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The role of aid for trade facilitation in Ghana's export diversification agenda

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Abstract

This study employs the novel dynamic Autoregressive Distributed Lag simulation alongside the traditional Autoregressive Distributed Lag model to investigate the extent to which aid for trade facilitation contributes to improvement in export diversification in a single case country using quarterly data from 2005 to 2020. The estimation results from the augmented Heckscher–Ohlin model adopted for the study indicate that aid for trade facilitation so far received by Ghana has been a significant resource for enhancing export diversification either measured as the number of exported commodities, number of trading partners or the Hirschman–Herfindahl Index (HHI). Based on these findings, the study concludes that Aid for Trade (AfT) facilitation is a potential policy option that the government of Ghana can employ to promote export diversification. Consequently, the study encourages the donor community and the Ghanaian government to allocate new and additional resources specifically aimed at reducing trade-related transaction costs since this could improve the diversification of exports in the country. Additionally, the study suggests that the Ghana Export Promotion Authority and the Ghana Free Zones Authority should provide targeted support in the areas of customs procedures, simplified documentation, and efficient logistics to industries with export potential. Facilitating trade procedures is recommended as a strategy to further diversify exports in the country.

Keywords: *Export diversification; Aid for Trade facilitation; Heckscher–Ohlin model; Dynamic Autoregressive Distributed Lag.*

1. Introduction

Since the mid-sixteenth century, when Adam Smith first emerged with his absolute advantage theory and David Ricardo built on it through his theory of comparative advantage, many economists have accepted the notion that cross-border trade is key to a nation's export competitiveness and overall economic development (Sharfuddin, 2005). Indeed, several shreds of evidence in the empirical literature have proven that no country has ever achieved economic success in terms of significant increases in growth and living conditions of people, without first being open to the rest of the world through free trade (Vijayasri, 2013).

For Ghana, even before gaining independence from British colonial rule in 1957, the economy was open to cross-border trade and operated a more liberal trade and payments system. However, following independence, the first president, Dr. Kwame Nkrumah, considered industrialization a key factor in the development process of the country and thus opted for massive government involvement and an import substitution strategy. Hence, a series of restrictive trade policies, including increases in tariffs and non-tariff measures, were implemented (Sakyi, Villaverde, & Maza,

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2015; Ghartey, 1987). For instance, in the 7-year development plan (1963-1970) implemented after independence, the tariff for luxury consumer products was projected to increase to reach about 128% by 1966, contrasting sharply with the relatively lower tariff rate of 16% for intermediate inputs used in production and an even lower tariff rate of 2% for capital goods essential for industrial production. Additionally, the government actively maintained an overvalued exchange rate by imposing restrictions on the availability of foreign currency. Also, the government incentivized investment in manufacturing through subsidies such as tax exemptions and accelerated depreciation. These restrictive trade policies, combined with the fixed exchange rate at the time, eroded the country's trade openness agenda and set the nation towards a more downward trade trend (Sakyi, Villaverde, & Maza, 2015). To correct the imbalances and restore the economy towards a more open and market-oriented strategy, the Ghanaian economy implemented some economic recovery and structural adjustment programs in the early 1980s with the help of the IMF and the World Bank. Among some of these interventions are the gradual removal of quantitative restrictions on both current and capital accounts and the lowering of the level and range of tariffs (Laryea & Senadza, 2017; Vijay, 2012) to facilitate free international trade. Again, the exchange rate, which was fixed, was transformed to its current floating regime, and a new non-traditional export was vigorously pursued to diversify the country's exports (Obeng, 2022). Thereafter, the country's trade with the rest of the world started improving, with trade as a percentage of Gross Domestic Product (GDP) jumping from 1 percent of GDP in 1983 to over 45 percent in 1986.

In 1992, when the country returned to a democratic regime, it continued with the trade liberalisation agenda and pursued an export-led industrialisation strategy aimed at improving the competitiveness and efficiency of the country(s) exports. In this regard, several measures were implemented in an attempt to establish strong trade-related transport infrastructures and a more transparent trade environment for the conduct of cross-border trade and also to help simplify customs procedures and reduce the cost associated with trade. Some of these interventions include the USAID-sponsored Trade and Investment Programme (TIP), the Private Enterprise Export Development (PEED) initiative sponsored by the World Bank, the Trade and Investment Reform Programme (TIRP), and the Trade and Investment Programme for a Competitive Export Economy (TIPCEE) programme. Also, the country signed the interim Economic Partnership Agreement (iEPA) with the EU and the African, Caribbean and Pacific (ACP) countries, the Economic Community of West African States (ECOWAS) and the West African Monetary Zone (WAMZ). Other interventions made to improve the efficiency of institutions offering trade-related services also include the establishment of the Customs, Excise and Preventive Service (CEPS), the Ghana Ports and Harbour Authority, the Ghana Investment Promotion Centre, the Ghana Immigration Service and the Ghana Free Zones Authority. Unfortunately, after the implementation of these interventions, it appears the quality of trade and export-related transport infrastructures did not improve as expected. For example, the share of the country's exports to the rest of the world rather reduced from 0.033% in 1994 to 0.027% in 2004. Again, the country(s) exports varieties of 194 products in 1999 reduced to 180 product varieties by early 2000s. In terms of overall export competitiveness, the Ghanaian economy became less competitive than several other economies in the continent. Statistics from the Global Competitiveness Report show that the country(s) value declined from 3.70 in 2012 to 3.30 in 2017. Ackah et al. (2014) cited the private sector's slow response to the reforms amid some institutional and structural constraints as the reasons for the decline in the county's competitiveness and trade.

It is with this understanding that the removal of trade barriers seems insufficient for allowing developing countries, like Ghana, to enhance their trade performance that led to the launching of the Aid for Trade (AfT) initiative by the World Trade Organisation (WTO) (Hellgren & Klingvall, 2020) in December 2005. The AfT consists of development assistance targeted at supporting developing countries in overcoming their domestic trade constraints and non-tariff barriers to trade and improving their ability to reap the benefits from increased global trade integration (OECD & WTO, 2019). Within the AfT are four distinct aid flows, ranging from aid flows that go to trade policy and administrative management, regional trade agreements, multilateral trade negotiations, and trade facilitation. In this study, the attention is on AfT facilitation since its sole aim is to help recipient countries facilitate their cross-border trade, thereby enabling them to diversify their export and improve their competitiveness (Hellgren & Klingvall, 2020). Statistics from the

OECD credit reporting system in 2022 indicate that between 1995 and 2020, official development assistance under the label AfT facilitation has been increasing persistently in Ghana, from 557 million USD in 1995 to about 1,371 million in 2020. Considering the magnitude of the AfT facilitation so far disbursed to the country, many researchers have raised the question of whether the AfT goal of reducing trade costs and increasing the export diversification of recipient countries has been achieved (Beverelli, Neumueller & Teh, 2015). Also, following the signing of the African Continental Free Trade Agreement (AfCFTA) in 2019 and with the secretariat situated in Ghana, the Ghanaian government is looking forward to improving on the various factors that could enhance the competitiveness of the nation's exports in the African and the world market. Therefore, a study on how the AfT facilitation Ghana has received so far has diversified the country's exports is important for policy formulation.

Unfortunately, very little is known in a country-specific case study. Empirical studies such as Nathoo et. al. (2021), Safaeimanesh and Jenkins (2020), Hellgren and Klingvall (2020), Kim (2019), Gnangnon (2018), Seck (2016), and Fujimitsu (2013) are related works that examined aid for AfT and export diversification within developing countries and sub-Saharan Africa (SSA) sub-region frame. Even for these studies, Nathoo et. al. (2021), Safaeimanesh & Jenkins (2020), Kim (2019), and Gnangnon (2018) used the Hirschman–Herfindahl Index (HHI) of export concentration as their main measure for export diversification. This HHI is an export concentration index that measures disparities in export shares across a country's export product lines. The closer the HHI value is closer to zero (0) the more diversified the export bundle, whereas a value close to one (1) indicates a significant dominance of a small number of products. The index does not, however, differentiate between an increase in export diversification that happens among existing product lines and those resulting from new export products as a result of access to new markets. In the case of a developing country like Ghana, this decomposition is important because the country's exports remain concentrated on unprocessed primary production. Secondly, these studies investigated the impact of aid for trade facilitation on export diversification using the aggregate aid for trade values with the exception of Nathoo et. al. (2021) and Hellgren and Klingvall (2020). Though this measure is good, it does not illuminate potentially the heterogeneous effects of the various types of aid for trade.

Against this background, this study filled the gap in the empirical literature by answering the following research questions with respect to Ghana: First, what role can the AfT facilitation play in Ghana's export diversification drive? Second, which of the export diversification margin is more useful when considering the effect of AfT facilitation on Ghana's export diversification, particularly along the lines of products and trading partners? The uniqueness of this study is that it provides a pioneering empirical estimate of the potential export diversification effect of trade facilitation for a single country case. Indeed, such estimates permit the determination of the potential trade diversification changes to better situate the expectations of a country with an inflow of resources for trade. Secondly, beyond providing the estimates, this study also unearths which of these interventions are good for the trade creation of the economy with respect to aid for trade facilitation, whether diversifying along products or along trading partners.

The rest of the study is presented as follows. Section 2 discusses theoretically how aid for trade and export diversification has been conceptualized in this study and how aid for trade facilitation affects export diversification. Section 3 presents an overview of Ghana's export diversification and trade facilitation while section 4 discusses the model specification, data sources and the econometric strategy that helps to perform the empirical analysis of the effect of aid for trade facilitation on export diversification. Section 5 presents and interprets the empirical results, and section 6 concludes and provides the policy implications.

2. Literature review

The international economics literature, by tradition, recognizes the fact that aid for trade facilitation plays an important role in the cost structure of cross-border trade leading to export diversification of any nation (Hellgren & Klingvall, 2020; Gnangnon 2018; Beverelli, Neumueller & Teh, 2015; Cadot et al., 2015; Orliac, 2014; Cortes, 2014; Cordero, 2014; Busset et al., 2012; Portugal-Perez and Wilson, 2012; Hoekstra, 2012; Malcolm and Karingi, 2011; Zaki, 2011; Dennis

& Shepherd, 2011; Djankov, Freund & Pham, 2010; Wilson, 2007). A conceptual review of these studies shows that the relationship between aid for trade facilitation and export diversification is analysed either from the micro or macro point of view or both (Hoekstra, 2012; Orliac, 2014) and hence the notion of aid for trade facilitation and export diversification does not benefit from a generally agreed definition as far as international trade is concerned.

For instance, regarding aid for trade facilitation, whereas OECD and the World Trade Organization (WTO) view it narrowly as any developing assistance allocated to a developing country with the objective of only improving international trade procedures, the United Nations and the World Bank interpret it as widely as including assistance towards customs, transport and transit issues, banking and insurance, information for trade, business practices, telecommunications, human resources development and legal issues (Orliac, 2014). For example, the WTO, in a training note on its website, defines aid for trade facilitation as any fund that goes into "the simplification and harmonization of international trade procedures allowing developing countries to expand their export volumes". The OECD definition presents aid for trade facilitation as the assistance that goes into "simplification and standardization of procedures and associated information flows required to move goods internationally from seller to the buyer and to pass payments in the other direction". The definition by United Nations Economic Commission for Europe (UNECE) is rather broad, and it defines trade facilitation as a “comprehensive and integrated approach to reducing the complexity and cost of the trade transactions process and ensuring that all these activities can take place in an efficient transparent and predictable manner based on internationally accepted norms, standards and best practices. A conceptual review of all the definitions provided by the above institutions underlines a set of “universal” points, such as the development assistance into simplification, standardization, and reduction of procedures. Therefore, for this study, aid for trade facilitation is defined in its narrowest sense as the measures introduced to reduce the costs associated with cross-border trade and this is in consonance with the definition provided by WTO in its training note.

Concerning export diversification, whereas Ali et al. (1991) and Dennis and Shepherd (2007) refer to it as the transformation in a country’s export basket from primary products to secondary or tertiary sectors through increased value addition, Herzer and Nowak-Lehnmann (2006) and Samen (2010) see it as increasing the number of primary commodities being exported by the country. In the works of Çeviker and Ta ş (2011) and Matthee and Naudé (2008), the first definition by Ali et al. (1991) and Dennis and Shepherd (2007) were classified as vertical export diversification and the later definition by Herzer and Nowak-Lehnmann, 2006; and Samen, 2010) as horizontal diversification. In this study, the degree to which a country’s exports are spread across a large number of products and/or trading partners will be used to describe export diversification. In order to formalize the relationship between export diversification and AfT facilitation, it is necessary to clarify the theoretical distinction between the intensive and extensive margin effects of diversification. From Hellgren and Klingvall (2020) study, diversification along the extensive margin is where diversification occurs as a result of new product types being exported that were not previously part of the country’s export bundle, and intensive margin diversification is where diversification occurs as a result of a change in the export share of existing products.

Although trade facilitation and export diversification have been conceptualized differently by various authors, there is some level of consensus in both the theoretical and empirical literature about the relationship between them either at the micro level or the macro level. Regarding the theoretical relationship between trade facilitation and export diversification, the classical trade theory and the factor proportions trade theory both confirm that gains from trade are rooted in production efficiency achieved through realizing comparative advantage (Feenstra, 2003). Both the classic theory (Absolute and Comparative Advantage Theories), based on technology differences, and the factor proportions theory (the Factor Endowments and the Heckscher–Ohlin (H–O) theories), relying on endowment differences, predict that international trade allows countries to concentrate more on what they can produce at lower cost—therefore, under free trade, they will be able to produce and export more commodities and hence, gain from trade. One essential implication of these theories is that enhancing trade through trade facilitation improves diversification internationally through production concentration and greater efficiency, and therefore, reducing trade costs can potentially help developing economies diversify their export (increase the number

of commodities or markets they export to) and gain enormously from trade.

The new trade theory, pioneered by Paul R. Krugman, expands the category of gains from trade to include efficiency realized through scale economies, product differentiation, and imperfect competition. Unlike the classical and factor proportions theories, this theory focuses on the dynamic effects of international trade and introduces the idea that firms and industries may benefit from producing a large quantity of output due to economies of scale and international trade exposes firms to international competition, leading to efficiency through specialization. According to Helpman and Krugman (1985), whereas the classical and factor proportions theories tend to focus on inter-industry trade, the new trade theory generally explains intra-industry trade. Overall, trade facilitation measures, such as streamlined customs procedures, reduced paperwork, and efficient logistics, are believed to significantly lower transaction costs for firms engaged in international trade, and this may induce firms to become more exporters while stimulating the growth of existing exporters.

Empirically, studies (such as Kuru, 2023; Sawadogo et al., 2023; Gnangnon, 2022; Vellem & Espoir, 2021; Masunda, 2020; Hellgren & Klingvall, 2020; Gnangnon, 2018; Beverelli, Neumueller & Teh, 2015; Orliac, 2014; Cortes, 2014; Cordero, 2014; Busset et al., 2012; Portugal-Perez & Wilson, 2012; Hoekstra, 2012; Malcolm & Karingi, 2011; Zaki, 2011; Dennis & Shepherd, 2011) anticipate a positive effect of trade facilitation measures on export diversification. In these studies, Kuru (2023), for instance, uses panel data to analyse a sample of 92 Least Developed Countries (LDCs) over the period 2007-2017 and finds that trade facilitation measures have a positive impact on product variety and markets in developing countries. The analysis is performed using aggregate trade facilitation measures and not trade facilitation separated by category. Hellgren and Klingvall (2020) also investigated whether aid for trade facilitation could be a key driver for increased export diversification in 131 aid-for-trade recipient countries using panel data sets and the Generalized Method of Moments (GMM) estimation method for the period 2002-2017. The authors developed a simple theoretical framework that disentangles the effect of total aid on export diversification from trade facilitation measures. The results supported the hypothesis that aid for trade facilitation increases the range of exported product types from recipient countries. Specifically, the study concluded that a 10% increase in AfT facilitation would, on average, increase the number of exported product categories from the recipient country by 0.168%. In absolute terms, this would equal one more product category per extra 9000 USD of AfT facilitation at mean values.

Kim (2019) also uses a similar theoretical framework with panel data sets and GMM estimation method, and his result showed a positive and statistically significant impact of AfT facilitation on export diversification. Beverelli, Neumueller and Teh (2015), in a related study, also estimated the effects of trade facilitation on export diversification as measured by two extensive margins: the number of products exported by a country and the number of export destinations where products are exported to. The study found a positive impact of trade facilitation on the extensive margins of trade and the result was also robust to trade facilitation estimations in SSA, Latin America and the Caribbean sections of the study. Dennis and Shepherd (2011) also showed that improving trade facilitation helps promote export diversification by making it easier for countries to export new products, particularly those not currently exported by the countries involved.

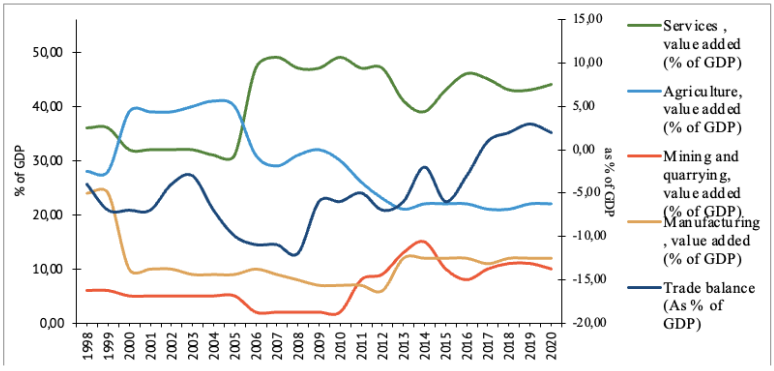
From this review, it is clear that aid for trade facilitation has an overwhelmingly positive effect on export diversification. However, the studies that have established this effect have primarily employed conventional panel econometric methods. Unfortunately, very little is known in a country-specific case study. Therefore, this study employed a modern econometric method to investigate the effect of aid for trade facilitation on export diversification in a country-specific case.

3. Overview of Ghana's export diversification and trade facilitation.

Since its independence in 1957, the Ghanaian economy has remained focused on promoting economic prosperity for its citizens despite the challenges. The economy is currently considered the tenth largest in Africa, surpassing Tunisia and Côte d'Ivoire's economy after the rebasing of the GDP in 2017. According to the African Development Bank Socio-Economic Database, the country's GDP at current US Dollars stands at $76.3 billion in 2021. In line with the expansion of the economy, the structural composition of the economy has also changed significantly over the

years as shown in Figure 1. According to the data, the contribution of the agriculture sector and the manufacturing sector has fallen over the years, while those of the service sector, mining and quarrying sector as well as have experienced some upward trend.

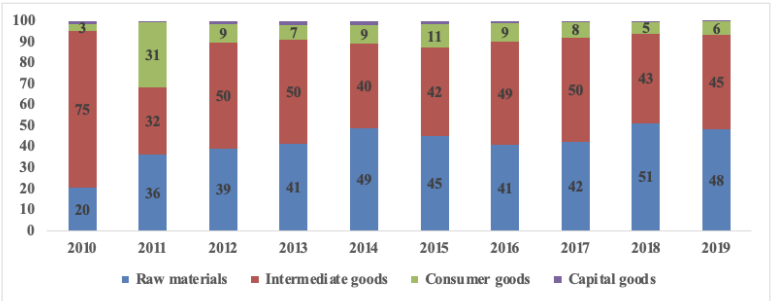
Figure 1. Sectoral Share of the Ghanaian Economy



Source: Author compilation with data from World Bank WDI database, 2022

The diversification of the Ghanaian economy from over-reliance on agriculture and other primary and extractive commodities is a stated goal of the African Agenda 2063, as it seeks to reverse the resource curse and "Dutch disease" syndromes and develop other critical sectors of the economy in order to promote balanced and sustainable development (Amoako-Tuffour et al., 2016). Unfortunately, the export structure of the economy is dominated by raw materials and intermediate goods. According to data from the World Bank's World Integrated Trade Solution (WITS) database, between 2010 to 2019, exports of the Ghanaian economy were dominated by the following commodity order: raw materials, intermediate goods, consumer goods, and capital goods. This is shown in Figure 2. Efforts to diversify the export base of the economy from primary commodities are gathering steam, and the contributions of the non-oil sector to exports are expected to increase with the establishment of the AfCFTA.

Figure 2. Export structure of the Ghanian economy

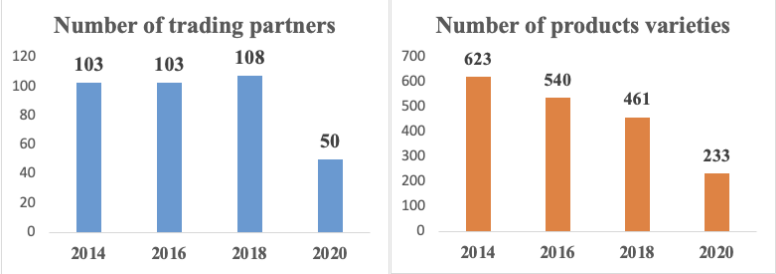


Source: Author's computation using data from World Bank WITS database, 2022

The number of the country's export partners and products, which is a measure of export diversification, has also declined significantly in recent years. In 2014, Ghana had 103 trading partners, but this has been reduced to 50 partners by 2020. Similarly, the country's export varieties of 623 products in 2014 were also reduced to only 233 products by 2020. The declining trend of export products and partners signals the concentration of Ghana's export products and trading partners, which could undermine economic development in the long term.

In SSA, poor trade-related transport infrastructure and services such as customs procedures and port efficiency are the biggest challenges in the export diversification drive and growth of intra-

Figure 3. Number of Ghana's exported product varieties and trading partners



Source: Author's computation using data from World Bank WITS database, 2022

regional trade enshrined in the African Agenda 2063. Indeed, empirical evidence in the literature indicates that improving trade-related infrastructure in the SSA can increase trade by over US$250 billion over the next 15 years (Deen-Swarray et al., 2014; Akpan, 2014). Unfortunately for Ghana, in the Global Competitiveness Report in 2017, the value of 2.3, representing the overall quality of infrastructure, can be poor compared with the value of 3.5, 4.0 and 4.5 values for Kenya, South Africa and Egypt, respectively.

In the area of trade logistics, the performance of Ghana can also be considered poor since the World Bank's Logistics Performance Index (LPI) (World Bank 2018) shows that Ghana ranks 106 among 167 countries, with an average logistics performance index score of 2.57 out of 5.0. With the figure of 2.57 means that Ghana is lower compared with Cote d'Ivoire (3.08), Rwanda (3.02), Benin (2.75) and Burkina Faso (2.62). In terms of customs and border efficiency and administration, Ghana's performance is also low, implying inefficiency at borders and increased difficulties in importing and exporting goods. According to the LPI, the performance of Ghana's customs services and procedures is rated at 2.45 out of 5.0. The total time to comply with export documentation and border procedures totalled 266 hours and cost US$1036 compared to 139 hours and US$293 for Rwanda and 168 hours and US$598 for South Africa. This places additional time and financial costs on Ghanaian exporters, especially exporters of time-sensitive or perishable items.

Table 1. Quality of different infrastructure

	Ghana	Kenya	Rwanda	Nigeria	South Africa	Egypt
Quality of overall infrastructure	2.3	4.3	4.6	2.3	4.2	3.4
Quality of trade- and transport-related infrastructure	2.4	2.6	2.8	2.6	3.2	2.8
Logistics performance index	2.6	2.8	3.0	2.5	3.4	2.8
Efficiency of the clearance process	2.5	2.7	2.7	2.0	3.2	2.6
Ability to track and trace consignments,	2.6	3.1	2.8	2.7	3.4	2.7
Time to export: Border compliance	108.0	15.5	83.3	135.4	92	48
Time to export: Documentary compliance	89.3	19	30	119.0	68	88
Cost to export: Documentary compliance US$	490	142.5	183.3	785.7	1257	258
Cost to export: Border compliance US$	155	190.5	110	250.0	55	100

Source: Global Competitiveness Report in 2017 and World Bank's Logistics Performance Index (LPI) (World Bank 2018)

4. Model specification and econometric approach

4.1. Model specification and data sources

A quarterly series of data covering the period 2005 to 2020 was used for the analysis. This timeframe was chosen particularly due to data availability. The AfT facilitation data starts from 2005. To help prevent any estimation challenges that might emanate because of unevenly spaced datasets, the missing data on the aid for AfT facilitation were filled using the linear method of

data interpolation. The theoretical basis for examining the impact of aid for trade facilitation on export diversification can be gleaned from the Factor Endowments and the Heckscher-Ohlin (H − O) model. The model predicts that when countries concentrate on the commodities whose production requires intensive use of their cheap factors, then under free trade, they will be able to produce and export more commodities and, hence, gain from trade. Given the above preposition, if countries could specialize in the production of their primary commodities, then trade which is effectively facilitated will serve as one of the instrumental pathways for them to diversify their export (increase the number of commodities or markets they export to) and gain enormously from trade. Based on these theoretical considerations and empirical evidence from studies such as Hellgren and Klingvall (2020), Kim (2019), Gnangnon (2018) and Bexerelli et al. (2015), this study specifies the empirical model, which relates export diversification to aid for trade facilitation and other explanatory variables in the Ghanaian economy as.

$$ED_t = \varphi + \delta ED_{t-1} + \alpha AfTF_t + \beta Z_t + \varpi_t \tag{1}$$

Where the dependent variable (ED_t) is a measure of export diversification at time $t; AfTF_t$ represents aid for trade facilitation disbursement at time $t; Z_t$ is a set of (exogenous) control variables, and ϖ_t is the idiosyncratic disturbance term. The terms φ, δ, α and β, are parameters to be estimated. The first lag of the dependent variable (i.e., ED_{t-1}) is included to capture the initial levels of export diversification as well as their persistence over time.

The dependent variable, export diversification, is measured in this study using three different indicators drawn from the literature (e.g., Hellgren & Klingvall, 2020; Kim, 2019; Gnangnon, 2018; Beverelli et al., 2015; Agosin et al., 2012; Cadot et al., 2011). The first indicator is the number of exported products denoted by "NOP". This measure has been used in several studies, including Hellgren & Klingvall (2020), Kim (2019), Gnangnon (2018), Dennis & Shepherd (2011), and for this study, the exported products are classified based on the Harmonized System 6-digit commodity classification (HS6) index. The database from which the data for this variable is drawn is the World Integrated Trade Solution (WITS) database.

The second indicator used in this study to measure export diversification is the number of trading partners denoted by "NOM". In the literature, this measure has also been used in a number of studies, including Kim (2019), Gnangnon (2018), Dennis and Shepherd (2011), and the number of trading partners used is usually classified based on the Harmonized System 6-digit commodity classification (HS6) index. The third and final indicator used is the Hirschman–Herfindahl index of export concentration (also sometimes referred to as the Herfindahl index), which is the most used indicator for measuring export diversification. The HHI index measures export diversification by summing the squared share of export volume for all registered products, and the values are normalized around 0 to 1. A value close to 1 indicates a strong domination of a few numbers of products, while a value close to 0 implies a more diversified export bundle. However, the introduction of new export product categories or a more equitable distribution of existing exported items may cause a negative change in the HHI. The data on this variable is collected from the UNCTADstat database and it is calculated using export products three-digit group level based on the Standard International Trade Classification (SITC) Revision 3.

The Official Development Assistance (ODA) provided by multilateral agencies and bilateral donors to support trade facilitation programs in Ghana served as the key independent variable. The data is extracted from the OECD Creditor Reporting System (CRS), in which all member donors in the Development Assistance Committee (DAC) report their aid activities at the project level, and the database is considered the most prominent and prevalent aid activity database (Busse, Hoekstra Koniger, 2012). The aid for trade facilitation is the aid that goes into the simplification and harmonization of trade procedures and tariff reforms. Following, for example, Hellgren and Klingvall (2020); Kim (2019) and Wang and Xu (2018), the AfT facilitation variable used in this study is measured in absolute amounts (i.e., expressed in current US Dollars) and the data ranges from 2005 to 2020.

Based on the literature on the determinants of export diversification in the SSA region, this study includes a few control variables as follows GDP per capita, population size, foreign direct

investment, political stability, institutional quality and trade openness. GDP per capita has been introduced in the model as a control variable to capture the degree of economic development in the country. Imbs and Wacziarg (2003) find that as countries' per capita income increases, their production structure tends to become more diversified. Thus, for the purpose of this study, it is assumed that the export structure of Ghana tends to diversify during the country's development stage and that income has a linear positive relation to export diversification. The population size variable is also included in this study to complement the real per capita income in capturing the size of the country. The population size variable is captured in this study as a proxy for the market demand. The empirical literature on the determinants of export diversification has usually posited that bigger countries (reflected in their population size) enjoy a larger share of export diversification than small nations (e.g., Hellgren Klingvall (2020), Kim (2019), Goswami et al., 2012). In addition, Trade openness has also been found to play a significant role in the export diversification of many nations in the empirical literature. For example, Parteka and Tamberi (2013) reveal that free trade has a positive relationship with export diversification, suggesting that the freer the market, the more diversified the exports.

It is widely accepted that countries with high institutional and governance quality create more favourable environments for trade and other economic activity to take place. For example, Liu and Tang (2018) use various components of Worldwide Governance Indicators (WGI) and find that a higher quality of institutional factors and a stable political system have a positive effect on African trade with the rest of the world. In Kim's (2019) and Hellgren and Klingvall (2020) studies, they found that better institutional quality lowers the cost and time of trading and hence impacts positively on the number of exported products. In this study, institutional and governance quality is measured using regulatory quality and political stability and absence of violence/terrorism in the Worldwide Governance Indicators (WGI) and their effect is expected to be positive.

Based on these discussions, the empirical model formulated for the estimation of the effect of AfT on export diversification is given as.

$$In(ED)_t = \varphi + \delta \ln(ED_{t-1}) + \alpha \ln(AfTF_t) + \beta_1 \ln(GDP_t) + \beta_2 \ln(POP_t)$$

$$+\beta_3 \ln(FDI_t) + \beta_4 POL + \beta_5 INQ + \beta_6 TO + \varpi_t \quad (2)$$

Where GDP is the annual GDP per capita, POP is population size, FDI represents foreign direct investment, POL is the level of political stability, INQ is the level of institutional quality, TO is trade openness and ln is the natural log operator. All other variables are the same as defined before. The natural logs of the number of products and number of markets as measures of export diversification, AfT facilitation, annual GDP per capita, population size and foreign direct investment are used in this study instead of the raw scores to induce some form of covariance stationarity and linearity among them and reduce the problem of multicollinearity (Chandio et al., 2020). In the case of the HHI as a measure of export diversification, political stability, level of institutional quality and freedom to trade, the natural log is not taken since they are already an index. Additional information on the series is outlined in Table 2.

5. Estimation Strategy

The effect of aid for trade facilitation on export diversification is captured by the coefficients which is the primary coefficient of interest. The goal of this study is to obtain a more reliable and unbiased estimate of the coefficient , however, this is sometimes very difficult due to the potential concerns for endogeneity and stationarity. Such concerns may arise from the potential feedback effects of the export diversification measures to trade facilitation. For instance, AfT facilitation helps recipient countries attract more international trading partners by improving recipient countries' infrastructure and other trade-related capacities. Furthermore, countries with stronger trade performance tend to receive more AfT. Hence, the AfT variable will be treated as an endogenous variable. In addition, aid for trade facilitation always seems to correlate with other unobserved variables captured in the error term. These concerns of aid for trade facilitation as shown in the works of Hellgren and Klingvall (2020), Gnangnon (2018), and Kim (2019), and this potential endogeneity also threatens the identification of the effects of aid for trade facilitation on export diversification.

Table 2. Data description and measurements

Variable	Measurement	Source
Dependent variables		
Number of exported products (NOP)	Total number of products exported by Ghana.	WITS
Number of trading partners (NOM)	Total number of trading partners or countries Ghana trades with.	WITS
Hirschman–Herfindahl Index (HHI)	The HHI index measures the export diversification by summing the squared share of export volume for all registered products and the values are normalized around 0 to 1. A value close to 1 indicates a strong domination of a few numbers of products, while a value close to 0 implies a more diversified export bundle.	UNCTADstat
Independent variable		
AfT facilitation (AfTf)	This is the total amount of aid provided by multilateral agencies and bilateral donors to support trade facilitation programmes in Ghana. This is expressed in millions of US Dollars)	OECD/CRS
Control Variables		
GDP per capita (GDP)	GDP per capita expressed in current USD	WDI
Population size (POP)	The total count of all residents in the country	WDI
Foreign direct investment (FDI) in current USD	The net inflow of foreign direct investment expressed WDI	WDI
Political stability (POL)	The political stability variable measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism	WGI
Institutional quality (INQ)	This variable captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	WGI
Trade openness (TO)	Trade freedom is a composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services.	The Heritage Foundation's Index of freedom of trade

Note: *WDI is World Bank World Development Indicators; WITS is World Integrated Trade Solution, UNCTADstat is the United Nations Conferences on Trade and Development; OECD/CRS is the OECD Creditor Reporting System (CRS) and WDI is the World Governance Indicators Source: Authors' computation*

Another important concern regarding the estimation of equation (2) is the presence of the lagged dependent variable among the regressors on the right-hand side. As Nickell (1981) and Anderson and Hsiao (1982) pointed out, in dynamic models with small sample sizes, the first-order autoregressive term may also be correlated with unobserved country-specific variables absorbed in the error term. This may also render the ordinary least squares and within-group estimates of to be biased and inconsistent. Therefore, to address these issues, a more robust dynamic estimator capable of handling small sample size cases, endogeneity between AfT and export diversification as well as endogeneity between the lag value of export diversification and the error term as well as multicollinearity among the regressors needs to be adopted.

In this study, the novel dynamic Autoregressive Distributed Lag (ARDL) simulation approach proposed by Jordan and Philips (2018) is employed. This estimation approach, just like the traditional ARDL approach, is a dynamic process that tends to produce more robust results for small sample sizes (such as in this study) than any other co-integrating estimation techniques (Pesaran & Shin, 1999) and addresses the issue of endogeneity, multicollinearity, and concerns about the number of endogenous and exogenous variables (if any) to be included in the models. One of the main advantages of the dynamic ARDL simulation procedure over the traditional ARDL framework is its ability to better interpret the significance of short-term and long-term effects of ARDL models, which becomes difficult as the lag structure gets more complex. The unique function of the procedure is to simulate and automatically visualise the impact of a counterfactual change in one weakly exogenous regressor at a single point in time using stochastic simulation techniques while holding all else equal (Khan et al., 2020).

The estimation procedure is very simple but technical. The first procedure requires a strict first-difference stationary, I (1) dependent variable (Sarkodie & Owusu, 2020; Jordan & Philips, 2018). That is, the dependent variable should be non-stationary at level I (0) however, it must be stationary at first difference. Also, all sampled independent variables need to be either I (0)

or integrated of order one, I (1), but cannot be greater than I (1). Secondly, a test for long-run cointegrating relationships among the variables needs to be done using the Autoregressive Distributed Lag (ARDL) approach to cointegration otherwise known as the bounds testing approach to cointegration. The cointegration must be done after the optimal lag for all the variables must have been selected. Given that there is a cointegrating relationship among the variables, the third procedure requires the estimation of the long-run coefficients and the short-run dynamics among the variables using the dynamic ARDL and the ARDL estimation techniques. Thereafter, the stability and diagnostic test statistics of the simulations are examined to ensure the reliability and the goodness of fit of the estimated models. The final procedure requires the estimation of the novel dynamic ARDL simulations.

In this study, to test this conditional requirement, first, the asymptotic behaviour and the stationarity properties of all the variables were examined using the Phillips–Perron (PP) test, the Augmented Dickey–Fuller (ADF) test, and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) techniques test. Also, the optimal lag for the model was selected using the Schwarz Information Criterion (SBC) and the Akaike Information Criterion (AIC). In estimating the cointegration among the variables, the bootstrap ARDL-bounds testing proposed by McNown et al. (2018) is employed. This approach is adopted due to the number of advantages it has over the traditional ARDL framework of Pesaran et al. (2001). For instance, the approach addresses the issue of weak size and power properties that characterise the traditional ARDL bounds-testing. Based on the Monte Carlo simulations, McNown et al. (2018) demonstrated that the inclusion of an additional test on the lagged level(s) of the independent variable(s) to complement the existing F- and t-tests presented in the traditional ARDL bounds-testing framework makes the bootstrap ARDL bounds-testing approach more superior to the conventional ARDL. Secondly, the bootstrap ARDL method is also preferred to the traditional ARDL co-integration approach due to its ability to eliminate the issue of inconclusive inferences which may arise when using the traditional ARDL procedure (Goh et al., 2017; McNown et al., 2018).

In this study, to perform the bootstrap ARDL bounds-testing, an unrestricted error correction model for equation 2 is specified as follows:

$$\begin{aligned}\Delta In(ED)_t = \varphi + \textstyle\sum_{i=1}^{p} \delta \Delta \ln(ED_{t-1}) + \sum_{i=1}^{n_1} \alpha \Delta \ln(AfTF_{t-1}) + \sum_{i=1}^{n_2} \beta_1 \Delta \ln(GDP_{t-1}) \\ + \textstyle\sum_{i=1}^{n_3} \beta_2 \Delta \ln(POP_{t-1}) + \sum_{i=1}^{n_4} \beta_3 \Delta \ln(FDI_{t-1}) + \sum_{i=1}^{n_5} \beta_4 \Delta POL_{t-1} \\ + \textstyle\sum_{i=1}^{n_6} \beta_5 \Delta INQ_{t-1} + \sum_{i=1}^{n_7} \beta_6 \Delta TO_{t-1} + \eta_1 \ln(ED_{t-1}) + \eta_2 \ln(AfTF_t) \\ + \eta_3 \ln(GDP_t) + \eta_4 \ln(POP_{t-1}) + \eta_5 \ln(FDI_{t-1}) + \eta_6 POL_{t-1} + \eta_7 INQ_{t-1} \\ + \eta_8 TO_{t-1} + \gamma_t \end{aligned} \tag{3}$$

Where Δ represents the difference operator; φ is the constant term; δ and β are the coefficients of the lagged dependent variables and the regressors; η is the vector of coefficients of the lagged levels of dependent and independent variables; $t = 1 \ldots T$ denotes time; $^{\gamma}$ is the stochastic error term with zero mean and constant variance. The test begins by estimating equation (3) with the bounds test by applying the Monte Carlo simulations which is usually the first procedure in the bootstrap ARDL bounds-testing. The F-test and the t-test are used to test for the presence of longrun relationships among the variables in equations (3). McNown et al. (2018) noted that there are three ways that the null hypotheses of no long-run relationship among the variables in equations (3) can be rejected.

First, the overall F-test based on all lagged-level variables (F1). Ho: $\eta_1 = \eta_2, = \eta_3 = \eta_4 = \eta_5 = \eta_6 = \eta_7 = 0$ and the alternative is stated as: Ha: $\eta_1 \neq \eta_2 \neq \eta_3 \neq \eta_4 \neq \eta_5 \neq \eta_6 \neq \eta_7 \neq 0$. Second, t-test on the lagged level of the dependent variable (t) $H_0 : \eta_1 = 0$ and the alternative is

stated as: Ha: $\eta_1 \neq 0$ Third, F-test on the lagged levels of the independent variable(s) (F1) H_0 : $\eta_1, = \eta_2, = \eta_3 = \eta_4 = \eta_5 = \eta_6 = \eta_7 = 0$ and the alternative is stated as: Ha: $\eta_1 \neq \eta_2 \neq \eta_3 \neq \eta_4 \neq \eta_5 \neq \eta_6 \neq \eta_7 \neq 0$.

If all three null hypotheses are rejected (i.e., if the three statistics exceed their respective critical values at the specific level of significance), it is concluded that co-integration exists.

Given that there is a long-term co-integrating relationship between the variables, the long run and error correction estimates of the ARDL model are obtained as:

$$\begin{aligned}\text{In(ED)}_t = \theta + \textstyle\sum_{i=1}^{p} \varphi_1 \ln(ED_{t-1}) + \sum_{i=1}^{n_1} \varphi_2 \ln(AfTF_{t-1}) + \sum_{i=1}^{n_2} \varphi_3 \ln(GDP_{t-1}) \\ + \textstyle\sum_{i=1}^{n_3} \varphi_4 \ln(POP_t) + \sum_{i=1}^{n_4} \varphi_5 \ln(FDI_{t-1}) + \sum_{i=1}^{n_5} \varphi_6 POL_{t-1} \\ + \textstyle\sum_{i=1}^{n_6} \varphi_7 INQ_{t-1} + \sum_{i=1}^{n_7} \varphi_8 TO_{t-1} + \gamma_t \end{aligned} \quad (4)$$

φ denotes the long-run variance of variables in Equation (4). In choosing the correct lags, the paper uses the SBIC and the AIC. For the short-run ARDL model, the error-correction model used is as follows:

$$\begin{aligned}\Delta In(ED)_t = \varphi + \textstyle\sum_{i=1}^{p} \delta_1 \Delta \ln(ED_{t-1}) + \sum_{i=1}^{n_1} \delta_2 \Delta \ln(AfTF_{t-1}) + \sum_{i=1}^{n_2} \delta_3 \Delta \ln(GDP_{t-1}) \\ + \textstyle\sum_{i=1}^{n_3} \delta_4 \ln(POP_t) + \sum_{i=1}^{n_4} \delta_5 \Delta \ln(FDI_{t-1}) + \sum_{i=1}^{n_5} \delta_6 \Delta POL_{t-1} \\ + \textstyle\sum_{i=1}^{n_6} \delta_7 \Delta INQ_{t-1} + \sum_{i=1}^{n_7} \delta_8 \Delta TO_{t-1} + \omega_1 ECT_{t-1} + \gamma_t \end{aligned} \quad (5)$$

In Equation (5), δ represents the short-run variability of the variables, while ECT stands for the error-correction term, which describes the disequilibrium's rate of adjustment. The range of the calculated ECT coefficient is from -1 to 0 . The coefficient of the lagged error correction term γ is expected to be negative and statistically significant to further confirm the existence of a cointegrating relationship among the variables in the model.

At this stage of the estimation procedure, several diagnostic test statistics are done on the selected model to ensure the reliability and goodness of fit of the model. The Ramsey RESET test is used to make sure that the model is correctly stated, and the Jarque-Bera test is used to determine if the estimated residuals are normally distributed. The Breusch-Pagan-Godfrey test and the ARCH test are both used to test for heteroscedasticity in the error term and the Breusch-Godfrey serial correlation LM test is used to check for the presence of serial correlation. The test for parameter stability can also be performed at this stage by plotting the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) to know whether the coefficients of the estimated model are stable over the study period.

The novel dynamic ARDL simulations model is employed in this study to ascertain the impact on export diversification following a counterfactual change (or shock) in aid for trade facilitation for a period of 5 years (i.e., from 2020 to 2025). The model for such estimation is given in equation (6) as follows:

$$\begin{aligned}In(ED)_t = \alpha_0 + \eta_1 \ln(ED_{t-1}) + v_1 \Delta \ln(AfTF_t) + \eta_1 \ln(AfTF_{t-1}) + v_2 \Delta \ln(GDP_t) + \eta_2 \ln(GDP_{t-1}) \\ + \text{v}_3 \Delta \ln(POP_t) + \eta_3 \ln(POP_{t-1}) + v_4 \Delta \ln(FDI_t) + \eta_4 \ln(FDI_{t-1}) + v_5 \Delta POL_t \\ + \eta_5 POL_{t-1} + v_6 \Delta INQ_t + \eta_6 INQ_{t-1} + v_7 \Delta TO_t + \eta_7 TO_{t-1} + \delta ECT_{t-1} + \varepsilon_t \end{aligned} \quad (6)$$

It was essential to examine the validity and the reliability of the model results; therefore, following Khan et al. (2020), the Breusch-Godfrey LM test was used to test for serial correlation

in the residual terms, while the ARCH and the Breusch-Pagan-Godfrey tests were adopted to test for heteroscedasticity in the error terms. Also, the accuracy of the model was assessed using the Ramsey RESET test.

6. Results and discussion

6.1. Descriptive Statistics

Table 3. Results of Zivot-Andrews unit root test

Variable	Obs.	Mean	Std. dev.	Max	Min
Dependent variables					
Number of exported products (NOP)	64	422	101.875	623	233
Number of trading partners (NOM)	64	96.375	13.413	108	50
Hirschman–Herfindahl Index (HHI)	64	0.429	0.036	0.488	0.349
Independent variable					
AfT facilitation (AfTf) (In millions of USD)	64	0.433	0.960	4.051	0.008
Control Variables					
GDP per capita (GDP) ((In thousands of USD)	64	1.636	0.557	2.361	0.493
Population size (POP) (In Millions)	64	26.350	2.869	31.073	21.815
Foreign direct investment (FDI) (In millions of USD)	64	2,599.30	1,044.73	3,879.83	144.97
Political stability (POL)	64	0.035	0.049	0.101	-0.089
Institutional quality (INQ)	64	-0.150	0.112	0.085	-0.312
Trade openness (TO)	64	63.706	2.724	67.800	55.400

Source: Authors' computation

The mean value of the number of exported products indicates that Ghana has an average number of 422 products exported each year within the period under investigation. The maximum number of products Ghana has exported within the period under investigation is 623. For the number of trading partners, the result indicates that Ghana has exported to an average number of 96 countries within the study period. Among these years, the highest number is 108 countries, while the lowest record shows 50 countries. The Hirschman–Herfindahl Index (HHI) also show an average of 0.429. This figure shows that, on average, Ghana's export is not dominated by a few commodities. The statistics for aid for trade facilitation, which is the main independent variable also show $0.433 million as the average amount of aid Ghana has received to facilitate trade over the study period. A high standard deviation of 0.96 reflects a wide disparity in the amount of aid for trade facilitation received during the study period.

Regarding the control variables for the study, statistics from Table 3 indicate that the mean for GDP per capita, population size, foreign direct investment, political stability and trade openness also have a positive mean, except for institutional quality, whose mean is negative.

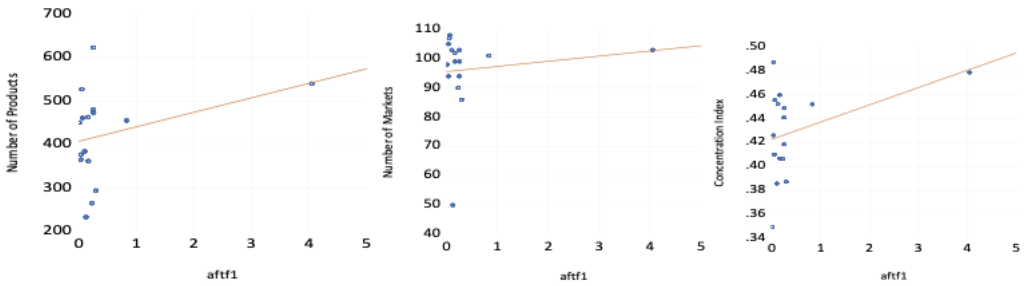
6.2. Relationship between Export Diversification and Aid for Trade Facilitation

The results of the correlation analysis for aid for trade facilitation and all the indices for export diversification are presented in Figure 4. Data used for aid for trade facilitation has been logged. From the graphs, it is evident that there is an apparent positive relationship between aid for trade facilitation and the number of products as well as the number of trading partners. Regarding the cross-correlation between the Hirschman–Herfindahl index (HHI) and aid for trade facilitation within the period under investigation, it is evident that the relationship is also positive. This result confirms that export diversification and aid for trade facilitation may have a favourable cross relationship.

6.3. Unit Root and Co-integration Test Results

As indicated in Section 4.2, before estimating the relationship between the aid for trade facilitation and export diversification in Equation 2, the stationarity test for all the variables was first

Figure 4. Cross-plot of export diversification indicators and aid for trade facilitation



Source: Authors' computation

conducted to ascertain the unit root properties of the series. The test was performed using the ADF, PP, and KPSS unit root tests and the results are presented in Appendix 1. As shown in the results, whereas the number of products, number of markets, HHT, aid for trade facilitation, trade openness, government effectiveness and population size are integrated of order 1 (confirming no unit root only after first difference), the test confirms that GDP per capita and foreign direct investment are stationary at level. These results mean that none of the variables used in this study is I (2). However, they are made up of I (0) and I (1) series, which is consistent with the assumptions under the bootstrap ARDL bounds test.

Table 4 reports the findings for the test of long-run co-integrating relationship between the export diversification indicators (number of products, number of markets and HHT) and the independent variables such as aid for trade facilitation, GDP per capita, population size, foreign direct investment, political stability, and trade openness using the bootstrap ARDL bounds testing. From the results, the calculated values of the F and T statistic were statistically significant and higher than the upper bounds values generated through the bootstrap procedure at all the significance p values. This means there is enough evidence to suggest a long-run relationship between the aid for trade facilitation and export diversification variables. Thus, the variables have a common trend that moves them into an equilibrium relationship in the long term.

Table 4. Result of long-run cointegration test

Model	Lag length	Stats	Values	Bootstrap-generated CVs 1%	5%	10%
First Objective						
LNNOP = f (InAFTF, LNGDP, InPOP, InFDI, POL, INQ, TO)	1, 1, 0, 0,	F	13.397***	5.339	4.206	3.685
	0, 0, 0, 0	T	-9.053***	-5.49	-4.85	-4.53
LNNOM = f (InAFTF, LNGDP, InPOP, InFDI, POL, INQ, TO)	1, 1, 0, 0,	F	14.303***	5.339	4.206	3.685
	0, 0, 0, 0	T	-9.019***	-5.49	-4.85	-4.53
HH1 = f (InAFTF, LNGDP, InPOP, InFDI, POL, INQ, TO)	1,1,1,0,0,	F	11.549***	5.339	4.206	3.685
	0,1,0,1	T	-8.781***	-5.49	-4.85	-4.53

Note. Asterisk (***) denotes significance at the 5% level based on critical values generated from the bootstrap procedure (with 5000 replications) of McNown et al. (2018). Source: Authors' computation

6.4. ARDL and Dynamic Simulated ARDL Results

To ensure the robustness of the regression results, this study estimates the short-run and long-run relationship expressed in equation with the ARDL approach of Pesaran et al. (2001) at the first instance and secondly with the dynamic ARDL model simulations as proposed by Jordan and Philips (2018) as indicated in equations 4, 5 and 6. This is done to ensure the results of the study will remain resolute even when the estimator changes. The estimated results are presented in Table 5. In the result, SEPC I present the findings for the long- and short-run relationship using the ARDL and the dynamic ARDL model with a number of products (NOP) as the dependent

variable. SPEC II also presents results with similar specifications using the number of trading partners (NOM) as the measure of export diversification, while SPEC III presents the result with HHI as the measure of export diversification. It is, however, important to indicate that results for the dynamic ARDL simulation are obtained using 1000 simulations from a multivariate normal distribution point of view. In SPEC I, II and III, the result in Table 5 finds that the coefficient associated with the 1-year lag of the dependent variable is positive and statistically significant at the 1% level of significance for both ARDL and DYNARDL models. This suggests that the previous year's degree of diversification influences positively the current year's level of export diversification. These findings suggest that export diversification as a dependent variable exhibits a state dependence path as its 1-year lag values are positively and significantly associated with its current values and hence highlight the relevance of considering a dynamic model to examine the effect of AfT facilitation on export diversification in Ghana.

Table 5. Estimated long and short-run effect of aid for trade facilitation on export diversification.

	SPEC I		SPEC II		SPEC III	
Variable	ARDL	DYNARDL	ARDL	DYNARDL	ARDL	DYNARDL
Constant	20.50	10.17	7.855**	4.432	2.788**	2.788 **
Dep (-1)	0.528***	0.317 ***	0.312***	0.191**	0.244***	0.244***
InAfTfacilitation	0.078***	0.051**	0.049**	0.022**	-0.014***	-0.014***
InGDP	0.551**	0.315**	0.178***	0.116***	0.040**	0.040**
InPOP	-1.080***	-0.523	-0.464**	-0.255*	0.156**	0.156**
InFDI	-0.017	-0.011	-0.025	-0.019	0.006	0.006
POL	0.343**	0.235***	0.407***	0.274***	-0.047*	-0.047*
INQ	-0.375*	-0.159*	0.012	0.015	0.041	0.041
TO	0.496***	0.315***	0.214***	0.139**	-0.002	-0.002
Short-run estimates						
ΔInAFTfacilitation	0.113***	0.122***	0.070***	0.070**	-0.071***	-0.070***
ΔInGDP	0.708***	0.679***	0.879***	0.879***	0.122***	0.106***
ΔInPOP	0.247	-1.349	-2.954***	-2.954***	0.765***	0.804***
ΔInFDI	0.003	0.011	-0.060*	-0.06	-0.015	-0.022*
ΔPOL	-0.583***	-0.565***	-0.587***	-0.587**	-0.332***	-0.344***
ΔINQ	-0.689***	-0.673***	-0.422***	-0.422**	0.222***	0.238***
ΔTO	0.805***	0.804***	0.708***	0.708***	0.015	0.016
Post-estimation test						
CointEq (-1)	-0.420***	0.541***	-0.191***	-0.714***	-0.317***	-0.381 ***
R2	0.795	0.781	0.892	0.892	0.853	0.892
Adjusted R2	0.729	0.711	0.876	0.858	0.805	0.858
F-statistic	94.15***	11.15***	55.8***	25.89***	19.04***	17.56***
DW	2.177	1.895	2.097	2.013	1.941	1.906
Breusch-Godfrey Serial Correlation LM Test	5.68(0.590)	0.595(0.674)	0.409(0.667)	0.139(0.874)	0.048(0.953)	0.254(0.777)
Heteroskedasticity Test: ARCH	1.036(0.313)	0.032(0.858)	1.065(0.306)	0.256(0.614)	0.218(0.642)	0.005(0.946)
Heteroskedasticity Test: Breusch-Pagan-Godfrey	3.225(0351)	0.773(0.675)	0.891(0.271)	1.041 (0.477)	1.483(0.185)	1.782(0.178)
Functional (RESET) test	0.290(0.592)	1.735(0.164)	0.638(0.418)	1.246(0.773)	0.114(0.237)	1.665(0.442)

Note. The model is estimated by setting the maximum lag to 4, and the optimum lag length is suggested by AIC. Δ is the first difference operator. Asterisks (***), (**) and (*) denote significance levels at 1%, 5%, and 10%.
Source: Authors' computation. .

In SPEC I, the results confirm the initial hypothesis that AfT facilitation leads to more product types being exported from the country, Ghana. The result suggests that increasing AfT facilitation disbursements to Ghana by 1% would, on average, increase the number of products exported by 0.078 and 0.123, respectively in the long and short run using the ARDL estimation and 0.051 and 0.122, respectively in the long and short run using the DYNARDL suggesting that AfT facilitation is a key driver of export diversification on the extensive margin. This is an interesting finding in relation to previous research. As discussed in the literature review, both Kim (2019) and Gnangnon and Roberts (2017) studies find no significant effects of AfT facilitation on export diversification measured with the number of exported products. However, in Hellgren and Klingvall (2020) study,

AfT facilitation has a positive and significant effect in increasing the recipient country's exported products, similar to the findings of this study. In both Kim (2019) and Gnangnon and Roberts (2017) studies, the data used as the number of exported products is classified according to the HS6 level as indicated in section 4.1 and hence may be the reason why the effect is insignificant. Therefore, the result of this study could signify the need for highly disaggregated data when analyzing the effect of AfT facilitation.

Similar to the effect of AfT facilitation on the number of exported products reported in SPEC 1, the evidence from SPEC II also confirms the a priori expectation that AFT facilitation has a positive and statistically significant impact on increasing recipient access to different markets. The magnitude of the coefficients suggests that for every 1% increase in the amount of AfT facilitation disbursed, the Ghanaian economy is able to increase its trading partners or access to new markets by 0.049 and 0.070% in the long and short run respectively using the ARDL model and 0.070% and 0.070% in the long and short run respectively using the DYNARDL model and these coefficients are statistically significant at 5% level. This result connects to our theoretical prediction that AfT facilitation reduces the cost of trading, and hence yields increased export diversification. Although the result of this study does not say anything about the factors that drive the linkage between AfT facilitation and the number of accessed markets, they do connect with evidence in the empirical literature. First, results from Busse et al. (2012) show that AfT significantly lowers domestic trade costs. Secondly, results from Dennis and Shepherd (2011) and Beverelli et al. (2015) also show that domestic trade costs have a strong negative impact on export diversification.

Again, results in Table 5 suggest that AfT facilitation exerts a negative and statistically significant negative impact on the recipients' exports measured using the Hirschman–Herfindahl index of export concentration as reported in SPEC III. As indicated in Section 4.1, when there is a negative change in the HHI, it is as a result of increases in export product categories or by a more even distribution among already exported goods. Therefore, the result in SPEC III means that when AfT facilitation increases, it induces a greater diversification of exports in recipient countries. From the result, a 1 percent increase in the AfT facilitation disbursement induces export diversification by 0.041 and 0.071% in both the long and short run respectively using both DYNARDL models. This finding is in line with Gnangnon (2018) and Kim (2019) who also found a negative effect of AfT facilitation on export diversification of recipient countries using the HHI index. However, in Hellgren and Klingvall (2020) study, the impact of AfT facilitation does not have any significant effect on export diversification when measured with HHI.

In view of the second question as to whether diversifying along the number of products or access to different markets is more useful when considering the effect of AfT facilitation, the result in Table 5 is quite revealing. In SPEC I and II, the result finds that the coefficient associated with the number of products seems to be larger or higher than access to different markets. For instance, the magnitude of the coefficients, in the long run, suggests that for every 1% increase in the amount of AfT facilitation disbursed, the Ghanaian economy is able to increase its number of exported products and trading partners or access to new markets by 0.051 and 0.022% respectively using the DYNARDL model and 0.112% and 0.070% in the short run respectively also using the DYNARDL model and these coefficients are statistically significant at 5% level. This result connects to our theoretical prediction that AfT facilitation reduces the cost of trading, and hence yields increased export diversification. These findings are similar to studies that suggest AfT for trade facilitation works better to promote the number of exported products in recipient countries.

Concerning the effect of the control variables, the estimated results in Table 5 for SPEC I, II and III also reveal that among the control variables, GDP per capita, trade openness, population size, political stability and institutional quality of recipient countries all have significant impacts on export diversification, particularly in the number of products and the number of markets models. GDP per capita for both SPEC I and II were found to have a positive and significant relationship with export diversification. From the result, a 1 percent increase in annual GDP per capita induces diversification in products by 0.315% and access to new markets by 0.116%, in the long run, using the DYNARDL model. In the short run, the results indicate that, if annual GDP per capita increases by 1 percent, diversification in the number of products and access to new markets will significantly fall by 0.679 and 0.879 percent respectively. This result is consistent

with the argument of Kim (2019), Gnangnon (2018) and Imbs and Wacziarg (2003) whose studies confirmed the assertion that when countries' per capita income increases and climbs the ladder of development, their production structure tends to become more diversified and therefore they are able to export more disaggregated products and to new products. With regard to population size, the result shows that the Ghanaian population is a relatively small nation with limited market access coupled with trade barriers and competition from larger economies, therefore, the country finds it difficult to expand its exports beyond a few diversified sectors. As a result, the effect of population size is significantly negative. This result is also consistent with the result obtained by Hellgren Klingvall (2020), even though their result is not significant.

As anticipated, political stability which is used to capture governance quality is appropriately signed. That is, the coefficient is significantly positive at 5 percent significance level at both the number of exported products and access to new markets or the HHI index. Specifically, the results indicate that, if the political environment improves by 1 percent, export diversification improves by 0.235% and 0.274% in the long run when estimated using the DYNARDL model for the number of products and access to new markets respectively. Also, when export diversification is measured by HHI, the coefficient of political stability is associated with a less concentrated export base, leading to a higher overall level of diversification. This evidence suggests that when institutional quality becomes favourable, its effect on trade diversification is positive and is consistent with Kim (2019) study. Additional evidence from the study also suggests that when institutional quality becomes favourable, its effect on trade diversification is positive and consistent with Kim (2019) study. The result in Table 5 also shows that trade openness has also been found to play a significant role in the export diversification of many nations in the empirical literature. For example, Parteka and Tamberi (2013) reveal that free trade has a positive relationship with export diversification, suggesting that the freer the market, the more diversified the exports.

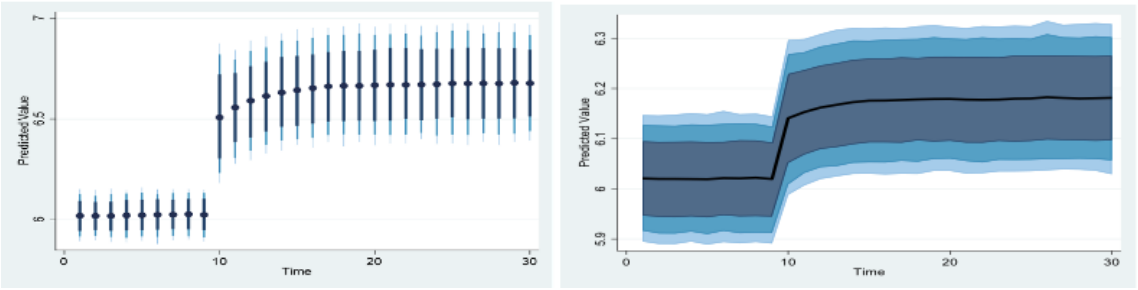
Additionally, the error correction term (ECT) was negative and statistically significant in all models. The adjusted R2 values of 0.824 and 0.794 means that 82.4% and 79.4% of the variations in EQ were being accounted for by the explanatory variables under the two methods, respectively, while the significant F-values under the two approaches are an indication that the model had a very high predictive power. Various diagnostic tests were performed to examine the validity of the model. From Table 5, the Breusch-Godfrey LM test confirmed no serial correlations in the error terms, while the ARCH and the Breusch-Pagan-Godfrey tests revealed no heteroscedasticity amidst the residuals of the model. Finally, the Ramsey RESET test affirmed the model to be correctly specified. In terms of stability, the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMQ) plots of Brown, Durbin and Evans (1975) presented in Appendix Table II indicate the stability of the parameters in the long term, and hence the suitability of the empirical outcome for policy making.

6.5. Dynamic ARDL Counterfactual Simulation

An essential aspect of the dynamic ARDL estimator is that it can dynamically graph the responses from the dependent variable based on either positive or negative shocks to the independent variables while keeping the others constant. For this study, the analysis of how export diversification indicators change to the counterfactual change in aid for trade facilitation while holding other explanatory factors constant is recorded in Figures 4 and 5 and this type of analysis is new to the frontiers of all previous studies on this subject even for panel analysis. From the results, as shown in Figure 4, a + 10% shock in AfT facilitation increases the number of exported products in Ghana. This implies increasing AfT facilitation would boost the export of products in the country; however, if disbursement in AfT facilitation for Ghana is minimized, the number of products exported from the country could be minimized.

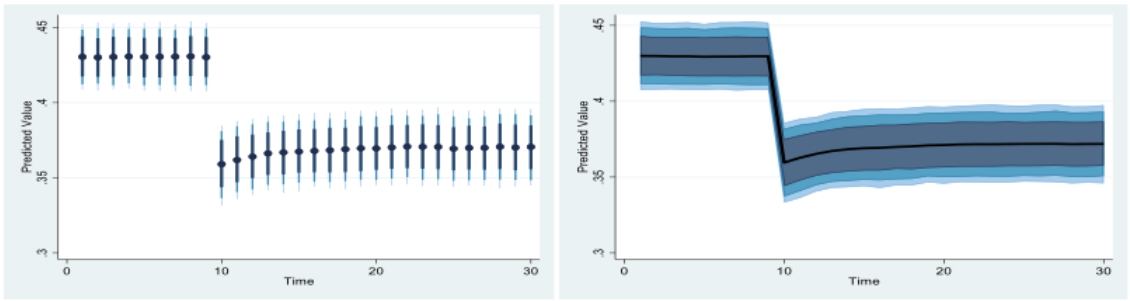
Figure 5 also describes the impact of 10 shocks in the predicted value of AfT facilitation on the Hirschman–Herfindahl index of export diversification used as a measure of export diversification. The graph indicates that + 10 shocks produced a significant decrease in the Hirschman–Herfindahl index of export diversification used in the short-run, and the impact remained significant at the predicted long-run value of about 10.1.

Figure 5. AfT facilitation and number of exported products



Notes: These plots show the impact of ±10 shocks in predicted AfT facilitation on the number of exported products. The dots indicate the average predicted value; dark blue to light blue lines explain the 75%, 90%, and 95% confidence intervals.
Source: Authors' computation

Figure 6. AfT facilitation and HHT



Notes: These plots show the impact of ±10 shocks in predicted AfT facilitation on the number of exported products. The dots indicate the average predicted value; dark blue to light blue lines explain the 75%, 90%, and 95% confidence intervals.
Source: Authors' computation

7. Conclusion and policy implications

This paper examined the extent to which aid for trade facilitation contributes to export diversification with reference to Ghana using quarterly data from 2005 to 2020. Three different measures of export diversification were used as the dependent variable to measure the effect of aid for trade facilitation: the number of exported product varieties, the number of trading partners or markets and the Hirschman–Herfindahl Index (HHI) of export concentration. Using the Dynamic ARDL and ARDL estimation techniques, this study finds AfT facilitation to be positively associated with export diversification in Ghana, with the magnitudes of this positive effect being higher in the short run than in the long run. Moreover, the dynamic ARDL simulations show a significant increase in export diversification in the long run following a counterfactual shock in aid for trade facilitation. Based on these findings, the study concludes that AfT facilitation is a potential policy option that the government of Ghana can employ to promote export diversification. Consequently, the study recommends to the donor community that allocating new and additional resources to trade facilitation in Ghana could yield immediate and high returns in terms of aid effectiveness.

Concerning which of the export diversification margin is more useful when considering the effect of AfT facilitation on Ghana's export diversification, the empirical evidence in the study indicate that the coefficient associated with the number of exported product varieties seems to be larger than the number of trading partners or access to different markets. The magnitude of the coefficients, in the long run, suggests that for every 1% increase in the amount of AfT facilitation disbursed, the Ghanaian economy is able to increase its number of exported products and trading partners or access to new markets by 0.051 and 0.022% respectively. In the short run, the corresponding increases are 0.112% and 0.070%, respectively, and these coefficients are statistically significant at the 5% level. This result connects to the theoretical prediction that AfT facilitation reduces the cost of trading and hence works better to promote the number of exported products in recipient countries.

The findings of this study also have important implications for policymakers in the country aiming to diversify the economy further as far as trade is concerned. First, the Ministry of Finance and Trade should increase its allocation of development aid toward trade facilitation initiatives, with a focus on reducing trade barriers and improving logistics, and infrastructure. This strategy is expected to further improve the diversification of exports in the country. Second, the Ghana Export Promotion Authority and the Ghana Free Zones Authority should encourage the diversification of export products by providing targeted support to industries with export potential and lowering entry barriers for new products. Additionally, promoting trade partner diversity through initiatives like trade missions and diplomatic efforts is essential and recommended. Third, to ensure accountability on the part of the disbursed aid funds, a robust system for monitoring and evaluating the effectiveness of trade facilitation programs should be established. Finally, collaborating with international donors and aid organizations to secure additional resources for trade facilitation initiatives in the country is also recommended. By adopting these measures, Ghana can harness the positive relationship between AfT facilitation and export diversification, ultimately promoting economic growth and resilience in a challenging global economic landscape.

References

1. Ackah, C., Adjasi, C., & Turkson, F. (2014). Scoping study on the evolution of industry in Ghana. Learning to compete. Working Paper 18. Washington, DC: Brookings Institution.

2. Agosin, M. R., Alvarez, R., & Bravo-Ortega, C. (2012). Determinants of export diversification around the world: 1962–2000. The World Economy, 35(3), 295-315.

3. Akpan, U. (2014). Impact of regional road infrastructure improvement on intra-regional trade in ECOWAS. African Development Review, 26(S1), 64-76.

4. Amoako-Tuffour, J., Balchin, N., Calabrese, L., & Mendez-Parra, M. (2016). African Transformation Forum 2016 trade facilitation and economic transformation in Africa.

5. Anderson, T. W., & Hsiao, C. (1982). Formulation and estimation of dynamic models using panel data. Journal of Econometrics, 18(1), 47-82.

6. Bakari, S. (2017). The three-way linkages between export, import and economic growth: New evidence from Tunisia. Journal of Smart Economic Growth, 2(3), 13-53.

7. Beverelli, C., Neumueller, S., & Teh, R. (2015). Export diversification effects of the WTO trade facilitation agreement. World Development, 76, 293-310.

8. Busse, M., & Königer, J. (2012). Trade and economic growth: A re-examination of the empirical evidence. Available at SSRN 2009939.

9. Busse, M., Hoekstra, R., & Königer, J. (2012). The impact of aid for trade facilitation on the costs of trading. Kyklos, 65(2), 143-163.

10. Carrère, C., Cadot, O., & Strauss-Kahn, V. (2011). Trade diversification: Drivers and impacts. Trade and Employment: From Myths to Facts, 253-307.

11. Coe, D. T., & Helpman, E. (1995). International R&D spillovers. European Economic Review, 39(5), 859-887.

12. Constantinescu, C., Mattoo, A., Ruta, M., Maliszewska, M., & Osorio-Rodarte, I. (2019). Global Trade Watch 2018: Trade Amid Tensions. World Bank.

13. Cordero, M. (2014). Logistics and trade facilitation between CARICOM and Central America. Economic Commission for Latin America and the Caribbean (ECLAC) (pages 1-28). Mexico

14. Deen-Swarray, M., Adekunle, B., & Odularu, G. (2014). Policy recipe for fostering regional integration through infrastructure development and coordination in West Africa. Regional Economic Integration in West Africa, 29-56.

15. Dennis, A., & Shepherd, B. (2011). Trade facilitation and export diversification. The World Economy, 34(1), 101-122.

16. Djankov, S., Freund, C., & Pham, C. S. (2010). Trading on time. The Review of Economics and Statistics, 92(1), 166-173.

17. Feenstra, R. C. (2003). Advanced International Trade: Theory and Evidence (Ist ed.). Princeton: Princeton University Press. Retrieved from https://www.amazon.com.

18. Fujimitsu, M. (2013). Quantifying the effect that aid for trade facilitation has on customs clearance in Sub-Saharan Africa in terms of time and cost. World Customs Journal, 7(01), 39.

19. Gnangnon, S. K. (2018). Aid for trade and trade policy in recipient countries. The International Trade Journal, 32(5), 439-464.

20. Gnangnon, S. K. (2022). Aid for Trade, export product diversification, and foreign direct investment. Review of Development Economics, 26(1), 534-561.

21. Gnangnon, S. K., & Roberts, M. (2017). Aid for trade, foreign direct investment and export upgrading in recipient countries. Journal of International Commerce, Economics and Policy, 8(02), 1750010.

22. Grossman, G. M., & Helpman, E. (1991). Trade, knowledge spillovers, and growth. European Economic Review, 35(2-3), 517-526.

23. Hainmueller, J., & Hazlett, C. (2014). Kernel regularized least squares: Reducing misspecification bias with a flexible and interpretable machine learning approach. Political Analysis, 22(2), 143-168.

24. Helble, M., Shepherd, B., & Wilson, J. S. (2007). Transparency & trade facilitation in the Asia Pacific: Estimating the gains from reform (pp. 84-p). Australia: Department of Foreign Affairs and Trade.

25. Helpman D. & Krugman P. R. (1985). Market structure and foreign trade, The MIT Press, Mass., Cambridge

26. Imbs, J., & Wacziarg, R. (2003). Stages of diversification. American Economic Review, 93(1), 63-86.

27. Joel, H. & Hilda, K. (2020). Export diversification effects of aid for trade facilitation (Master dissertation, University of Gothenburg).

28. Jordan, S., & Philips, A. Q. (2018). Cointegration testing and dynamic simulations of autoregressive distributed lag models. The Stata Journal, 18(4), 902-923.

29. Khan, M. K., Teng, J. Z., Khan, M. I., & Khan, M. O. (2019). Impact of globalization, economic factors and energy consumption on CO2 emissions in Pakistan. Science of the Total Environment, 688, 424-436.

30. Khan, S. A. R., Yu, Z., Belhadi, A., & Mardani, A. (2020). Investigating the effects of renewable energy on international trade and environmental quality. Journal of Environmental Management, 272, 111089.

31. Kim, I. & Osgood, L. (2019). Firms in trade and trade politics. Annual Review of Political Science, 22, 399-417, 22.

32. Kim, J. H. (2019). Multicollinearity and misleading statistical results. Korean Journal of Anesthesiology, 72(6), 558-569.

33. Masunda, S. (2020). Export diversification effects of aid for trade in sub-Saharan Africa. Journal of African Trade, 7(1/2), 29-36

34. Nathoo, R., Salim, R., Ancharaz, V., & Kabir, M. (2021). Does aid for trade diversify sub-Saharan Africa's exports at the intensive and extensive margins? Applied Economics, 53(55), 6412-6425.

35. Nickell, S. (1981). Biases in dynamic models with fixed effects. Econometrica: Journal of the Econometric Society, 1417-1426

36. Obeng, C. K. (2022). Export Efficiency and Diversification in Ghana (African Economic Research Consortium Research Paper No: 5004). AERC: Nairobi, Kenya.

37. Parteka, A., & Tamberi, M. (2013). What determines export diversification in the development process? Empirical assessment. The World Economy, 36(6), 807-826.

38. Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289-326.

39. Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. Journal of the American Statistical Association, 94(446), 621-634.

40. Portugal-Perez, A., & Wilson, J. S. (2012). Export performance and trade facilitation reform: Hard and soft infrastructure. World Development, 40(7), 1295-1307.

41. Safaeimanesh, S., & Jenkins, G. P. (2020). Trade facilitation and its impacts on the economic welfare and sustainable development of the ECOWAS region. Sustainability, 13(1), 164.

42. Sakyi, D., Villaverde, J., & Maza, A. (2015). Trade openness, income levels, and economic growth: The case of developing countries, 1970–2009. The Journal of International Trade & Economic Development, 24(6), 860-882.

43. Sarkar, S., & Costa, A. I. (2008). Dynamics of open innovation in the food industry. Trends in Food Science & Technology, 19(11), 574-580.

44. Sawadogo, B., Fouopi Djiogap, C., Ouedraogo, I., & Takpara, M. M. (2023). An empirical assessment of the role of trade in services in export product diversification in Sub-Saharan Africa. Journal of Productivity Analysis, 1-29.

45. Seck, A. (2016). Trade facilitation and trade participation: Are sub-Saharan African firms different? Journal of African Trade, 3(1-2), 23-39.

46. Shafaeddin, M. S. (2005). Trade liberalization and economic reform in developing countries. The IMF, World Bank and Policy Reform, 155, 2-20.

47. Spence, M., & Karingi, S. (2014). Impact of trade facilitation mechanisms on export competitiveness in Africa, UNECA African Trade Policy Centre Work in Progress No. 85, UNECA, Addis Ababa, Ethiopia.

48. Tadesse, B., & Shukralla, E. K. (2013). The impact of foreign direct investment on horizontal export diversification: empirical evidence. Applied Economics, 45(2), 141-159.

49. Toyin Onanuga, A., & Toyin Onanuga, O. (2016). Do financial and trade openness lead to financial sector development in Nigeria? Zagreb International Review of Economics & Business, 19(2), 57-68.

50. Uddin, M. T., Goswami, A., Rahman, M. S., & Dhar, A. R. (2019). How can governance improve the efficiency and effectiveness of value chains? An analysis of pangas and tilapia stakeholders in Bangladesh. Aquaculture, 510, 206-215.

51. Vellem, V., & Espoir, L. M. (2021). The impact of aid for trade on horizontal and vertical export diversification: The case of Sub-Saharan Africa and Developing Asia. International Journal of Research in Business and Social Science (2147-4478), 10(5), 135-147.

52. Vijayasri, G. V. (2013). The importance of international trade in the world. International Journal of Marketing, Financial Services & Management Research, 2(9), 111-119.

53. Wilson, N. (2007). Examining the trade effect of certain customs and administrative procedures.

54. Xu, L., Wang, C., & Zhao, J. (2018). Decision and coordination in the dual-channel supply chain considering cap-and-trade regulation. Journal of Cleaner Production, 197, 551-561.

55. Yanikkaya, H. (2003). Trade openness and economic growth: a cross-country empirical investigation. Journal of Development Economics, 72(1), 57-89.

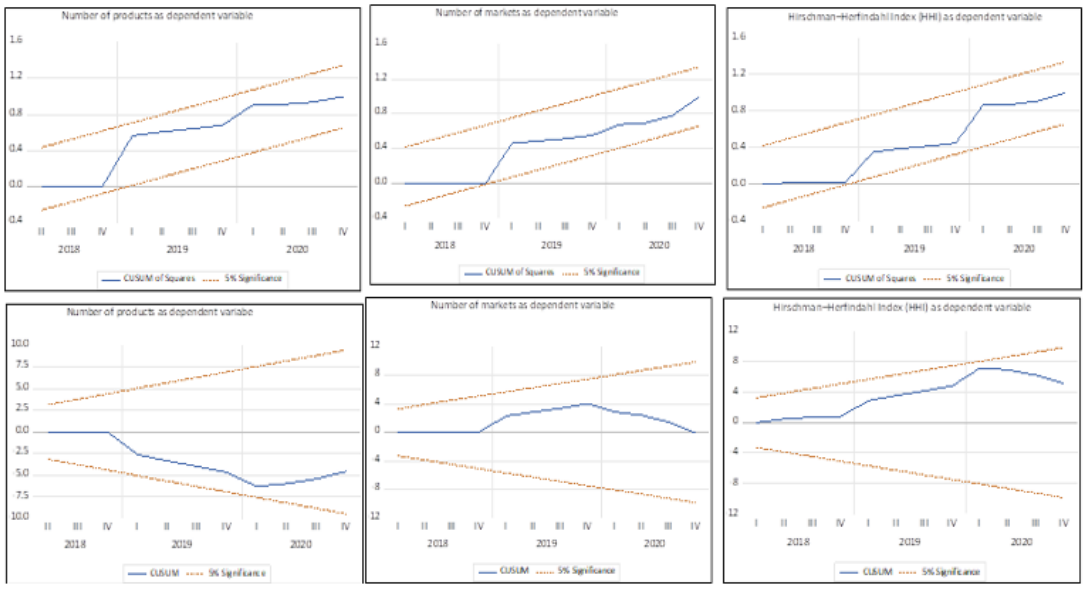
56. Zaki, C. (2011). Assessing the global effect of trade facilitation: Evidence from the MIRAGE model. In Economic Research Forum Working Paper Series (No. 659).

Appendix Table 1: Unit root test

Variable	Levels			First Difference			Decision
	With Intercept	Intercept and Trend	Without Intercept and Trend	With Intercept	Intercept and Trend	Without Intercept and Trend	
Augmented Dickey-Fuller (ADF) Test							
InNOP	-1.384	-0.729	-0.307	-7.754***	-8.087 ***	-7.810 ***	I (1)
InNOM	-0.522	-0.756	-0.756	-7.815***	-8.197 ***	-7.810 ***	I (1)
HHT	-1.905	-2.788	0.399	-7.338***	-7.272 ***	-7.369 ***	I (1)
InAFTF	-2.330	-2.400	-0.395	-7.749***	-7.687 ***	-7.810 ***	I (1)
InGDP	-2.748*	-2.888	-0.565	-8.178***	-8.498 ***	-7.810 ***	I (0)
InPOP	-2.431	-1.775	1.563	-1.945	-2.544 ***	-3.696 ***	I (1)
InFDI	-3.763***	-2.573	0.912	-7.962 ***	-8.964 ***	-7.810 ***	I (0)
POL	-2.314	-2.377	-2.169**	-7.746 ***	-7.841 ***	-7.810 ***	I (1)
INQ	-1.816	-2.813	-1.182	-7.748 ***	-7.700 ***	-7.810 ***	I (1)
INT	-1.812	-2.203	-1.056	-7.870 ***	-7.832 ***	-7.810 ***	I (1)
Phillips-Perron Test							
InNOP	-1.482	-0.711	-0.307	-7.754 ***	-8.179 ***	-7.810 ***	I (1)
InNOM	-0.572	-0.724	-0.756	-7.815	-8.247 ***	-7.810 ***	I (1)
HHT	-3.059	-3.761	0.105	-7.760 ***	-7.700 ***	-7.810 ***	I (0)
InAFTF	-2.459	-2.531	-0.395	-7.748 ***	-7.687 ***	-7.810 ***	I (1)
InGDP	-3.350**	-2.708	-0.565	-8.200 ***	-8.661 ***	-7.810 ***	I (0)
InPOP	-1.135	-7.352	18.793	-27.615 ***	-37.602 **	-7.810 ***	I (1)
InFDI	-8.439 ***	-3.643 **	0.925	-7.962 ***	-9.186 ***	-7.810 ***	I (0)
POL	-2.453	-2.429	-2.287 **	-7.746 ***	-7.841 ***	-7.810 ***	I (1)
INQ	-1.885	-2.860	-1.190	-7.748 ***	-7.700 ***	-7.810 ***	I (1)
INT	-1.993	-2.421	-1.062	-7.868 ***	-7.832 ***	-7.810 ***	I (1)
KPSS UNIT ROOT TEST							
InNOP	0.37 *	0.246 ***	-	0.337	0.083	-	I (0)
InNOM	0.211	0.167 **	-	0.353 *	0.102	-	I (1)
HHT	0.698 **	0.046	-	0.026	0.024	-	I (1)
InAFTF	0.208	0.121 *	-	0.057	0.054	-	I (1)
InGDP	0.919 ***	0.216 ***	-	0.312	0.077	-	I (0)
InPOP	1.021 ***	0.253 ***	-	0.354 *	0.273 ***	-	I (0)
InFDI	0.574 **	0.237 ***	-	0.687 **	0.303 ***	-	I (0)
POL	0.103	0.099	-	0.148	0.051 ***	-	I (1)
INQ	0.605 **	0.084	-	0.107	0.100	-	I (1)
INT	0.409 *	0.10	-	0.098	0.075	-	I (1)

Note. The model is estimated by setting the maximum lag to 4, and the optimum lag length is suggested by AIC. is the first difference operator. Asterisks (***), (**) and (*) denote significance levels at 1%, 5%, and 10%.
Source: Authors' computation. .

Appendix Figure 1: Stability test for the ARDL estimation



Source: Authors' computation