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1. Introduction

Over the past two decades, the relationship between financial sector development and globalization has received a lot of attention among scholars. The debate gained momentum with the prominent contribution of Mishkin (2009) which reveals that globalization reinforces the institutions of an economy, the essential determinants of financial development and economic growth. It is well established that a well-developed financial sector is a major asset in stimulating economic growth of countries (see Levine, 2005; 1997). Besides, globalization is known as one of the stimulating factors of growth process through the increased movement of people between countries, improving social and human capitals, developing financial and technological infrastructures, and promoting FDI (see O'Rourke 2001; Agenor 2003). In view of the above benefits, it is essential to understand the relationship between financial development and globalization for developing countries and especially Sub-Saharan African (SSA, hereafter) countries.

The contribution of this paper in the existing literature is threefold. First, to the best of our knowledge, this is the first study that considers the economic dimension of globalization in analyzing the causal nexus between financial sector development and globalization for SSA countries. Second, this study is the first that applied a bootstrap panel causality approach to explore the link between financial sector development and globalization. This makes it possible to test Granger causality individually for each country in the panel by considering the existence of contemporaneous correlation across countries (see Kónya 2006; Chang et al. 2014; Menyah et al. 2014). Third, apart from contemporaneous correlation, this study takes into account cross-sectional dependence and country-specific heterogeneity across the twenty-one SSA economies of the sample.

The rest of this study is organized as follows. Section 2 is concerned with the related literature review. Section 3 presents the data used in the empirical analysis. Section 4 provides the Econometric methodology. Preliminary analysis appears in Section 5. Section 6 provides and discusses the empirical results. Section 7 concludes the paper.

2. Related Literature Review

There is no consensus on whether globalization follows or conduces financial development. On the theoretical level, Mishkin (2009) hypothesizes that globalization encourages financial development and economic growth throughout the mediating role of institutional reforms. More precisely, he points out that globalization is a mighty lever able to enhance the quality of institutions. As these institutions are the basis of effective legal systems, strong property rights and sound financial regulation, they will in turn stimulate financial sector development. Consequently, owing to the enhancement of these institutional environments, the cost of domestic financial capital will match with foreign competitive cost of investment suggesting the law of single price that will enable domestic consumers and business firms to access capital from banking and stock markets for their consumption and investment purposes. In the same vein with Mishkin (2009), García (2012) indicates that globalization carries away financial globalization that fosters the development of the financial system. On the other hand, Rajan and Zingales (2003) point out that globalization, in terms of trade openness and capital flows, promotes financial development by limiting the ambitions of powerful companies to hamper financial development.

Empirically, some studies have attempted to examine the link between financial development and globalization across countries or regions based on varied methodologies and data. Law (2009) documented that the weakness of institution and low competition among the banks in developing countries hinder the financial sector to benefit sufficiently of foreign capital inflows and trade openness. Falahaty and Law (2012) examined globalization-financial development nexus for MENA region over the period 1991–2007 by means of Panel Vector Auto-regressive (PVAR) and Fully Modified Ordinary Least Squares (FMOLS) methods and found that globalization positively influences financial sector and economic growth, whereas globalization does not induce institutions. In the case of eight East Asian countries, Law et al. (2014) performed heterogeneous panel cointegration and causality tests. Their main results suggest a significant causation from economic globalization to institution quality and institutional reforms from banking sector. They also found that economic globalization cause directly stock market development. Similarly, Law et al. (2015) provided evidence that globalization significantly affects institutions and that subsequent institutional reforms will stimulate financial sector development. Kandil et al. (2015) applied panel cointegration and causality technics on 32 countries and found that financial development affects globalization positively but contrariwise globalization does not promote financial development. Muye and Muye (2017) explored the dynamic effect and causality between globalization, institutions and financial development and provided evidence of a long run equilibrium among these variables for three economic blocs from 1984 to 2013. They also validate Mishkin (2009) hypothesis, such that institutions play a transitive role in causal effect of globalization on the banking sector (i.e., financial development). Shahbaz et al. (2018) used cointegration and causality tests to analyze the link between globalization and financial development. They found that globalization is detrimental for financial development in a very large emerging country like India. In the case of US, Bilir et al. (2019) showed that sound financial development in host economies encourages globalization and FDI by multinational enterprises. More recently, Nasreen et al. (2020) showed that financial globalization impedes the process of financial development in 23 European countries over the period of 1989-2016. Katircioğlu and Zabolotnov (2020) studied how financial development acts on economic globalization all around the world over the period 1980-2014. They revealed that financial development is an important conductor for economic globalization.

Considering the above discussion, the nature of the relationship between financial sector development and globalization (economic globalization) is still an open topic, especially since very few studies have focused on developing countries. Therefore, this study aims at filling this gap by addressing the above issue in the case of SSA region.

3. Data Description

This paper considers annual data of 21 SSA countries covering the period 1980-2017. Financial sector development is measured by the overall financial development index (*fsd*) gathered from the International Monetary Fund; for more information about this more comprehensive index of the financial development, see Cihak et al. (2012) and Svirydzenka (2016). To capture globalization, we use the new version of KOF 'overall' economic globalization index (*glob*) updated by Gygli et al. (2019) and initially developed by Dreher (2006). The '*overall*' economic globalization index is composed of '*de jure*' and '*de facto*' indices. The '*de jure*' economic globalization index (*globdj*) focuses on trade and investment regulations, trade taxes, tariffs, capital account openness, and trade and investment agreements; while the '*de facto*' economic

globalization index (*globdf*) is based on volumes of trade (trade openness), portfolio investments, FDI, international debt, international reserves, and the market diversification. Economic globalization index provides an overview of trade globalization and financial globalization. In Table 1, we report the summary statistics for the financial development and economic globalization variables used throughout this study.

Table 1. Descriptive Statistics

	Fsd	Glob	Globdf	Globdj
Mean	0.135	42.134	46.406	37.862
Median	0.115	42.769	46.266	36.775
Maximum	0.627	62.778	81.299	66.335
Minimum	0.013	15.746	11.647	14.018
Std. Dev.	0.085	9.460	15.447	9.409
Skewness	3.171	-0.358	-0.006	0.438
Kurtosis	15.490	2.819	2.420	3.145
Jarque-Bera	6524.440	18.131	11.185	26.252
Probability	0.000	0.000	0.004	0.000
Observations	798	798	798	798

4. Econometric Methodology

First, as a condition for using panel Granger causality tests, we execute cross-dependence and slope homogeneity tests. Detecting for the cross-sectional dependence and slope homogeneity are fundamental in panel data study. Especially, the recent global trend has highlighted that shock in a country can be diffused to other countries through international trade and economic and financial integration (see Nazlioglu et al., 2011). As a matter of fact, Pesaran (2006) argues that neglecting cross-sectional dependency leads to considerable bias and size distortions.

4.1. Cross-sectional Dependence Test

If there is a cross-section dependency between the series, it will affect the accuracy and reliability of the results (see Breusch - Pagan, 1980; Pesaran, 2006). As Peseran (2006) indicates, ignoring cross-section dependence, which means that a shock that affects any of the units that make up the panel can affect other units, can cause biased results. Therefore, in this study, the LM_{BP} test developed by Breusch Pagan (1980), the CD_{LM} and CD test of Peseran (2004), and the LM_{BC} test are used to investigate the presence of cross-sectional dependencies among selected countries. Breusch-Pagan (1980) LM test is used when time dimension is too large compared to the cross-section dimension $(T > N)$. Pesaran (2004) CD_{LM} test is used when the time dimension is greater than the cross-section dimension $(T > N)$ but the difference between the two dimensions should be moderate. Pesaran (2004) CD test is used when cross-section dimension is greater than the time dimension $(N > T)$. Baltagi et al. (2012) bias-corrected scaled LM test is used as a recent one. The test statistics can be calculated using the following panel data model:

$$y_{it} = \alpha_i + \beta_i^{'} x_{it} + \mu_{it} \text{ for } i = 1, \cdots, N \text{ and } t = 1, \cdots, T \quad (1)$$

The hypotheses for testing cross-sectional dependence are as follows:

$$H_0 : Cov\left(\mu_{it}, \mu_{jt}\right) = 0 \ \ for\ all\ t\ and\ i \neq j$$
$$H_1 : Cov\left(\mu_{it}, \mu_{jt}\right) \neq 0 \ \ for\ at\ least\ some\ i \neq j\ or\ some\ t$$

The test statistics developed by Breusch and Pagan (1980), Pesaran (2004) and Baltagi et al. (2012) are presented in Table 2.

Table 2: **Tests for cross-section dependence**

Test	Statistic
$LM_{BP}\left(BP, 1980\right)$	$LM = \sum_{i=1}^{N-1}\sum_{j=i+1}^{N} T_{ij}\hat{\rho}_{ij}^2 \rightarrow \chi^2 \frac{N\left(N-1\right)}{2}$
$CD_{LM}\left(Pesaran, 2004\right)$	$CD_{LM} = \sqrt{\frac{1}{N\left(N-1\right)}}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(T_{ij}\hat{\rho}_{ij}^2 - 1\right) \rightarrow N\left(0,1\right)$
$LM_{BC}\left(2012\right)$	$LM_{BC} = \sqrt{\frac{1}{N\left(N-1\right)}}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(T_{ij}\hat{\rho}_{ij}^2 - 1\right) - \frac{N}{2\left(T-1\right)} \rightarrow N\left(0,1\right)$
$CD\left(Pesaran, 2004\right)$	$CD_p = \sqrt{\frac{2}{N\left(N-1\right)}}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N} T_{ij}\hat{\rho}_{ij} \rightarrow N\left(0,1\right)$

4.2. Slope Homogeneity Test

Another useful step in the bootstrap panel causality framework is determining for cross-country heterogeneity. To deal with the issue of cross-sectional heterogeneity, the study employs the slope homogeneity test of Pesaran and Yamagata (2008). Ignoring heterogeneity of slope in the panel can produce misleading results (see Breitung, 2005). Pesaran and Yagamata (2008) proposed a modified version of the Swamy's (1970) for a panel with a large *N*. The delta test for slope homogeneity is expressed as,

$$\Delta = \sqrt{N}\left(\frac{N^{-1}\hat{s} - p}{\sqrt{2p}}\right) \rightarrow N\left(0,1\right). \quad \left(N,T\right) \rightarrow \infty, \frac{\sqrt{N}}{T^2} \rightarrow 0 \tag{2}$$

with p the number of exogenous regressors and $\hat{s}$ the modified dispersion statistic of Swamy (1970). The biased-adjusted version of the Δ test is given as follows:

$$\Delta_{adj} = \sqrt{N}\left(\frac{N^{-1}\hat{s} - E\left(z_{iT}\right)}{\sqrt{\mathrm{var}\left(z_{iT}\right)}}\right) \tag{3}$$

where $E\left(z_{iT}\right) = p$ and $\mathrm{var}\left(z_{it}\right) = 2p\left(T-p-1\right)/T+1$.

Pesaran and Yamagata (2008) take into account the following panel data model with fixed effects and heterogeneous slopes,

$$y_{it} = \alpha_i + \beta_i^{'} x_{it} + \varepsilon_{it} \text{ for } i = 1, \cdots, N \text{ and } t = 1, \cdots, T$$

The hypotheses for testing slope homogeneity are as follows,

$H_0 : \beta_i = \beta$ for all i;

$H_1 : \beta_i \neq \beta_j$ for a non-zero fraction of pairwise slopes for $i = j$.

4.3. Konya (2006) Panel Bootstrap Causality Test

The method developed by Kónya (2006) was applied in recent times in studies that concern the linkages between financial development and economic growth (see Kar et al. 2011; Menyah et al. 2014; Mhadhbi et al. 2020). The current study is the first that implements a bootstrap panel causality approach to explore the causal linkage between financial development and globalization. The procedure adopted to achieve bootstrap panel causality tests is described as follows. The point of departure to examine the correlation between *fsd* and *glob* in the spirit of Kónya (2006) consists in introducing a bivariate finite order vector autoregressive (VAR) model:

$$\begin{cases} fsd_{i,t} = \alpha_{1,i} + \sum_{s=1}^{lfsd_1} \beta_{1,i,s} fsd_{i,t-s} + \sum_{s=1}^{lglob_l} \lambda_{1,i,s} glob_{i,t-s} + \varepsilon_{1,i,t} \\ glob_{i,t} = \alpha_{2,i} + \sum_{s=1}^{lfsd_2} \beta_{2,i,s} fsd_{i,t-s} + \sum_{s=1}^{lglob_2} \lambda_{2,i,s} glob_{i,t-s} + \varepsilon_{2,i,t} \end{cases} \quad (4)$$

where *fsd* and *glob* stand for financial development index and globalization index respectively. The subscripts *i* and *t* indicate the country $(i = 1, \cdots, N)$ and time-period $(t = 1, \cdots, T)$ respectively, s is the lag, $lfsd_1$, $lgob_1$, $lfsd_2$ and $lgob_2$ refer to the lag lengths. The error terms $\varepsilon_{1,i,t}$ and $\varepsilon_{2,i,t}$ are supposed to be innovations that may be correlated with one another for a given country, but not across countries.

For each country-unit *i* in model (4), equations have the same lagged exogenous and endogenous variables, in this circumstance the estimation of parameters based on OLS is always consistent and asymptotically efficient. This implies that the estimation of 2*N* equations in the bivariate system can be operated one-by-one. Therefore, in lieu of *N* VAR bivariate systems (4), we prefer the two sets of equations given below:

$$\begin{cases} fsd_{1,t} = \alpha_{1,1} + \sum_{s=1}^{lfsd_1} \beta_{1,1,s} fsd_{1,t-s} + \sum_{s=1}^{lglob_l} \lambda_{1,1,s} glob_{1,t-s} + \varepsilon_{1,1,t} \\ fsd_{2,t} = \alpha_{1,2} + \sum_{s=1}^{lfsd_1} \beta_{1,2,s} fsd_{2,t-s} + \sum_{s=1}^{lglob_l} \lambda_{1,2,s} glob_{2,t-s} + \varepsilon_{1,2,t} \\ \vdots \\ fsd_{N,t} = \alpha_{1,N} + \sum_{s=1}^{lfsd_1} \beta_{1,N,s} fsd_{N,t-s} + \sum_{s=1}^{lglob_l} \lambda_{1,\mathrm{N},s} glob_{N,t-s} + \varepsilon_{1,N,t} \end{cases} \quad (5)$$

and

$$\begin{cases} glob_{1,t} = \alpha_{2,1} + \sum_{s=1}^{lfsd_2} \beta_{2,1,s} fsd_{1,t-s} + \sum_{s=1}^{lglob_2} \lambda_{2,1,s} glob_{1,t-s} + \varepsilon_{2,1,t} \\ glob_{2,t} = \alpha_{2,2} + \sum_{s=1}^{lfsd_2} \beta_{2,2,s} fsd_{2,t-s} + \sum_{s=1}^{\lg lob_2} \lambda_{2,2,s} glob_{2,t-s} + \varepsilon_{2,2,t} \\ \vdots \\ glob_{N,t} = \alpha_{2,N} + \sum_{s=1}^{lfsd_2} \beta_{2,N,s} fsd_{N,t-s} + \sum_{s=1}^{lglob_2} \lambda_{2,N,s} glob_{N,t-s} + \varepsilon_{2,N,t} \end{cases} \quad (6)$$

Testing for causality on the above system is straightforward. For example, in the *i*th row of Equation (5), $i = 1,2,\ldots,N$, *glob* does not Granger cause *fsd* if $\lambda_{1,i,s} \equiv 0 \ \forall s$. Likewise, in the *i*th row of Equation (6), $i = 1,2,\ldots,N$, *glob* does not Granger cause *fsd* if $\beta_{2,i,s} \equiv 0 \ \forall s$.

As each equation has different predetermined variables, the unique potential source of relation among individual regressions arises from the contemporaneous correlation within the system. However, the suitable approach allowing the contemporaneous correlation within the system (5) and (6) is the seemingly unrelated regression (SUR). In the current situation, estimates based on SUR are more efficient than those on OLS. In light of Kónya (2006), we apply country-specific bootstrap Wald critical values to perform Granger causality test. This method is advantageous on several points: (i) - It makes the assumption of the heterogeneity of the panel-unit, thus, it is possible to obtain panel causality test individual-by-individual. Moreover, on the base of extra information given by the panel data setting in the presence of contemporaneous cross-correlation, it is possible to provide specific bootstrap critical values for each individual (country). (ii) - This method does not impose testing for unit roots and cointegration at first, although it still necessitates the determination of the numbers of optimal lags. (iii) - This panel test makes it possible to define for each country its characteristics in terms of unidirectional, bidirectional or absence of Granger causality.

5. Preliminary Analysis

Table 3 reports the results of cross-section dependence test.

Table 3: Cross-section dependence test

Fixed Model	Statistics	P-value
Tests		
$LM_{BP}(BP,1980)$	23.598	0.008
$CD_{LM}(Pesaran,2004)$	3.040	0.002
$LM_{BC}(2012)$	2.936	0.003
$CD(Pesaran,2004)$	-3.789	0.000

Since our time dimension is larger than cross section dimension, we can look at LM_{BP} and CD_{LM} test's results. Since p-values are less than 0.01, for all models we reject the null hypothesis of no cross-sectional dependence at 1% significance level and conclude that there is cross sectional dependency between variables. These findings imply that a shock occurred in one developing

country can be transmitted to other developing countries in SSA. The results of the slope homogeneity tests are presented in Table 4 :

Table 4: Slope homogeneity test results

Test	Statistic	P-value
$\Delta test$	4.603	0.000
Δadj	4.894	0.000

Results show that since probability values are less than 0.01, the null hypothesis of slope homogeneity is rejected at 1% significance level. Therefore, these results show that we have to apply a causality test which take into consider both cross-sectional dependence and slope heterogeneity.

Table 5 reports the results of both cross-section dependence and slope homogeneity tests. The results associated with the CD test of Pesaran (2004) strongly reject the null hypothesis of no cross-sectional dependence at 1% significance level in SSA. These results suggest that shocks to either globalization or financial development in one countries can propagate to other countries. The results drawn from the slope homogeneity of Pesaran and Yamagata (2008) validate the heterogeneity of countries, which states that each country is affected by its own characteristics.

Table 5. Cross-sectional dependence and homogeneous tests

	Cross-sectional dependence test Pesaran (2004)	Slope heterogeneity test Pesaran and Yamagata (2008)	
	CD_{LM}	$\tilde{\Delta}$	$\tilde{\Delta}_{adj}$
fsd = *f*(glob)	71.976***	28.112***	29.292***
glob = *f*(fsd)	64.876***	23.018***	23.984***
fsd = *f*(globdf)	78.492***	28.256***	29.442***
globdf = *f*(fsd)	72.304***	27.305***	28.451***
fsd = *f*(globdj)	79.193***	24.715***	25.753***
globdj = *f*(fsd)	90.726***	24.950***	25.997***

Notes: *** significance at the 0.01 level

6. Empirical Results

After establishing the evidence of cross-sectional dependency and heterogeneity among SSA countries, we execute the bootstrap panel causality approach of Kónya (2006). We estimate the system by assuming from 1 to 3 lags with the Schwarz Information Criterion (SIC) and the number chosen for bootstrap is 1,000 replications.

Table 6 provides the results of the causality test between *fsd* and *glob*. We observe that there is unidirectional causality running from *glob* to *fsd* for Burkina-Faso, Togo and Uganda. In contrast, in the case of Ethiopia, Ghana, Mali and Senegal there is a causality running from *fsd* to *glob*. In addition, we find a bidirectional causality for Cameroon and Lesotho. Concerning the rest of countries of the panel there is no existence of causality between financial development and economic globalization.

Table 6. Results for panel causality (glob index)

Countries	H_0: fsd does not Granger cause glob				H_0: glob does not Granger cause fsd			
	Wald statistics	Bootstrap critical value			Wald statistics	Bootstrap critical value		
		1%	5%	10%		1%	5%	10%
Benin	0.310	56.458	28.679	20.602	4.500	42.327	25.473	19.548
Botswana	0.205	3.164	1.886	1.390	5.946	19.793	12.635	10.714
Burkina-Faso	6.119*	4.969	2.628	2.093	7.493	18.023	13.151	11.004
Cameroon	4.805***	4.095	3.017	2.437	31.228**	39.219	26.698	21.077
Congo, Rep	2.871	9.391	6.478	5.398	10.593	33.878	23.865	20.292
Cote d'Ivoire	0.524	5.793	4.534	3.934	2.396	58.631	37.438	27.936
Ethiopia	0.105	2.126	1.334	0.908	30.318**	38.193	27.213	20.280
Gabon	6.491	13.587	10.328	9.536	25.218	46.572	31.389	25.667
Gambia, The	8.066	21.245	13.291	9.031	5.290	34.989	22.036	18.440
Ghana	0.072	8.591	5.920	5.087	24.375**	36.519	23.544	18.816
Kenya	6.311	14.009	11.003	9.740	4.235	37.995	26.587	22.460
Lesotho	5.085***	1.032	0.492	0.339	47.789***	45.574	29.316	22.903
Mali	0.510	14.111	10.413	9.268	26.552*	39.213	26.798	20.455
Nigeria	1.345	4.402	2.802	2.209	2.277	37.662	24.138	19.761
Rwanda	0.080	1.731	0.748	0.493	33.256	70.351	42.843	33.885
Senegal	0.206	17.051	14.323	13.081	33.154***	14.456	9.913	7.447
South Africa	3.557	15.730	9.225	6.260	13.869	27.632	20.887	16.679
Tanzania	1.605	11.125	6.926	5.290	3.584	51.726	32.621	24.859
Togo	1.700*	3.859	2.358	1.669	1.267	33.413	23.289	16.446
Uganda	28.384***	10.795	9.053	8.028	12.944	72.278	50.741	42.772
Zambia	7.763	14.315	11.157	10.078	2.499	45.628	35.566	29.540

Notes: ***, **, * significance at the 0.01, 0.05, 0.1 levels, respectively

Now let's turn on the results based on the *de facto* index of economic globalization and the *de jure* index of economic globalization.

Table 7 shows the results of bootstrap panel causality test between *fsd* and *globdf*. We note that there exists a unidirectional causality running from *globdf* to *fsd* for Botswana, Congo, Kenya, Togo and Zambia. However, the reverse unidirectional causality running from *fsd* to *globdf* is identified for Cameroon, Cote d'Ivoire, Ethiopia, Gabon, Mali, Senegal and South Africa. Moreover, a bidirectional causality between *fsd* and *globdf* is observed in the case of Burkina-Faso and Lesotho.

Table 7. Results for panel causality (globdf index)

Countries	H_0: fsd does not Granger cause globdf				H_0: globdf does not Granger cause fsd			
	Wald statistics	Bootstrap critical value			Wald statistics	Bootstrap critical value		
		1%	5%	10%		1%	5%	10%
Benin	0.220	48.175	30.219	23.678	0.042	4.597	3.453	2.960
Botswana	21.085***	11.371	9.256	8.422	1.187	9.271	7.814	7.038
Burkina-Faso	3.968**	5.877	3.600	2.832	4.108***	2.941	1.629	1.099
Cameroon	0.688	8.826	6.198	5.334	1.097***	0.719	0.421	0.281
Congo, Rep	8.510**	9.224	6.271	5.236	4.067	9.623	6.692	5.796
Cote d'Ivoire	0.579	6.911	4.960	3.935	13.170***	6.277	5.129	4.450
Ethiopia	0.259	2.381	1.034	0.692	26.030***	2.518	1.436	0.937
Gabon	0.227	4.918	3.336	2.736	21.565***	17.852	14.763	13.503
Gambia, The	1.081	29.521	13.670	9.029	0.620	17.438	9.984	6.807
Ghana	0.461	9.248	6.930	5.863	0.155	11.039	8.111	7.160
Kenya	1.126**	1.434	0.735	0.484	2.312	5.798	4.267	3.658
Lesotho	2.421**	2.092	0.973	0.682	10.008**	12.302	9.993	9.021
Mali	3.036	7.742	5.416	4.500	0.975**	1.246	0.733	0.509
Nigeria	0.001	4.076	2.451	1.875	0.770	2.137	1.383	1.064
Rwanda	0.051	2.091	1.028	0.692	0.648	8.012	5.005	3.650
Senegal	5.997	11.920	8.318	7.375	21.840***	4.949	4.063	3.611
South Africa	3.319	19.573	9.588	7.244	8.508*	15.924	8.862	6.261
Tanzania	4.520	11.360	7.733	6.412	1.807	9.962	8.519	7.698
Togo	12.976***	5.703	3.902	2.953	0.067	1.178	0.622	0.444
Uganda	8.393	11.608	9.569	8.578	1.756	5.996	4.675	4.000
Zambia	1.056*	2.202	1.221	0.876	0.263	1.903	1.215	0.962

Notes: ***, **, * significance at the 0.01, 0.05, 0.1 levels, respectively

Table 8 provides the results of panel causality analysis between *fsd* and *globdj* for 21 SSA countries. For Cameroon, Ghana, Nigeria, Togo and Uganda, we find a unidirectional causality running from *globdj* to *fsd*. Conversely, for Benin, Botswana and Congo, we find a unidirectional causality running from *fsd* to *globdj*. Moreover, we find a bidirectional causal link between *fsd* and *globdj* only for Lesotho and Mali. In the remaining eleven countries, i.e. half of the panel, there is no causality between *fsd* and *globdj*.

Table 8. Results for panel causality (globdj index)

Countries	H_0: fsd does not Granger cause globdj				H_0: globdj does not Granger cause fsd			
	Wald statistics	Bootstrap critical value			Wald statistics	Bootstrap critical value		
		1%	5%	10%		1%	5%	10%
Benin	4.428	25.900	13.125	8.237	70.674***	43.646	25.063	20.412
Botswana	2.004	4.562	3.361	2.828	10.098*	16.990	11.812	9.708
Burkina Faso	0.171	6.998	4.930	4.147	3.439	15.407	11.383	9.560
Cameroon	3.304*	5.544	3.850	3.095	23.634	38.661	28.334	23.657
Congo, Rep	0.082	4.677	3.113	2.249	18.620*	27.504	19.644	15.988
Cote d'Ivoire	0.802	1.944	1.113	0.845	11.138	34.478	24.082	18.454
Ethiopia	0.138	3.979	2.609	2.241	3.713	43.731	25.703	19.792
Gabon	3.415	17.521	14.526	13.356	20.990	43.200	31.793	25.782
Gambia, The	6.347	20.832	11.523	7.452	8.034	27.896	20.804	17.538
Ghana	10.386***	3.938	2.315	1.782	8.006	27.394	19.098	15.022
Kenya	2.392	7.421	5.407	4.824	3.989	34.360	26.141	22.503
Lesotho	3.937***	1.314	0.767	0.609	47.194***	42.805	29.060	21.801
Mali	2.783***	1.095	0.544	0.328	21.180*	42.476	27.738	20.668
Nigeria	4.848***	3.173	1.898	1.426	4.432	37.805	24.960	19.654
Rwanda	0.000	1.982	0.851	0.521	19.851	55.977	39.576	31.319
Senegal	5.819	22.849	18.832	16.688	6.581	15.112	10.816	8.817
South Africa	1.170	16.461	9.546	6.373	15.927	29.548	20.857	16.504
Tanzania	2.071	9.001	5.655	4.314	5.379	53.864	32.505	24.484
Togo	7.961***	2.025	0.985	0.610	8.035	36.773	21.775	16.236
Uganda	20.946***	7.248	5.822	5.120	2.145	66.837	48.494	39.742
Zambia	5.293	9.139	6.696	6.074	17.166	47.380	35.948	29.749

Notes. ***, **, * significance at the 0.01, 0.05, 0.1 levels, respectively

7. Final Remarks

This paper examines the relationship between financial sector development and globalization in twenty-one SSA countries over the period 1980-2017. To attain the main objective a bootstrap panel causality test is used, this method takes into consideration cross-sectional dependency and heterogeneity existing among countries. We focus on aggregate data as well as the economic dimension of globalization with the *de facto* and the *de jure* measures of economic globalization index. As an indicator of the financial sector development, we use a more comprehensive index of the financial development well known in the empirical literature.

The empirical results support evidences of cross-sectional dependency, heterogeneity and causality between financial sector development and globalization in SSA countries. The results of causality are sensitive to the choices of globalization indices and thus some interesting points appear. First, the economic globalization causes financial development in three countries (Burkina-Faso, Togo and Uganda), conversely financial development causes economic globalization in four countries (Ethiopia, Ghana, Mali and Senegal). In addition, there is a bidirectional causality between economic globalization and financial development for two countries (Cameroon and Lesotho). Second, there is causality from economic globalization *de facto* to financial development for five countries (Botswana, Congo, Kenya, Togo and Zambia); the reverse causality, that is from financial development to economic globalization *de facto* is observed for seven countries (Cameroon, Cote d'Ivoire, Ethiopia, Gabon, Mali, Senegal and South Africa). Moreover, a

bidirectional causality between economic globalization *de facto* and financial development is obtained for only two countries (Burkina-Faso and Lesotho). Third, there is causality from economic globalization *de jure* to financial development for five countries (Cameroon, Ghana, Nigeria, Togo and Uganda); reversely, financial development Granger causes economic globalization *de jure* in three countries (Benin, Botswana and Congo). Furthermore, evidence reveals a bidirectional causality between economic globalization *de jure* and financial development for two countries (Lesotho and Mali). Four, regardless of the economic globalization index used, there is no causality for half of the sample. From a policy perspective, the authorities should implement strategies capable of stimulating globalization and financial development in order to induce economic development.

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