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Does proximity matter? The effect of financial sector development on economic growth in the EAC and SADC regional blocs

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Abstract

This study examines the finance-growth nexus among countries in the Southern African Development Community and East Africa Community regional blocs. We aim to see if small economies can rely on expansionary monetary policies to stimulate economic growth given the illusive nature of such policies. The panel error correction model is applied to analyze the aggregated data, which were obtained from the World Development Indicators and the Comité Européen d'Etudes des Polyphosphates. The results indicate that proximity to trading giants jeopardizes the freedom to use monetary expansionary policies among relatively small countries. If such policies are adopted, it will be a significant impact on countries located in regions where trading powers are evenly distributed.

Keywords: Geographic proximity, Money, Financial sector development, Domestic credit, Centrality

1. Introduction

Roughly a quarter of world trade takes place between countries with sharing borders. Half of the world trade occurs between partners that are less than 3,000 kilometers apart (Berthelon and Freund, 2004). Geographic proximity, therefore, provide the ease/difficulty with which goods, services, labor, capital, information, and ideas traverse in space (Yue *et al.*, 2022; World Bank, 2009; Shabani *et al.*, 2011). Although geographic proximity is generally related to Euclidean distances between two locations, in economic geography distance, it can either be economic, physical, or both (McCann and Oort, 2019). Chen and Kim (2021) suggest that

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psychic distance is the main source of economic distance dimensions that poses a real threat in cross-border trade. Psychic distance mainly comprises of logistical information.

From these perspectives, economic distance is defined as the distance from one country to another country where its output market locates; or the distance from one country to another country that supplies and provides the capital equipment and intermediate goods required for production (supplier access) (Redding and Venables, 2004).

In these contexts, proximity is considered to increase the diffusion effect of best practices from nearby countries. Along with it, the risk of negative adoption from neighboring countries is also higher with closer proximity (Mossig *et al.*, 2022; Amidi and Majidi, 2020). The importance of economic proximity in economic growth is further reinforced by regional growth. These models also emphasize the importance of technology and human capital spillovers (Minerva and Ottaviano, 2009; World Bank, 2009; Shabani *et al.*, 2011). Thus, economic and physical distance between any two locations can generally be understood as the measures of geographic proximity. This concept has the potential to contribute positively to growth (Nsiah *et al.*, 2016).

Market access has been used as one of the measures of proximity between trading countries in the field of economic geography. Market access measures the possible spatial interaction between producers and their markets (Harris, 1954; Chen and Kim, 2021). The underlying assumption is that proximity to potentially large market favors the growth of the manufacturing industries. Potentially, these advantages come from the existence of a large and diversified labor force, the presence of many specialized services, the ease of obtaining components or sub-assemblies nearby, the presence of large industrial markets for new parts and gadgets, the ability to deliver quickly to the markets, and a host of other factors reinforce the proximity advantages to these market potentials (McCann and Oort, 2019).

Alternatively, geographic proximity through sharing a border has also been observed to increase bilateral trade in the respective countries (Mossig *et al.*, 2022; Bhupatiraju and Verspagen, 2013). For Africa, the Middle East, and Asia, between 1% and 5% of trade by value is from land-neighboring countries. For Latin America, trade with land neighbors accounts for 10 to 20% in total. For Europe and North America, the proportion is 25-35% (Hummels, 2007).

Redding and Venables (2004) assume two cases of no border. The first one is between Germany and the Czech Republic. The second one is between the United States and Mexico. Redding and Venables (2004) observe that there is a fall in predicted income per capita in the Czech Republic (26%), and Mexico (27%). Economic distance, however, is different for a varied range of good, physical capital and ideas (Shabani *et al.*, 2011; World Bank, 2009).

Despite the foregoing, eliminating the common border in low-income developing countries, which trade relatively little with one another, is proved to be not effective. This suggests that the gains from geographic proximity among low-income developing countries may be

relatively small compared to those to be had from close economic integration with high-income developed economies (Alananga and Mutasa, 2021; Redding and Venables, 2004).

In effect, geographic proximity makes sense only if those involved do trade regularly (Mossig *et al.*, 2022). This means one or both of them have a relatively higher centrality index. Bhupatiraju (2014) further notes that country trade across a shared border is significantly negative at -0.32, which is opposed to -0.007 when the common border is not taken into account. Even in developed economies, empirical evidence concerning proximity and economic growth is still debatable. Hinz, (2012) notes that the border coefficient is much lower for the estimation with all EU member states compared to the selection of the EU15. He attributes this to lower trade reductions when crossing a border in the new member state countries compared with the old member states. Similarly, Frankel and Romer (1999) observe that sharing a border has a large but insignificant effect on trade. Potentially, this insignificance is because only a small fraction of country pairs share a border and therefore could have been imprecisely estimated.

Given the above contradictory observations, this study focuses on the effect of proximity to a trading partner through a shared border with a relatively higher centrality neighbor among the EAC and SADC members stated. The core hypothesis is that geographic proximity significantly increases the impact of Financial Sector Development (FSD) on growth by making it easy to transfer financial resources from one country in exchange for goods and services produced by her neighboring country of almost equal economic status otherwise it turns out to be inflationary. The selected regional bloc comprises countries with relatively lower cross-country trade volumes despite being among the FSD-related policy lovers. To the majority of these countries, FSD through expansionary monetary policies is likely to be detrimental to growth unless geographic proximity is with a relatively trade giant country.

The remaining of this paper consists of several sections. Section two dives in reviewing the literature on the related concepts. it is then followed by section three, where methodology and data are presented. Section four shows the analysis results and discussion. Section five concludes the paper.

2. Literature Review

2.1 Proximity and growth

Geographic proximity is related to productivity and income levels in trade, foreign direct investment (FDI), and technology diffusion (Chih *et al.*, 2021; Boulhol and de Serres, 2008). The economic geography hypothesis postulates that not all the areas in the world are equally endowed in terms of geographic attributes such as soil quality, natural resources, topography, climate, and disease environment. This unevenly distribution leads to the necessity of cross-country resources transfer. In this framework, each country's production is intrinsically dependent on the cost of transportation (Acemoglu, 2009; Diamond, 1997; Gallup and Sachs, 2001; Landes, 1998). With resource and output disparities across countries, Harris (1954)

argues that the potential demand for goods and services produced in one location is determined by the distance-weighted GDP of all other locations.

Bhupatiraju (2014) observes that distance has a significant negative impact on bilateral trade. It is clear in this study that countries tend to trade more with partners that are geographically closer to them than those locate further away. A similar conclusion is stated by Amidi and Majidi, (2020) who suggest that geographic proximity is a key determinant of spatial spillovers.

Clark *et al.* (2004) spot that a 100% reduction in the proximity between the export country and the US increases the maritime transport costs by around 20%. Clark *et al.* (2004) provide evidence that doubling distance generates an 18% increase in transport costs. Using shipping company quotes for transporting a standard container from Baltimore (USA) to selected worldwide destinations, Limao and Venables (2000) note that an extra 1,000 km in distance raises the costs by $380 (or 8% for a median shipment). Boulhol and de Serres (2008) observe that an increase of 10% in the distance triggers an average decrease of 9% in trade flows. Hinz (2012) estimates the combined effect of distance, a common language, and a shared border (contiguity) to be about 76% of the variation in the GDP data.

Redding and Venables (2004) carry a hypothetical example of having a country's distance from all of its trade partners observing substantial gains and predicted an increase in income of around 27% which is similar to gaining a coastline or pursuing open-trade policies. A observation in China suggests that openness to international trade significantly reduces the impact of export service diversification on revenue instabilities (Gnangnon, 2021).

Based on the estimates, which do not control for country-fixed effects, related to the sum of distances, an increase of 10% in the distances to all countries triggers a decrease of 2.1% in GDP per capita (Boulhol and de Serres, 2008). Redding and Schott (2003) note that a 1% increase in distance is associated with a 1.2% reduction in bilateral exports in 1970, and a 1.5% reduction in exports by 1990. In measuring geographic proximity, trade cost is often preferred to sheer miles, although data constraints may hamper this option (Harris, 1954). Trade cost includes not only the expense of physically moving products but also all information, communication, monitoring, and policy costs associated with transacting at a distance (Redding and Scott, 2003; Mossig *et al.*, 2022). Limao and Venables (2000) show that increasing trade costs by 10%, reduces trade volume by more than 20%.

Similarly, supplier access, which is also called market access, is an alternative measure of market proximity. Countries that are remote from their manufacture goods' supply sources (low supplier access) incur greater transport costs, which eventually increases the affordable wage differentials (Redding and Venables, 2004). Redding and Venables (2004) further state that the estimated coefficient on supplier access is negative. This estimation statistically suggests that countries with higher levels of supplier access are characterized by a lower relative price of machinery and equipment. When included on its own, foreign supplier access was observed to explain about 38% of the cross-country variation in income

per capita. The results remain robust even when total supplier access is used. Leamer (1997) finds that Central and Eastern European countries' dissimilar access to Western European markets creates differences in their potential to achieve higher standards of living.

2.2 Proximity in the finance-growth nexuses

Since Schumpeter (1911) highlighs the positive role of FSD on economic growth, subsequent empirical results have, however, been contradictory (Pagano, 1993; Levine, 1997; Levine, 2003). Currently, there are at least four theoretical strands on the finance-growth causality nexus. The supply leading hypothesis (SLH) postulates that a well-functioning financial institution can promote overall economic efficiency, create and expand liquidity, mobilize savings, enhance capital accumulation, transfer resources from traditional (non-growth) sectors to the more modem growth inducing sectors, and support competent entrepreneurs (Evans, 2015; Garru and Peter, 2016; Ezzahid and Elouaourti, 2017). The demand following hypothesis (DFH) claims that FSD is merely a lagged response to economic growth (growth generates demand for financial products) (Garru and Peter, 2016). The bi-directional causality hypothesis (BCH) assumes that FSD and economic growth are mutually or bi-directionally causal (Zerbo, 2015; Ezzahid and Elouaourti, 2017). Lastly the independent hypothesis suggests that FSD and economic growth are causally independent (Acaravci *et al.*, 2009).

Despite the finance-growth causal paradigm, a great body of literature suggests that FSD and economic growth granger-causes each other in many Sub-Saharan Africa countries. This finding complicates policy prioritizating since countries fail to design appropriate macroeconomic policies for fostering FSD (Schumpeter, 1911; Beck *et al.*, 2009; Honohan, 2005) or directly focusing on real economic growth parameters (Sissoko *et al.*, 2018). It is a fact that countries participating in economic integration are relatively closer to one another. Those with close proximity tend to have a more frequent and cheaper trade linkage. Understanding the role of proximity perse opens an opportunity to justify or cautionarily adopt and implement an expansionary monetary policy.

Theoretically, the prices of mobile factors tend to be similar across trading locations, and the costs of remoteness are made up by the immobile factors from an international trade perspective. Some empirical observations, however, disprove these theoretical propositions since returns from physical and human capital tend to be relatively higher in countries that have better access to larger markets (Redding and Scott, 2003).

Indeed, even with the same technologies, firms in more distant countries can only afford to pay relatively lower wages (Boulhol *et al.*, 2008; Redding and Venables, 2004). Greater proximity to central markets increases the opportunity to concentrate resources on comparative advantage activities. It also encourages the specialization of firms that can attain efficient scale and more generally exploit increasing returns in specific fields of production, including banking and related financial servicing (Boulhol *et al.*, 2008). As a result, differences in

financial resource productivity may persist despite the enforcement of free bilateral and multilateral trade across countries.

Geographic proximity does matter for economic growth prospects because of geographic externalities which partly emanate from centrality in trade (Bloom *et al.* 1998). Clark *et al.*, (2004) provide evidence that developing countries have relatively higher intra-trade costs to the magnitude of 8% compared to their developed counterparts. One of the main challenges of cross-country resources relocation among African economies is market inaccessibility due to geographical constraints (Bloom *et al.*, 1998). The proximity hypothesis as developed in this study therefore, postulates that being closer to a trade center poses both risks and benefits in terms of expanded FSD and growth relationships. Generally, reducing the economic distance between trading countries not only reduces contemporaneous factor rewards, but also lowers GDP by suppressing human capital accumulation and decreasing the supply of high-income skilled workers in a relatively smaller country (Redding and Schott, 2003). As such the positive effect of FSD on growth for a relatively smaller economy may be reversed simply because of this contagious effect happening in the nearby central countries.

3. Methodology and data

3.1 The methodology

The mean group (MG) estimator that consists the averaging the separate estimators for each group in the panels could be used with panel data. There is strong evidence that the average estimators are consistent and efficient in a large sample (Pesaran *et al.*, 1999; Pirotte, 1999). The estimated parameters are, however, freely independent across groups and disregard potential homogeneity between groups. Alternatively, the traditional random or fixed effects and GMM methods could be applied. These procedures force the parameters to be identical across countries, potentially leading to inconsistent and misleading coefficients (Pesaran *et al.*, 1999). The pooled mean group (PMG) remedies the deficiencies observed in the two mention methods. It allows short-term parameters to differ between groups. Meanwhile, it imposes equality of the coefficients among countries (Bangake and Eggoh, 2012). The implementing of PMG differentiates short-run dynamic specifications across the countries while constraining them to the same long-run coefficients. The PMG varies from the dynamic OLS (DOLS) and fully modified OLS (FMOLS) because the PMG estimator makes adjustments between short and long-run. thus capturing short-run country specific dynamics. The FSD-growth long-run link is expected to stabilize across countries while the short-run coefficient is the same. By applying the Hausman test, it is possible to verify the null hypothesis of the homogeneity in the long-run coefficients. If both FSD and growth are I(1) and cointegrated, the error term (ε_{it}) is supposed to be I(0) for all i and is independently distributed across t. At the optimal one lag for all variables, the autoregressive distributed lag, ARDL (1,1) model can be specified as:

$$grow_{it} = \beta_i + \delta_{0i}(FSD)_{it} + \delta_{1i}(FSD)_{i,t-1} + \lambda_i(grow_{i,t-1} + \varepsilon_{it} \quad (1)$$

The ARDL version of the ECM panel regression model for this study is represented in equation 2 as follows:

$$\Delta grow_{it} = \emptyset_i[grow_{i,t-1} - \gamma_i X_{it}] + \sum_{j=1}^{P-1} \beta_{ij} \Delta grow_{it-j} + \sum_{j=1}^{P-1} \delta_{ij} \Delta X_{it-j} + \mu_i + \varepsilon_{it} . \quad (2)$$

Where $\Delta grow_{it}$ is the GDP growth of country i at time t; $\varnothing_i$ is given by -(1-α_i) group specific speed of adjustment coefficient expected that $\varnothing_i < 0$; γ_i is a vector of long-run relationships; ECT = ($grow_{i,t-1} - \gamma_i X_{it}$) is the error correction term; X_{it} is a set of covariates i.e. m3_gdp; dcps_gdp, gfcf, open and wpop; B_{ij}, δ_{ij} are the short-run dynamic coefficients.

3.2 Data and variables

The dependent variable is real GDP growth and the independent variable of interest is FSD, which is measured using two indicators. First is the domestic credit to the private sector (DCPS) (as a percentage of GDP) (Saci *et al.*, 2009). Second is the liquid liabilities of the financial system which is measured by broad money (M3) (percentage of GDP) (Acaravci *et al.*, 2009). Additional control variables are trade openness (OPEN), gross fixed capital formation (GFCF) and working population (WPOP). The dummies for regional block and whether a country is a neighbor (sharing a border) are also included. The annual time series data from the World Development Indicators (WDI) of the World Bank provide aggregate data for real GDP per capita measures. Data from 1980 to 2017 are used.

The core issue in the relationship is proximity to a central country with centrality being measured by bilateral trade volumes as compiled by CEEP[1]. Based on CEEP documentation, centrality is measured in terms of foreign market potentials for each country, according to Redding and Venables (2004). To define center countries the average centrality is used. If one country has a centrality index above average, it is a center country, otherwise, it is not a center. Geographic proximity is then defined as sharing a border with a center country and coded 1 (neighbour) and 0 (non-neighbour). In terms of regional blocs, SADC member countries include all countries in the SADC regional integration except for Tanzania, Angola, Comoros and the Democratic Republic of Congo. The East African Community bloc comprises all the countries in the region except for South Sudan. Tanzania is considered an EAC member country despite being a member of the SADC as well. Table 1 presents the description of variables.

The data were analyzed based on a panel error correction model (PECM), following the IPS test, Im *et al.* (2003) panel unit root tests, and the augmented Dickey-Fuller (ADF) cointegration tests. Levin *et al.* (2002) and Im *et al.* (2003) show that there is a considerable improvement in the power of unit root tests when using panel data rather than the univariate testing procedures. Moreover, the use of panel data may be instrumental in offering relevant information about the economic systems considered, rather than analyzing each country (Alagidede *et al.*, 2015). Dumitrescu and Hurlin (2012) pairwise tests of non-causality were further implemented to provide a specific direction of effect.

Table 1. Description of the variables

Abbreviation	Variable name	Measurement	Data source
Dependent variable			
grow	Constant (2010) annual GDP growth	Values	WDI
Intervening Variables			
centr	Trade centrality	Dummy{1 if centrality index exceeds average, 0 otherwise}	CEEP
eco_block	Regional integration	Dummy{1 if EAC, 0 otherwise}	SADC and EAC websites
proxis	Proximity to trade centers	Dummy{1 if shares a border with center country, 0 otherwise}	CEEP
Independent variables			
m3_gdp	Broad money as a share of GDP	Values	WDI
dcps_GDP	Domestic credit to the private sector as a share of GDP	Values	WDI
gfcf_gdp	Gross fixed capital formation as a share of GDP	Values	WDI
open	Import plus export as a share of GDP	Values	WDI
wpop_gdp	Working population as a share of GDP	Values	WDI

Source: Authors' compilation

3.3 Data description

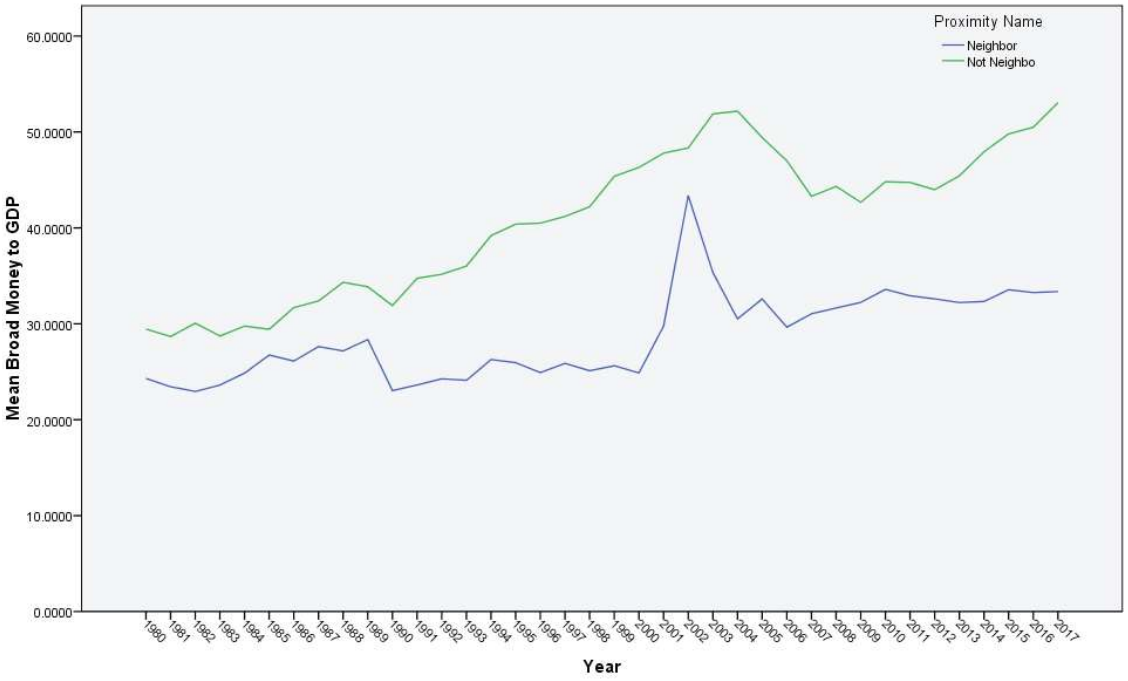
The descriptive statistics based on the neighbor and non-neighbor classifications are provided in Table 2. Higher GDP growth is noted among countries with trade center neighbors, which also comes with higher volatility. A similar pattern is observed for dcps_gdp and wpop_gdp. There is a prominent higher m3_gdp in countries without a trade center neighbor compared to those with one. A similar conclusion is seen for gfcf_gdp and trade openness though the differences among the two country groups are slim. In terms of the finance-growth relationship, having a trade center neighbor could make a difference as these groups of countries vary substantially.

Table 2. Descriptive statistics for proximity

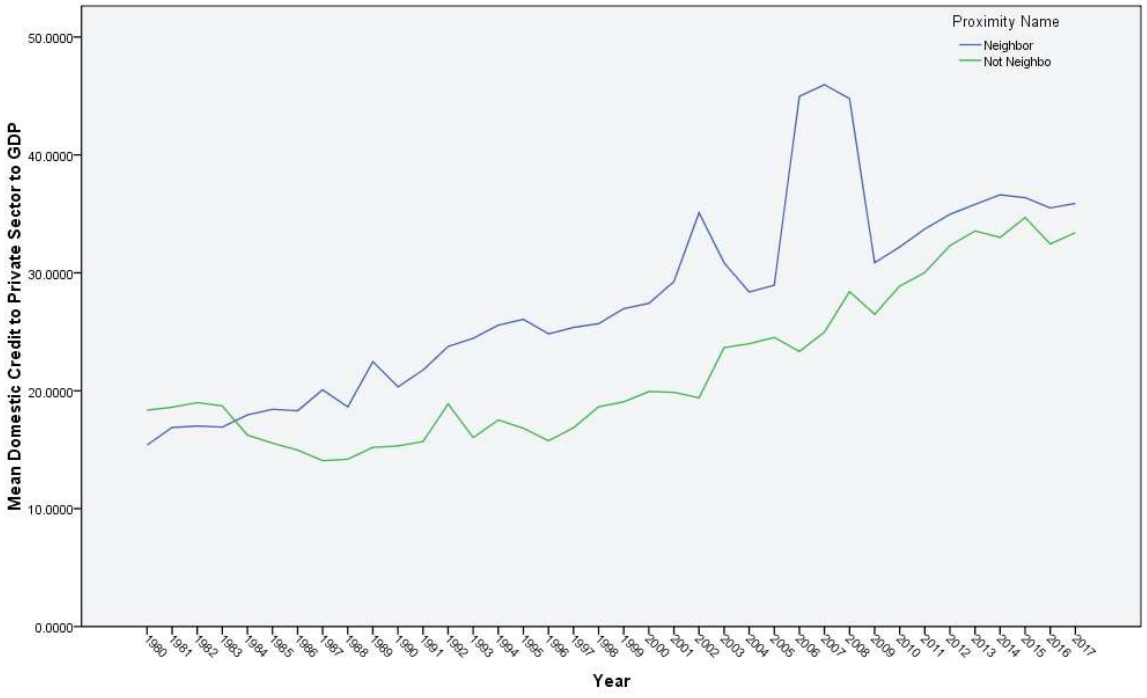
Variable		Neighbour				Non-Neighbour			
		Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max
grow	overall	4.19	5.78	-50.25	35.22	3.41	4.35	-12.67	16.73
	between		1.61	1.97	6.41		0.94	1.94	4.54
	within		5.57	-51.07	34.40		4.26	-11.21	16.58
m3_gdp	overall	28.65	16.42	4.68	151.55	40.75	28.91	10.48	114.13
	between		13.79	15.96	60.10		27.66	19.67	78.27
	within		10.00	3.19	150.06		14.83	2.40	88.94
dcps_GDP	overall	27.75	35.13	1.58	160.12	21.80	22.19	4.13	106.31
	between		32.85	8.43	112.39		20.11	10.32	57.50
	within		16.49	-30.67	129.55		12.93	-14.27	70.61
gfcf_gdp	overall	19.24	6.90	2.00	36.23	20.58	9.74	7.92	93.30
	between		5.23	12.70	29.13		5.73	15.05	29.11
	within		4.82	7.63	35.63		8.27	2.37	94.03
open	overall	0.60	0.37	0.10	1.93	0.81	0.53	0.05	2.43
	between		0.36	0.32	1.24		0.42	0.30	1.25
	within		0.13	0.29	1.38		0.38	0.09	2.53
wpop_gdp	overall	7.61	6.42	0.84	25.99	6.33	5.32	0.49	16.17
	between		6.36	0.96	19.71		5.82	0.74	13.13
	within		2.26	-1.76	20.81		1.02	2.58	9.37

Source: The authors' calculation

Figure 1 suggests proximity clearly explains differences in broad money as a share of GDP in Panel (a). Broad money, which is calculated as a share of GDP, is higher among non-neighbor countries throughout the study period. The gap in broad money growth between neighbor and non-neighbor countries is widening over time. Inversely, the Panel (b) shows that neighboring countries have a higher domestic credit to the private sector as a share of GDP compared to non-neighbor. It is important to highlight that non-neighbor countries are closing the gap over time in terms of the usage or issuance of domestic credit to the private sector. The key message here is that although proximity does not directly explain growth, it may affect growth indirectly through finance-related variables. Proximity can magnify the effect of finance on growth among non-trade center neighbor countries, or reduce the effect of DCPS among trade center neighbor countries.



(a) Proximity effect in the trend of m3_gdp



(b) Proximity effect in the trend of lndcps_gdp

Figure 1. Trends in the effect of proximity on the core variables of the finance-growth relationship

Source: Authors' calculation

4. Analysis results and discussion

The Levin-Lin-Chu (LLC) unit-root test, with lag (1) suggests that GDP growth, gross fixed capital formation, and working population to GDP are stationary at a level while the other variables namely m3_gdp, dcps_gdp, and trade openess are only stationary when differenced once. The Im-Pesaran-Shin (IPS) test was implemented which provides a similar result.

The panel unit root based on IPS and LLC are based on the assumption of independence of cross-sectional units, which is often violated with the use of panel data. Thus, rejecting the null hypothesis of panel unit roots at levels based only on the IPS and LLC tests might be false. The ADF tests were further carried out and the null hypothesis was only rejected for gross fixed capital formation (gfcf_gdp). For all of the remaining five series there was significant evidence that across panels, the data display a unit root problem at a level. After differencing once, the null hypothesis is rejected for these six panels, suggesting that the panels become stationary (autoregressive of order 1).

Following the detection of AR1 for five series, the "Pedroni (1999) panel tests for co-integration" was employed to examine the long-run behavior across the series and countries. The null hypothesis in all the tests is "No co-integration across panels" against the alternative that "At least one panel is co-integrated". The critical values for the test are derived from Pedroni's (1999) and Pedroni (2004) procedures, where the adjusted values can be compared to the N(0,1) distribution.

Table 3 provides the test results for a baseline case, the intercept, and L(1) case. All the computed values lead to the rejection of the null hypothesis of no cointegration across panels, as they are significantly less than the hypothetical critical values. The conclusion is that at least one panel series is co-integrated. Similar tests were carried out for groups of countries, namely SADC and EAC, periphery and center, and neighbour and non-neighbor yielded similar results.

Table 3. Pedroni's cointegration tests

Test Stats	Panel	Group
v	2.195	
rho	-4.547	-3.864
t	-11.55	-13.39
adf	-10.42	-11.87

Source: Authors' calculation

It is mandatory to identify the best estimator among pooled mean group (PMG), mean group (MG), and dynamic fixed effect (DFE) before carrying out a panel-based error correction model. To determine the best method, the Hausman test is used. The results of this test are shown in Table 3. It is presented that the PMG model is superior in both cases.

The Akaike information criterion (AIC) was used for optimal lag selection of counteracting variables in each country based on the ARDL model. As such lags are allowed to vary per variable. The most recurring optimal lags across countries were then chosen as the best lags for the panel ARDL model which is implemented hereafter.

The PMG regression results among neighbour countries are presented in Table 5. There are 324 observations for nine (9) countries. In the long run, finance is significantly detrimental to growth. A unit increase in the ratio of m3_gdp reduces the differenced GDP growth by about 0.5, while a similar increase in dcps_gdp reduces differenced GDP growth by 0.24. In the short run, the differenced m3_gdp and dcps_gdp contribute positively to GDP growth although they are not statistically significant. The lagged values of m3_gdp have a negative contribution to GDP growth while that of dcps_gdp has a positive sign. For neighbor trade center countries, the finance-growth nexus is often positive in the short run but ends up negative in the long run. The short-run effect was also evident in China where the clustering of industries was characterized by "aggregation" and "small world" development, reflecting a more open communication and cooperation channel between the network nodes (Liu *et al.*, 2022).

Table 4. Panel ECM model regression results

Variable	Pooled mean group (PMG)			
	Neighbor countries		Non-neighbor countries	
	Coef.	Std. Err.	Coef.	Std. Err.
ECT				
m3_gdp	-0.484	0.169	-0.491	0.121
dcps_gdp	-0.241	0.122	0.411	0.108
gfcf_gdp	1.097	0.273	-0.126	0.075
open	-0.248	0.202	0.202	0.068
wpop_gdp	0.257	0.152	0.662	0.216
SR				
ECT	-1.067	1.066	1.418	1.211
grow				
L1	0.701	0.996	-1.952	1.348
m3_gdp				
D1	0.612	0.999	-0.555	0.350
LD	-0.695	0.889	-0.994	0.954
dcps_gdp				
D1	0.862	0.912	0.218	0.213
LD	0.251	0.361	-0.912	0.670
gfcf_gdp				
D1	-0.441	0.829	0.07	0.150

Table 4. Panel ECM model regression results (*continued*)

Variable		Pooled mean group (PMG)			
		Neighbor countries		Non-neighbor countries	
		Coef.	Std. Err.	Coef.	Std. Err.
open					
D1		1.801	2.932	-0.134	0.384
wpop_gdp					
D1		-88.611	11.281	-97.877	2.050
LD		62.872	10.071	48.549	18.994
_cons		-0.427	1.497	0.824	1.280
Number of obs					324
Number of groups					9
Obs per group	**min**				36
	avg				36
	max				36
Log likelihood					-137.015

Source: Authors' calculation

The control variables are gfcf_gdp, which is significant in the long run, and wpop_gdp, which reduces current growth with a positive and significant contribution to next year's GDP growth. This observation is similar to previous models. The speed of adjustment for neighbour trade center countries is around one (1.07) which means that each subsequent year, current year deviation from long-run GDP growth trajectories is corrected by around 25.6%.

The PMG regression results among non-neighbour countries are presented in Table 4. There are 180 observations for nine (9) countries. In the long run, growth in m3_gdp is significantly detrimental to growth. A unit increase in the ratio of m3_gdp reduces the differenced GDP growth by about 0.5. In reverse, a similar increase in dcps_gdp increases the differenced GDP growth by 0.4.

In the short-run, the differences dcps_gdp contribute positively towards GDP growth while the differences m3_gdp contribute negatively to GDP growth. These effects are, however, not statistically significant. Both the lagged values of m3_gdp and dcps_gdp have a negative contribution to GDP growth. For non-neighbour countries, the finance-growth nexus could be negative in the short-run but positive in the long-run only in response to dcps-gdp increase. The growth in broad money for these countries is detrimental to GDP growth, in the short-run and the long-run.

The control variables that are significant at 5% include openness and working population per GDP, and wpop_gdp. The first two are significant in the long-run while the last one is significant in the short-run. As with the other models, wpop as a share of GDP reduces GDP growth in the short-run. However, its one-period lag has a significant positive contribution to GDP growth. This also translates to a long-run positive relationship. Trade openness is

negative and insignificant in the short term. However, this is significant in the long vision. For non-neighbour countries, there is a significant contribution of wpop_gdp both in the short- and long-run whereby it immediately reduces growth in the current year and becomes significantly positive in subsequent years. The major challenge of this model is the fact that it is explosive by around 80.5% in each subsequent year, which is inconsistent with the theory. It is noteworthy that, regardless of the proximity status, broad money growth is detrimental to GDP growth. Neighbor countries growth are also negatively impacted by domestic credit to the private sector. DCPS has a significant positive effect on countries that are not sharing borders with trade center countries.

The results for individual country effects are presented in Table 5. All island countries were considered to have no border with any center country. Madagascar, Seychelles, and Mauritius fall in this category. Malawi is included as it borders Tanzania (a trade center) through lake Nyasa. Zambia is also included given the larger border share, which is not shared by any center country. It is evident that non-neighbours countries are significantly and negatively affected by broad money growth in the long run. Potentially, broad money growth is inflationary and has no real contribution to growth for numerous far from trade center countries. This could be associated with the distance explanations where the benefit of expansionary monetary policy fails to trickle down to productive sectors due to distance contraints (Redding and Schott, 2003; Redding and Venables, 2004).

Table 5. Significant coefficients in the short-run finance-growth nexus in the neighbor model

	m3_gdp	lag	dcps_gdp	lag	ECT
Botswana			-0.780		0.172
Kenya	0.928				0.392
Rwanda	7.470		6.443		0.835
Eswatin	1.406	2.764	-2.051	-1.218	0.494
Tanzania			0.577	0.368	0.460
Uganda			4.417	2.639	0.000
Zimbabwe		0.498			

Source: Authors' calculation

On the contrary, expanded DCPS has a positive long-run effect on GDP growth. However, this overall model was explosive for Seychelles, Malawi, and Madagascar. Thus, only the results of two countries can be interpreted. These two countries have no significant short-run effect. This result points to the importance of nearby center country. All the finance-related strategies only have a long-term effect (Ottaviano and Puga, 1998; Lafourcade and Thisse, 2008; Resende *et al.*, 2016). For a country to expect some benefits from expanded FSD, giant trade neighbour will make a difference in the short run. This is contrary to expectations because the short-run effect of increased centrality through transport cost reduction is negative on the GDP, which only becomes positive in the long-run (Resende *et al.*, 2016). This short-

run positive and significant effect of increased proximity to trade centers may require further investigation.

Countries having trade center neighbors are significantly and negatively affected by both broad money growth and expanded DCPS in the long-run. In this cluster of nine countries, Burundi is excluded because of the explosive model while South Africa is omitted because there is no significant financial growth relationship to explain. The remaining cluster consists of seven countries as shown in Table 5. The long-run observations regarding neighbour countries cement the spatial spillovers hypothesis (Shabani *et al.*, 2011; Amidi and Majidi, 2020). Bordering a trade giant mean that most of the FSD initiatives might be assimilated into a larger countries' economy. Non-trade centers would use most of the expanded finances for imports. If these imports are consumables rather than capital goods from a nearby trade center giant, both short-run and long-run growth may be negatively affected. Theoretically, it is not a matter of proximity rather proximity to a center country is what provides an additional spillover advantage, as observed with regard to FDI innovation and technology spillover to local enterprises in China (Yue *et al.*, 2022). There is also evidence that spillovers in terms of policy diffusion in proximal countries have been on the rise (Mossig *et al.*, 2022).

For country-specific short-run effect, Table 5 summarizes the coefficients and the adjustment speed towards long-run equilibrium. Neighbour country's observations do not change most of the previous ones. Rwanda outpaces all the center countries, followed by Eswatin and Tanzania. Proximity to trade center neighbor results in higher adjustment speed. However, finance growth relationships almost remain similar to the regional bloc effect, the centrality effect, or both of them combined (Alananga and Mutasa, 2021). With the exception of Uganda, the CGH holds as the poorest countries adjust relatively faster than relatively rich countries (Bhupatiraju and Verspagen, 2013; Barro and Sala-I-Martin, 2003; Ottaviano and Pinelli, 2006). Within SSA, adjustment toward long-run equilibrium has been provided in several studies. However, CGH is still difficult to prove (Ibrahim, 2017; Mahawiya, 2015).

Table 6. Dumitrescu and Hurlin (2012) Granger non-causality test results

Broad Money Growth (M3)						**DCPS**				
	lags (AIC)	W-bar	Z-bar Stat.	Z-bar p-value	Causality	lags (AIC)	W-bar	Z-bar Stat.	Z-bar p-value	Causality
Neighbor countries										
grow ← m3_gdp	10	16.65	4.46	0.00	One-way	1.00	2.01	2.13	0.03	Two-way
m3_gdp ← grow	1	1.66	1.40	0.16		10.00	15.75	3.85	0.00	
Not neighbor countries										
grow ←m3_gdp	1	1.22	0.34	0.73	One-way	2.00	5.50	3.92	0.00	Two-way
m3_gdp ←grow	9	17.28	4.36	0.00		10.00	15.14	2.57	0.01	

Source: Authors' calculation

Observations concerning causal direction are summarized in Table 6. The literature on spatial spillover is still limited, specifically on finance-growth nexus in relation with geographical spillover. Among non-neighbours, M3 expansion has a higher GDP growth while DCPS has a marginal effect on GDP growth. This observation concurs with the finding of Bara and Pierre (2017), which suggests that the impact of geographic proximity far outweighs that of credit expansion. The causal direction for M3 runs from growth to monetary expansion and not the other way around. The DFH is supported by Zerbo (2015) and Aziakpono (2004). The argument behind the DFH is that most SSA are resource-based economies (ADB, 2013), and the FSD has limited depth and efficiency with high levels of financial exclusion. For DCPS, causality is bidirectional, suggesting a feedback response on the call for even higher DCPS, following a previous downward response of the GDP growth.

5. Conclusion

Based upon the above discussion, geographic proximity works in two folds. First, a neighbor country benefits from reduced transport costs for manufactured consumables compared to a distant country. Second, the neighbor can obtain supplies for its infant industry at a lower cost thus attracting the spillover effect locally in terms of knowledge, innovation, information and support services (Harris, 1954; Liu *et al.*, 2022; Yue *et al.*, 2022; Amidi and Majidi, 2020).

The evidence in this study reinforces proximity and trade centrality as core variables in spatial spillovers (Shabani *et al.*, 2011; Bara and Pierre, 2017). The prices and wages in the center-neighbor country could be lower than in a distant country. Among countries with neighboring trade centers, the finance-growth nexus is negative with the causality effect running from FSD to GDP growth. In these countries expanded M3 as well as DCPS granger, causes lower GDP growth. Potentially most of the expanded M3 and DCPS spill over to nearby countries rather than encouraging domestic production, given the poor infrastructure in these countries.

Spatial proximity to trade center countries provides both benefits and costs to the countries in this study. Countries with nearby trading centers do not benefit from expansionary monetary policies. The use of such policies retains much of its inflationary consequences within the country with limited possibility for being transferred abroad. Potentially, trade centers are cushioned from the negative consequences of monetary expansion in nearby countries through effective absorption capacity emanating from the production and investment infrastructure available in these countries.

Since causality is two-way, these negative consequences mean that the finance-growth nexus reinforces one another in a downward direction among countries closer to trade centers. Countries that are not closer to trader centers tend to have higher GDP in response to broad money growth. Since causality is two-way, these countries will enjoy an upward GDP growth spiral in response to monetary expansion. DCPS is, however, negative and yields a downward GDP growth spiral. Distancing a country from a trade center eliminates the negative consequences of broad money growth but cannot do the same for DCPS.

Potentially, failure of DCPS to stir growth is an intrinsic behavior of the underlying structure of the economy, which may be hard to change. The existing body of knowledge suggests that spatial spillover may arise from education, technology transfer (innovations), and labor productivity (McCann and Oort, 2019). For the case of DCPS, the observations in this study suggest that the DCPS's long-run negative consequences on GDP growth tend to persist regardless of proximity.

That is although FSD effects on GDP growth reverse from negative in neighbour countries to positive in non-neighbour countries, DCPS's negative effect remains statistically significant in either case. This observation contradicts the observation by Nsiah *et al.* (2016), who suggest a positive effect of proximity on growth while the current finding suggests a negative effect that is not moderated by financial sector development. The probable reason behind this observation is that DCPS's ability to influence economic growth is more connected to the structure of the economy which is limitedly influenced by geography. For the highest benefits to FSD countries do not only need to adopt expansionary monetary policies but also re-structure their real economies. When countries move closer to trade centers but have poor economic infrastructure, they are similarly negatively affected as countries further away from trade centers.

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Appendix

Appendix 1. Full error correction model -non-neighbour countries

D.grow	Coef.	Std. Err.	Log likelihood		[95% Conf. Interval]
			z	P>|z|	
Madagascar					
ECT	0.711	0.307	2.320	0.021	0.110
grow					
L1	-1.310	0.445	-2.950	0.003	-2.182
m3_gdp					
D1	-0.323	0.220	-1.470	0.142	-0.755
LD	0.281	0.220	1.280	0.202	-0.150
dcps_gdp					
D1	0.685	0.293	2.340	0.020	0.110
LD	-0.407	0.310	-1.310	0.189	-1.014
gfcf_gdp					
D1	0.201	0.157	1.280	0.201	-0.107
open					
D1	0.247	0.501	0.490	0.622	-0.736
wpop_gdp					
D1	-96.761	0.817	-118.490	0.000	-98.361
LD	39.658	19.015	2.090	0.037	2.389
_cons	2.639	0.826	3.190	0.001	1.020
Mauritius					
ECT	-1.468	0.750	-1.960	0.050	-2.937
grow					
L1	0.995	0.674	1.480	0.140	-0.326
m3_gdp					
D1	-0.871	0.821	-1.060	0.288	-2.480
LD	-0.939	0.685	-1.370	0.170	-2.282

Appendix 1. Full error correction model -non-neighbour countries *(continued)*

D.grow	Coef.	Std. Err.	Log likelihood		[95% Conf. Interval]
			z	P>|z|	
dcps_gdp					
D1	0.470	0.497	0.940	0.345	-0.505
LD	-0.031	0.497	-0.060	0.950	-1.006
gfcf_gdp					
D1	0.420	0.335	1.260	0.209	-0.236
open					
D1	-0.617	0.595	-1.040	0.300	-1.783
wpop_gdp					
D1	-104.039	1.653	-62.930	0.000	-107.279
LD	51.202	15.485	3.310	0.001	20.852
_cons	1.072	0.769	1.390	0.164	-0.436
Malawi					
ECT	3.161	1.388	2.280	0.023	0.441
grow					
L1	-3.372	1.413	-2.390	0.017	-6.142
m3_gdp					
D1	0.114	0.931	0.120	0.903	-1.712
LD	0.274	0.921	0.300	0.766	-1.532
dcps_gdp					
D1	-0.393	0.732	-0.540	0.592	-1.827
LD	-0.468	0.690	-0.680	0.497	-1.821
gfcf_gdp					
D1	0.132	0.664	0.200	0.842	-1.170
open					
D1	1.030	0.664	1.550	0.121	-0.271
wpop_gdp					
D1	-95.753	2.908	-32.920	0.000	-101.453
LD	83.186	7.480	11.120	0.000	68.525
_cons	3.795	2.007	1.890	0.059	-0.138
Seychells					
ECT	5.150	0.135	38.260	0.000	4.887
grow					
L1	-6.418	.	.	.	.

Appendix 1. Full error correction model -non-neighbour countries *(continued)*

D.grow	Coef.	Std. Err.	Log likelihood		[95% Conf. Interval]
			z	P>|z|	
m3_gdp					
D1	-1.761	2.125	-0.830	0.407	-5.926
LD	-4.699	2.289	-2.050	0.040	-9.186
dcps_gdp					
D1	0.514	1.531	0.340	0.737	-2.486
LD	-3.568	1.552	-2.300	0.021	-6.609
gfcf_gdp					
D1	-0.485	0.650	-0.750	0.456	-1.759
open					
D1	-1.239	0.839	-1.480	0.140	-2.883
wpop_gdp					
D1	-92.170	3.878	-23.770	0.000	-99.770
LD	-18.217	12.948	-1.410	0.159	-43.595
_cons	-3.682	2.258	-1.630	0.103	-8.107
Zambia					
ECT	-0.465	0.341	-1.360	0.173	-1.133
grow					
L1	0.348	0.371	0.940	0.348	-0.378
m3_gdp					
D1	0.068	0.303	0.230	0.822	-0.525
LD	0.112	0.318	0.350	0.724	-0.512
dcps_gdp					
D1	-0.187	0.154	-1.210	0.225	-0.488
LD	-0.084	0.148	-0.560	0.572	-0.374
gfcf_gdp					
D1	0.080	0.116	0.690	0.490	-0.147
open					
D1	-0.093	1.128	-0.080	0.934	-2.303
wpop_gdp					
D1	-100.661	1.245	-80.860	0.000	-103.101
LD	86.918	10.621	8.180	0.000	66.101
_cons	0.297	0.425	0.700	0.484	-0.535

Source: Authors' calculation

Appendix 2. Full error correction model -non-neighbour countries

D.grow	Coef.	Std. Err.	Log likelihood		[95% Conf. Interval]
			z	P>|z|	
Burundi					
ECT	0.552	0.203	2.720	0.006	0.155
grow					
L1	-0.699	0.217	-3.220	0.001	-1.124
m3_gdp					
D1	0.095	0.655	0.150	0.884	-1.189
LD	-0.326	0.755	-0.430	0.666	-1.805
dcps_gdp					
D1	-0.631	0.432	-1.460	0.144	-1.478
LD	-0.635	0.437	-1.450	0.146	-1.491
gfcf_gdp					
D1	0.512	0.235	2.170	0.030	0.050
open					
D1	1.570	1.221	1.290	0.198	-0.823
wpop_gdp					
D1	-102.724	2.087	-49.230	0.000	-106.814
LD	84.891	7.014	12.100	0.000	71.145
_cons	1.176	0.443	2.660	0.008	0.309
Botswana					
ECT	-1.572	0.639	-2.460	0.014	-2.824
grow					
L1	1.032	0.544	1.900	0.058	-0.034
m3_gdp					
D1	0.034	0.338	0.100	0.921	-0.629
LD	0.140	0.279	0.500	0.616	-0.407
dcps_gdp					
D1	-0.780	0.344	-2.270	0.023	-1.453
LD	0.381	0.301	1.270	0.206	-0.209
gfcf_gdp					
D1	1.221	0.617	1.980	0.048	0.011
open					
D1	-0.527	0.428	-1.230	0.218	-1.366

Appendix 2. Full Error Correction Model -Non-neighbour Countries *(continued)*

D.grow	Coef.	Std. Err.	Log likelihood		[95% Conf. Interval]
			z	P>|z|	
wpop_gdp					
D1	-104.653	1.128	-92.790	0.000	-106.863
LD	46.843	16.205	2.890	0.004	15.082
_cons	-0.122	0.872	-0.140	0.889	-1.831
Kenya					
ECT	-0.438	0.233	-1.880	0.060	-0.895
grow					
L1	0.220	0.199	1.100	0.269	-0.170
m3_gdp					
D1	0.928	0.428	2.170	0.030	0.088
LD	0.736	0.422	1.750	0.081	-0.091
dcps_gdp					
D1	-0.253	0.330	-0.770	0.443	-0.901
LD	-0.117	0.319	-0.370	0.713	-0.743
gfcf_gdp					
D1	-0.004	0.345	-0.010	0.990	-0.680
open					
D1	-1.882	1.007	-1.870	0.062	-3.857
wpop_gdp					
D1	-101.180	1.190	-85.040	0.000	-103.512
LD	80.828	7.677	10.530	0.000	65.782
_cons	0.321	0.395	0.810	0.416	-0.453
Rwanda					
ECT	1.624	1.692	0.960	0.337	-1.693
grow					
L1	-1.700	1.748	-0.970	0.331	-5.127
m3_gdp					
D1	7.470	3.175	2.350	0.019	1.247
LD	-5.637	3.054	-1.850	0.065	-11.623
dcps_gdp					
D1	6.443	1.712	3.760	0.000	3.089
LD	0.901	1.805	0.500	0.617	-2.636
gfcf_gdp					
D1	0.363	3.135	0.120	0.908	-5.782

Appendix 2. Full Error Correction Model -Non-neighbour Countries *(continued)*

D.grow	Coef.	Std. Err.	Log likelihood		[95% Conf. Interval]
			z	P>|z|	
open					
D1	-6.058	5.661	-1.070	0.285	-17.153
wpop_gdp					
D1	-80.879	2.889	-27.990	0.000	-86.542
LD	89.018	10.904	8.160	0.000	67.647
_cons	3.079	3.307	0.930	0.352	-3.402
Eswatin					
ECT	-0.023	0.181	-0.130	0.900	-0.378
grow					
L1	-0.307	0.209	-1.470	0.142	-0.716
m3_gdp					
D1	1.406	0.675	2.080	0.037	0.082
LD	2.764	0.662	4.170	0.000	1.466
dcps_gdp					
D1	-2.051	0.652	-3.150	0.002	-3.329
LD	-1.218	0.576	-2.120	0.034	-2.347
gfcf_gdp					
D1	0.347	0.499	0.700	0.487	-0.631
open					
D1	-0.321	0.630	-0.510	0.611	-1.555
wpop_gdp					
D1	-115.296	2.287	-50.410	0.000	-119.779
LD	66.450	11.428	5.810	0.000	44.051
_cons	6478474.000	0.275	2.360	0.019	0.109
Tanzania					
ECT	-0.160	0.420	-0.380	0.704	-0.982
grow					
L1	-0.559	0.435	-1.280	0.199	-1.412
m3_gdp					
D1	0.000	1.298	0.000	1.000	-2.543
LD	0.161	1.228	0.130	0.896	-2.246
dcps_gdp					
D1	0.577	0.157	3.680	0.000	0.269
LD	0.368	0.160	2.310	0.021	0.055

Appendix 2. Full Error Correction Model -Non-neighbour Countries *(continued)*

D.grow	Coef.	Std. Err.	Log likelihood		[95% Conf. Interval]
			z	P>|z|	
gfcf_gdp					
D1	0.481	0.961	0.500	0.617	-1.404
open					
D1	-3.405	2.221	-1.530	0.125	-7.758
wpop_gdp					
D1	-94.294	5.074	-18.590	0.000	-104.238
LD	35.261	9.523	3.700	0.000	16.597
_cons	2.246	0.961	2.340	0.019	0.363
Uganda					
ECT	-9.293	.	.	.	.
grow					
L1	8.418	0.146	57.540	0.000	8.132
m3_gdp					
D1	-4.056	2.660	-1.530	0.127	-9.269
LD	-4.567	2.602	-1.760	0.079	-9.667
dcps_gdp					
D1	4.417	1.500	2.950	0.003	1.478
LD	2.639	1.310	2.010	0.044	0.072
gfcf_gdp					
D1	-6.998	5.495	-1.270	0.203	-17.769
open					
D1	24.292	11.183	2.170	0.030	2.373
wpop_gdp					
D1	-1.704	2.075	-0.820	0.412	-5.772
LD	-0.339	1.927	-0.180	0.860	-4.116
_cons	-12.088	7.170	-1.690	0.092	-26.142
ECT	-0.200	0.131	-1.530	0.127	-0.457
grow					
L1	0.057	0.124	0.460	0.644	-0.186
m3_gdp					
D1	-0.231	0.694	-0.330	0.739	-1.591
LD	-0.025	0.589	-0.040	0.967	-1.180

Appendix 2. Full Error Correction Model -Non-neighbour Countries *(continued)*

D.grow	Coef.	Std. Err.	Log likelihood		[95% Conf. Interval]
			z	P>|z|	
dcps_gdp					
D1	0.001	0.318	0.000	0.998	-0.623
LD	-0.046	0.368	-0.130	0.900	-0.767
gfcf_gdp					
D1	0.102	0.678	0.150	0.880	-1.227
open					
D1	1.499	1.348	1.110	0.266	-1.143
wpop_gdp					
D1	-98.796	1.627	-60.730	0.000	-101.984
LD	88.278	5.582	15.810	0.000	77.337
_cons	0.278	0.170	1.630	0.102	-0.056
Zimbabwe					
ECT	-0.091	0.187	-0.490	0.626	-0.458
grow					
L1	-0.155	0.159	-0.970	0.331	-0.467
m3_gdp					
D1	-0.134	0.186	-0.720	0.471	-0.498
LD	0.498	0.190	2.630	0.009	0.126
dcps_gdp					
D1	0.040	0.155	0.260	0.797	-0.264
LD	-0.013	0.128	-0.100	0.917	-0.264
gfcf_gdp					
D1	0.007	0.180	0.040	0.968	-0.345
open					
D1	1.042	1.124	0.930	0.354	-1.160
wpop_gdp					
D1	-97.977	1.353	-72.430	0.000	-100.629
LD	74.615	11.234	6.640	0.000	52.596
_cons	0.619	0.319	1.940	0.052	-0.006

Source: Authors' calculation