THE IMPACT OF ECONOMIC INFRASTRUCTURE INVESTMENT ON FOREIGN TRADE FLOWS: THE CASE OF SOUTH AFRICA

Nomfundo Portia Vacu-Ngqila *
The Department of Economics University of South Africa, Pretoria, South Africa.
vacunp@unisa.ac.za

Abstract: *A well-functioning economic infrastructure is fundamental for sustainable economic growth in both developing and developed countries. It can be an effective tool for addressing economic and socioeconomic challenges and improving a country's competitiveness. It is therefore critical to understand how economic infrastructure investment affects different aspects of economic growth. This would assist policymakers in ensuring that there is proper alignment between policies on infrastructure development and policies pertaining to economic development. Although many studies have been conducted on the impact of infrastructure development on economic development, literature focusing on the foreign trade aspect is scant. This study, therefore, bridges this gap by examining the impact of economic infrastructure investment on foreign trade flows in South Africa in the long run and short run. To examine this linkage, the study applied the autoregressive distributed lag (ARDL) bounds test on annual data for the period 1986 - 2022 and estimated two models. Model 1 investigates whether economic infrastructure investment has a significant impact on exports, while Model 2 examines the impact of economic infrastructure investment on imports. The findings of the study confirmed that economic infrastructure investment has a positive impact on exports both in the long run and short run, while it has no significant impact on imports. On the control variable, the findings confirmed that economic growth only has a long-run positive impact on exports, while it has a long-run and short-run positive impact on imports. It was found that trade openness and real effective exchange rates have positive effects on foreign trade flows regardless of the proxy used. The results confirmed that human capital has a negative effect on exports in the long run and short run, while it only has a positive long-run impact on imports. Furthermore, the findings show that money supply does not affect exports, while it negatively drives imports both in the long run and short run. Based on the main findings, the study recommends that governments should design policies that support investment in improving the country's geographical conditions and connectivity. Furthermore, it is recommended that the South African government should prioritize the establishment and maintenance of functional economic infrastructure to create a conducive environment for local productivity and exports.*

Keywords: ARDL Model, Economic Infrastructure Investment, Foreign Trade Flows, Imports, South Africa, Exports

JEL codes: F14, H54

1. Introduction

Worldwide, foreign trade is viewed as a long-run and short-run catalytic agent for economic growth and integration of developing economies into the world economy. It provides poor

* Cite as:
The journal editors will add this information after completion of the volume!

and resource-constrained countries with access to capital from developed countries and promotes efficient allocation of resources through a comparative advantage (Chang et al, 2009). Furthermore, foreign trade provides easy access to economies of scale and international specialization for developing and developed countries (Suriaganth and Abdullah, 2021). Estimates from the World Bank (2023) confirm that foreign trade contributes significantly to economic growth, accounting for 63% of the world's gross domestic product. In the case of South Africa, foreign trade also plays a critical role in boosting economic growth and integration. Since democracy, the country has made significant strides in integrating itself into the world trading system by signing various multilateral and bilateral agreements with multiple regions and individual countries. These agreements have boosted the contribution of foreign trade to the country's economy by reducing trade costs and integrating the country into the world supply chain. This can be seen through the increases in foreign trade as a share of GDP since democracy from 37% in 1994 to 66% in 2023 (World Bank, 2023). Although the contribution of foreign trade has increased over the years, the country's trade account faced chronic fluctuations for a long time, with trade deficits dominating. In 2016, the country started continually recording a trade surplus, however, the magnitude of this surplus has started diminishing in recent years. According to the estimates from the World Bank (2023) South Africa's trade surplus as a share of national output declined from 6.1% in 2021 to 0.3% in 2023.

South Africa's inability to maintain a healthy trade account raises questions on the country's ability to create a conducive environment for trade, especially, exports. Existing literature points out the cost of trade emanating from the geographical position of the African continent as one of the biggest factors undermining foreign trade in African countries, as it makes the continent economically remote from the world markets (African Bank, 2010). According to Etensa. *et al,* (2022) a sustainable and effective solution to this challenge would be securing and maintaining a functional economic infrastructure as it reduces transport costs, improves connectivity, and boosts productivity. A functional infrastructure reduces trade costs, improves a country's comparative advantages, and promotes the country's intraregional trade to the world economy (Brooks, 2018 cited in Ahmad, 2016). Furthermore, enhanced infrastructure reduces both bilateral and multilateral trade costs (Donaubauer, 2018).

The current study explores the impact of economic infrastructure investment on foreign trade flows in South Africa. It particularly focuses on whether economic infrastructure investment drives foreign trade and impacts the different components of foreign trade differently. Although previous studies have extensively examined the role of economic infrastructure investment in promoting different aspects of economic growth, literature on its role in promoting foreign trade activities remains scant. As far as we understand, no study has examined the effects of economic infrastructure investment on foreign trade flows in the case of South Africa.

The remaining sections are structured as follows: sections 2 and 3 present the literature review examining infrastructure development's impact on foreign trade and model specifications and the econometric methodology employed in the study, respectively. The empirical results and conclusion of the study are presented in sections 4 and 5, respectively.

2. Literature Review

The impact of economic infrastructure investment on foreign trade has been explored in numerous studies for both developing and developed countries. The findings from these studies are inconclusive, as some studies confirmed a positive link, while some confirmed a negative link or no significant link between the two variables. For example, Shepard and Wilson (2007) examined the impact of infrastructure quality of interregional trade in countries of Europe and Central Asia using the ordinary least squares method and the Pseudo Poisson Maximum Likelihood (PPML). The study employed annual data covering the period from

1995 to 2004, and the findings confirmed that proper infrastructure has a positive impact on trade flows. A similar study was conducted by Albarran *et al.* (2013) for Spanish firms using the probit pooled model and annual panel data for the period 1990 - 2005. The results confirmed that transport infrastructure leads to an increase in a firm's probability of exporting. For Malaysia, Ahmad *et al.* (2016) employed the fixed effect model to examine the impact of infrastructure development on trade flows. The study employed annual data for the period 1980-2013 and found that infrastructure development positively impacts export volume.

Donaubauer *et al.* (2018) examined the impact of infrastructure on trade in open and emerging economies. The study applied the Pseudo Poisson Maximum Likelihood (PPML) on panel data for the period 1992-2011. The findings confirmed that infrastructure development has a positive impact on trade. For Nigeria, Nwaogwugwu and Olaoye (2018) studied the link between infrastructure development and exports using the ordinary least squares method. The study employed annual data covering the period from 1984 to 2017 and the findings confirmed that infrastructure development has a positive impact on exports. A similar study was conducted by Karymshakov and Sulaimanova (2020) for three Central Asian countries. The study applied the Pseudo Poisson Maximum Likelihood (PPML) estimation method on panel data covering the period from 2010 to 2018. To measure infrastructure, the study used quality and quantity proxies, and the findings confirmed that infrastructure has a positive impact on trade, although the impact diminishes over time. Based on these findings, the authors argued that for a sustainable impact, infrastructure development should be accompanied by supportive government policies.

Rehman *et al*. (2020) confirmed similar findings for Southeast Asian economies. The study applied the pooled mean group, Dynamic ordinary least squares, and the fully modified least squares on panel data for the period 1990 - 2018. Using the same techniques and panel data for the period 1990 - 2017, Rehman *et al.* (2020) confirmed that improved infrastructure promotes exports and reduces trade deficit. A similar finding was confirmed by Vidya and Taghizadeh-Hesary (2021) who examined the impact of infrastructure investment on trade connectivity between ASEAN and three Asian countries. The three countries are India, China, and Japan. The paper employed panel data covering the period from 1990-2018. The findings confirm that foreign trade connectivity is positively influenced by hard infrastructure.

Using the generalized effects of the moments method and annual data covering the period from 2005 to 2019, Zhou *et al*. (2022) examined the impact of broadband infrastructure on international trade in 243 cities. The findings confirmed that infrastructure development has a positive impact on international trade through information efficiency, which in turn reduces trade costs and barriers to trade. For African countries, Ngassam (2023) examined the impact of infrastructure development on export diversification using the Panel Corrected Standard Error (PCSE) and the two-step system Generalized Method of Moments on annual panel data covering the period from 2000 to 2014. The funding confirmed that infrastructure development has a positive impact on export diversification.

Thia and Lopez (2023) examined the impact of infrastructure quality on the trade balance for selected developing countries. The study applied the gravity model on a panel data from 2006-2017 and the findings confirmed that an improvement in infrastructure quality has a positive effect on trade flows. A similar finding was confirmed by Zheng and Hongtao (2022) in the case of OECD countries. The study applied the augmented gravity method to panel data covering the period from 2000 to 2016. The results confirmed that an improved infrastructure plays a critical role in reducing trade costs, which in turn encourages trade.

Mao *et al.* (2024) examined the impact of infrastructure development on international trade in Asian countries. The study applied the cross-sectional autoregressive distributed lags and the augmented gravity model to cross-sectional data covering the period from 2004 to 2020.

The findings from this study confirmed that infrastructure development has a positive and significant impact on trade.

3. Research Methodology and Data

This section provides the model, estimation technique, and data used in this study to explore the impact of economic infrastructure investment on exports. The model used in this study is adopted from Rehman *et al.* (2020), who specified trade as a function of economic growth, Human Capital, Infrastructure, exchange rate, and Institutional quality. Due to data limitations, the model is modified in this study to exclude institutional quality and include trade openness and money supply. The inclusion of these variables is supported by empirical studies such as Nwaogwugwu and Olaoye (2018). The study employs two models, that is, Model 1 where the focus is on the export side of foreign trade flows, and Model 2 where imports are used. The empirical model used in this study can be specified as:

TRD = f (INFD, GDP, REER, HC, TOP, MS) ……(1)

$$TRD_{it} = \alpha_0 + \alpha LINFD_{i.t} + \alpha LGDP_{it} + \alpha LREER_{it} + \alpha LHC_{it} + \alpha TOP_{it} + \alpha LMS_{it} + \varepsilon t \text{ …..(2)}$$

Where:

- TRD refers to foreign trade flow, measured through aggregate values of exports and imports.
- INFD refers to the economic infrastructure investment variable
- GDP refers to the economic growth variable measured through gross domestic product
- TOP refers to trade openness,
- MS refers to money supply,
- HC refers to human capital, and
- REER refers to real effective exchange rates.

3.1. The Autoregressive Distributed Lag (ARDL) Cointegration Approach

With the ARDL technique, the pretesting of the unit root in variables used is not required. However, it is important to conduct the unit root tests as time series data is commonly associated with unit root problems, which may result in false results. For the unit root testing, the Dickey-Fuller Generalised Square (DF-GLS) and Phillips-Parron were used. After confirming the stationarity of the variables, the study explores the impact of economic infrastructure investment on different proxies of foreign trade flows using the ARDL technique. This technique was proposed by Pesaran and Shin (1999) and has various advantages over other cointegration techniques. The advantages are that: (i) it can be applied regardless of whether the regressors are integrated of I(0) or I(1), as long as the order of the regressors integration is equal to one or less (Arize, 2017). (ii) Through a simple linear transformation, it allows for the derivation of the Error Correction Model, which integrates adjustments in the short run with equilibrium in the long run without losing information (Thao and Hua, 2016). (iii) The error correction representation becomes relatively more efficient when there is a single long-run equation and small or infinite data sample size (Nkoro and Uko, 2016; Arize, 2017). The ARDL function for trade is specified as :

$$\Delta LTRD_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta LTRD_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta INFD_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta LGDP + \sum_{i=0}^{n} \beta_{4i} \Delta LLF_{t-i} + \sum_{i=0}^{n} \beta_{5i} \Delta REER + \sum_{i=0}^{n} \beta_{6i} \Delta LTOP_{t-i} + \sum_{i=0}^{n} \beta_{7i} \Delta LMS_{t-i} + \sum_{i=0}^{n} \beta_{8i} \Delta LHC_{t-i} + \pi_1 LTRD_{t-1} + \pi_2 LINFD_{t-1} + \pi_3 LGDP_{t-1} + \pi_4 LLF_{t-1} + \pi_5 LREER_{t-1} + \pi_6 LTOP_{t-1} + \pi_7 LMS_{t-1} + \pi_8 LHC_{t-1} u_t \ldots \ldots (3)$$

Where: L represents the logarithm, i represents the number of lags, Δ is the first difference, u_t represents the white noise error term, β_0 is a constant, $\beta_1 - \beta_8$ are the coefficients of the long-run ARDL model, $\pi_1 - \pi_8$, are short-run coefficients. To estimate the short-run relationship between foreign direct investment and exports, the short-run model is specified as follows. The Error correction model is specified as:

$$\Delta LTRD_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta LTRD_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta INFD_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta LGDP + \sum_{i=0}^{n} \beta_{4i} \Delta LLF_{t-i} + \sum_{i=0}^{n} \beta_{5i} \Delta REER + \sum_{i=0}^{n} \beta_{6i} \Delta LTOP_{t-i} + \sum_{i=0}^{n} \beta_{7i} \Delta LMS_{t-i} + \sum_{i=0}^{n} \beta_{8i} \Delta LHC_{t-i} + \alpha_1 ECM_{t-1} + u_t \ldots \ldots (4)$$

3.2 Data and definition of variables

Table 1: Description of variables

Notation	Description	Data source
EX	The aggregate value of exports	World Bank database
IM	The aggregate value of imports	World Bank database
INFD	Economic infrastructure investment is measured through gross fixed capital formation on economic infrastructure as a share of GDP. This variable is expected to have a positive impact on foreign trade and has been confirmed to be a determinant of foreign trade in studies such as Hassan *et al* (2022).	South African Reserve Bank
GDP	GDP represents gross domestic product and is used to measure economic growth. This variable is measured through GDP per capita at a constant price.	World Bank database
HC	HC represents human capital. In this study, this variable is measured through life expectancy which measures the production capacity of human beings. Life expectancy has been used in several studies as a measure of human capital. It is expected to have a positive impact on trade (Akpolat, 2014).	World Bank database
REER	REER stands for real effective exchange rate. The theoretical expectation for this variable is that it should positively affect exports and	World Bank database

	negatively affect imports. The relationship between REER and trade has been tested in studies such as Hassan *et al.* (2022); Matlasedi (2017)	
TO	TO represents trade openness. This variable is measured as total foreign trade as a share of GDP. This variable is expected to have a negative effect on foreign trade.	World Bank database
MS	MS represents the money supply. This variable is measured through broad money as a share of GDP. Theory suggests that this variable should negatively influence foreign trade flows regardless of the proxy used. The inclusion of this variables is supported by studies such as Nwaogwugwu and Olaoye (2018).	South African Reserve Bank

4. Empirical Analysis and Results

This section provides an analysis and discussion of the results on the impact of economic infrastructure investment on foreign trade flows. Table 2 presents the stationarity results from two techniques, that is. Phillips Parron and Dickey-Fuller Generalized Square.

Table 2: Unit root results

	Levels			
Variables	**DF-GLS Test**		**Phillips Parron**	
	Without Trend	With Trend	Without Trend	With Trend
LEXPORTS	0.075682	-2.499615	-0.094264	-2.389906
LIMPORTS	-0.500934	-5.785723***	-2.156985	-5.081716***
LINFD	-1.729684*	-2.804577	-1.945578	-2.649907
LREER	-0.923064	-3.397979*	-1.063980	-2.342673
LMS	0.230606	-1.167028	4.468962	-1.077575
LHC	0.240496	-2.644121	-0.997211	-2.490952
LGDPCS	-3.776266***	-4.018498***	-3.752938***	-3.580772**
LTO	-2.415726	-4.101344***	-2.394767	-3.909928
	First Differenced			
	DF-GLS Test		**Phillips Parron**	
	Without Trend	With Trend	Without Trend	With Trend
LEXPORTS	-4.888525 ***	-4.777152 ***	-4.855729***	-4.795646***
LIMPORTS	-9.050151***	-8.947260***	-5.081716***	-15.61111***
LINFD	-7.030208***	-7.036577***	-6.999061***	-7.176745***
LREER	-4.483527***	-4.879342***	-6.508216***	-8.861221***
LMS	-1.897562	-3.759710***	-1.875060	-3.500590***
LHC	-6.329113***	-6.418443***	-6.282626***	-6.264940***
LGDPCS	-5.680259***	-5.843968***	-11.06018***	-11.72985***
LTO	-7.318916***	-7.331703***	-13.76537***	-14.93748***

**** refers to statistical significance levels at 1%*

The results from both the DF-GLS and Phillips Parron tests confirm that all the variables used are stationary after first differencing and including a trend. Given that the variables are

stationary, the study proceeds to examine the impact of infrastructure development on foreign trade using the ARDL cointegration technique. Table 3 presents the F statistics for both models 1 and 2, and the critical values.

Table 3: Cointegration results

Dependent Variable	**Function**			**F-Statistics**	**Cointegration Status**	
LEX	$F(EX \mid INFD, GDPC, REER, MS, TO, HC)$			8.281*	Cointegrated	
LIN	$F(IN \mid INFD, GDPC, REER, MS, TO, HC)$			5.712**	Cointegrated	
Asymptotic Critical Values						
Critical Values	1%		5%		10%	
	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
	4.270	6.211	2.970	4.499	2.457	3.797

***,* refers to statistical significance levels at 5%, 10%.*

The results from the bounds test are presented in Table 3, and they confirm that there is cointegration between economic infrastructure investment and foreign trade flows, regardless of the proxy used. The F-statistics for models 1 and 2 are 8.281 and 5.712, respectively. Having confirmed the cointegration between the variables, the study examines the long-run and short-run impact of economic infrastructure investment on foreign trade flows with a particular focus on the imports and exports. Table 4 presents the results for the long run cointegration.

Table 4: Long-run Cointegration

Model 1: Impact of Economic Infrastructure Investment on Exports of Goods and Services				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LINFD	1,580**	0,607	2,604	0,014
LGDP	0,291**	0,136	2,138	0,041
LREER	1,152**	0,420	2,744	0,010
LMS	0,291	0,338	0,863	0,395
LTO	0,597	0,430	1,388	0,175
LHC	-3,425**	1,667	-2,055	0,048
C	1,256	2,521	0.498	0.623
Model 2: Impact of Economic Infrastructure Investment on Imports of Goods and Services				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LINFD	-0,066	0,203	-0,323	0,749
LGDP	0,187*	0,039	4,850	0,000
LREER	0,388**	0,172	2,254	0,031
LMS	-0,437**	0,165	-2,658	0,012

LTO	1,283*	0,159	8,061	0,000
LHC	-0,026	0,434	-0,060	0,952
C	-5.214	0.938	-5.559	0,000

***,* refers to statistical significance levels at 5%, 10%.*

The results shown in Table 4, Panels 1 and 2 suggest that economic infrastructure investment has a positive significant long-run impact on foreign trade flows when exports are used as a proxy, while it has no significant effect when imports are used. The coefficient of this variable confirms that a 1 percent increase in infrastructure development leads to a 1.580 percent rise in exports in the long run. The findings are in line with the outcome predicted by theory. Economic growth and real effective exchange rates are found to positively impact foreign trade flows regardless of the proxy used. The coefficients of economic growth suggest that a 1 percent increase in this variable leads to a long-run increase of 0.291 percent in exports and 0.187 percent in imports. For the real effective exchange rate variable, the coefficients confirm that a 1 percent increase in real effective exchange rates leads to an increase of 1.152 percent and 0.388 percent in exports and imports, respectively. The positive coefficient of the real effective exchange rate on imports contradicts the theoretical expectations but is supported by the findings in studies such as Kemal and Qadir (2005). Money supply and trade openness are found to have no significant long-run impact on exports, while they negatively and positively impact imports, respectively. The coefficients of these variables suggest that a 1 increase in money supply and trade openness leads to a 0.437 percent decline and a 1.283 percent increase in imports, respectively. Human capital is found to have a negative long-run impact on exports, while it has no significant impact on imports. The findings suggest that a 1 percent increase in human capital results in a 3.425 percent decline in exports. The sign carried by the coefficient of this variable contradicts the theory, however, it is supported in studies by the results from a study by Ayeni and Akeju (2023), who argued that human capital does not increase trade. The short-run findings are presented in Table 5.

Table 5: Short-run results

Model 1: Impact of Economic Infrastructure Investment on Exports of Goods and Services				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
ECM	-0,545	0,064	-8,549	0,000
DLINFD	2,340***	0,541	4,325	0,000
DLINFD(-1)	-0,946***	0,540	-1,753	0,090
DLGDP	0.159	0115	1.380	0.181
DLREER	1,278***	0,088	14,469	0,000
DLMS	0,159	0,199	0,800	0,432
DLTO	1,185***	0,091	13,073	0,000
DLHC)	-1,950**	0,765	-2,548	0,016
DLHC(-1))	3,377***	0,743	4,546	0,000
R-Squared	0,861	Serial Correlation	1,482[0,240]	
DW-statistic	2.337	Normality	0,343[0.842]	
F-Statistics	33,333	Heteroskedasticity	0,869[0.589]	
Model 2: Impact of Economic Infrastructure Investment on Imports of Goods and Services				

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM	-1,085	0,100	-10,834	0,000
DLINFD	0,098	0,181	0,541	0,594
DLINFD(-1)	0,662***	0,229	2,887	0,008
DL(GDP)	0,341***	0,092	3,716	0,001
DLGDP(-1)	0,552***	0,123	4,488	0,000
DLREER	0,090***	0,029	3,065	0,006
DLREER(-1)	-0,162***	0,047	-3,461	0,002
DLMS	-0,156***	0,049	-3,195	0,004
DLMS(-1)	0,469***	0,068	6,912	0,000
DLTO	1,001***	0,036	27,978	0,000
DLTO(-1)	-0,192***	0,051	-3,748	0,001
DLHC	1,227***	0,353	3,479	0,002
DLHC(-1)	-0,624**	0,258	-2,418	0,024
R-Squared	0.987	Serial Correlation	0.015[0.985]	
DW-statistic	1.994	Normality	1.293[0.524]	
F-Statistics	214.717	Heteroskedasticity	1.357[0.281]	

****,**refers to statistical significance levels at 1%, 5%.*

The short-run findings presented in Table 5, panels 1 and 2, suggest that economic infrastructure investment has a positive impact on trade when exports are used as a proxy, while it has no significant short-run effect when imports are used. The coefficient of this variable suggests that a 1 percent increase in economic infrastructure investment leads to a 2.340 percent increase in exports. The positive coefficient of this variable is in line with the theoretical expectations. On the contrary, the results show that the lagged values of economic infrastructure investment negatively affect aggregate exports and positively affect aggregate imports.

In terms of the control variables, the findings confirm that economic growth measured through GDP has a positive short-run impact on imports and has no significant impact on exports. The coefficient of this variable suggests that a 1 percent increase in economic growth leads to a 0.552 percent increase in imports. It was also confirmed that real effective exchange rates and trade openness positively affect foreign trade regardless of the proxy used. The coefficients for these variables suggest that a 1 percent increase in each of the variables results in a 1.279 percent and 1.185 percent increase in exports, while it leads to a 0.090 percent and 1.001 percent increase in imports, respectively. The positive impact of exchange rates on imports is inconsistent with the theoretical expectations but is in line with Ndou (2021), who found that an increase in exchange rates leads to a deterioration in net trade, which could be a result of an increase in imports. The results confirmed that the money supply has no significant impact on exports and a negative impact on imports. Human capital was found to positively drive imports and negatively drive exports. The negative effect of human capital on exports contradicts theory but is supported by studies such as Ayeni and Akeju (2023), who argued that human capital does not increase trade.

The error correction terms are statistically significant at 1% and have negative signs both when exports and imports are used as proxies for trade flows. This also confirms that there is a long-run relationship between economic infrastructure investment and foreign trade flows.

5. The CUSUM and CUSUMSQ tests

Figures 1A-B and 2A-B below present the CUSUM and CUSUMSQ test results.

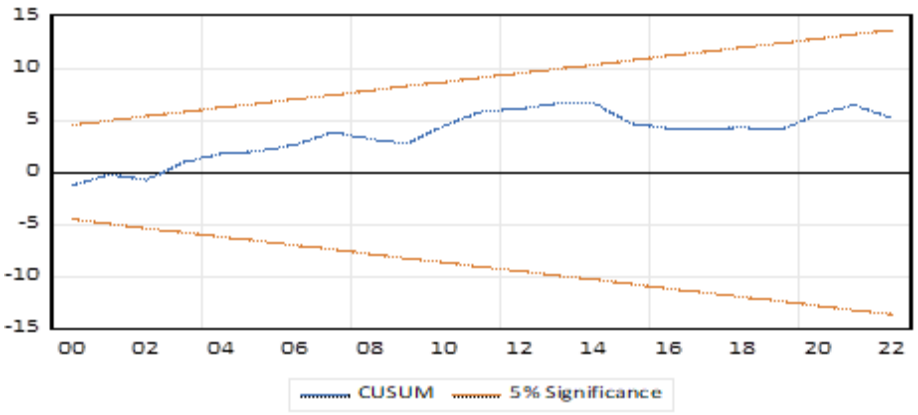

Figure 1A: Model 1: CUSUM

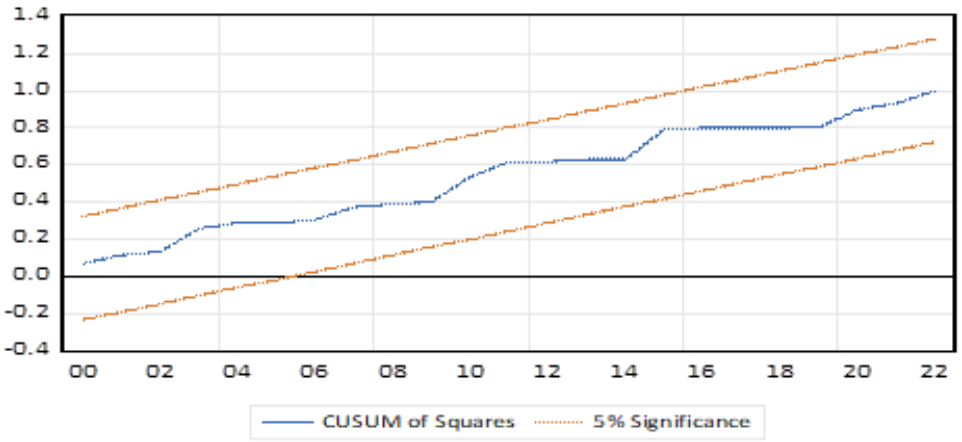

Figure 1B: Model 1: CUSUM of Squares

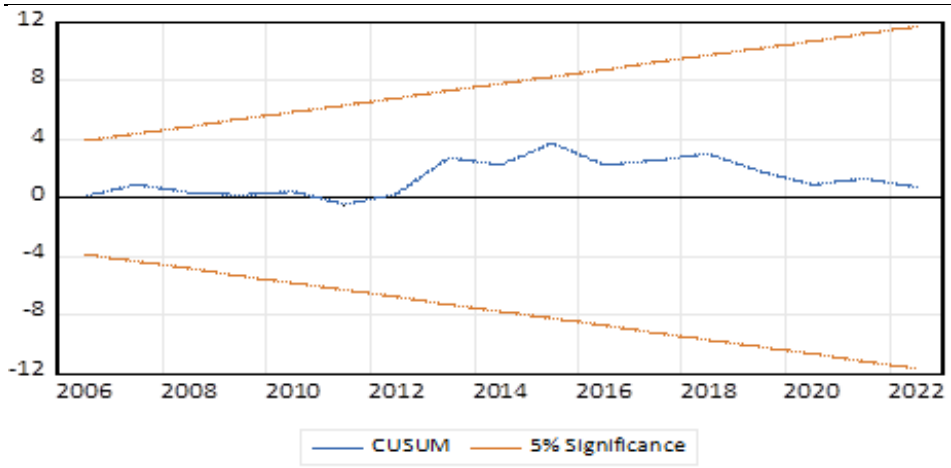

Figure 2A: Model 2: CUSUM

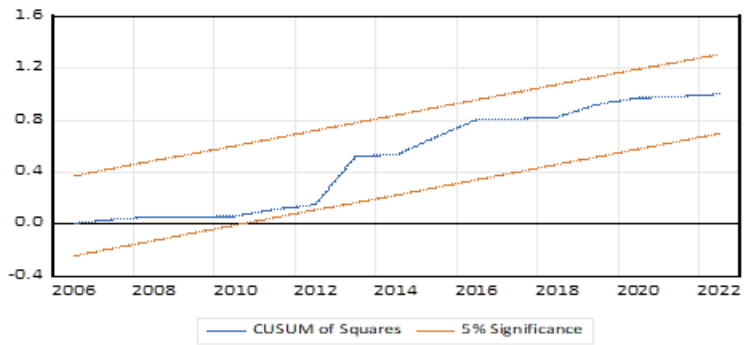

Figure 2B: Model 2: CUSUM of Squares

As shown in Figures 1A-B and 2A-B, the cumulative sum of recursive residuals and the cumulative sum of squares of recursive residual plots are within the critical bounds at 5%, and there are no structural breaks in both models.

6. Conclusion

The study explored the role of economic infrastructure investment in driving foreign trade flows in South Africa for the period of 1986 - 2022. To capture the different aspects of foreign trade, the study employed two models, with Model 1 examining the impact of economic infrastructure investment on exports and Model 2 examining the impact of economic infrastructure investment on imports. The main findings confirm that the nature of the relationship between economic infrastructure investment and foreign trade flows differs depending on the proxy used to measure foreign trade flows. When exports are used, the results confirm that economic infrastructure investment has a positive long-run and short-run impact on foreign trade flows, while it has no significant impact when imports are used. The positive impact of economic infrastructure investment on exports underscores the key role played by economic infrastructure in facilitating trade and improving efficiency. It suggests that investment in economic infrastructure can improve a country's current account, as it promotes local production, import substitution, and exports. The findings of the study further confirm that the lagged values of economic infrastructure investment negatively influence exports and positively influence imports.

In terms of control variables, the findings for Model 1 confirm that economic growth has a positive impact on exports only in the long run, while real effective exchange rates and human capital have a positive and negative long-run and short-run impact on exports, respectively. The results further show a positive short-run effect of that trade openness on exports. For Model 2, the findings confirm that trade openness, economic growth, and real effective exchange rate positively affect imports both in the long run and the short run. Money supply was found to negatively affect imports both in the long run and short run. The findings of the study confirmed negative long-run and positive short-run effects of human capital on imports. Based on these findings, the study recommends that policymakers in South Africa should design policies in a manner that supports the channeling of more resources toward improving geographical conditions and the establishment and maintenance of high-quality infrastructure to create a conducive environment for foreign trade activities.

References

African Bank, 2010. Trade and Trade Costs in Africa: An Overview. [online] available at: *https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/African%20Development%20Report%202010_CH%201.pdf.*

Ahmad, N. A., 2016. The Impact of Infrastructure on Trade: The Case of Malaysia. *Journal of Economics and Finance.7(6). 50-53.*

Akpolat, A. G., 2014. The Long-Term Impact of Human Capital Investment on GDP: A Panel Cointegrated Regression Analysis. *Hindawi Publishing Corporation Economics Research International, 2014, 1-10.*

Albarran, P., Carrasco, R and Holl, A., 2013. Domestic Transport Infrastructure and Firms' Export Market Participation. *Small Business Economics. 40.879-898.*

Arize, C. A., 2017. A Convenient Method for the Estimation of ARDL Parameters and Test Statistics: USA trade balance and real effective exchange rate relation. *International Review of Economics and Finance 50(3), 75-84.*

Ayeni, R.K and Akeju, F.K., 2023. Human Capital, Capital Goods Import and Economic Growth in West Africa. *Cogent Economics and Finance, 11.1-14.*

Chang, R., Kaltani, L and Loayza, N., 2009. Openness is Good for Growth: The role of Policy Complementarities. *Journal of Development Economics, 90(1). 33-49.*

Donaubauer, J., Glas. A ., Meyer, B., and Nunnenkamp. P., 2018. Disentangling the Impact of Infrastructure on Trade Using a New Index of Infrastructure. *Review of World Economics. 154:745–784.*

Etensa, T., Taye.L., and Bersisa, M., 2022. Infrastructural Development and Economic Growth in East Africa: Quantity Versus Quality Dimensions Using Panel-ARDL Approach. *International Journal of Empirical Economics 01(04). 1-33.*

Hassan, M.S., Kausarhttps, A and Arshedhttps, N., 2022. Investigating Export Determinants: A Time Series Evidence from Canada. *Sage Open, 12(2).*

Kamguila.B., Ndjakwa and Tadadjeu. S., 2023. Does Infrastructural Development Foster Export Upgrading in Africa? *African Development Review 35 (1).79-94.*

Karymshakov, K and Sulaimanova, B., 2021. The Impact of Infrastructure on Trade in Central Asia. *Asia Europe Journal. 19.5-20.*

Kemar, M.A and Qadir, U., 2005. Real Exchange Rate, Exports, and Imports Movements: A Trivariate Analysis. *The Pakistan Development Review, 44(2)177-195.*

Mao, H., Cui. G., Hussain. Z and Shao, L., 2024. Investigating the Simultaneous Impact of Infrastructure and Geographical Factors on International Trade: Evidence from Asian Economies. *Heliyon 10 (2024) E2379.*

Matlasedi, T.N., 2017. The Influence of the Real Effective Exchange Rate and Relative Prices on South Africa's Import Demand Function: An ARDL Approach. *Cogent Economics and Finance, 5(1).*

Ndou, E., 2021. Exchange Rate Changes, Price Level, and the Income Effects on Trade Balance In South Africa. *SN Business and Economics 1(36). 1-19.*

Ngassam, S.B., 2023. Exports Diversification in Africa: The Role of Infrastructures. *Journal of the Knowledge Economy.*

Nkoro, E and Uko, A.K., 2016. Autoregressive Distributed Lag (ARDL) Cointegration Technique: Application and Interpretation. *Journal of Statistical and Econometric Methods, 5(4), 63-91.*

Nwaogwugwu, I.C and Olaoye. O.O., 2018. Infrastructure Development and Export Trade in Nigeria. *BVIMSR's Journal of Management Research. 10(1). 8-20.*

Pesaran, M. H. and Shin, Y.,1999. An Autoregressive Distributed Lag Modelling Approach to Co-Integration Analysis, in Strom, S. (Ed.): Econometrics and Economic Theory in 20th Century: The Ragnar Frisch Centennial Symposium, Chapter 11, Cambridge University Press, and Cambridge.

Rehman, F., Noman. A. A., and Ding. Y., 2020. Does Infrastructure Increase Exports and Reduce Trade Deficit? Evidence from Selected South Asian Countries Using a New Global Infrastructure Index. *Journal Economic Structures. 9 (10). 1-23.*

Shepherd, B., and Wilson. S.J., 2007. Trade, Infrastructure, and Roadways in Europe and Central Asia: New Empirical Evidence. *Journal of Economic Integration, 22(4),723-747.*

Suriaganth,S and Abdullah, A., 2021. Impact of Foreign Trade on the Economic Growth of India.*Indian Journal of Economics and Business. 20 (1). 1077-1083.*

Thao, D and Hua, Z., 2016. ARDL Bounds Testing Approach to Cointegration: Relationship International Trade Policy Reform and Foreign Trade in Vietnam. *International Journal of Economics and Finance,8(8), 84-94.*

Vidya, C.T and Taghizadeh-Hesary, F., 2021. Does Infrastructure Facilitate Trade Connectivity? Evidence from the ASEAN. *Asia Europe Journal 19(1). S51-S75.*

World Bank database, 2023. World Bank Indicators. [online] available at: http://www.worldbank.org/indicator .

Zheng, H and Hongtao, L., 2022. Transportation Infrastructure and Trade. *Japan and the World Economy, 64. 1-17.*

Zhou, F., Wen. H and Lee, C., 2022. Broadband Infrastructure and Export Growth. *Telecommunication Policy. 46(5). 1-17.*

Bio-note

Nomfundo Vacu-Ngqila is a lecturer in the Department of Economics at the University of South Africa and she holds a PhD in economics. Her research interest is macroeconomics, with a particular focus on international economics and public economics. Over the years Nomfundo Vacu-Ngqila has published research work on foreign trade and its drivers. She has also published research papers on financial and fiscal issues focusing on the South African context.