West African Financial Sector Development: Empirical Evidence on the Role of Institutional Quality and Natural Resource Rents

Fisayo Fagbemi[1*]   John Oluwasegun Ajibike[2]   Peter Abiodun Ige[1]
1.Graduate Student of the Department of Economics, Obafemi Awolowo University, Ile – Ife, Nigeria
2.Department of Banking and Finance, The Polytechnic Ibadan, Ibadan, Nigeria

Abstract
The paper examines the effect of natural resource rents and institutional quality on financial sector development in West Africa. Using pooled OLS, fixed effect and system generalized method of moments (GMM) estimations with several robustness checks, the results indicate that natural resource rents have an adverse effect on financial development. Further evidence shows that institutional indicators, based on control of corruption, rule of law and government effectiveness, positively influence financial sector development. In contrast, the interaction of natural resource rents with various institutional measures consistently alters the relationship. Thus, findings show that the indirect effect of natural resource rents on financial development process is detrimental through the channel of institutional quality, as increased natural resource wealth could exacerbate the incidence of corruption and gross mismanagement in the public sector. In addition, natural resource windfalls encourage high tendencies for divestment in financial sector in the sub-region. Based on these findings, the paper argues that strong institutions could help enhance the performance of financial sector in West Africa. However, to achieve this aim, policy makers across countries should formulate policies anchored on effective governance system to enhance efficiency of the financial sector in West Africa. Also there should be right mix of policies that will mitigate the incidence of gross mismanagement of natural resource wealth, and thus infuse improved demand for financial credit and market services within the sub-region.
Keywords: Financial Development, Institutional Quality, Natural Resource Rents and West Africa.

1. Introduction

The conduct and performance of financial system in sub-Saharan Africa (SSA), particularly in West Africa, has been a topic of debate in recent times. The debate has considered several issues that determine the development trajectory of financial sector in the region. The effectiveness of financial system in enhancing economic growth and diversification of risk is critical in both emerging and developing economies (King and Levine, 1993). Relating to key frame of reference, the role of the financial sector is a sine qua non in any economy. Hence, a well-functioning financial system has been widely viewed as the bastion of effective coordination of government policy and the amelioration of the effect of market imperfections (Bencivenga and Smith, 1991; Aryeetey, 2003; McDonald and Schumacher, 2007).

West Africa's relevance as the major source of oil, gas and other natural resources has necessitated burgeoning debate on the effect of natural resources on financial development conditional on institutional quality of West African countries. In SSA, for instance, total natural resource rents accounted for 16% of gross domestic product (GDP) in 2012 (IMF, 2014). This is far above the global average of 10%. Over the past decade, humongous commodity rents, before the recent contraction of commodity prices, have led to a huge increase in government revenues across African countries. However, owing to low absorptive capacity, policy inconsistency and the presence of weak institutions, the efficient utilisation of natural resource wealth has been hindered, especially its effective intermediation through financial sector coupled with the transformative effect on the economies as a whole (Cheikh and Munseob, 2015; Beck and Poelhekke, 2016). Specifically, domestic credit to private sector (% of GDP) in 2016, as one of the significant measures of financial development, on a country basis compared to South Africa (144.7), is low across West African countries (see figure 1) based on World Bank report (2017), despite the huge natural resource gains in the sub-region.
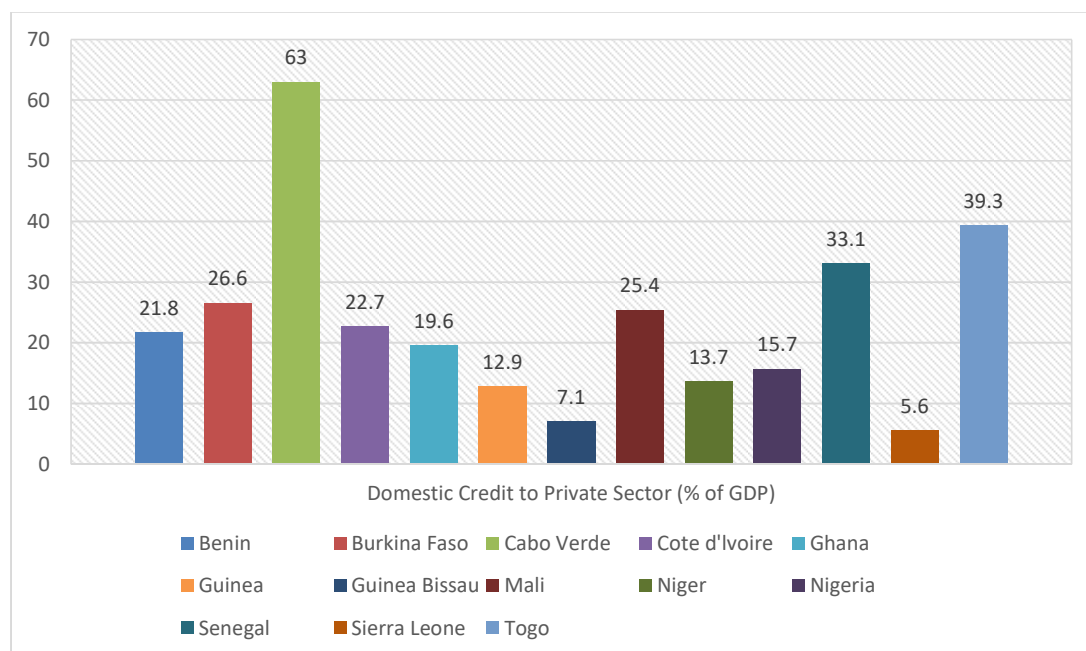
Figure 1: Domestic Credit to Private Sector (% of GDP) in West African Countries (2016)
        (Source: World Bank Report, 2017 and Authors' Computation)

A critical case is that, as can be observed in figure 1 above, many West African countries such as Guinea, Guinea Bissau, Nigeria and Sierra Leone are rich in diamonds, oil or many other minerals, and yet continue to experience shallow financial systems. This could be attributed to the deteriorating features pervasively prevalent in these economies, especially in most resource-rich countries, which are fundamental factors underpinning the extent to which the financial sector performs. The weak governance and institutional capacity in public and private financial institutions have engendered the financial sector fragility across countries in Africa (Bachmann and Hanappi-Egger, 2014; Demirgüç-Kunt et al., 2015).

The relationship between institutional quality and financial development has been discussed quite extensively in both theoretical and empirical literature, yet the focus on West African sub-region has been limited. Most studies have focused on either sub-Saharan Africa (SSA) or Middle East and North Africa (MENA). Whilst Cherif and Gadzar (2015); Ayadi, Arbak, Naceur and De Groen (2013); Thai-Ha, Kim and Lee (2015) centered their studies on MENA, Adegboye and Fagbemi (2017); Anayiotos and Toroyan (2009); Mbulawa (2015) focused on SSA countries. These studies found evidence that good institutions would contribute positively to financial sector development in the two regions. However, the common observation from the empirical literature is that none of the known studies focused exclusively on West Africa. Hence, the question as to whether institutional quality, with the exclusion of other regions, influences financial development has provoked a series of debates amongst researchers (economists) in recent times.

In addition, although a few studies indicate that natural resource endowment is associated with low level of financial development (Allen, Carletti, Cull Qian and Senbet, 2010; Sach and Warner, 1995; Gylfason et al., 1999; Beck, 2010), none has considered the relationship between natural resource rents and financial development across Economic Community of West African States (ECOWAS). The complementary role of institutions in financial development process has been confirmed by some scholars such as Nellor (2008); Collier and Hoeffler (2009); Bhattacharyya and Hodler (2010). This notwithstanding, the interaction effect of natural resource rents and institutions on financial development, within the context of West African countries, has not been extensively studied in the literature. As a consequence, there have been increased agitations as to whether resource-based economies of West Africa are exclusively prone to heightened rent-seeking practices, corruption, lack of accountability and weak institutions, which in turn impede financial sector development.

In view of the foregoing, it is imperative to take into account the effect of natural resource rents and institutions on financial development in West Africa. And also to examine whether the weak institutions that persisted over time influence the relationship between natural resources and financial development in the region. Thus, in this study, we analyze the effect of natural resources rents on financial development in West Africa. The study also examines the effect of institutional quality on financial sector development, extending the analysis to encompass the interaction effect of natural resource rents and institutional quality in West African countries. This study is of immense benefit to policy research on regional financial development by providing more

fundamental conditions that promote and sustain the process of financial sector development. Moreover, the justification for this study also stems from the paucity of empirical findings on what determines the level of financial sector development in ECOWAS Member States. In conclusion, the study further contributes to the existing knowledge in the literature on financial sector development in Africa.

The rest of the paper is organized as follows. The next section gives an overview of financial sector in West Africa. Section 3 briefly discusses theoretical and empirical issues on financial development. Section 4 describes the methodology followed in the study. Section 5 contains the discussion of the empirical results, and finally the concluding remarks are presented in the last section.

2. An Overview of Financial Sector in West Africa.

Financial sector development has been widely adjudged by a large body of literature to be of immense importance to economic growth and welfare enhancement. Specifically, this is likely to be the true case in developing economies of the world, as the financial sector of these economies is particularly viewed to be underdeveloped (ECOWAS-Japan Business Forum, 2015). While sub-Saharan African (SSA) countries are among the least developed financial system in the world, West African countries are far below South Africa's financial system, and in relation to private sector credit as a percentage to GDP, is in the lowest median category (KPMG, 2014). Access to financial services can enhance social and economic welfare through the similar channels that influence the overall economic development: by promoting good cooperate governance, facilitating high return on investment, increased access of the poor to finance and as well as welfare enhancement (Sharma, 2008; Rodrik, 2013).

Over the last decade, West Africa's financial sector has witnessed improved growth. Bank credit has increased considerably in most ECOWAS Member States, since the early 2000's (West Africa Economy and Monetary Union (WAEMU), 2014). This development has been linked to various policy reforms espoused by the successive governments, which have contributed to better financial services in the sub-region. Much progressed has been made through the introduction of highly needed information infrastructure, legal regulatory framework and regulatory institutions. Consequently, when measured by the ratio of private credit to GDP, the depth and coverage of financial systems have improved.   However, the poor in West Africa countries still find it difficult to have access to formal financial services. This hampers their capacity to participate fully in economic activities and to improve their businesses (IMF, 2013). According to 2014 World Bank estimates, only 34% of the adult population in Africa have a bank account. Also, following the report, cellular phone penetration in West Africa is at 80%. Thus, the use of mobile phone technology has been an alternative to usual traditional banking in the sub-region.

When compared to other emerging market economies, most African financial markets, especially West Africa, can be easily accessed by the new entrant or foreign investors. This has given the African continent, including ECOWAS Member States, a certain advantage over its emerging market counterparts (WAEMU, 2015). There have been growing number of subsidiaries of major world banks across all countries. As a result, the quality of financial services has improved in recent years. Nonetheless, in West Africa, the largest market, Nigeria is dominated by large indigenous players. In all, Nigeria, Ghana and the West African Economic and Monetary Union, which comprise mainly Francophone countries and one Portuguese speaking country, are the major concentration of the West African banking and financial sectors.

Generally, the financial system in ECOWAS Member States remains chiefly bank-based, microfinance institutions (MFIs) account for a small but increasing share of the financial sector in the region. During commodities boom, banks in West Africa produced high returns. But recently, in the face of commodity prices contraction cum slow economic growth, the industry has experienced more risks and lesser rewards. Prior to this, The growth of the sector in West Africa was strong in 2014, as the first 50 banking institutions in the sub-region had improvement in their balance sheets by 10 % as against 6.8 % and 15.1 % in 2013 and 2012 respectively (WAEMU, 2015).

3. Literature Review
3.1 Theoretical issues.

The first exposition on the prominent role of financial sector in the economy can be traced back to Locke (1965), Smith (1776), Bentham (1787), Bagehot (1873) and Schumpeter (1912). The dominant view is that banks perform a crucial developmental function, as they ensure monitoring and screening of borrowers in order to minimize moral hazard problems, especially in developing countries where sources of finances are inadequate. Many other economists, through the investigation of this relationship, hold the view that financial development is a prerequisite condition for rapid economic growth performance (King and Levine, 1993; Mckinnon, 1973; Shaw, 1973). This is called the 'supply leading' role of financial sector development (Patrick, 1966). Over all, it is argued that financial development can positively affect long run growth.

In contrast, Robinson (1952) argues that, based on the demand-following finance theory (growth-led

finance), finance does not influence economic growth, as financial development may passively response to variations in the real sector. Any development in the financial sector is stimulated by the improved growth in the real sector. The investment in critical infrastructure, which is crucial for financial development, is engendered by higher economic growth from the proceeds of resource sales (Patrick, 1966). This view is based on the proposition that the operation of the financial system could be determined through the monetary policy framework designed to navigate the economic direction.

Specifically, with respect to legal theory, an initial body of empirical evidence documents the importance of legal tradition in explaining financial development (La Porta et al., 1997, 1998, 2000) and also traces the effect of legal tradition on financial development through to long-run growth (Levine, 1998, 1999; Levine, Loayza, and Beck, 2000). In short, it is argued that differences in legal tradition account for international differences in modern financial development (La Porta et al., 1998, 1999). Given that private property rights form the basis of contractual arrangements, countries with Common law legal systems tend to encourage greater financial development than Civil law countries. The politics and finance theory, however, downplays the emphasis on legal tradition. The argument is that political experience of a State significantly determines the level of its financial system (Rajan and Zingales, 2001). Financial development can be impeded by financial repression in the form of preferential taxes on financial intermediation, and also by government restrictions on the operation of financial systems. However, if the ruling group sees free financial markets as supporting their interests, then they will create laws and institutions that support financial development (Marx, 1972; North, 1990).

On the endowment view, the development of all institutions, including legal and financial institutions, are determined by the geography, topology, and disease environment of a State. Private property rights protection and financial development in the long-run are affected by some environmental factors (such as differences in resource endowment) which define initial institutions (Acemoglu, Johnson and Robinson, 2001). In addition, typically exogenous endowments profoundly contribute to institutional and financial development in mainstream economies (Kamarck, 1976; Gallup, Sachs, and Millinger, 1998).

3.2 Empirical evidence

Given the importance of identifying the key determinants of financial development, there has been a notable burgeoning delve into the fundamental determinants of well-functioning financial systems in both developed and developing economies. Specifically, rummaging through the plethora of studies on financial development that explain significant predictors of financial sector development and the issue of variations in the development of the financial sector across countries, empirical evidence is growing with continuum of studies. Whilst most of the studies are based on the different categories of major factors that affect financial development, several others focus on a particular country, region or on some selected countries.

Based on macroeconomic determinants of financial sector development, a good number of empirical studies have been conducted. These include; Bayar (2016), Thai-Ha et al. (2015), Cherif and Gazdar (2015), Mahawiya (2015), Elsherif (2015), Motelle (2011), Yu and Gan (2010), Kablan (2010), Benyah (2010) among others. The study by Bayar (2016) using ARDL cointegration, Toda and Yamamoto (1995) causality test and regression analysis concludes that both economic growth and stock market liquidity have a long-run impact on stock market development, whilst inflation adversely affects stock market development. Cherif and Gazdar (2015) similarly shows, following data from 14 MENA countries (1990-2007), that income level, saving rate, stock market liquidity and interest rate are important determinants of stock market development but inflation is insignificant. Thai-Ha et al. (2015) explore the determinants of financial development in Asia and the Pacific (1995-2011) using dynamic generalized method of moments (GMM) conclude that economic growth and trade openness are major determinants of financial depth in developed economies. In addition, based on comparative study between the Economic Community of West African States (ECOWAS) and Southern African Development Community (SADC), Mahawiya (2015) shows that in both regions inflation robustly reverses financial sector development with the effect in ECOWAS greatest. Elsherif (2015) assesses determinants of financial market development in Egypt. Using ARDL (Autoregressive Distributed Lag Model) and Johansen Test for Cointegration, the author finds that financial development is influenced by economic growth, trade openness, investment in human capital, and GDP per capita, whilst inflation adversely impacts financial development in the country.

Furthermore, Motelle (2011) examines the effect of remittances on financial development in Lesotho (1990-2003). Using Granger causality test, the results provide evidence that financial development granger-causes remittances, whilst remittances do not cause financial development but tend to have a long run effect on financial development. Focusing on Malaysia, Yu and Gan (2010), employing ordinary least squares (OLS) techniques, show that although financial openness is found to have an adverse effect on banking sector development in Malaysia, real income stimulates banking sector development in the country. More importantly, studies on sub-Saharan Africa (SSA) by Kablan (2010) reveals that financial development is adversely affected by inflation and heavy dominance of the system by a few banks in the region whilst Benyah (2010) shows that trade openness is positively related to financial intermediary development.

In line with focus on institutional factors, as mentioned before, there seems to be common consensus in the literature regarding the effect of institutions on financial development. Studies based on Asia and Middle East and North Africa (MENA) countries reveal that financial development is affected by institutional quality. For instance, Trinugroho et al. (2015) assess the determinants of financial deepening across regions in Indonesia. With the use of ordinary least square (OLS) techniques, they show that local governance is essential in explaining the level of financial deepening. In addition, they provide evidence that regions with good governance, represented by a high degree of bureaucracy index and government index, have a higher level of financial deepening, but regions with poor local governance have a lower level of financial deepening. Ayadi, et al. (2013) study of MENA countries (1985-2009) conclude that strong legal institutions, good democratic governance and adequate implementation of financial reforms can have a substantial positive impact on financial development. Similarly, Falahaty and Hook (2010) adopting the Fully Modified Ordinary Least Squares (FMOLS) method posit that by improving quality of institutions will stimulate the development of financial sector in MENA region. Covering the most *Sukuk* issuers' countries (2003-2012), Said and Grassa (2013), following panel analysis under the fixed and random effects specifications, argue that countries ranking higher in institutional development have a larger *Sukuk* market which is strongly linked to efficiency and reliability of regulations.

Similarly, studies on SSA countries also corroborate the aforementioned conclusions. Thus, based on 11 SSA countries (1996-2010), Mbulawa (2015) using both the fixed effects and dynamic model (GMM estimations) reveals that financial development is enhanced by keeping corruption at low levels, increasing government accountability, improving regulatory quality, maintaining rule of law and low levels of political violence. In a somewhat related manner, Anayiotos and Toroyan (2009) using data envelopment analysis (DEA) posit that institutional factors affect financial depth and access to financial services more than asset quality and profitability (measured by nonperforming loans (NPLs) and return on equity (ROE) in SSA region. Also in another study, by means of the auto regressive distributed lag (ARDL) approach, Seetanah, et al. (2009) analyse the determinants of financial development in Mauritius (1970-2008). They conclude that strong institutions is more important for the development of financial sector.

More importantly, studies on demographic and geographical determinants of financial development, although they are few, have also been conducted by some researchers. Mlachila et al. (2016) using the panel generalized method of moments (GMM) estimator based on SSA countries argue that financial development has progressed over the past four decades, with the exception of the region's middle-income countries, both financial markets and financial institutions are less developed compared to other developing regions. The study by De-Han (2015) including cross-section of 120 countries (1999-2011) posits that distribution of access positively influences private credit. Ang and Kumar (2013), based on cross-sectional data for 123 countries, and with the use of least squares estimator, reveal that genetic distance to the global frontier has both economic and statistical significant effect on financial development, indicating that countries that are genetically far from the technology leader tend to have low level of financial development. Given the linkages between natural resources and financial development, Kurronen (2012) using pooled OLS and fixed effect estimator on 133 countries (1996-2006) indicates that the banking sector tends to be less developed in resource-dependent countries, as the threshold at which increased dependence will negatively affect the financial sector. Furthermore, with cross-country comparisons in view of resolving the African financial development gap, and a within-country study of Kenya, Allen et al., (2012) document that the financial sectors of most sub-Saharan African (SSA) countries remain significantly underdeveloped compared to other developing countries. In addition, they provide evidence that population density appears to be considerably more important for banking sector development in Africa than elsewhere. Also in another study, Allen et al., (2010) using the benchmarking exercise developed by Beck et al., 2011 affirmed that analogous to other developing countries, natural resource endowment is associated with low level of financial development in Africa.

Recently, Adegboye and Fagbemi (2017) explore both the role of natural resource endowments and institutions in financial development process across 36 countries in sub-Saharan Africa (2005-2014). Using pooled OLS, fixed effect and system general method of moments (GMM) estimations, the authors posit that financial sector development is directly undermined by resource rents handiness across all countries in SSA, and indirectly accounts for weak institutions. Moreover, they provide support for the argument that poor intermediation of natural resource revenues through financial sector, in most resource-rich countries, is attributed to low institutional quality, especially in SSA.

In conclusion, none of the empirical studies reviewed above has been centered exclusively on West Africa sub-region regarding the topical issue. Essentially, the relationship between natural resource endowment and financial development has been scarcely reported within the context of West Africa. The general concern is: will the same result hold in the case of West African countries given the economic policy, the origin and the quality of environment as well as low level of institutional quality? This is the empirical issue which this study has been motivated to explore.

4. Methodology

4.1 Data description and sources

The study is carried out for fifteen West African countries over the period of 2005-2015. The countries covered are Benin, Burkina Faso, Liberia, Cabo Verde, Cote d'lvoire, Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. The choice of scope basically encompasses both the era of global economic boom and crisis. Essentially, the selection of countries is guided by the availability of the data for the variable used in the estimated model.

In this study, total natural resource rents is measured by the sum of oil, gas, forest rent, mineral and coal (hard and soft) expressed as a share of GDP. We measure financial development indicator by the size of credit given to the private sector by financial institutions, and also by the expansion of savings and payment activities provided by the financial sector. This paper uses two proxies for financial development, which include the ratio of private credit to GDP and *M2* to GDP (broad money as % of GDP). The real GDP per capita (constant 2010 US$) represents the economic growth whilst inflation is measured by consumer price index (annual %). Communication infrastructure is proxy by the number of internet users, In addition, population density is the number of residents per square kilometer. Theoretically, with exception of inflation, it is expected that other variables should have direct effect on financial development.

Moreover, out of the six institutional indicators resulting from the work of Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi[1], control of corruption, rule of law and government effectiveness are used in this study, since all the institutional indicators have high intercorrelations as they mainly appear to measure the same broad concept. Whilst institutional quality index on the West African countries is sourced from World Governance Indicators (2017 Edition), others variables are sourced from the World Bank's World Development Indicators (2017 Edition).

4.2 Model specification

In this study, we adopt demand-following finance (Robinson, 1952; Patrick, 1966) type model, and follow Mickinno (1973), Shaw (1973) and Beck (2011) to specify financial development equation that accounts for the effects of natural resource rents and institutional quality as follows:

$$FD_{i,t} = \varphi + \gamma NRR_{it} + \delta_0 INT_{it} + \delta' X_{it} + \varepsilon_{i,t} \qquad 4.1$$

Where *FD* indicates financial development indicators[2] (the ratio of private credit to GDP and *M2* to GDP); *NRR* is the total natural resource rents; *INT* is the institutional variables (indicators); X represents vector of the control variables (inflation, population density, the number of internet users and real GDP per capita). In addition, ε is the error term whilst i represents the countries with t indicates time periods. In a more explicit form, equation (4.1) is rewritten as:

$$FD_{i,t} = \varphi + \omega FD_{i,t-1} + \gamma (NRR_{i,t}) + \delta_0(INT_{i,t}) + \delta_1(INT_{i,t} * NRR_{i,t}) + \delta' X_{i,t}$$
$$+ \varepsilon_{i,t} \qquad 4.2$$

Where;

φ represents the constant whilst $\omega, \gamma, \delta_0, \delta_1 and \delta'$ measure the relative effect of each individual variable on financial development.

$FD_{i,t}, NRR_{i,t}, INT_{i,t}, X_{i,t}$ and $\varepsilon_{i,t}$ remain as defined in equation (4.1)

$INT_{i,t} * NRR_{i,t}$ is the interaction term of various institutional variables with natural resource rents; indicating whether the indirect effect of natural resource rents on financial development process is negative or both are complements, depending on the sign.

$FD_{i,t-1}$ accounts for financial development indicator lagged by 1 which represents its initial level.

Whilst it is necessary to control for heterogeneity because of differences among the countries, even in panel data model, case of dynamic information may be possible. This may result to endogeneity problem between the explanatory variables and financial development indicator. Thus, equation (4.2) is transformed to;

$$FD_{it} - FD_{it-1} = \varphi_t + \omega FD_{it-1} + \gamma NRR_{it} + \delta_0 INT_{i,t} + \delta_1(INT_{i,t} * NRR_{i,t}) + \delta' X_{i,t} + \mu_i$$
$$+ \upsilon_{i,t} \qquad 4.3$$

Where μ_i represents unobserved time unvarying country specific effects and $\upsilon_{i,t}$ denotes disturbance term; the growth rate of financial sector development is represented by $FD_{it} - FD_{it-1}$; and to account for change common to all, φ_t indicates the period specific intercept.

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[1] The six institutional indicators, which include control of corruption, government effectiveness, rule of law, political stability, regulatory quality and voice and accountability, are the result of work of Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi (2010). The estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5. The close the index to negative, the worse the institutional quality.

[2] Our major measure of financial development indicator is the credit to private sector as a percentage to GDP whilst the use of broad money (*m2*) as % to GDP will enable us to check the robustness of the results obtained.

To eliminate the country-specific effect term (μ_i), the first differences of equation (4.3) is taken, so that country specific effects is controlled for. Hence, the model is stated as;

$$\Delta FD_{it} = \Delta\varphi_t + (\omega + 1)\Delta FD_{it-1} + \gamma\Delta NRR_{it} + \delta_0\Delta INT_{i,t} + \delta_1\Delta\big(INT_{i,t} * NRR_{i,t}\big) + \delta'\Delta X_{i,t} + \Delta v_{i,t} \qquad 4.4$$

As postulated by Arellano and Bover (1995), to address the endogeneity issue, both time and country-specific effects should be controlled for, as FD_{it-1} might be endogenous to the disturbance terms through (v_{it-1}). In combination with the usual techniques, lagged first-differences is used of the variables as instruments for equations in levels.

4.3 Techniques of estimation.
In order to provide for robustness check, different estimation techniques are used. For equation (4.1) and (4.2), we use Pooled OLS and Fixed Effect estimation whilst the dynamic panel System-GMM estimator that estimates with a level-equation and a difference equation, developed by Arellano and Bover (1995) and Blundell and Bond (1998), is used for the estimation of equation (4.3) and (4.4) respectively. The System-GMM estimator, even when the sample period is short, produces unbiased and consistent estimates after controlling for endogeneity and country-specific effects. Furthermore, as we add the lagged value as an explanatory variable in the model, lagged first-differences is used of the variables as instruments for equations in levels. Hence, in this study, our conclusion is based on the results of System-GMM.

5. Empirical results
5.1 Descriptive statistics.
Table 1 shows the summary statistics of data used in the model. During 2005-2015, the overall statistics indicates a relatively low average value of credit to private sector as a percentage to GDP (Prcredit) 18.11, on the other hand, the second indicator of financial development, $m2$/GDP ($m2$) has the overall mean value of 33.57. The overall standard deviation of the two indicators (Prcredit and $m2$) are 12.88 and 16.57 units respectively, suggesting the existence of finance gap across countries over the period. Similarly, the within statistics show the standard deviation of all the variables used, while the overall minimum and maximum values are reported accordingly. In all, the low average values of institutional indicators suggest that there is presence of weak institutions across countries in West Africa.

Regarding correlation analysis, Table 2 shows the correlation coefficients among the variables in the model. The results indicate that, with the exception of natural resource rents and inflation, all the variables are positively correlated. Substantial association is found to exist between pcredit and $m2$ (0.87), suggesting that they can be used interchangeably. The two financial indicators (pcredit and $m2$) are each negatively correlated to natural resources rents (-0.28 and -0.24). In addition, the relationship between natural resource rents and GDP per capita, internet user, population density, specifically institutional indicators, is consistently negative, indicating that natural resource rents have an adverse effect on both institutional quality and financial development across countries in the sub-region.

Table 1: Summary Statistics

Variable	Mean (overall)	Standard deviation			Minimum	Maximum
		overall	between	within		
Financial development (FD)						
Private credit (Prcredit)	18.11	12.88	12.18	5.10	1.35	65.74
M2 to GDP (m2)	33.57	16.57	15.86	6.18	11.60	98.45
Macroeconomic determinants						
Real GDP per capita (GDP)	959.08	810.09	827.43	115.52	279.06	3500.21
Inflation (INF)	5.71	6.90	5.00	4.98	-35.83	34.69
Geographical determinants						
Natural resource rents (NRR)	13.07	9.88	9.56	4.37	0.43	50.39
Population density (POPD)	80.94	48.51	49.38	7.93	10.56	200.05
Number of Internet user	7.17	9.67	7.69	6.12	0.23	47.44
Institutional Indicator						
Control of corrupt (Corrupt)	-0.63	0.50	0.49	0.15	-1.51	0.91
Govt effectiveness (Gov eff)	-0.81	0.45	0.45	0.12	-1.62	0.35
Rule of law (Rlaw)	-0.69	0.53	0.52	0.14	-1.60	0.59

Table 2: Correlation Matrix

Variable	Pcredit	M2	GDP	INF	POPD	Internet user	NRR	Corrupt	Govt eff	Rlaw
Pcredit	1.000									
m2	0.856	1.000								
GDP	0.686	0.554	1.000							
INF	-0.215	-0.158	0.040	1.000						
POPD	0.361	0.417	0.554	0.084	1.000					
Internet user	0.491	0.348	0.754	0.031	0.639	1.000				
NRR	-0.279	-0.239	-0.277	0.391	-0.104	-0.197	1.000			
Corrupt	0.670	0.618	0.506	-0.104	0.049	0.257	-0.353	1.000		
Govt eff	0.480	0.417	0.462	-0.079	0.106	0.265	-0.488	0.836	1.000	
Rlaw	0.591	0.525	0.404	-0.197	0.115	0.239	-0.487	0.902	0.874	1.000

5.2 Pooled OLS and Fixed Effects

The results of the pooled OLS and fixed effects are shown in Table 3 and 5. Table 3 shows the results of the model which includes credit to private sector as a percentage to GDP (Prcredit) as the dependent variable, on the other hand, Table 5 presents the results of m2/GDP (m2) which is reported in the appendix. In this study, the Hausman test validates the appropriateness of the fixed effects in the model. In addition, we carry out Panel-Corrected Standard Error' (PCSE) estimation to ascertain the validity of our results after accounting for Heteroskedasticity and autocorrelation issue. Each of the columns (i - iii) represents a different measure of institutional indicators (control of corruption, rule of law and government effectiveness). Under pooled OLS, the three institutional variables in general have a substantial positive effect on both measures (pcredit and m2) of financial development, and also always statistically significant. This suggests that strong institutions are critical elements in the development of financial sector in West Africa. Thus, it is in tandem with the previous findings that a good institutional environment is salutary to financial sector development (Said and Grassa, 2013; Mbulawa; 2015; Falahaty and Hook, 2010). Based on the results, natural resources rents (NRR) coefficients are consistently negative, indicating that NRR has a negative effect (-0.016, -0.027 and -0.211) on financial sector development, while it is only significant in column three (iii) at 1% level. The empirical evidence is further corroborated by Table 5 presented in the appendix, although is consistently significant, it shows the negative relationship between natural resource rents and m2 in West African countries. However, this adverse effect is more pronounced on m2. A plausible explanation for the negative relationship between natural resource rents and financial development as found in this study could be attributed to high tendencies for divestment in financial sector in most resource-rich countries as noted by (Beck 2011; Kurronen 2012).

On interaction term of institutional indicators and natural resource rents, as can be strongly observed in the model (column (i) – (iii)), the interaction term coefficients, in both Table 3 and 5, are systematically and persistently negative, but not consistently significant, suggesting that the indirect effect of natural resource rents on financial development through the channel of institutions is negative. This implies that huge natural resource

rents are most likely to induce rent- seeking behavior that may result to higher propensities for weak contract enforcement, corruption and weak governance system, which in turn inhibit financial development process in West African countries. Thus, this finding is consistently in line with existing literature (Baland and Francois, 2000; Torvik, 2002; Collier and Hoeffler, 2009) that poor governance system could be induced by the discovery of natural resources, especially in resource-dependent countries. Furthermore, regarding our control variables, GDP per capita, inflation and internet user, with exception of population density in column (iii) under the pooled OLS estimation, are consistent with our theoretical expectations. Specifically, the results show that GDP per capita has a positive effect on financial development while inflation adversely affects it. On economic growth, this corroborates the results obtained by Robinson, (1952); Patrick (1966) that high growth would stimulate demand for credit thereby strengthening financial development, while Inflation, as being reported in the literature (Fry, 1995; Bayar, 2016), is found to retard financial development.

In addition, another control variable (internet user) is also in line with our expectations, as is positively related with financial development. It is suggestive of the possibility that high level of technological expansion across countries is salutary to financial development in the region. While the population density does not consistently maintain its signs, overall we can conclude that population density is positively associated with financial development, suggesting that the distribution of access induces financial sector development. This finding is in consonance with the work of De-Han (2015).

It is imperative to note that pooled OLS model does not account for heterogeneity or individuality that may exist among countries. Consequently, using WITHIN estimations (the fixed effects model in Table 3) could solve this problem by distinguishing between various countries that we have. Thus, under fixed effects estimation, our variable of interest, institutional indicators and total natural resource rents, coupled with their interaction term, the coefficients are of similar magnitude in comparison with those derived from pooled OLS, as they all maintain their signs. Although, from column (i) – (iii), natural resource rents are consistently not significant, all institutional variables are significant, and whilst only the interaction of rule of law and natural resource rents is significant at 10% level. In line with pooled OLS results, specifically, this suggests that in each country in West Africa, institutions have a positive influence on financial development but natural resource rents adversely affect it. Moreover, it also buttresses the negative indirect effect of natural resource rents on financial development through the channel of institutions.

Also, from the fixed effects results, not all our control variables maintain their signs as in the pooled OLS. The inclusion of WITHIN estimations change the sign of internet user to negative whilst it is consistently insignificant, suggesting that in most countries due to insecurity issue and individual privacy protection, people are often reluctant to fully embrace the digital medium in carrying out their financial transaction. This is in line with empirical literature (Vaithilingam, Nair and Samudra, 2006) that technological expansion may not stimulate financial development owing to certain public and individual concern. However, the signs of GDP per capita, Inflation and population density are preserved. While population density is statistically significant at the 1% level, inflation and GDP per capita are not statistically significant. The results in Table 5 (see appendix), under fixed effect estimations, regarding our main variables of interest in this study (natural resource rents and institutional indicators) when Pcredit is replaced with *m2* (i.e. another financial development indicator) in the model, are consistent with results obtained in Table 3.

5.3 System Generalized Method of Moments (GMM)
Under the System GMM dynamic panel estimation, the first test is Arrelano-Bond test with null hypothesis that there is no second order autocorrelation in each model. The p-values, as reported in Table 4 and 6, confirm the validity of each model. Also, the second test (Sargan test); the test of overidentifying restrictions, which check the validity of the instruments (i.e if the instruments as a group are not varying together with the error process), the required condition is satisfied—the acceptable p-values are given. On the number of instruments, the rule of thumb is satisfied as the number of instruments is less than the number of observations. Indicating the dynamic nature of each model, the lag of private credit to GDP, in Table 4, and lag of broad money (*m*2) reported in the appendix (Table 6) are positive and statistically significant at 1% level. This suggests that both financial development indicators are positively influenced by their values in the preceding period. The findings vividly support the results obtained by Thai-Hale, Kim and Lee (2015) that the preceding values of financial indicators have substantial significant effect on financial development.

Table 3: Pooled OLS and Fixed Effects Estimation when dependent variable is credit to private sector as % to GDP

FD(Pcredit) log	Pooled OLS			Fixed effects		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)
GDP per capita (log)	0.051	0.098	0.065	0.096	0.35	0.168
	[0.50]	[0.99]	[0.63]	[0.19]	[0.07]	[0.33]
Inflation	-0.015**	-0.015**	-0.016**	-0.004	-0.005	-0.004
	[2.59]	[2.52]	[2.66]	[1.10]	[1.07]	[1.13]
Population density (log)	0.024	0.019	-0.023	2.689***	2.617***	2.417***
	[0.37]	[0.30]	[0.34]	[4.21]	[3.99]	[3.77]
Internet user (log)	0.234***	0.215***	0.251***	-0.082	-0.048	-0.029
	[4.60]	[4.19]	[4.73]	[0.88]	[0.50]	[0.31]
Natural resource rents (log)	-0.016	-0.027	-0.211***	-0.097	-0.007	-0.060
	[0.27]	[0.46]	[3.25]	[0.71]	[0.05]	[0.40]
Control of corruption (corrupt)	0.586***			0.681**		
	[4.06]			[2.47]		
Rule of law (Rlaw)		0.732***			0.824**	
		[4.33]			[2.51]	
Govt effectiveness (Govt eff)			0.848***			0.567**
			[3.74]			[2.01]
NRR*Corrupt	-0.040			-0.164		
	[0.67]			[1.21]		
NRR*Rlaw		-0.123**			-0.295*	
		[2.02]			[1.87]	
NRR*Gov eff			-0.275**			-0.295
			[3.43]			[1.23]
Constant	2.390***	2.112 ***	2.729***	7.900*	7.944*	6.309
	[3.37]	[3.01]	[3.76]	[1.83]	[1.81]	[1.44]
R2	0.589	0.593	0.560	0.469	0.459	0.448
Observations	139	139	139	139	139	139
No. of Countries	15	15	15	15	15	15
Huasman test				27.52	22. 62	19.15
				(0.000)	(0.002)	(0.008)
PCSEs test (panel corrected)				520.71	510.21	257.99
				(0.000)	(0.000)	(0.000)

Figures in parentheses are /t-values/. (***), (**) and (*) indicates significance at 1%, 5% and 10% respectively.

The results of the system GMM marry up with the findings of both pooled OLS and WITHIN estimation, especially regarding the coefficients of the natural resource rents and institutional indicators and also with the interaction term. However, they are not consistently significant as only in column (iii) natural resource rents is statistically significant whilst control of corruption and rule of law are statistically significant in column (i) and (ii) respectively, all at 10% level. Generally, although the signs remain almost preserved, the magnitudes of the effect drop substantially in each model for both control variables and the main variables that form the empirical focus. This implies that low value of institutional quality, across countries, may have partly accounted for this. In addition, since the coefficients of natural resource rents have been consistently negative, it shows that natural resources exploration does not, in any way, contribute positively to financial sector development in West African countries[1]. Overall, the results are robust in all the estimations as the signs of all the coefficients remain almost preserved in the whole estimation, even in line with system GMM which takes into account possible endogeneity.

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[1] West Africa comprises fifteen (15) countries, which include; five (5) Anglophone countries (Ghana, Liberia, Nigeria Sierra Leone and the Gambia), nine (9) francophone countries (Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Guinea, Mali, Niger, Senegal and Togo) and one Portuguese speaking countries (Guinea Bissau).

Table 4: System GMM when dependent variable is credit to private sector as % to GDP

FD(Pcredit) log	System GMM		
	(i)	(ii)	(iii)
FD (Pcredit) Lag	0.830***	0.843***	0.822***
	[16.14]	[17.35]	[20.82]
GDP per capita (log)	0.023	0.070	0.017
	[0.48]	[1.27]	[0.42]
Inflation	-0.004	-0.005	-0.004
	[1.13]	[1.41]	[1.22]
Population density (log)	0.012	0.008	0.004
	[0.40]	[0.24]	[0.16]
Internet user (log)	-0.007	-0.017	0.007
	[-0.26]	[-0.50]	[0.29]
Natural resource rents (log)	-0.023	-0.017	-0.083*
	[0.94]	[0.53]	[1.98]
Control of corrupt (Corrupt)	0.231*		
	[1.70]		
Rule of law (Rlaw)		0.205*	
		[1.58]	
Govt effectiveness (Govt eff)			0.296
			[1.40]
NRR*Corrupt	-0.083*		
	[1.61]		
NRR*Rlaw		-0.017	
		[0.50]	
NRR*Gov eff			-0.121*
			[1.74]
Constant	0.436	0.093	0.605**
	[1.18]	[0.26]	[2.37]
Observations	125	125	125
No. of Countries	15	15	15
Number of instruments	77	77	77
A-Bond AR(1) test p-value	-2.74	-2.78	-2.72
	(0.006)	(0.005)	(0.007)
A-Bond AR(2) test p-value	1.06	1.50	1.10
	(0.291)	(0.294)	(0.270)
Sargan test	50.1	57.9	56.1
	(0.949)	(0.804)	(0.847)

Figures in parentheses are /t-values/. (***), (**) and (*) indicates significance at 1%, 5% and 10% respectively.

6. Concluding Remark

West Africa's relevance as one of the major sources of oil, gas and other natural resources has necessitated burgeoning debate on the effect of natural resource windfalls on financial development conditional on institutional quality of West African countries. In view of this, the paper examines the effect of natural resource rents and institutional quality on financial sector development in West Africa. Given the main gap in the existing literature that none of the previous studies is exclusively focused on the West African sub-region, we cover the whole West African (15) countries for the period 2005-2015. Our empirical model is built on pooled OLS and fixed effect estimations to analyse the level of financial sector development. However, it is relevant to add a lagged dependent variable to the explanatory variables to account for the presence of a dynamic relationship; in addition there is a potential measurement error and endogeneity of some variables. Hence, the study employed the dynamic System-GMM estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998), and choose two most widely use indicators (credit to private sector as a percentage to GDP and $m2$/GDP) of financial development as the dependent variables.

Specifically, with several robustness checks[1], the effect of natural resource rents on financial development

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[1] Parks' Feasible Generalized Least Squares (FGLS) estimator (Parks, 1967) can only be used when the number of time periods (T) is greater than or equal to the number of Cross-section (N). Thus, it is not applicable in our model, as the number of cross-section is greater than the number of time periods. Hence, the Panel Corrected Standard Error' (PCSE) estimation is more appropriate for the robustness check of our results. It is performed substantially better than the asymptotically efficient FGLS (Parks) estimator.

is consistently negative, indicating that financial development will be adversely affected by the increase in natural resources rents. Nonetheless, evidence shows that strong institutional structures are positively salutary to financial development; hence policies formulated to strengthen institutions will enhance the performance of financial system. In contrast, the indirect effect of natural resources on financial development process is detrimental through the channel of institutional quality, as increased natural resource wealth could exacerbate the incidence of rampant financial recklessness, corruption and gross mismanagement in the public sector. This has been experienced in most resource-dependent economies in the sub-region such as Nigeria, Guinea, Guinea Bissau, Cote d'Ivoire and Sierra Leone. In all, on population density and GDP per capita, the empirical evidence reinforces the argument that both are significantly essential for West African financial system, whilst reduction in inflation will also improve financial sector. However, internet user due to perceived threat to security and privacy may slowdown financial development across countries in the sub-region, as people are often reluctant to fully embrace the digital medium in carrying out their financial transaction.

In general, from the study, the evidence supports the view that policy makers across countries should formulate policies anchored on effective governance system to enhance efficiency of the financial sector in West Africa. In addition, there should be right mix of policies that will mitigate the incidence of gross mismanagement of resource gains which could help promote savings and investment, and thus infuse improved demand for financial credit and market services. Hence, such strategic development will induce greater regional integration of West African financial markets and institutions into the sub-region's economic system.

Finally, it is imperative to note that the study does not factor in the colonial origins of countries in West Africa, as the reasons advanced in our study are mainly suggestive. Hence, allowing and ascertaining the possibility of the influence of colonial system and modelling of such effect on financial sector is indeed another area of inquiry that will enable policy makers understand better those factors that determine the level of financial development in the sub-region.

Acknowledgements

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Appendix

Table 3: Pooled OLS and Fixed Effects Estimation when dependent variable is *M*2/GDP

FD(*m*2) log	Pooled OLS			Fixed effects		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)
GDP per capita (log)	0.092*	0.047	0.029	0.041	0.137	0.009
	[1.59]	[0.84]	[0.68]	[0.32]	[0.07]	[0.07]
Inflation	-0.002	-0.005*	-0.004**	-0.002	-0.001	-0.001
	[0.62]	[1.70]	[2.21]	[0.20]	[0.94]	[0.39]
Population density (log)	0.199***	0.094**	0.036	0.657***	0.969***	0.728**
	[3.55]	[2.87]	[1.42]	[3.89]	[5.67]	[4.42]
Internet user (log)	0.081**	0.068**	0.021	0.008	-0.027	0.614
	[2.86]	[2.36]	[0.92]	[0.36]	[1.16]	[0.65]
Natural resource rents (log)	-0.155***	-0.218***	-0.202***	0.070***	0.075***	0.030*
	[5.11]	[7.07]	[9.24]	[3.63]	[3.84]	[1.52]
Control of corruption (corrupt)	2.065***			2.653***		
	[7.61]			[21.37]		
Rule of law (Rlaw)		2.334***			2.366***	
		[8.64]			[21.08]	
Govt effectiveness (Govt eff)			3.017***			2.519***
			[14.79]			[20.36]
NRR*Corrupt	-0.523***			-0.759***		
	[6.58]			[20.63]		
NRR*Rlaw		-0.675***			-0.684***	
		[8.25]			[20.28]	
NRR*Govt eff			-0.897***			-0.756***
			[15.02]			[21.23]
Constant	3.979***	3.780***	3.474***	0.891	0.216	0.259
	[10.72]	[10.18]	[12.27]	[0.82]	[0.20]	[0.24]
R2	0.714	0.711	0.690	0.550	0.561	0.566
Observations	139	139	139	139	139	139
No. of Countries	15	15	15	15	15	15
Huasman test				8.33	23.92	11.69
				(0.003)	(0.001)	(0.001)
PCSEs test (panel corrected)				827.50	639.82	114.9
				(0.000)	(0.000)	(0.000)

Figures in parentheses are /t-values/. (***), (**) and (*) indicates significance at 1%, 5% and 10% respectively.

Table 4: System GMM when dependent variable is _m2_/GDP

FD(_m2_) log	System GMM		
	(i)	(ii)	(iii)
FD (_m2_) Lag	0.728***	0.736***	0.640***
	[6.95]	[8.08]	[5.89]
GDP per capita (log)	0.001	0.019	0.414
	[0.02]	[0.31]	[0.69]
Inflation	-0.002	-0.001	-0.001
	[0.82]	[0.52]	[0.03]
Population density (log)	0.037*	0.028	0.012
	[1.48]	[1.43]	[0.77]
Internet user (log)	-0.007	-0.016	-0.030
	[0.37]	[0.49]	[1.00]
Natural resource rents (log)	-0.045*	-0.068**	-0.079***
	[1.93]	[2.27]	[3.59]
Control of corruption	0.59*		
	[1.57]		
Rule of law (Rlaw)		0.915*	
		[1.88]	
Govt eff (Gotv eff)			1.426***
			[2.63]
NRR*Corrupt	-0.203*		
	[1.58]		
NRR*Rlaw		-0.274*	
		[1.96]	
NRR*Govt eff			-0.425***
			[2.79]
Constant	0.992***	0.880**	1.148
	[3.25]	[2.12]	[0.008]
Observations	125	125	125
No. of Countries	15	15	15
Number of instruments	77	77	77
A-Bond AR(1) test p-value	-2.89	-2.72	-2.81
	(0.004)	(0.007)	(0.005)
A-Bond AR(2) test p-value	-0.41	-0.46	-0.50
	(0.684)	(0.648)	(0.617)
Sargan test	2.57	4.23	2.35
	(1.000)	(1.000)	(1.000)

Figures in parentheses are /t-values/. (***), (**) and (*) indicates significance at 1%,
5% and 10% respectively.