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The nexus of foreign trade and economic growth in Tanzania. Examining the influence of COVID-19 pandemic. Evidence from vector error correction model

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Abstract. *The study intended to study the relationship between foreign trade on economic growth (GDP) of Tanzania by examining the influence COVID-19 pandemic with evidence from Vector Error Correction Model. Dummy variable was used to capture COVID-19 impact. The study period spanned from 2002 to 2021. Foreign trade was defined by using export, trade openness and tariffs. The findings indicate that COVID-19 dummy variable (dmy) and tariffs (tr) are negatively significant at 1 percent and 10 percent respectively. While, export (exp) and trade openness (to) are statistically insignificant as a result the COVID-19 pandemic. The coefficient of the Error-Correction Term for the estimated GDP equation is both statistically significant and negative, implying that, it will rightly act to correct past deviations from the long- run equilibrium. The findings of this study have revealed a long run relationship between foreign trade and economic growth of Tanzania (GDP), while in the short-run, there is causality running from COVID-19 to GDP, unlike other independent variables, that is export, trade openness and tariffs that do not seem to have a short run relationship with GDP. For this reason, we recommend for reviewal of trade policies to fit the current global trading trend. Moreover, as the findings highlight that tariff have become more sensitive to foreign trade and economic growth, therefore, policy makers and practitioners are recommended to keep an eye on tariffs but also, re-setting the tariffs rates may be useful in this period. To boost export of a country, the government of Tanzania is advised to support domestic production through subsidies and other incentives.*

Keywords: Tanzania, economic growth, GDP, COVID-19, foreign trade, VECM.

JEL Classification:

1. Introduction

The role of international trade in influencing economic growth of countries around the globe has always been an issue of interest for searchers, economists and politicians. International trade also referred to as foreign trade, has caught headlines on top journal for decades now (Dutt et al., 2015). Obviously, around the world, it is likely inevitable for a country to endure behind locked doors (autarky economy) without engaging itself in foreign trade with other partner countries especially in the world of trade liberalization and globalization (Abubakar and Shehu, 2015). Thus, both classical and neoclassical schools of thought have defined considerable insights into international trade as a driver for the growth of the economy (Abubakar and Shehu, 2015). Many researchers and economic analysts such as Abubakar and Shehu (2015) and Agbo et al. (2018) come to an agreement that, opening doors to foreign trade speeds up the rate of economic development.

Many countries embrace trade liberalization of economies to attain economic growth, basically through foreign trade (Obadan and Okojie, 2016). Tanzania like other developing countries has taken advantage of foreign trade to speed up its economic growth (World Bank, 2020). Since 1996 when Tanzania opened doors for trade liberalization and thereafter known as an open economy, the country has attracted numerous trading partners around the globe including China, India, and intercontinental trading (World Bank, 2021). According to the Bank of Tanzania, 2020, until 2019 about 4% Tanzania's GDP was represented by foreign trade.

The key objectives of the country's trade policy are to enhance domestic industries that appeal to the prevailing competition around the globe and to enable diversification of the exportation sector to stimulate the country's economic growth (UN Comtrade, 2020). Indeed, over the last decades, Tanzania has maintained a comparatively high economic growth rate averaging form 6 percent of 7 percent. Tanzania's growth accompanied by other development indicators, was noticed and the country officially graduated from low income to lower middle-income economies in 2020 (World Bank, 2020).

Despite the challenges in infrastructures which create trade barriers, Tanzania through its membership in different international communities such as East African Community (EAC) and South African Development Community (SADC) enjoys trade interactions through trade agreements with other member states as well as direct trade relations with the United States and the European Union (Bank of Tanzania, 2020).

With diverse of natural resources, Tanzania has been exporting mainly agricultural products, minerals such as gold and raw materials (Manamba and Mwakalasya, 2017; Manamba, 2016). A number of researchers, have pointed out that export-led growth hypothesis which believes that exports can be an engine of growth has indeed been and engine country's (Tanzania) growth (Kilindo, 2019; Manamba, 2016). Further studies conducted in Tanzania also indicated a positive significant impact of export on economic growth and foreign trade as a whole (see Magai, 2018; Nguto, 2020).

Nevertheless, in defining foreign trade, not only export is considered, but also trade openness which is measures the extent to which a country is engaged in the global trading system. Is measured by the ration between the sum of import and export to Gross Domestic

Product. (GDP). Trade openness captures the level of trade liberalisation in a country. (Fetaki-Vehapi et al., 2015; Ismail and Lwesya, 2021)

The relationship between trade openness and economic growth has been analysed from theoretical to empirical literatures. The traditional trade theory of Ricardian-Heckscher-Ohlin outlines that trade openness enhances output in the short-run through more efficient allocation of resources. According to the endogenous growth models of Grossman and Helpman (1991) and Rivera-Batiz and Romer (1991), trade openness promotes growth in the long-run through the transmission of technologies, increases in the size of the market available to domestic firms and through product specialisation. A number of empirical studies have examined the long-term impact of trade openness on economic growth and most studies conclude that there is a positive relationship between the variables (Alragas et al., 2015 and Keho, 2017). Other researchers suggest that trade openness does not trigger growth (Trejos and Barboza 2015). Furthermore, some studies argue that trade openness has a positive effect on economic growth under certain conditions. Ahmed and Suardi (2009) suggest that trade openness is beneficial in countries with a more diversified export structure while Fetaki-Vehapi et al. (2015) state that trade openness impacts positively on economic growth in countries with higher initial per capita incomes, higher levels of foreign direct investments and gross fixed capital formation.

However, it is worth noting that foreign trade performance in all countries of the globe has been highly disturbed as a result of COVID-19 pandemic. (World Bank, 2021). The pandemic has disturbed the supply chain system, while COVID-19 protective measures such as lockdown, border closure and travel restrictions highly declined countries' economic growth since revenues earned through foreign trading dropped tremendously (Ibn-Mohammed et al., 2021; Thuy and Manh, 2021; Eddy et al., 2020; Kazunobu and Hiroshi, 2021)

Studies that were analysing the impact of COVID-19 pandemic in Tanzania specifically, including; Pantaleo and Ngasamiaku (2021) and Katera (2021), revealed that the pandemic weakened in economic activities especially exports and imports and increased government spending which resulted to the decrease in economic growth.

Graphs 1 and 2 show the trend of Export and GDP (Economic growth) as well GDP and COVID-19 pandemic respectively in Tanzania. In Graph 2, the break in 2020 is evident. This is more likely due to COVID-19 pandemic. GDP declined dramatically from 5.8% in 2019 to 1.99% in 2020, while export declined from 16.0% in 2019 to 14.2% in 2020 (World Bank Development Indicators (WDI), 2021). However, from year 2021 GDP seems to start increasing event to 4% from 19% in 2019. This is the sign of the economy recovery from the pit of COVID-19 pandemic. According to The Game Changer (2020, pp. 513-552), the efforts aimed at enhancing stability in all sectors of the economy anticipated to bring productive effects. In specifying the impact of COVID-19 pandemic on different sectors of the economy, namely transport, education, tourism and hospitality, manufacturing, agriculture, construction and real estate, financial sector and retail businesses, the chapter indicated despite the fact that the pandemic hit the country's economy, the government's response was undeniable hope for the better economy and quick recovery The Game Changer (2020, pp. 513-552). From 2021, borders had started to open up, allowing for

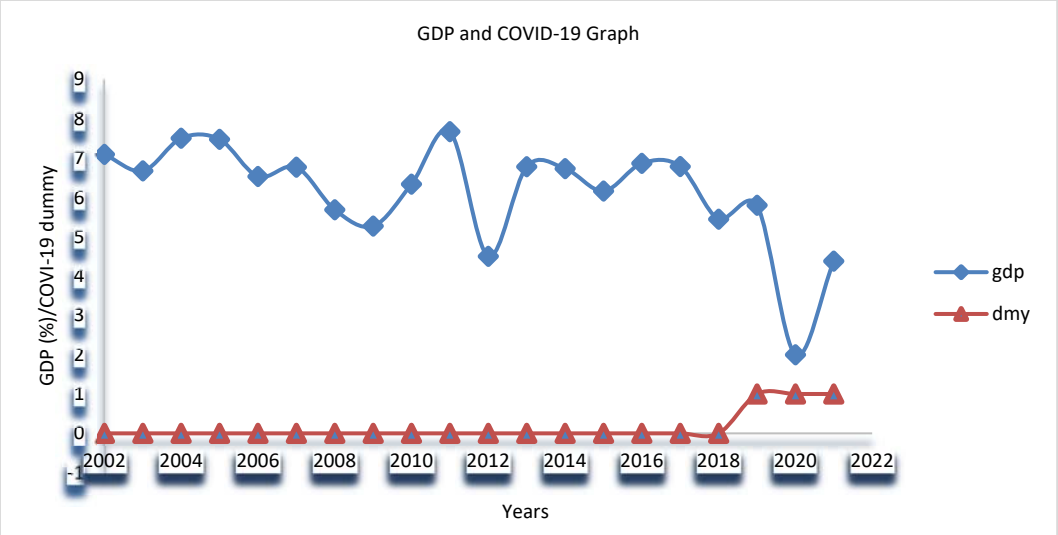
international trade to take place, the incoming of tourists in Tanzania, opening of businesses that had closed during the lockdown the actions that indeed contributed highly to the growth of Tanzania's economy (GDP).

In the same manner, Graph 1 indicate a decline in economic growth during the period of COVID-19 pandemic, especially in 2020, whereas, the GDP starts rising from 2021, accompanied by a slight increase in export.

Graph 1. *GDP and export in Tanzania from 2002 to 2021*

Source: Authors construction from WDI, 2022.

Graph 2. *GDP and COVID-19 pandemic in Tanzania from 2002 to 2021*



Source: Authors construction from WDI, 2022.

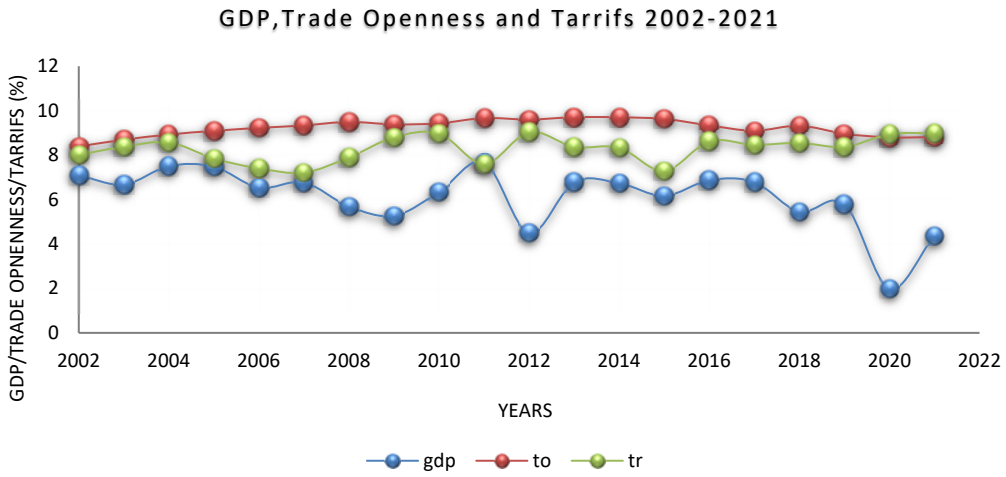
Although it has been two years since the eruption of COVID-19 pandemic, its impact on foreign trade which in turn impact economic growth, can not be ignored. There are already researches that highlights foreign trade-economic growth relationship taking into consideration the impact of COVID-19 pandemic, but most of these studies are featuring developed and high emerging economies for instance (Jianfei et al., 2021; Carlos et al., 2022; Anandaraman, 2021; Ibn-Mohammed et al., 2021; Nashwan et al., 2021 and Eddy et al., 2020). Others are cross country and general studies capturing the global foreign trade in relations to COVID-19, or cross countries that make it cumbersome to draw a robust conclusion when viewing a single country like Tanzania (Kazunobu and Hiroshi, 2021; Antonietti et al., 2021; Barlow et al., 2021; Bontempi and Coccia, 2021; Thuy and Manh, 2021; Carlos et al., 2022).

There are very limited studies on foreign trade and economic growth in relation to the COVID-19 in Africa. Among them are Anyanwu and Salami (2021), and Kehinde and Gidigbi (2021). In Tanzania to be precise, there are studies by Pantaleo and Ngasamiaku (2021) and Katera (2021), that both analysed the impact of COVID-19 on transport sector in Tanzaania. Katera (2021) stressed on transport sect, while Pantaleo and Ngasamiaku (2021) undertook a cross sectors study, generally highlighting how export and impart had been affect as one of the sectors in the economy. Therefore, according to the best of our knowledge (presently), there is no a study that stresses on the impact of COVID-19 on foreign trade and economic growth.

Based on this fact, the present study intends to fill the existing literature gap by examining the impact of foreign trade on economic growth by considering the influence of COVID-19 pandemic in Tanzania, using Vector Error Correction Model. Furthermore, since majority of previous studies highlighted a presence of long-run and significant relationship between foreign trade and economic growth for instance: Osabuohien, 2007; Sakyi, 2011; Arodoye and Milton, 2014; Makun, 2017; Khobai et al., 2018; Kilindo, 2019; Yusuf and Omar, 2019; Magai, 2019; Nguto, 2020; Malik and Muhammad, 2020; Khandaker and Khairul, 2020; Ismail and Lwesya, 2021). With exceptional of few studies that revealed a mixed finding, including Zahonogo, 2017; Sabina and Mehic, 2018; Nguyen and Bui, 2021; Madinatou et al., 2022). This study therefore seeks to examine whether the impact of foreign trade on economic growth (as revealed on previous literatures) has changed after COVID-19 pandemic. Differently from past studies, the present study will take into consideration the effect of tariffs as one of the proxies of foreign trade. As claimed by Rodriguez (2000), direct trade policy measures, namely tariff rates, non-tariff barriers on imports directly affect a country's trade volume. Additionally, Urasan (2014), whose study concluded that tariff rate is negatively associated with economic growth and lowers foreign trade, motivates us the re-think the importance of including tariffs a variable that previous studies have not considered.

Graph 3 illustrate the trend on trade openness (to), tariffs (tr) and GDP. While trade openness is a bit smaller comparing to the spread on tariffs and GDP, tariffs seem to be more volatile comparing to trade openness. This is an alarm that tariff is a variable to watch closely. In 2020 the graph depicts no gap between trade openness and tariffs, while GDP had declined severely.

Graph 3. *GDP, trade openness and tariffs in Tanzania from 2002 to 2021*



Source: Authors construction from WDI, 2022.

2. Literature review

The contribution of trade particularly foreign trade on economic growth had attracted both empirical and theoretical literatures.

International trade theories

Comparative advantage theory. David Ricardo (1817) and Heckscher-Ohlin (H-O) (1933) are among the pioneers of trade theories. They both concentrated on the determinants of global production. The Ricardo theory of Comparative Advantage ascertain that that if one nation has absolute advantage in all goods and one country has no absolute advantage in all products, trade will be advantageous for two nations. Similarly (H-0), theory investigated the association between technology and production location of multinational firms. The model predicted that production location is acquired by the divergence in labour productivity that may be grounded by the production gap techniques between countries. Therefore, each country has to produce goods with relatively higher yields and to be able to import other goods. Each country generates goods using available factors and sometimes exchanges goods using its available resources via international trade.

The theory of Absolute Advantage. Provided by Adam Smith in 1776, however, claims that a nation should specialize in certain goods that it can manufacture effectively.

Theory of Mercantilism. It was popularized by Adam Smith. It upholds those countries should encourage exports and deter imports, since income of a nation depends on the export-minus import balance

Export base theory. Nicholas Kaldor as the pioneer of the export-led growth model made the foundation of the theory on the concept of cumulative causation. The export base theory

provides the basis for the notion that trade stands as an engine for economic growth, hence export growth provides productivity benefits and positive externalities to the countries participating or partners (Lam, 2015; Daniel, 2000)

Endogenous growth theories. The Endogenous Growth Theory emphasises the importance of economic growth within the economic field. Mankiw et al. (1992) is one of the main contributors to this theory. The model proposes ways by which growth in less developed countries could be accelerated by making maximum and efficient use of available resources. Generally, the theory states that the output per worker (growth per unit of labour) increases with the output per capita (growth per unit of capital) with increasing rate. This theory capitalises on the demise of the Solow Model. Solow (1956) that had failed to explain how to determine the GDP growth rate (Brzezinski and Dzielinski, 2009).

Selected empirical literatures

Different studies had revealed different findings on foreign trade and economic growth subject matter. While greater number of Resches identifies a positive influence of foreign trade on economic growth, other researchers still claim a mixed findings while others conclude a non-liner and non-significant influence.

Arodoye and Milton (2014) used quarterly time-series data for 1981Q1 through 2010Q4 and vector autoregressive model, the study revealed a stable, long- run relationship between foreign trade and economic growth on developing countries. The findings by Arodoye and Milton (2014), were supported by Farahane and Heshmati (2020) who highlighted that foreign trade is the engine of economic growth.

Hummera, Malik and Muhammad (2020) using bootstrap auto regressive distributed lags (ARDL) cointegration test to examine the long-run relationship among FDI, GDP and TO for selected South Asian countries for 1975-2016. The findings highlighted that economic growth (EG) is significantly related to Trade Openness. The findings also agree to Khandaker and Khairul (2020) on the study on Asian countries, whose results also found a positive impact of trade openness on economic growth

Kilewise, when assessing the impact of international trade on development, Mounir and Atef (2021) trade openness has no effect on economic growth in the short-term. Yet, in the long-term, trade openness has a significant negative impact on country's economic growth of Saud Arabia. In analysing the impact of COVID-19 in the first quarter, Hayakawa and Mukunoki (2020)

Highlighted that the pandemic resulted from greater decline of export in developing countries than developed countries.

Similarly, Ogbokor and Meyer (2019), also found positive relationship of foreign trade variables as well as long-run relationship accompanied by co-integration among the variables in Namibia. With the use of Vector Auto-Regression (VAR) technique. Similar findings were concluded by Khobai, Kolisi and Moyo (2018). Using autoregressive distributed lag model the paper highlighted long run relationship between foreign trade defined by trade openness and economic growth in Nigeria and Ghana. Khandaker and Khairul (2020) on the other hand employed vector error correction model while Granger

causality analysis and concluded a bidirectional causality between trade openness and economic growth while stressing a positive impact of trade openness. On the other hand, a number of studies revealed a mixed finding. Pooled OLS findings by Madinatou, Simon and Yin (2022) show trade openness has a mixed influence on economic growth of sub-Saharan Africa countries. And, when subdividing Africa into sub-regions, trade openness demonstrated a non-linear relationship. The results were in line with Madinatou, Simon and Yin (2022) who added that while export boost growth in Africa, imports stifle growth. Sabina and Mehic (2018) also, revealed that trade openness had mixed findings on economic growth of transition economies

Surprisingly, Malefane and Odhiambo (2021) concluded that foreign trade through trade openness has no significant impact on economic growth in both the short run and long run in Lesotho, Tinta, et al. (2018) has previously concluded the same findings, arguing that international trade does not provide a better solution to lift economies of the countries within regional integrations. Whereas, Zahonogo (2017) revealed a positive up to a threshold on sub-Saharan African countries. Thresholds were also revealed by Nguyen and Bui (2021) who concluded a nonlinear impact of Trade Openness on Economic Growth.

On Tanzania context however, almost all researchers' findings on the reviewed literatures had concluded a significant impact of foreign trade on growth. Magai (2018) used Autoregressive Distributed Lag to analyse the impact of foreign trade on economic growth in Tanzania, with import, export, exchange rate and foreign direct invest as independent variables. The findings of the study confirmed the existence of a long-run relationship between selected variables, implying that in the long-run, all variables can move together, export having significant influence on economic growth in Tanzania. His findings were in line with Manamba (2016) revealed that export and trade liberalization were highly influential to and real GDP (economic growth) and had a stable long-run relationship. As well as Romanus and Utonga (2019).

Yusuf and Omar (2019) utilized co-integration and Vector Error Correction Mechanism (VECM) approach to test the relationship between trade openness and economic growth in Tanzania, and findings revealed a positive long run relationship between trade openness and economic growth in Tanzania over the study period, while granger causality test revealed that, there is no causal relationship between trade openness and economic growth in Tanzania, the findings that confirms to Hamad et al. (2014).

Who revealed a long run relationship between export and economic growth, and existence of causality which runs from economic growth to exports. In the same vein, Kilimbo (2019) used Error Correction Model to investigate the export-led hypothesis in Tanzania. The results supported a long-run relationship between exports and economic growth in Tanzania during the period of study in support of the Export-Led Growth Hypothesis. Nguto (2020) and Mkubwa, Mtengwa and Babiker (2014) employed a slightly different method (OLS) yet the findings still indicated a significant impact and relationship. In examining the impact of international trade on the economic growth of Tanzania, Nguto (2020) used Ordinary Least Squares (OLS) and export and import as proxies of international trade. The study concluded that foreign trade plays a substantial role in the economic growth of Tanzania. Kilewise, Mkubwa, Mtengwa and Babiker (2014) indicated

that trade openness had a positive and significant effect on economic growth in Tanzania. The study adopted a simple linear regression model.

Differently, according to Ismail and Lwesya (2021), while trade openness and real effective exchange rate recorded insignificant association, export had a significant impact of growth, accompanied with long-run relationship with economic growth of Tanzania. ARDL model was used for analysis. Using autoregressive distributed lag (ARDL) bound testing approach. Their findings were indeed in in with Malefane and Odhiambo (2021) and Tinta et al. (2018)

The view of foreign trade in relation to COVID-19 pandemic had caught attention of number of reaches. Studies that were conducted examining the impact of foreign trade on economic growth in relation to COVID-19 pandemic, also revealed different outcomes.

Antonietti et al. (2021), Barlow et al. (2021), and Bontempi and Coccia (2021) started the debate by claiming that international trade through trading network contributed to the pandemic spread among nations or trading partners. Jianfei et al. (2021) highlighted that trade restrictions and domestic lockdown measures had resulted in restrictions on air, main land, and sea transportation routes, and interruption of production, which had a serious negative impact on manufacturing production and its import and export trade for a period of time. Carlos, Antonios and Carsten (2022) employed Fuzzy-set Qualitative Comparative Analysis (fsQCA) on country level analysis highlighted that COVID-19 weakens international trade resilience. Similar findings were revealed by (Khandaker and Khairul, 2020; Bontempi and Coccia, 2021)

Anyanwu and Salami (2021) using the paper used conceptual analysis highlighted that international trade was affected during the COVID-19 pandemic especially in the lockdown that resulted into failure of commercial activities. Likewise, Kehinde and Gidigbi (2021) raised a concern of less stimulus of foreign trade as a result of COVID-19 pandemic destructions for the active period of the pandemic especially on countries that implemented locked-down policies. Equally, Thuy and Manh (2021) foreign trade had dramatically declined as a result of disruption of shipping and the entire international transport. Border closure and shutdowns worsen the global trade and dramatically increased trade costs on the global trade. Output decline and increased foreign trade costs (Nashwan et al., 2021). Albertoni and Wise (2021) in the study of international trade norms in the age of COVID-19 the pandemic is said to adversely affect export-import and foreign trade as a whole, but did not reveal to what extent.

The same findings, were obtained in the research by Ibn-Mohammed et al. (2021) who urged that COVID-19 pandemic had adversely affected international trade by disturbing the global supply chain. Additionally, Barlow et al. (2021) and Eddy et al. (2020) concluded that COVID-19 affected foreign trade in both supply and demand and had negative impact on export and import, therefore leading to negative impact on economic growth. In relation to foreign trade on economic growth, Chinedu et al. (2022) raised the issue of tax polies (tariffs) claiming that they had accelerated adverse impact of COVID-19 on economic growth by raising the cost of foreign trade especially during the COVID-19 pandemic.

The study by Kazunobu and Hiroshi (2021) stressed that regardless of our measures to quantify the COVID-19 pandemic, COVID-19 has a significantly negative effects on the international trade of both exporting and importing countries. The study that was undertaken in Tanzania, Katera (2021) revealed that COVID-19 pandemic has impacted the trade and transport sectors differently. In a way that, even within the same sector, different sub-sectors had been differently affected. On the trade sector, the study concluded that through import and export were affected, trade sector as a whole was not very much affected, while Pantaleo and Ngasamiaku (2021) revealed that COVID-19 have weakened trading sector (exports and imports), leading to the decrease in economic growth.

Past pieces of literatures have discussed the impact of foreign trade on economic growth, even how COVID-19 has adversely impacted foreign trade. However, by how much the pandemic had affected the economy (GDP) through affecting foreign trade is still unfilled puzzle. The literatures that incorporated the effect of COVID-19 pandemic have used conceptual analysis, cross sectional survey and qualitative analysis Anyanwu and Salami (2021) such as Fuzzy-set Qualitative Comparative Analysis Carlos, Antonios and Carsten (2022) therefore, making it difficult to draw solid robust findings. The studies before COVID-19 however, used mixed approaches and methods, yet came up with mixed findings. From the reviewed works of literatures, it is evident that no consensus on foreign trade-growth subject, neither before nor after the COVID-19 studies are clear. In fact, the pandemic has brought even more confusion in a sense that prior COVID-19 studies and findings may have less significance after the pandemic that has altered global trade to different trend. This calls for more researches with more focus on the impact of foreign trade on economic growth while considering the influence of the COVID-19 pandemic. Additionally, on literature as a whole, as stated earlier, developing countries specifically African has attracted very few literatures on the subject matter. The present paper, intends to close both literature and methodological gap by quantitatively examining how foreign trade is impacting Tanzanian economic growth by keenly observing the influence of COVID-19 pandemic, by using the Vector Error Correction Model (VECM) for the period of 2002 to 2021.

3. Methodology

Data and variables

On examining the impact of foreign trade on economic growth, the present study uses secondary data from World Bank Development Indicators (WDI, 2021). From reviewed literatures, we use export, trade openness, tariffs and we employed a dummy variable to capture the impact of COVID-19, with zero (0) before the pandemic period and one (1) during the Covid-19 (2019 to 2021). The study period if from 2002 to 2021, the period id justified by the fact that it includes the time when Tanzania had already adopted trade liberalization (adopted in 1996) with open economy, which allows foreign trade (export and import) and the fact that it also include a COVID-19 period, from 2019 to 2021.

Model specification

Specified equation for impact of foreign trade on economic growth is as follows:

$GDP = f(EXP, TO, TR, DMY)$ (i)

The variables appearing in the equations are defined as follows:

GDP = Real GDP (economic growth) in annual percentage.

EXP = Total Export of goods and service, percent of GDP.

TO = Trade Openness, measured by the ratio of sum of export and import divided by GDP.

TR = Trade tariffs rate, percentage of GDP.

DMY = Dummy variable capturing the impact of COVID-19, assigned 0 before and 1 after the pandemic.

$$GDP_t = \beta_1 EXP_t + \beta_2 TO_t + \beta_3 TR_t + \beta_4 DMY_t + \Theta_t \quad \text{(ii)}$$

From (ii), unrestricted error correction model (ECM) can be presented as:

$$\Delta GDP_t = \beta_1 \Delta EXP_{t-1} + \beta_2 \Delta TO_{t-1} + \beta_3 \Delta TR_{t-1} + \beta_4 \Delta DMY_{t-1} + \Theta_t \quad \text{(iii)}$$

$$\Delta GDP_t = \beta_1 \Delta EXP_{t-1} + \beta_2 \Delta TO_{t-1} + \beta_3 \Delta TR_{t-1} + \beta_4 \Delta DMY_{t-1} - \\ - \lambda_y (GDP_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + \Theta_{t-1} \quad \text{(iv)}$$

$$\Delta X_{t-1} = \beta_1 \Delta EXP_{t-1} + \beta_2 \Delta TO_{t-1} + \beta_3 \Delta TR_{t-1} + \beta_4 \Delta DMY_{t-1} - \\ - \lambda_x (GDP_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + \Theta_{t-1} \quad \text{(v)}$$

Where:

$\alpha_0 - \alpha_1 x_{t-1}$ is the long-run cointegration relationship between the variables (GDP *(Y)* that is dependent variable and foreign trade *(X's)* that independent variables defined by export, trade openness, tariffs and dummy) and λ_y and λ_x are the error correction parameters that measure how *Y* and *X* react to deviations from long-run equilibrium. The error term (Θ_t) is assumed to be identically, independently and normally distributed i.e., $\Theta_t \sim iid(0,\sigma^2)$ and *(t)* index time. For the examining a long-run relationship the bound Cointegration test based on critical values adopted from Pesaran et al. (2001) is used with the null and alternative hypotheses as follows:

$H_0 = \beta_1$ to β_4 = zero (0) = No long-run relationship among the variables.

$H_1 = \beta_1$ to β_4 = different from zero (0) =There is long-run relationship among the variables.

Estimation techniques

The co-integration and error-correction methodology (ECM) is employed. The ECM helps minimizing the possibility of estimating spurious relations, whereas at the same time retaining long-run information in the data. However, following Ramírez et al. (2002), whose study highlighted that if the model's error term is normally, independently and

identically distributed OLS yields the efficient/unbiased estimators for the model's coefficients, the results for OLS are also reported and analyzed.

Granger causality test

Granger Causality test the methods that are used to test a lagged relationship between two variables. This test also gives information about the short-term relationship between the variables. It is used to determine the direction of causality between variables in the long-run using the t-statistic and in the short-run using the F-statistic. Optimal lag length for the VAR model is determined by using the Akaike Information Criterion (AIC) and the Schwartz Bayesian Information Criterion (SBIC). Basing on these criteria, VAR (3) is selected. According to this test, a variable (economic growth) is said to Granger cause another variable (exports) if past and present values of economic growth helpto predict exports. The VAR (3) model is estimated basing on the following pair of regression equations (3) and (4) with stationary variables:

$$\Delta GDP_t = \alpha \sum_{i=1}^{4} \lambda_i \Delta GDP_{t-i} + \alpha \sum_{i=1}^{4} \alpha_i X_{t-i} + \varepsilon_{1t} \quad \text{(vi)}$$

$$\Delta X_t = \beta \sum_{i=1}^{4} \gamma_i \Delta GDP_{t-i} + \alpha \sum_{i=1}^{4} \Theta_i X_{t-i} + \varepsilon_{2t} \quad \text{(vii)}$$

Where: α and β and intercepts, λ_i, γ_i and Θ_i show contributions of each lagged observation to the predicted values of GDP, foreign trade (x) variables. ε_{1t} and ε_{2t} are predicted errors for each series.

When we assume that ε_{1t} and ε_{2t} are not serially correlated, then, to test for the causality, the joint hypotheses: Θi = 0, for i =1, …, m and γi = 0. i =1, …, m are tested. The test (t-stat) statistics follow a Chi-squared distribution with (k-m) degree of freedom. The variables X are said not to Granger-cause the variable *GDP* if all the coefficients of lagged *X* in equation (vi) are not significantly different from zero. If none of the null hypotheses is rejected, it means we accept the claims that *X* variables do not Granger cause *GDP* and *GDP* also does not Granger cause *X*. This indicates that the two variables are independent of each other. If all hypotheses are rejected, there is bi-directional causality between *X* and *GDP*.

Time series characteristics of the data

Unit root test

As a rule of thumb, use of time series variables in estimating econometric models requires that a stochastic process generating the data series be stationary. The distinction between whether the levels or differences of a series is stationary leads to substantially different conclusions and henceforth, it is crucial to test the order of integration of each variable in a model, to establish whether it is non-stationary and how many times the variable needs to be differenced to derive stationary series Engle and Granger (1987), define a non-stationary time series to be integrated of order *d* if it achieves stationarity after being differentiated *d* times. This notion is usually denoted by *Xt ~I(d).* The null hypothesis of the unit root implies non-stationarity, such that if the null hypothesis is rejected then the

series is stationary. Hence, no differencing in the series is necessary to induce stationarity. The present study uses Dickey-Fuller (ADF) to test stationarity. The beauty of ADF unit root tests is that it makes a parametric correlation for higher-order correlation by assuming that the series follows autoregressive process and adjusting the test methodology. ADF test also controls for higher-order correlation by adding lagged difference terms of the dependent variable to the right-hand side of the regression model

Multicollinearity and heteroscedasticity

Multicollinearity exists when independent variables are correlated in a regression model and it may induce problems when estimating and interpreting the model by weakening the statistical power of the model. (Gujarati, 2012). We use the Variance Inflation Factor (VIF) to test presence of multicollinearity. The test hold that, explanatory variables with VIF exceeding 10 values may threaten the results while VIF between 1 and 10 values can be tolerated.

On the other hand, we employ to Breusch-Pagan/Cook-Weisberg test and *ARCH* Model *to* test Heteroscedasticity on in regression analysis, heteroscedasticity, the problem that is being looked at in terms of the error term or residual. The null hypothesis is that there is heteroscedasticity and can be rejected if Prob. Chi-Square is greater than 5 percent.

Testing cointegration

Testing for cointegration provides the basis in which we trace the long-term relationship between the variables. Variables are said to be co-integrated if their linear combination is integrated to any order less than 'd'. There are two procedures that are popularly used to identify and estimate the cointegrating vectors and the short run adjustment parameters. These are Granger and Engle two-step estimation procedure and the Johansen procedure. Granger and Engle involves normalizing the cointegrating vector on one of the variables, which makes the assumption that the corresponding element of the cointegrating vector is not-zero. The Johansen procedure is a multivariate approach, the estimation of which would consume a lot of degree of freedom. We test long run relationship among the variables will be tested using the Johansen cointegration technique. The theory of co-integration put forward by Johansen and Juselius (1990) indicates that the maximum likelihood method is more proper in a multivariate system.

4. Empirical results and discussion of the findings

Descriptive statistics

Table 1 provides a descriptive statistic of the variables used in the paper. As reported in the table, the Jarque-Bera probability fails to rejects the null hypo- thesis of no normally distribution among the variables. Nonetheless, variables are transformed into their first difference to reduce the severity of multicollinearity and serial correlation that might happen among the variables. The estimates suggest that the correlation between the GDP and export is positive, the same GDP is negatively correlated with trade openness, tariffs and COVID-19 variables. Surprisingly, COVID-19 dummy variable

seems to have a positive correlation with trade openness. On the other hand, export is negatively correlated with COVID-19 and tariffs variables. In fact, from the literatures that addressed a severe adverse impact of the pandemic of growth and export, it is not a surprise to see that COVID-19 is negatively correlate with growth and export. The pandemic variable is also positively correlated with tariffs and this indeed confirms Nashwan et al. (2021) and Chinedu et al. (2022) who highlighted the increase of tariffs making foreign trade costly as a result of COVID-19 pandemic

Table 1. *Descriptive statistics*

Variables	Obs	Mean	Std. Dev	Min	Max	Kurtosis	Skewness	Variance	Jarque-Bera
Gdp	20	6.123	1.338	1.996	7.672	5.5667	-1.5662	1.7893	.72
exp	20	17.37	2.421	14.277	22.372	2.2271	.4612	5.8588	.51
to	20	-2.274	1.583	-5.0580	-2.442	1.9664	- .5160	2.51	.27
tr	20	8.281	.579	7.21	9.03	2.1074	- .4920	.3354	.24
dmy	20	.15	.366	72	1	4.8431	1.9603	.1342	.17

Source: Authors estimates from literature review.

Table 2. *Matrix of correlations*

Variables	gdp	exp	to	tr	dmy
(1) gdp	1.000				
(2) exp	0.186	1.000			
(3) to	-0.170	-0.731	1.000		
(4) tr	-0.515	-0.231	0.198	1.000	
(5) dmy	-0.665	-0.417	0.420	0.361	1.000
Source: Authors estimates from STATA 14.					

Time series properties of the data

Stationarity tests

Unit root test results reported in Table 3, indicate that the hypothesis of a unit root cannot be rejected in all variables in their levels. Therefore, it is concluded that all variables are non-stationary at their levels. Nevertheless, the same hypothesis of a unit root is rejected in first differences, suggesting that, variables are stationary at first differences and hence further estimations could be carried while in first differences for the sake of avoiding spurious correlation and results.

Table 3. *ADF Unit Root Tests for Stationarity: Variables at Level and First-Difference, Δ*

Maximum rank	Levels		First-Difference, Δ	
Optimal	Constant	Constant and trend	Constant	Constant and trend
Lag = 1	$\alpha_1 = 0$	$\alpha_1 = \alpha_2 = 0$	$\alpha_1 = 0$	$\alpha_1 = \alpha_2 = 0$
gdp	-0.072	-1.002	-3.315	-3.519
exp	-2.024	-2.274	-7.898	-7.890
to	-2524	-1.655	-6.436	-6.725
tr	-2.019	-1.892	-5.649	-5.621
dmy	-1.146	-1.785	-6.069	-5.986
5%-Critical Value	-2.923	-3.404	-2.925	-3.509

Sample: 2004-2021, Lags = 2.
Source: Computed Using from WDI data, with STATA 14.

Cointegration test results

Having established that the variables are non-stationary at level but when integrated of the same order (first difference) they become stationary, the next procedure is to test the possibility of long run relationship among the variables used in the regression model. Trace statistic is used to determine the presence of co-integration between variables. Table 4 reports the results of the Johansen test for cointegration. On the basis of on the trace statistic value test and the maximum eigen value test, the null hypothesis of no cointegration (r = 0) is rejected at the 5% level of significance in favour of the alternative hypothesis, that is, there is at most one cointegrating vector (r = 1) (Because the first significant value, where trace statistic is less than critical value, is found at maximum rank of one). This implies that a linear combination of all the five series is found to be stationary and that, there is a stable long-run relationship between the series.

Table 4. *Johansen co-integration test*

Maximum rank	**Eigenvalue**	**Trace Statistic**	**5% Critical value**
None		113.4703	68.52
At most 1	0.98370	39.3731*	47.21
At most 2	0.77260	12.7146	29.68
At most 3	0.41436	3.0837	15.41
At most 4	0.15745	0.0000	3.76
At most 5	0.00000		
Maximum rank	**Eigenvalue**	**Maximum Statistic**	**5% Critical value**
None		74.0972	33.46
At most 1	0.98370	26.6585*	27.27
At most 2	0.77260	9.6309	20.97
At most 3	0.41436	3.0837	14.07
At most 4	0.15745	0.0000	3.76
At most 5	0.00000		

Sample: 2004-2021, Lags = 2.
Source: Authors' Computations (2022) from STATA 14.

Estimation results of the model

Table 5. *Regression model estimation results*

Gdp	**Coef.**	**St.Err.**	**t-value**	**p-value**	**[95% Conf**	**Interval]**	**Sig**
ECM_{t-1}	-1.032	.52	-1.98	.047	2.052	-.013	**
exp	-.042	.143	-0.29	.775	-.346	.263	
To	0	0	0.39	.702	0	0	
Tr	-.759	.431	-1.76	.099	-1.677	.159	*
dmy	-2.264	.741	-3.05	.008	-3.844	-.684	***
Constant	13.659	4.33	3.15	.007	4.429	22.889	***

Mean dependent var	6.123	SD dependent var	1.338
R-squared	0.651	Number of obs	20
F-test	4.595	Prob > F	0.013
Akaike crit. (AIC)	59.371	Bayesian crit. (BIC)	63.354

*** p < .01, ** p < .05, * p < .1.
Source: Authors estimates from STATA 14.

Estimation results presented in Table 5 indicates that the F-statistic is significant at one percent, hence rejecting the null hypothesis that all the explanatory variables have coefficients not different from zero. This is to say that, F-statistic of 4.6 suggests that

explanatory variables jointly affect GDP. The Durbin-Watson statistic *(DW)* of 2.0 in Table 5 fails to reject the null hypothesis of no serial correlation in the regression model. Furthermore, R-squared, which measures the goodness of fit of the variables, is greater than 50%, which is sufficiently large, suggesting that about 65 percent of the variations in economic growth of Tanzania is jointly explained by the explanatory variables, that is exports, trade openness, tariffs and the COVID-19 dummy variable. On the significance of individual variables, COVID-19 dummy variable is the most significant variable, having a negative significance at one percent. The results suggest that for each year of COVID-19 added, tends to affect the GDP by 2.26 percentage points. Tariff is another significant variable in the model. It is significant at ten percent, meaning that for each increase of tariffs by one percent as a result of the COVID-19 pandemic, reduces GDP of Tanzania by 75 percent.

By considering the impact of COVID-19 pandemic, the findings reveal that export and trade openness are insignificant. This is not a surprise however. From the reviewed literatures, we have observed that COVID-19 pandemic has adversely affected foreign trade particularly export as a result of closure of border and ports, postponed and reduced production, as well as disturbance in the whole global supply chain hence resulting into a massive decline in export (See: Hayakawa and Mukunoki, 2020; Khandaker and Khairul, 2020; Bontempi and Coccia, 2021; Antonietti et al., 2021; Barlow et al., 2021; Anyanwu and Salami, 2021; Pantaleo and Ngasamiaku, 2021; Kehinde and Gidigbi, 2021; Thuy and Manh, 2021; Nashwan et al., 2021 and Albertoni and Wise, 2021). Other Studies went on to discuss that taxes on foreign trade are increasing the burden, making international trade more costly (Nashwan et al., 2021 and Chinedu et al., 2022).

The coefficient of the Error-Correction Term, ECT_{t-1} for the estimated GDP equation is both statistically significant and negative, implying that, it will rightly act to correct past deviations from the long- run equilibrium. The coefficient of -1.03 denotes that 1.03 percentage points of any pastdeviations will be corrected in the current period.

The diagnostic tests show that the error correction model does not suffer from non-normality. The histogram and Jarque-Bera normality test (Table 7) with the null hypothesis that residuals are normally distributed, probability values are greater than 5% thus, we cannot reject the null hypothesis. That is, residuals of the model are normally distributed. Furthermore, in Table 6, the Breusch-Godfrey serial correlation Lagrange Multiplier (LM), and Shapiro-Wilk W test confirm that the residual terms in the model are not serially correlated (serially independent). This is also supported by correlogram test in Table 8. In the same manner, the ARCH LM test strongly suggests that there exists no heteroscedasticity in the residual terms of the model (Table 6). Likewise, Ramsey RESET test suggests that the model is correctly specified (Table 6) since the probability value is greater than 5 percent. This allows us to confidently accept the null hypothesis that the model has no omitted variables. The VIF test results in Table 9 show that there is no multicollinearity problem among independent variables since the VIF result for each variable and the mean as well is below 10. In fact, the mean is less than 2 (1.45), indicating a clear model, free from multicollinearity. The fact that the Error Correction Model passes all the diagnostic tests, the findings are reliable.

Long-run and short-run relationship among the variables

Assessing the long-run causality

The EMC model depicted in Table 5 and on Appendices A.1 clearly reveals that there a is long run causality running from export, trade openness, tariffs and COVID-19 variables to GDP. A negative (-1.032) ECM model and statistically significant at 5 percent, indicate the presence of long-run relationship among the variables under this study.

Assessing the short-run causality

After observing that there is a long-run relationship among the variables, we are curious to know the short-run relationship among the them. The null hypothesis that no short-run causality running from independent variables to Economic growth (GDP) is rejected in all variables except dummy variable. This is because probability values of Chi2 are not significant at 5 percent and different from zero in Table 5, for export, trade openness and tariffs. Whereas, for COVID-19 dummy, we fail to reject the null hypothesis, since the probability significant at 5% meaning that there is a short-run causality running from COVID-19 dummy variable to GDP. This consistent with the findings of this study shows COVID-19 as the most significant variable with more influence on GDP for the short period of time since it was announced a pandemic in late 2019 (WHO, 2020).

Table 6. *ARCH, Breusch-Godfrey, Shapiro-Wilk and Durbin-Watson Test*

Heteroskedasticity test: ARCH		
F-statistic	Chi-Square	1.033
Obs*R-squared	Prob. Chi-Square	0.3095
Breusch-Godfrey serial correlation LM test:		
F-statistic	Prob.	3.914
Obs*R-squared	Prob. Chi-Square	0.479
Ramsey RESET test		
F-statistic	Probability	0.25
Prob > F	Probability	0.8592
Shapiro-Wilk W test for normal data		
W = 0.956	Z	-0.072
V= 0.965	Prob>z	0.529
Durbin-Watson d-statistic (5, 19) = 2.603768		

Source: Authors estimates from STATA 14.

Table 7. *Jarque-Bera test*

Equation	**chi2**	**df**	**Prob>Chi2**
D_gdp	0.556	2	0.757
D_exp	0.899	2	0.638
D_to	1.023	2	0.600
D_tr	3.245	2	0.197
D_dmy	1.245	2	0.537
ALL	6.967	10	0.729

Source: Authors estimates from STATA 14.

Table 8. *Correlogram test*

LAG	AC	PAC	Q	Prob>Q	-1 0 1 [Autocorrelation]	-1 0 1 [Partial Autocor]
1	0.1782	0.1961	.73548	0.3911		
2	-0.0251	-0.0523	.75093	0.6870		
3	-0.1984	-0.2291	1.7701	0.6215		
4	0.1461	0.3014	2.3573	0.6704		
5	-0.2015	-0.3331	3.5486	0.6160		
6	-0.1569	-0.1486	4.3225	0.6331		
7	-0.0087	0.1788	4.3251	0.7417		
8	0.2502	0.2237	6.6201	0.5781		

Table 9. *Test for multicollinearity*

Variable	VIF	1/VIF
to		
D1.	1.79	0.557142
tr		
D1.	1.49	0.669757
dmy		
D1.	1.34	0.745122
exp		
D1.	1.17	0.855021
Mean VIF	1.45	

5. Conclusion and policy recommendation

What previous studies lacked was actually clear metrics on how much and to what extend COVID-19 is adversely affecting foreign trade and therefore deterring economic growth and that is the gap that this study has filled. Moreover, the study intended to examine if the impact of foreign trade, on economic growth (that is positive impact), which has been revealed by approximately more than a half of the reviewed literatures that were conducted before the COVID-19 pandemic are still the same findings during and after the COVID-19 pandemic. Indeed, the findings of the present study clearly point out that the pandemic has altered the direction, that is impact that foreign trade used to have on economic growth. For this reason, we recommend for reviewal of trade policies to fit the current global trading trend. Moreover, as the findings highlight that tariff have become more sensitive to foreign trade and economic growth, we recommend policy makers and practitioners to keep an eye on tarries but also, re-setting the tariffs rates can be useful in this period. Similarly, domestic production should be encouraged by providing of subsidies and other incentives so as to boost export. Since export has been and will remain an import engine any economy growth, Tanzania government need to really encourage domestic producers so as to increase export and curb the associated costs as seem to be increasing as the result of the pandemic. Conclusively, the present study reveals that there is a long run relationship between foreign trade economic to growth of Tanzania (GDP), while in the short-run, there

is causality running from COVID-19 to GDP, unlike other independent variables, that is export, trade openness and tariffs that do not seem to have a short run relationship with GDP.

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Appendices

A1. *Vector error-correction model*

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
D_gdp: _ce1L1	-1.032	.52	-1.98	.047	-2.052	-.013	**
gdp.LD	.125	.313	0.40	.691	-.489	.738	
exp.LD	-.037	.184	-0.20	.84	-.398	.324	
to.LD	0	0	0.61	.544	0	0	
tr.LD	.055	.485	0.11	.909	-.895	1.005	
dmy.LD	-2.613	1.196	-2.19	.029	-4.957	-.27	**
Constant	-.125	.24	-0.52	.602	-.596	.345	
D_exp: _ce1L1	-2.055	.553	-3.72	0	-3.138	-.971	***
gdp.LD	1.121	.333	3.37	.001	.469	1.774	***
exp.LD	.482	.196	2.46	.014	.098	.865	**
to.LD	0	0	0.13	.9	0	0	
tr.LD	-1.43	.515	-2.78	.006	-2.439	-.42	***
dmy.LD	-.518	1.271	-0.41	.683	-3.009	1.973	
Constant	.046	.255	0.18	.858	-.455	.546	
D_to: _ce1L1	8.032	5.113	1.57	.116	-1.990	1.805	
gdp.LD	-5.086e	3.078	-1.65	.098	-1.112	947078	*
exp.LD	-3.565	1.809	-1.97	.049	-7.111	-18563	**
to.LD	.028	.321	0.09	.93	-.601	.658	
tr.LD	-924131	4.764	-0.19	.846	-1.026	8.413	
dmy.LD	-1.256	1.175	-0.11	.915	-2.429	2.178	
Constant	4.34	2.362	0.00	1	-4.629	4.629	
D_tr: _ce1L1	.09	.459	0.20	.844	-.809	.99	
gdp.LD	-.151	.276	-0.55	.584	-.693	.39	
exp.LD	-.062	.162	-0.38	.703	-.38	.256	
to.LD	0	0	-0.12	.905	0	0	
tr.LD	-.422	.428	-0.99	.323	-1.26	.416	
dmy.LD	.558	1.055	0.53	.597	-1.51	2.625	
Constant	-.003	.212	-0.01	.988	-.419	.412	
D_dmy: _ce1L1	-.139	.145	-0.96	.339	-.423	.146	
gdp.LD	.033	.087	0.38	.702	-.138	.204	
exp.LD	-.01	.051	-0.19	.846	-.111	.091	
to.LD	0	0	-0.90	.366	0	0	
tr.LD	-.044	.135	-0.32	.746	-.309	.221	
dmy.LD	.234	.333	0.70	.483	-.42	.887	
Constant	.028	.067	0.42	.671	-.103	.16	

Mean dependent var	0.000	SD dependent var	0.758
Number of obs	18.000	Akaike crit. (AIC)	.

*** p < .01, ** p < .05, * p < .1.

A.2. *Selection criteria*

Selection-order criteria
Sample: 2006 - 2021 Number of obs = 16

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-429.975				2.8e+17	54.3718	54.3842	54.6133
1	-387.384	85.182	25	0.000	3.8e+16	52.173	52.2471	53.6216
2	-287.358	200.05	25	0.000	1.3e+13	42.7947	42.9307	45.4505
3	867.156	2309	25	0.000	1.7e-46*	-99.0195	-98.8341	-95.398
4	2152.69	2571.1*	25	0.000	.	-259.086*	-258.888*	-255.223*

Endogenous: gdp exp to tr dmy
Exogenous: _cons

A.3. *ADF unit root test*

Dickey-Fuller test for unit root Number of obs = 19

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-2.836	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0533