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Article

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Cogent Economics & Finance

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Suggested Citation: Umar, Ahmed Tukur; Othman, Moh'd Shahwahid Hajj (2017) : Causes and consequences of crude oil pipeline vandalism in the Niger delta region of Nigeria: A confirmatory factor analysis approach, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 5, Iss. 1, pp. 1-15,
<https://doi.org/10.1080/23322039.2017.1353199>

This Version is available at:

<https://hdl.handle.net/10419/194710>

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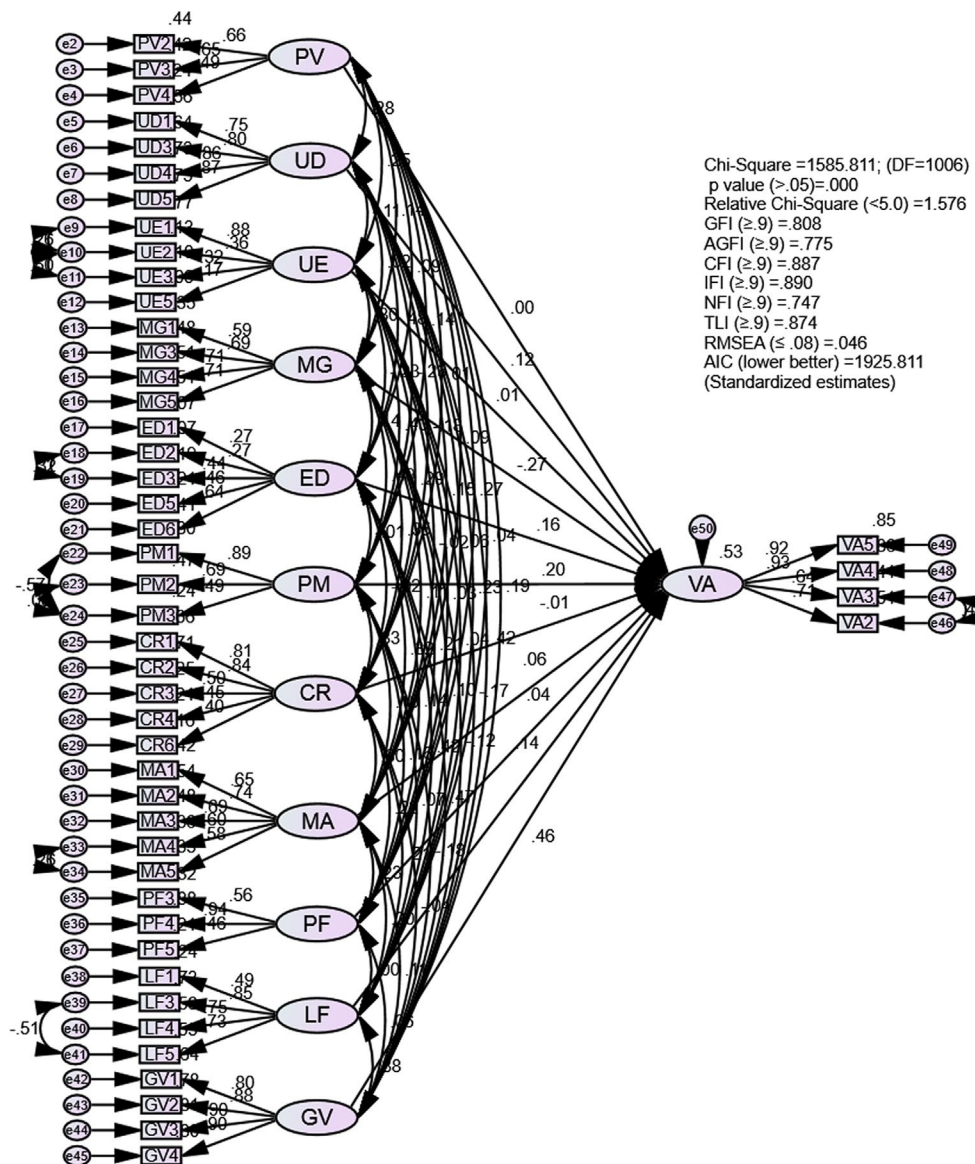
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GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

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Cogent Economics & Finance (2017), 5: 1353199



Received: 23 January 2017
Accepted: 05 July 2017
First Published: 12 July 2017

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Reviewing editor:
Miao Wang, Marquette University, USA

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Causes and consequences of crude oil pipeline vandalism in the Niger delta region of Nigeria: A confirmatory factor analysis approach

Ahmed Tukur Umar^{1*} and Moh'd Shahwahid Hajj Othman²

Abstract: Significant number of crude oil pipeline vandalism in the Niger delta region of Nigeria were carried out by the militant groups on the pretext for a better environmental management and development of the region. This research work examined the relation between socioeconomic, institutional factors and pipeline vandalism using confirmatory factor analysis (CFA). The CFA is a superior model of analysis since it establishes a better mathematical relationship between observed and unobserved variables compared to other models previously used by other studies such as correlation analysis, ordinary least squares and descriptive statistics. The study involved 269 respondents who were selected from the Niger delta region using purposive and simple random sampling techniques. The results from the study show the existence of a significant and positive relationship between poor management, poor governance, legal, and environmental degradation while significant but negative relationship between marginalization and pipeline vandalism. The study recommends the need for institutional reform through improvement in infrastructural provision, effective governance among others. Unlike other previous studies, our results show no significant relationship between poverty, unemployment and vandalism.



Ahmed Tukur Umar

ABOUT THE AUTHORS

Ahmed Tukur Umar is a specialist in environmental economics. He holds a BSc Economics, MBA Marketing and MSc Economics at the University of Maiduguri, Nigeria. Presently the author is a PhD research student at the University Putra Malaysia (UPM), under the supervision of Prof, Dr Mohd Shahwahid Hajj Othman. This research article is part of his PhD thesis which assesses the factors that encourages crude oil pipeline vandalism in the Niger delta region. The study also evaluates the negative environmental impact of crude oil pipeline vandalism on the socioeconomic life of the oil-producing communities in the Niger delta region, and the need to adopt measures that will end Militancy in the region.

Moh'd Shahwahid Hajj Othman, PhD, is a professor of economics at the University Putra Malaysia. He has written a number of books on economic valuations and forest conservation and published a number of research papers in many reputable international journals.

PUBLIC INTEREST STATEMENT

Frequent attacks by the Niger delta militants on oil pipelines are worrisome due to its devastating environmental effects. It destroyed arable land for agriculture and causes economic loses in terms of revenue to the government. This study analyses factors that encourage crude oil pipelines vandalism using structural equation modeling (SEM). The SEM model has the ability to establish mathematical relationship between independent variables and dependent variable through confirmatory factor analysis (CFA). The study found that factors such as poor management, poor governance, weak legal system, and environmental degradation are among factors that encourage crude oil pipeline vandalism in the Niger delta region. The study recommends a more proactive governance in the provision of infrastructure, effective environmental management among others to bring an end to crude oil pipeline vandalism. This will promote the socioeconomic well-being of the Niger delta oil producing communities and enhance environmental sustainability of the region.

Subjects: Environmental Studies & Management; Environmental Management; Development Economics; Environmental Economics

Keywords: militancy; crude oil pipeline vandalism; economic losses; environmental degradation

1. Introduction

The Niger delta region is one of the richest oil producing areas in Nigeria and the largest wetland in Africa. The region is estimated to have 37 billion barrels (bb) of oil reserves and 168 trillion cubic feet of gas deposits (Omotola, 2009). The oil sector account for over 90% of foreign exchange earnings for Nigeria and the bulk of it comes from the Niger delta region. However, the region is considered as one of the most oil impacted region in the world due to poor regulated oil activities (Omotola, 2009; Raji & Abejide, 2013; and UNEP, 2011). A number of factors are said to have contributed to the environmental degradation of the region over the years, which includes gas flaring, industrial pollution, oil spillage etc. (Raji & Abejide, 2013). Although government make concerted efforts to promote development in the region for many years through the establishment of Niger delta Development Commission (NDDC), Oil Mineral Producing Areas Development Commission (OMPADEC), Ministry of Niger delta (MND), and Amnesty program for the militants and improvements of revenue derivation for the oil producing states in the region from 1 to 13% over the years, however no significant development is achieved partly due to inconsistency in programs implementations and corruption.

Over the years, crude oil spillage through pipeline vandalism is considered one of the major problems of the region. Rising cases of pipeline vandalism by militant groups have significantly affected sources of revenues of government and oil companies operating in the region. The militants claimed to be fighting for the emancipation of the region from environmental neglect. Statistics have shown that Nigeria is losing well over 300,000 barrels per day (bpd) as a result of crude oil pipeline vandalism, which runs into billions of dollars in losses (James, 2014; NNPC, 2013). This has resulted in significant negative socioeconomic and environmental problems in the region with serious effects on human lives and farm lands. Although factors such as institutional weakness, lack of effective implementation of environmental laws were hypothesized as the causes of vandalism in the region, they are considered neither exhaustive nor confirmed as no available empirical evidences can be found confirming the asserted causes of vandalism in the area. Against this background, this study employed confirmatory factor analysis (CFA) on 12 latent variables in determining the real factors that cause and influence frequent pipeline vandalism in the Niger delta region, Nigeria.

2. Theoretical and empirical literature

Vandalism is defined as a deliberate hostile behavior aimed at environmental objects with the motive of damaging the property (Christensen, Johnson, & Brookes, 1992). While Zinganel (2005) looked at vandalism from the Marxian perspectives as a productive force that fought against exploitation of the capitalist system. Vandalism may include Tactical vandalism e.g. sabotage at the work place; Vindictive behavior, e.g. form of revenge; Play vandalism e.g. breaking of window panels and Malicious vandalism e.g. vandalism out of boredom, exasperation, resentment, and frustration (Winter, 1992).

Theoretical approaches to vandalism focuses on two issues: the actors and the targets of vandalism (Christensen et al., 1992). The former tries to assess the psychology of the actors trying to find out the social causes of vandalism. The latter is based on the realm of environmental psychology. It raises questions about why some objects are damaged and others are not. Understanding psychology of vandalism enables us to identify a link between the actor and the object and the rewards attached to it. In addition, it also allow us to establish a causal relationship between purpose and benefit of vandalism and the social cost of the damage to the society and the context relates the destruction or dilapidation of an environmental object (Christensen et al., 1992).

Vandalism may arise as a result of perceived marginalization which is a state of denial, deprivation and exclusion from societal resources, socioeconomic backwardness that result in little or no control over an individual or a group of individual's lives and resource (Kagan et al., 2002). This may lead to the formation of groups among the aggrieved persons and may result to stress and emotional outburst (Tajfel, 1982). Therefore, marginalized people who feel deprived of their rightful position in the society will feel motivated to cause damaged towards public or private properties. Equally, marginalized societies feel social policies and practices tend to favor them less when it comes to attaining educational, health services, housing, income, leisure activities and employment opportunities. Fathi, Aram, and Karimian (2012) pointed out that marginalization has a significant relationship with vandalistic behavior and may result in society characterized by a breakdown or even absence of social norms and values. In a comparative analysis of marginalized and non-marginalized areas, they concluded that vandalized behavior in youths is more pronounce in marginalized areas. Sayaf Zadeh and Behnam Ghaderzadeh (2016) found that marginalized people suffer more from social problems, therefore, government needs to take their plight seriously before it promotes social unrest.

Relative deprivation (RD) theory shades light into Tajfel's Categorization-Identity-Comparison (CIC) theory. It explains the relationship into three categories: social identification, (identify with a particular group), social categorization (identification with one group and exclusion from others) and, social comparison which includes value emotional adaptation of members (Tajfel, 1982). Therefore, deprived societies perceived discrepancy between individual's subjective "value expectations and value capabilities". While value expectations represent the expected good conditions of life an individual believe is his right and entitle for, and value capabilities are the goods and better conditions of life they are capable of attaining in life. In-ability to achieve above may result in stress which leads to emotional outburst that takes the form of violence against the society (Crosby, 1976). Despite criticisms against Gurr and Crosby for their failure to differentiate between egoistic and fraternalistic individual and group emotions, their theories have contributed significantly in the field psychology. Equally RD has provided satisfactory progress in understanding social psychology of intergroup and Tajfel theory.

Looking at criminal opportunity theories, Cook (1986, p. 2) pointed out that, "Criminals tend to be somewhat selective of crime target and are most attracted to targets that appear to offer a high payoff with little effort or risk of legal consequences". He argued that Potential victims usually take precautionary measures of self-protection efforts to respond to the crime threat, the magnitude of which tends to aggravate with the probability of victimization, also see (Cohen & Felson, 1979). Hence, it can be argued that there exists compelling evidence from studies that people vandalize for economic or political benefits, as in the case of the Niger delta region. The arguments for marginalization and pipelines vandalism in the Niger delta region resulted to the region benefiting from the following programmes: NDDC 1961, OMPADEC 1992, MND 2009 and Amnesty programe for the Niger delta Militants 2009. In addition the region has been enjoying a revenue derivation formula ahead of all the regions in the country. They enjoy revenue derivation from 1% in 1978; 1.5 in 1979; 3% in 1987; to 13% in 1999. Despite that, the region is still demanding between 25, 50 and 75% respectively for the region to become truly self-reliant and competitive (Okpo & Eze, 2012). Militancy activities are also used as a means of negotiating with the government and oil companies (Eragha & Irugbe, 2009; Okolo & Etekepe, 2010).

Blowing up pipelines creates shortages of petroleum products for home and international markets and sent signals for sudden increase in the crude oil prices (United Nations Development Report [UNDP], 2006). Empirical studies have found that there is positive relationship between geopolitical instability in oil producing regions and market price shocks (Khalifa, Alsarhan, & Bertuccelli, 2017). With instability in oil producing regions, Misund and Oglend (2016) and Chen and Xiao (2015) argued that there will be effects on the perspective of chain supply disruption, they pointed out that firms try to find ways of managing an anticipated disruptions in supply by adopting strategies to avert disruptions in supply and demand uncertainty more effectively. Also see Liu, Liu, Zhu, Wang, and Liang (2016).

On the other hand, instability in oil producing areas can also affect the dynamic relationship between aggregate demand and supply shocks and oil price volatility, Misund and Oglend (2016). They further argued that a shortage in supply may result in creating competition among available supply sources which makes the situation very complex. While Iwayemi, Adenikinju, and Babatunde (2010) and Chen and Xiao (2015) looked at it from the point of income and price elasticity which in turn affects the demand for petroleum products, especially considering that Nigeria as an importer of refined petroleum products despite been the largest oil producer in Africa. It shows that there is long term relationship between income and demand for imports of petroleum products in Nigeria.

Although theories have shown a positive relationship between unemployment and crime, however, significant numbers of empirical studies have shown a weak or negative relationship. Altindag (2012) found out that there exist a positive relationship between unemployment and property crime, especially among people with lower educational levels and it's magnitude on the economy is significant. While, Phillips and Land (2012) found a mixed results which indicates a weak relationship between unemployment and crime and statistically not significant. However, there is a positive and significant relationship between property crime and unemployment (e.g. burglary, car theft) and concludes that there is need for further investigation. Also Blomquist and Westerlund (2014) have found out the existence of a non-stationary relationship between unemployment and crime or there exist no cointegration between unemployment and crime. They further questioned previous results with previous findings of a significant unemployment-crime relationship might be spurious. Kapuscinski, Braithwaite, and Chapman (1998) observed that although statistics from different parts of the world provided a positive link between unemployment and crime also cross-sectional data provided that positive relationship, but a time series failed to support positive relationship. They concluded that to make their position scientifically acceptable there's need to have positive results from both cross-sectional and time series. Equally, their study also failed to support that until both male and female unemployed were considered. While a number of studies have shown that unemployment results to increase in burglary, car theft, homicide, etc. Edmark (2005); Kapuscinski et al. (1998); Altindag (2012) however, it can't be related to vandalism.

Institutional factors are also among the most likely factors considered promoting vandalism in the Niger delta region. Empirical results show a significant and positive relationship between poor governance and vandalism. A number of African and Latin American countries face huge socio-economic challenges that might not be unconnected with the macroeconomic instability such as high government budgets with little or no positive results, high inflation rate, and weak legal systems. Weak institutions encouraged macroeconomic instability which leads to weak property rights, and also lack of equal opportunities for education which may lead to state failure (Acemoglu, Johnson, Robinson, & Thaicharoen, 2003). This is why many African countries have weak rule of law, corruption, absence of accountability and lack of freedom of information which results in poor governance and political violence (Bräutigam & Knack, 2004).

Rametsteiner (2002) citing Musgrave (1959) and North (1991) observed that the function of government includes allocation, distribution and stabilization. Therefore, government intervention is justified where the free market have failed to allocate in allocating resources efficiently. Also see Schmid (2008); Ménard and Shirley (2005) and Slavíková, Klavánková-Oravská, and Jílková (2010). In addition quite a number of empirical evidences blame government institutions as either been weak or in some cases failed to adhere to environmental standards which results to total disregard to environmental standards (Slavíková et al., 2010; UNEP, 2011). This has led to institutions playing more or less significant role in environmental changes with little or poor incentives to for protecting these resources (Young, 2002). Slavíková et al. (2010) citing (Block, 1990a and Raeder, 1998) argued that instead of blaming market failure on environmental degradation, it is evident that environmental poor quality is as a result of failure of the state as the main leader to block the evolution of property right due to its interest (Stroup & Goodman, 1992).

There are substantial evidences of institutional failures in Nigeria which can leads to violent behavior. UNDP (2006) observed that despite huge financial allocations to NDDC, OMPADEC, derivation fund, less is achieved in terms of development of the region due mainly to corruption, mismanagement, lack of adequate justice and human right abuses. The expectations of achieving meaningful development through infrastructural provision, environmental protection are lacking due to poor governance. d'Agostino, Dunne, and Pieroni (2016) also arguing in line of the above pointed out that despite having abundant resources that could have benefited African countries it turn out to be resource curse which fuel conflict primarily due to poor governance. It is viewed that country's institutions which comprises legal, social and political system influences economic performance of the country could not do much (Ambituuni, Amezaga, & Emeseh, 2014; Kherallah & Kirsten, 2002)

Equally Akpomera (2015) pointed out that weak government institutions may results in failure to protect the environment through strict environment laws ultimately leads to environmental degradation. Besides, it gives room for host community leaders and influential people to support the youths to vandalize crude oil pipelines in the name of liberating the region from government neglect. Ultimately this becomes the source of livelihood of many youths and some community leaders in the Niger delta region.

A number empirical researches claimed that institutional weakness, injustices, marginalization and corruption force people to fight for justice in a negative way (Al-Kasim, Søreide, & Williams, 2013; Dzhumashev, 2014). On the other hand d'Agostino et al. (2016) blamed increased in government expenditures and limited growth in Africa for promoting corruption. This results in to anger frustration and loss of confidence in the government which in turn encouraged youths reacting through vandalism. This is evident from the number of programmes set up by government such as the NDDC, OMPADEC, MND, which failed to deliver the developmental efforts of the government due to corruption, hence fueled pipeline vandalism in the region. Akpomera (2015) observed that absence of political will can also institutionalize and supports corruption by elites and government officials which weakened governance and legal establishments. Also see Ulman and Bujancă (2014).

Equally, Barker and Bridgeman (1994) argued that despite existence of a relationship between legal system and vandalism, the legal system can't do much to reduce vandalism because it's role is limited by absence of evidence of those who commits the act of vandalism. Although military option was taken to deal with militancy in the Niger delta region, there was unclear legal implication of military engagement which resulted to civilian casualties (Lutz, 2013).

Katsouris and Sayne (2013) pointed out that although oil industries operates under certain laws, but oil theft in Nigeria is not given much legal attention it requires which makes it easier even for their business partners to engage in illegal oil activities. Equally, Meng, Zeng, Shi, Qi, and Zhang (2014) attributed positive relationship between weak legal and low penalties to low or selective reporting of environmental damage by companies.

3. Methodology of the study

3.1. Sources of data

The study uses primary data and employed the Structural Equation Model (SEM) for the analysis. Questionnaires were administered to respondents in the study area. From the questionnaire the respondents were asked set of questions relating to environmental issues and their awareness about the significance of environment (indicate the section from the Qs) from the Likert-scale options. The respondents are made up of 214 male and 55 female. The age distribution of the respondents ranges as follows: 63.3% of the respondents fall within the age group of 18–30, 29.0% made up respondents between the age group of 31–40, while 8.9% is made up of respondents between the age group of 41–50 and 5.6% is made of respondents between the age of 51–70. The distribution is considered to be significant for the study because its focus on the young and middle age members of the

communities affected by crude oil spillage and in some cases who actively participated in the act of pipelines interjection. Also we focused on young farmers in the affected communities who are significantly feeling the impact of crude oil spillage due to pipeline vandalism and some community stake holders in the affected region of lower Niger delta region of Nigeria. Maximum cooperation was given to the researchers while collecting the data as it is seen as a step towards making their plight known to the international community.

The respondents' income groups are classified as low income, medium and high income groups. With 47.2% as low income, 39.7% as middle income, and 13% as high income earners. The respondents were asked about environmental awareness in relation to erosion and flood, air pollution, oil spillage, climate change and loss of fauna and flora on a scale rating of 4–1. The statistical results indicates environmental issues from very important, rather important, not very important and not important respectively. The statistics show 91.8% of the respondents considered environmental issues very important, 4.1% considered it rather important, 2.2% viewed it as not very important and 1.9% maintained that it is not important. From the statistical analysis it's clear that the respondents (who represent the Niger delta people) have adequate knowledge about the environment they live in (Table 1).

3.2. Assessment of normality

Assessing data normality is important before undertaking SEM analysis. However, there are disagreements between researchers on the cut off points for skewness and kurtosis. While some researchers give the normal distribution with a base of positive and negative sign kurtosis (DeCarlo, 1997; Kline, 2011). However, it appears no consensus has been reached to date (Kline, 2011) but absolute kurtosis values ranging from ± 2.0 to ± 7.0 and higher have been proposed as possible early departure points of non-normality (Byrne, 2013 citing Boomsma & Hoogland, 2001; DeCarlo, 1997; West, Finch, & Curran, 1995). This study therefore adopted Byrne (2013) kurtosis of between ± 2.0 and ± 7.0 as cut off point. The skewness of the data for this study falls within -1.968 to $-.439$, while kurtosis -1.194 to $+6.040$ which is still within the acceptable limit. From the questionnaire the respondents were asked set of questions relating to environmental issues and their awareness about the significant of environment (indicate the section from the Qs) from the likert-scale options 1–5: Strongly Disagree = 1; Disagree = 2; Disagree = 3; Agree = 4 and Strongly Agree = 5.

3.3. Model specification

The mathematical model specification for the study was built on the hypothesis that:

$$Y = \beta_0 + \beta_1 PV + \beta_2 UD + \beta_3 UE + \beta_4 MG + \beta_5 ED + \beta_6 PM + \beta_7 CR + \beta_8 MA + \beta_9 PF + \beta_{10} LF + \beta_{11} GV + U_i$$

where, Y = Vandalism; β_0 = Constant; PV = poverty; UD = Underdevelopment; UE = Unemployment; MG = Marginalization ED = Environmental Degradation; PM = Poor Management; CR = Corruption; MA = Black Market Availability; PF = Weak Political Factors; LG = Weak Legal Factors; PGV = Poor Governance and U_i is the error term. $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10},$ and β_{11} are coefficients of the independent variables showing the magnitude of effects of the respective independent variables on the dependent variable "vandalism." The model for the study was validated by experts in the field after series of pre-tests.

Table 1. Environmental awareness of the respondents

Awareness	Frequency	Percent (%)
Very important	247	91.8
Rather important	11	4.1
Not very important	6	2.2
Not important	5	1.9
Total	269	100

Factor analysis comprises exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is not theory driven as pointed out by (Thompson, 2004) and not aimed at hypothesis testing but to assess how variables form distinct clumps as explanations for some underlying latent constructs base on their inter-correlation as it provides a justifiable ground for calculating an aggregate value in respect of each dimension for further analysis. The grouping of variables is important in explaining some structural dimensions. It takes into account that summated measures for the various dimension is to be subjected to reliability analysis to determine if they measure the same latent construct. While on the other hand CFA is theory driven which tries to test specific hypothesis or theories about the dimensional structure that underlines a set of variables. Amos graphics version 22 was used in the analysis of the study.

4. Results and discussion

4.1. Confirmatory factor analysis

The study adopted the three levels in undertaking SEM analysis which includes; CFA, measurement model and the structural model. The first two serves as data preparation for undertaking SEM, while the third level is the complete SEM analysis. The CFA provide analysis on the relationship between the latent variables and their corresponding indicators. This gives the researcher the ability to test a theory and observe how constructs can represent latent variables (Kline, 2011; Loehlin, 2004).

Therefore, in testing the convergent validity, CFA was carried out. Convergent validity is set of items (indicators) that are considered to measure a given construct through average variance extracted (AVE) test. While Fornell and Larcker (1981) considers AVE >0.5 as high convergent validity, on the other hand Haire et al. argued that ≥ 0.5 can be considered as high convergent validity and constructs with lower values below the cut-off points are to be removed. The above procedures were carried in this study as specified and all factor loadings below the cut-off points were removed, while those above the threshold were maintained.

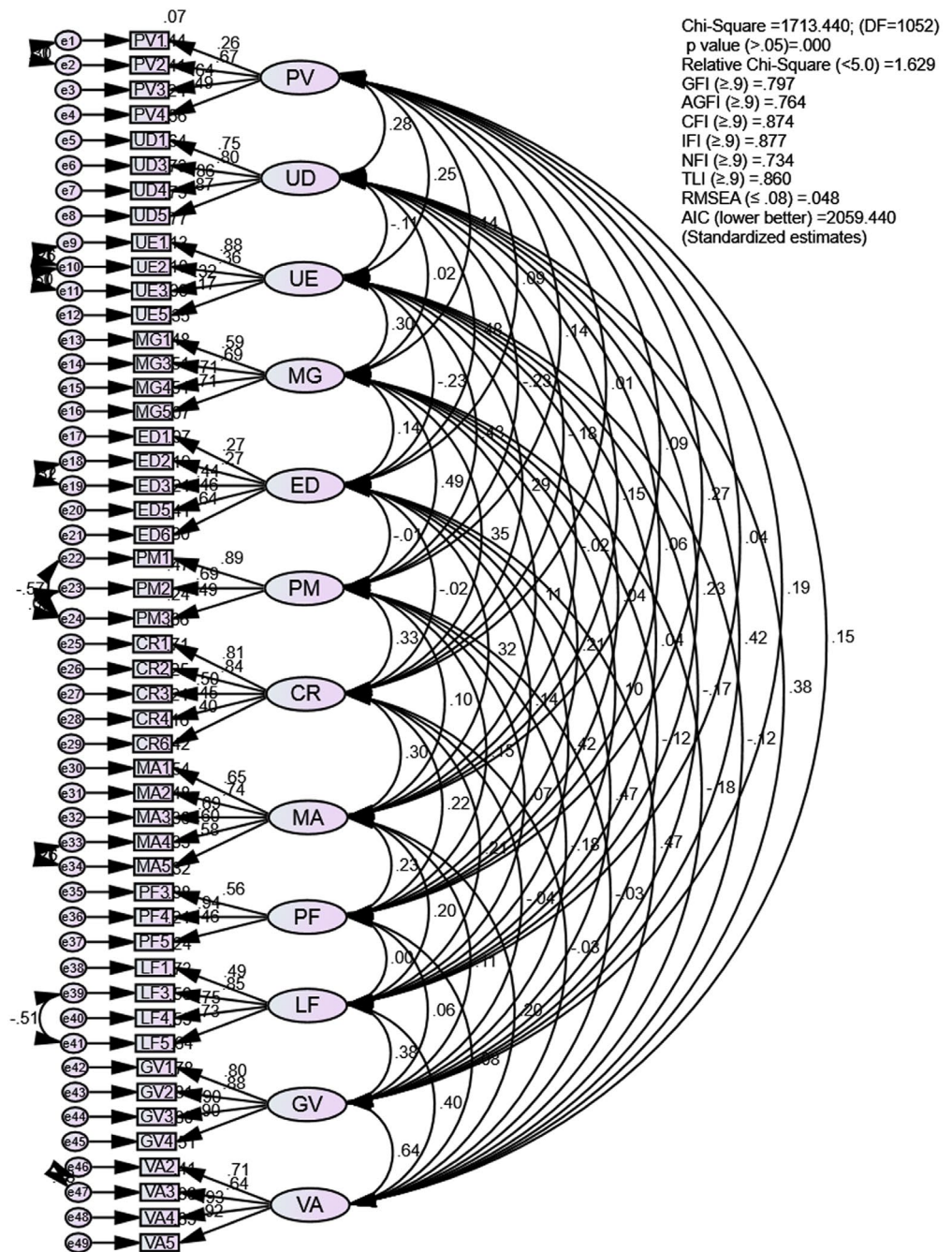
4.2. The measurement model

The measurement model is a data preparatory part which assesses normality of the measurement instruments. It's also used as measure between latent and their observed measures in CFA analysis. It explains the relationship between latent and observed variables (Ho, 2006). In this research work, after analyzing all the variables, all factors with a cut-off point of greater or equal to ≥ 0.5 were selected and considered in the measurement model. In order to determine the goodness-of-fit indices consideration were given to the following recommended fit indices provided by (Ho, 2006). This includes: χ^2 , the relative χ^2/df , RMSEA, GFL, CFI, AGFL, IFI, RMR and TLI.

However, one of the most significant measure of goodness-of-fit in SEM is χ^2 (Jöreskog & Sörbom, 1993) and the measurement model is said to be acceptable if the χ^2 value is less than three times the value of df which is the value of relative χ^2 (Carmines & Melver, 1981). As earlier observed the GFI and AGFI indices ranges from 0- 1.00 (Bentler & Yuan, 1999), with values close to 1.00 ($\geq .9$) indicating good fit. Also other fit indices like CFI, IFI, and TLI ranging from 0-1.00 with values close to $\geq .95$ (for studies with large sample size) are considered good fit (Hu & Bentler, 1999). While RAMSEA as suggested by Steiger and Lind (1980) with the value of $< .05$ is indicating good fit and $> .08$ indicates substantial errors in population approximation.

The measurement model in Figure 1 with the goodness of fit indices as follows; χ^2 value of 1,713.440, $df = 1,052$, relative χ^2 (χ^2/df) = 1.629, $p = .00$, GFI = .797, AGFI = .764, CFI = .874, IFI = .877, NFI = .734, TLI = .860, and RMSEA = .048. Although the fit indices fall short of good fit expectations we can still accept it as a moderately fit measurement model. Since χ^2 , RMSEA has good fit with CFI and IFI having moderates fit of proximately .90 since Hair et al. suggested that, if any 3 to 4 of the fit indices meets the requirement it can be accepted as a measurement model.

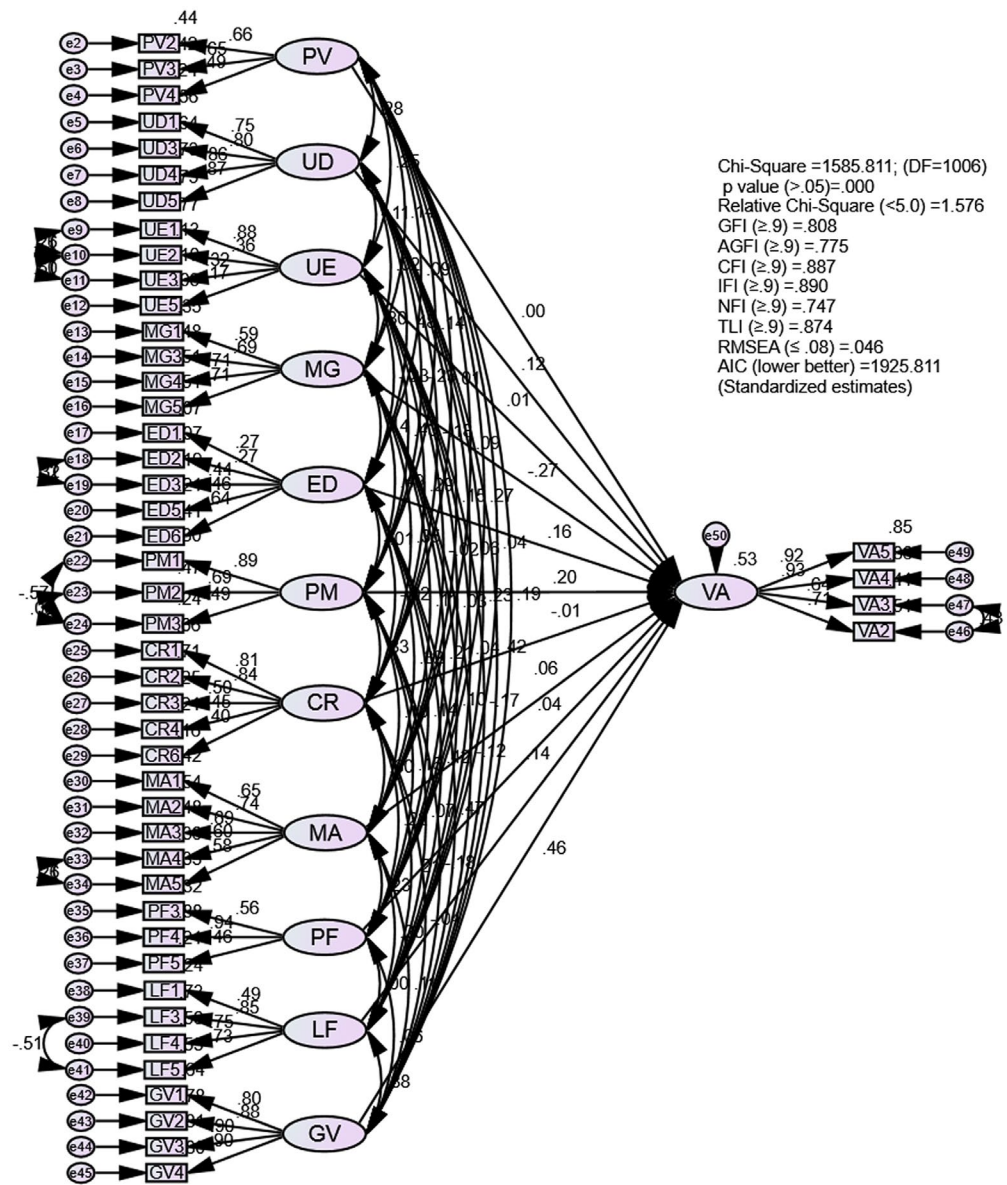
Figure 1. Measurement model of the study.



4.3. CFA model with interaction

The third level in SEM analysis is used to assess the individual and collective contribution of the independent (predictors) variables as specified in the equation in relation to the dependent variable (vandalism). The analysis shows the model moderately fit the data as outlined by the fit indices in Figure 2. The χ^2 (known as CMIN) has a value of 1,585.811 which is significant at one percent ($p = .000$), indicating that the model fit the data. Equally, the normed χ^2/df (CMIN/df) with a value of 1.576 shows significant improvement from the previous 3.2, RMSEA .046 is also indicates a good fit since its now less than the cut-off point of .08. Equally there are some improvement in GFI .808, AGFI .775, CFI .889, IFI .890, NFI .747, and TLI .874. Although some measurement cut-off points like the GFI, AGFI and NFI still indicates poor fit but it is observed that once RMSEA and χ^2 and any other two

Figure 2. Estimated structural model.



met the requirement then it's. Therefore, with CMIN/df of $1.6 < 5$, RMSEA $.05 < .08$ and CFI $.90$, IFI $.90$ and TLI $.90$ we can conclude that a minimum requirement have been achieved, that signifies that the measurement model fits the observed data.

The path diagram show the contribution of each structural path to the overall structural model which explains the relationship between the dependent variable (vandalism) and 11 independent variables. The analysis of the SEM in Figure 2 shows that the standardized regression weight in the hypothesized path model are consistent with hypothesis of the study, which by observing that, reveal that there are a number of factors that are contributing and influencing pipeline vandalism in the Niger delta region.

The structural equation regression weights estimates on Table 2 indicates that poor management significantly contributed to crude oil pipeline vandalism in the Niger delta region ($\beta = .197$, CR = 2.564, $P = .010$) The study also found out that Poor management has a positive and significant relationship with vandalism and can encourage crimes which is in line with the findings of Anifowose, Lawlar,

Table 2. Unstandardized and standardized regression weight in the hypothesized path model

Hypothesized relationships			B	SE	β	CR	P
VA	<—	PM	.158	.062	.197	2.564	.010
VA	<—	CR	-.011	.051	-.014	-2.208	.835
VA	<—	MA	.060	.071	.055	.842	.400
VA	<—	PF	.032	.051	.038	.642	.521
VA	<—	LF	.215	.105	.138	2.059	.039
VA	<—	GV	.425	.071	.464	6.024	.000
VA	<—	ED	.728	.541	.157	1.345	.053
VA	<—	MG	-.244	.073	-.269	-3.359	.000
VA	<—	UE	.004	.051	.006	.081	.935
VA	<—	UD	.094	.060	.116	1.553	.120
VA	<—	PV	.003	.074	.003	.042	.967

Note: B = Unstandardized regression weight, β = Standardized regression weight; SE = Standard error, CR = Critical ratio, P = p-value; VA, PM, CR, MA, PF, LF, GV, ED, MG, UE, UD, PV.

Horst and Chapman (2012) and Klassen and McLaughlin (1996). Therefore, we can attribute violence in the Niger delta region to poor environmental management with serious significant effects on their sources of water supply, farm land and other economic activities in the region. It can also be attributed to poor governance and inadequate compensation leads to violence in the Niger delta region (Onuoha, 2007; Oshwofasa, Anuta, & Aiyedogbon John, 2012).

Legal factors has significant contribution to crude oil pipeline vandalism in the Niger delta region ($\beta = .138$, CR = 2.059, P = .039). In addition it was established that there is a significant relationship between legal factors and vandalism. This finding also is in line with Loftin and McDowall (1982). It was argued that, the level of resource allocated to law enforcement agencies have a direct relationship with the fight against crimes. Although, crime has been negatively related with the resources allocated to law enforcement. Economic theory of Property right gives the owner the right to use and dispose his property in a without any interference, equally there should be punishment for offenders who damage other people’s property (Cooter & Ulen, 2016).

This finding is in line with Imosemi, Abangwu, and Nwano (2013) and Onuoha (2007) were it was found that the weak laws and in adequate compensation to victims of whose properties were damaged can encourage crime. Weak legal system which failed in prosecution of vandals in the Niger delta region almost is a factor that contributes vandalism. Evidence have shown that despite the used of security agencies such as Nigeria Security and Civil Defence Corps (NSDC), the special military, the joint task force (JTF) and the police the vandals still carry out their activities without much challenge. Equally the number of militants prosecuted and jailed over vandalism seems to be difficult if not impossible. This is not unconnected with the corruption in the Nigeria’s legal system. Especially when the vandals have the support of politicians from the region and corrupt judges can easily be bribe easily to frustrate prosecution of vandals (Galadima, Garba, Leke, Almustapha, & Adam, 2011; Okonmah, 1997).

Poor Governance has significantly contributed to crude oil pipeline vandalism in the Niger delta region ($\beta = .464$, CR = .6024, P = .000) The findings of the study was able to establish that poor governance (GOV) have a significant relationship with vandalism is in line with other empirical studies (Anifowose et al., 2012; Aroh et al., 2010; Jike, 2004). Poor governance has been attributed to countries with weak governance and poor management of resources can encourage deliberate attacks on its infrastructural facilities. This is because, these are the major challenges’ most developing countries are facing especially Nigeria. They are the institutional factor whose inefficiencies can encourage deviant behavior, especially among the youths.

Environmental degradation has significantly contributed to crude oil pipelines vandalism in the Niger delta region ($\beta = .157$, $CR = 1.345$, $P = .053$). Our findings show that significant relationship between environmental degradation and vandalism does exist which is in line with the findings of Eragha and Irugbe (2009) who observed that years of neglect of the environment and its socio-economic and health and psychological effects on lives of the people resulted to encouraging vandalism in the region. Also UNDP (2006) attributed militancy in the region to environmental neglect and underdevelopment due to oil activities fueled violence in the region. Osaghae et al. also argued that militancy in the Niger delta region is as a result of environmental neglect and poor economic conditions of the people in the region. Equally the finding of the study is in line with the findings of Eweje (2006) argued militancy in the region is as a result of unacceptable environmental degradation from oil companies' activities. Also, Omotola (2009) and Jike (2004) pointed out that psychological disorientation stemming from environmental degradation is a factor that affects critical family institutions in the society which leads loss of parental responsibility and which subsequently results in violent behavior among youths.

There's a significant, but negative relationship between Marginalization and crude oil pipeline vandalism in the Niger delta region ($\beta = -.269$, $CR = -3.359$, $P = .000$). The result of the study shows significant but negative relationship with vandalism while Fathi et al. (2012) also found a significant but negative relationship between marginalization with vandalistic behavior. This indicates that as the militants vandalize marginalization is reduced since there are economic benefits involved. It's also argued that the resources belong to them and they are fighting for the resource control. Babatunde (2010) found a significant relationship between marginalization and neglect by oil companies and government leads to vandalism of oil facilities in the region. Lawal and Ese (2012) also attributed vandalism to environmental neglect and marginalization. Generally there is believe among the Niger delta agitators' that the petroleum resources belong to the Niger delta people only, therefore, as they engaged in vandalization of petroleum pipelines they feel they are less marginalized because of the proceeds from sales makes them economically comfortable. This is rooted to their opposed to the 1978 land use Decree, which transferred ownership of all lands and its resources to the central government which others considers as the genesis of the Niger delta problems (Okpo & Eze, 2012). It also enables the region to benefits more from federal allocation and developmental programs. This is evident in the establishments of NDDC, OMPADEC, MND Amnesty program and improved revenue allocation to the region from 1% to 13% over the years (Okpo & Eze, 2012). Equally they feel less unemployed as long as they are vandalizing crude oil pipelines that now serve as a source of employment opportunities for them.

While on the other hand, corruption with ($\beta = -.014$, $CR = -.208$, $P = .835$); Black market availability ($\beta = .055$, $CR = .842$, $P = .400$), Political factors ($\beta = .038$, $CR = .642$, $P = .521$); Unemployment ($\beta = .006$, $CR = .081$, $P = .935$); Underdevelopment ($\beta = .116$, $CR = 1.553$, $P = .120$); and Poverty ($\beta = .003$, $CR = .042$, $P = .967$) respectively don't contribute significantly to crude oil pipeline vandalism in the Niger delta region.

5. Conclusion and recommendation

Based on the findings of the study, the researchers conclude that poor management, legal factors, poor governance, and environmental degradation are the major factors that cause and influence crude oil pipeline vandalism in the Niger delta region of Nigeria. While marginalization though significant, but with a negative sign indicates that it is used as a means to influence allocation of subsidies, developmental programs, increased in revenue derivation and to justify pipeline vandalism.

The researchers also conclude that improvements in the provision of good infrastructure such as road network, hospitals, electricity, portable water supply and reduction in land degradation will bring an end to militancy and sustain lasting peace in the region with less compensation. Also preference should be given to good governance and accessibility for the training of ex-militants. Finally, there will be significant reduction in the costs of maintenance of crude oil pipelines in the Niger delta region if government will consider the findings of this research study and implement with utmost sincerity.

Abbreviations

NNPC	Nigeria National Petroleum Corporation
UNEP	United Nations Environmental Program
NDDC	Niger Delta Development Commission
OMPADEC	Oil Mineral Producing Areas Development Commission
MND	Ministry for Niger Delta
UNDP	United Nations Development Program
NSDC	Nigeria Security and Civil Defence Corps

Funding

The research is self-funded by the researcher and is carried out at the University Putra Malaysia.

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Citation information

Cite this article as: Causes and consequences of crude oil pipeline vandalism in the Niger delta region of Nigeria: A confirmatory factor analysis approach, Ahmed Tukur Umar & Moh'd Shahwahid Hajj Othman, *Cogent Economics & Finance* (2017), 5: 1353199.

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