Financial development and total factors productivity channel: Evidence from Africa

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Abstract

We explore the links between financial development and economic growth through Total Factors Productivity canal in African economies. First, we use a composite index to gauge the levels of financial development in 40 African economies during the period 2004-2014. Second, we study the Finance-Total Factors Productivity (TFP) relationship in a panel of 22 economies classified by their income level. The main results of our study show that financial development in Africa promotes economic growth, improves the allocation investment, and stimulates total factors productivity, but affects negatively saving mobilization. Results by group of countries show that financial development does not promote total factors productivity in low-income and upper-middle-income countries. For low-income countries, this is due to the inadequacy of financial services available to the needs of economic agents. For the second category of countries, this result is probably due to the fact that the financial system is biased toward the formal sector, which does not make enough efforts to increase TFP. The Finance-TFP relationship is significantly positive in the lower middle-income countries. the reforms of African financial systems have to be designed and directed to increase the adequacy of financial services to the needs of each economy and its development level. Financial sectors should encourage the accumulation of inputs in factors-driven economies, improve the reallocation of resources to high-productivity sectors in efficiency-driven economies, and finance Innovation in innovation-driven economies.

Key words: Total Factors Productivity, financial development, financial composite index, economic growth, Africa.

1. Introduction

Several studies examined the links between the real and the financial sectors. The financial sector facilitates trade, mobilizes and collects savings, produces ex-ante information on potential projects needed for better allocation of capital, monitors projects and exercises ex-post control on businesses, and identifies, diversifies and create tools to manages risks (Levine 1997; Levine, 2005, p. 869; Abouch and Ezzahid, 2011)

Concerning causality between finance and economic growth, there are two doctrines. The first argues that causality goes from growth to finance. This position is supported by the Keynesians. For them, financial development is a consequence of changes in supply and demand which are rooted in the real sector. According to Joan Robinson (1952), finance is a relatively unimportant factor in economic development, « *where entreprise leads, finance follows* ». For the second doctrine, the financial system plays a key role in the process of economic growth. The development of business activities requires the allocation of capital, which the source is savings collected by financial intermediaries. J. Schumpeter (1935) highlighted the role of financial intermediaries in the process of economic growth. They facilitate drainage of savings, project appraisal, risk management, and reduction of costs inherent to economic activity (King and Levine 1993, p. 01). According to Schumpeter, all of these functions stimulate technological innovation and, consequently, economic development. Other schoolars have demonstrated a two-way causality between the two sectors (Jung, 1986).

The correlation between financial development and economic growth has been examined by several studies (Gurley and Shaw, 1955; Goldsmith, 1969; King and Levine, 1993; Levine and Zervos, 1998). There is a large agreement that this correlation is positive. King and Levine (1993) explored the link between financial development and economic growth in 80 countries during the 1960-1989 period. Their main results showed that financial development indicators are strongly related to the growth rate of GDP. In line with Schumpeter's thesis, Levine and Zervos (1998) explored the links between economic growth, stock markets and banks; they used data from 42 countries during the 1976-1993 period. They found a positive correlation between financial development and growth. Beck and Levine (2004) analyzed the effect of the financial sector (banks and stock markets) on economic growth. They used data about 40 countries during the 1976-1998 period and the GMM method. Their results showed that financial development affects positively economic growth.

One of the important roles of the financial system is the reduction of the asymmetry of information between different actors. For Boyd and Prescott (1986), banks play a key role in improving the quality of information about projects and the resources allocation in the economy. Stiglitz (1985) and Bhide (1993) showed that stock markets will never produce an information about projects and resources allocation at a quality comparable to what banks produce (Beck and Levine, 2004, p. 424).

Many studies emphasize the complementarity between banks and stock markets, not their substitutability in collecting information and reducing transaction costs. For Allen and Gale (2000), banks have a monopoly in financial markets, which reduces competition. On the other hand, a competitive environment between banks and stock markets encourages innovation and

reduces the cost of financial resources; consequently, it stimulates economic growth (Beck and Levine, 2004).

The proliferation of speculation and massive investment in toxic assets, in the detriment of investment in the real sector, are among the triggers of the 2008 global financial crisis. This dysfunctioning of the financial system has led to a new debate on the nature of the links between financial development and economic growth. Lartey and Farka (2011) analyzed the negative effect of a highly developed financial system on growth during the crisis. They affirmed that financial crises had a high negative effect on economic growth in countries with over developed financial systems, but economies with moderately developed financial systems have been less affected. This asymmetry, due to the extent of the crush which depends on the size of financial market, and the nature of the products that are traded. Financial development is beneficial to growth below a given threshold, above which it will affects negatively economic growth (Arcand et al., 2012).

The relationship between finance and total factors productivity has been treated in several papers. Beck et al. (2000), explored empirically the relationship between financial development, economic growth, total factors productivity, investments and saving. Their main result shows the positive impact of financial intermediation on total factors productivity and economic growth. Investments and savings are affected to a less extent. Dabla-Norris et al. (2010) highlighted how innovation affects the productivity of the firm, as well as the role of the financial sector in this relationship. Using a database about firms, the results show the important role of innovation as a catalyst of business performance and productivity. The positive effects of the financial sector on productivity are mediated by financing innovative firms. These firms benefit from a maximum advantage of financing in countries whit high developed financial sectors. This contribution is particularly important for high-tech firms with the highest external financing requirements.

In African continent, there is a consensus that the financial sector contributes to increase economic growth and to improve total factors productivity. R. Oluitan (2012) showed that growth and financial development have positive effects each on the other. He used a panel of 30 African countries during the period 1970-2005 and the variables mobilized by King and Levine (1993). Using a sample of 21 countries and dynamic panel methodology, E. Ngongang (2015) demonstrated a positive link between financial development and economic growth. Ikhide (2015, p. 18) highlighted the effect of the degree of inclusiveness of the financial sector as one of its features that conditions its contribution to economic growth, notably through the promotion of the access to finance by individuals and SMEs. Ikhide's study presents estimates with and without the financial inclusion variable. The results show that if the inclusiveness of the financial sector is not taken into account, the link between financial development and economic growth remains negative. After adding the variable measuring the degree of inclusiveness of the financial sector in the model, the financial sector contributes to the economic growth. Mlachila and al., (2016, p. 10) points out that financial development supports growth and reduces its volatility in the case of sub-Saharan Africa. Tita and Aziakpono (2016, p. 17) used a panel of 15 countries during the 1985-2007 period, and their results suggest that the inclusiveness of financial systems is necessary to reduce inequality in the African continent. Inoue and Hamori (2016) used a database of 37 economies over the period 2004-2012 to

examine empirically the effects of access to finance on economic growth in sub-Saharan Africa. Their results showed that the coefficient attached to the financial access variable is statistically significant. A recent study by Tita and Aziakpono (2017, p. 13) examined the effect of the inclusiveness of the financial system on inequality. In order to determine which aspect of financial inclusiveness has the greatest potential to reduce income inequality in Sub-Saharan Africa, the study has mobilized seven indicators[1] to capture the various aspects of financial inclusion. The results show that the wider use of formal accounts, of electronic payments, and of formal savings by economic agents contribute to the reduction of income inequality.

The economic literature showed two sources of economic growth. The first is the accumulation of factors of production, in particular the capital factor whose positive effect on economic growth is counteracted by the decline of its marginal productivity. The second source is technical progress measured by improvement in total factors productivity (TFP). It is regarded as an inexhaustible source of economic growth. TFP comes from unidentified and exogenous factors to the economy (Solow, 1956) or endogenous factors to the economy through investment in technological capital (Romer, 1986), human capital (Lucas, 1988), or public capital (Barro, 1990). Investment in physical capital, human capital or public capital stimulates TFP and, as a result, is a driver for economic growth. The spectacular growth achieved by Asian economies attracted the curiosity of researchers in order to investigate its sources. This growth is due to investment, i.e. accumulation of factors of production, which remains unsustainable because of the law of diminishing returns, hence the need to rely on more total factors productivity (Ajai, 2015, p. 02). That's why we focus in this paper on the evidence concerning the role of the financial sector in improving total factors productivity in the African context.

The remain of this paper proceeds as follows. In the following section, we present a comparative analysis of financial development in African countries. In the third section, we discuss the empirical results of the study. In the fourth section, we present some concluding remarks.

2. Data, variables, and the model

We use the methodology of panel data to study the relationship between financial sector development and economic growth. First, we perform to a comparative analysis of the levels of financial development in 40 African countries. Our database is composed for four variables measuring financial development during the period 2004-2014. Second, we will explore the relationship between financial development and total factors productivity in 22 African countries using data from the World Bank, the International Monetary Fund, and the Penn World Tables. The indicators that measure financial sector development and economic growth are derived from theoretical and empirical literature (Table 1).

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[1]The seven variables that capture financial inclusion are: percentage of adults over 15 years old with an account in a formal financial institution, percentage of adults using their accounts for commercial purposes, percentage of adults using electronic payments to settle Purchases, percentage of adults who obtained credit from a financial institution last year, percentage of adults with debt to pay school fees, percentage of adults with insurance contracts, percentage of adults Having a savings account (Tita and Aziakpono, 2017, p.26).

Table 1: Study variables

Variables	Contents	Data Sources
1) Dependent Variables		
GDP growth (in % per year)	The annual growth rate of domestic production (sum of value added) in percentage.	World Bank database
Total Factors Productivity	The annual growth rate of Total Factor Productivity (TFP at constant national prices (2011 = 1)).	Penn World Tables v 8.0
Investment (in % of GDP)	Measures the total value of gross fixed capital formation, subtract disposals of a unit or sector as a percentage of GDP.	International Monetary Fund Database
Savings (in % of GDP)	Is gross income minus final consumption expenditure after taking into account an adjustment for pension funds.	
2)Indicators of Financial Sector Development		
Domestic credit provided by the banking sector (% of GDP)	Refers to financial resources provided by the banking sector in percentage of GDP.	World Bank database
Automated teller Machines (ATMs) (per 100,000 adults)	Number of ATMs per 100,000 adults.	
M2 in % du GDP	The M2 aggregate in percentage of GDP.	
Branches of commercial Banks (per 100 000 adultes)	Number of commercial bank branches per 100,000 adults.	
3) Control Variables		
Inflation (% annual)	Measures the annual change in the cost of a basket of products and services.	World Bank database
Openess rate (in% per year)	Exports plus imports as a share of GDP.	
Population growth (% annual)	The annual growth rate of the population.	
Public expenditure (% of GDP)	Operating expenses incurred by the government for the supply of products and services.	
Level of human capital	Human capital index based on years of schooling and return to education.	Penn World Tables v 8.0
Dummy variable to qualify countries with access to the sea (Landlockedness)	1 = With access to sea 0 = No access to the sea	Map of the African continent
Dummy variable to qualify countries with natural resources	1 = With natural resources 0 = No natural resources	

The specified model integers the financial sector development index as a determinant of growth. It's similar to the models used by T. Beck and R. Levine (2004) and R. King and R. Levine (1993). The specification of this model in a panel data framework is as follows:

$$PTF_{it} = \beta_0 + \beta_1 * Finance\ Index_{it} + \sum_{k=2}^{8} \beta_k * X_{it.k} + u_{it}$$

$$\text{With}: \quad u_{it} = \alpha_i + \lambda_t + \varepsilon_{it}$$

Studies on this topic (Levine, 1997, Beck, 2010, Ngare and al., 2014) use variables such as the M2 aggregate in % of GDP, domestic credit provided by the banking sector in % of GDP or market capitalization in % of GDP to quantify the development of the financial sector. Given the problem of collinearity between these variables, we use the Principal Component Analysis (PCA) method to reduce four indicators of financial development (Domestic credit provided by the banking sector in % of GDP, number of automated teller machines (ATMs) per 100,000 adults, number of commercial banking branches per 100,000 adults, and M2 aggregate as % of GDP) in a single index that summarizes the initial information. The mobilized database covers the period 2004-2014 and concerns 40 economies.

Instead of using the method of computing a composite index as in M. Sarma and J. Pais (2011), M. Sarma (2012), and X. Wang and J. Guan (2017), we recourse to the Principal Component Analysis methodology to aggregate sub-indicators into a final synthetic index. Based on the

principle of inertia (explained variance) (Nardo and al., 2005, p. 65), the weight of each sub-indicator in the synthetic index is:

$$w_j = Weight_j = \frac{\left(LF_j\right)^2}{VT}$$

LF (Loading Factor) is the highest coefficient of the indicator in the matrix of components and VT is the total variance measured by the sum of the eigenvalues in the explained variance table. The aggregation that leads to the composite index can be done by blocking the cells of the weights (w) which are considered to be the same for all years since these weights are derived from the data of all these years, and the cells of the initial variables are allowed to switch. The composite index for country *i* in year *t* is:

$$FinINDEX_{it} = \sum_{j=1}^{J} w_j \times Indicator_{ijt}$$

Index *j* refers to one of the 4 sub-indicators aggregated to obtain the synthetic index.

Figure 1: Index of financial development in Africa[2], 2014 data
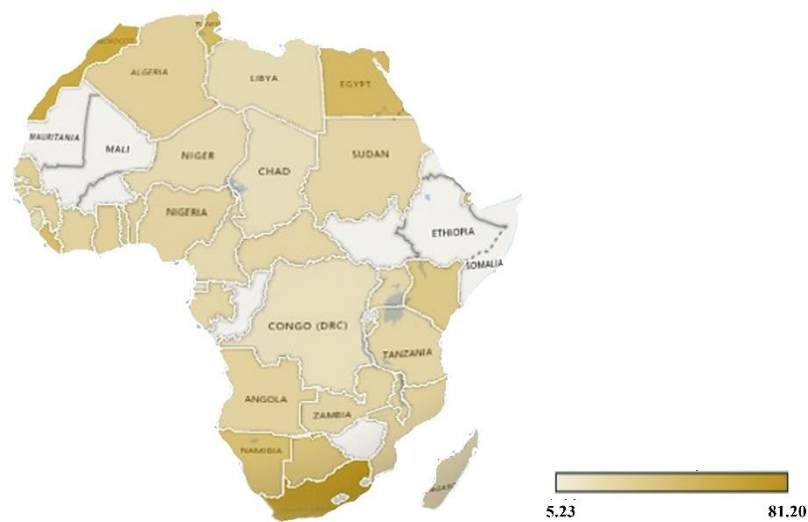
Source: The authors

Figure 1 reflects the levels of financial development in African countries in 2014. The bulk of financial sectors in Africa are less developed compared to the South African financial sector which comes first with an index of 81.20, followed by the Moroccan financial sector with an index of 68.77.

3. Empirical results and discussion

3.1. Results

The 40 countries in our sample are classified into three subgroups according to their income level (Annexes a, b and c). The results of the Breusch-Pagan test by group of countries, showed that there are no specific individual effects for the countries in the same sub-group (Table 2).

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[2] Countries in blank are those countries for whose data on the level of financial development are not available.

This confirms the relevance of the grouping by income level. In the whole African continent sample (22 countries), the same test indicates the heterogeneity of the data proving the existence of specific individual effects. These effects are modeled by a fixed effect model according to the Hausman test.

In low-income and upper-middle-income African countries, the development of the financial sector does not improve total factors productivity. Investment and human capital affect negatively total factors productivity. In low-income countries, public spending affects negatively TFP. On the other hand, in the lower middle-income African countries, the Finance-TFP relationship is significantly positive, but very low. An increase of the composite financial development index by 1% leads to a TFP increase of 0.0035%. As in low-income countries, public expenditure and human capital affect negatively and significantly total factors productivity in the lower middle-income countries. However, in the African whole sample, the financial system contributes slightly and significantly to the increase of total factors productivity. While public spending and human capital affects negatively the TFP.

Table 2: Financial Development and TFP: 2004-2014.

	Low income countries	Lower Middle Income Countries	Upper Middle Income Countries	Africa[3]
Fin-Index	-0.0013	0.0035**	- 0.0022	0,0028**
	(-0.70)	(2.33)	(-0.95)	(2.23)
Inflation	0.0003	0.0003	0.0102***	-0.0002
	(0.43)	(0.17)	(2.80)	(-0.33)
Population	-0.0692***	- 0.0772***	- 0.0309	-0.0541***
	(-4.00)	(-3.41)	(-1.55)	(-3.41)
Public Expenditure	-0.0057**	-0.0121***	0.0045	-0.0071***
	(-2.21)	(-4.35)	(1.38)	(-3,36)
Openess rate	0.0002	- 0.0001	0.0007	0,0006
	(0.63)	(-0.20)	(0.69)	(1,49)
Country landlockedness	0.0756***		- 0.1597*	
	(3.09)		(-1.74)	
Natural resources		0.1518***	0.1195	
		(5.14)	(1.21)	
Human capital	-0.0757*	0.0389	-0.2046*	-0.0787
	(-1.73)	(0.59) (5.14)	(-2.00)	(-1.20)
Rate of investment	-0.0015*	0.0034**	- 0.0068**	-0.0015
	(-1.66)	(2.19)	(-2.69)	(-1,59)
Constant	1.3932***	1.1014***	1.6596***	1.3439***
	(14.81)	(6.93)	(6.26)	(11.62)
Observations	110	77	55	242
Number of countries	10	7	5	22
Breusch-Pagan LM Test	1.0000	1.0000	1.0000	0.0002
Hausman Test				0.0002
Estimation method	OLS[4]	OLS	OLS	Within
R²	0.52	0,66	0,64	0,27
Prob > F	0.0000	0.0000	0,0002	0.0000

Source: The authors. P-value: <0.01 (***), <0.05 (**) and <0.1 (*), t-statistics in parentheses

As many other studies on Africa (Nyamongo and al., 2012, Oluitan, 2012, Ikhide, 2015, Taiva and Nene, 2016; Mlachila and al., 2016; Inoue and Hamori, 2016) we conclude to the existence of a positive correlation between financial development and economic growth, and a positive

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[3]Country specific-effects: Benin (0.014), Botswana (0.199), Burkina Faso (-0.044), Cote d'Ivoire (-0.024), Egypt. Nigeria (-0.107), Senegal (0.006), Sierra Leone (0.068), South Africa (-0.050), Mozambique (-0.012), Tanzania (0.048), Togo (-0.031), Tunisia (-0.035).

[4]OrdinaryLeast Squares.

link between financial development and the rate of investment. However, financial development affects negatively the savings rate (Table 3).

Table 3: Financial Development, Economic Growth, Investment and Saving: All the sample, 1981-2011.

	GDP	Investment rate	Savings rate
Fin-Index	0.0429***	0.0284	- 0.0727**
	(3.67)	(1.42)	(-2.13)
Inflation	-0.0632*	-0.0753 **	0.1338***
	(-1.96)	(-2.28)	(3.00)
Public Expenditure	0.0176	0.5107***	- 0.0496
	(0.38)	(9.01)	(-0.64)
Population	1.3455***	2.5276***	0.6343
	(3.57)	(4.31)	(0.75)
Openess rate	0.0668***	0.1101***	-0.0059
	(4.65)	(5.49)	(-0.20)
Human capital	0.1733	4.1281***	4.3882**
	(0.21)	(3.09)	(2.23)
Country landlocked	1.3118*	3.2861	
	(-1.79)	(1.43)	
Natural resources	1.6686**	-5.3638***	
	(-2.57)	(-2.57)	
Constant	- 4.7186***	-14.2998***	10.6830**
	(-2.75)	(-4.22)	(2.33)
Observations	302	302	302
Number of countries	15	15	15
Breusch-Pagan LM Test	0.3918	0.0000	0.0000
Hausman Test		0.0648	0.0000
Estimation method	OLS	GLS[5]	Within
R²	0.13	0.45	0.05
Prob > F	0.0000	0.0000	0.0083

Source: The authors. P-value: <0.01 (***), <0.05 (**) and <0.1 (*), t-statistics in parentheses

3.2. Discussion

The financial sector in African low-income countries does not stimulate total factors productivity. This can be explained by the under development of financial sectors in this group of countries (Annex a). This does not help collecting savings and better allocating it to investment. Public spending and human capital do not improve TFP too. As a result, the accumulation of productive factors, especially physical capital, should be the concern of financial systems in lower-income countries. The financial systems of lower middle-income countries (Annex b) contribute to the improvement of total factors productivity. The effort should focus on developing infrastructures and human capital and on the mechanisms through which the financial system could contribute to this.

In high middle-income African countries (Annex c), financial development does not promote total factors productivity. This result can be explained by the fact that the African financial systems serve primarily formal sector enterprises. In the absence of competition and the

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[5]Generalized Least Squares.

dominance of the rent, these firms do not make the necessary efforts to increase their productivity. Thus, it is important to reorient the financial sector to help mobilize financing for all firms that can achieve an increase their total factors productivity. This can be done by the development of suitable financial services for the informal sector and for financing innovation and R&D.

Future financial sector reforms in low-income economies, have to create mechanisms for financing infrastructure, accumulating human capital, especially via basic education to consolidate individual's capabilities, and promote inclusive finance. In lower middle-income economies, financial sectors should contribute to infrastructure development, to business environment improvement for greater attractiveness of FDI, and the accumulation of human capital through secondary and higher education systems. In higher middle-income economies, financial sector should enhance innovation and R & D through the development of specialized financial institutions (Figure 2).

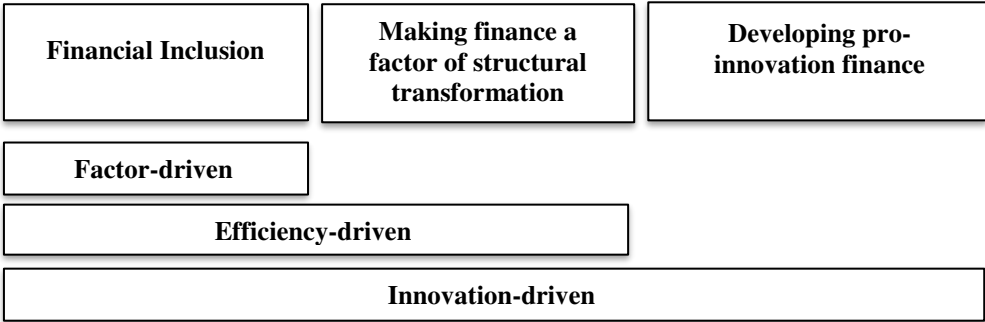**Figure 2:** Reforms by Stage of Economic Development
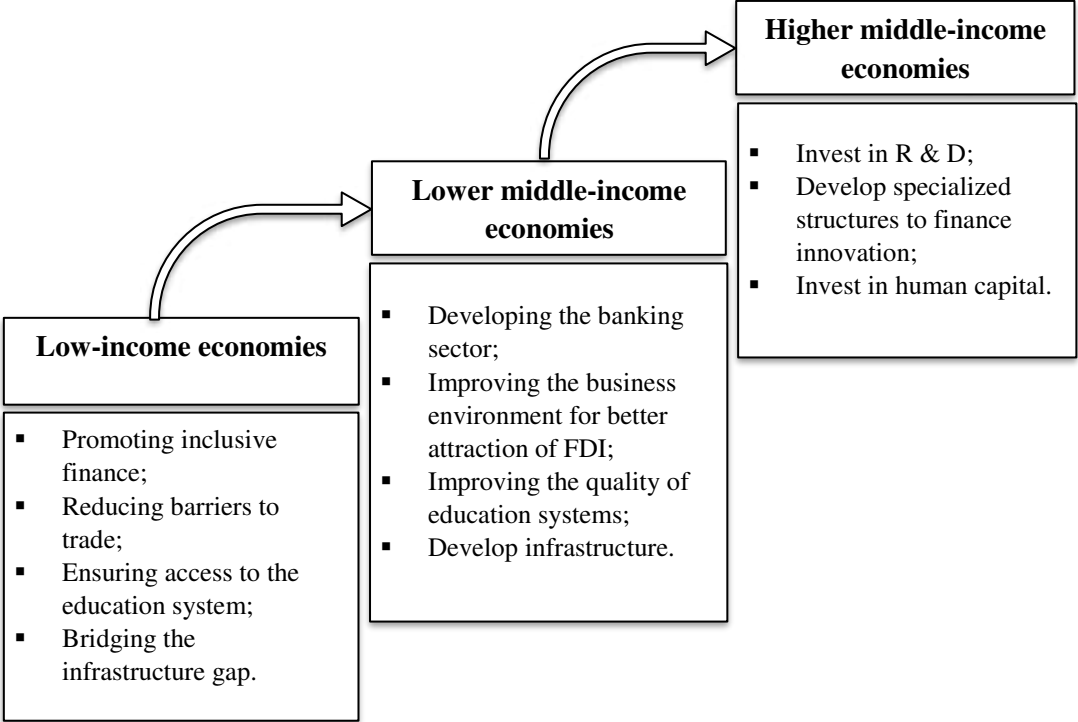
Source: The authors; Inspired by (AJAI, (2015)).

Many studies showed that economic development depends more on the quality and quantity of financial services rather than on the structure of the financial system. Demirgüç-Kunt and Levine (1999, p. 35) used a panel of 150 countries to examine how the size, activity and efficiency of financial systems differ between groups of countries. The main result highlight the fact that financial sector development tends to be more important in higher-income countries, where stock markets become more active and efficient than banks. Levine (2000, p. 36) used a database to classify countries during the 1980-1995 period and show that bank-based financial systems stimulate economic growth in the early stages of development more than market-based financial systems, which provide financial services that promote innovation and long-term growth in high-income countries. For Beck (2003, p. 36), who worked on a panel of 40 countries during the 1975-1998 period, the volume and quality of financial services are more important to economic development than the structure of the financial system (bank-based or

market-based). What is important depends on the characteristics of the available financial services and not the channel of their delivery.

Financial systems should offer services in line with the level of development and the needs of each country. Thus, financial systems in factor-driven economies should be able to offer financial services that encourage the accumulation and use of productive factors. For efficiency-driven economies, financial sectors should help to improve the reallocation of resources to higher productivity sectors. In innovation-driven economies, financial systems should develop pro-innovation finance. Figure 3 show a calibration of financial reforms according to the sources of growth of each economy as proposed by the report of the World Economic Forum on Competitiveness 2014-2015 (Schwab, 2014, p. 11). To establish this calibration, we answer this question: what financial services are vital to encourage factors accumulation, to improve efficiency of economies, and to finance innovation?

Figure 3: Typology of financial reforms according to the sources of economic growth

Financial Inclusion	Making finance a factor of structural transformation	Developing pro-innovation finance

Factor-driven

Efficiency-driven

Innovation-driven

Source: The authors, the classification of economies is proposed by (Schwab, 2014, p. 11).

4. Conclusion

In this paper, we have explored the links between financial development and total factors productivity, using a panel of 22 African countries grouped by their development level and observed during the 2004-2014 period. We have completed this analysis by studying the links between financial development, economic growth, investment, and savings using a database of 15 countries over the period 1981-2011.

In contrast to others studies on the same subject that use many variables to quantify financial sector development, we found it more appropriate to construct a composite index in order to carry out a comparative analysis of Africans financial sectors. The index summarizes four sub-indicators, with data covering the period 2004-2014, for 40 countries. The bulk of African financial sectors remain undeveloped compared to the South African's and Moroccan's financial sectors.

The main results by group of countries show that the development of the financial sector does not promote total factors productivity in low-income and upper-middle-income countries. For low-income countries, this is due to the inadequacy of financial services available to economic agents. For the second category of countries, this result is probably due to the fact that the financial system is biased toward the formal sector, which don't make enough efforts to increase TFP. The Finance-PTF relationship is significantly positive in the lower middle-income countries.

Several studies (Demirguç-Kunt and Levine 1999; Levine, 2000; Beck, 2003) have shown that economic development depends more on the quality of the available financial services than their source or size. In line with this reasoning, the reforms of African financial systems have to be designed and directed to increase the adequacy of financial services to the needs of each economy and its development level. Financial sectors need to encourage the accumulation of inputs in factors-driven economies, improve the reallocation of resources to high-productivity sectors in efficiency-driven economies, and finance Innovation in innovation-driven economies.

The results of our study corroborate those of several empirical studies about African countries (Nyamongo and al., 2012; Oluitan, 2012; Ikhide, 2015; Taiva and Nene, 2016; Mlachila and al., 2016; Inoue and Hamori 2016). Financial development in Africa promotes economic growth, increases investment and slightly boosts total factors productivity. This is due to the fact that formal sector enterprises take up all the financial resources mobilized by the financial sector in Africa, to the detriment of the informal sector, despite the later place in terms of job and added value creation. In this sense, financial systems in Africa should develop financial services to match the needs of informal sector operators in order to fully exploit the potential of African economies.

On other hand, the synthetic index of financial development is negatively correlated with saving. The lack of adequate financial products for small savers is the main factor undermining the collection of savings. To this end, the extension of commercial banks branches and the development and diversification of financial services proposed by banks, especially those aimed to drain small savings, are a priority.

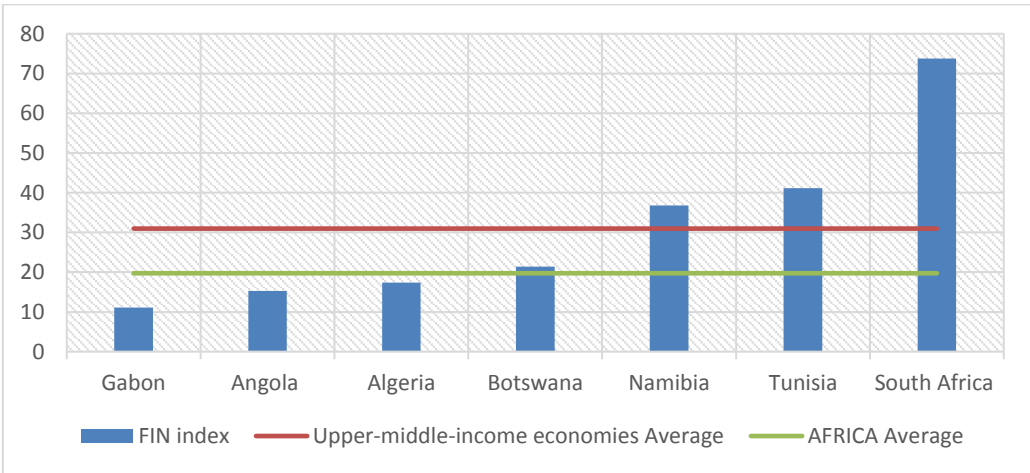## 5. Annexes (Financial development by stage of development during 2004-2014)

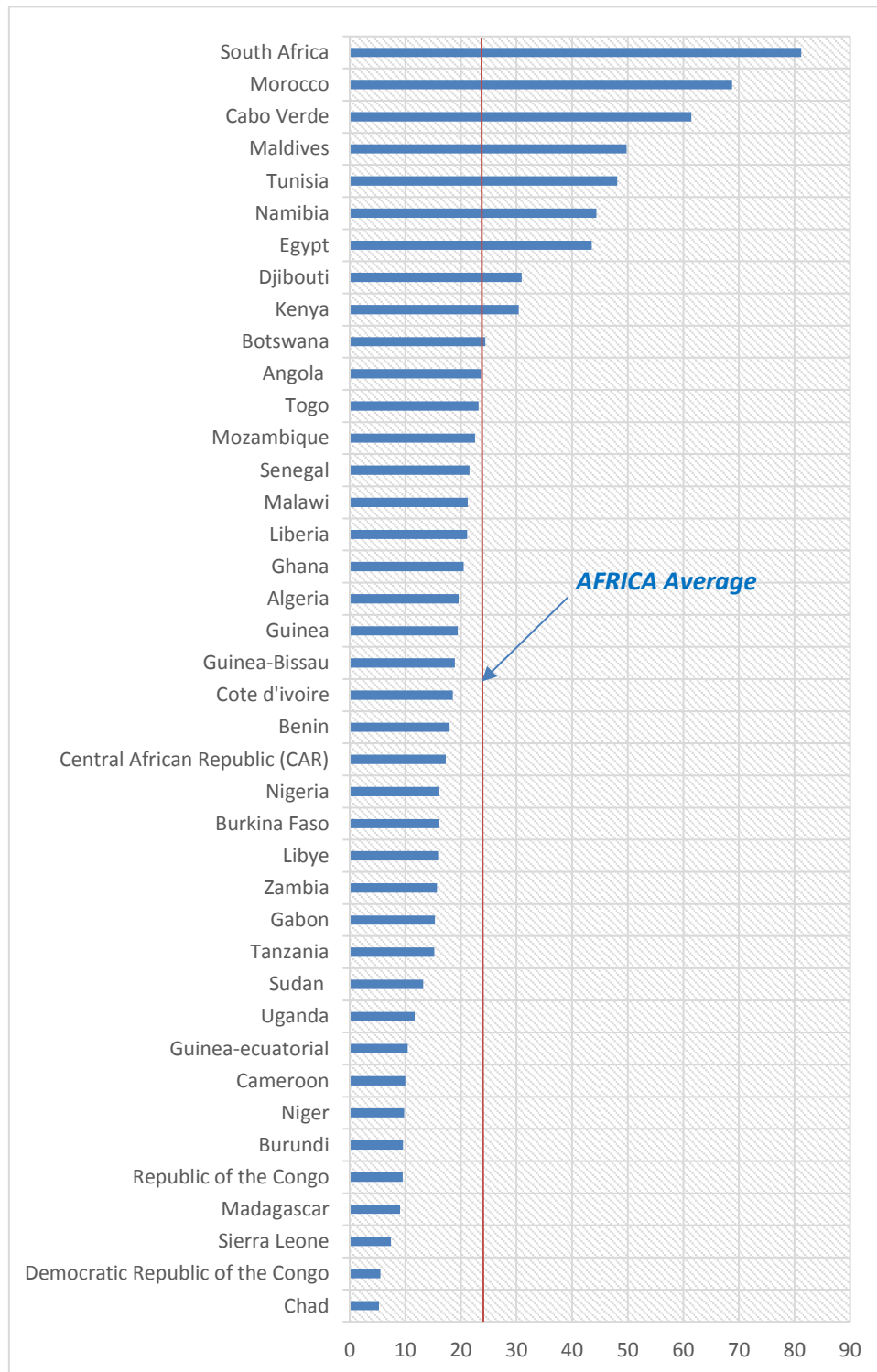### a. Low-income economies
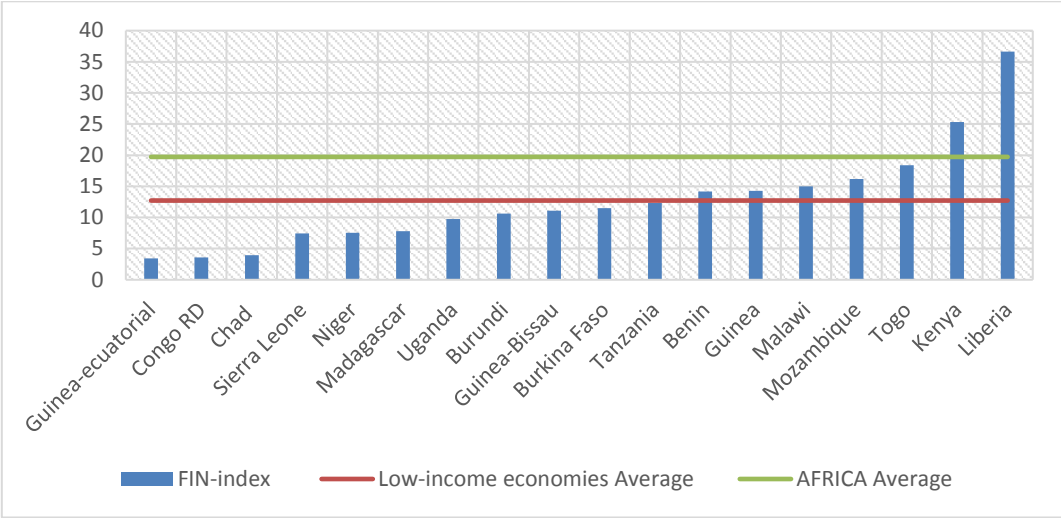
b. Lower middle-income economies
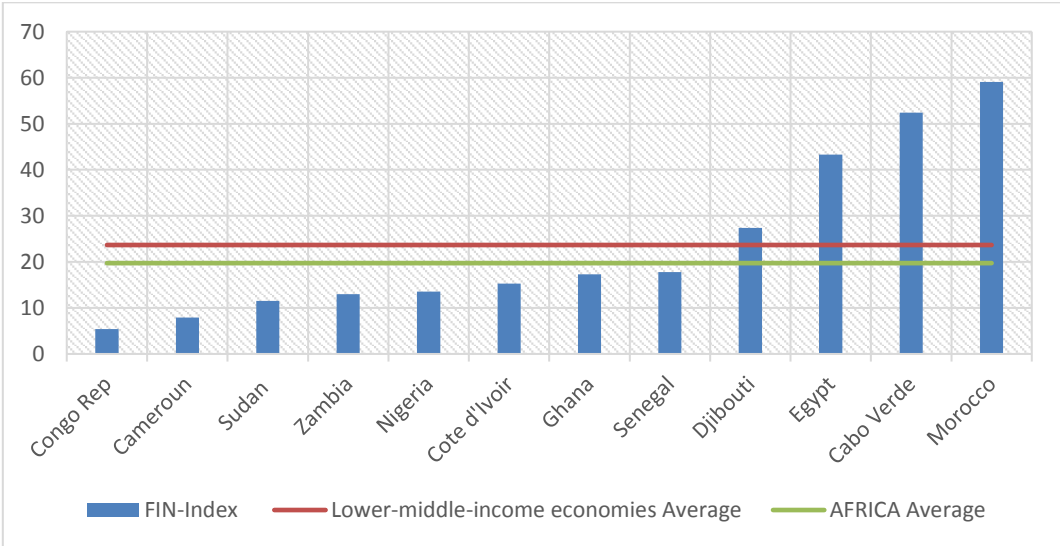
c. Higher middle income economies

Source : The authors.

d. Index of African financial development in 2014.

Source: The authors

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