Non-linear finance–growth nexus in WAEMU Countries : Evidence from Quantile Regression

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Abstract

This article examines the impact of financial development on economic growth in 7 UEMOA countries. Unlike previous studies that focus on average effects, it uses a quantile regression methodology to examine whether the effect of financial development on economic growth is the same for countries at all levels of economic development. The results highlight that financial development is more conducive to economic growth in countries with higher living standards. In addition, economic openness benefits countries with a high standard of living more. Civil liberties have a positive impact on the economic growth of the countries in the area. The study also concludes that investment has a negative impact on economic growth in WAEMU countries.

1 Introduction

Financial development stimulates economic growth by facilitating the mobilization of savings, the optimal allocation of resources, risk management and the provision of services necessary for trade. In the history of theoretical

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developments of the impact of the financial sector on economic growth, we find in the first place the drafts of ideas of Bagehot (1873) [6]   who argues that the success of British development is due to the superiority of its financial market, which had a relative ease in mobilizing savings to finance various long-term investments. Thus, the opportunities for access to finance for companies would have been decisive for the implementation of new technologies in England. Consequently, economic underdevelopment would be linked to the inability to mobilize resources, which is characteristic of an atrophied or almost non-existent financial system. While the dominant idea that financial development leads to economic growth has lost some of its impetus, particularly from the work of Robinson (1952) [48]   and Patrick (1966) [45], the return to grace of neoclassical theory in the 1970s encouraged the emergence of a new conception of finance in the process of economic growth and development. Indeed, Robinson (1952) [48] argues that "where the company leads, finance follows". For him, financial development is a consequence of economic development. Patrick (1966) [45], rightly proposes to distinguish financial development "initiated by supply" from financial development "induced by demand". But the work of Cameron (1972) [12], Goldsmith (1969) [24], Gerschenkron (1962) [23], McKinnon (1973) [41] and Shaw (1973) [53] suggests that financial development is essential for economic growth. According to the latter, if countries are underdeveloped with low growth rates, then it would be because of their low level of financial development.   Since McKinnon (1973) [41]   and Shaw (1973) [53]   proposed financial liberalization policies as a solution for improving economic growth in developing countries, numerous studies have been conducted on the relationship between financial development and economic growth.   In theoretical terms, the arguments in favour of a favourable effect of financial development on growth are based on the idea that financial development makes it possible to make the allocation of resources more efficient, improves risk management and ultimately increases capital productivity, also increases the amount of savings and investment. Empirically, however, the results are more nuanced. The meaning and extent of the relationship between financial development and growth may depend on income (Deidda and Fattouh, 2002) [17] or the level of financial development (Shen and Lee, 2006) [54].

These studies therefore confirm a non-linearity between financial development and growth. Beck and Levine (2002) [8], studying the relationship between banks, financial markets and economic development, conclude that the development of the banking system and the financial market can be beneficial to economic growth if a few conditions are met.   Thus, Deidda and Fattouh (2002) [17] obtain a non-linear relationship in an endogenous growth model with financial intermediation. As a result, the effect of intermediation on economic growth is ambiguous, especially when the level of development of the banking sector is low. Agents with risk aversion prefer to bear the costs on transactions imposed by financial intermediaries rather than place themselves on the market. This choice would result from the behaviour of banks seeking to reduce risk by diversifying

assets. In this case, the development of the banking sector weighs on economic growth relative to the market. However, for a high level of development in the banking sector, the effect on growth is still positive because of the relatively high level of revenues.

In the case of poor countries, even the choice of indicators can be problematic because of the effects on people's well-being. Out of a panel of 71 countries from 1960 to 2006, Eggoh and Villieu (2013) [21] highlight the presence of multiple balances, which may reveal a non-linear relationship between financial development and growth. They argue that economic growth and development are positively linked when the financial sector is close, with this relationship becoming indeterminate when the financial system is developed. As a result, the interaction between the real and financial sectors reveals multiple balances, which can produce a non-linearity of the relationship between growth and financial development.

The literature emphasizes the importance of political and legal institutions in promoting financial development, considered necessary for economic development (King and Levine 1993[33]; Levine and Zervos, 1998[39]). This idea was already reflected in the theory of financial repression. In this vein, numerous studies (Acemoglu et al. 2005[1]; Easterly and Levine, 2003[20]; Rodrik et al. 2004[49]) conclude that institutional development is a precursor to financial development. Democracies would be useful in promoting economic institutions that are ultimately beneficial to financial development (Clague et al. 1996) [15]. The work of Begović et al (2017) [9] confirms this intuition. Democracy is conducive to the economic growth of States insofar as it ensures the accountability and transparency of the regimes in power. In fact, democracy is characterized by popular participation, political competition for public office and institutional constraints on rules (Siegle et al. 2004) [52].

In Africa, according to Honohan and Beck (2009) [26], South Africa, Botswana and Mauritius have high percentages of access to banking services. Mauritius has a modern and important domestic financial system. The population is highly banked, with 1.3 bank accounts per capita (IMF, 2016) [29]. Access to bank credit for small and medium-sized enterprises is very easy. The banking system is dynamic, profitable, liquid and solid. The equity ratio is close to 13% and the non-performing loans ratio does not exceed 8%. According to IMF Regional Economic Outlook data (IMF, 2016) [29], Botswana's loan-to-deposit ratio rose from 55.4% in 2009 to 82.5% in 2014. Over the same period, it rose from 67.7% to 74.9% in Mauritius, from 72.5% to 59.2% in Cape Verde and from 120.1% to 117.3% in South Africa. Between 1980 and 2009, GDP growth averaged 5 per cent in Mauritius and 6.8 per cent in Botswana. GDP per capita growth averaged 3.8 per cent and 4.3 per cent respectively, roughly tripling per capita income over this period.

According to data from the Islamic Development Bank (ISDB, 2018) [30], from 1980 to 2018, GDP per capita in the WAEMU region showed a sharp decline. GNP per capita increased from 579.10 in 1980 to 356.29 in 1985 and 557.84 in

1990. This rate fell to 378.03 in 2000 and reached 586.20 in 2005. In 2010, the rate rose from 777.05 to 827.60 in 2015 and 910.88 in 2018. According to WDI (2018) [56], domestic credit to the private sector (% of GDP) has also experienced the same trend. Indeed, for Côte d'Ivoire, the rate, which was 40.76 in 1980, rose to 34.05 in 1985 and 36.49 in 1990. From 18.50 in 1995, this rate rose to 15.06 in 2000 and 12.45 in 2005. Between 2010 and 2017, this rate increased from 18.35 to 26.49. In Senegal, it is noted that this rate has increased from 28.77 in 1980 to 23.55 in 1985 and 20.88 in 1990. From 11.60 in 1995, this rate rose to 14.75 in 2000 and 15.60 in 2005. This rate rises to 21.17 in 2010 and 29.48 in 2017. In these two most important countries of the zone, there was a decline in banking activity from 1980 to 1995 when, over the same period, the zone's GDP per capita showed different trends. But in recent years, the banking sector has been one of the most dynamic economic sectors in WAEMU countries. The low rate of bancarisation attracts new banking groups every year. The number of credit institutions increased from 119 in 2012 to 138 in 2016. The number of bank accounts increased significantly between 2012 and 2016. There were more than 2.4 million accounts opened over this period in all EU countries. The banking rate has risen from 9.60% in 2012 to 22.80% in 2016.

From the above, it is possible to question the link between financial development and economic growth. Thus, the central problem of this study revolves around the fundamental question: to what extent does financial development influence economic growth in the UEMOA region?   Thus, the main objective of this study is to analyse the impact of financial development on economic growth in the area. More specifically, the study will analyse the influence of banking development on the economic growth of WAEMU member countries. It will also examine whether the link between finance and growth is linear In relation to our objectives, we can postulate two hypotheses. The first is that the link between financial development and growth is not linear. The second is that financial development has a positive influence on the economic growth of the countries in the region.

Methodologically, the study uses the quantile regression method. Ordinary least squares regression is one of the most widely used statistical methods. However, this is a parametric model that is based on assumptions that are often not respected. Here, we use quantile regression, which has the advantage of not making any assumptions about the distribution of residues. It also allows you to explore different aspects of the relationship between the dependent variable and the independent variables.

This paper contributes in several ways to the empirical literature seeking to measure the impact of finance on economic growth.   It completes the limited list of empirical studies on the UEMOA region. The remainder of this document is structured as follows. Section 2 reviews the literature on the relationship between financial development and growth. Section 3 describes the methodology adopted in the study. Section 4 is reserved for the presentation of data sources and descriptive statistics. The results of the estimates are presented in Section 5 and Section 6 is reserved for conclusion.

2 Review of literature

In this section, we first present the review of theoretical literature and then the review of empirical literature.

2.1 Financial developement and growth

The analysis of the relationship between finance and economic growth has gained renewed interest based on the work of Gurley and Shaw (1955) [25] and McKinnon (1973) [41].   Since then, the study of these two spheres has continued to interest economists.   Financial development would have a positive impact on economic development ((Pagano (1993) [44]; Levine et al. (2000) [38]; Calderon and Liu (2003) [11], Beck (2008) [7]).   It is recognized that the financial sector affects growth through two channels: capital accumulation and productivity enhancement.   A financial system consists of financial institutions, for example, commercial banks and financial markets, for example, equity and bond markets. At the macroeconomic level, a robust and effective financial system promotes growth by channelling resources to their most productive uses and promoting a more efficient allocation of resources. A deep and sound financial system can also benefit growth by increasing the savings rate and overall investment. Financial development can also accelerate the pace of physical capital accumulation. Financial development also promotes growth by strengthening competition and encouraging innovative activities that can stimulate dynamic efficiency. According to Demirgüç-Kunt and Levine (2008) [19], the overall function of a financial system is to reduce transaction and information costs that impede economic activity, and its five core functions are (i) to produce ex-ante information on possible investments and to allocate resources ; (ii) monitor investments and provide governance means for enterprises after providing financing; (iii) facilitate exchange, diversification and risk management; (iv) mobilize and pool savings; and (v) facilitate the exchange of goods and services. The efficiency of a financial system refers to its ability to perform the five core functions and financial development refers to an improvement in the efficiency of a financial system. A vast empirical literature confirms the theoretical predictions. At the empirical level, the pioneering work goes back to King and Levine (1993) [33], who examine the relationship between financial depth, measured by total liquid liabilities, and three measures of growth: real GDP per capita growth, capital stock growth, and total productivity growth. Using data from 77 countries over the 1960-1989 period, the authors find a statistically significant relationship between financial depth and these three measures of growth. For its part, the study by Levine and Zervos (1998) [39] indicates that the initial level of banking development and stock market activity have a statistically significant relationship with the average growth rate, the growth rate of the capital stock and the productivity growth rate of 47 countries over the period 1976-1993. Levine et al. (2000) [38] have thus shown, from a sample of 74 developed and developing

countries over the period 1960-1995, that greater financial development is accompanied by stronger economic growth. The interest of their study is in particular to show that this result is robust to the use of various estimation techniques, namely the technique of instrumental variables on cross-sectional data or the Generalized Moment Method on a dynamic panel.

2.2 Financial Development and Growth : A non-linear relationship
From the mid-1990s onwards, a literature has developed that nuances the presence of positive links between financial development and long-term economic growth. This literature - both theoretical and empirical - identifies the presence of threshold effects in this relationship. Several theoretical justifications for the presence of non-linearities between finance and growth are proposed. The main arguments focus on the effects of economies of scale, learning-by-doing and diminishing returns in the financial sector (Berthelemy and Varoudakis 1996[10]; Lee Jaewoo, 1996[37]; Acemoglu and Zilibotti 1997 [3]; Yahyaoui and Rahmani, 2009[57]). More specifically, it provides that the contribution of financial development to long-term growth depends on the level of financial development (Khan and Senhadji 2003[32]; Rioja and Valev, 2004[47]), per capita income (De Gregorio and Guidotti, 1995[16]; Deidda and Fattouh 2002[17]; Demetriades and Law, 2006[18]), or domestic inflation rates (Rousseau and Wachtel 2002 [50]; Huang Ho-Chuan et al. 2010 [27]; Yilmazkuday, 2011[58]). This work is important in that it can reconcile, to some extent, previous studies that have led to conflicting conclusions. Fung (2009) [22] studies a sample of 57 developed and developing countries over the period 1967-2001 and uses a more recent estimation technique: the Generalized Moment Method on a dynamic panel with fixed effects. His study leads to two interesting results. First, financial development and economic growth interact all the more strongly as the country is at an early stage of economic development. The relationship tends to weaken as the level of economic development increases. Secondly, there are poverty traps linked to an initial level of financial development that is too low, a level that precludes any prospect of convergence in terms of economic growth. Fung's (2009) [22] results are relatively close to those obtained by Aghion at al. (2005) [1], who analyze the behaviour of innovation, at equilibrium, considering two situations: on the one hand, the presence of financial constraints, and, on the other hand, the absence of such constraints. The objective is to show how the degree of financial development affects the nature of its link with long-term growth and GDP.
Looking at a large sample of developed and developing countries, Cecchetti and Kharroubi (2012) [14] find that the level of financial development only stimulates growth to a certain extent, from which it tends to slow it down. When bank credit to the private sector exceeds 90% of GDP, any further increase in bank credit tends to reduce growth. In addition, the rapid growth of the financial sector is proving detrimental to aggregate productivity growth in developed countries. The growth of the financial sector disproportionately affects sectors that are either financially dependent or intensive in research and development. Eggoh and Villieu

(2013) [21] present a simple model of endogenous growth in which the financier sector improves the efficiency of the transformation of savings into investment. The model shows the existence of multiple trajectories of endogenous long-term growth, and the possibility of a non-linear relationship between financier development and growth, with the level of financial development acting as a threshold in this relationship. Empirical tests carried out according to the PSTR method (Panel Smooth Threshold Regression) on a panel of 71 countries over the period 1960-2006 confirm this threshold effect: the relationship between financial development and growth is positive when financial development is relatively low, but its sign becomes difficult to determine in developed countries. In addition, Aizenman et al (2015) [5] observed the relationship between financial depth and output growth using data on output growth from ten sectors in 41 countries, including 9 countries in Latin America and 11 countries in East Asia. When observing countries with similar living standards, these authors find large differences in the impact of financial depth on sectoral growth and confirm that financial deepening slows output growth in several sectors. The results confirm that the impact of financial development on sectoral growth may be non-linear, i.e. it only promotes growth to a certain extent before it is detrimental to it.

In a recent IMF study, Sahay et al (2015) [51] observed a sample of 128 countries over the period 1980-2013. They confirm a bell-shaped relationship between financial development and growth: financial development first stimulates growth, but the effects weaken at high levels of financial development and eventually become negative. There is no single threshold point for all countries or at any given time. Several countries have already passed the turning point and are experiencing excessive financial development; this is the case, for example, in Ireland, the United States and especially Japan. Conversely, further financial development can still help to stimulate growth in developing countries such as Ecuador and Gambia.

3 Econometric Strategy

In this section, we present the specification of the model, the research methodology and presentation of the data and its sources.

3.1 Model Specification

To assess the impact of financial development on growth, we specify the following model:

$$LGDP_{i,t} = \beta_0 + \beta_1 FIN_{i,t} + \beta_2 INVEST_{i,t} + \beta_3 OPEN_{i,t} + \beta_4 INF_{i,t} +$$

$$\beta_5 CIVILLIBERTY_{i,t} + \mu_{i,t}$$

$$(1)$$

Where i represents country i in the panel, t time, $LGDP$ is the logarithm of

real GDP per capita, FIN the financial development indicator (it is the average of

private sector credit relative to GDP, liquid liabilities and bank assets relative to
GDP). In addition, $INVEST$ represents gross fixed capital formation as a

percentage of GDP, $OPEN$ the opening cough of each country, INF the

inflation rate, and $CIVILLIBERTY$ which refers to civil liberties and $\mu_{i,t}$ the

error term.
In this equation 1, it is most often assumed that the marginal effect of financial
development and civil liberty are the same regardless of the level of growth. And
yet the effects can vary according to the growth levels of countries, which a linear
relationship cannot take into account. To do this, we estimate the model in order to
identify changes in growth in response to changes in financial development and
civil liberty at different points in the distribution of growth. This requirement
guides our choice of the quantile regression method, which is a widely used
estimation technique when examining the impact of explanatory variables at
different points in the distribution of the dependent variable. From this study, it is
expected that financial development and civil liberty will positively influence the
growth of WAEMU countries.

3.2 Quantile Regression Methodology

The quantile regression method was first introduced by Koenker and Bassett
(1978) [34] and extended in subsequent studies (Koenker and Machado, 1999 [36];
Koenker and Hallock, 2001[35]). Compared to OLS regression, this method is
more robust, especially in the presence of outliers and non-normality. The quantile
regression model can be formulated as follows:

$$q(LGDP_{i,t}) = \beta_{0t} + \beta_{1t}FIN_{i,t} + \beta_{2t}INVEST_{i,t} + \beta_{3t}OPEN_{i,t} + \beta_{4t}INF_{i,t} +$$

$$\beta_{5t}CIVILLIBERTY_{i,t} + \mu_{i,t}$$

$$(2)$$

where $q(LGDP_{i,t})$ is the conditional quantile of economic growth. This
equation 2 can be written as follows:

$$y_{it} = x_{it}\beta(\tau) + \varepsilon_{it} \qquad\qquad (3)$$

where $x_{it} = (1, FIN_{i,t}, INVEST_{i,t}, OPEN_{i,t}, INF_{i,t}, CIVILLIBERTY_{i,t})$ is the vector of the explanatory variables, $\beta(\tau)$ are the $kx1$ regression coefficients at the τ-th quantile of the dependent variable y. Contrary to the usual minimization of the sum of squared residuals in the OLS case, the quantile regression estimator minimizes the weighted sum of absolute deviations :

$$Min_\theta \left[\sum_{y_{it} \geq x_{it}\theta_\tau} \tau |y_{it} - x_{it}\beta(\tau)| + \sum_{y_{it} \leq x_{it}\theta_\tau} (1-\tau)|y_{it} - x_{it}\beta(\tau)| \right] \tag{4}$$

We have as many estimators of β as values of $\tau \in [0,1]$. The special case $\tau = 0.5$ which minimizes the sum of absolute residuals corresponds to median regression. The first quartile is obtained by setting $\tau = 0.25$ and so on. As one increases τ from 0 to 1, one traces the entire conditional distribution of economic growth. It is in this way that quantile regression allows for parameter heterogeneity in the response of the dependent variable to explanatory variables. Previous panel quantile regressions do not take into account unobserved country heterogeneity. In this paper, we perform panel quantile regressions with fixed effects following the two-step method suggested by Canay (2011) [13]. Following this approach, a fixed-effects regression is estimated as a first step. As a second step, these fixed effects are used to demean the dependent variable and this transformed variable is taken as the dependent variable in the quantile regression described above. The use of panel quantile regressions with fixed effects improves the usual panel pooled data regressions by exploring simultaneously two kinds of heterogeneity: unobserved country heterogeneity via fixed effects and common heterogeneity via covariates effects along the dependent variable distribution.

4 Data and Descriptive Statistics

In this section, we first present the data sources and then present descriptive statistics.

4.1 Source of data

The empirical study uses annual time series data from 7 WAEMU countries except Guinea-Bissau. These are Côte d'Ivoire, Senegal, Niger, Mali, Burkina Faso, Togo and Benin. Countries were selected based on data availability. The variables in the study are: gross fixed capital formation as a percentage of GDP, the logarithm of real GDP per capita, the economic openness rate measured by the

ratio (import + export)/2*GDP, the inflation rate calculated from the GDP deflator and a financial development indicator. We have calculated this indicator by using the average of bank credit to the private sector relative to GDP, liquid bank liabilities relative to GDP and bank assets relative to GDP. The study data are mainly from the World Bank's 2017 World Development Indicator (WDI) database. The rule of law is measured by the Freedom House Civil Liberties Index, which has the advantage of being available over a long period of time and for a broad sample of developing countries. This index, built on a scale of 1 and 7, decreases with the improvement of the rule of law. Thus, the value 7 of this index corresponds to the total absence of civil liberties. The civil liberties index comes from the V-DEM (Variety of Democracy) database. All data cover the period 1984 to 2016.

4.2 Descriptive Statistics

The descriptive statistics of all variables are recorded in Table 1. The table shows a measure of tails, i.e. flattening, among other descriptive statistics. Flattening measures the apogee or flatness of the distribution of the series. It is well known that when this quantity exceeds 3, we say that the data have heavy tails. It is obvious that most variables are leptocurtic. Another statistic is asymmetry, which measures the asymmetry of the distribution of the series around its mean. A formal normality test combining flattening and asymmetry is given by the Jarque-Bera test statistic, which suggests that all variables follow a non-normal distribution.

Table 1: Descriptive Analysis

VARIABLE	OBS	MEAN	ST.DEV.	MIN	MAX	KURT	SKW
FIN	231	21.498	8.296	4.93	60.651	3.663	0.731
OPEN	231	30.721	9.434	14.187	62.516	3.092	0.655
INF	231	3.529	6.952	-9.823	46.386	16.765	3.096
INVEST	231	18.050	6.346	6.767	38.895	3.726	0.707
CIVILLIBERTY	231	0.706	0.161	0.329	0.907	2.997	-0.998
GDP	231	697.872	331.530	318.409	1650.376	3.506	1.152

Source: Author based on data from WDI (2017) and V-DEM (2017)

For the financial development indicator, the average is 21.49, the standard deviation is 8.29 and a skewness coefficient of 0.73, a kurtosis coefficient of 3.66. As a result, financial development is not uniform in the area and this corresponds to a distribution spread to the right of the average. With Kurtosis, we can see that the density has a higher peak than the normal law (Kurt greater than 3). For real GDP per capita, the average is US$697, an asymmetry coefficient of 1.15 and a flattening coefficient of 3.50. As a result, the standard of living is not uniform in the area and the distribution is spread to the right of the average. With Kurtosis, we can see that the density has a higher peak than the normal law. With regard to investment, the average ratio is 18.05, a Skew 0.70 and a Kurt 3.72. As a result,

investment ratio vary between WAEMU countries and distribution is spread to the right of the average. With Kurtosis, we can see that the density has a higher peak than the normal law. Concerning civil liberties, the average is 0.70, a Skew of -0.99. With Kurtosis, we can see that the density has a lower peak than the normal law.

5   Empirical Results

The empirical analysis follows the following approach. First, we apply unit root tests to the series to study the stationarity of the variables.   Second, we estimate the coefficients of the quantile regression.

5.1 Unit Root and Cointegration Test Results

Econometric analysis requires unit root tests to be applied to the series in order to study the stationarity of the variables. These tests ensure that all variables in the model are cointegrated. The order of integration of the variables is tested according to the tests of Im, Peseran and Shin (IPS, 2003) [28] and Maddala and Wu (1999) [40]. The results are presented in Table 2.

In Table 2, it appears that at the 5% threshold, the null hypothesis confirming the presence of a unit root cannot be rejected for all level variables, with the exception of the inflation rate. Not all variables are therefore stationary in level. But all variables are stationary in first difference. It follows from the above that there is a presumption of a cointegrating relationship between the different variables.

Table 2: Summary of Unit Root Tests

	In Level		In first difference	
	IPS(2003)	MW(1999)	IPS(2003)	MW(1999)
LGDP	3.248	4.189	-6.222***	160.655***
	(0.999)	(0.994)	(0.000)	(0.000)
FIN	6.158	3.540	-5.858***	100.217***
	(1.000)	(0.999)	(0.000)	(0.000)
OPEN	-0.475	18/747	-8.402***	211.178***
	(0.317)	(0/174)	(0.000)	(0.000)
INF	-7.457***	145.471***	-	-
	(0.000)	(0.000)		
INVEST	0.061	20.297	-8.586***	236.304***
	(0.524)	(0.121)	(0.000)	(0.000)
CIVILLIBERTY	-0.476	0.460	-6.803)***	125.426***
	(0.316)	(13.857)	(0.000)	(0.000)

Source: Author based on data from WDI (2017) and V-DEM (2017)
Note: The variables in brackets are the p-values; (*), (**), (***) represent the respective significance levels of 10%, 5% and 1%.

A cointegration test should therefore be applied (Pedroni, 1999) [46]. In Table 3, we present the results of the pedroni cointegration test that support the existence of a long-run relationship between the variables. In the context of panel data, conventional estimators such as fixed or random effect models that do not take into account the presence of unit roots in the series can provide biased estimates and statistical tests that do not follow a standard *Student's* T *Distribution.*

Table 3: Pedroni Cointegration Test

	Statistic	P-value
Modified Phillips-perron t	2.822	0.002--4
Phillips-perron t	3.265	0.0005
Augmented Dickey Fuller t	3.073	0.0011

Source: Author based on data from WDI (2017) and V-DEM (2017)

For this reason, we propose a panel integration-cointegration analysis, using the methods of completely modified least squares (FMOLS) and dynamic least squares (DOLS). However, Kao and Chiang (2000) [31] state that the OLS estimation, in finite sample, presents a bias problem with respect to the FMOLS method. But they also show the superiority of the DOLS method over the FMOLS method, which is considered to be the most effective technique for estimating cointegrating relationships on panel data. The results of OLS, FE, DOLS and FMOLS regressions are given in Table 4.

Table 4: Results of Conditional Models

VARIABLE	OLS	FE	DOLS	FMOLS
FIN	0.024***	0.011***	0.008**	0.011***
	(0.000)	(0.000)	(0.004)	(0.000)
OPEN	0.009**	-0.0021	-0.003	-0.003
	(0.002)	(0.233)	(0.360)	(0.162)
INF	0.00008	-0.006	-0.005	-0.0003
	(0.980)	(0.573)	(0.160)	(0.850)
INVEST	-0.243***	0.003**	0.005	0.004*
	(0.000)	(0.024)	(0.166)	(0.079)
CIVILLIBERTY	1.026***	0.259***	0.347**	-0.003**
	(0.000)	(0.000)	(0.006)	(0.023)

Source: Author based on data from WDI (2017) and V-DEM (2017)
Note: The variables in brackets are the p-values; (*), (**), (***) represent the respective significance levels of 10%, 5% and 1%.

As can be seen, in the case of OLS, the financial development indicator (FIN), the openness rate of the economy and civil liberties are significantly and positively

correlated with growth. However, the investment rate is significantly and negatively correlated with growth.

The investment rate that negatively impacted the growth rate in the OLS regression, positively influences GDP per capita in the case of FE and FMOLS. The financial development improves economic growth in four models (OLS, FE, FMOLS and DOLS). As for civil liberties, they positively influence growth in three specifications (OLS, FE and DOLS) and negatively in the case of FMOLS.

5.2 Results from Quantile Regressions

Empirical investigation is conducted by the quantile regression model at 5 quantiles, namely the 10th, 25th, 50th, 75th and 90th quantiles. This allows us to examine the impact of explanatory variable at different points of the distribution of growth (LGDP).

  In Table 5, we present the estimated parameters. The estimates show that financial depth is positively related to real per capita income and the effect increases overquantiles. For example, a 10% increase in financial development indicator increases the real per capita income by 0.14% at the lower level of real per capita income but by 0.32% at the higher level of real per capita income.

Another interesting result is the effect of investment on real per capita income. It appears that investment has a negative impact on the GDP per capita of the populations of the WAEMU zone. However, this effect decreases for high-income countries. Ouattara (2011) [43] showed in the case of Côte d'Ivoire that corruption was a factor in overestimating the amount of investment in Côte d'Ivoire and that it had perverse effects on economic growth. This situation seems to be the case for the other countries in the WAEMU zone.

In addition, economic openness has a positive and significant influence on countries with high per capita GDP. It does not appear significant for low-income countries. Regarding the positive impact of economic openness, it plays a crucial role in determining economic growth. The importance of its role in financial development and economic growth was initially discussed by McKinnon (1973) [41] and Shaw (1973) [53], who are the founders of the theory of financial liberalization. Consequently, trade and financial openness is a key variable in economic growth.

Table 5: Synthesis of Quantile Regression Results

VARIABLE	Quantile				
	Q10	Q25	Q50	Q75	Q90
FIN	0.014**	0.033***	0.032***	0.029***	0.030***
	(0.038)	(0.000)	(0.000)	(0.000)	(0.000)
OPEN	0.001	0.003	0.008*	0.019***	0.027***
	(0.805)	(0.451)	(0.088)	(0.000)	(0.000)
INF	-0.002	0.002	0.003	0.022	-0.001
	(0.389)	(0.569)	(0.382)	(0.551)	(0.471)

INVEST	-0.003*	-0.015**	-0.025***	-0.028**	-0.030***
	(0.080)	(0.003)	(0.000)	(0.001)	(0.000)
CIVILLIBERTY	0.362	0.989***	1.271***	0.794**	0.822***
	(0.256)	(0.000)	(0.000)	(0.007)	(0.000)
CONS	5.471***	5.017***	5.014***	5.389***	5.314***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Source: Author based on data from WDI (2017) and V-DEM (2017)
Note: The variables in brackets are the p-values; (*), (**), (***) represent the respective significance levels of 10%, 5% and 1%.

Another result, by way of confirmation, is that the quality of institutions positively influences the well-being of populations. Notwithstanding, civil liberties benefit low-income countries more than high-income countries. For example, a 10% increase in civil liberties increases the real per capita income by 12.71.% at the lower level of real per capita income but by 8.22% at the higher level of real per capita income.

6 Concluding Remark

The objective of this study was to analyse the effects of financial development on economic growth in the case of WAEMU countries. The study covers a panel of 7 countries in the area, with the exception of Guinea-Bissau, over the period 1984-2016. This study was motivated by the very mixed results of empirical studies on the effects of financial development on economic growth in underdeveloped countries. Using the panel quantile regression, the empirical results revealed important relationships. In the sample studied, financial development has a positive impact on GDP per capita, but the effect is amplified for countries with a high standard of living. As for the openness rate, it positively affects economic growth in high-income countries. Economic openness does not benefit economic growth in low-income countries. An important result is the effect of investment on economic growth. It appears that investment has a negative impact on growth in the UEMOA region. This counter-intuitive result could be explained by the low level of investment in Africa. In general, private investment in sub-Saharan Africa is lower than in other developing countries, averaging 2% of GDP. It averaged 15% of GDP between 2010 and 2016, compared to 22% in Asian developing countries. This result could also be explained by the high level of corruption, which has perverse effects on growth. It is recognized that excessive corruption could discourage investment in the economy (Acemoglu and Verdier, 1998 [2]). The study also found that the rule of law is beneficial to economic growth in the UEMOA region. The effect is much more pronounced for low-income countries. Milton Friedman (1962) [42] already indicated that economic freedoms and civil and political freedoms were complementary in that they were mutually reinforcing. For the author, the expansion of political rights favoured the strengthening of economic rights, which

in turn would accelerate growth. These results lead to major lessons. The first is that the effect of financial development on economic growth is not linear. It benefits high-income countries more than low-income countries. Countries would benefit from continuing efforts to promote growth and fight poverty. The second lesson to be learned is that investment is a drag on economic growth. Not only must the level of investment be increased, but corruption must also be combated so that investment benefits economic growth. The third lesson is that the rule of law is an essential factor for economic growth in the UEMOA region. Governments of countries in the area would benefit from promoting the rule of law and strengthening the quality of institutions.

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