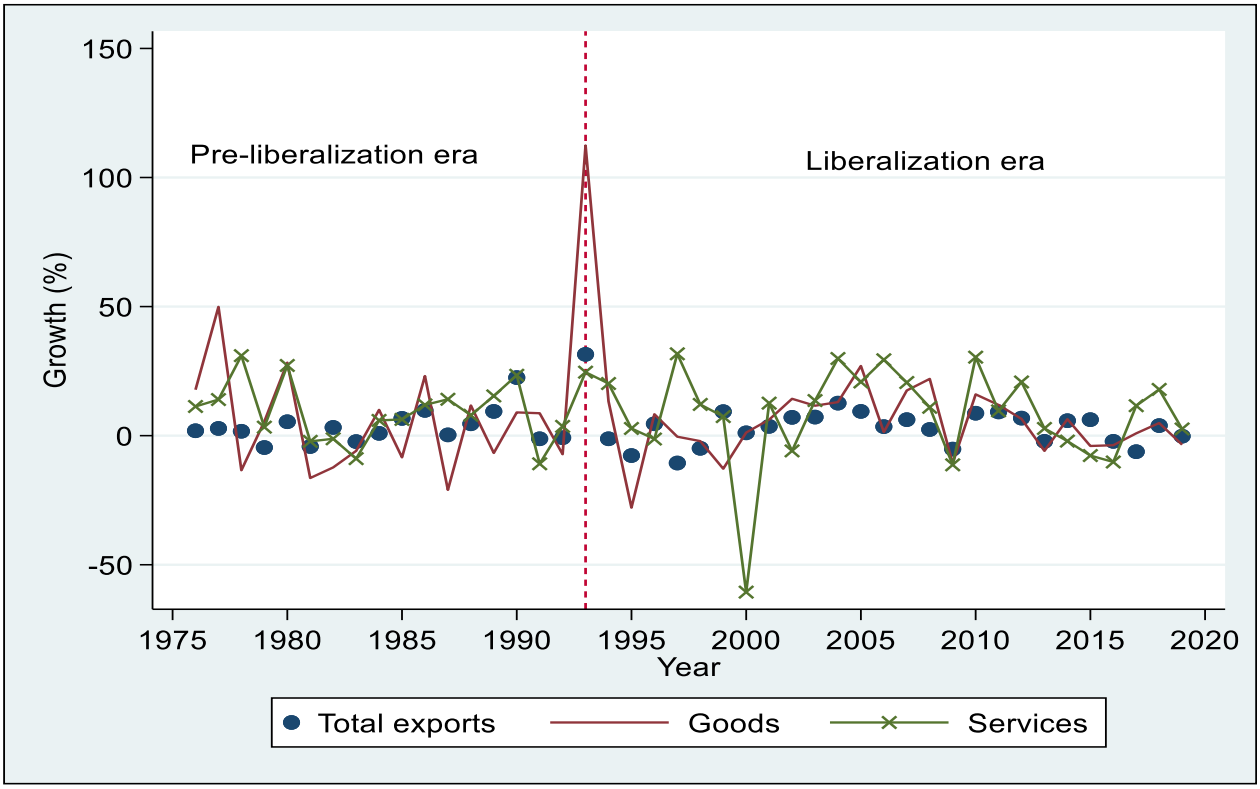

Figure 4.1: Growth of services, goods, and total (goods and services) exports in Kenya, 1975-2019

Source: Author's computation using WDI (2022) data

Second, considering policies that improve the survival of exports. Policies aligned to mainstream trade theory (absolute and comparative advantage, and Heckscher-Ohlin) primarily seek to have countries increase their market entry and participation in trade. However, as proved by Besedeš and Prusa (2006a, b) and Sabuhoro, Larue, and Gervais (2006), trade relationships are short-lived. The effect is higher in developing countries which create new trade relationships faster than developed countries but have slow export growth rates due to low survival rates (Brenton, Saborowski and Uexkull, 2010; Besedeš and Prusa, 2011). Therefore, identifying factors that cause lower survival rates in developing countries may help policymakers overcome this and promote

long-term export growth, deepening existing trade relationships and ultimately raising economic growth.

Export survival is the likelihood of consecutively exporting non-zero values of a product (service in our case) to a particular destination over some time (e.g., year). This concept has been studied in several countries from the perspective of goods (viz., Besedeš and Prusa, 2006a, b) in the United States of America, Nitsch (2009) in Germany, and Carrère and Strauss-Kahn (2017) in developing countries). It has been studied by Kinuthia (2014), Chacha et al. (2017), Majune et al. (2020) and Türkcan, Majune and Moyi (2022) in Kenya. A few studies have analysed the export survival of services in the world, often using firm-level data. For example, Ariu (2016) in Belgium, Dzhumashev et al. (2016) in India, Türkcan, and Erkuş-Öztürk (2020) in Turkey, and Farah et al. (2021), Lupton et al. (2021), and Getachew and Beamish (2021) in Japan. Christen et al. (2019) used Austrian firm-level data to study intensive and extensive margins in the service sector. The extensive margin captures variations in trade flows (value and volume) arising from sales of new services/products and new markets, but the intensive margin serves to track fluctuations in exports flows of trade ties that are already established (Amador and Opromolla, 2013)[26].

The intensive margin is often related to export survival – with the difference that intensive margin assesses performance – in both value and volume metrics– of an existing trade relationship at two points in a time period, while export survival estimates the probability of such a relationship staying active during the intervening period (Besedeš and Prusa 2011). Therefore, evaluating the performance of exports by the survival metric demonstrates the fragility of business relationships (that is entry, exit, and churn) compared to an approach that uses an intensive margin that demonstrates only the exports' amount and value.

4.1.1 Problem statement

Kenya has joined several trade agreements, bilateral and multilateral, after liberalization in 1993, for instance, the WTO in 1995 and the AfCFTA in 2018 (Abrego et al., 2020). This strategy expands market access of firms and products from Kenya but does not guarantee their capacity to

[26] Different definitions of extensive and intensive margins exist depending on whether the analysis is at the micro or macro level (refer to Creusen et al., 2011 for details).

survive in external markets. According to Brenton et al. (2010), the creation of new trade relationships is greater in developing countries as compared in developed ones. However, developed countries' high export growth rates are credited to their high survival rates in their importing markets. Therefore, a country like Kenya, which values the growth of exports, should be concerned about policies that boost export survival rates.

Kenya's trade policy has predominantly targeted goods (ROK, 2017), yet Figure 4.1 shows a higher growth rate for services than goods. Similarly, literature on exports in Kenya has mainly focused on goods with that on services largely being descriptive (Ikiara, Nyandemo, and Ikiara, 2008; Dihel et al., 2012; Serletis, 2014; Khanna et al., 2016 and Kodi, 2016). Based on these reasons, this essay contributes to the discussion of trade agreements and export survival in Kenya. This relationship has been studied for goods in Kenya (Kinuthia, 2014; Chacha et al., 2017; Majune et al., 2020; Türkcan, Majune and Moyi, 2022) but not services. Globally, survival studies on services are few, often using firm-level data. For example, Ariu (2016) in Belgium, Dzhumashev, Mishra, and Smyth (2016) in India, and Türkcan and Erkuş-Öztürk (2020) in Turkey, and Farah et al. (2021), Lupton et al. (2021), and Getachew and Beamish (2021) in Japan.

In this study, we consider the role of GATS, which is a service-specific trade agreement, on the survival of services exported from Kenya. Services are analysed at the one-digit level: viz., travel/tourism; transport; computer and information (ICT); government services; construction; insurance; other business services (OBS); financial; and personal, cultural and recreational services. The study analyses a discrete-time probit model with random effects on data ranging from 1995 to 2019.

4.1.2 Research questions

The general research question in this chapter was how trade agreements affect the survival of exports of services from Kenya. The specific questions were:

1. What is the rate of survival of Kenya's services exports?
2. Which factors determine the survival of services exported from Kenya?
3. How does the interaction between a service-specific trade agreement and trade facilitation affect the survival of services exported from Kenya?

4.1.3 Objectives

The main objective in this chapter was to establish the effect of trade agreements on the survival of services exported from Kenya? The specific objectives were:

1. To determine the survival rate of Kenya's service exports.
2. To identify factors that significantly influence the survival of Kenya's service exports.
3. To determine the effect of the interaction between a service-specific trade agreement and trade facilitation on the survival of services exported from Kenya.

4.1.4 Significance of the study

Studying export survival and trade agreements of services is beneficial to government policymakers and exporters. Ideally, establishing the level of export survival and factors that affect it contributes to trade policy that seeks to enhance the sustainability of exports of existing exporters, in existing markets, and for existing products. Concentrating on trade agreements informs this policy on the sustainable markets and products that should be promoted during trade negotiations. Current and potential firms that export services from Kenya can also identify characteristics of their destination markets that are likely to influence their survival in those markets. Overall, this study increases stylized facts on trade in services from Kenya and Africa at large.

4.1.5 Organisation of the study

The remainder of this chapter is organised as follows. Section 4.2 reviews the theoretical and empirical literature. Section 4.3 explains the methodology, while section 4.4 presents the results and discusses them. Section 4.5 concludes the study and offers some policy recommendations.

4.2 Literature review

4.2.1 Theoretical literature review

Canonical international trade theories, namely Absolute advantage theory, Comparative advantage theory, and Heckscher-Ohlin theory – mainly describe international trade and why and how it takes place. As explained by Geda (2012), the Absolute advantage theory states that countries export goods and services with which they possess absolute advantage (produce with less labour cost) and import commodities with which they have whose have absolute disadvantage (labour cost is high). The Comparative advantage theory forecasts that trade takes place between countries as a result of their respective comparative production costs (opportunity costs). Countries trade because of their differences in factor endowments according to the Heckscher-Ohlin theory. However, these theories fail to describe trade survival and duration. So, theoretical frameworks for instance search and matching theory, the product cycle theory, and the product switching theory are at the core of the empirical debate on trade duration and survival. In the recent past, Besedeš (2013) and Besedeš et al. (2016) have advanced a model that relates liberalization of trade with export survival.

Vernon's (1966) theory of product cycle describes the stages in the evolution of a product. Initially, a developed country endowed with skilled labour and advanced technology develops a product and then exports it to a developing country. Time passes and the product becomes widely accepted. Consequently, the less developed country learns and adopts the production technique. The less developed country has a lower cost of production (endowed with cheap labour, though less skilled) and so enjoys a comparative advantage in producing and exporting the product. At this point, the developed country will react by developing a better version of the product or abandoning the product completely. This process is not instant but long-term and may explain the disappearing and reappearing of a product. So, Vernon's theory does not explain real-life short-term trade relations (Hess et al., 2011; Besedeš et al., 2006b).

The search and matching theory also explain export survival. Rauch and Watson (2003) stipulate that a seller-buyer trade relationship goes through several stages. Buyers and sellers are not found in the same country but in different countries, thus searching and matching buyers with sellers is the first stage. When a buyer finds a seller, the latter begins to export their product, first in small

quantities. The seller's reliability determines whether the business relationship will grow deeper or halt. If the relationship stops, the buyer goes back to the re-matching stage, that is, finding another seller. According to Besedeš (2008), if a buyer and a seller abandon a relationship of trade soon, it is said to be brief. From the Search and Matching theory, the time that a trade relationship lasts is influenced by the cost of the search, the level of information asymmetry, and the export volume at the beginning of the trade relationship.

Bernard et al. (2010) proposes a product switching model stipulating that demand in foreign markets ensures export survival. Therefore, products (services) with negative demand in the foreign market are substituted. Those whose demand remains stable will continue to be traded. The product in question, the characteristics of the firm, and a product's destination will determine whether a product is abandoned or added. Therefore, the duration of the trade relationship will depend on the possibility of introducing the product and the turn-over of the product in a foreign market.

Besedeš (2013) and Besedeš et al. (2016) model posits that liberalization of trade reduces the per-unit trade cost and effectively raises entry rates, and enhances export survival. So, before a seller finds a dependable buyer-partner, the seller must be productive. The seller's level of productivity, their set-up costs and per-unit trade costs influence the sellers' likelihood of going into a foreign market. This model argues that the liberalizing trade cuts both set-up costs and per-unit trade costs. Consequently, the trade relationships will increase and the duration of time they last will also increase. This model is closest to our study because trade liberalization can be through trade agreements.

4.2.2 Empirical literature review

Research on the export duration of services is scarce. The few existing articles are at firm-level and focus on the overall service sector in Belgium (Ariu, 2016), the information technology sector in India (Dzhumashev et al., 2016), the tourism sector in Turkey (Türkcan and Erkuş-Öztürk, 2020), and foreign subsidiaries in Japan (Getachew and Beamish, 2021; Farah et al., 2021; Lupton et al., 2021). Results of these studies generally suggest that the duration of exporting services is short. However, they are weak at explaining how service exports are affected by trade agreements.

Empirical evidence on the influence of trade agreements and duration of exports is primarily for goods. Besedeš and Blyde (2010) is one of the seminal studies in this area of research by studying the drivers of export survival in Latin America. They found countries that shared an FTA to have greater levels of export survival than those that did not. Evidence from the African continent illustrates that trade cooperation within Africa augments export survival (Kamuganga, 2012). However, a greater effect was found on deeper Economic Integration Agreements (EIAs) such as Monetary Unions (MUs), Common Markets (CMs), and Customs Unions (CUs) than shallow ones such as Preferential Trade Areas (PTAs). Engaging in trade under the North American Free Trade Agreement (NAFTA) enhanced the survival of intra-NAFTA exports to Canada and the US but reduced it in Mexico (Besedeš, 2013). Besedeš (2013) also used two variables, NAFTA members and NAFTA in effect, to weigh the role of NAFTA on export duration in Canada, the US, and Mexico. NAFTA in effect, an indicator of the duration of NAFTA membership by a country, diminished rates of survival in all countries but was not significant in Canada.

Besedeš et al. (2016) developed the theoretical model relating export survival to the liberalization of trade and examined the effect of Economic Integration Agreements (EIAs) with respect to their existence and the relationships of trade that are ignited by the implementation of an EIA. The authors found that EIAs boosted export survival. However, the effect was only positive for the trade relationships that had began before an EIA was developed. On the other hand, trade relationships that began after an EIA's implementation were to be anticipated to die sooner and also encountered a decrease in the volumes traded.

Degiovanni et al. (2017) expanded the study by Besedeš et al. (2016) by concentrating on Latin America. The latter studied 180 countries. Degiovanni et al. (2017) found that deeper EIAs enhanced export survival more than shallow ones. Relationships of trade that were in existence after a trade agreement had been signed had a lower probability of dying, though the depth of a specific trade agreement also determined it. The effect of the spells that had existed before the creation of an agreement also depended on the depth of that agreement. The authors used the methodology by Kohl et al. (2016) to develop an index of the quality of trade agreements and revealed that high-quality agreements increased survival better than low-quality ones.

Oanh and Linh (2019) brought into this line of research the diversion effects of EIAs. They used SITC 4-digit level data for 149 countries dated 1962 to 2000. To illustrate the diversion effect, they used two variables, exporter and importer outsider. The exporter/importer outsider are relationships formed by exporters or importers with other partners other than the original partner. Hence, the effect of this new relationship on the hazard rate of the original relationship is the diversion effect. Probit results revealed that the exporter and importer outsider lowered export survival rates. Thus, new EIAs enhanced the rate of failure of products exported or imported within existing EIAs and the effect was larger in manufacturing as compared to products from agriculture.

Türkcan and Saygılı (2018) studied how EIAs affected Turkey's export survival at the country level. They made use of four EIAs: Non-Reciprocal PTAs, PTAs, Free Trade Areas (FTAs), and CUs. Moreover, they evaluated the effect of each of the four EIAs by its formulation, whether it was operational between Turkey and an importer in a specific year, whether a trade relationship began after an EIA had been implemented, and the period of time the EIA was active. Like preceding studies, the authors found that EIAs enhanced the survival of a trade relationship, especially FTAs and PTAs. Though, trade relations that began after the establishment of an agreement were expected to die. Jin (2022) also found that China's agricultural exporters had a higher export survival rate when trading under an FTA than without. However, newly created trade relationships had a lower survival rate under FTAs as they faced fierce competition as more firms entered the FTA.

Another country-level study is by Nkansah et al. (2022). The authors establish the effect of the Economic Community of West African States (ECOWAS) agreement on Ghana's export survival between 1996 and 2018. Results from the complementary log-log (clog-log) model show that ECOWAS enhances Ghana's overall and commodity-specific (such as textile) export survival. A similar result was established when variables EIA-in-existence and EIA-in-effect were introduced. EIA-in-existence is a binary variable indicating whether Ghana shares an agreement with a trading partner in the world. EIA-in-effect is a dummy variable for all active agreements between Ghana and its trade partners.

In the context of Kenya, Kinuthia (2014) studied the effect of EAC and COMESA agreements on the survival of exports of merchandise products. The author employed a Cox proportional hazard model on data spanning the period 1995-2010 and found that the two agreements had an insignificant effect on export duration in Kenya. Majune et al. (2020) employed a logit model with random effects on data dated 1995 to 2016 to study the same question. The authors find that COMESA enhanced Kenya's export survival, but the EAC agreement dampened it. AGOA, a non-reciprocal trade agreement, also improved Kenya's export survival. At the micro-level, results from the complementary log-log (clog-log) model reveal that Kenya's membership in an EIA boosts the survival of exports by 4.3% (Türkcan, Majune and Moyi, 2022). COMESA's effect on export duration is positive but not significant, according to Chacha et al. (2017), who analysed customs transaction data from 2004-2013 using the Cox, and logit and probit fixed and random-effects models.

Other factors that affect export survival are real GDP, shared border and language, exchange rate volatility, time-zone differences, distance, colonial history, and institutions. Since these are gravity variables, they can be obtained from survival studies (which are largely on goods) (see Kamuganga, 2012; Kinuthia, 2014; Araujo et al., 2016; Huang, 2017; Bista and Tomasik, 2017; Carrère et al., 2017) or bilateral service export studies (see Kimura and Lee, 2006; Guillin, 2013; van der Marel and Shepherd, 2013a; Hellmanzik and Schmitz, 2016; Fiorini and Hoekman, 2018; Mitra et al., 2018).

4.2.3 Overview of reviewed literature

Both the empirical and theoretical review of literature show that services have been scarcely described in the context of export survival. Borrowing from goods-specific studies, we conclude that trade agreements have a heterogeneous effect on survival of trade. For example, given their level of depth, CMs have a higher likelihood of boosting the survival of exports as opposed to FTAs and PTAs. However, trade agreements on services are not highly disaggregated like those of goods. GATS is the predominant service-specific trade agreement. Empirical evidence thus far has not established its effect on the survival of service exports. This study expands the present literature by investigating how GATS affects Kenya's survival of service exports. The study also

assesses the effects of geographical regions and trade facilitation on the relationship between GATS and export survival in Kenya.

4.3 Methodology

4.3.1 Theoretical framework

We build on the model by Besedeš (2013) and Besedeš and Nitsch (2016) to establish the effect of EIAs on the survival of exports. We first show the link between trade agreements and market entry by an exporter. Afterward, we establish the effect of having an agreement on export survival.

a) Export entry

The basic setup of the model assumes that a trade relationship exists between two parties; sellers who are firms in the origin country (o), and buyers, i.e., firms in the foreign country (d). The period this relationship lasts with non-zero exports of a specific product is called a spell.

The first task of the seller is to identify a buyer. We assume that a possible match is realizable, and a potential buyer appears following a Poisson process with a parameter λ. If the match succeeds, the relationship stays active for an exogeneous period, z, with a distribution $H(z) = 1 - e^{-z/\mu}$ and mean μ. The relationship stops after period z.

Assuming θ is the probability of entering a foreign market, several factors determine the size of the business relationship that has been established. First is the seller's revenue, w, which follows a distribution $F(w)$. It also depends on the per-unit trade cost $\tau > 1$ and a fixed cost f_E - the set-up cost – from Melitz (2003). Heterogeneity among firms is characterised by their level of productivity, δ. Therefore, the revenue of a firm and its likelihood of penetrating an overseas market depends on its performance, fixed costs, and per-unit trade cost which are represented by $\theta = \theta(f_E, \tau, \delta)$ and $w = w(f_E, \tau, \delta)$.

It can be concluded that most productive firms will export, $\frac{\partial \theta}{\partial \delta} > 0$, and the most active firms in the export market are the larger ones on firms' distribution, $\frac{\partial w}{\partial \delta} > 0$. Trade agreements either reduce the per-unit trade cost, $\frac{\partial \theta}{\partial \tau} < 0$, or reduce the set-up costs, $\frac{\partial \theta}{\partial f_E} < 0$.

b) Export survival

We let $v_k(t)$ to indicate the probability of a spell having k business associations at time t. It follows a Poisson distribution which is expressed as:

$v_k(t) = e^{-\theta\rho(t)}\big(\theta\rho(t)\big)^k/k!$ …… *19*

With parameter $\theta\rho(t) = \theta\mu\vartheta(1 - e^{-t/\mu})$. In the long-run, when *t* approaches infinity, $v_k(t) = v_k$ and $\theta_\rho(t) = \theta\vartheta\mu$. Over time, chances of having k business relationships depend on the probability of exporting and the parameter associated with the buyers-sellers generation process[27].

$v_k = e^{-\theta\vartheta\mu}(\theta\vartheta\mu)^k/k!$ …… *20*

We define $s(t)$ as the period a trade spell lasted as from the time it was active up to the point when it ceased. The possibility that a spell with duration s at time t has exactly k trade relationships is represented by $w_k(t) = (s(t), t)$. $w_k(t)$ follows a Poisson distribution such that:

$w_k(s(t), t) = e^{-\theta\rho(s)}\big(\theta\rho(s)\big)^k/k!$ …… *21*

The mean given by $\theta\rho(s) = \theta\lambda\mu\left(1 - e^{\frac{s}{\mu}}\right)$, is an increasing function of trade duration. The presence of a trade agreement, by increasing θ, increases the number of export relationships over time. If $n(t)$ symbolizes the number of business relations in a spell at time t, the size of each spell depends on the revenue created by each spell, m= $\sum_0^{n(t)} w$. Therefore, for any t, T∈(0, ∞), the probability of a trade spell stopping by time (t + T) decreases in its size, *m*, and in the case where a trade agreement is present.

Furthermore, the effect of trade agreements on export survival depends on whether they start before or after a trade relationship is formed. Trade agreements that start before a trade relationship is established have a more prolonged effect in terms of the length of the relationship than those that start after the creation of a trade relationship. This is because firms that are already operating

[27] Many derivation steps are found in Klepper and Thompson (2006).

can increase their export volumes while new firms can exploit the conditions of an existing trade agreement.

4.3.2 Analytical model

Survival analysis was employed to establish factors that determine the duration of Kenya's service exports. To understand survival analysis, we start by specifying the following life table estimator survival function:

$$\hat{S}(j) = Pr(T > j) = \prod_{m=1}^{j}\left(1 - \frac{d_m}{r_m}\right) = \prod_{m=1}^{j}(1 - h_m) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 22$$

where T is a spell, meaning the number of years that a service is exported consecutively from Kenya to its trading partner. A spell lasts for a period d_m, starting at t_m and ending at t_{m+1} ($d_m = (t_m, t_{m+1})$ for $m = 1, \ldots, j$). r_m, which is the adjusted number of spells at risk of failure at the midpoint of the time interval, is presented as $r_m = R_m - \frac{d_m}{2}$, where R_m is the number of relationships likely to fail at the beginning of the interval. h_m is the hazard rate which indicates the failure of a trade relationship (spell). Equation 22 only establishes the survival rate (hazard rate) of exporting a service from Kenya to another country. Hence, a discrete-time duration function needs to be specified to establish the effect of GATS and other covariates on the probability of exports surviving, as follows:

$$Pr\left(y_{ijt} > 0 \middle| Y_{ijt}\right) = \boldsymbol{F}[\propto_{ij} + \delta_{ij} + \lambda_t + Z_{it}\beta + W_{jt}\varphi + X_{ijt}\theta + \varepsilon_{jt,i}] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 23$$

where y_{ijt} measures Kenya's (i) exports to country (j) at time (t). The model controls for fixed effects by including duration (δ_{ij}), spells ($\propto_{ij}$) and periods (λ_t). $\boldsymbol{F}(.)$ is an appropriate distribution function ensuring that $\Pr\left(y_{ijt} > 0 \middle| Y_{ijt}\right)$ ranges between 0 and 1 for all *i, j, t.* This study considered three commonly used distribution functions: logit, complementary log-log (clog-log), and probit. These functions are classified within a class of discrete-time models proved by Hess and Person (2011; 2012) to be more suitable for duration analysis than the semi-parametric continuous-time Cox (1972) proportional hazard model. The continuous-time model suffers from unobserved heterogeneity (frailty), tied spells where relationships halt simultaneously, and the assumption of

restrictive proportionality, which makes the assumption that over time, covariates have a uniform influence on the hazard rate.

Handling left and right censoring is a usual problem in survival analysis. Left-censored export records are present in the data from the first year. However, we don't know when they started. Conversely, right-censored records are active in the last year in our dataset, but we cannot know whether or when they will end. There is need to correct for left-censoring otherwise, we will obtain biased estimates (Hess and Persson 2012). We do this by leaving out the first year of recorded export flows, so this study considers export flows from 1996 rather than 1995. Brenton et al. (2010) and Hess and Persson (2012) have found right censoring to be less problematic during survival analysis, so we incorporate records of trade for the final year in our data - 2019. In line with related studies, we also include a dummy variable for multiple spells, which come up when during the study period, an export relationship ceases and then relapses (Besedeš et al. 2006a; Fu et al., 2014; Majune et al. 2020).

Z_{it} is a vector containing product-specific characteristics - initial export value, lagged duration, and total export value - and Kenya-specific factors (Kenya's GDP). To proxy for past experience, we use the initial value of export at the beginning of an export spell (the period a service is exported to a specific destination) and the lagged duration (the duration a previous spell lasted). To account for the effect of experience on export survival, the total value of the exports of a service is also included. Kenya's GDP shows the effect of the domestic production capacity on survival. W_{jt} is a vector containing destination-specific factors, namely, gravity factors (time zone differences, distance, common language, colony, and GATS), and macro-economic indicators (partner GDP, exchange rate, and financial development). Our variable of interest, GATS, is also included to show the influence of service-specific integration on the survival of service exports. Other variables show how the survival of service exports from Kenya is affected by the characteristics of the destination country. X_{ijt} is bilateral trade in goods. It shows the potential of a network effect from goods to services (Egger, Francois and Nelson, 2017). β, φ and θ are vectors containing coefficients. $\varepsilon_{jt,i}$ is the error term.

Data on our dependent variable, bilateral services trade, was obtained from the Extended Balance of Payments Services (EBOPS) of 2002 and 2010. EBOPS 2002 is hosted by the Organisation for Economic Co-operation and Development (OECD), and it ranges from 1995 to 2012. EBOPS 2010 is hosted by the WTO, and it ranges from 2013 to 2019. Therefore, we merged the two datasets to form one database for bilateral service trade ranging from 1995 to 2019. For the accuracy of data, we relied on import data reported by Kenya's trade partner. This is often recommended, especially where the exporter is a developing country (Brenton et al., 2010; Carrère and Strauss-Kahn, 2017). Some recent studies have also applied EBOPS data: Xu and Kouwoaye (2019), El-Sahli (2020), Nordås (2018; 2020), Fu et al. (2020), Maurer (2020), Visagie and Turok (2021), Turok (2021), Tajoli et al. (2021), Xiong and Sun (2022) and Benz, Jaax and Yotov (2022). More information about our variables is indicated in Table 4.1. In general, a negative sign on the coefficient in equation 23 shows an increase in export survival (reduction in the hazard rate). On the other hand, the hazard rate rises (survival drops) when the coefficient is positive.

Table 4.1: Variable definition, measurement and source

Variable	Definition	Description	Source
Dependent variable			
y_{im}	Likelihood of a spell ending	Dummy where 1 indicates cessation of spell i during the mth time interval, 0 otherwise	OECD/WTO
Independent variables			
TZD	Time Zone Differences	Difference in hours between Kenya's capital (Nairobi) and partner's capital	CEPII database
D	Distance	Natural logarithm of the distance (kilometres) between Nairobi, Kenya's capital city, and the capital of a partner country	CEPII database
CL	Common language	Dummy if a country has a common language with Kenya	CEPII database
CN	Colony	Dummy if a country has a colonial relationship with Kenya	CEPII database
Goods	Goods	Natural logarithm of bilateral trade in goods between Kenya and trade partners (US$ millions)	CEPII database
GATS	GATS	Dummy if a country is a signatory of GATS	CEPII database
GDPK	GDP Kenya	Natural logarithm of GDP (current) (US$ millions) for Kenya	WDI
GDPP	GDP partner	Natural logarithm of GDP (current) (US$ millions) of a partner	WDI
FD	Financial development	Principal Component Analysis for Domestic credit to the private sector (% of GDP), Domestic credit provided by financial sector (% of GDP), Domestic credit to the private sector by banks (% of GDP), and Broad money (% of GDP)	WDI
ExR	Exchange rate	Natural logarithm of the partner's real exchange rate in US$	WDI
IEV	Initial export value	Natural logarithm of the value of exports at the start of the spell	CEPII database
LD	Lagged duration	Number of years that the previous spell of the same export relationship lasted	CEPII database
TEV	Total export value	Natural logarithm of the total value of exports per service in a year	CEPII database

Source: Author's computation

4.4 Results and discussion

4.4.1 Descriptive statistics

Figure 4.2 displays the distribution of service exports in Kenya between 1995 and 2019. Close to 86% of overall service exports from Kenya were at most US$1 million. Of the remaining categories, about 8% ranged between US$1 million and US$5 million, 2.4% between US$5 million and US$10 million, about 3% between US$10 million and US$50 million, 0.5% between US$50 million, and US$100 million, and 0.3% over US$100 million.

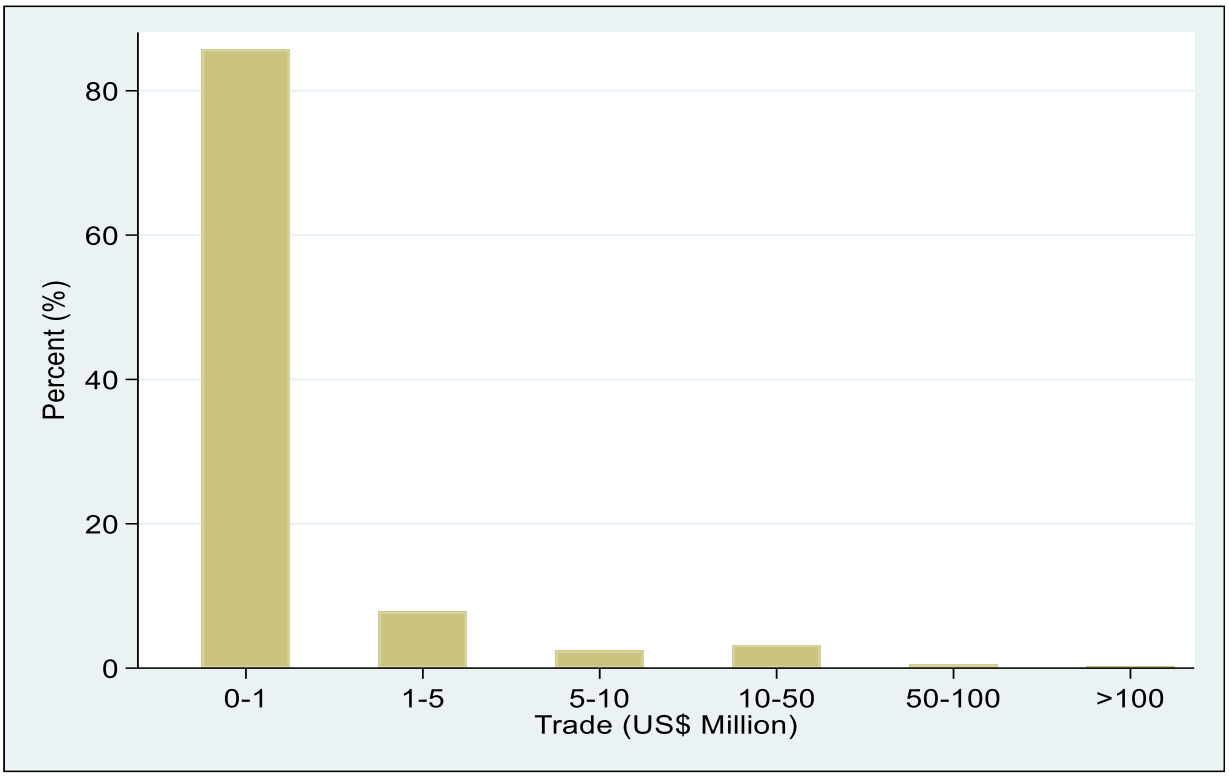

Figure 4.2: Histogram of service export values in Kenya (1995-2019)

Source: Author

Table 4.2 displays results of export survival in Kenya along with dynamics such as survival rate (after the first, tenth, fifteenth, and twenty-fifth year), the mean and median duration period in years, and the number of observations and spells for total and categories of services[28]. We find that about 86% of Kenya's service exports survive through their first year of trading. Nearly 70% last

[28] Survival is assessed at a partner-industry-year level.

for a decade, and 68% exist to the 15th year. About 61% of services lasted for the entire period of our study (25 years). These rates are by far higher than those for goods whose first-year survival rate ranges between 48% and 39% (Chacha and Edwards, 2017; Majune et al., 2020). This is puzzling since services are expected to have a lower survival rate compared to goods (Ariu, 2016).

Nonetheless, it could be influenced by the low level of disaggregation in our dataset compared to that of goods. Both Chacha and Edwards (2017) and Majune et al. (2020) use Harmonised System 6-digit product classification data, yet our data only classifies services at 1-digit. This means that 1-digit categories have fewer observations than the 6-digit and in turn, are likely to portray lower exit rates than the latter. The mean and median period of exporting services in Kenya is 16 years and 19 years respectively.

Table 4.2: Survival dynamics by total and categories of services exports from Kenya

Service	**Survival rate (year)**				**Duration (years)**		**No. of Obs.**	**No. of spells**
	1st	**10th**	**15th**	**25th**	**Mean**	**Median**		
Total	86%	70%	68%	61%	16	19	33,974	2167
Computer and information	74%	52%	50%	47%	9	7	3,230	348
Construction	75%	40%	35%	10%	9	5	2,566	283
Financial	93%	76%	75%	63%	18	25	3,929	223
Government	95%	90%	89%	85%	21	25	4,241	199
Insurance	89%	71%	69%	63%	16	18	3,914	252
Other Business Services	99%	98%	97%	97%	24	25	4,315	180
Personal, cultural, and recreational	78%	55%	55%	52%	12	8	3,256	280
Transportation	96%	90%	89%	89%	22	25	4,273	196
Travel	93%	85%	85%	84%	21	25	4,250	206

Source: Author

The export survival of services by categories is displayed in the columns after total services in Table 4.2. We find that other business services have the highest survival rate across time. It is followed by transport, government and travel services respectively. Financial services have the highest survival rate of the remaining services, followed by insurance, personal, cultural, and recreational, computer and information, and construction services. Computer, information and construction services are the only categories whose survival rates fall below 50% during the

analysis period. The hazard rate of computer and information service exports is 53% in the twenty-fifth year, while that of construction services is 90%. The mean duration of exporting services is highest in other business services (24 years) while computer, information and construction services have the least duration (9 years). The median duration of exporting services is shortest for construction services, 5 years, while services such as financial and travel have 25 years. Nonetheless, we have to reiterate that the survival rates and duration in years are higher than those of goods because our level of disaggregation is low. The mean and median export periods of goods in Kenya are 2.2 years and 1 year, respectively (Majune et al., 2020).

Figure 4.3 plots the Kaplan–Meier survival graph to show the survival rate of service exports by the presence of GATS. We find that trading with a partner who is a signatory of GATS boosts the survival of exports after the first year of trading by 91% as opposed to 86% if a partner is not a member of GATS. After the second year of trading, the survival rate is 87% and 82% for partners who are members of GATS and non-GATS members, respectively. The gap in survival between the two groups widens over time, especially between the fourth and sixteenth year of trading. The difference in survival in the twenty-fifth year is 3% in favour of GATS members. In general, trading under a service-specific trade agreement boosts export survival of services from Kenya.

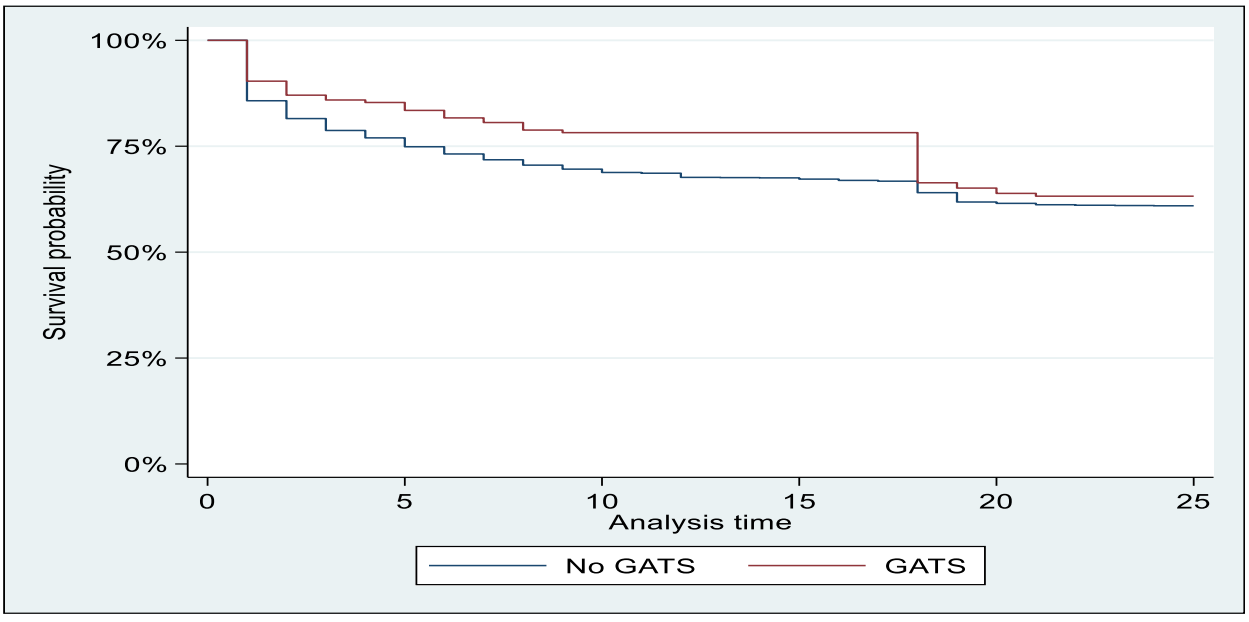

Figure 4.3: Export survival in GATS member countries

Source: Author

The survival of exports by geographical region is shown in Figure 4.4. The highest first-year survival rate of service exports from Kenya is to Europe, then to Asia, Africa, Oceania, South America, and North America, in that order. The top rank of Europe and Asia affirms the findings of Table 2 whereby most top importers of Kenya's services are from these regions: countries such as the UK, Germany, France, Japan, India, and China. Figure 4.4 also shows that export survival in the twenty-fifth year of trading is highest in Europe followed by Asia, Africa, South America, North America, and Oceania follow in that order. Summary statistics of all variables are presented in Table C.1 in the Appendix.

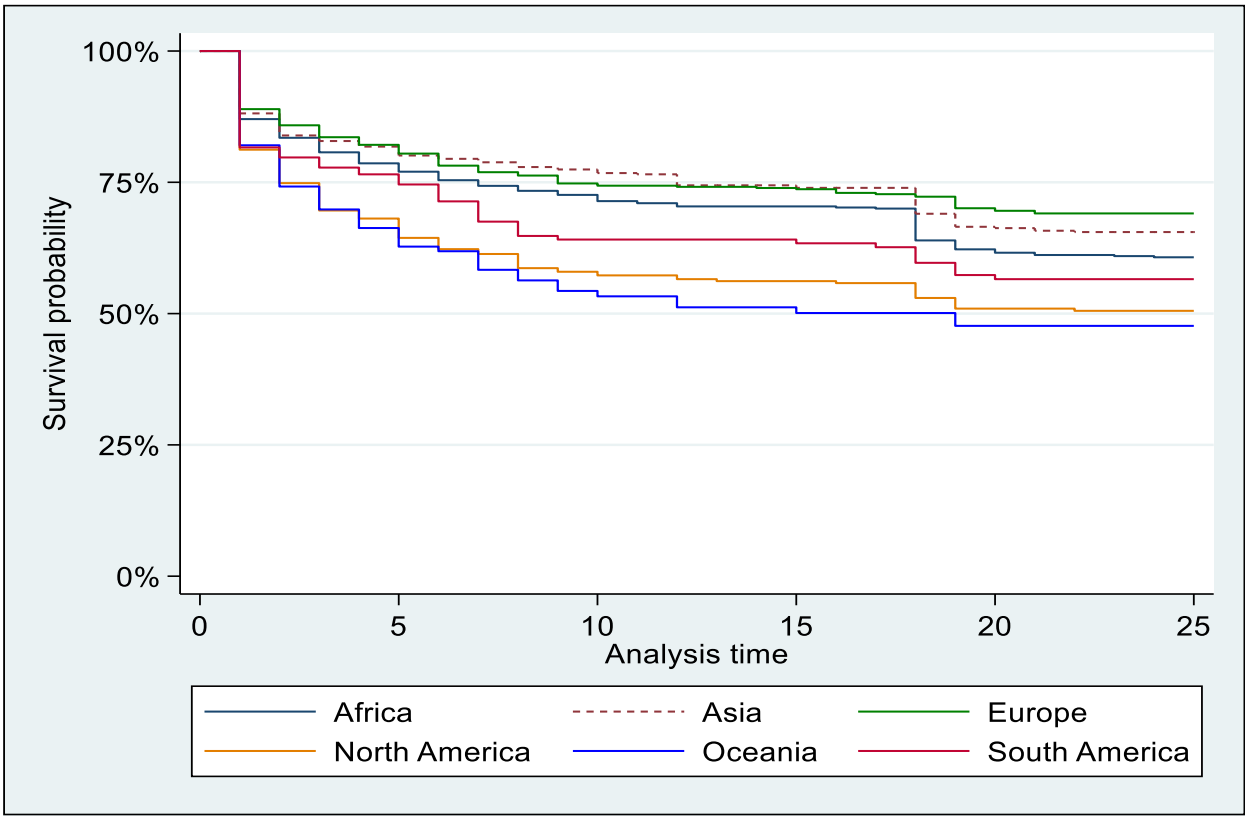

Figure 4.4: Export survival by geographical region

Source: Author

4.4.2 Results and discussion

The first step of the investigation was to establish the appropriate discrete-time model for our study. Table 4.3 displays regression results for logit, probit, and clog-log models. The dependent

variable, the likelihood of a spell ending taking the value of 1 and 0 otherwise, was regressed on a set of country-specific (Kenyan and destination) variables along with control variables. A positive sign on a coefficient points to a decline in the survival probability of an export spell or relationship. On the other hand, a negative coefficient denotes an increase in survival of an export spell or relationship.

Frailty (importer–service random effects) was controlled in all the models. We find that in all three specifications, the values and signs of the estimated coefficients (hazard rates) have similar quality. However, we use the log-likelihood values to establish a suitable model. The log-likelihood values appear at the bottom of the table and the probit model gives us the largest value across the three models. This outcome indicates that the probit model gives a better fit than the logit and clog-log models. The rho test statistic from Table 4.3 is statistically significant, indicating that the probit random-effects model is appropriate for this study. Therefore, we interpret probit results for the rest of the paper.

4.4.2.1 Effect of trade agreements on survival of service export categories

This section discusses results in line with our primary objective of determining the influence of trade agreements on Kenya's service exports survival. Table 4.4 displays the average marginal effects of the probit regression for total and nine categories of services. The first model indicates that GATS, a service-specific trade agreement, significantly reduces the survival of service exports from Kenya by 0.78%. This outcome implies that trading with a country that is a signatory of GATS increases the chances of ceasing to export services to them. This result contradicts the theoretical expectation (Besedeš, 2013; Besedeš et al., 2016) and empirical evidence by studies such as Degiovanni et al. (2017) in Latin America, albeit for goods-specific agreements.

The result could suggest that GATS might be affected by the delay in negotiating services-related agreements that are often discussed after those of goods (Simo, 2020). This slows the speed of implementing agreements related to services. The low commitment and liberalisation in services by countries (Shepherd, 2022; Xiong and Sun, 2022) could also be the reason for this finding. The result can also be attributed to the goods-trade network, which has dominated the effect of trade agreements in services trade (Egger, Francois and Nelson, 2017). Furthermore, restrictive domestic

regulations overshadow the role of trade agreements for trade in services (Kern et al., 2021). This is the reason for introducing trade facilitation in section 4.4.2.3.

Table 4.3: Estimation results of the discrete-time hazard models with random effects

Variables	**Clog-log**	**Logit**	**Probit**
GDP Kenya	-1.4063***	-1.3633***	-0.5430**
	(0.407)	(0.469)	(0.226)
GDP importer	-0.1926***	-0.2008***	-0.0931***
	(0.050)	(0.054)	(0.025)
Distance	0.5492**	0.5975**	0.2978**
	(0.244)	(0.258)	(0.118)
Time Zone Differences	-0.0100	-0.0155	-0.0117
	(0.046)	(0.048)	(0.022)
Goods	-0.0622**	-0.0692**	-0.0312**
	(0.030)	(0.032)	(0.015)
Common language	0.2325	0.2422	0.1088
	(0.182)	(0.192)	(0.087)
Colonial relationship	0.1271	0.1537	0.0660
	(0.179)	(0.189)	(0.086)
Financial development	-0.1355***	-0.1356**	-0.0588**
	(0.052)	(0.055)	(0.025)
Exchange rate	0.0666***	0.0755***	0.0357***
	(0.024)	(0.026)	(0.012)
GATS	0.3574	0.4332	0.2098*
	(0.258)	(0.275)	(0.127)
Initial export value	-0.2305***	-0.2516***	-0.1157***
	(0.036)	(0.039)	(0.018)
Lagged duration	-0.1077***	-0.1265***	-0.0566***
	(0.028)	(0.032)	(0.015)
Total export value	-0.5235***	-0.5431***	-0.2371***
	(0.038)	(0.040)	(0.019)
Rho	0.3530***	0.2055***	0.1180**
	(0.067)	(0.058)	(0.051)
Year dummies	✓	✓	✓
Spell no. Dummies	✓	✓	✓
Duration dummies	✓	✓	✓
Observations	22,557	22,557	22,557
Log likelihood	-1497	-1488	-1479

*Note: Standard errors are in parentheses. * indicates the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Source: Author

As earlier indicated in Table 4.2, export survival varies by category of service. In this regard, results in Table 4.4 reveal that GATS significantly increases the survival of construction and government services by 5.15% and 3.44%, respectively. Since the magnitude of the coefficients is larger for construction services, this result suggests that a service-specific trade agreement is likely to boost the sustainability of these services. However, there is no evidence that GATS significantly affects the survival of the remaining services.

4.4.2.2 Effects of other covariates on categories of services exports from Kenya

In this section, we establish the effect of macroeconomic (such as GDP), gravity (such as distance), goods trade, and product-specific (such as initial export value) factors on the survival of service exports from Kenya.

Of the gravity variables, we find that distance, which often represents the cost of trading (Yotov et al., 2017), raises hazard rates of all services. The effect is statistically significant for total services and government services. A difference in time zones raises export survival of most services, mainly government services, whose coefficient is statistically significant. Using goods data, Bista and Tomasik (2017) find that differences in time zones boost the intensive margin of exports. As aforesaid, the intensive margin is closely related to export survival. However, the intensive margin assesses the performance of already existing export relations at two points in time - both in value and volume, while export survival estimates the probability of export relationships staying active during the period in question (Besedeš and Prusa 2011).

We also find that sharing a common language has no significant effect on the duration of service exports from Kenya but having a historical colonial relationship with a trading partner significantly improves the survival of construction services. Kenya's GDP portrays the country's production capacity, while the importer's GDP indicates the level of demand for Kenya's services abroad (Yotov et al., 2017). The latter has the expected sign of reducing the failure rate of services exported from Kenya when demand in destination markets grows. This excludes transport services whose survival declines when the GDP of Kenya's trading partners grows. The unexpected adverse effect of the importer's GDP on export survival has also been established in goods by Hess and Persson (2011). Growth in Kenya's GDP boosts survival of total, computer and information

services, and personal, cultural, and recreational services. Conversely, it reduces the survival rates of transport, construction, financial, and government services.

Financial development and exchange rate are the other macroeconomic factors of our independent variables. Financial development is an index that was constructed using the PCA method. Following related studies (Sahoo and Dash, 2014; 2017), we developed the financial development indicator from domestic credit to the private sector by banks (% of GDP), broad money (% of GDP), domestic credit provided by the financial sector (% of GDP) and domestic credit to the private sector (% of GDP). These variables had a high correlation amongst themselves (at least 0.76), prompting us to conduct a PCA. As expected, the financial development of a destination country boosts the survival of most service exports from Kenya, particularly total, financial and personal, cultural, and recreational services whose coefficients are significant.

The coefficient of the percentage change in the real exchange rate in Table 4.4 is statistically significant for most services and is correctly signed (an increase in the index indicates appreciation). This finding indicates that an appreciation of the importer's currency decreases the survival of service exports from Kenya. On the other hand, exporting goods improves the survival of Kenya's total, construction, and insurance services.

All product-specific variables indicate the impact that is expected on the survival of most services. Particularly, the first export value and lagged duration are found to be negatively related with the hazard rate, confirming our estimation that export relationships are inclined to last longer as exporters grow their knowledge, experience, and trust over time (Rauch and Watson, 2003; Besedeš and Prusa 2006b; Hess and Persson 2011). The total value of the exports of a service is also included to account for the effect of experience on export duration. The variable is expected to boost survival (Hess and Persson, 2011; Stirbat et al., 2015). We also observe a negative relationship between the hazard rate and the total value of the exports for total and construction services. However, the effect is positive for insurance and personal, cultural, and recreational services, indicating that these variables do not benefit from experience.

Table 4.4: Probit regression coefficients and their marginal effects on service exports from Kenya

	(1)	(2)	(3)	(4)	(5)
Variables	**Total**	**Travel**	**Transport**	**ICT**	**Construction**
GDP Kenya	-0.0180**	0.0105	0.1989**	-0.0478*	0.1441***
	(0.007)	(0.085)	(0.093)	(0.024)	(0.029)
GDP importer	-0.00131***	-0.0082	0.0177*	-0.0068	-0.0272***
	(0.001)	(0.010)	(0.009)	(0.006)	(0.009)
Distance	0.0104***	0.1452	0.0779	0.0411	0.0268
	(0.004)	(0.106)	(0.088)	(0.027)	(0.033)
Time Zone Differences	-0.0005	-0.0132	-0.0143	-0.0050	-0.0014
	(0.001)	(0.014)	(0.014)	(0.005)	(0.007)
Goods	-0.0010**	0.0168**	0.0069	-0.0036	-0.0080*
	(0.001)	(0.008)	(0.005)	(0.003)	(0.004)
Common language	0.0036	-0.0511	0.0418	-0.0347	0.0422
	(0.003)	(0.043)	(0.041)	(0.022)	(0.027)
Colonial relationship	0.0023	0.0450	0.0117	0.0269	-0.0499*
	(0.003)	(0.032)	(0.033)	(0.021)	(0.028)
Financial development	-0.0020**	0.0038	-0.0064	-0.0116**	-0.0070
	(0.001)	(0.006)	(0.010)	(0.006)	(0.006)
Exchange rate	0.0012***	0.0160*	0.0099**	-0.0026	0.0004
	(0.000)	(0.009)	(0.005)	(0.003)	(0.004)
GATS	0.0078*	-	-	0.0363	-0.0515**
	(0.004)	-	-	(0.029)	(0.026)
Initial export value	-0.0038***	-0.0143*	-0.0286***	-0.0113***	-0.0046
	(0.001)	(0.009)	(0.008)	(0.004)	(0.005)
Lagged duration	-0.0019***	-0.0137	-0.0084**	-0.0008	-0.0082***
	(0.000)	(0.010)	(0.004)	(0.004)	(0.003)
Total export value	-0.0079***	0.0843	-0.1259	-0.0071	-0.0145***
	(0.001)	(0.117)	(0.099)	(0.013)	(0.004)
Year dummies	✓	×	×	×	×
Spell no. Dummies	✓	✓	✓	×	✓
Duration dummies	✓	✓	✓	×	✓
Observations	22,557	416	384	2,297	1,630

*Note: The table reports coefficients of the average marginal effects. Robust standard errors are in parentheses. * indicates the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. ICT means computer and information services.*

Source: Author

Table 4.4: Continuation

	(6)	(7)	(8)	(9)	(10)
Variables	**Financial**	**Government**	**Insurance**	**OBS**	**PCR**
GDP Kenya	0.0273***	0.0776**	-0.0309	-0.0031	-0.0349***
	(0.010)	(0.031)	(0.025)	(0.008)	(0.013)
GDP importer	-0.0051*	-0.0001	-0.0037	0.0102	-0.0136**
	(0.003)	(0.003)	(0.005)	(0.007)	(0.006)
Distance	0.0059	0.0606**	0.0174	0.0846	0.0244
	(0.011)	(0.029)	(0.025)	(0.070)	(0.031)
Time Zone	0.0019	-0.0091**	0.0023	-0.0118	0.0019
Differences	(0.002)	(0.004)	(0.004)	(0.010)	(0.006)
Goods	-0.0018	-0.0000	-0.0047*	-0.0021	0.0008
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Common language	-0.0016	0.0134	0.0189	0.0200	-0.0082
	(0.010)	(0.012)	(0.018)	(0.020)	(0.026)
Colonial relationship	0.0162	0.0024	-0.0139	0.0375	0.0331
	(0.010)	(0.012)	(0.018)	(0.027)	(0.026)
Financial	-0.0075*	0.0007	-0.0078	0.0004	-0.0132*
development	(0.004)	(0.002)	(0.007)	(0.002)	(0.008)
Exchange rate	0.0036**	0.0016	0.0049*	0.0045	0.0064*
	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)
GATS	0.0124	-0.0344*	0.0151	-	0.0261
	(0.012)	(0.021)	(0.027)	-	(0.031)
Initial export value	-0.0058***	-0.0047*	-0.0106***	-0.0039	-0.0119***
	(0.002)	(0.002)	(0.004)	(0.003)	(0.004)
Lagged duration	-0.0026	-0.0004	-0.0067**	-	-0.0019
	(0.002)	(0.004)	(0.003)	-	(0.003)
Total export value	0.0025	-0.0426	0.0525***	0.0049	0.0284**
	(0.007)	(0.031)	(0.019)	(0.005)	(0.012)
Year dummies	×	×	×	×	×
Spell no. Dummies	✓	✓	✓	×	✓
Duration dummies	✓	✓	✓	×	×
Observations	1,945	1,069	1,510	2,541	2,287

*Note: The table reports coefficients of the average marginal effects. Robust standard errors are in parentheses. * indicates the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. OBS stands for other business services, while PCR means personal, cultural, and recreational services.*

Source: Author

4.4.2.3 Robustness checks

Additional duration analyses are performed in this section to establish whether our results change by geographical region and trade facilitation.

a) Export survival by geographical regions

Table 4.5 displays the results of the survival of overall services by geographical regions. GATS, which is our variable of interest, only affects trade within Africa. We find that the presence of GATS within Africa reduces the survival of Kenya's service exports to the continent by 1.3%. This result could be of concern to policymakers engaged in the negotiations of AfCFTA, which is meant to boost intra-Africa trade in goods and services (Abrego et al., 2020). Perhaps identifying factors that boost Kenya's service trade could be of help. According to column one, Kenya's service exports in Africa are boosted by the GDP of the importer, the presence of a colonial relationship with an African country, and product-specific characteristics (initial export value, lagged duration, and total export value). The elasticity is highest for trade with a country that shares a colonial relationship (1.27%). Initial export value has the largest coefficient (0.47%) among product characteristics, suggesting that a sizeable initial export value reduces the degree of uncertainty in a trade relationship, thereby boosting its sustainability. Time Zone Difference increases the hazard rate of service that is exported in Africa from Kenya.

Export survival of services from Kenya to Asia is boosted by GDP (for Kenya and Asian economies), level of financial development in Asia, and the total export value. Nonetheless, sharing a language and colonizer with an appreciation of the exchange rate dampens the survival of services from Kenya to Asia. Survival of services to Europe is boosted by merchandise trade, the initial export value, and the total export value. Results of these product-specific characteristics indicate the importance of experience in boosting trade in Europe. The exchange rate determines the survival of services in North America. A similar result was established by Majune et al. (2020) for trade in goods to North America. Product-specific characteristics - initial and total export value – also determine the survival of services in North America. These product-specific factors also determine the survival of services from Kenya to Oceanic countries.

Table 4.5: Probit regression coefficients and marginal effects by geographical regions

Variables	(1) Africa	(2) Asia	(3) Europe	(4) North America	(5) Oceania	(6) South America
GDP Kenya	-0.0091	-0.0229*	-0.0038	0.0125	-0.0313	0.0273
	(0.014)	(0.013)	(0.019)	(0.026)	(0.041)	(0.076)
GDP importer	-0.0055***	-0.0051**	-0.0058	-0.0111	0.0370	-0.0162
	(0.002)	(0.002)	(0.005)	(0.008)	(0.060)	(0.015)
Distance	-0.0061	0.0252	-0.0006	0.0046	8.5492	-1.0750
	(0.007)	(0.019)	(0.029)	(0.302)	(10.779)	(0.787)
Time Zone	0.0083**	-0.0034	-0.0026	-0.0007	-0.5063	0.1120
Differences	(0.004)	(0.004)	(0.008)	(0.031)	(0.660)	(0.087)
Goods	-0.0016	-0.0002	-0.0032*	-0.0033	-0.0057	0.0010
	(0.001)	(0.001)	(0.002)	(0.004)	(0.005)	(0.004)
Common	0.0036	0.0115*	-0.0013	0.0433	-0.3781	-0.1657
language	(0.006)	(0.006)	(0.023)	(0.064)	(0.378)	(0.144)
Colonial	-0.0127**	0.0153**	0.0031	-0.0271	-0.8495	-
relationship	(0.006)	(0.007)	(0.023)	(0.065)	(1.105)	-
Financial	-0.0011	-0.0039**	0.0004	-0.0163	0.0031	-0.0194
development	(0.002)	(0.002)	(0.003)	(0.011)	(0.021)	(0.016)
Exchange rate	-0.0009	0.0028**	0.0007	0.0076*	0.0444	0.0078
	(0.001)	(0.001)	(0.002)	(0.004)	(0.047)	(0.006)
GATS	0.0130**	-0.0006	0.0057	-	0.0686	-
	(0.006)	(0.012)	(0.010)	-	(0.372)	-
Initial export	-0.0047***	-0.0001	-0.0058***	-0.0251***	-0.0147**	-0.0372
value	(0.001)	(0.001)	(0.002)	(0.005)	(0.007)	(0.026)
Lagged duration	-0.0025***	-0.0000	-0.0019	-0.0042	-0.0037	0.0040
	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.008)
Total export	-0.0094***	-0.0091***	-0.0111***	-0.0179***	-0.0212***	-0.0369
value	(0.001)	(0.002)	(0.002)	(0.004)	(0.007)	(0.024)
Year dummies	✓	✓	✓	✓	×	×
Spell no. Dummies	✓	✓	✓	✓	×	×
Duration dummies	✓	✓	✓	✓	×	×
Observations	6,599	3,935	3,264	1,274	812	691

*Note: The table reports coefficients of the average marginal effects. Robust standard errors are in parentheses. * indicates the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Source: Author

b) Export survival by trade facilitation indicators

Trade facilitation – costs associated with infrastructural, policy and procedures that can be improved in order to ensure efficiency in trade across the borders – was also analysed to establish its effect on overall service survival in Kenya. This analysis was done by interacting GATS, our variable of interest, with the quality of institutions, STRI, mobile subscriptions, fixed telephone subscriptions, and the level of internet access. The first two factors represent soft indicators of trade facilitation while the latter variables denote its hard indicators.

Results of the interaction term in Table 4.6 indicate that improving the quality of institutions and STRI under GATS significantly boosts the survival of services from Kenya by 0.48% and 7.7%, respectively. Individually, neither institutions nor STRI have a statistically significant effect on the survival of total service exports. GATS does not have a statistically significant effect on service exports in model 1 but reduces export survival in model 2.

The interaction terms of all the hard indicators of trade facilitation – mobile subscriptions, fixed telephone subscriptions, and the level of internet access – with GATS do not have statistically significant effects. However, the individual effect of mobile subscriptions and internet access is statistically significant. In general, the results indicate that soft indicators of trade facilitation have a higher effect on the survival of service exports in Kenya, other than hard indicators, when a service-specific trade agreement like GATS is in operation.

Table 4.6: Probit regression marginal effects results for trade facilitation indicators

Variables	(1) Institutions	(2) STRI	(3) Mobile	(4) Telephone	(5) Internet
GATS	-0.0010	0.2836**	-	-	-
	(0.005)	(0.138)	-	-	-
Indicator	0.0005	0.0076	-0.0004**	-0.0004	-0.0015**
	(0.001)	(0.011)	(0.000)	(0.002)	(0.001)
Interaction	-0.0048**	-0.0772**	0.0030	-0.0103	0.0051
(GATS*indicator)	(0.002)	(0.037)	(0.007)	(0.017)	(0.007)
GDP Kenya	-0.0188**	0.0406**	-0.0546**	-0.0014	-0.0605***
	(0.008)	(0.016)	(0.024)	(0.014)	(0.019)
GDP importer	-0.0031***	-0.0039	-0.0027	0.0005	-0.0055
	(0.001)	(0.002)	(0.003)	(0.005)	(0.004)
Distance	0.0102***	0.0302	-0.0104	-0.0148	-0.0069
	(0.004)	(0.018)	(0.012)	(0.015)	(0.011)
Time Zone Differences	-0.0006	-0.0042*	0.0120	0.0128	0.0126
	(0.001)	(0.002)	(0.008)	(0.011)	(0.008)
Goods	-0.0010**	-0.0011	-0.0031	-0.0062*	-0.0012
	(0.000)	(0.001)	(0.003)	(0.004)	(0.002)
Common language	0.0036	-0.0000	-0.0122	0.0013	-0.0128
	(0.003)	(0.007)	(0.012)	(0.016)	(0.012)
Colonial relationship	0.0027	-0.0133	-0.0111	-0.0155	-0.0088
	(0.003)	(0.009)	(0.010)	(0.012)	(0.010)
Financial development	-0.0020**	-0.0057***	0.0014	0.0068	0.0028
	(0.001)	(0.002)	(0.004)	(0.006)	(0.004)
Exchange rate	0.0013***	0.0029***	0.0002	0.0013	0.0003
	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)
Initial export value	-0.0038***	-0.0018	-0.0055**	-0.0048**	-0.0047**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Lagged duration	-0.0018***	-0.0038***	0.0027	-0.0040**	0.0022
	(0.000)	(0.001)	(0.002)	(0.002)	(0.002)
Total export value	-0.0077***	-0.0091***	-0.0155***	-0.0115***	-0.0156***
	(0.001)	(0.002)	(0.003)	(0.002)	(0.003)
Year dummies	×	✓	✓	×	✓
Spell no. Dummies	✓	✓	✓	✓	✓
Duration dummies	✓	✓	×	✓	×
Observations	22557	6417	2548	1579	2571

*Note: The table reports coefficients of the average marginal effects. Robust standard errors are in parentheses. * Indicates the level of significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Source: Author

4.5 Summary, conclusions and implications

4.5.1 Summary of the study

This essay sought to establish the effect of trade agreements on Kenya's export survival of services. Trade agreements are expected to increase export volumes and chances of exports surviving in foreign markets since they reduce entry and operation costs (Türkcan and Saygılı, 2018; Cyrus, 2021). In this study, GATS, a service-specific trade agreement, was used. Other covariates were: macroeconomic factors (GDP for Kenya and destination countries, financial development, and exchange rate), gravity indicators (distance, time zone difference, common language, and colonial relationship), merchandise trade, and product-specific factors (lagged duration, initial export value, and total export value).

Bilateral exports of services data from Kenya to 176 countries for the period 1995 and 2019 were used. Service export data was at a 1-digit level in that we considered: travel, transport, computer and information, construction, financial, insurance, government, other business, and personal, cultural, and recreational services. A discrete-time probit model with random effects was employed in the analysis. In addition, dummies for the duration of trade relationships, number of spells, and years were included to correct for endogeneity.

Preliminary results revealed that about 86% of exports of services from Kenya survived beyond the first year of trading. Nearly 70% lasted for a decade, 68% existed until the 15^{th} year, and about 61% of services were traded for the whole study period (25 years). The mean and median period of exporting services in Kenya was 16 years and 19 years, respectively. When service categories were considered, we found that other business services had the highest survival rate across time. It was followed by transport, government and travel services respectively. Of the remaining services, financial services had the highest survival rate followed by insurance, personal, cultural, and recreational, computer, information, and construction services. We also found that trading with a partner who is a signatory of GATS boosted the survival of exports. The survival of exports by geographical region was highest in Europe followed by Asia, Africa, South America, North America, and Oceania in that order.

Probit regression results indicated that GATS significantly reduced Kenya's service exports survival by 0.78%. This implies that trading with a country that is a signatory of GATS increases the chances of ceasing to export services to them. Nevertheless, GATS significantly increased the survival of construction and government services by 5.15% and 3.44%, respectively. GATS did not have a statistically significant effect on the remaining services.

When the analysis was expanded to geographical regions, only Africa was significantly affected by GATS. The presence of GATS reduced Kenya's service exports survival by 1.3%. Kenya's service exports in Africa were instead boosted by the GDP of the importer, the presence of a colonial relationship, and product-specific characteristics (initial export value, lagged duration, and total export value). Kenya's export survival of services to Asia was enhanced by GDP (for Kenya and Asian economies), level of financial development in Asia, and the total export value. Survival of services to Europe was boosted by merchandise trade, the initial export value, and the total export value. The exchange rate determined the survival of services in North America. Product-specific characteristics - initial and total export value – also determined the survival of services in North America. These product-specific factors also determined the survival of services from Kenya to Oceanic countries.

Given the growing importance of trade facilitation in trade discussions (Seck, 2016; van der Marel and Shepherd, 2020), we interacted GATS with five indicators of trade facilitation. The quality of institutions and STRI were used as soft indicators while mobile subscriptions, fixed telephone subscriptions, and the level of internet access represented hard indicators of trade facilitation. We found that improving the quality of institutions and STRI under GATS significantly boosted the survival of services from Kenya by 0.48% and 7.7%, respectively. On the other hand, all the hard indicators of trade facilitation did not significantly affect the survival of services exports in Kenya under GATS. Therefore, reducing regulations and general improvement of the quality of institutions can help countries reap the benefits of a service-specific trade agreement fully.

4.5.2 Policy implications

This study adds to the trade discourse of services trade—specifically, deliberations on the performance of services under trade agreements. The key finding—GATS, a service-specific trade

agreement, significantly reduces the survival of service exports from Kenya—should be put into more policy context. This result implies that trading with a country that is a signatory of GATS increases the chances of ceasing to export services to them. This could either be influenced by the prioritization of goods over services in trade negotiations (Simo, 2020) or restrictive domestic regulations which overlook the role of service-specific agreements (Kern et al., 2021). In this regard, we recommend that negotiations and implementation of protocols related to services should be done alongside those of goods. For instance, the AfCFTA has synchronously enforced protocols for both goods and services (Mold and Mangeni, 2022).

Consequently, the result indicating that GATS reduces the survival of services exported from Kenya to Africa should concern policymakers who are engaged in the negotiations of AfCFTA. AfCFTA is meant to boost intra-Africa trade in goods and services; hence, this result means that this objective might not be achieved for Kenya. As for other continents, where macroeconomic factors and product-specific characteristics determine survival, we recommend the maintenance of a stable macroeconomy (GDP and exchange rate) in Kenya and supporting firms in the service sector. These efforts should aim to enhance the capacity of these firms to diversify their services and markets and overall experience in foreign markets.

Since GATS significantly increases the survival of construction and government service exports, there is a need to enhance trade negotiations in these sectors[29]. In general, the effect of GATS on the survival of trade in services in Kenya can be boosted by reducing regulations in the sector and improving the quality of institutions.

4.5.3 Areas for further research

This study can be advanced by using firm-level data. The increasing accessibility of firm-level data has necessitated the formation of stylized facts on firms that trade internationally. However, these assertions are mainly for firms that trade in goods, yet services have some fundamental differences with goods that require a separate policy focus. For instance, services are more dynamic and have quantitative differences with goods (Ariu, 2016). Thus, firm-level data can

[29] For instance, schedules on specific commitments for the construction sector among other six sectors were expected to be completed by December 2021 (Africa Renewal, 2021).

enable future studies to tease out critical firm-level characteristics that influence service sector firms' survival.

4.5.4 Limitations of the study

A fundamental shortcoming of the study is the use of data that is less disaggregated. As aforesaid, the rate of survival of our services was greater than that of goods mainly because our services data is at 1-digit classification. Services are expected to have lower survival rates than goods (Ariu, 2016). Nonetheless, we note that getting a reliable data set on services is challenging, particularly in developing countries.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.0 Summary of the study

This study is a compilation of three essays on Kenya's service exports. Trade in services has become an essential part of international trade. The current portion of services in total trade of goods and services globally is approximately a quarter (Maurer, Magdeleine, and Lanz, 2016; Loungani et al., 2017; Choi and Park, 2018). In Kenya, the average rate of services in the total exports of commodities between 2010 and 2019 was 45%, meaning that services account for nearly half of the country's total exports. Kenya is also the fifth largest services exporter in Africa after Egypt, South Africa, Morocco, and Tunisia. The country has a comparative advantage in trade in services such as financial, transport and travel services. In addition, Kenya has a trade surplus in services, implying that it exports more services than it imports. In contrast, the percentage of goods in total exports in Kenya has been falling while the general export growth has been dismal (seldom exceeds 10%). Given that exports are critical to Kenya's economic growth and existing empirical evidence on the country's international trade is predominantly on goods, this study assessed the growth path (economic and export) through service exports. Therein three main objectives were addressed (each objective formed an essay).

The first essay (chapter two) is on the drivers of service exports from Kenya. The essay aimed at identifying domestic factors that boost exports of services from Kenya. Using time-series data from 1975 to 2017, the study analysed eight ARDL models for traditional services (transport, travel, and government services), modern services (financial and insurance, and communication), and composite services (total, traditional and modern). Following the import demand function by Romero and McCombie (2018), supply and demand factors were mixed to determine the drivers of exports of the different services. The supply-side factors considered were Kenya's infrastructure, human capital endowment, merchandise exports, institutional quality, and financial development. Real exchange rate and world demand per service represented demand-side indicators.

Service exports were determined by goods exports, world demand for services, human capital, real exchange rate, institutional quality, financial development, and infrastructure. World demand for services had a positive and significant effect in the short-term but not in the long-term. Fluctuations

in the real exchange rate were found to affect service exports in a J-curve pattern. Currency depreciation led to deterioration in the balance of trade, but the situation improved with time, as observed by Magee (1973). This was also evident in travel, transport, insurance and financial, and communication services. The effect of human capital development on total service exports was negative in the short-term but positive in the long-term. Institutional quality as proxied by democratic elections improved total service exports but only in the short-term. The effect of financial developments on exports of services was found to be negative in the short-term but positive in the long-term. Infrastructure growth positively affected exports of services in the long-term, meaning that building both physical (such as roads) and soft infrastructure (such as the internet) boosts services exports.

Comparing traditional and modern services, the effect that goods exports improve service exports in the long-run was more prominent in traditional services. As for specific services, we found the highest effect on transport followed by communication and government services. World demand for respective services, which represented an external shock, positively affected traditional services, specifically travel, transport, and government service exports. The effect was highest in travel exports meaning that sanctions such as travel advisories against visiting Kenya deal a heavy blow on this form of service export. Furthermore, world demand for respective modern services positively affected exports of modern services (composite, insurance, financial, and communication services) but only in the short-term. The effect was negative in the long-term.

The second essay (chapter three) is on the role of time zones differences on bilateral service exports from Kenya. This essay aims to establish the effect of characteristics of the destination country, specifically time zone differences, on service exports from Kenya. Time zone differences can hinder or boost international trade. Coordination and real-time communication among businesses can be hampered if the regular working hours of trading partners do not coincide. Production and delivery of services can also be affected by "jet lag" if business travellers have to move from East to West and thus take time to adjust to fatigue from travelling. Conversely, time zone differences can enhance trade if the production process can be fragmented into stages such that one stage is started in one country and completed in another country. The transmission of instructions from one stage to another is facilitated by the communication network in the two countries as it is

assumed that work is best executed during the daytime and the time zones are non-overlapping. Unlike goods, services are best suited for this arrangement due to their nature of intangibility and the possibility of disintegration.

This assessment is appropriate for Kenya, which exports a variety of services to international markets situated in different regions whose time zones do not overlap. At the same time, the level of technology and innovation in Kenya is growing as the country has the highest contribution of the internet to GDP in Africa (Dihel et al., 2012; Økland, 2019). This outcome signals an improvement in communication infrastructure that is necessary for trade in services.

This essay relied on bilateral exports data between Kenya and 176 countries from 1995 to 2019. Ten models (total, travel, transport, computer and information, other business services, financial, insurance, government, construction, and personal, cultural, and recreational services) were analysed using the gravity model's PPML estimator. Results showed that the time zone difference between Kenya and partner countries is significantly positive in technology-sensitive service exports: computer and information and other business services. The effect is significantly negative for construction, financial, and government service exports. Further analysis revealed that these results are robust when an alternative model (Zero-Inflated Poisson) is employed and overlapping workday hours are used.

We also find that the effect of differences in time zones on services is non-linear as it is not statistically significant across all time intervals across services. There is also a threshold for the "continuity effect": between 2- and 3-hour time difference for computer and information services and other business services and 10-hour difference for total and personal, cultural, and recreational services. The "synchronisation effect" does not have a threshold. In addition, the effect of differences in time zones on service exports from Kenya is sensitive to "soft" (GATS, quality of institutions, and STRI) and "hard" (mobile subscriptions and level of internet access) indicators of trade facilitation.

The third essay (chapter four) is about the influence of trade agreements on the survival of exports of services from Kenya. Kenya has joined several trade agreements, bilateral and multilateral, after

liberalization in 1993, such as the WTO in 1995 and the AfCFTA in 2018 (Majune and Mwania, 2020; Abrego et al., 2020). This expands market access of firms and products from Kenya. However, it does not guarantee the sustainability of exports in those markets. According to Brenton et al. (2010), developing countries are better at creating new relationships compared to developed ones. However, developed countries' high export growth rates are credited to their high survival rates in their importing markets. Therefore, it is crucial for a country like Kenya, which values the growth of exports, to be concerned about policies that boost export survival rates.

To achieve this objective, data on bilateral services exports from Kenya to 176 countries from 1995 to 2019 was used. Service export data was at a 1-digit level covering: travel, transport, computer and information, construction, financial, insurance, government, other business, and personal, cultural, and recreational services. A discrete-time probit model with random effects was employed in the analysis. In addition, dummies for the duration of trade relationships, number of spells, and years were included to correct for endogeneity.

GATS, which is a service-specific trade agreement, was the variable of interest. Other covariates were: macroeconomic factors (GDP for Kenya and destination countries, financial development, and exchange rate), gravity indicators (distance, time zone difference, common language, and colonial relationship), merchandise trade, and industry-specific factors (lagged duration, initial export value, and total export value).

Initial results revealed that about 86% of Kenya's service exports survived beyond the first year of trading. Nearly 70% lasted for a decade, 68% existed until the 15^{th} year, and about 61% of services were traded for the whole period of the study (25 years). The mean and median period of exporting services in Kenya was 16 years and 19 years, respectively. When service categories were considered, we found that other business services had the highest survival rate across time. It was followed by transport, government and travel services respectively. Financial services had the highest survival rate of the remaining services, followed by insurance, personal, cultural, and recreational, computer, information, and construction services. We also found that trading with a partner who is a signatory of GATS boosted the survival of exports. The survival of exports by

geographical region was highest in Europe followed by Asia, Africa, South America, North America, and Oceania in that order.

Probit regression results indicated that GATS significantly reduced the survival of service exports from Kenya by 0.78%. This result implies that trading with a country that is a signatory to GATS increases the chances of ceasing to export services to such a country. Nevertheless, GATS significantly increased the survival of construction and government services by 5.15% and 3.44%, respectively. On the other hand, GATS reduced the survival of most of the remaining services, albeit with a statistically insignificant effect.

When the analysis was expanded to geographical regions, we found that only Africa was significantly affected by GATS. The presence of GATS reduced the survival of Kenya's service exports to the continent by 1.3%. Kenya's service exports in Africa were instead boosted by the GDP of the importer, the presence of a colonial relationship, and industry-specific characteristics (initial export value, lagged duration, and total export value). Kenya's export survival of services to Asia was enhanced by GDP (for Kenya and Asian economies), level of financial development in Asia, and the total export value. Survival of services to Europe was boosted by merchandise trade, the initial export value, and the total export value. The exchange rate determined the survival of services in North America. Industry-specific characteristics - initial and total export value – also determined the survival of services in North America. These industry-specific factors also determined the survival of services from Kenya to Oceanic countries.

Lastly, GATS was interacted with five indicators of trade facilitation - infrastructural, policy, and procedural systems on and beyond the border – to establish their effect on export survival. The quality of institutions and STRI were used as "soft" indicators while mobile subscriptions, fixed telephone subscriptions, and the level of internet access represented "hard" indicators of trade facilitation. We found that improving the quality of institutions and STRI under GATS significantly boosted the survival of services from Kenya by 0.48% and 7.7%, respectively. On the other hand, we did not find evidence that "hard" indicators of trade facilitation significantly affected the survival of services exports in Kenya under GATS. This suggests that reducing

regulations and general improvement of the quality of institutions can help countries reap the benefits of a service-specific trade agreement fully.

5.1 Policy implications

The findings of this study have significant policy implications. At the domestic level, policies should target to improve the exports of goods since they also improve exports of all services. This targeting could be done through export promotion schemes and the formation of bilateral and multilateral trade agreements. The policy should also target a stable exchange rate whose effect is high in transport, travel, and communication sectors. Development of human capital, the financial sector, and infrastructure should be pursued. Liberalizing services in Kenya should be sector-specific. Opening the transport and communication sectors should be prioritized to ensure that more firms are engaged in these sectors. Government services can also be liberalized through trade agreements that facilitate the inauguration of embassies and consulates. On the contrary, regulating travel, insurance, and financial sectors is vital due to their potential of attracting negative externalities. For instance, Kenya imposed restrictions on international travel at the beginning of the COVID-19 pandemic to prevent its spread (Majune, 2020).

At the bilateral level, the government can pursue policies that attract Foreign Direct Investors to Kenya. Specifically in ICT-intensive sectors - computer, information and other business services - whose exports improve when they trade in markets that are situated in different time zones. Reduction of trade barriers should also be prioritized for the success of the service sector. This can be done by improving the quality of institutions, particularly regulations that deal with bilateral trade in services such as those on the movement of labour. The government should also prioritize improving infrastructure that aids in communication, such as cell phone signal boosters. The government should promote service-specific trade agreements such as GATS to boost exports of services from Kenya. At the firm level, traders of services in the travel, transport, computer and information, insurance, and other business service sectors can take advantage of the positive effect of the differences in time zones on their exports by creating networks with their foreign partners.

To boost the export survival of services from Kenya, the government should consider negotiating and implementing protocols related to services synchronously with goods. Service-specific

agreements such as GATS should be formed in construction and government service sectors. This can be done by targeting investment and labour movement policies, which are vital in these sectors. In addition, service-specific agreements are likely to boost the survival of service exports when the quality of institutions is improved and regulations are reduced. Maintaining a stable macroeconomy – especially targeting GDP and exchange rate – and enhancing the capacity of firms to diversify their services and markets and overall experience in foreign markets should be encouraged.

5.2 Limitations of the study

A major shortcoming of this study is that the data used is less disaggregated, which affected our survival analysis results in the third essay (chapter four). Services are expected to have a lower export survival rate than goods (Ariu, 2016). However, our results showed that the annual survival rates of services were by far higher than those of goods as established by Türkcan, Majune and Moyi (2022), Chacha and Edwards (2017) and Majune et al. (2020) in Kenya. The key reason is that our services data was at a 1-digit level (travel, transport, computer and information, construction, government, financial, insurance, other business, and personal, cultural, and recreational services) in contrast with the aforementioned goods-specific studies, which used 6-digit product classification data. Therefore, the 1-digit categories had fewer observations than the 6-digit and in turn, are likely to portray lower exit rates than the latter. This problem also affected our chances of obtaining coefficients for some variables, such as GATS, especially for services whose survival rates were high (such that they had low hazard rates, yet the hazard rate was the dependent variable of our regression function).

5.3 Areas for further research

Each essay of this thesis can be improved as follows. Forthcoming studies can improve the first essay on the drivers of service exports from Kenya by establishing the role of exports of services on Kenya's economy's growth and development. Such an inquiry could be termed as "testing the services export-led growth hypothesis in Kenya." Given the ongoing premature deindustrialization where the role of the service sector in economies has intensified earlier than historically expected (Rodrik, 2018), such a study shall inform policy on how countries are likely to grow with a dominant service sector. The first essay can also be advanced by assessing the role of services on the manufacturing sector's performance, often called servicification (Lodefalk, 2014; Aiginger and

Rodrik, 2020; Pattnayak and Chadha, 2022). Such examination shall inform policy on how the two sectors can complement each other and the overall involvement of services in Global Value Chains. Studies can also advance the first essay by establishing the determinants of comparative advantage in Kenya's service exports. This has been done by Cunha and Forte (2017) and Seyoum (2007) in developing countries. Exploring Kenya's comparative advantage in service exports identifies the main ingredients in maintaining the advantage and sheds light on how to reverse the comparative disadvantage experienced in some service exports.

The second essay can be advanced in three ways. Foremost, studies can examine the effect of differences in time zone on services such as E-commerce which can be delivered virtually and physically, and their implications on welfare and fiscal policy. Readers eager to get a theoretical intuition can refer to Marjit et al. (2020). Second, with the occurrence of COVID-19, studies can assess the effect of disasters and uncertainty on the performance of services. Motivation can be sought from papers by Xu and Kouwoaye (2019), Didier (2020), and Minondo (2021). Lastly, studies can use alternative models to predict the effect of covariates on bilateral trade in services. For example, the World Bank (2020) has applied the CGE model to predict the effect of AfCFTA on services exports.

All three essays can be improved by using firm-level data. The increasing accessibility of firm-level data has necessitated the formation of stylized facts on firms that trade internationally. However, these assertions are mainly for firms that trade in goods, yet services have some fundamental differences with goods that require a separate policy focus. For instance, services are more dynamic and have quantitative differences with goods (Ariu, 2016). They also have different trade costs and face different restrictions compared to goods (Hoekman, 2018). In the case of this thesis, firm-level data can enable future studies to tease out critical firm-level characteristics that influence bilateral trade and the survival of firms in the service sector. Formulation and testing of service-specific trade theories are also likely to be enhanced by the availability of firm-level data. For instance, some services are exported directly to consumers, yet existing goods-specific international trade theory mainly explains trade between firms (see Ohlin, 1933, p. 238).

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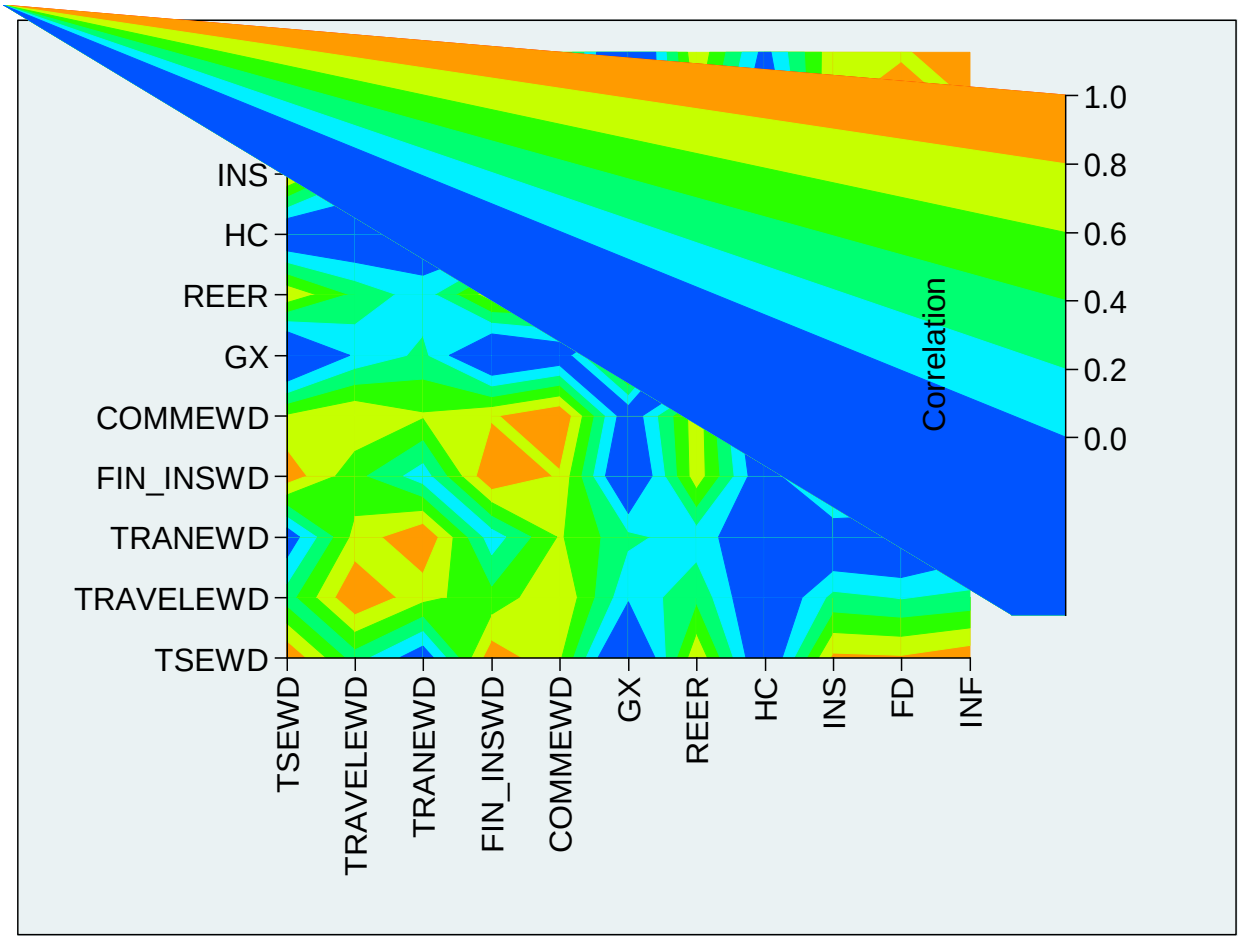
APPENDIX

Appendix A: Essay One - Drivers of service exports from Kenya

Note: ICT= Information communication and technology services; Ins&Fin =insurance and financial services; and REER = Real Exchange Rate.

Figure A.1: Graphical plot of all variables over time

Source: Author



Note: TSEWD is world demand for total service exports, TRAVELEWD is world demand for travel export, TRANSEWD is world demand for transport export, FIN_INSWD is world demand for financial and insurance exports, COMMEWD is world demand for communication and computer service exports, HC is human capital, REER is exchange rate, GX is goods exports, INS is institutions, and INF is infrastructure. The natural logarithm of World GDP net Kenya's GDP is used as a proxy for world demand for government services exports. This is because we could not find sufficient data that spans the period of study. Furthermore, this approach has been proposed by (Sahoo and Dash, 2017).

Figure A.2: Correlation matrix heat map

Source: Author

Appendix B: Essay Two - The role of time zone differences on bilateral service flows from Kenya

Table B.1: Distribution of services by export value (US$ millions)

Service	Obs.	US$0 mil	US$0-US$1 mil	>US$1 mil	Total
Computer and information	4319	25.21%	73.77%	1.02%	100%
Construction	4319	40.59%	59.20%	0.21%	100%
Financial	4319	9.03%	88.75%	2.22%	100%
Government	4319	1.81%	84.83%	13.36%	100%
Insurance	4319	9.38%	88.98%	1.64%	100%
Other business services	4319	0.09%	81.66%	18.24%	100%
Personal, cultural, and recreational	4319	24.61%	74.90%	0.49%	100%
Transportation	4319	1.07%	59.60%	39.34%	100%
Travel	4319	1.60%	62.86%	35.54%	100%
Total services	4319	0%	44.92%	55.08%	100%

Note: Mil= million

Source: Author

Appendix C: Essay Three - Trade agreements and survival of service exports from Kenya

Table C.1: Summary statistics for survival analysis

Variable	Obs.	Mean	Std. Dev.	Min	Max
Y (dependent variable)	33,974	0.023	0.151	0	1
GDP Kenya	33,974	17.178	0.733	16.018	18.375
GDP importer	33,398	17.226	2.335	10.961	23.787
Distance	33,974	8.642	0.650	6.227	9.664
Time Zone Difference	33,974	3.320	2.749	0	10
Goods	28,039	7.160	3.242	-5.809	13.564
Common language	33,974	0.309	0.462	0	1
Colonial relationship	33,974	0.277	0.447	0	1
Financial Development	33,974	0.074	1.731	-2.576	10.372
Exchange rate	29,371	3.050	2.772	-6.766	22.625
GATS	33,974	0.093	0.290	0	1
Initial export value	33,974	-4.371	3.258	-13.816	4.850
Lagged duration	33,974	0.496	2.007	0	23
Total export value	33,974	3.923	2.516	-8.286	7.690

Note: Only Financial Development, Time Zone Difference, lagged duration and dummies are not in natural logarithm.

Source: Author