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Contribution of corporate capital structure on compliance to forestry law in Cameroon

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ABSTRACT

The need to understand the persistence of unsustainable forest logging within existing titles can provide ample knowledge on this practice, hence setting a reference base required to design appropriate strategy to counter illegal logging practices. The main objective of this research was to model algorithms to determine the overall effect of corporate capital structure on the compliance to forestry law by quoted logging companies in Cameroon. Primary and secondary data used for the research was collected directly from 40 logging companies found in the Lom and Djerem, Ocean and Upper Sanaga Divisions. Data collected from secured documents on species logged and volume, corporate data on debt rates, equity, company age and size were all obtained during interviews with responsible personnel. Information on logging offenses and their frequency of occurrence was obtained from both the centralized and decentralized services of the Ministry of Forestry and Wildlife. Other existing research documents from other stakeholders were exploited. Collected data was entered into an Excel spreadsheet and analyzed using R. Capital structure is observed to significantly influence sustainable forest management performance in the Cameroonian forest logging industry at a 0.01 level of significance.

Keywords: Corporate, Illegal, Offenses, Debt, Sustainable.

INTRODUCTION

The concept of sustainability, although cumbersome to actually define, has been accepted globally by forest resource managers and policy makers as an appropriate medium for the fight against the fast eroding resource base vis-a-vis its multi-facet functions (FAO, 2005b). Use of forest resources and assessment of progress towards its sustainability over the years by conventional forest management practices, has yielded unsuccessful results. Outcome of credible reports such as the forest resources assessment of the Food and Agriculture Organization (FAO, 2005b), International Tropical Timber Organization's report (ITTO, 2005) on tropical forest management and the Millennium Ecosystem Assessment (MEA, 2005) have all indicated that global forest cover continues to drop, at the rate of 25,000 hectares on a daily bases with the magnitude weighing more on tropical forests. On the other hand, forests provide more than

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86 million green jobs worldwide and support the livelihoods of many more people (FAO-UNEP 2020).

The present condition of forest resources in developing countries couldn't have been in any much better situation as degradation is even more pronounced. However, with inception of the criteria and indicators processes (Rebugio, 2000) of forest certification principles and other conventional forest management practices promoting resource-use in perpetuity involving stakeholders from the trio sectors, some emerging progress on resource sustainability in this direction has been recorded.

Among Cameroon's numerous natural resources, the most important is the forest which covers more than 60% of the national territory remains the most directly threatened (Bambot et al., 2011). About 22.8 million hectares of the 200 million hectares of the Congo basin tropical rainforest vegetation is found in Cameroon (Ngueguim et al., 2009). Cameroon's forests are mainly tropical rainforests of two predominant types; lowland evergreen (54% of total forest area), and lowland semi-deciduous (28%) (ITTO, 2011). They are particularly rich in commercial species, including various species of Meliaceae, such as *Entandrophragma cylindricum* Sprague (sapelli) and *Entandrophragma utile* Sprague (sipo). The evergreen forests can be divided into two main categories; the Biafran forests, forming an arc around the Gulf of Guinea and the Congo Basin forests in Cameroon's south and southeast. The Biafran forest, which formerly covered the entire coastal lowland, has been largely exploited or still exists as secondary forests and degraded primary forests, characterized by species such as *Lophira alata* Banks (azobé) and *Sacaglottis gabonensis* (Baill.) Urb. (ozouga). The growing challenges of climate change and land footprint from agriculture and urbanization are taking a toll on forest lands. Increase in per capita demand for forest products has risen sharply with increasing population, leading to the need of innovative financial and technological investments and quality managerial skills, to continue to generate the necessary goods and services on a sustained basis. Sustainable Forest Management (SFM) means management of forest resources that meet current generation needs without decrease of future generations to meet their needs (Elbakidze and Angelstam, 2007). SFM has a specified importance due to existence of multiple challenges in forests ecosystems (Zandebasiri and Parvin, 2012). Therefore, evaluation of SFM is necessary to ensure the durability forests ecosystems functions (Wolfslehner and Vacik, 2011).

The role of SFM as a key element in sustainable development equations has already been identified and enshrined by UNCED under its forest policy provisions. Subsequent action plans developed by this body thereafter, according to CAB International (2001), have all been vociferously explicit on such forest management approach with chapter eleven (11) of the blueprint, 'Combating Deforestation' specifically addressing it. Section 22b of the above mentioned document entreats all governments at the national level, to pursue in cooperation with special interest groups and international organizations, "the formulation of scientifically sound criteria and guidelines for the management, conservation and sustainable development of all forest types". These mentioned conventions and locally designed regulations still find it hard to curb unsustainable logging practices within forest concessions. Though much has been carried out in terms of research on the impact of bad governance on forest management, trivial issues like corporate strategy as well as financial management practices could still have a major role to play in curbing illegal forest logging.

The financing decision of debt and equity ratio represents a fundamental issue faced by financial managers of companies. The actual impact of capital structure on sustainable forest management practices of logging companies in Cameroon is a major problem that researchers have not resolved. Hitherto, there is no empirical evidence in the literature about how capital structure influences sustainable forest management performance of Cameroonian logging industry.

According to Salim and Yadav (2012) the relationship between capital structure and firm performance on a study of 237 companies listed on the stock exchange in Bursa Malaysia in 6 industries: construction, plantation, manufacturing, consumer products, industrial products, property, trade and services, 1995-2011; using 4 profitability measures: ROE, ROA, Tobin's Q and EPS, with independent variables identified as capital structure including long-term debt (LTDT), short-term debt (STDT) and total debt (TDC) showed a significant relationship. The raising of appropriate capital for logging companies will enhance company operations efficiency hence, providing leverage for logging companies in the Cameroonian forest industry with optimum debt-equity ratio that gives quality performance, after a good analysis of business operations and obligations.

In practice, companies differ from one another in respect of size, nature of earnings, cost of capital, competitive conditions, market expectations and risk. Therefore, the theories of capital structure may provide only a broad theoretical framework for analyzing the relationship between LTDT and STDT and the company's forest logging practices. A forest manager however, should go beyond these considerations as no empirical model may be able to incorporate all these subjective features. There are in fact, a whole lot of factors, qualitative, quantitative and subjective, which should be considered and factored in the process of planning and designing a capital intensive industry such as logging companies. Besides, these considerations, care should be taken to ensure that the capital structure is evaluated in its totality and a forest manager should find out as to which capital structure is most advantageous to the company and hence suitable to promote corporate sustainability. Considering the importance of capital structure on profit margins and corporate operation patterns, the main objective of the research is to build an algorithm that identifies the underlying patterns between corporate capital structure and the compliance to forestry law in Cameroon.

MATERIALS AND METHODS

Study location

The study was carried out within the Lom and Djerem, Ocean and the Upper Sanaga Divisions in East, South and Center Regions in Cameroon. The study area was identified considering the diversity of logging titles operating within the area.

Sample population

The research team picked a cross section of 40 logging companies of different categories within three Divisions from the Center, South and East Regions, from the total number of registered logging companies listed in the records of the Ministry of Forestry and Wildlife (MINFOF), after negotiations were made on their potential availability to share confidential financial information. Other companies whose financial reports were not up to date and that are no longer in existence as of 2016 were excluded. A total of 80 logging titles exploited by the concerned companies was used as the sample population. The title distribution of studied companies was represented by 45% of Sales of Standing Volume, 30% of Community Forest, 12% of Forest Management unit, 9% of Council Forest and 3% of Public Auction Sales.

Data collection and evaluation metric

Corporate financial information on equity and liabilities of the studied companies were obtained using questionnaires through interviews with company resource personnel and from financial reports. According to the modified method used by Ang, Cole and Lin (2000) and Tian and Zeitun (2007), however, the ROA is widely regarded as the most useful measure to test firm performance (Abdel 2003; Tian and Zeitun, 2007), the most common accounting proxies that are used by many authors for performance evaluation are Return On Assets (ROA), Return On Equity (ROE) and/or Return On Investment (ROI). Hence ROA was used during the study to test for contribution to community development by logging companies.

Based on an adapted method used by Krishnan and Moyer (1997), all collected data are measured over five year averages ending in 2020 to avoid problems of short-term measurement instability and bias. All information was transmitted to the research team after agreement on privacy clauses had been made. It was required that the company identity be concealed for privacy and security purposes. Primary and secondary data on the exploited species and production volume were obtained from secured documents and databases of concerned companies and archives of the Divisional Delegations of the Ministry of Forestry and Wildlife of the study areas. All required data was collected between the months of August 2021 to March 2022.

The sustainable forest management evaluation metrics were considered from the Cameroonian forest law as well as Forest Stewardship Council (FSC) certification principles.

Data analysis

The main data analytics packages used for modeling was Microsoft Excel, MySQL and R. Data wrangling techniques employed are namely the descriptive statistics, multiple linear regression and machine learning algorithms like Logistic Regressions was used for model classification. To confirm model quality other ML algorithms like Random forest and Decision tree were used to corroborate obtained results and verify for accuracy rates. Common evaluation metrics like accuracy, precision, recall and F1-score were used to measure the quality of the models used. The collected data was split into a split ratio of 0.8 (used to train the model) and 0.2 (test set to evaluate the model performance). The binary logistic regression classification algorithm a commonly used machine learning algorithm was used to train the model to detect underlying patterns and relationships through an iterative process.

Model specification

From the literature a company's performance within attributed titles could be affected by their capital structure choice and by the structure of debt maturity as debt affects a company's management options. So, investigating the consequences of capital structure ratios on a company's logging practices will provide evidence on how the company carries out its logging operations within their titles. Following the research questions earlier formulated, a regression model was formulated to capture the effect of capital structure (measures of LTDT and STDT rates on compliance of forest logging rules and regulations (measured by the number of logging offenses committed). Other administrative variables like the company age and company size equally having a significant impact on corporate cultural values of a company were also used to evaluate effects of corporate performance on sustainable forest management. These factors deeply impact corporate performance and how companies improve their organizational culture over time.

Equation 1 that was obtained through an iterative process to detect underlying patterns of independent variables that show significant level of influence on the projected outcomes depicts a short panel model with few time series and large cross sections (individual companies). Using this panel method will help provide outcome estimates that are unbiased and efficient since it avoids loss of degree of freedom. Hence, the analytical panel data model tested in this study consists of the following equation structured as follows:

NLO = number of logging offenses= f (Long Term Debt, Company Size, Short Term Debt, Company Age)

$Yit1 = \beta o+\beta 1LTDTit+\beta 2Sizeit + \beta 3STDTit + \beta 4Ageit + \varepsilon i + \mu it$……...…… (1)

Yit1 = Compliance to forest logging rules and regulations (measured by the number of logging offenses committed on an annual basis)

βo= Intercept

β1, β2, β3, β4 = vector of coefficients

εi= Error

A cutoff value set at 5 and above annual logging offenses to be considered as non-compliance to forest logging rules and regulations was used during modeling.

RESULTS

The results obtained are presented beginning with a summary descriptive analysis for the entire study sample data collected, a correlation matrix and results of regression algorithms used for modeling. Finally, a supervised Machine Learning classification model is used to train the model and test the goodness of fit through its Area Under the curve (AUC) value and a confusion matrix (receiver operator characteristic (ROC) curve that is used to evaluate the accuracy of the of the models. It is however important to point out that the descriptive statistics and correlation analysis only indicate the associate link between variables. They do not necessarily establish a causal relationship even with high coefficients. Consequently, more rigorous and advanced econometric techniques are used through regression algorithms to adequately capture definite significant relationship between the sustainable forest management performance measures and the explanatory variables.

Statistical analysis

Descriptive statistics

Insights from summary statistics for the variables used in the study indicates an average Number of logging offenses for the entire sample set of 05, while the average number of most logged species is 03. The average ROA for the sample as a whole sample is 22.7%. Corporate liability values of LTDT and STDT rates have mean values of 19.5% and 14.8% respectively. On average the median of company size is 02 representing the medium size companies. From obtained standard deviation (stdev) values, a high concentration of the number of most logged species, number of logging offenses and LTDT rates is observed around their mean values (stdev of 1.648, 1.819 and 0,086 respectively). This indicates a sharp normal distribution curve for observed values of study variables (Figure 5). Skewness from the descriptive statistics indicates an acceptable range of values that falls below +1.5 and above -1.5 for the entire used variables.

A maximum of 11 logging offenses were registered on an annual basis for a single company with multiple logging titles and a minimum value of 01 offense equally registered. The highest number of most logged species registered was 08 and a minimum of 01, was observed in some highly specialized logging companies. The 95% confidence interval indicates the range of values that can have 95% certainty that it contains the true mean of the population. Which represents a high confidence level.

Correlation matrix

The correlation matrix for the variables was used to evaluate the correlation that exists among independent variables (Table 2). The matrix shows very low correlation between explanatory variables used in the model, eliminating the problem of multicollinearity hence, enhancing the quality of proposed model. There exists a high and positive correlation between LTDT and NLO as well as LTDT and NMLS of the order of 95.25% and 79.21% respectively indicating that LTDT is the main explanatory variable for the compliance to forestry law and the risk of loss of genetic diversity. ROA and STDT equally have relatively average correlation values of the order of 54.26% and 38.72% that influence the variance in Corporate Social Responsibility policy execution (CSR) of logging companies.

The contribution of corporate capital structure (LTDT and STDT) on compliance to forestry law in Cameroon

Insights obtained from results in Table 3, show that LTDT rates have a positive and highly significant relationship with the logging performance. It is interesting to note that the 94.7% of the variance of the dependent variable is explained by the variation of four different explanatory variables using the logistic regression model. The P-values for all explanatory variables are highly significant at a 1% level. The Multiple R (Pearson correlation) value of 0.9733 indicates a very performant model. Adjusted R^2 value of 0.9464 indicates that 95% of the variance of the of

compliance to forestry law in Cameroon (Number of Logging Offenses, NLO) as a measurement of sustainable forest logging in Cameroon is explained by the variations in their LTDT, STDT, age and size of company. The value of the DW statistics which stands at 1.70 further indicates that the regression equation is free from the problem of auto correlation. Hence, the results can be relied upon to make meaningful inferences. A standard Error value of 0.4211 indicates a small difference between the actual and the predicted values of the model.

Insights obtained from regression analysis indicates that there is a linear and positively correlated relationship between LTDT and the number of logging offenses committed. This indicates that companies with higher LTDT rates actually committed more logging offenses within studied logging titles than those with higher STDT rates. At a 50% LTDT rate the number of logging offenses observed was above 09, meanwhile at a LTDT rate of 10% only a maximum of 03 logging offenses is registered. A distribution of compliance to the forestry law in Cameroon with LTDT rates of companies within various company structure categories from large, medium and small, indicates that above 20% rates of LTDT companies of all sizes show a non-compliance to the forestry laws in Cameroon. At a less than 20% LTDT rate all companies committed less than five (05) logging offences annually, hence comply more with the Cameroonian forestry law.

Peak values of average annual LTDT rates of 20% in 2016 and 2020 correspond to an average number of 05 logging offenses registered. At a LTDT rate of 19% in 2017, the number of logging offenses stood at an average of 04 which is considered as compliance to the Cameroonian forestry law. STDT rates of 30% and above show relatively fewer or no logging offenses, meanwhile at a STDT rate of 20% and below, the number of logging offenses rose up to 11. Small and medium size companies show higher rates of non-compliance to forestry law at very low rates of STDT meanwhile at a 15% STDT rate large companies show some compliance to law. Only a few small size logging companies could show some degree of compliance to forestry law at a 5% STDT rate and below though insignificant. An average annual STDT rate of 14% corresponding to 05 logging offenses was registered in 2016, meanwhile 2018 with the highest average STDT rate of 16% registered 05 logging offenses.

It is clear that funds from various sources have different STDT rates and the logging titles operating with these funds show different degree of compliance to the forestry law in Cameroon. On average, logging titles with funds from Cam/Asia investors show the highest STDT value of 23% with an average of 05 logging offenses annually, followed by logging titles with Cameroonian invested funds with as high as 18% STDT with 05 number of logging offenses. Private invested funds from Asia, the European Union and joint funds from Eur/Asia have STDT values of 14%, 14% and 7% respectively having corresponding logging offenses of 03, 03, and 02.

Additional administrative information analyzed provided that large size companies have fewer logging offenses below 05, meanwhile the small size companies committed as much as 11 logging offenses during the study period. It was also noticed that companies with an average age of 20 years and above, commits lesser logging offenses, meanwhile at an average age of 05 up to 11 logging offenses were registered for newly created logging companies.

A confusion matrix was used to evaluate the model quality with a cutoff value set at 0.5 confirming the compliance or not to the forestry law during logging practices. This matrix indicates that 57 observations predicted companies liable to comply with forestry law came out as true positives, meanwhile 12 observations that were predicted to be law abiding came out as false positives. A total 112 observations were predicted to not comply with the forestry law came out as true negatives and 12 predicted not to respect the forestry law

were false negatives. The model indicates an 84.5% accuracy rate for predicted outcomes.

The ROC value of 0.84 also indicates the perfectness of the classification, showing the performance of the model at all classification thresholds. The Area under the Curve (AUC) that is the sorting based algorithm which measures the accuracy of the quantitative diagnostic test has a value of 0.9 which is considered excellent. An AUC value of 0.9 indicates the goodness of fit of the model and certifies that it can be used to evaluate data different from the trained dataset.

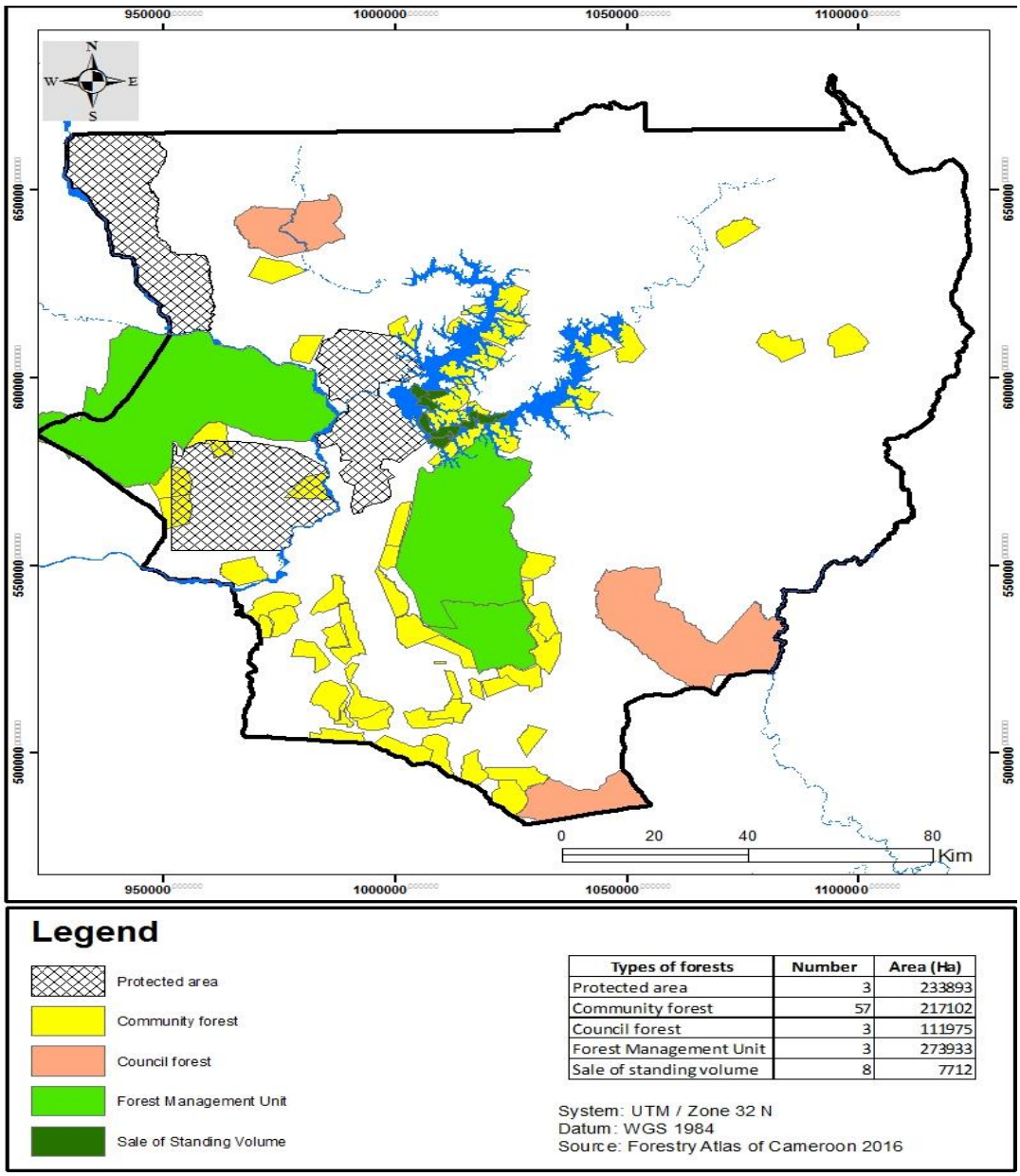
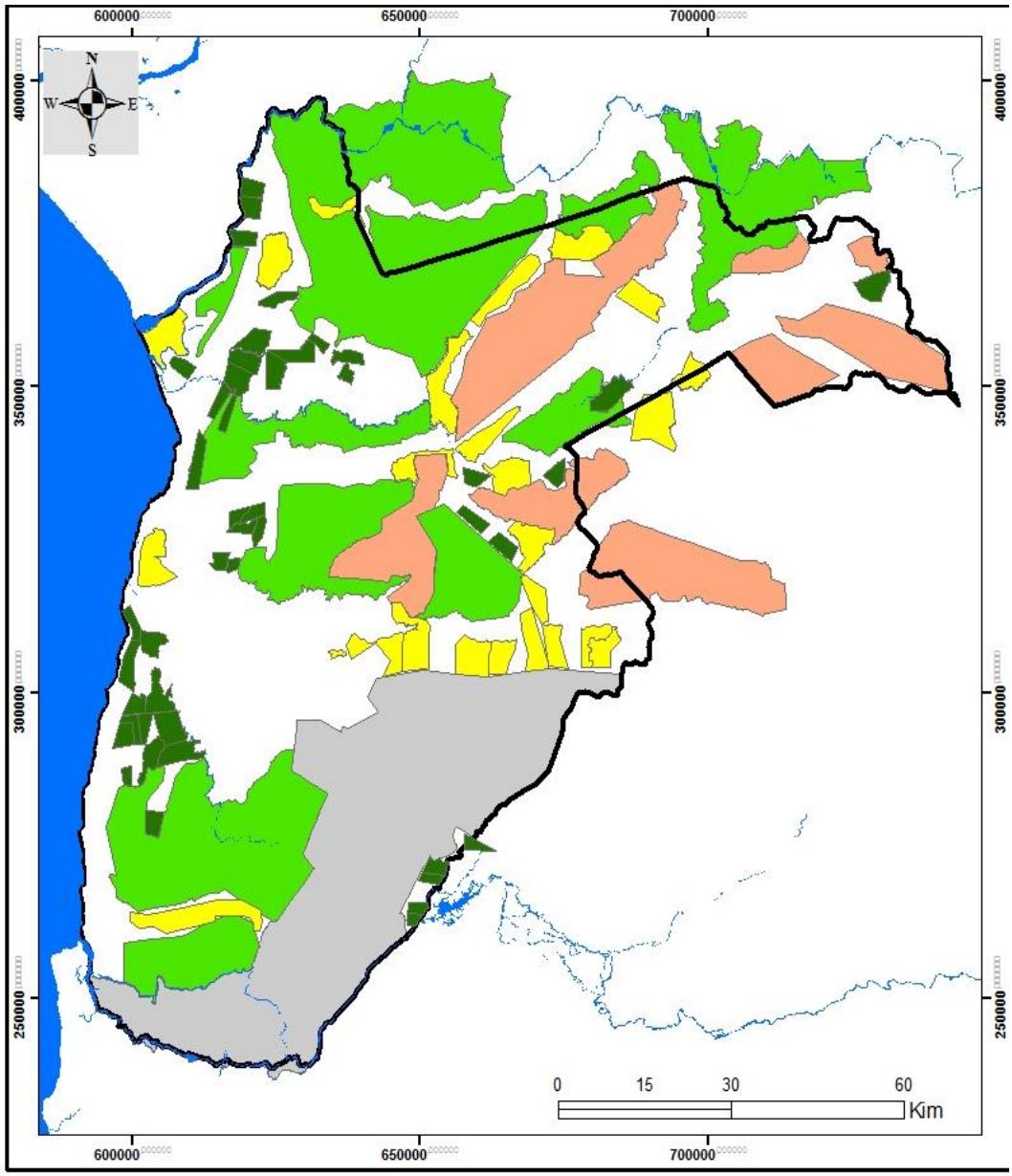
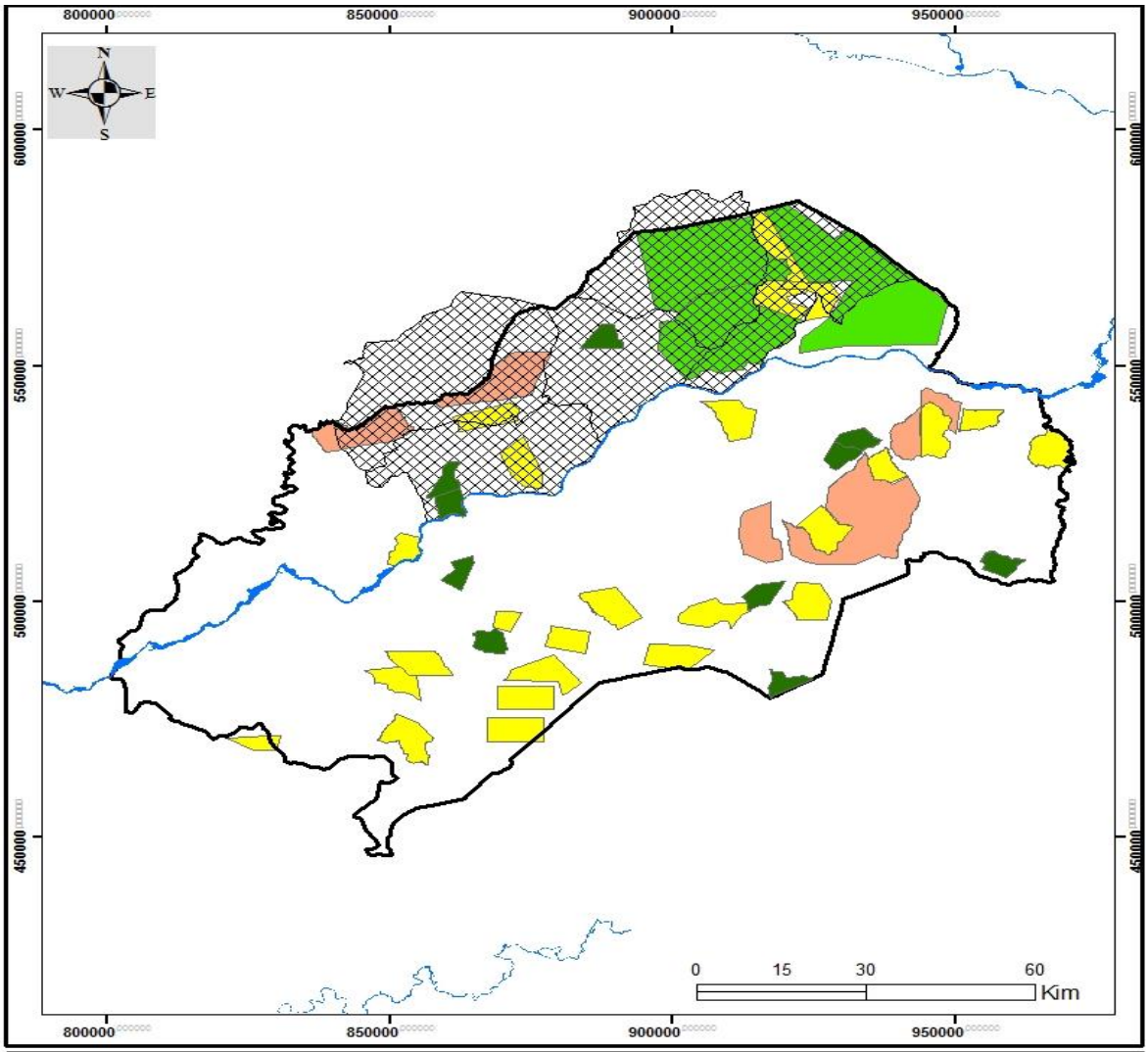


Figure 1: Distribution of titles in the Lom and Djerem Division for the year 2016.



Types of forests	Number	Area (Ha)
National park	1	203682
Community forest	25	79511
Council forest	5	157736
Forest Management Unit	9	386710
Sale of standing volume	46	51771

Figure 1: Distribution of titles in the Ocean Division for the year 2016.



Legend

- Protected area
- Community forest
- Council forest
- Forest Management Unit
- Sale of Standing Volume

Types of forests	Number	Area (Ha)
Protected area	5	329085
Community forest	26	107199
Council forest	5	62451
Forest Management Unit	3	113688
Sale of standing volume	10	23316

System: UTM / Zone 32 N
Datum: WGS 1984
Source: Forestry Atlas of Cameroon 2016

Figure 2: Distribution of titles in the Upper Sanaga Division for the year 2016.

Table 1: Descriptive Statistics for Dependent and Explanatory Variables.

	Cap. origin	***Age***	***Size***	***STDT***	***ROA***	***Equity***	***LTDT***	***NLO***	***NMLS***	***CSR***
Mean	2	11	2	0.15	0.23	0.60	0.19	5	3	2
Error	0	0	0	0.01	0.01	0.01	0.01	0	0	0.05
Median	2	9	3	0.15	0.24	0.62	0.20	5	3	2
Mode	2	8	3	0.12	0.30	0.60	0.20	7	2	2
Stdev	0.89	5.89	0.80	0.08	0.10	0.18	0.09	1.82	1.66	0.70
Sample Variance	0.79	34.72	0.64	0.01	0.01	0.03	0.01	3.31	2.76	0.50
Kurstosis	1.24	2.22	-1.21	5.26	1.98	-0.11	2.63	1.44	0.49	-0.95
Coefficient d'asymétrie	0.91	1.49	-0.56	1.28	0.58	-0.71	1.09	0.91	0.92	0.35
Plage	4	31	2	0.60	0.59	0.75	0.45	10	7	2
Minimum	1	1	1	0.00	0.00	0.15	0.05	1	1	1
Maximum	5	32	3	0.60	0.59	0.90	0.50	11	8	3
Sample population	200	200	200	200	200	200	200	200	200	200
Confidence level	0.124	0.822	0.111	0.011	0.015	0.025	0.012	0.254	0.232	0.098
ROA	***EBIT/total assets***									

Cap. Origin = Capital Origin
ROA= the return on assets (EBIT/ total assets); STDT= short term debt; LTDT= LTDT (Total long term liabilities; NLO= Number of logging offenses; NMLS= number of most logged species,
Size= the total capital assets for the companies and number of workers.

Table 2: Correlation Matrix of the Variables.

	Cap. origin	*Age*	*Size*	*STDT*	*ROA*	*Equity*	*LTDT*	*NLO*	*NMLS*	*CSR*
Cap. origin	1									
Age	0.3161	1								
Size	-0.1039	-0.0017	1							
STDT	-0.0799	-0.1116	0.0781	1						
ROA	0.0596	0.0412	-0.1910	-0.0724	1					
Equity	0.2734	0.2183	-0.2228	-0.0041	0.4088	1				
LTDT	-0.2217	-0.1175	0.2986	0.3502	-0.0988	-0.0766	1			
NLO	-0.2397	-0.1782	0.3610	0.1778	-0.0980	-0.1427	0.9525	1		
NMLS	-0.1305	0.0508	0.2811	0.1326	-0.1007	-0.0548	0.7869	0.7688	1	
CSR	0.2208	0.1303	-0.2874	-0.3872	0.5423	0.4842	-0.2546	-0.2255	-0.1232	1

Cap. Origin = Capital Origin
ROA= the return on assets (EBIT/ total assets); STDT= short term debt; LTDT= long term debt; NLO= Number of logging offenses; NMLS= number of most logged species,
Size= the total capital assets for the companies and number of workers.

Table 3: Estimation of compliance to forest logging laws using LTDT and STDT as explanatory variables for the 2016-2020 period.

Dependable variable	**NLO**
Regression Statistics	
Multiple R	0.973387655
R Square	0.947483526
Adjusted R Square	0.946406265
Standard Error	0.421160767
Observations	200

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	624.031536	156.007884	879.5301472	1.5815E-123
Residual	195	34.5883964	0.177376392		
Total	199	658.6199324			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*lower 95%*	*upper 95%*
Intercept	1.014826075	0.124512688	8.15038285	4.30567E-14	0.769261647	1.260390502
Age	-0.025315095	0.005118088	-4.946201335	1.62918E-06	-0.03540901	-0.015221181
Size	0.188684465	0.039198991	4.813503063	2.96678E-06	0.111376055	0.265992875
STDT	-4.210122806	0.406387165	-10.35988133	2.56558E-20	-5.011601219	-3.408644392
LTDT	20.82407907	0.390890846	53.27338636	3.6788E-118	20.05316256	21.59499558

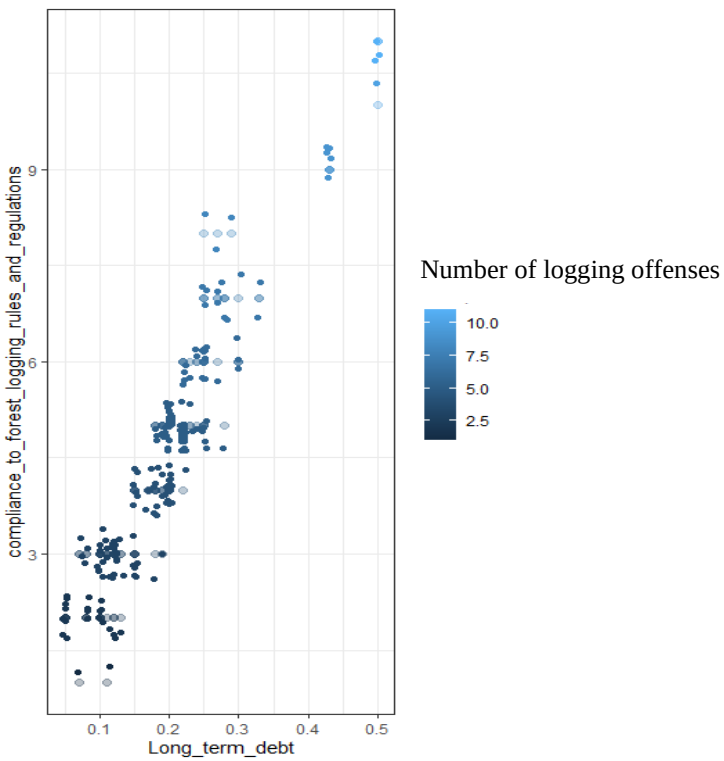


Figure 3: Relationship between LTDT rates with compliance to forestry laws in Cameroon.

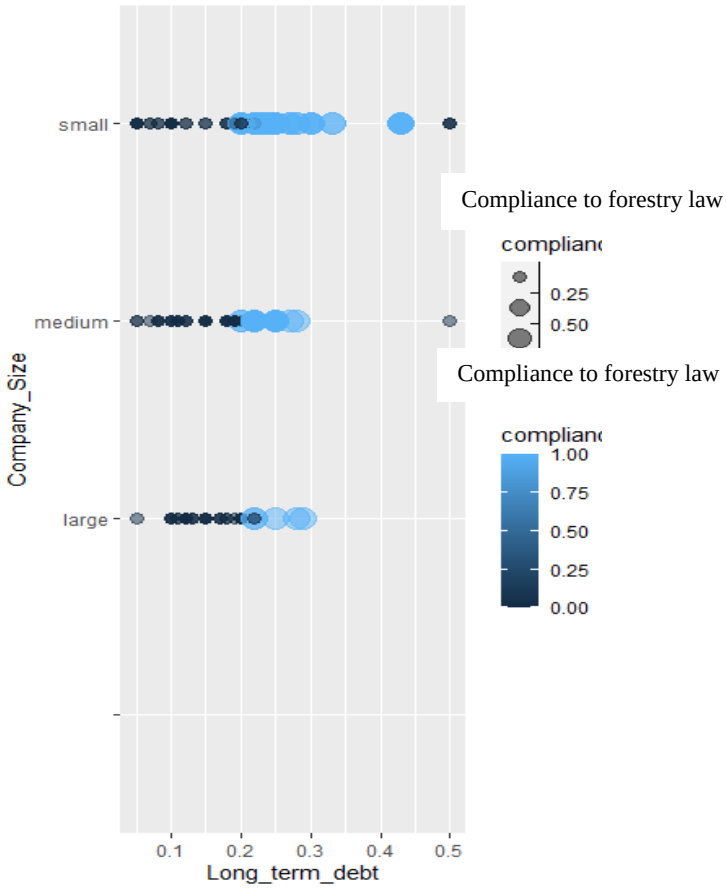


Figure 4: Relationship between LTDT rates with Company size to compliance to the forestry law in Cameroon.

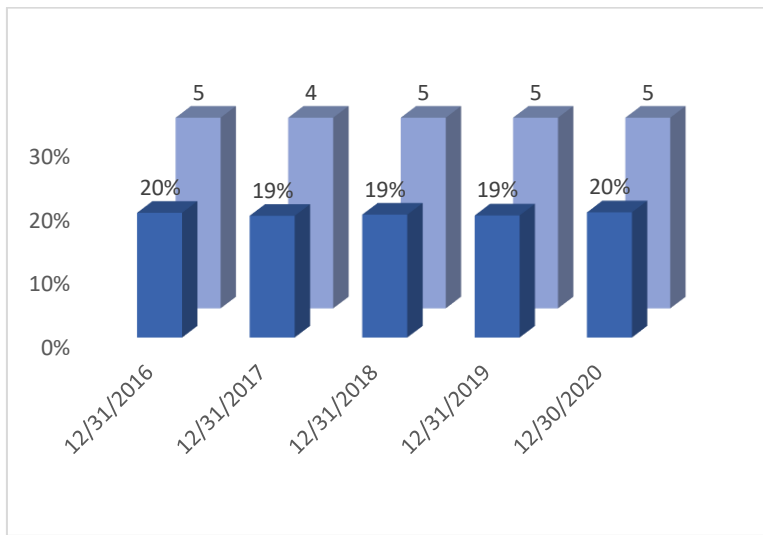


Figure 5: Average annual trend of logging offenses with LTDT rates.

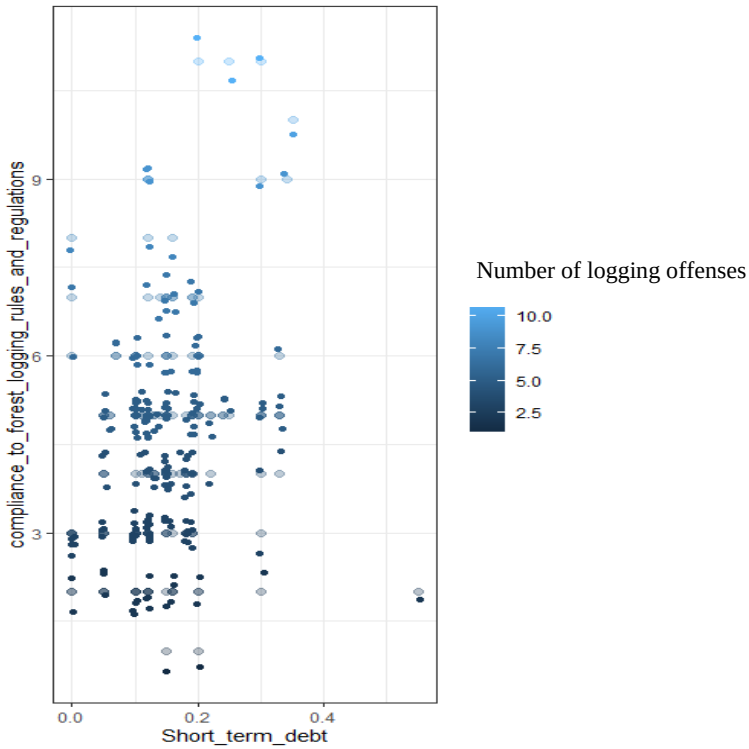


Figure 6: Relationship between STDT rates with compliance to the forestry law in Cameroon.

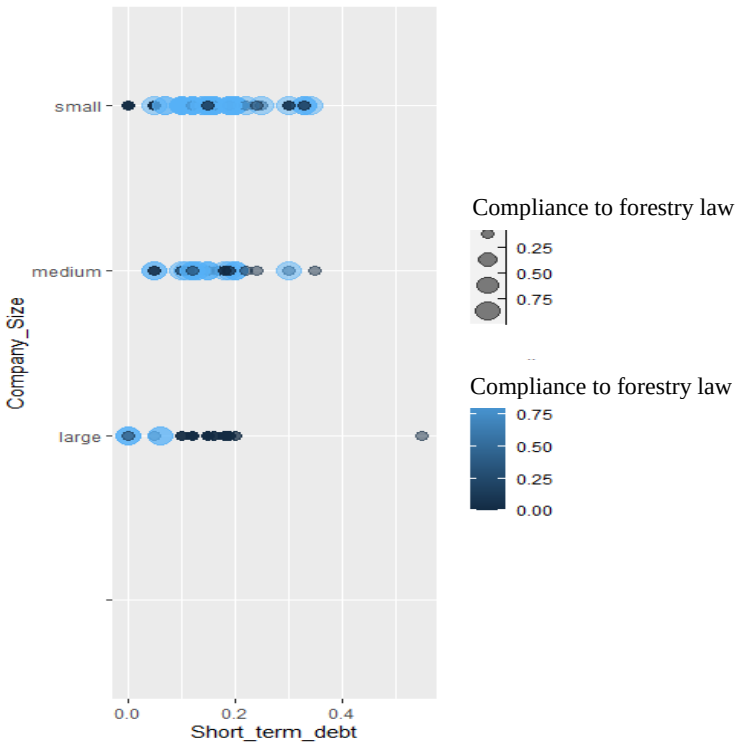


Figure 7: Relationship between STDT rates with company size to compliance forestry law.

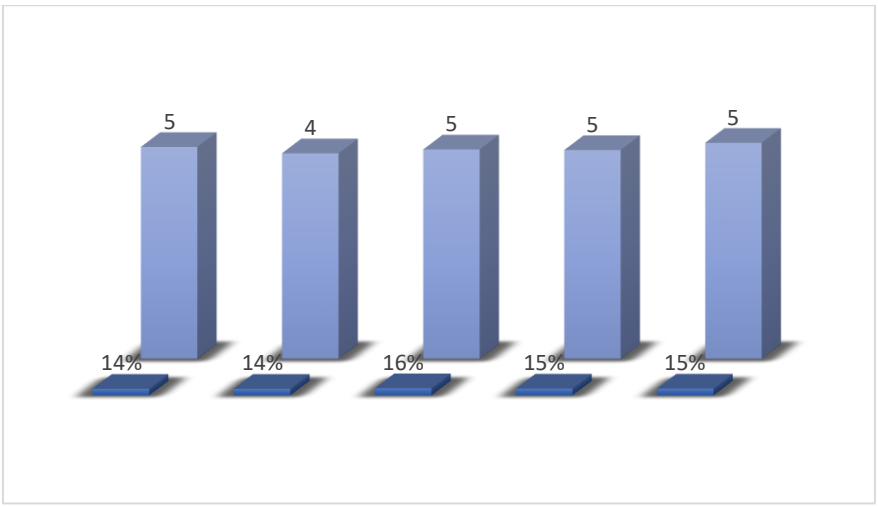


Figure 8: Average annual trend of logging offenses with STDT rates.

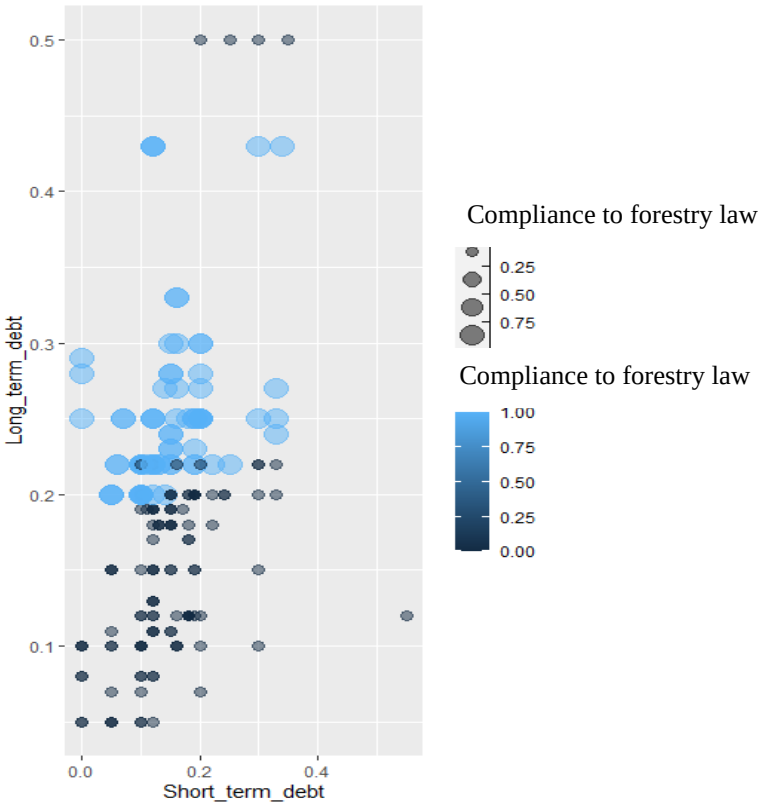


Figure 9: Relationship between LTDT rates with STDT rates to compliance to forest logging rules and regulations.

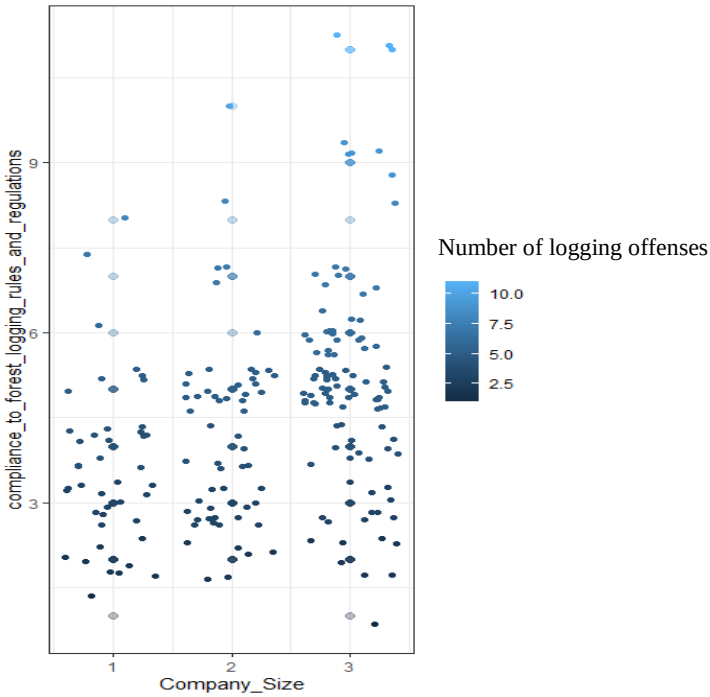


Figure 10: Relationship between Company Size with compliance to forest logging rules and regulations with company size.

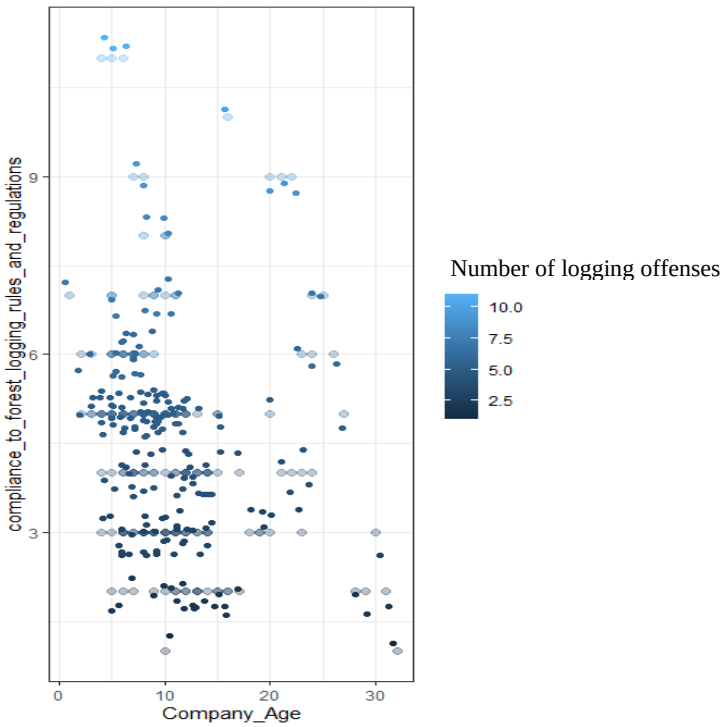


Figure 11: Relationship between Company Age with compliance to forest logging rules and regulations.

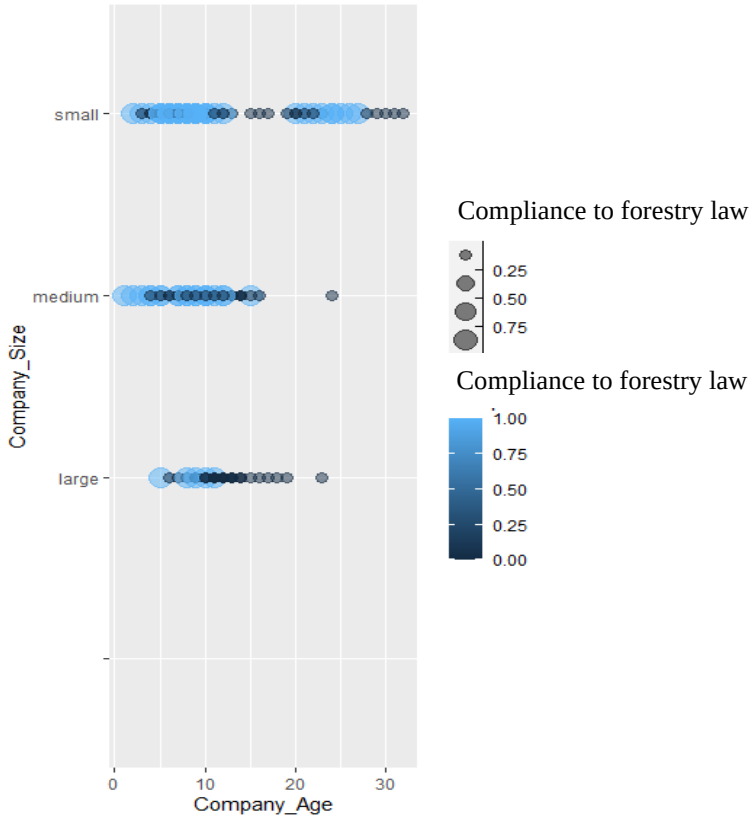


Figure 12: Relationship between Company size with Company Age to compliance to forest logging rules and regulations.

Table 4: Confusion matrix for compliance to forestry law in Cameroon.

	Suc-Obs	**Fail-Obs**	
Suc-Pred	57	12	69
Fail-Pred	19	112	131
	76	124	200
Precision	75.0%		
Accuracy	85%		
Cutoff	0.5		
Recall	82.6%		
Specificity	85.5%		
F1-scores	78.6%		

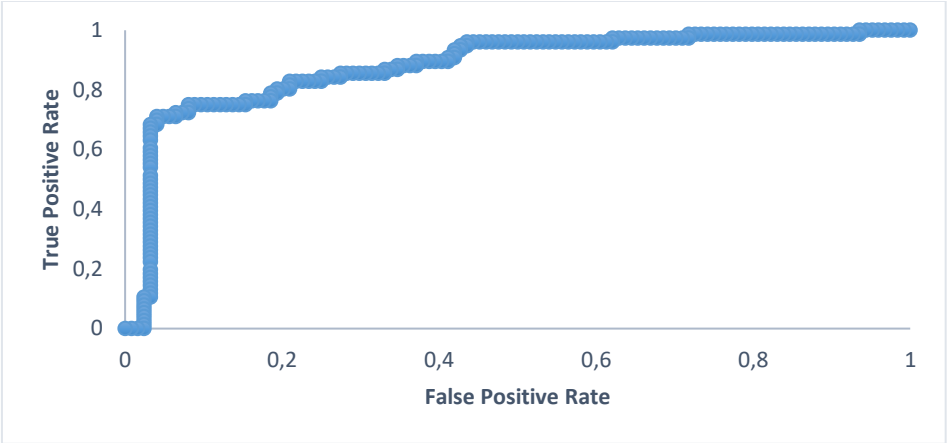


Figure 13: ROC curve for compliance to forest logging rules and regulations.

DISCUSSION

Analytical insights from obtained data indicate that a company's capital structure is predicted to have a significant influence on its compliance to forestry law in Cameroon. However, from the regression results, the coefficients of the LTDT and STDT measures as expected are highly significant at a 1% level. LTDT and STDT rates are respectively positively and negatively correlated to the compliance of the forestry law in Cameroon (NLO). These results show that higher LTDT rates lead to a rise in the number of logging offenses committed within studied titles through a linear relationship. Furthermore, findings indicate that small size logging companies representing 51% of the sample population studied have relatively the highest LTDT rates hence they comply less to the forestry law.

This phenomenon can be attributed to the extreme volatility of the small and medium enterprise (SME) sub-sector, through their unstructured capital management history, as well as the investment patterns involved. These findings show that as company size gets smaller, the probability of it not to comply with forestry law rises. The Binary logistic regression algorithm used, indicates that predictions validates at an 85% accuracy rate field observations, indicating that up to 62% of studied companies did not comply to the forest logging laws in Cameroon. This high rate of non-compliance was mainly backed by rising LTDT rates of the logging companies. High LTDT rates observed in the SME categories defines the low credibility of the businesses, hence limiting their access to less risky funds. Medium and small size companies with the relatively higher LTDT rates invest more in short life logging titles like the Sales of standing volume and Public Auction Sales where there exists extremely high rates of illegal forest logging. Large size companies have relatively smaller LTDT rates. It is also observed that large size logging companies have the lowest average LTDT rates of the order 16% and lowest number of logging offenses of the order of 03.

These results provide insights on the links between markets consuming timber from the Cameroonian logging industry and the average annual logging offenses perpetuated within titles supplying these markets. Analysis indicates that there has been a progressive drop in supply of timber products from titles with high illegal logging activities (non-compliance to the forestry law) into the European markets as policies on legality and traceability (The United States of America (US's Lacey Act),

Australia (Australian Illegal Logging Prohibition Bill), Japan (Japan's Goho Wood), the European Union (FLEGT) (Teketay et al., 2016) and the institution of SIGIF 2 management software tightens. The same situation is noticed with products sold into the Eur/Asian markets, as control mechanisms put in place by European clients on products coming from Asia becomes stringent. Only products sold into the Asian markets persistently come from titles with high average illegal logging rates. This situation could be justified by the fact that the Asian markets have less stringent policy or control measures to regulate timber commerce.

The persistent funding of short life titles (Sales on Standing Volume and Public Auction Sales) by medium and small size companies showing up to 70% of registered logging offenses, further confirms the high rate of illegality within titles of the Non-Permanent forest domain. It is equally observed that most of the short life logging titles supply Asian markets. Considering that most of these titles supply markets from where their operating funds are obtained, it could be concluded that the fund providers have a significant influence on the forest management culture adopted by these logging companies.

Regression algorithms show that STDT rates significantly and negatively correlates to the number of logging offenses committed within studied titles. The model used for the regression highlights the fact that as STDT rate increases there is a sharp fall in number and frequency of logging offenses is observed. The year 2018 stands out with the highest STDT rates of the order 16%, followed by 2019 with a 15% high. In 2020 the average number of logging offenses registered was 05. Companies who prefer smaller rates for STDT automatically operates with higher LTDT rates hence obviously lead to a rise in the number logging offenses. Meanwhile companies with high STDT rates most obtain their financing from private investors who most often in search for specific species to suit their value chain demand and mostly show no interest in funding logging titles.

It is therefore, expected that the large size companies with less liabilities (LTDT and STDT rates) will better manage attributed logging titles than small and medium size companies with same liability rates. The positive relationship between LTDT rates and compliance to the forestry law also suggests that the logging industry is facing extremely high volatility hence making risk averse investors to levy extremely high rates for cost of capital invested. The high LTDT rates for the Cameroonian and CAM/Asian funded companies corresponds to high average rate of annual logging offenses, attributed mostly to the informal nature of companies of the small and medium size category hence, the volatility of the titles in which they invest their funds. Conclusively, high LTDT rates considerately increases non-compliance to the forestry law in Cameroon leading to the unsustainable management of logging titles. This could suggest the fact that larger companies are able to access long term debts from banks and also extract trade credits from suppliers and/or suppliers who are willing to extend trade credit to larger firms. This could also indicate why large companies comply more to the forestry law with higher rates of STDT than small and medium size companies. Considering the innovative nature of the study much has not been done to reference research work.

Conclusion

A remarkable relationship exists between capital structure logging companies and sustainability performance within forest logging titles in Cameroon. It is generally observed that LTDT rates correlates positively and at a 1% level of significance with the number of logging offenses committed by logging companies within the logging industry in Cameroon. Small and medium size companies prefer STDT and invest most of their funds in logging titles found in Non-Permanent Forest Domain. Meanwhile, large companies with high value financial reporting and history contracts more of LTDT and use Equity funding, show relatively higher compliance with the forestry law. Conclusively it is noticed that there exists a high rate of non-

compliance to forestry law by the Cameroonian forest logging industry in recent years. These inferences highlight the growing challenge observed by the Cameroonian Government with unsustainable forest logging practices.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

CNN: Promoter of the paper, contributed to the conception of the paper and research protocol, data collection, processing and analysis, drafting and revision of the original and final manuscript. CT: Collected field data. KB: conception of questionnaire, collected and entered field data into predesigned database. BE: Contributed to the methodology, supervision and validation of the field manuscript.

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