Institutional Quality and Tax Revenue in Côte d'Ivoire: Evidence from ARDL Approach

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ABSTRACT

In this paper, we examine the main determinants of tax revenues in Côte d'Ivoire, paying attention to institutional factors and the informal economy. To do this, we apply the autoregressive distributed lag model developed by Pesaran et al. (2001) on annual data covering the period 1984-2016. The results show that the low quality of institutions and the high share of the informal economy are among the factors explaining the low mobilization of tax revenues in Côte d'Ivoire. The results also reveal that GDP per capita, official development assistance, the share of services in GDP, the distribution of income within the population and the education level of the population positively affect tax revenues. On the other hand, trade openness negatively affects tax revenues. Based on these results, the paper provides several recommendations that can help improve tax revenues in Côte d'Ivoire.

Keywords: Tax Revenue, Institutional Quality, Informal Economy, Cointegration, Côte d´Ivoire
JEL Classifications: H2, O171.

1. INTRODUCTION

In a context of inclusive growth and the fight against poverty, one of the main challenges for the Ivorian government remains the mobilization of tax revenues. This is essential to initiate structuring projects and accelerate the fight against poverty as well as access to modern services which would make it possible to gain in productivity and efficiency. In addition, given the harmful effects of the crisis on the economic and social situation of the country, the State, in addition to the major challenge of reconstruction and reconciliation, must ensure the well-being of the populations, while doing the country a pole of sustainable development. The State must, beyond the interventions of development partners, improve its own resources in order to meet these challenges.

Côte d'Ivoire has distinguished itself in recent years by increasing the mobilization of its tax revenue following the reforms undertaken (Banque Mondiale, 2016). Despite the progress made following the fiscal and institutional reforms undertaken, the level of tax revenue mobilization in Côte d'Ivoire remains low (Keho,

2009; ACBF, 2014). Indeed, the rates of fiscal pressure recorded since 1994, the date of creation of the WAEMU, remained below those of the community standards of 17% and 20%, fixed within the framework of the community convergence criteria. The poor performance of tax revenues indicates that the country has limits in its mechanism for collecting tax revenue. If the understanding of these limits can guide governments regarding appropriate tax policy measures, knowledge of the factors determining tax revenue is also important for a better mobilization of tax revenue.

Research on the factors influencing tax revenues has not always been unanimous in the empirical literature. Empirical results have been mixed due to the sensitivity of the country and / or the sampling period. Indeed, the work of the precursors (Lotz and Mors, 1967; Lotz and Morss 1969; Shin, 1969; Bahl, 1971; Heller, 1975) identified the level of development, the degree of monetization, the commercial opening and the sectoral composition of the product. as determinants of revenue. Some authors have supplemented these factors identified by the precursors with social determinants such as the level of education, the informal economy, tax compliance,

urbanization, inflation, official development assistance (Teera, 2003; Davoodi and Grigorian, 2007; Osoro, 1995; Togler, 2007; Botlhole, 2010 and 2011; Keho, 2015). In addition, other authors have added institutional factors such as corruption, government accountability, the rule of law, political and economic stability (Alm et al., 1991; Tanzi and Zee, 2000; Teera and Hudson, 2004; Ghura, 1998; Gupta, 2007; Bird et al., 2008; Ajaz and Ahmad, 2010; Botlhole, 2011; AMAO, 2011; Azka et al., 2014).

Various empirical studies have been conducted to study the determinants of tax revenue. Most of these studies examine the question by relying on dynamic general equilibrium models or more broadly on cross-sectional data and more recently on panel data whereas studies by country are rather rare. As is well known, the cross-sectional analysis ignores possible changes over time, while panel data includes both cross-sectional and temporal information. However, when defining panel data, it is not possible to distinguish country-specific behavior from explanatory variables, while a country may have a distinct characteristic in a group of countries. In addition, Bird (1976) notes that individual countries are so unique in terms of economic, political and institutional characteristics, that the generalization of these differences will provide less meaningful information than they obscure. Consequently, any analysis of time series at the scale of a single country has its own merit, especially since the trajectory of each country is unique.

Studies on the determinants of country-specific tax revenues have identified several factors in the empirical literature (Karagöz, 2013; Chaudhry and Munir, 2010; Azka et al., 2014). However, it is important to note that the estimation techniques used in these various works have remained relatively limited by the fact that new econometric developments (cointegration) are not considered. Consequently, although the determinants thus identified may remain relevant, the models resulting from these models would be hardly capable of correctly identifying the factors of the mobilization of tax revenues. Faced with this weakness of empirical work, we question the determinants of tax revenues in Côte d'Ivoire.

The objective of this paper is to identify the main determinants of the mobilization of tax revenue in Côte d'Ivoire. It is a contribution to the empirical literature on the determinants of tax revenue mobilization. The aim will be to identify the factors that influence the mobilization of tax revenues in the long term, paying attention to the institutions and the informal economy. To do this, the autoregressive distributed lag (ARDL) method will be used. The application of this method has the advantage of allowing the distinction between the short-term and long-term determinants of tax revenues. However, the analysis will focus on long-term determinants.

The rest of the paper is organized as follows. Section 2 is devoted to the literature review on the determinants of tax revenues. Section 3 presents the econometric methodology and describes the data from the study while section 4 presents the empirical results and discusses the implications of economic policies. Finally, section 5 concludes the paper.

2. LITERATURE REVIEW

2.1. Traditional Determinants of Tax Revenues

The first works on the determinants of tax revenues are attributed to Lotz and Mors (1967); Lotz and Morss (1969), Shin (1969), Bahl (1971) and Heller (1975). These authors have highlighted the level of development, the degree of monetization, trade openness and the sectoral composition of the product as determinants of the level of tax revenue. Other authors (Tanzi, 1987; Tanzi and Zee, 2000; Chambas, 2004) have simply compared the level of public revenue with that of potential revenue. The latter being determined by a set of structural factors including those identified by the precursors. Indeed, these authors identified GDP per capita, the sectoral origin of income, the degree of urbanization, the degree of openness to the world economy as structural factors determining the potential level of tax revenue.

In one study, Tanzi (1992) found that half of the change in the tax rate is explained by per capita income, the share of imports, the share of agriculture, and the share of external debt. The share of agriculture in GDP is strongly inversely proportional to the share of taxes and its explanatory power is greater than per capita income. Ghura (1998) found that per capita income and the degree of openness are positively and significantly related to the tax rate and the share of agriculture in GDP is negatively and significantly related to the tax rate. He also found that other factors such as structural reforms and human capital development affect tax performance. An increase in the level of human capital and structural reforms is associated with an increase in the tax rate. Eltony (2002) examined the determinants of tax revenue and constructed an index of tax effort in a study of 16 Arab countries for the period 1994-2000. The results obtained suggest that the main determinants of the tax share in GDP are per capita income, the share of agriculture in GDP and the share of mining in GDP.

Karagöz (2013) studied the determinants of tax revenue in Turkey, with particular emphasis on the sectoral composition of the economy. These results reveal that tax revenue in Turkey is significantly affected by the share of the agricultural and industrial sectors in GDP, the stock of external debt, the rate of monetization of the economy and the rate of urbanization while the sign of the share of the agricultural sector is negative. The results suggest that opening up to foreign trade has no significant impact on tax revenue in Turkey. Furthermore, Chaudhry and Munir (2010) analyzed the determinants of the low tax revenue in Pakistan over the 1973-2009 period. They found that openness, money supply, foreign debt, foreign aid and political stability are the main determinants of the tax effort in Pakistan. The share of agriculture, the share of manufacturing production and the share of the service sector are negligible, unlike GDP per capita and urbanization. They also found that the determinants of low tax revenue in Pakistan are the narrow tax base, increased dependence on the agricultural sector, devaluation, foreign aid, the informal economy and low literacy rates. Finally, they concluded that the Pakistani economy could generate high tax revenues by enhancing openness, literacy, political stability and broadening the tax base and by controlling income inequality, tax evasion and tax exemptions.

In examining the revenue performance of many developing countries, Gupta (2007) found that structural factors such as GDP per capita, the share of agriculture in GDP and trade openness are determining factors revenues performance. He observed a strong negative and significant relationship between the share of agriculture and income performance. He also found that foreign aid improves tax revenues while external debt has no significant effect. He also observed that countries that depend on taxes on goods and services as the main source of tax revenue have relatively low returns. On the other hand, countries that put more emphasis on income taxes, profit taxes and capital gains taxes, are much better.

Some empirical studies have shown a negative relationship between the size of the informal economy and tax revenues (Botlhole, 2010 and 2011; Teera, 2003; Davoodi and Grigorian, 2007; Osoro (1995). Botlhole (2010) shows that the informal sector has a significant impact on tax revenues, therefore any effort to increase the tax revenues should simultaneously aim to curb the activities of the informal sector. As the underground economy grows, evasion also increases and tax revenues decrease. In a study of Tanzania, Osoro (1995) finds an inverse relationship between tax revenues and the existence of the underground economy because the growth of the underground economy erodes the tax base and therefore reduces revenue, which affects income productivity.

2.2. Institutional Quality and Tax Revenue
Various empirical studies have looked at the effects of institutions on domestic resources. Although institutional variables are generally criticized for their quality, many empirical studies have highlighted a significant relationship between the quality of institutions and the performance of tax revenues. Thus, for some authors, countries with poor quality institutions are not able to establish effective tax systems and these countries are thus characterized by persistent weakness in tax collection (Bird et al, 2006; Davoodi and Grigorian, 2007; Botlhole, 2011).

For Ajaz and Ahmad (2010), developing countries are usually unable to generate a enough income through their taxes because these countries face a number of institutional problems in the income generation process. They analyze the effect of institutional and structural variables on tax revenue using a panel of 25 developing countries over the period 1990-2005. Using the generalized moments method (GMM), they show that institutional variables have a significant impact on all taxes. However, corruption has a negative effect on tax collection while good governance contributes to better performance in tax collection.

Some empirical work has focused on the phenomenon of corruption in the mobilization of tax revenues. They have widely recognized that corruption is a social phenomenon that can significantly reduce tax revenues (Ghura, 1998; Bird et al., 2006; Imam and Jacobs, 2007; Gupta, 2007; Bornhorst et al., 2009). Various studies have explained that tax revenue mobilization is one of the most important areas where corruption can be practiced (Richupan, 1984; Alm et al., 1991; Bird, 1990; Tanzi and Davoodi, 1997 and 2000; Tanzi, 2000; Fjeldstad and Tungodden, 2001; Attila et al., 2006). The loss of tax revenue and therefore of government spending is as high as the proportion of money received as a bribe. Part of the existing

literature attributes the weak performance of tax revenues in most African economies partly to corruption and weak institutions.

Other empirical studies have emphasized the importance of certain institutional aspects such as accountability, civil liberties, legitimacy, efficiency of government, political stability and governance in the mobilization of tax revenues (Togler, 2003; Bird et al., 2004; Gupta, 2007; Profeta and Scabrosetti, 2010; Dioda, 2012). For example, Bird et al. (2004) examined the importance of institutional factors in the performance of tax revenues for a sample of 110 developing countries over the period 1990-1999. They find that factors such as indices of civil liberties and political rights, political stability and the rule of law have a statistically significant and positive link with tax revenue.

The question of the impact of conflicts, instability or the existence of violence on the mobilization of public revenues has interested other authors (Besley and Persson, 2007; Cárdenas et al., 2010). Besley and Persson (2007) analyzed the effects of wars on the fiscal capacity of the state to increase tax revenues with data from 180 countries between 1945 and 1997. They find that armed conflicts affect the ability of a government to mobilize tax revenue. In a study covering 118 countries over the period 1975-2004, Cárdenas et al. (2010) find a negative correlation between internal conflicts and fiscal capacity.

In addition, studies have focused on certain WAEMU countries (Ameth, 2014a and 2014b; Keho, 2013 and 2015; Beyera, 2015). By analyzing the role of institutions in the performance of tax revenue in these countries, they find that the low tax revenues in these countries is due to the low quality of the institutions. According to these authors, institutions have played an important role in the inability of countries to meet the convergence criterion linked to the performance of tax revenues. Thus, strong institutions are crucial for greater performance of tax revenues.

In two other articles, Bird et al. (2008; 2014) found that political stability, effective government, freedom from violence, corruption, respect for the law, voice and accountability play an important role in determining tax revenues. Also, good governance and corruption behaviors strongly affect public finances and especially the level of tax revenues (Ghura, 1998; Tanzi and Davoodi, 2000; Brun et al., 2007; Attila et al., 2006).

At the end of this literature review, it is clear that in addition to the traditional factors of tax revenue mobilization, the quality of institutions and the level of the informal economy play a crucial role in the performance of tax revenues. Indeed, it seems that if the quality of the institutions is low, the same will apply to tax revenues and vice versa. Similarly, an inverse relationship is observed between tax revenues and the existence of the informal economy.

3. ECONOMETRIC METHODOLOGY AND DATA

3.1. Specification of the Empirical Model
Tax revenues depends on several factors. However, for reasons of data availability on the one hand and to avoid multicollinearity

problems which could lead to bias in the estimates on the other hand, the choice of explanatory variables was limited. Thus, the relationship between tax revenues and its determinants is as follows:

$$\text{rrecfis}_t = \beta_0 + \beta_i X_{it} + \varepsilon_t \qquad (1)$$

Where rrecfis is the tax revenue-GDP ratio; β_0 and β_i are the parameters of the model, X_i is a matrix composed of explanatory variables. More specifically, the model is written structurally as follows:

$$\text{rrecfis}_t = \beta_0 + \beta_1 l Pibh_t + \beta_2 qualinst_t + \beta_3 xm_t + \beta_4 urb_t + \beta_5 laidpd_t + \beta_6 inf_t + \beta_7 ecoinf_t + \beta_8 agr_t + \beta_9 serv_t + \beta_{10} indice\_Gini_t + \beta_{11} niv\_edu_t + \varepsilon_t \qquad (2)$$

Where lPibh indicates the logarithm of GDP per capita; represents the quality of institutions; xm indicates the commercial opening; urb is the share of the urban population in the total population; is the logarithm of official development assistance; inf indicates the consumer price inflation rate; ecoinf is the informal economy as a percentage of GDP; agr is the share of agriculture in GDP; serv is the share of services in GDP; indice_Gini corresponds to the index of GINI; niv_edu is the education level of taxpayers and ε denotes the error term or stochastic perturbation.

3.2. Estimation Technique

To examine the determinants of tax revenue, various empirical models have been considered. As part of this study, the determinants of tax revenue will be estimated in two main steps. In the first step, we examine the stationarity of the variables using unit root tests. In the second step, we test the presence of a long-term relationship between the variables. To examine the long-term relationship between the variables, the ARDL co-integration approach developed by Pesaran et al. (2001) will be used. This method has advantages over the traditional methods of Engle and Granger (1987), of Johansen (1988) and of Johansen and Juselius (1990) well documented in the econometric literature. The ARDL bounds testing approach to cointegration is based on the following error-correction model:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \alpha_2 Y_{t-1} + \alpha_3 X_{t-1} + \sum_{i=1}^{P} \beta \, \Delta Y_{t-i} + \sum_{i=0}^{P} \alpha \, \Delta X_{t-i} + \varepsilon_t \quad (3)$$

Where Δ is the difference operator, Y_t is the variable of interest (explained variable) and X_t is the matrix of explanatory variables. The presence of a long-term relationship is tested by restricting the coefficients of the lagged variables in level to zero. In other words, the null hypothesis of no long-term relationship is: $\alpha_2 = \alpha_3 = 0$. This hypothesis is tested by an F test. The asymptotic critical values are provided by Pesaran et al. (2001). However, it should be noted that the critical values provided by Pesaran et al. (2001) are calculated based on large samples of the order of 500 and 1000 observations, and 2000 and 40000 repetitions respectively. Thus, Narayan (2005) produced a new set of critical values for small samples ranging from 30 to 80 observations. The sample size is not large (33 observations), so we use the critical values provided by Narayan (2005). In addition, the ARDL procedure is sensitive to the selection of the lag structure (p, q). In this study,

the maximum lag length on each variable was set to one and the optimal lag structure was selected using the Akaike Bayesian information criteria (AIC).

3.3. Description of Data
The study data are annual and cover the period 1984-2016. The data come from the databases of the Central Bank of West African States (CBWAS), the World Bank Group (WDI) and the Political Risk Service (PRS). We use as tax revenues variable the total tax revenues relative to GDP. Indeed, the use of total tax revenues is preferable because they are the largest in the budget and budget forecasts are made on the basis of these revenues unlike non-tax revenues which are unstable and sometimes depend on several factors (international economic situation, government stability, hunting to keep rulers, etc.). Also, public policies are based on tax revenues. Tax revenues are linked to a set of factors. Given the availability of data, we consider that the mobilization of tax revenue depends on the following variables:

3.3.1. Real GDP per capita
Real GDP per capita is the first and most common explanatory variable used to understand the level of development. This variable assumes that a high level of development leads to a higher demand for public spending (Tanzi, 1987) and a higher level of tax collection to pay for higher spending. Consequently, the expected sign for the coefficient of this variable is positive.

3.3.2. The quality of institutions
The quality of institutions plays a decisive role in tax revenue mobilization. Several studies find that the weak tax revenues are due to the low quality of institutions (Ghura, 1998; Gupta et al., 2003; Tanzi and Davoodi, 2000; Bird et al., 2008; Ajaz and Ahmad 2010; Botlhole, 2011; Ameth, 2014; Keho, 2015). Thus, an improvement in the functioning of tax administrations lowers the cost of tax collection and strengthens tax compliance. This variable is used to represent efficiencies or even inefficiencies in tax collection. The expected sign of the coefficient is positive.

3.3.3. Trade openness
Trade with the outside constitutes a more taxable base than income and domestic transactions because of customs barriers (Tanzi, 1987; Stotsky and WoldeMariam, 1997). For example, Keen and Simone (2004) point out that revenues can increase when trade liberalization is accompanied by improved customs procedures. Thus, the expected sign for the coefficient of this variable is the positive sign.

3.3.4. The share of the urban population in the total population
The degree of urbanization has a positive impact on public charges. Indeed, gathered in a smaller geographic space, businesses, traders and manufacturers are more likely to pay tax easily. In addition, urbanization creates a strong demand for improving infrastructure and therefore a need to expand public spending. This implies the collection of larger tax revenues. In addition, the city reduces the share of self-consumed production and therefore results in the commodification or monetization of trade, which favors tax collection. Therefore, the coefficient associated with the share of the urban population in the total population is assumed to be positive.

3.3.5. Official development assistance

Previous research has shown that official aid is a significant explanatory factor for the tax rate (Tanzi, 1992; Gupta, 2007; Gupta et al., 2004; Brun et al., 2007). Gupta et al. (2004) find that external aid in the form of loans leads to higher tax revenues due to the burden of future loan repayments. Brun et al. (2007) find that the impact of aid on tax revenue appears to be heterogeneous across countries and unstable over time. It is also possible that the diversity of results indicates the difficulty in correctly identifying the impact of aid in this type of study. They do not allow for a systematic impact of aid. The expected sign is therefore not determined.

3.3.6. The consumer price inflation rate

High inflation rates act as a sign of bad macroeconomic policy, which reduces investment and therefore tax revenue (WAMA, 2011). Also, for Pessino and Fenochietto (2013), countries that obtain resources from inflation have a negative efficiency for tax collection. So the expected sign for this variable is supposed to be negative.

3.3.7. The informal economy as a percentage of GDP

The informal sector is a relevant source of income for many people in developing countries, which plays an important role in determining tax revenue. For Alm and Torgler (2004), the informal economy is correlated with low tax morale because of the lower moral cost of tax evasion and less motivation to pay taxes. It is expected that a strong informal economy will be associated with a low level of revenue collection. Therefore, the expected sign of this variable is negative.

3.3.8. The share of agriculture in GDP

The agricultural sector is difficult to tax because of the importance of subsistence activities and production units which are often dispersed and have low unit production (Stotsky and Wolde Mariam, 1997). The costs of implementing and controlling a tax on agricultural activities would be very high and the expected gains low (Ghura, 1998). This therefore results in a negative relationship between the share of agriculture in the economy and tax revenues. The expected sign of this variable is negative.

3.3.9. The share of services in GDP

Economies characterized by strong service sectors generally follow better accounting practices and have taxpayers that are easily identifiable and accessible than those that are largely agricultural. Consequently, the expected sign for the coefficient of this variable is the positive sign.

3.3.10. Income distribution

It should facilitate collection and voluntary respect for taxpayers. The variable used is the GINI coefficient which measures how the distribution of income between individuals deviates from the egalitarian distribution. The expected sign of this variable is positive.

3.3.11. Level of education

More educated people can better understand how and why it is necessary to pay taxes. With higher education, compliance will be higher. This variable is measured by total public expenditure on education as a percentage of GDP. The expected sign for this variable is assumed to be positive.

However, other variables exist in the literature. However, we were guided in the choice of our variables by two main considerations. First, the availability of data and the need to provide a sufficiently complete selection of the various determinants that previous research has shown to be relevant. In fact, omitting important control variables could lead to a problem of omitted variables, which would bias the estimates. Second, despite the aspiration to be exhaustive, the number of variables identified in the literature is quite large, and poses an increased risk of multicollinearity, which would reduce the precision of our statistical estimates. With this in mind, we have chosen several key variables. The choice of our variables is based on the previous literature and the desire for completeness.

Furthermore, putting all the institutional indicators in a model could lead to problems of multicollinearity and simultaneity bias. To avoid these problems, we have constructed a synthetic indicator of the quality of institutions using a principal component analysis in order to prioritize the information available on institutional variables. We therefore estimated the variable relating to the informal economy by adopting the demand for money approach proposed by Tanzi (1983).

4. EMPIRICAL RESULTS AND DISCUSSION

In the empirical analysis, we proceed as follows. First, we perform a descriptive analysis of the variables. Next, we apply unit root tests to determine the order of integration of the variables. Finally, we estimate the short and long-term coefficients using the ARDL approach.

4.1. Descriptive Statistics

Descriptive analysis is the first phase of study variables. Indeed, the raw data hides the visualization of what the data would show. Descriptive statistics are therefore important to present the data in a more meaningful way and this allows for easier interpretation of the data. The results of the descriptive statistics of the study variables are reported in Table 1.

Overall, it can be noted that the standard deviations are small, which means that the variances are minimal between the values of the variables. Except for GDP per capita and official development assistance that has been transformed, it is not necessary to do a logarithmic transformation to normalize the variables.

4.2. Unit Root Tests

In this first step of our analysis, we test the order of integration of the variables by applying the tests of Dickey and Fuller (ADF, 1979), Phillips and Perron (PP, 1988) and Kwiatkowski et al., (KPSS, 1992). This step is necessary because the ARDL bounds test requires that the endogenous variable be integrated of order one i.e I(1) and the exogenous variables are I(0) or I(1). If a variable is I(2), the F-test will provide biased results. Table 2 below presents the results of the unit root tests carried out on the

variables. As we can see, some variables are stationary in level, i.e integrated of order zero I (0). However, they all become stationary in first difference, i.e integrated of order one I (1). We can conclude that the variables are I (1) and proceed to ARDL estimation of the factors determining tax revenues.

4.3. ARDL Model Estimation Results

In this second step of the analysis, we test the presence of a long-term relationship between the variables. Next, we describe the long-term relationship between the variables. The results of the ARDL bounds test are presented in Table 3. The results show that there is a long-term relationship between the variables. Indeed, the calculated F-statistic exceeds the critical value above the significance level of 5%. Also, all diagnostic tests show no violation of the assumptions of the classical linear regression model.

We noted the existence of cointegration relationships between the variables. Now, we estimate the long-term effects of exogenous variables on the mobilization of tax revenues. The results of the estimate are shown in Table 4 below. Among the variables considered, only the share of the urban population in the total population and the share of agriculture in GDP do not explain, statistically and significantly tax revenues. Consequently, these variables cannot be considered as determining factors for tax revenues in Côte d'Ivoire. Apart from these variables, all the other variables are statistically significant. GDP per capita, official development assistance, inflation, informal economy, share of services in GDP, Gini index and level of education all influence positively tax revenues while quality of institutions and trade openness have a negative impact on tax revenues.

As can be seen, the coefficient of GDP per capita is significantly positive, which is in line with the view of the literature that the ability to collect and pay taxes increases with the level of development of an economy. The higher the level of development of a country, the stronger its capacity to draw resources. All

Table 1: Descriptive statistics of the variables

Variables	Moyenne	Médiane	Ecart-type	Maximum	Minimum
Tax revenue-GDP ratio	16.35922	15.64741	2.568192	23.60653	12.32674
Real GDP per capita (log)	13.36258	13.35041	0.102321	13.55508	13.19027
Quality of institutions	4.596696	4.189583	0.966561	5.833333	3.175000
Trade openness	7.938229	7.623867	3.809462	16.48508	2.597985
Share of urban population	44.69709	43.54100	5.408787	37.69300	54.86900
Official dev. assistance (log)	20.05503	20.26107	0.894998	21.78286	18.32944
Inflation	4.030303	2.500000	4.944030	26.10000	-0.800000
Informal economy	61.48345	60.29298	11.62061	91.74242	36.55964
Share of agriculture in GDP	25.68118	24.60262	3.853310	34.00969	20.93149
Share of services in GDP	50.08012	52.93190	5.221731	40.60816	56.31725
Index of GINI	40.78818	41.34000	2.347041	36.89000	45.53000
Education level	5.032425	4.562620	1.199463	3.670730	6.785970

Source: Our calculations

Table 2: Results of unit root tests

Variable	Level			First difference		
	ADF	PP	KPSS	ADF	PP	KPSS
Tax revenue-GDP ratio	−3.041 (0.137)	−2.981 (0.152)	0.192** (0.146)	−6.913* (0.000)	−14.71* (0.000)	0.296* (0.146)
Real GDP per capita (log)	−0.391 (0.983)	−0.383 (0.998)	0.152** (0.146)	−3.687** (0.038)	−3.665** (0.040)	0.108 (0.146)
Quality of institutions	−2.150 (0.499)	−2.033 (0.561)	0.109 (0.146)	−7.216* (0.000)	−7.394* (0.000)	0.151** (0.146)
Trade openness	−4.459* (0.006)	−4.633* (0.004)	0.069 (0.146)	−8.066* (0.000)	−9.354* (0.000)	0.135*** (0.146)
Share of urban population	−2.249 (0.447)	−2.056 (0.549)	0.205** (0.146)	−1.876 (0.641)	−1.337 (0.859)	0.132*** (0.146)
Official dev. assistance (log)	−2.751 (0.224)	−2.666 (0.256)	0.082 (0.146)	−7.256* (0.000)	−7.256* (0.000)	0.091 (0.146)
Inflation	−4.274* (0.010)	−4.204** (0.011)	0.056 (0.146)	−5.802* (0.000)	11.30* (0.000)	0.134*** (0.146)
Informal economy	−0.823 (0.952)	−0.949 (0.937)	0.141*** (0.146)	−5.266* (0.000)	−5.256* (0.000)	0.151** (0.146)
Share of agriculture in GDP	−3.003 (0.146)	−3.003 (0.146)	0.058 (0.146)	−4.745* (0.003)	−4.696* (0.003)	0.079 (0.146)
Share of services in GDP	−1.674 (0.739)	−1.951 (0.604)	0.125*** (0.146)	−5.967* (0.000)	−5.970* (0.000)	0.128*** (0.146)
Index of GINI	−4.118** (0.014)	−4.278* (0.009)	0.115 (0.146)	−7.545* (0.000)	−7.241* (0.000)	0.127*** (0.146)
Education level	−0.697 (0.964)	−0.901 (0.943)	0.172** (0.146)	−4.663* (0.004)	−4.656* (0.004)	0.089 (0.146)

Source: Our calculations. *; **; ***Respectively indicates statistical significance at the 1%, 5% and 10% level of the series and the p-values are in square brackets. Critical values at the 5% threshold (0.146) are in parentheses

Table 3: Results of the ARDL cointegration test

Endogenous variable	F-stat.	Critical value bounds					
		1%		5%		10%	
		I0	I1	I0	I1	I0	I1
Tax revenue-GDP ratio	4.740*	3.599	5.230	2.597	3.907	2.196	3.370
Diagnostic tests	Normality		0.798	Heterosc.	0.671	Correlation	0.053

Source: Our calculations. *Indicates the rejection of the null hypothesis of no cointegration at 10% level of significance

Table 4: Long-run determinants of tax revenue

Variables	Dependent variable (Tax revenue-GDP ratio)			
	Coefficient	Std. Error	t-Statistic	Prob.
Real GDP per capita (log)	21.9850*	3.2611	6.7416	0.0000
Quality of institutions	−2.7075*	0.5526	−4.8992	0.0004
Trade openness	−0.2026*	0.0619	−3.2708	0.0067
Share of urban population	−0.1811	0.1396	−1.2976	0.2188
Official dev. assistance (log)	1.3901*	0.2917	4.7660	0.0005
Inflation	0.1166**	0.0485	2.4013	0.0334
informal economy	0.0575*	0.0201	2.8569	0.0144
Share of agriculture in GDP	−0.1260	0.1084	−1.1624	0.2677
Share of services in GDP	0.2007**	0.0676	2.9702	0.0117
Index of GINI	0.1992***	0.1005	1.9816	0.0709
Education level	0.9883*	0.2295	4.3060	0.0010
Constante	−303.6616*	47.9217	−6.3366	0.0000

Source: Our calculations. *, (**), [***] indicates respectively a statistical significance at the threshold of 1%, (5%), [10%]. The significance thresholds of the t-statistics are: 1%=2,58; 5%=1,96; 10%=1,62

the same, inflation and official development assistance has a positive impact on tax revenues. An unexpected result is the positive coefficient of the informal economy. Nevertheless, we note the low value of the coefficient of this variable, indicating the low contribution of the informal economy to tax revenues. This finding reflects some extent the largely informal nature of the economy. Informal activities cause loss of tax revenue and threaten the official tax collection system because the tax potential is highly concentrated at the level of the largest and most honest companies. Thus, given the size of the informal economy, it is one of the factors hindering tax revenues in Côte d'Ivoire.

The tax revenues are also a function of the composition of the economy, as some sectors are easier to tax than others. The industrial and services sector is generally easier to control than the agricultural sector. As can be seen, tax revenues are positively and significantly linked to the share of services in GDP. The insignificance of the coefficient for the share of agriculture in GDP could be explained by the fact that a large part of agriculture is subsistence and this sector is difficult to tax. The increase in tax revenue will then require a structural transformation from the agricultural sector to the industrial and service sectors which contribute more to tax revenue. These two sectors have the advantage of being easy to tax because the taxpayers and the industrial units of these sectors are easily identifiable and they generally follow better accounting practices, which facilitates the taxation of profits and the levying of contributions.

The coefficient linked to the distribution of income measured by the Gini index as well as that of the level of education measured by the share of public expenditure on education are positive and statistically significant. The result on income distribution is consistent with the view that better income distribution facilitates tax collection and the voluntary respect of taxpayers. Likewise, the result on the level of education shows that more educated people understand better why it is necessary to pay taxes and how its taxes must be paid. They are also willing to comply with the tax and this also increases tax compliance. This highlights the importance of human capital in the tax revenue mobilization process.

In addition, we observe a negative, statistically significant relationship between the quality of institutions and tax revenues. Although the expected sign of the coefficient of this variable is contrary to theory, it is still justified. Indeed, from a theoretical point of view, the absence of government stability, law and order, democratic accountability and corruption have a negative impact on the governance of a State, one of the immediate consequences of which is the reduction of these tax revenues. Taken individually, these variables have a negative relationship with the mobilization of tax revenues, except corruption and law and order which have positive and non-significant coefficients. This explains the negative relationship found. As seen above, the institutions are of poor quality, which suggests that improving institutional quality is essential to increase tax revenues. A quality institutional environment is an advantage for better revenue mobilization and the promotion of tax compliance. We also observe a negative, statistically significant relationship between trade openness and tax revenues. This unexpected relationship can be explained by the negative impact of trade liberalization.

The results of the short-term relationship are presented in Table 5 in the appendix. We find that all variables have the same sign as the long-term relationship except for GDP per capita. This would mean that the variables have the same effect in the short-term relationship as in the long-term relationship. Also, we can see that the coefficient of the error correction term is significant at the 1% threshold with an expected negative sign. This confirms the long-term stable relationship between the variables. This coefficient suggests that a deviation from the long run equilibrium level of tax revenue in one year is corrected by 26% over the following year.

The components of the quality indicator for institutions were considered in order to understand precisely the effect of each component of the quality indicator for institutions on the mobilization of tax revenue. Indeed, considering each component of institutional quality should provide interesting insights into the relationship between tax revenues and quality of institutions. The results of the estimation of tax revenue and the different components of the institutional indicators are reported in Table 6 in the appendix. As can be seen, the coefficients relating to the stability of government, the

profile of investments, the democratic accountability and the quality of the bureaucracy are statistically significant while those relating to the corruption and law are not significant. It is clear from these results that the stability of government, the investment conditions, the democratic accountability and the quality of the bureaucracy negatively affect the mobilization of tax revenues. In contrast, the corruption and law and order have no significant influence on the mobilization of tax revenues.

Like most countries, Côte d'Ivoire wants to raise enough tax revenues to finance public investment, basic social services, reduce the debt and the public deficit. Whatever plans are put in place, certain economic and institutional conditions limit the mobilization of tax revenue regarding the existing fiscal potential. In Côte d'Ivoire, tax revenues are limited on the one hand, by the quality of the institutions, notably the stability of the government, the conditions of investment, democratic accountability and the quality of the bureaucracy, and on the other hand, by trade opening and the informal economy.

5. CONCLUSION

In this paper, we have examined the main determinants of tax revenue in Côte d'Ivoire, paying attention to institutional factors and the informal economy. Also, we adopted the technique of autoregressive distributed lag model developed by Pesaran et al. (2001). The results confirm the existence of a long-term relationship between the variables. In addition, they show that tax revenues are positively associated with GDP per capita. High tax revenues are associated with high level of GDP per capita. The same positive effect is obtained for the official development assistance, the informal economy, the distribution of income among the population and the level of education of the population. Like other studies, the positive role played by the share of services in GDP is confirmed. In addition, a negative effect is observed about the quality of institutions and trade openness. The results show that the poor quality of institutions and trade liberalization are the determining explanatory factors for the low tax revenues.

The results provide several economic policy implications. The first part looks at the factors that positively impact tax revenues. The higher the GDP per capita, the higher of tax revenue. The State must work for a better distribution of income among the population and continue its efforts to improve the level of education of its population. The more educated the workforce, the more the economy can be taxed due to a larger formal sector and higher incomes. Also, to strengthen tax revenues, the State must remove obstacles to entry into the formal economy in order to reduce the share of the informal economy. This will reduce the willingness to stay in the informal economy and widen the tax base. Also, it must continue its efforts in the management of official development assistance in order to gain the trust of donors. However, the development of services being essential for development, it will have to invest in their improvements.

The second part concerns the factors that negatively influence tax revenues. The results suggest that institutional arrangements are

needed to strengthen tax revenues. Specifically, it appears that efforts to improve government stability, investment conditions, democratic accountability and the quality of the bureaucracy will strengthen the mobilization of tax revenues. Therefore, the quality of institutions is an important determinant of the mobilization of tax revenues. Also, trade liberalization has a negative impact on tax revenues. With the development of free trade zones and customs unions, a reduction in customs tariffs is to be expected. This suggests that increased trade opening will result in lower tax revenues. Thus, to offset the risk of a fall in tax revenue, the State must mobilize other sources of revenue, in particular domestic revenue because trade opening requires an economy that is competitive enough to engage in international trade in order to profit from the exchanges.

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APPENDIX

Table 5: Short run determinants of tax revenue

Independent variables	Variable expliquée (tax revenue-GDP ratio)			
	Coefficient	Std. Error	t-Statistic	Prob.
D (Real GDP per capita (log))	−1.2581	3.0056	−0.4186	0.6829
D (Quality of institutions)	−1.8336*	0.2170	−8.4492	0.0000
D (Trade openness)	−0.1822*	0.0235	−7.7446	0.0000
D (Share of urban population)	−8.1213*	0.6442	−12.6071	0.0000
D (Official dev. assistance (log))	1.4020*	0.1308	10.7157	0.0000
D (Inflation)	0.1590*	0.0194	8.1967	0.0000
D (Informal economy)	0.0773*	0.0128	6.0302	0.0001
D (Share of agriculture in GDP)	−0.1296*	0.0514	−2.5227	0.0268
D (Share of services in GDP)	0.1879*	0.0331	5.6731	0.0001
D (Index of GINI)	0.2621*	0.0524	4.9993	0.0003
D (Education level)	3.6543*	0.3734	9.7865	0.0000
ECM (−1)	−0.2626*	0.1016	−4.4221	0.0003

Source: Our calculations. *, (**), [***] indicates respectively a statistical significance at the threshold of 1%, (5%), [10%]. The significance thresholds of the t-statistics are: 1%=2,58; 5%=1,96; 10%=1,62

Table 6: Institutional determinants of tax revenue

Independent variables	Institutional variables					
	Government stability	Investment profile	Corruption	Law and order	Democratic accountab	Bureauc. quality
Real income per capita (log)	24.191* (7.095)	14.531** (2.897)	16.608* (3.945)	17.009 (1.652)	12.358* (2.978)	12.532** (2.370)
Quality of institutions	−1.134* (−5.079)	−1.073** (−2.511)	0.300 (0.855)	0.035 (0.032)	−0.956** (−2.076)	−0.736*** (−1.823)
Trade openness	−0.147** (−2.747)	−0.014 (−0.222)	−0.149*** (−1.885)	−0.207 (−1.698)	−0.075 (−1.078)	−0.197** (−2.357)
Share of urban population	−0.230 (−1.662)	0.387 (1.710)	0.160 (1.175)	0.112 (0.669)	0.384 (1.656)	−0.250 (−1.026)
Official dev. assistance (log)	0.419** (2.089)	0.541*** (1.973)	0.018 (0.062)	0.125 (0.348)	0.548** (2.033)	1.120** (2.274)
Inflation	0.008 (0.147)	−0.007 (−0.095)	0.038 (0.846)	0.227*** (1.775)	0.021 (0.515)	0.060 (1.036)
Informal economy	−0.016 (−0.681)	−0.067*** (−1.808)	−0.000 (−0.004)	0.025 (0.600)	0.028 (0.953)	0.089 (1.655)
Share of agriculture in GDP	−0.014 (−0.146)	−0.119 (−0.763)	0.072 (0.587)	0.043 (0.216)	−0.026 (−0.221)	−0.292 (−1.489)
Share of services in GDP	0.008 (0.153)	0.184 (1.717)	0.240** (2.447)	0.222 (1.347)	0.429* (3.335)	0.236** (2.628)
Index of GINI	0.303** (2.408)	−0.349 (−1.480)	0.055 (0.325)	0.207 (0.951)	−0.350 (−1.429)	0.058 (0.385)
Education level	−0.350 (−1.024)	1.003** (2.156)	1.079** (2.649)	0.819 (1.483)	1.997* (4.154)	1.553* (3.644)

Source: Our calculations. *, (**), [***] indicates respectively a statistical significance at the threshold of 1%, (5%), [10%]. The significance thresholds of the t-statistics are: 1%=2,58; 5%=1,96; 10%=1,62