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The Influence of Trade Facilitation on Export Diversification in Tanzania

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Abstract
This paper examines the relationship between trade facilitation and export diversification in Tanzania. Specifically, it attempts to ascertain the role of infrastructure in facilitating export diversification. The study uses trade data for Tanzania's export with its trading partners for the period from 2008 to 2017. The gravity model is used for data analysis. Findings reveal that the quality of airport infrastructures positively influences export diversification in Tanzania while other infrastructures had no influence on export diversification. The paper concludes that reliable infrastructure specifically airport infrastructures reduces trade costs, improves competitiveness, and increases export diversification in Tanzania and; thus recommends continual investment towards airport infrastructure development and maintenance.

Keywords: *Trade facilitation, Infrastructure, Export Diversification, Trade Cost, Gravity Model*.

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Introduction

Export diversification reflects the country's trade structure (Zafar et al., 2022) or the degree to which the country's exports range across many products or trading partners (Töngür & Ekmen – Özçelik, 2020). It enables countries to hedge against adverse terms of trade shocks (Yuan et al., 2022; Carrasco & Tovar-Garcia, 2021) by stabilizing export earnings, nurturing employment creation, and hence stimulating economic growth (Haini et al., 2023; Phiri, 2022). Moreover, export diversification is also well acknowledged as one of the development manifestos by the United Nation's Sustainable Development Goals (SDGs), the Istanbul Programme of Action for the Least Developed Countries (LDCs), and the African Union's Agenda 2063 (AUC, 2015; UN, 2015 and 2011). Despite tangible commitment made vide the above instruments and envisaging positive outcomes of export diversification, many developing countries still depend on a small number of manufactured goods and few export markets for the bulk of their export earnings (Mazengia et al., 2023). Fosu and Abbas (2019) study revealed that African countries have the lowest export diversification globally. Phiri (2020) reported that Sub-Saharan Africa (SSA) countries have a high degree of dependence on few agricultural and mineral exports.

Prior studies on export diversification suggest that several factors contribute to the deficit. These factors include unfavourable trade-related policies (Gnangnon, 2019; Elhiraika & Mbate, 2014), human capital and technology (Fosu et al., 2019), weak trade-related institutions (Francois & Manchin, 2013), deficiencies in infrastructure (Rehman et al., 2021; Tongur& Ekmen-Ozcelik, 2020) among others. Infrastructure is necessary within a trade facilitation framework due to its influence in reducing trade costs (Tang, 2021). Trade costs are described as all the costs other than the marginal cost of producing goods incurred in getting goods from the manufacturer to the final consumer. Several studies have revealed that trade facilitation reduces trade costs (Maggi et al. 2022; Leudjou, 2021) and increases export varieties (Fontagné et al., 2020).

Despite the importance of trade facilitation in reducing trade costs and enhancing export diversification, limited scholars have examined this link (Tongur & Ekmen-Ozcelik, 2020; Beverelli et al. 2015; Ferro, Wilson & McConaghy, 2015; Persson, 2013). Moreover, few studies on the impact of trade facilitation on export varieties were conducted in Western countries and emerging Asian economies. Hence their findings cannot be applied to least-developed countries such as Tanzania due to cultural and social-economic differences. This is supported by McMillan et al. (2014) study, which reported that the gains from trade may differ from country to country and depends critically on country-specific differences in the fiscal and institutional environment. Furthermore, limited studies have tested the new structural economic theory and heterogeneity theory applicability to the nexus between trade facilitation and export diversification. Therefore, the influence of trade facilitation on export diversification is yet to be fully explained in Tanzania. This paper, therefore, seeks to fill the above gaps by examining the influence of trade facilitation on export diversification. More precisely, the study intends to focus on the role of infrastructure, the critical variable of trade facilitation deployed in this study.

Infrastructure is one of the indicators of trade facilitation as defined by Portugal-Perez and Wilson (2012). These scholars describe trade facilitation from a broader perspective as

comprising hard and soft dimensions. The hard dimension relates to physical infrastructure such as roads, ports, railways, airports and telecommunication, similar to a study by Arif and Khan (2021). On the other hand, the soft dimension consists of transparency, customs management, business environment and other intangible institutional aspects. Similarly, Oberhofer et al., (2021) define trade facilitation as decreasing administrative formalities that impact a firm when crossing the border. Since there is no universally accepted definition of trade facilitation (Morini et al., 2016; Host et al. 2019), this paper adopts Portugal-Perez and Wilson's (2012) definition as it includes infrastructure at the border and beyond the border.

The infrastructure and structural evolution have been part of Tanzania's trade facilitation reforms and modernization programs to improve its competitiveness. These measures can be evidenced by ongoing Standard Gauge Railways (SGR) construction and several infrastructure projects, such as constructing roads and enhancing port and airport infrastructure. Given that Tanzania has significantly invested in infrastructure, an indicator of trade facilitation, this paper attempts to analyse the influence of such investments on export diversification in Tanzania. The paper contributes to understanding the relationship between trade facilitation and export diversification. The findings will contribute to developing context-specific policy guidelines to nurture the desired investment in trade facilitation, specifically infrastructure.

Literature

Theoretical Framework

The export diversification concept has been used to describe the change in the country's export composition (Töngür & Ekmen – Özçelik, 2020) by launching new goods or extending and improving current products, and it might happen across products, sectors or trading partners. (Carrasco & Tovar-Garcia, 2021). Numerous studies on export diversification have concentrated on its determinants (Phiri, 2022), while other studies focused on other areas. For instance, a survey by Bashir et al. (2020) ascertained the relationship between export diversification and energy efficiency, while Shahzed (2021) examined the impact of export varieties on renewable energy consumption. Ibrahim, Veronique and Gautier (2020) examined determinants of export diversification in SSA by looking at the natural resources endowment. Notwithstanding many studies on export diversification, many extant studies focused on analysing the global or regional impacts. Moreover, despite the significant number of studies on export diversification, few scholars have examined its link with trade facilitation. Similarly, studies on trade facilitation have concentrated on other avenues, including its impact on trade flows (Sakyi & Afesorgbor, 2019; Yushi & Borojo, 2019), foreign direct investment (Onyango & Kiriti-Nganga, 2016) and inbound tourism (Tang, 2021).

The literature suggests that trade facilitation can reduce non-tariff impediments and boost export diversification in developing countries (Maggi et al. 2022, Fontagné et al., 2020). For example, Melitz (2003), who founded the heterogeneous firms theory, postulated that fixed and variable costs characterize the trading environment. These costs pose a trade barrier to existing and new players from entering international trade. Consequently, implementing trade facilitation measures will reduce these costs (Tang, 2021; Hendy & Zaki, 2021) and increase the number of export varieties (Carrasco & Tovar-Garcia, 2021). This assentation has been tested empirically by Mania and Rieber (2019) and Bourdet and Persson (2014). Henceforth,

export diversification is widely seen as a favourable trade objective in attaining and sustaining economic growth (Phiri, 2022).

Correspondingly, Lin's (2012) New Structural Economic (NSE) theory suggests that economic progress can be achieved through structural transformation. This theory posited that government should play an active role in smoothing structural change by providing essential infrastructure which mitigates the coordination and externality problem. The literature suggests that NSE theory is essential in creating a conducive and friendly environment for export diversification through the structural transformation of the country's endowment. One of the endowments is the infrastructure which affects the firm's trade costs. Nonetheless, other scholars such as Fontagné et al. (2020) and Persson (2013) deployed the heterogeneous firm theory founded by Melitz (2003) to explain the nexus between trade facilitation and export varieties. The justification for these scholars has been based on the ground that trade facilitation is a means to reduce trade costs associated with international trade. However, scant studies have been done to test its applicability at a country-level analysis, particularly in Tanzania.

Hypotheses Development

Töngür and Ekmen – Özçelik (2020) studied the impact of infrastructure and export varieties in Turkey. They used Melitz's theorem and gravity model techniques to examine the role of infrastructure in reducing trade costs and increasing export varieties. This study used Turkey's export trade data with its 174 trading partners from 2007 to 2017, and the analysis revealed a positive influence of infrastructure on export value and a significant effect on export varieties than trade flows. Moreover, the study found that export varieties played a substantial role in the growth of the Turkish economy. Likewise, Rehman et al. (2022) examine the effect of infrastructure on China's export diversification. The study used a dynamically simulated autoregressive distributed lag (DYS-ARDL) method for China's annual data from 1990 to 2019. The findings indicated that a higher infrastructure level positively affects export diversification. Based on the empirical findings reviewed above, the paper hypothesizes:

H_1: *Infrastructure positively influences export diversification.*

Sénquiz-Díaz (2021) examined the infrastructure quality and logistic performance in export of twenty-nine developing countries for the period 2012 to 2018. Sénquiz-Díaz's (2021) paper showed that increased exports in developing economies are highly influenced by the condition of roads, among other infrastructure. They suggested that the quality of roads is relevant for timely deliveries, particularly for sensitive goods. This is similar to the study findings of Arif and Khan (2021), who suggested that sectors with low levels of technological sophistication, such as agriculture, and road infrastructure, are particularly crucial. However, poorly maintained roads may result in higher transportation costs, such as increased fuel use and transit time. Additionally, a similar study of the quality of road infrastructure was examined by Coşar and Demir (2016), who assessed its impact on Turkey's international trade. Using the Ordinary Least Square (OLS) and PPML gravity model techniques, their study's findings revealed that road investment had reduced costs and increased export trade flows and diversification, particularly in regions remote from the ports. These results suggest that road infrastructure is essential in accessing the international market, and hence this paper hypothesizes:

H_{1a}: *Quality of road positively influences export diversification*

Similarly, Yuan et al. (2022) studied the effect of China's railway infrastructure efficiency on export varieties. The study employs the difference in difference method to verify and quantify using China's annual export dataset from Customs. The study's findings revealed that improvement in rail infrastructure increased the firm's export variety. Railways are regarded as an effective inland transportation method, particularly for moving large freight over long distances. Railways, in particular, enable higher benefits due to economies of scale. Based on these arguments, this study hypothesizes:

H_{1b}: *Quality of railways positively influences export diversification*

Bottasso et al., (2018) examined the impact of port infrastructure on Brazil's global trade from 2009 to 2012. The study findings analyzed using the gravity model with the Pseudo Poisson Maximum Likelihood (PPML) technique showed Brazilians export more than they import due to port enlargement. Specifically, the study suggests that the port infrastructure investment has increased by approximately 14% for export and 11% for imports over the sample period. Additionally, Dappe et al., (2017) studied the efficiency of the ports' infrastructure in the Indian and Western Pacific Oceans. Their study revealed that even though many developing countries have inadequate port infrastructures, they can still increase productivity using the same infrastructure facilities if they allow handling higher cargo levels with the same facilities and at reduced costs. The reduction of trade costs induces more export firms and increases export varieties. Similarly, Feenstra and Ma (2014) use the gravity model to investigate the relationship between trade facilitation and export variety for various countries. Port efficiency was employed to quantify trade facilitation. The study's findings revealed that improved port efficiency significantly enhances the number of products exported. Based on these arguments, this study hypothesizes:

H_{1c}: *Quality of port positively influences export diversification*

The quality of airport infrastructure was examined by Sénquiz-Díaz (2021) as one of the types of infrastructure, and by using OLS, the study's findings on the quality of airports revealed negative sign which affects export performance. A similar paper on airport infrastructure quality was conducted by Wessel (2019) assessed the trade impacts of various forms of transport infrastructure using the PPML. The study's findings showed a positive trade impact on the quality improvement of airport infrastructure. The trade impact is for trade flow performance and the number of products exported. Based on this finding, this study hypothesizes:

H_{1d}: *Quality of airports positively influences export diversification*

Methodology

The paper uses secondary data extracted from various sources for the period between 2008 and 2017. These sources are the International Trade Centre's (ITC) trade maps database for the number of product lines (Harmonised System six-digit level (HS6)) exported from Tanzania. The number of product lines represents or is used to measure export diversification, similar to a study by Dennis and Shepherd (2011) and Shinyekwa et al. (2021). Similarly, data

for the quality of infrastructure variables (roads, railways, ports and airports) were extracted from the World Economic Forum (WEF) global competitive indicator (GCI) report from 2007 to 2018. Likewise, the World Trade Organization provides data for tariffs and Centre D'etudes Prospectives et d'informations Internationales (CEPPI) database for gravity dummy variable. The above data were merged using STATA version 14.2 to form Panel data.

Panel data are appropriate in this study as they facilitate in identifying and measuring effects that are not detectable (Baltagi, 2021). Moreover, it encompasses more degree of freedom, extra informative data, and sample variability than time-series data. It is also helpful for studying more complex behavioural models (Hoffman et al. 2020). It also improves estimation efficiency and corrects the deficiencies that can arise when only cross-section data or when only time-series data is employed. Moreover, data were analysed using the gravity model, which provides a tractable framework for trade policy analysis in a multi-country setting (Baier et al. 2018). Furthermore, it is commonly used to analyse international trade and is frequently used in many credible studies (Oberhofer et al., 2021; Host et al., 2019). Pseudo Poisson Maximum Likelihood High Dimension Fixed Effect (PPMLHDFE) was used to analyse data.

Measures

Dependent variable

The dependent variable of the study is export diversification. It is measured by the number of product lines exported from Tanzania to other importing countries similar to Persson (2013), Dennis & Shepherd (2011), Kim, (2019) and Shinyekwa et al. (2021). These data were extracted from the ITC trade maps database. The ITC's trade map database contained import trade data of reporting countries that trade with Tanzania and the rest of the world. The import data is generally preferred to export data since importing country is concerned with determining tariff revenue data (Alihaashan, 2020; Yotov et al., 2016; Beverelli et al., 2015). Therefore, this study adopted a similar approach of mirroring data extracted from ITC as exports from Tanzania. Numerous scholars such as Andrei et al. (2021), Shinyekwa et al. (2021) and Yilmaz and Bayrak (2021) have previously used the ITC trade map database. Moreover, the ITC trade map database is considered to be appropriate for this study as it provides comprehensive statistical data on the global trade movement for hundred and twenty nations and territories. Besides, this database covers 5,300 product lines of the HS6. HS6 is preferred due to its strength in providing broader categories of goods (Akin, 2019; Dennis & Shepherd, 2011), which facilitates capturing product diversity. The study uses the infrastructure variable since it is one of the most extensively used and recognized indicators of national competitiveness in the literature.

Independent variable

The independent variable for this study is trade facilitation as indicated by the quality of the infrastructure. The infrastructure indicator measures the effectiveness and quality of roads, railways, ports and airports. These data were extracted from WEF GCI for the period 2008 to 2017. The quality of the overall transport infrastructure is obtained by computing, using STATA, the aggregate infrastructure of all the five modes of transport infrastructure deployed in the study. The study uses the infrastructure variable since it is one of the most extensively used and recognized indicators of national competitiveness in the literature (Kuc-Czarnecka

et al., 2022). Prior studies that used these indicators include Tang (2021), Sakyi and Afesorgbor (2019) and Portugal-Perez and Wilson (2012).

Control variables

This study considers a number of control variables as provided in the gravity model. These include:

Economic variables, which are measured by the real GDP of the importing country for a particular year are considered an appropriate control variable in this study because it measures the purchasing power of the importing country. These data were obtained from CEPII Database 2022 similar to studies by Nathoo et al. (2021), Kareem and Martinez-Zarzoso (2020) and Bottasso et al. (2018).

Simple average tariff in the importing country for a particular year. This variable is considered relevant in this study because it measures the effect of increasing costs of exports in the importing country. This variable affects the purchasing power and negatively influences the number of products exported. The figures for this indicator were extracted from the WTO tariff dataset from 2007 to 2018 similar to a study by Beverelli et al. (2015).

Geographical and cultural variables, which affect the trade costs, include the distance between the importing country and Tanzania, dummy variables to indicate importing country has a common land border with Tanzania and whether the importing country has English as an official language; Regional trade agreements, which control for whether the importing country belongs to East Africa Community (EAC_{jt}) or Southern African Development Community ($SADC_{jt}$) and ε_t is the error term. This paper's geographical and cultural variables were extracted from the CEPII database 2022. The CEPII database is appropriate for this study as it collects and compares data from different sources, creating indicators and statistical measures. CEPII is extensively used in the literature. For instance, it was used by Silva et al. (2014) to examine the estimating model of the extensive margin of trade.

The distance between the importing country and Tanzania which was extracted from CEPII, represents the transport costs. This indicator is relevant in this study as it measures the effect of transport costs on export diversification. Prior scholars who used this indicator include Nathoo et al., (2021), Kareem & Martinez-Zarzoso (2020) and Bottasso et al., (2018). Similarly, the dummy for a common border captures the effect on trade between the importer and exporter if they share a common border. The literature suggests that countries which share the same border tend to have a positive impact due to lower costs on bilateral trade than countries which do not share land borders. Likewise, using the official language indicator was used in this study to check its influence on export diversification. The literature suggests that sharing the same language increase trade due lower cost of communication between the bilateral trade partners. Besides, the study measures the influence of being in the same regional trade block, such as EAC or SADC. The literature suggests that countries that belong to the same regional trade agreement trade more due to lower costs emanating from preferential import duty accorded to members of the same regional trade block.

Descriptive Analysis

Table **1** shows the summary statistics of the variables employed. The study's finding shows on average, Tanzania exports forty-two different products to its trading partners. This paper

presents trade facilitation by the infrastructure, whose indicators are the quality of roads, railways, ports, and airports. The findings show that the average score on road infrastructure is four while the minimum is one and the maximum is seven. This suggests that even though the performance is generally slightly above average at three points five, the quality of road infrastructure is poor in some other places. Similar observations are noted on the railway's infrastructure: the average performance is three, the minimum is zero, and the maximum is seven. A score of zero suggests that the railway infrastructure is completely obsolete or non-existent.

The study's findings on port infrastructure show an average score of four, with a minimum of one and a maximum of seven. This finding is similar to the score on the quality of airport infrastructure, which shows an average of four while the minimum is one and the maximum is seven. These findings suggest that the average quality score for port and airport infrastructure of four is above the average of three point five. Moreover, the higher performance is seven and a low score of one, suggesting that the quality of port infrastructure is good while other areas are not. The state of the overall transport infrastructure for all its variables shows a standard deviation of one. The standard gravity dummies deployed in this paper are distance, GDP of Tanzania's trading partner state or destination, contiguity, sharing the same official language, and being a member of EAC or SADC. An indicator for distance, use kilometres between the most populated city of Tanzania and its trading partners. The results for this indicator revealed that 7,000 kilometres are the average distance between Tanzania and the most populated cities of its trading partners. The shortest distance in this category is 700 kilometres, while the maximum distance is 15,000 kilometres. The standard deviation of distance is 3,400 kilometres.

The descriptive statistics for destination GDP show a mean of five hundred and sixty million USD. The minimum score result for this dummy variable is one million USD and the maximum of twenty thousand million USD. The destination's GDP indicates the country's purchasing power which imports goods from Tanzania. Other gravity dummy variables in this study comprise contiguity, common language, and being a member of regional integration such as EAC or SADC, which has two leading indicators. The performance results for these indicators are of two scores: zero and one. The zero scores suggest that Tanzania's training partner is neither a member of EAC nor SADC. Moreover, it is not sharing land borders (contiguity) or use the same official language. On the other hand, a score of one suggests that Tanzania's trading partner shares the same land border, uses the same official language, or are members of the same regional economic community, either EAC or SADC.

Table 1. Descriptive Statistic Values of Key Variables

Variable	Number of Observation	Mean	Standard Deviation	Minimum	Maximum
Export Diversification and Trade					
Export Diversification	1,222	41.80	88.26	0	643
Trade in values (Mil USD)	1,222	30.82	111.59	0	1,289
Infrastructure Environment					
Quality of roads	1,222	4.08	1.19	1	7
Quality of railways infrastructure	1,034	3.21	1.42	1	7

Quality of port infrastructure	1,222	4.24	1.11	1	7
Quality of air transport infrastructure	1,222	4.61	1.08	1	7
Standard Gravity Dummies					
Distance (most populated cities, in km *100)	1,222	69.95	34.47	7	153
Destination GDP (Mil USD)	1,222	563.22	1,819.24	1	19,519
Contiguity	1,222	0.06	0.23	0	1
Common Language	1,222	0.24	0.43	0	1
EAC Member	1,222	0.03	0.17	0	1
SADC Member	1,222	0.09	0.29	0	1

Analysis of the Measurement Model

The model estimates with overall infrastructure and gravity dummy variables by using PPMLHDFE are shown in column 1 of Table 2. The overall transport infrastructure includes roads, railways, ports, and airports. Findings suggest that infrastructure has a positive influence on export diversification. However, this result is not significant at a 5 % level. Colum two to six illustrate the influence of each transport infrastructure variable when it is analysed independently with its gravity dummy variables. The findings revealed similar outcomes of positive influence for all transport infrastructures except for road infrastructure which is presented in column two of Table 2. The result of road infrastructure indicates a negative influence of road infrastructure on export diversification. Nonetheless, this finding is not significant at a 5 % level. This suggests that the hypothesis is not supported.

Similarly, column three shows a positive influence on the quality of railways infrastructure on export diversification similar to port infrastructure quality shown in column four. However, both findings are not significant at 5%. This suggests that both hypotheses are not supported. Other standard gravity model variables, distance and tariff, have expected a negative influence on the number of products exported. The analysis results for the gravity dummy variable include GDP, using the same language, and sharing the same border shows an expected positive influence on export diversification at a 5% significance level. An indicator for EAC members shows a negative influence at a 5% level of significance.

Table 2: The Influence of Trade Facilitation on Export Diversification Using PPMLHDFE

	(1)	(2)	(3)	(4)	(5)	(6)
Overall Transport Infrastructure	0.036					
	(0.056)					
Road infrastructure		-0.222				-0.375
		(0.229)				(0.276)
Railroad infrastructure			0.228			0.337
			(0.259)			(0.233)
Port infrastructure				0.059		-0.019
				(0.188)		(0.205)
Airport infrastructure					0.295	0.432
					(0.168)	(0.245)
Distance (log)	-0.273	-0.171	-0.188	-0.124	-0.352	-0.679
	(0.508)	(0.438)	(0.569)	(0.409)	(0.399)	(0.428)
Average tariff in (logs)	-0.442	-0.307	-0.469	-0.324	-0.327	-0.474
	(0.283)	(0.223)	(0.289)	(0.239)	(0.235)	(0.265)
Importer GDP (log)	0.249	0.314**	0.222	0.265**	0.283**	0.322**
	(0.131)	(0.105)	(0.136)	(0.099)	(0.102)	(0.103)
Contiguity	1.336***	1.323***	1.354***	1.358***	1.338***	1.309***
	(0.108)	(0.082)	(0.118)	(0.096)	(0.079)	(0.101)
Common Language	1.771***	3.663***	1.905***	3.553***	3.392***	1.504***
	(0.493)	(0.236)	(0.539)	(0.222)	(0.235)	(0.431)
WTO Member	0.086	0.067	0.082	0.043	0.035	0.084
	(0.069)	(0.096)	(0.069)	(0.101)	(0.100)	(0.059)
EAC Member	-0.417*	-0.568**	-0.322	-0.498*	-0.535**	-0.496*
	(0.199)	(0.217)	(0.246)	(0.202)	(0.206)	(0.207)
SADC Member	-0.106***	-0.278*	-0.116***	-0.232*	-0.204	-0.168
	(0.031)	(0.115)	(0.017)	(0.111)	(0.122)	(0.087)
Importer fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Rsquared						
Observations	778.000	945.000	778.000	945.000	945.000	778.000

Notes: The tables shows the effect of trade facilitation on export diversification in Tanzania. The standard errors are in parenth > esis. ***, **, * indicate significance at 0.1, 1 and 5 percent levels, respectively.

Robustness Checks

The earlier findings were analysed by using PPMLHDFE. However, the robustness check in this study uses OLS, Tobit, and PPML. The purpose of analysis using OLS, Tobit and PPML is to test the reliability of the PPMLHDFE regression technique. Columns one, two, and three of Table 3 display the OLS, Tobit, and PPML analysis findings. This paper relies on the findings of OLS and Tobit presented in Table 3. The main reason is that PPMLHDFE is an extension of PPML, while OLS and Tobit are different independent gravity techniques which have been extensively used in the literature, as suggested by Kuc-Czarnecka et al. (2022).

Results of Robustness Check

A robustness check is done to check the reliability of PPMLHDFE by using OLS, Tobit and PPML. The findings for OLS and Tobit show a negative influence on export diversification for overall transport infrastructure and railways. However, these findings are not significant. Similarly, the analysis findings of the road infrastructure on export diversification revealed a negative influence on export diversification. The OLS finding is insignificant while Tobit shows a significant influence at a 5% level.

The airport infrastructure illustrates a positive influence on export diversification at a 5% level of significance. These findings were the same for both OLS and Tobit. The robust check analysis for other standard gravity dummy variables, such as distance and average tariffs imposed on the importing country, negatively insignificant influences export diversification. However, as expected, the GDP in the importing country and sharing the same border positively influences export diversification at a 5% significance level for OLS, Tobit and PPML. The results for these dummy variables portrayed the same pattern and hence supported the analysis of PPMLHDFE.

Table 3: Robustness Check of PPMLHDFE by Using OLS, Tobit, and PPML

	OLS (1)	OLS (2)	TOBIT (3)	TOBIT (4)	PPML (5)	PPML (6)
Overall Transport Infrastruc~e	-0.005		-0.010		0.036	
	(0.057)		(0.059)		(0.055)	
Distance (log)	-0.118	-0.215	-0.745	-1.369**	-0.344	-0.535**
	(0.258)	(0.269)	(0.478)	(0.519)	(0.194)	(0.180)
Average tariff in (logs)	-0.138	-0.205	-0.137	-0.227	-0.451	-0.483
	(0.163)	(0.169)	(0.170)	(0.175)	(0.276)	(0.258)
Importer GDP (log)	0.460***	0.503***	0.503***	0.551***	0.249	0.322**
	(0.103)	(0.105)	(0.109)	(0.113)	(0.131)	(0.103)
Contiguity	4.647***	4.388***	1.292***	1.146***	2.122***	2.079***
	(0.608)	(0.627)	(0.082)	(0.092)	(0.260)	(0.231)
Common Language	0.197	0.001	1.340*	0.490	0.153	-0.149
	(0.169)	(0.206)	(0.519)	(0.546)	(0.392)	(0.323)
EAC Member	0.000	0.000	-0.508**	-0.605**		
	(.)	(.)	(0.163)	(0.198)		
SADC Member	-0.058*	0.032	-0.065*	0.059	-0.106***	-0.167
	(0.026)	(0.060)	(0.026)	(0.070)	(0.031)	(0.087)
Road infrastructure		-0.020		0.013		-0.374
		(0.223)		(0.250)		(0.276)
Railroad infrastructure		-0.085		-0.100		0.338
		(0.215)		(0.234)		(0.233)
Port infrastructure		-0.283		-0.407*		-0.019
		(0.150)		(0.184)		(0.205)
Airport infrastructure		0.636*		0.763*		0.433
		(0.311)		(0.337)		(0.245)
Importer fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Rsquared	0.9	0.9			1.0	1.0
Observations	782.000	782.000	782.000	782.000	778.000	778.000

Discussion

This study intended to examine the influence of trade facilitation, operationalized in terms of the quality of the country's transport infrastructure i.e. roads, airports, railways, and ports, on export diversification. The results indicate that overall transport infrastructures do not have an influence on export diversification. Similarly, the results indicate that the roads, railways, and ports transport infrastructures have no influence on export diversification. The results suggest that there is a misalignment between the quality of infrastructure and export diversification in Tanzania.

Most African countries' exports rely on a small list of traditional agricultural products (Mazengia et al, 2023; Phiri, 2020) with the lowest export diversification globally (Fosu & Abbas, 2019). This situation is similar to Tanzania, whose primary exports, according to Lwesya (2016), include cashew nuts, tea, coffee, cotton, raw hides, skins, and tobacco. Similar findings were observed by Mufuruki et al. (2017), who reported that in 2014 Tanzania's exports mainly were gold, precious stone, raw tobacco, cashew nuts, raw cotton, and fish fillet, among others. These main export products are mainly transported through roads or ports and little go through railway. Therefore, since there is lack of enhanced diversification of export products for quite long in Tanzania and most African countries, enhancement of roads and ports quality mainly helps improvement of imports rather than exports. This explains why improved quality of roads, railways and ports does not have bearing on export diversification.

These findings are in conflict with most prior studies. For example, Elhiraika and Mbate (2014), found a significant negative influence of infrastructure on export diversification when examining determinants of export diversification in Africa. Conversely, Töngür and Ekmen – Özçelik (2020), who examined the link between infrastructure and export diversification in

Turkey found a significant positive influence of infrastructure on export diversification. Rehman et al. (2022), who did their study in China, reported similar results of a positive infrastructure influence on export varieties. The possible justification for this deviation between Tanzania and other African countries on one hand and Turkey, China and other developed countries is due to variations in the balance of trade. While Tanzania and most African countries are net importers, China, Turkey and other developed countries are net exporters. This suggests that improvement in the quality of transport infrastructures in the African countries cannot enhance export but it will do in the developed countries. In other words, in African settings, the problem is the lack of products to export rather than the means to export.

The study further indicated that the influence of each transport infrastructure variable when analysed independently of each other indicates that airport infrastructures positively influence export diversification. This suggests that the improvement in airports infrastructure enhances export diversification in Tanzania. A possible justification for this outcome is mainly contributed by the type of goods exported through airports which are mainly high-valued and perishables goods commonly referred to as non-traditional exports. Lwesya (2016) revealed that non-traditional exports from Tanzania comprise horticultural products, fish and fish products, and precious minerals. Accordingly, non-traditional exports have surpassed traditional products, mainly transported by other modes of transport, including roads, railways and ports. That is why the performance in increasing the number of primary commodities exported has not significantly changed.

Generally, the findings indicate that transport infrastructure in Tanzania does not enhance export diversification except for airports. The findings mean that Tanzania has little number of traditional mainly agricultural products which are the subject matter of export and has not improved for decades. On the other hand, the improvement of airports has opened doors to exportation of non-traditional products such as perishable goods and minerals. This means Tanzania and other African countries struggle more with lack of products to export rather than means of export.

Conclusion

This paper examines the influence of trade facilitation on export diversification, focusing on the role of infrastructure. The quality of roads, railways, ports, and airports represented the infrastructures, while the number of products exported from Tanzania represented export diversification. The results show that only airport infrastructure positively influences export diversification while the rest of the infrastructures do not significantly influence export diversification. The findings contribute to the understanding of the nature of influence of trade facilitation through transport infrastructure on export diversification in Tanzania which was identified as lacking. The findings are somewhat inclined to findings from other few studies undertaken in African countries which provide further insights in the challenges of export diversification in Africa.

The study findings indicate that Tanzania, like other African countries, struggles with the lack of products to export. The country still relies on traditional agricultural products for export. Due to underdeveloped manufacturing industry, the country export has not

enhanced for decades. This means that Tanzania needs to increase its product base for exportation concurrent to improvement of transport infrastructures. Therefore, it is important for the ministries responsible with agriculture, fisheries, livestock and manufacturing to find ways to identify new products that may be subject for exports. This may be done by putting in place policies that enable identification of new export markets and an increase in export products.

The study also indicated that export diversification is enhanced through improvement in the quality of airports infrastructures. This shows airports have opened up for possibility of exporting products which have not been possible to export through other infrastructures. This may imply that other possibly other infrastructures have limitations that inhibit transportation of perishable and valuable products. The ministry responsible for infrastructure needs to identify these inhibitors and see how they can be addressed. This study findings also supported Tanzania government's decision to acquire cargo aircraft as it will enhance export diversification by reducing trade costs and time compared to foreign commercial airlines. Therefore, the findings of this paper suggest to the ministry responsible for infrastructures the importance of continually investing in the development, maintenance, and upgrading of airport infrastructure to enhance trade facilitation.

This study has a limitation in using infrastructure related to transport to measure trade facilitation. Trade facilitation comprises of hard and soft infrastructure as suggested by Portugal-Perez and Wilson (2012). The hard infrastructure related to transport infrastructure as well as application of information and communication technology. Similarly, soft infrastructure related with regulatory environment and Customs. The paper suggests that future research may be conducted to examine the influence of trade facilitation on export diversification by using other dimensions of trade facilitation, such as regulatory environments or institutions involved in international trade or examine the influence of Customs on export diversification. Moreover, this study uses secondary data, future study may be done by using primary data collected from the firm level.

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