Journal of Economic Integration | Vol: 10 - N°: 02 / (june 2022) | pp: 566-578

The Effect of Financial Development on the Long-Run Economic Growth: Panel Evidence from Less Developed Countries.

أثر التنمية المالية على النمو الاقتصادي على المدى الطويل: دراسة بواسطة نماذج البانل للدول المتخلفة

Dr. AIBOUD Kada[1], Dr. HAMELAT Benachour[2]

[1] University of Mustapha STAMBOULI- Mascara (Algeria), k.aiboud@univ-mascara.dz

[2] University of Mustapha STAMBOULI- Mascara (Algeria), bhamelat@univ-mascara.dz

Received: 10/04/2022 **Accepted:** 31/05/2022 **Published:** 30/06/2022

Abstract:

In this paper, we study the link between financial development and economic growth in 11 less developed countries between the period 1990 and 2017. For this purpose, we use three methods to estimate the relationship namely the pooled OLS method, the pooled OLS with nonparametric covariance matrix estimators by Driscoll & Kraay (1998), and the FGLS estimators by Parks (1967). The last two estimators provide robust estimation when errors are cross-sectionally dependent and/or serially correlated. The results reveal that financial development is not a determining factor of economic growth. Our results are robust for the second measure of financial development.

Keywords: Financial development, economic growth, pooled OLS, Driscoll & Kraay estimators, FGLS estimators.

JEL Classification Codes : F63 G21 O43

ملخص:

يهدف هذا البحث الى دراسة علاقة بين التنمية المالية والنمو الاقتصادي على المدى الطويل ضمن عينة تضم 11 دولة متخلفة في الفترة ما بين 1990 و2017. لهذه الغاية، قمنا أولا بتقدير النموذج باستخدام طريقة المربعات الصغرى المجمعة *POLS*، ثم إعادة تقدير النموذج بواسطة المربعات الصغرى المجمعة مع مصفوفة التغاير غير المعلمية للاقتصاديين *Driscoll & Kraay* (1998) وكذلك طريقة المربعات الصغرة المعممة *FGLS* للاقتصادي *Parks* (1967). تسمح الطريقتين الأخيرتين بالحصول على معلمات قوية (بدون تحيز) عندما تكون هناك ارتباطات تسلسلية و/أو مقطعية للأخطاء. بينت نتائج الدراسة أن التنمية المالية لا تعتبر عاملا محددا لنمو الاقتصادي في دولة العينة. تحصلنا على نفس النتائج عندما استعمالنا مؤشر الثاني للتنمية المالية.

كلمات مفتاحية: التنمية المالية، النمو الاقتصادي، المربعات الصغرى المجمعة، مقدرات Driscoll & Kraay (1998)، مقدرات المربعات الصغرة المعممة FGLS.

تصنيفات JEL : F63 G21 O4

Corresponding author: AIBOUD Kada, k.aiboud@univ-mascara.dz

INTRODUCTION:

The importance of the subject

Since Schumpeter (1911) highlighted the role of bank credit in financing innovation, the topic of the relationship between finance and economic growth has received a great deal of attention. Several academic works, including the theory of financial liberalization by McKinnon (1973) other theories developed in the framework of endogenous growth models, have proven that banks and financial markets play a prominent role in accelerating economic growth through the mobilization and allocation of savings towards productive investments, reducing the costs of market frictions (transaction costs and asymmetric information) ...etc.

However, due to the mixed results obtained by empirical studies, it seems difficult to make a final decision on the real effect of financial development on economic growth. For example, King & Levine (1993) and Levine & Zervos (1998) have confirmed that financial development stimulates economic growth. Nevertheless, Favara (2003) and Naceur & Ghazouani (2007) have found that the link between financial development and economic growth is negative. Beck (2009) believes that these mixed results are due to the bias of the coefficients of the financial development variables during estimation. This biased is due to different reasons, among them measurement error, reverse causation and omitted variable.

The research problem

In our study, we attempt to examine the association between financial development and long-term economic growth in underdeveloped countries. In fact, among the economic characteristics of these countries is the low per capita income and hence the lack of economic well-being of the population. Therefore, policy makers can focus on improving the activity of financial intermediaries to boost economic growth as promised by financial development theory. The main question is: ***Does financial development influence positively the long-run economic growth in the underdeveloped countries?***

Methodology

Our sample includes 11 less developed countries for the period 1990 to 2017. The number of countries and the period of study are chosen according to the available data which allows us to construct a balanced panel.

In this regard, we have specified two panel models. The first one includes the logarithm of liquid liabilities to GDP as a measure of financial development. The second model contains the alternative variable of financial development, i.e., the logarithm of deposit money bank assets to central bank assets and deposit money bank assets. This latter is used to check the robustness of the results.

In our empirical strategy, we have estimated the models under the assumption of a linear functional relationship. Furthermore, we have performed tests that address cross-sectional dependence in the error term when studying slopes heterogeneity and unit roots in order to pick out suitable estimators. Then we have used three methods to estimate the models' parameters that is the pooled OLS method, the pooled OLS with nonparametric covariance matrix estimators by Driscoll & Kraay (1998) and the FGLS estimators by Parks (1967). These two last estimators provide robust estimation when errors are cross-sectionally dependent and/or serially correlated. According to Pesaran (2015, p750) the cross-sectional dependence of errors in panel models is the rule rather than the exception, and overlooking them might have significant consequences on the estimation of the parameters.

The variables used in this study as indices of financial development are (1) liquid liabilities to GDP and (2) deposit bank assets to central bank assets and deposit bank assets. We note that the second variable is used to check the robustness of results. According to Beck et al. (2000) and King & Levine (1993) these two variables measure, respectively, two main functions of financial system, that is the access to financial services (i.e., financial deepening) and risk management and monitoring services. For the long-term economic growth, we have used annual GDP growth. As control variables, we have employed those that economic theory has recognized as having an effect on economic growth such as inflation, investment and foreign direct investment.

The structuring of the article

In order to provide elements of a response to our central question, we divide the article as follows: in section 1, we review the theoretical and some recent empirical studies on the link between financial development and economic growth. Section 2 outlines our empirical strategy. Section 3 is reserved for the discussion of the results. Finally, in Section 4, we present the conclusions drawn from this research and guidelines for financial development policies.

1. Financial development and growth nexus: Transmission channels and empirical findings.

This section presents some theoretical and recent empirical studies on the link between financial development and economic growth. The theoretical studies highlight the channels through which the effect of financial development is transmitted to economic growth. While the empirical studies present the results regarding the estimation of the relationship between financial development and growth in different samples and economic conditions.

The role of the financial system has long been widely recognized as a driver of economic development. Schumpeter (1911), for example, emphasized that bank credit plays a critical role in financing innovation in the production process set up by entrepreneurs. Gerschenkron (1962) stressed that the banks have contributed eminently in the success of the industrial revolution, in some European countries, by providing the necessary funds. However, some theorists believe that the efficiency of the financial system in the economy depends on the regulatory framework that governs the activity of financial intermediaries. Keynes (1936) postulated that financial repression policy, through capping the nominal interest rate in such a way as to reduce the real interest rate and liquidity preferences, push national income to its full-employment equilibrium level. In contrast, McKinnon (1973) asserted that financial liberalization policy by eliminating; interest-rate ceilings, directed credit program and reserve requirements accelerate the rate of economic growth.

The role of the financial system (*banks and stock markets*) in the economic development process has been further appreciated by endogenous growth models. In this respect, economists have identified different financial channels that stimulate economic growth. The most important of these channels are; (i) the mobilisation of savings and the provision of liquidity to entrepreneurs (Bencivenga & Smith, 1991), (ii) controlling the risks associated with the lending process (such as adverse selection) which leads to the availability of bank credit and the avoidance of rationing (Boyd & Smith, 1992), (iii) risk diversification that allows investors to acquire more productive advanced technologies (Saint-Paul, 1992), and (v) funding specialization that promotes learning-by-doing which is a key factor for economic growth (Cooley & Smith, 1998).

Furthermore, Levine (1997) mentioned that financial institutions provide a range of services that contribute to *capital accumulation* and *technological innovation* and therefore help firms to create wealth. These services include; (i) channelling funds to productive investments, screening and monitoring to control risks associated with information asymmetry and (iii) facilitating the exchange of products and services. Arestis et al. (2015) agreed with Levine (1997) on the positive effect of financial development on economic growth. They postulated that financial development reaches economic growth through two channels; (i) capital accumulation (*through mobilisation and affection of savings*) and (ii) total factor productivity (*via the main functions of financial intermediaries such as alleviation of market frictions, corporate control and promotion of trade*).

However, this causal effect, known as "*the supply-leading hypothesis",* is not the only one putted forward by economic theory. According to Robinson (1952) financial development does not affect economic growth, but rather economic development stimulates financial development due to increasing demand for financial services. This approach is called *demand-following hypothesis*. Patrick (1966) proposed another postulate that is "*the feedback hypothesis*". He assumed that the causality between financial development and economic growth is bidirectional. This means that financial development causes economic growth and vice versa. Moreover, Patrick (1966) pointed out that financial development affects economic growth in the early stages of economic development, whereas in the later stages it is economic growth that leads to financial development.

On the econometric side, the *supply-leading hypothesis* is not entirely confirmed. Previous research such as [King & Levine (1993), Levine & Zervos (1998) and Beck et al. (2000)], and more recent ones such as [Beck et al. (2014), Kumar Naik & Padhi (2015), Sehrawat & Giri (2016), and Yang (2019)] have proven that financial development (*banks and stock markets*) increases economic growth. Nevertheless, other studies, including that of de Gregorio & Guidotti (1995) (*for the Latin American region*), Favara (2003), Naceur & Ghazouani (2007)(*for MENA rerion*) and Menyari (2019)(for *West and Central Africa, East Africa)* have shown that financial development has a negative impact on economic growth

On the other hand, some surveys reveal that the positive effect of financial development on economic growth is related to certain factors, including;

a. *Information and communication technologies (ICT) diffusion.* Sassi & Goaied (2013) and Cheng et al. (2021) found that the effect of financial development on economic growth is negative or, according to Das et al. (2018), is statistically insignificant. But when ICT is considered in conjunction with financial development, they noticed that the effect becomes significantly positive.
b. *Economic and institutional background*. Hamadi & Bassil (2015) and Xue (2020) revealed respectively that in a context of financial instability (*financial crisises*) and macroeconomic instablity (*hight inflation*) financial development affectes adversely growth. Law et al. (2013)and Slesman et al. (2019) considered that a good policy institution is a key factor for financial development to have a favorable impact on economic growth. Huang & Lin (2009) and Hassan et al. (2011) asserted that the stage of economic development is decisive in the finance-growth relationship, with the influence being greater in low- and middle-income countries.

c. *Financial structure (market-based or bank-based).* Aali-Bujari et al. (2017) emphasized that stock markets development play a prominent role in improving economic growth compared to the banking sector development. Wongpiyabovorn (2016) and Durusu-Ciftci et al. (2017) have proven that the enhancement of economic growth is dependent primarily on the expansion of the banking sector, and capital markets have only a little impact. However, Sehrawat & Giri (2016), Guru & Yadav (2019) and Botev et al. (2019) stressed that banking and stock market development mutually support economic growth and there is no trade-off between these two financial structures.

Recently, the new thinking on finance and economic growth argues that the link between these two phenomena is non-linear. In other words, the relationship takes the form of an "inverted U-curve". This means that beyond a certain threshold, the effect of financial development on economic growth becomes negative. Arcand et al. (2015) called this fact by "too much finance". This approach is supported by several econometric studies, including Law & Singh (2014), Swamy & Dharani (2019). Ductor & Grechyna (2015) highlighted that too much finance is due to an unbalanced growth between the expansion of financial sector (more developed) and the real sector. Carré & L'Oillet (2018) cited some important factors responsible for too much finance which are; *financial structure, financial instability, allocation of talents (brain drain) and threshold of some economic variables.*

2. Empirical strategy

2.1 Data

This study aims at investigating the linkage between the development of financial sector and the evolution of long-run economic growth in 11 underdeveloped countries during the period 1990-2017. Depending on available data, the number of countries and the time period are selected so as to construct a balanced panel. The sample comprises the following countries; Burundi, Burkina Faso, Guinea-Bissau, Madagascar, Mali, Niger, Nepal, Sudan, Senegal, Togo and Tanzania. All yearly data relating to this empirical study are compiled from the world bank database.

Our measure of the long-term economic growth is the logarithm of the annual growth of GDP which is often employed in econometric studies. Regarding the measurement of financial development, we have chosen two indicators. The first one is the logarithm of *the liquid liabilities to GDP* which equal "currency plus demand and interest-bearing liabilities of banks and other financial intermediaries divided to GDP". According to Beck et al. (2000) and King & Levine (1993), this indicator measures the financial depth, *i.e., the overall size of the financial intermediaries* compared to the real sector. The second indicator of financial development includes the logarithm of *the deposit money bank assets to central bank assets and deposit money bank assets*. It equals "total claims of deposit banks on the domestic nonfinancial sector to total claims of the central bank and deposit banks". According to Beck et al. (2000) and King & Levine (1993) this indicator reflects the relative importance of primary banks to the central bank and expresses some of the main financial intermediaries' activities that are *risk management and monitoring services.* For the control variables, we include some variables that, according to economic theory, they affect economic growth. Therefore, we retain the inflation rate, as measured by the logarithm of consumer price index, and domestic investment, measured

by the logarithm of the share of gross fixed capital formation to GDP. These two variables represent *macroeconomic stability.* We introduce also foreign direct investment, measured by the logarithm of net inflows to GDP, as *indicator of financial openness.*

Table 1: Definition of variables	
Lngr	The logarithm of annual GDP growth
LnLi	The logarithm of liquid liabilities to GDP
Lnba	The logarithm of deposit money bank assets to central bank assets and deposit money bank assets
Lninf	The logarithm of consumer price index
Lninv	The logarithm of gross fixed capital formation to GDP
Lnfdi	The logarithm of net inflows to GDP

Table 2: Correlation Matrix

Variables	Lngr	LnLi	Lnba	Lninf	Lninv	Lnfdi
Lngr	1					
LnLi	0.0385	1				
Lnba	0.0231	0.7924***	1			
Lninf	-0.0012	-0.3493***	0.3102***	1		
Lninv	0.2194***	0.2586***	0.1369**	-0.0198	1	
Lnfdi	0.1079*	-0.0717***	-0.0460	-0.0866	0.3865***	1

*,** and *** denote respectively statistical significance at the level of critical values 10%, 5% and 1%

From the correlation matrix of the variables (table 2), we see that the two variables of financial development that is the *logarithm of liquid liabilities to GDP (LnLi*) and *the logarithm of deposit money bank assets to central bank assets and deposit money bank assets (Lnba)* are insignificantly correlated with *the logarithm of annual GDP growth* (*Lngr)*. We remark, also, that the logarithm of consumer price index (*Lninf)* is insignificantly correlated with *the logarithm of annual GDP growth* (*Lngr)*. The *logarithm of gross fixed capital formation to GDP* (*Lninv*) is positively and significantly associated with *the logarithm of annual GDP growth* (*Lngr)*. The logarithm of *foreign direct investment (Lnfdi*) is also positively associated with *the logarithm of annual GDP growth* (*Lngr)* but it is weaky significantly. As regards to the correlation of the financial development variables with the control variables, although they are almost all highly significant, the correlation coefficients are low (below 0.35). The same goes for the correlation between the control variables among them. Therefore, we can employ them in the same panel model without worrying about multicollinearity.

2.2 Methodology

We estimate the relationship between financial development and economic growth under the assumption of a linear functional relationship. We specify two panel models. The first one includes the logarithm of liquid liabilities to GDP as a measure of financial development. The second model contains the alternative variable of financial development, i.e., the logarithm of *deposit money bank assets to central bank assets and deposit money bank assets*. This latter is used to check the robustness of the results.

$$Lngr_{it} = a_i + \alpha_1 LnLi_{it} + \alpha_2 Lninf_{it} + \alpha_3 Lninv_{it} + \alpha_4 Lnfdi_{it} + u_{it} \cdots (panel\ 1)$$

$$Lngr_{it} = \beta_i + \beta_1 Lnba_{it} + \beta_2 Lninf_{it} + \beta_3 Lninv_{it} + \beta_4 Lnfdi_{it} + u_{it} \cdots (panel\ 2)$$

All these variables are defined previously in table 1. i and t refer, respectively, to country and time period. α and β are parameters to be estimated and they express elasticities.

In order to pick out acceptable estimators, we carry out the following tests: the "*CD-test"* of Pesaran (2015b) to check cross-sectional dependence for each variable (table 3). The "*delta-test"* of Pesaran & Yamagata (2008) and its extension developed Bersvendsen & Ditzen (2021) to verify the slope heterogeneity (table 4). These latter provide robust estimation when errors are cross-sectionally dependent. And, finally, the *"CIPS-test"* of Pesaran (2007) which is a *second-generation test* for studying unit roots when errors are cross-sectionally and/or serially dependent (table 5).

Table 3: Testing for weak cross-sectional dependence *(CD-test of Pesaran, 2015)*
H0: errors are weakly cross-sectional dependent

Variables	*Lngr*	*LnLi*	*Lnba*	*Lninf*	*Lninv*	*Lnfdi*
CD-test	(39.118)***	(37.562)***	(38.846)***	(38.623)***	(38.674)***	(38.527)***

, ** and * denote respectively statistical significance at the level of critical values 10%, 5% and 1%*

Table 4: Testing for slope heterogeneity (*delta-test)*
H0: slope coefficients are homogenous

(Panel 1)				(Panel 2)			
Pesaran & Yamagata (2008)		*Bersvendsen & Ditzen (2020)*		*Pesaran & Yamagata (2008)*		*Bersvendsen & Ditzen (2020)*	
Delta	*P-value*	*Delta*	*P-value*	*Delta*	*P-value*	*Delta*	*P-value*
-0.029	0.977	0.842	0.400	*0.751*	0.453	0.091	0.927
adj. -0.033	0.974	adj. 0.979	0.327	*adj. 0.847*	0.397	adj. 0.106	0.916

Table 5: *Testing for unit roots (CIPS-test of Pesran, 2007)*
H0: homogeneous non-stationary

Variables	*none*	*constant*	*constant & trend*
Lngr	(-3.983)***	(-4.289)***	(-5.103)***
LnLi	(-2.330)***	(-2.415)**	(-2.717)**
Lnba	(-2.336)**	(-1.847)**	(-2.563)
Lninf	(-3.491)***	(-3.542)***	(-3.602)***
Lninv	(-1.856)**	(-2.123)	(-3.602)***
Lnfdi	(-2.612)***	(-3.014)***	(-3.094)***

, ** and * denote respectively statistical significance at the level of critical values 10%, 5% and 1%*

Table 6: Breusch and Pagan Lagrangian multiplier test for random effects
Test: Var(u) = 0

(Panel 1)		(Panel 2)	
LR-test	p-value	LR-test	p-value
0.04	0.4209	0.06	0.4064

Table 7: Hausman test
Ho: difference in coefficients not systematic

(Panel 1)			(Panel 2)		
Chi-Sq statistic	df	p-value	Chi-Sq statistic	df	p-value
2.29	4	0.6833	3.33	4	0.5049

3. Discussions of the results

The results in Table 3 indicate that all variables are strongly cross-sectionally dependent. The results from table 4 and 5 reveal, respectively, that: slopes are homogenous and all variables are broadly stationary at level. Therefore, we can use one of the conventional estimators of panel models, namely Pooled OLS, random effect model (REM) or fixed effect model (FEM).

Nevertheless, in order to select the more consistent one, we carry out the *LM-test for random effects* (Breusch & Pagan, 1980) *and Hausman-test*. The former test indicates that the Pooled OLS estimators are more appropriate than REM (table 6). This means that there is no *country-specific effect* and the intercept might be considered homogenous. Furthermore, the *Hausman-test* (table 7) shows that the REM is suitable than FEM indicating that error term is not correlated with the explanatory variables (*explanatory variables are strictly exogenous*). Moreover, the F-test in the outcome of the FEM estimation is insignificant meaning that individuals are homogenous. Accordingly, the Pooled OLS estimators look to be the most suited.

After estimating the model's parameters with POLS method (*panel 1 and 2*), we conduct diagnostic tests to check if the errors are spherical (*i.e., homoscedastic and both serially and cross-sectionally uncorrelated*). We perform Wooldridge (2002) for serial correlation, Greene (2003) for heteroscedasticity and *LM-test (1980)* for cross-sectional dependence. The tests show that the errors are non-spherical, that is to say they are auto-correlated, heteroscedasticity and cross-sectionally dependent.

Therefore, to obtain efficient coefficients, we apply the *nonparametric covariance matrix estimators* proposed by Driscoll & Kraay (1998). This method is based on the adjustment of standard errors of the coefficients and it can be used with pooled OLS estimators or fixed effect (FE) estimators when the errors are correlated over time and between subjects.

Furthermore, we use *Feasible Generalized Least Squares* estimators *(FGLS) by* Parks (1967) to check the robustness of the results. This method allows to estimate the model's parameters in the presence of first order autocorrelation within panels AR (1), contemporaneous correlation and heteroscedasticity across panels.

Table 8 exhibits the linear estimation's outcomes for panel 1 and panel 2. As a reminder, the second panel refers to the estimation of robustness by using an alternative measure of financial development. The FGLS estimator was also employed for each panel to check the robustness of the results.

The three estimators, for each model, yield broadly similar results for both the direction of the relationship and the effect size. In panel 1, we observe that the logarithm of liquid liabilities to GDP (*Lnli*) is not significantly associated with the logarithm of the annual growth of GDP (*Lngr*) in both estimators Pooled OLS and Driscoll & Kraay (1998) standard errors. But, the FGLS estimators show that the relationship is negative and statistically significant at the level of 10%. Robustness estimation, in panel 2, reveal that the logarithm of deposit money

bank assets to central bank assets and deposit money bank assets (*Lnba*) is not significantly correlated with the logarithm of annual growth of GDP (*Lngr*) in all estimators.

Consequently, we conclude that financial development has no influence on economic growth. This finding is consistent with some empirical studies such as Das et al. (2018) which found that the relationship between financial development and economic growth is not statistically significant. If we rely on the on the outcomes of FGLS estimator in panel regression 1, although the link is weakly statistically significant, we can say that financial development and economic growth are negatively associated. This finding is also in accordance with many empirical studies like those ofde Gregorio & Guidotti (1995), Ben Naceur & Ghazouani (2007) and Menyari (2019).

As regards the control variables, the direction of the relationship between the inflation rate (logarithm of consumer price index) and the long-term economic growth (logarithm of annual GDP growth) ranges sometimes negative and sometimes positive, but it is statistically insignificant in all estimators. This result is not surprising given that it is obtained by other studies conducted in this same analytical framework [see Beck et al. (2000), Christopoulos & Tsionas (2004) and Kumar Naik & Padhi (2015)]. In fact, the relationship between inflation and economic growth needs to be studied carefully as it may have a specific structure form. For example, Burdekin et al. (2004) point out that, in developing countries, inflation only starts to affect, negatively and significantly, economic growth once it exceeds a specific threshold. Similarly, Sarel (1996) argue that the negative effect of inflation on economic growth starts above a certain threshold, otherwise, before this threshold inflation do not influence economic growth, or it might have a slightly positive impact.

With regard to financial openness, the results show that its effect is not significant on economic growth. Theoretically, financial openness, as measured by foreign direct investment (FDI) inflows, is supposed to boost economic growth by facilitating the transfer of technology and managerial skills, as well as increasing competitiveness in domestic market. However, Hermes & Lensink (2003) argued that, to reap the benefits of FDI inflows in terms of economic growth, the financial system needs to be highly developed. In contrast, Osei & Kim (2020) have proven, in a recent study, that more financial development can hinder the favorable effect of foreign direct investment on economic growth because of *too much finance*. Therefore, for our study, the lack of effect between FDI and economic growth can be explained by insufficient financial openness. Also, institutional underdevelopment can undermine the positive relationship between FDI and economic growth (see Brahim & Rachdi, 2014).

The only variable that affects positively and significantly the long-run economic growth domestic investment, as expected.

Table 8 : Panel linear estimation						
	The estimation's outcomes (Panel 1)			Results for robustness checks (Panel 2)		
Dep variable (Lngr)	*Pooled OLS*	*Pooled OLS (with Driscoll-Kraay standard errors)*	*FGLS estimators (Parks model)*	*Pooled OLS*	*Pooled OLS (with Driscoll-Kraay standard errors)*	*FGLS estimators (Parks model)*
LnLi	- 0.004	- 0.004	- 0.013*			
Lnba				- 0.001	- 0.001	- 0.002
Lninf	- 0.00007	- 0.00007	- 0.002	0.001	0.001	0.001
Lninv	0.101***	0.101***	0.112***	0.099***	0.099***	0.104***
Lnfdi	0.014	0.014	0.004	0.016	0.016	0.015
C	3.20***	3.20***	3.22***	3.19***	3.19***	3.19***
Diagnostic tests						
Wooldridge-test (2002)	11.3***			14.67***		
Greene-test (2003)	335.16***			333.61***		
LM-test	86.88***			87.57***		
Observations (N X T)	308	308	308	308	308	308
R-squared	0.049	0.049		0.048	0.048	
F-statistic	3.90***	12.80***		3.89***	13.07***	
Wald chi2			102.12***			96.40***
, ** and * denote respectively statistical significance at the level of critical values 10%, 5% and 1%*						

4. Conclusion and policy implications

In this paper, we have investigated the association between financial development and the long-term economic growth in 11 less developed countries during the period spanning from 1990 to 2017. We have estimated the parameters of our models under the assumption of a linear functional relationship. In order to draw accurate conclusions, we controlled for the presence of cross-sectional dependence in errors by using appropriate tests and estimators. This empirical strategy avoids bias in the estimation of model parameters. We also performed a robustness estimation using an alternative measure of financial development and an estimation technique.

Our findings reveal that, financial development does not stimulate economic growth in the long run. These results are consistent with results obtained by Das et al (2018) but differ from those of Christopoulos & Tsionas (2004) for the underdeveloped countries. These differences may be due to the method used in estimating the models, the sample or the period of study.

In light of our results and the previous studies presented in the literature review, we propose the following guidelines for policy makers in underdeveloped countries to take

advantage of the financial development. (i) the strengthen of the use of ICTs since it has been shown that they underpin economic growth jointly with financial development. (ii) Focus on the development of their financial markets, since it has been proven that they promote economic growth, either alone or in conjunction with banks. (iii) The improvement of economic environment by realizing monetary stability (*low inflation*), liberalizing more financial sector and enhancing institutional quality.

References

Aali-Bujari, A., Venegas-Martínez, F., & Pérez-Lechuga, G. (2017). Impact of the stock market capitalization and the banking spread in growth and development in Latin American: A panel data estimation with System GMM. *Contaduria y Administracion*, *62*(5), 1427–1441.

Arcand, J. L., Berkes, E., & Panizza, U. (2015). Too much finance? *Journal of Economic Growth*, *20*(2), 105–148.

Arestis, P., Chortareas, G., & Magkonis, G. (2015). The financial development and growth nexus: A meta-analysis. *Journal of Economic Surveys*, *29*(3), 549–565.

Beck, T. (2009). The Econometrics of Finance and Growth. In *Palgrave Handbook of Econometrics: Volume 2: Applied Econometrics* (Vol. 2). Springer.

Beck, T., Degryse, H., & Kneer, C. (2014). Is more finance better? Disentangling intermediation and size effects of financial systems. *Journal of Financial Stability*, *10*(1), 50–64.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2000). *A New Database on the Structure and Development of the Financial Sector*. *14*(3), 597–605.

Beck, T., Levine, R., & Loayza, N. (2000). Finance and the sources of growth. *Journal of Financial Economics*, *58*(1–2), 261–300.

Bencivenga, V. R., & Smith, B. D. (1991). Financial intermediation and endogenous growth. *The Review of Economic Studies*, *58*(2), 195–209.

Bersvendsen, T., & Ditzen, J. (2021). Testing for slope heterogeneity in Stata. *Stata Journal*, *21*(1), 51–80.

Botev, J., Égert, B., & Jawadi, F. (2019). The nonlinear relationship between economic growth and financial development: Evidence from developing, emerging and advanced economies. *International Economics*, *160*, 3–13.

Boyd, J. H., & Smith, B. D. (1992). Intermediation and the equilibrium allocation of investment capital Implications for economic development. *Journal of Monetary Economics*, *30*(3), 409–132.

Brahim, M., & Rachdi, H. (2014). Foreign Direct Investment, Institutions and Economic Growth: Evidence from the MENA Region. *Journal of Reviews on Global Economics*, *3*, 328–339.

Breusch, T. S., & Pagan, A. R. (1980). *The Lagrange Multiplier Test and its Applications to Model Specification in Econometrics*. *47*(1), 239–253.

Burdekin, R. C. K., Denzau, A. T., Keil, M. W., Sitthiyot, T., & Willett, T. D. (2004). When does inflation hurt economic growth? Different nonlinearities for different economies. *Journal of Macroeconomics*, *26*(3), 519–532.

Carré, E., & L'Oillet, G. (2018). The Literature on the Finance-Growth Nexus in the Aftermath of the Financial Crisis: A Review. *Comparative Economic Studies*, *60*(1), 161–180.

Cheng, C. Y., Chien, M. S., & Lee, C. C. (2021). ICT diffusion, financial development, and economic growth: An international cross-country analysis. *Economic Modelling*, *94*, 662–671.

Christopoulos, D. K., & Tsionas, E. G. (2004). Financial development and economic growth: Evidence from panel unit root and cointegration tests. *Journal of Development Economics*, *73*(1), 55–74.

Cooley, T. F., & Smith, B. D. (1998). Financial markets, specialization, and learning by doing. *Research in Economics*, *52*(4), 333–361.

Das, A., Chowdhury, M., & Seaborn, S. (2018). ICT Diffusion, Financial Development and Economic Growth: New Evidence from Low and Lower Middle-Income Countries. *Journal of the Knowledge Economy*, *9*(3), 928–947.

de Gregorio, J., & Guidotti, P. E. (1995). Financial Development and Economic Growth. *World Development*, *23*(3), 433–448.

Driscoll, J. C., & Kraay, A. C. (1998). Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. *Review of Economics and Statistics*, *80*(4), 549–560.

Ductor, L., & Grechyna, D. (2015). Financial development, real sector, and economic growth. *International Review of Economics and Finance*, *37*, 393–405.

Durusu-Ciftci, D., Ispir, M. S., & Yetkiner, H. (2017). Financial development and economic growth: Some theory and more evidence. *Journal of Policy Modeling*, *39*(2), 290–306.

Favara, G. (2003). *An Empirical Reassessment of the Relationship Between Finance and Growth* (No. 123; IMF Working Paper).

Gerschenkron, A. (1962). Economic backwardness in historical perspective. In *The Globalization and development Reader* (Second). Wiley Blackwell.

Greene, W. (2003). *Econometric Analysis* (5th ed.). Macmillan Publishing Company Inc.

Guru, B. K., & Yadav, I. S. (2019). Financial development and economic growth: panel evidence from BRICS. *Journal of Economics, Finance and Administrative Science*, *24*(47), 113–126.

Hamadi, H., & Bassil, C. (2015). Financial Development and Economic Growth in the MENA Region. *Comparative Economic Studies*, *57*(4), 598–622.

Hashem Pesaran, M., & Yamagata, T. (2008). Testing slope homogeneity in large panels. *Journal of Econometrics*, *142*(1), 50–93.

Hassan, M. K., Sanchez, B., & Yu, J. S. (2011). Financial development and economic growth: New evidence from panel data. *Quarterly Review of Economics and Finance*, *51*(1), 88–104.

Hermes, N., & Lensink, R. (2003). Foreign direct investment, financial development and economic growth. *Journal of Development Studies*, *40*(1), 142–163.

Huang, H.-C., & Lin, S.-C. (2009). Non-linear finance-growth nexus A threshold with instrumental variable approach 1. *Economics of Transition*, *17*(3), 439–466.

Keynes, J. M. (1936). *The general theory of employment, interest, and money*. London, Macmillan.

King, R. G., & Levine, R. (1993). Finance and growth: Schumpeter might be right. *The Quarterly Journal of Economics*, *108*(3), 717–737.

Kumar Naik, P., & Padhi, P. (2015). On the linkage between stock market development and economic growth in emerging market economies Dynamic panel evidence. *Review of Accounting and Finance*, *14*(4), 363–381.

Law, S. H., Azman-Saini, W. N. W., & Ibrahim, M. H. (2013). Institutional quality thresholds and the finance - Growth nexus. *Journal of Banking and Finance*, *37*(12), 5373–5381.

Law, S. H., & Singh, N. (2014). Does too much finance harm economic growth? *Journal of Banking and Finance*, *41*(1), 36–44.

Levine, R. (1997). Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature*, *35*(2), 688–726.

Levine, R., & Zervos, S. (1998). Stock Markets, Banks, and Economic Growth. *The American Economic Review*, *88*(3), 537–558.

McKinnon, I. R. (1973). *Money and Capital in Economic Development*. Brookings Institution.

Menyari, Y. el. (2019). Financial Development, Foreign Banks and Economic Growth in Africa. *African Development Review*, *31*(2), 190–201.

Naceur, S. ben, & Ghazouani, S. (2007). Stock markets, banks, and economic growth: Empirical evidence from the MENA region. *Research in International Business and Finance*, *21*(2), 297–315.

Osei, M. J., & Kim, J. (2020). Foreign direct investment and economic growth: Is more financial development better? *Economic Modelling*, *93*, 154–161.

Parks, R. W. (1967). Efficient Estimation of a System of Regression Equations when Disturbances are Both Serially and Contemporaneously Correlated. *Journal of the American Statistical Association*, *62*(318), 500–509.

Patrick, H. T. (1966). Financial Development and Economic Growth in Underdeveloped Countries. *Economic Development and Cultural Change*, *14*(2), 174–189.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, *22*(2), 265–312.

Pesaran, M. H. (2015a). *Time Series and Panel Data Econometrics* (First). Oxford University Press.

Pesaran, M. H. (2015b). Testing Weak Cross-Sectional Dependence in Large Panels. *Econometric Reviews*, *34*(6–10), 1089–1117.

Robinson, Joan. (1952). *The Generalization of the General Theory " in The Rate of Interest and Other Essays* . London: Macmillan.

Saint-Paul, G. (1992). Technological choice, financial markets and economic development. *European Economic Review*, *34*, 763–781.

Sarel, M. (1996). Nonlinear Effects of Inflation on Economic Growth. *IMF Staff Papers*, *43*(I).

Sassi, S., & Goaied, M. (2013). Financial development, ICT diffusion and economic growth: Lessons from MENA region. *Telecommunications Policy*, *37*(4–5), 252–261.

Schumpeter, J. A. (1911). *The Theory of Economic Development*. Harvard University Press.

Sehrawat, M., & Giri, A. K. (2016). The impact of financial development on economic growth: Evidence from SAARC countries. *International Journal of Emerging Markets*, *11*(4), 569–583.

Slesman, L., Baharumshah, A. Z., & Azman-Saini, W. N. W. (2019). Political institutions and finance-growth nexus in emerging markets and developing countries: A tale of one threshold. *Quarterly Review of Economics and Finance*, *72*, 80–100.

Swamy, V., & Dharani, M. (2019). The dynamics of finance-growth nexus in advanced economies. *International Review of Economics and Finance*, *64*, 122–146.

Wongpiyabovorn, O. (2016). Financial development and economic growth: the cases of Thailand, Malaysia, and the Philippines. *Int. J. Economic Policy in Emerging Economies*, *9*(2), 5–7.

Wooldridge, J. M. (2002). Econometric analysis of cross section and panel data. *MIT Press, Cambridge*, *108*.

Xue, W. J. (2020). Financial sector development and growth volatility: An international study. *International Review of Economics and Finance*, *70*, 67–88.

Yang, F. (2019). The impact of financial development on economic growth in middle-income countries. *Journal of International Financial Markets, Institutions and Money*, *59*, 74–89.