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Statistical Analysis of Trade-Development Linkage in Nigeria: The COVID-19 Era and Beyond

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ABSTRACT

Aim of the Study: In this study, the trade-development impact of COVID-19 is examined for the period spanning 2020-2021 covering 24 months. Some economic variables were converted appropriately into monthly basis to give similar frequency of data.

Methodology: The theoretical framework us based on the system theory and thereafter the two-stage least regression technique applied was applied on the relationship between each of trade and per capita income and the COVID-19 related variables including total confirmed cases, total death retarded in one way or the other trade relation and per capita income growth. Total number of laboratory tests retarded both trade and per capita income level during the period. Sensitivity analysis shows contrary effects of export and import trade on per capita income.

Findings: Research findings show that COVID-19 related variables including total confirmed cases, total death retarded in one way or the other trade relation and per capita income growth. Total number of laboratory tests retarded both trade and per capita income level during the period. Besides, sensitivity analysis shows contrary effects of export and import trade on per capita income; a reason attributed to overdependence and low domestic production. In all the economic variables employed as explanatory, only exchange rate showed a significant positive impact on trade and per capita income level.

Conclusion: The study concluded that the economy should encourage huge domestic production to reduce over dependence during and beyond the COVID-19 era. This aside from increasing domestic consumption will encourage revenue inflow that can serve as bail out in the period of global scarcity of funds.

Keywords: Trade, Development, COVID-19**,** Two-Stage Least Square.

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Introduction

COVID-19, a pandemic which emerged in December 2019 in China has become a universal challenge to health conditions. The pandemic has tampered with the situations in the global economy creating what is often termed a New Normal. The encircling capacity of the pandemic has resulted in different nomenclatures from various angles. For example, Gorbalenya et al. (2020) assert that the International Committee on Taxonomy of Viruses (ICTV) renamed the pandemic as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The detrimental effects of the pandemic have penetrated deeply into the world economy leading to a pronounced slack in economic activities including prolonged macroeconomic challenges. The spread of the virus which on a daily basis led to increasing levels of infections, death rate, among others initiated several government containment measures around the globe. While these measures such as lockdown and social distances became very necessary, the immediate negative impact remained inevitable (McKibbin & Fernando, 2020). The threats of the pandemic are not only on sustainable Development Goals (SDGs) alone but as well making them almost unattainable. Besides, the sustainable development derivatives including tourism, business, trade, management, etc have been in a state of deterioration. Many countries in the sub-Saharan Africa (SSA) including Nigeria, South Sudan, Sudan and the Democratic Republic of the Congo, have been thrown into social, socio-economic and political challenges and varying conflicts including corruption and poor governance system and these challenges have made the region highly vulnerable to COVID-19 pandemic since its emergence. Nigeria despite being one of the strongest economies in African continent (Kiangoi, 2020) is beset with fundamental challenges –high poverty level, poor quality education, among others which are further aggravated by poor governance system. The existing fragile progress recorded on these development indicators and other key SDG goals gives room for the COVID-19 outbreak to alter the process of development as set out in the 2030 Agenda. The intensiveness of the pandemic has shown a rising trend in the spread globally. For example, Nigeria confirmed a total of 46,577 cases early August of 2020. The health crisis emanating from the pandemic exacerbated the ongoing inequalities and making further creating more dimensions. As a result, Nigeria, overpowered by the informal sector, experiences a large decline in trade, welfare and consumption levels and demonstrated by the worsening economic performance over time. Based on recent rankings, Nigeria fell in bottom of 10 countries on an aggregate score of 100 in terms of progress made on all 17 SDGs. The rise in the COVID-19 pandemic spread rate has continuously weakened the growth and development plan in Nigeria. As of Q_1 of 2020, growth rate dropped by about -0.23% points basis compared to Q_1 of 2019 and then -0.68% points in comparison with Q_4 of 2019 (Proshare, 2020). However, the economy expanded in real terms in 2021 with about 3.4%, the fastest growth since 2014. The pandemic has caused economic difficulties as experienced from the deteriorating international trade, travel and domestic consumption which are consequences of containment measures put in place.

Motivation for the Study

Trade is expected to increase vaccines production and creating an inclusive growth thus, helping to combat the pandemic and move towards SDGs. Nigeria's trading activities shoot up in 2021 both at the domestic and international levels recording first trade surplus in 2021 compared to negative trade balance in the previous quarters of acute COVID-19 attack. The post COVID-19 era is to benefit the Nigerian trade sector through the African Continental Free Trade and will further boost trading activities among African nations. Attaining the SDGs which proves almost difficult following the pandemic effect and the possibility of achieving the goals in the post COVID era creates a motivation for this study.

Objective of the Study

Major objective of the study is to analyse the effect of COVID-19 related variables including total confirmed cases, total death, total number of laboratory tests and macroeconomic variables such as exchange rate, interest rate etc on trade and per capita income in Nigeria

Literature Review

Generally, it is of the belief that COVID-19 effects on trade flow among countries remains noticeable through reduction in the volume of imports and exports and thus further affecting countries income levels, these effects however still vary across countries. This is attributable the role which trade costs play across countries. Trade costs are linked to economic policy compared to other policy instruments such as tariffs which appear to be less important. WTO (2021) has stressed that trade differences are expected among high, low and middle- income countries on the basis of what constitute trade costs. Information flow, transport and costs of transactions appear to be relevant in engaging in trading activities between high-income countries whereas differences in trade policy and regulatory differences explain trade between low and middle income countries. Besides, issue of products composition is also another good reason and by convention, average skills put into production are more intensified to increase quality and spread of products in high income countries compare to low and middle income countries (Minondo, & Requena-Silvente, 2013). In this case, some specific products may require more technical knowledge and this may involve interventions of skills from many other countries (Barbero, de Lucio & Rodrı´guez-Crespo (2021)). However, it has been made clear that countries' participation in global chain activities is dependent on their levels of income and consequent upon their objectives in focus. For example, high income countries focus more on achieving growth and sustainability while attraction of foreign direct investment and increase in economic status can be fundamental to low and middle income countries. Also, Jobs availability is with lower share than what is needed in the home country and as such makes employment opportunities be more sensitive to the lock down as containment measure in the COVID-19. It is also not an exaggeration to mention that health care commodities are not affordable in some low income countries and as such effect of COVID-19 may be more pronounced for such countries with unaffordable medical supplies and hence negative impact on trade is more obvious and retard sustained growth.

Given the above discussion, it is expected that different countries respond to trade shocks which emanate from COVID-19 differently on the basis of their income levels. This has not been widely explored in the literature research on COVID-19 and trade.

The advent of the COVID-19 pandemic has resulted in a decline in the globalisation process. Some scholars are of the opinions that COVID-19 may likely end the globalisation process others have predicted that it will change it dimension (The Economist 2020; Yip, 2021) while others admit that it will not (Altman, 2020). Ideally, globalisation has created numerous gains to the world economy but at the same time it has been the cause of supply chain risks in which nations, corporations and individuals experience ((Goldin & Mariathasan, 2015; Scheibe & Blackhurst, 2018). The risks are often experienced in the areas widespread and long period of scarcity of commodity or service for which there may probably not be alternatives (Sheffi & Lynn, 2014). This invariably retards trade flows, integration and sustainable growth.

Highly globalised nations including United Kingdom, Italy and France were hard hit (Ahluwalia, 2020). The process of globalisation was induced economic and social linkages which have equally enhanced interdependence of many types paving way for the spread of the virus (Mas-Coma, Jones, & Marty, 2020). In reaction to this, borders were close, thus limiting trade and business activities. Governments began to contend access to few resources such as oil, vaccines, personal protective equipment (PPE) and ventilators ((New York Times, 2020; Chowdhury et al., 2020). With this situation, this has a ripple effect on global supply networks and affecting trade and development.

The advent of COVID-19 may be linked to the systems theory. Systems theory considers possible sources of emerging problems and observes the individual impact on the economic system. A system itself is a connection of things or partly connected thereby forming a complex whole. Based on (Ackoff, 1981, pp. 15-16) description, in a system, each element impacts on the functioning of the whole, is being affected

by at least any other element in the system and that all possible subgroups of elements are considered to have the first two properties as identified.

Empirical studies have been carried out on trade and previous and current pandemic within a short period. Fernandes & Tang (2020) estimated the effect of first SARS pandemic on Chinese firm. Trade data employed was based on quarterly transaction-level an results showed that Chinese regions existing in a local transmission of the pandemic witnessed a reduction in the margins of trade and that trade from more skilled and capital-intensive products was less sensitive to the pandemic. Studies have equally focused on COVID-19 trade shock but then limited to certain countries. Bu¨chel, Legge, Pochon & Wegmu¨ller (2020) examined the case of Switzerland through combination of weekly and monthly trade data during the lockdown for mid-March through end of July using information disaggregated by product and trade partner. Their study found among other findings, that Swiss trade dropped 11% in comparison with the corresponding period of 2019 during the lockdown signifying a trade shock proving more prominent than the previous 2009 trade shock. Kejzar & Velic (2020) employed a gravity model for the EU member states for June 2012-May 2020, to examine the role of chain forward linkages for COVID-19 demand shocks transmission. They observed that as pandemic spread and more measures taken both demand and labour supply shortage, including production declined.

Methodology and Data

The theoretical framework for this study centers on the system theory which considers possible sources and evaluate the role of each individual problem plays in the system. As an application to COVID-19, the pandemic is seen as an upsurge constituting problems and impacting negatively on the health and economic status of the global economy as a whole, Nigeria inclusive.

In what follows, the research questions answered are as given below:

How do COVID-19 and macroeconomic environment affect export trade and development in Nigeria and how do COVID-19 and the macroeconomic environment affect import trade and development in Nigeria?

On a general note the effect of COVID-19 on trade and development of the Nigeria economy is in focus. This theory in this case guides in the model specification as follows:

$$\exp ort = f(COVID-19, MACENV)$$

$$import = f(COVID-19, MACENV)$$

$$pci = f(COVID-19, MACENV)$$

$$\exp ort = \alpha_0 + \alpha_1 sprdrt + \alpha_2 tcc + \alpha_3 td + \alpha_4 tf + \alpha_5 t \ln t + \sum_{i=1}^{n} X_i + \mu \quad (1)$$

$$import = \beta_0 + \beta_1 sprdrt + \beta_2 tcc + \beta_3 td + \beta_4 tf + \beta_5 t \ln t + \sum_{i=1}^{n} X_i + \mu \quad (2)$$

$$pci = \delta_0 + \delta_1 sprdrt + \delta_2 tcc + \delta_3 td + \delta_4 tf + \delta_5 t \ln t + \sum_{i=1}^{n} X_i + \mu \quad (3)$$

In the functional specifications above, $COVID-19$ defines the pandemic related variables and the $MACENV$ is defined as the macroeconomic environment reflecting the contribution of macroeconomic variables in the system. This is stated in a more explicit form in the specifications (1), (2) and (3). The $\exp ort$ and $import$ represent the export and import volumes respectively, $sprdrt$ represents the spread rate of the virus, tcc is total confirmed cases, td is total death resulting from the virus, tf represents total

fatality case, and $t \ln t$ defines the total number of laboratory tests. X_i shows variables representing the macroeconomic environment such as exchange rate, interest rate and per capita income aside from the trade variables and μ is error term. $\alpha_0, \ldots\ldots\ldots, \delta_5$ are parameters to be estimated. The per capita income measures the level of development though this has been partly contested in literature due to inequality arising from this particularly in the developing world. But because this available, the study intends employing it.

Data Analysis Technique

Estimation technique is based on the two-stage least square regression on the basis that in the equations some specific variable act as dependent in one scenario and independent in the other. Two-stage least is a special instrumental variable estimation technique that corrects issue of endogeneity within variables in a given specification.

Data for this study is obtained for the period 2020-2021 covering 24 months altogether. The study employs monthly data based on existing COVID-19 cases. However, some economic variables needed to be converted into monthly bases to give data in similar frequency.

Data on COVID-19 related variables from National Centre for Disease Control (NCDC). The export and import volume variables were obtained from the National Bureau of Statistics (NBS)

Results

In order to avoid spurious regression results, the study carried out a stationarity test of variables employed. Variables that were stationary in their level forms include total number of laboratory tests, total confirmed cases and total death. However, spread rate, exchange rate, interest rate, export volume and total fertility rate were stationary in their first differences while per capita income and import volume remained stationary in their second differences (results not shown due to space constraint).

Table 1: *Two-Stage Least Square Regression*

Dep.	**EXP**	**Prob.**	**IMP**	**Prob.**
C	0.01	0.93	-97.38	0.40
SPRD RT	1.60	0.86	-0.01	0.78
EXR	1.60	0.03	1.29	0.11
INT	27.32	0.44	36.66	0.34
EXPORT	-------	------	-------	------
IMPORT	------	------	------	------
PCI	-23.59	0.14	5.73	0.73
TCC	-0.03	0.55	-0.09	0.14
TD	-0.04	0.46	0.10	0.08
TF	0.09	0.12	0.04	0.49
TNLT	-0.16	0.55	-0.32	0.28
R^2 ADJ.	0.75			0.66
PROB. F	0.00			0.00
PROB. J STAT	0.00			0.00
INST. RANK	11			11
DW	1.61			2.36

Source: Author's computation using E-views

Table 1 clearly shows the two-stage least square regression for the export equation, import equation and the per capita income equations.

Discussion

Table 1 shows the estimation results of the trade and per capita income equations containing a mixture of COVID-19 related variables and economic variables as explanatory variables. First, focusing on the export and import equations, exchange rate variable impacted positively but not significant on export and import volumes during the 24 month-period of the analysis. This points to the fact that appreciation of the domestic currency lowers importation costs as the economy can import more volumes.

Interest rate variable demonstrated a positive impact on both export and import during the period. However, a rising interest rate was expected to cause a declining investment which thus could lead to reduction in export volume.

Per capita income related positively with import but negatively with export volume. Thus, increase in the level of development can lead to trade orientation in the case of import. It however, gives a contrary sign to export volume.

Table 2: *Two-Stage Least Square Regression*

Dep.	**PCI**	**Prob.**	**PCI**	**Prob.**
C	3.94	0.01	4.67	0.005
SPRD RT	-0.0004	0.62	-0.0005	0.56
EXR	0.02	0.13	0.01	0.52
INT	-0.41	0.48	-0.73	0.24
EXPORT	-0.01	0.14	-------	-----
IMPORT	------	------	0.001	0.73
PCI	------	-----	------	------
TCC	0.001	0.10	0.002	0.03
TD	-0.002	0.04	-0.002	0.06
TF	0.001	0.40	0.0002	0.82
TNLT	-0.002	0.58	-0.001	0.82
R^2 ADJ.	0.20		0.07	
PROB. F	0.19		0.36	
PROB. J STAT	0.00		0.00	
INST. RANK	11		11	
DW	1.03		1.02	

Source: Author's computation using E-views

On the per capita income equation, the sensitivity analysis was performed in terms of substituting export for import and vice versa within the explanatory variables. While import related positively with per capita income, export related negatively. The positive relationship of import with per capita income may be attributed to Nigeria's high level of dependence on foreign goods and as such greater part of income is expended on foreign consumption. The negative relationship of export with per capita income demonstrated lack of self reliance and inadequate production base. Exchange rate appreciation favoured the level of development in both cases. Thus, currency appreciation is expected to reshape the naira position and put it on a steady equilibrium at the domestic and international level. For the future and given a large domestic production, appreciation of the naira may still be further pursued even beyond the pandemic era.

Interest rate showed a negative impact in both cases. This is expected in the sense that a lower interest rate increases investment, output level and thus sustained economic growth. Given adequate containment measures and macroeconomic stability, this is expected to trend beyond COVID-19 era

Turning to the COVID-19 related variables, total number of laboratory tests for COVID-19 related negatively on export, import and per capita income (see tables 1 and 2). Thus, increase in the number of laboratory tests is demonstration of the effect of the pandemic. This subsequently reduced trade relation

and development level during the period. Results also show that spread rate reduced import volume and per capita income, total confirmed cases reduced export and import volumes, and total death resulting from COVID-19 reduced export and per capita income during the 24 month period of analysis but significant for the per capita income. The reduction in export arsing from COVID-19 is inline with Fugazza (2020) who indicated that total commodity export in this case to China reduced due to COVID-19 pandemic. In the same vein, export trade reduction and welfare decline representing per capita income due to COVID-19 also agree with the findings of Manasseh (2021) who carried out a study on the impact of COVID-19 pandemic on export, welfare and economic growth in Nigeria with refrence to pre and post era.

Explanatory variables have a high explanatory power up to about 75% variation in the export equation whereas little is explained about the variation in per capita income where import was part of the explanatory variable. Thus, other per capita income determinants were probably not included due to data issues.

The export and import equations are not affected autocorrelation compared to the per capita income equation. The model is adequate in each case on the basis of the F-probability values

Conclusion

Trade-development impact of COVID-19 was examined during the 2020-2021 period on a monthly basis accounting for about 24 month's duration. Some background information showed detrimental effects of COVDI-19 on health and economic conditions including trade and income growth during the period. Application of the two-stage least regression technique showed that in most cases, COVID-19 related variables including total confirmed cases, total death retarded in one way or the other trade relation and per capita income growth. Total number of laboratory tests retarded both trade and per capita income level during the period. In all the economic variables employed as explanatory, only exchange rate showed a positive impact on trade and per capita income level and further indicated the significance of domestic currency appreciation. The sensitivity analysis carried out demonstrated that export and import volumes gave contrary impacts on per capita income level. This was attributed to over dependence and poor domestic production base. The Nigerian economy should plan for further containment measures beyond the era of COVID-19 to reduce any pandemic stress. The containment measures should be well complemented by increasing the supply chain which should rely more on large domestic production. This will not only reduce the negative effect on health but also curtail economic problems that may arise subsequently. Stability of the economy is also quite essential through policy formulation that could drive the economy towards appreciable growth path.

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Conflict of Interest

Authors have no conflict of interest.

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