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Corruption and the Efficiency of Customs Clearance Process in Selected Countries

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Abstract

In this study the author presents what is believed to be the first attempt at using micro-level data to evaluate a theory of how corruption affects the customs clearance process in selected African countries between 2007 and 2015 using ordinary least-squares (OLS). The study validates the hypothesis that corruption causes a diversion of effort from clearance functions to unproductive services of negotiating bribe payments. It also finds that improvements in port facilities will improve customs effectiveness. The relationship identified between corruption and the effectiveness of the customs service is robust and includes regulatory quality, government effectiveness and an alternative use of the corruption index.

Keywords: Corruption; Customs clearance; Government; Policies

Introduction

Countries trade with other countries due to differences in, for example, comparative advantage, resource endowment, taste and technology. These differences create disequilibrium between supply and demand for goods and services among citizens of different countries, while e-trade has a tendency to restore equilibrium.

However, despite the importance of international trade, it is not without its disadvantages. Countries tend to minimise or eliminate the disadvantages through trade policies, such as tariffs, embargos, quotas and other protectionist policies. The formulation of one or more of these policies may trigger counter policies from other nations in what may be regarded as tit-for-tat. The formulation of trade policies is one thing; implementation is another. As the gatekeeper of the nation, Customs performs many crucial functions, such as the implementation of trade policies, export promotion, stopping the entry of harmful goods into the country, and the implementation of international obligations. Thus, it is important to study the determinant of efficiency in customs services because their ability to transform inputs into services affects overall national economic performance.

Following Yan and Oum [1], we interpret the provisions of public services using the following sequence: government decides the target levels of public services, such as schools, transportation, customs services and public utilities given the budget constraint, and then employs labour and capital to achieve the target levels. Thus, the two research questions regarding efficiency of public services are:

- Whether or not the levels of different public services are over or underprovided.
- Whether or not the expenditures on capital and labour inputs are minimised in producing the target levels of services.

The focus of this study will be on the second question.

In most countries, the main targets for customs services are to generate as much revenue as possible and ensure that goods are cleared as quickly as possible. The latter target is very important for this study. Customs clearance has to do with all activities related to movement of goods in and out of a country through customs officers. Before this movement take place, certain things such as issuance of documents to a shipper indicating payment of duty and clearance of goods. The more efficient this process is, the higher the number of correctly cleared goods and thus the greater the revenue generated from the process. Thus, the first question is correlated with the second process. If this process is affected by corruption, government revenue will be affected, and the overall working of the economy could be similarly be affected. Our objective is to look at the major hindrances to this process with a view to finding solutions.

In view of the above, this paper attempts to empirically analyse the effect of corruption on the efficiency of customs services in Nigeria, Ghana, Chad, Cameroon and the Benin Republic. The paper is organized into five sections: introduction, literature review, methodology, results and conclusions.

Research Questions

- Does corruption have any impact on customs' efficiency?
- Is the impact of corruption on customs' efficiency significant?
- Do port facilities have any impact and how significant it is on customs' efficiency?
- What is the effect of interaction between corruption and port facilities on the efficiency of customs services?

Research Hypothesis

- Corruption has no impact on customs' efficiency.
- There is insignificant impact of corruption on customs' efficiency.
- Port facilities has no impact and insignificant on the efficiency of customs services.
- The interaction between corruption and port facilities have no impact on the efficiency of customs services.

Causes of Corruption in Customs Services

Causes of corruption in the customs service are complex. In this

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study we shall look at both the internal and external factors that cause corruption in the customs service.

Trade policy

The kind of trade policies that country pursues determines the willingness of the public to offer bribe to customs officials. Trade policies such as free import, quota system, high tariff, selective import control, total ban on imports from certain countries and trade incentives for exports firms go a long way to decrease or increase corruption. Restrictive or poorly designed trade policies promote corruption. High tariffs, extensive quantitative restrictions or prohibitions increase the propensity to violate the law. Multiplicity of exemptions or complexity of rules and regulations permit varying interpretations and create loopholes that can be exploited by corrupt officials.

Political executive

In most countries in Africa, government in power intervenes in the working of customs service. This interference is in the form of appointment of political confidantes to top management positions with the understanding that the bribes would be shared with the controlling politicians. A point in case is the appointment of Comptroller-General of Nigeria customs Service (NCS). The president of the federal republic of Nigeria has the right to appoint any customs officers into the position. The worst case was the appointment of CGC from outside the customs service by the government of President Mohammed Buhari in the person of Col. Hameed Ali (rtd). The new customs boss did not waste time in sacking over 40 senior officers in the agency on assumption of office. The action which is termed by some stakeholders as politically, religiously and regionally motivated. These positions were filled by people deemed loyal to the administration at the centre.

Political interference can also take the form of direct instructions to customs officials in specific cases. Politicians may intervene on behalf of clients, constituents, political financiers, family members or friends who would like to evade customs duties on intended imports or want to avoid penalties for infractions already detected. In the first quarter of 2017, it was reported widely by an online media that the senate president, Bukola Saraki attempt to evade tax on imported vehicles and was subsequently turn down by the customs boss. He denied the allegation via his media aid but observers are of the opinion that that was the reason for disagreement between the customs boss and the Senate Chamber headed by Senator Bukola. It was also alleged (though unconfirmed) that the administration of former president Goodluck Jonathan is mare by import wavers for political cronies, relatives, friends, etc. amounting to millions of Naira.

The integrity environment in the public sector

Corruption in customs does not exist in isolation. To some extent, it is a manifestation of the prevailing ethical standards in the public sector. If ruling politicians and senior civil servants, who are supposed to uphold integrity in the public sector, are seen to be corrupt, if public office is generally viewed as an asset to be exploited for personal benefit, if public servants have no compunctions about flaunting ill-gotten wealth, it becomes very difficult for customs officers to remain immune to the lure of illicit enrichment.

Society's attitude towards corruption

In many countries that have suffered systemic corruption for a long period, corruption has become an accepted fact of life. Finding little recourse against corrupt actions, seeing the corrupt prosper without any visible costs and finding it difficult to deal with the 'system' honestly, citizens have become resigned and cynical. They have developed life strategies around the reality of corruption. As a result, the stigma attached to corruption has lessened. The corrupt are no longer ostracized but courted as they hold the levers of power. Customs officials are no long deterred from moneymaking positions due to the societal acceptance of corruption.

Coordination, monitoring, supervision and evaluation

In most countries under study, coordination of customs officials at the headquarter and those at the border post is either weak, inefficient and never exist at all. This makes it easier for officials at the border to help their kinsmen and women and or collect bribes from importers to allow certain goods into the country. Supervision is hard to come by in the customs service due to lack of necessary gadgets to do so. Lack of specified targets has made monitoring and evaluation an exercise in futility. Nigeria customs service (NCS) and Cameroon Customs Administration had improved tremendously in the area of monitoring and evaluation due to the support they had from the government of the respective countries, World Bank and World Customs Service (WCS).

Organizational structure

This has to do with operational units. It may be too small or too much and this will it lead to a number of informal entry points left unman by customs officers in the case of the later and contraband may sneak in through those points. Corrupt customs officers will take advantage of that. In Nigeria, we have over 50 illegal routes to Nigeria from outside the country. Important organizational units that could help combat corruption, such as Intelligence, Vigilance, Mobile Anti-smuggling Teams, may be altogether missing in some of these countries.

Security of job

Frequent change of customs head encourages corruption in the agency. If they know that their tenure will be cut short, they will focus on short term goals and to achieve these goals, they end up circumventing the existing laws and orders by using corrupt people. The behavior of the leaders sets the tone for employee conduct throughout customs. When management is corrupt, employees follow suit. Also, institutional anti-corruption mechanisms break down, as it is the leaders who are supposed to enforce them. Even the external anti-corruption mechanisms will do little or nothing because it is control by the government in power which the head of customs.

It should be noted that these are the major causes of corruption in customs services. However, there are other causes such as religious, ethnic, god 'fatherism', and nepotism. The list is not exhaustive here.

Customs Efficiency in Selected Countries

In the last few years, World Bank had come up with a measure of the effectiveness of customs service in most countries in the world. Six indicators were put in place to assess the performance of customs administrations across countries in the world. These indicators include customs clearance Process, Logistics competence, Quality of infrastructures in ports, timelines, international shipment and tracking. Then the overall performance index which is the combination of all other indicators. We shall look at this index across countries under study for comparison sake. It should be noted that the analysis starts from 2007 to 2014 and scores for 2008, 2009, 2011, and 2013 are not available.

In terms of the customs clearance process, Nigeria perform better poorly in 2010, 2012 and 2014 compare to the neighboring Benin

republic. Cameroon did better on this scale than Nigeria in 2007 and 2010. Chad republic overtook Nigeria in 2010 and 2014. However, there is remarkable improvement in customs clearance process for Nigeria between 2007 and 2014. Figure 1 summarizes the performance of each country on Customs Clearance Process between 2007 and 2014. Some of the relative poor performance of Nigeria has been blame on customs officers' ineffectiveness by the stakeholders. However, part of the blame could be due to non-compliance with regulations by the stakeholders, terminal defects, inadequate infrastructures, etc.

Using the overall performance index, in 2010 Nigeria is better than all other countries under consideration except Benin republic. Nigeria score is 2.59 which is lower than 2.79 for Benin but greater than Cameroon, Chad and Ghana. In 2014, Nigeria composite index rise above only Cameroon but fell below Benin, Chad and Ghana as shown in Figure 2. The improvement is not unconnected with various reforms initiated by the administration of former President Goodluck Ebele Jonathan between 2012 and 2014. These reforms lead to increased staff trainings and re-trainings, improve in customs welfare, introduction of various electronic process and the development of the ICT unit of the customs service.

In sub-Sahara Africa, Benin was ranked 4th and 9th in composite logistics performance index and Customs Clearance process respectively in 2010 above Ghana. The figure in bracket is the ranking of countries under study by the author while the other figure represents the position of the each country in the sub Sahara Africa ranking.

Theoretical Framework and Empirical Analysis

Basically, there are about three theories in literature that attempt to explain the relationship between corruption, growth and productivity. Some of these theories have been tested empirically with different results from different data, methods and countries. We shall review each of these theories.

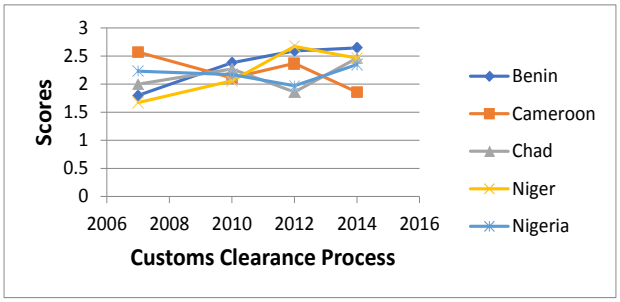

Figure 1: Cross country comparison of customs clearance process [18].

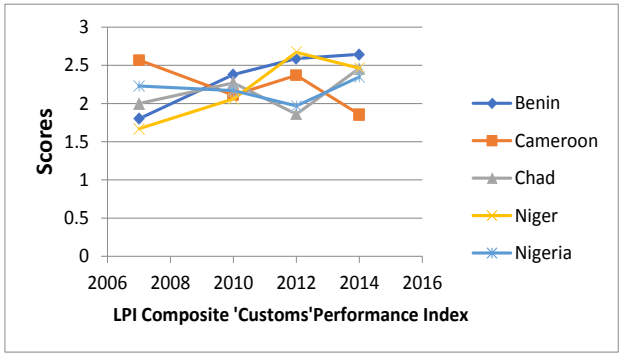

Figure 2: Composite logistics performance index [18].

Second-best theory

Second-best theory is also referred to as 'grease-the-wheel' hypothesis by some scholars. The central message of this theory is that in countries, firms or organisations with a lot of bureaucracy, corruption becomes the second-best option in dealing with the burdensome regulatory requirements. Given the distortions created by government, corruption could help to eliminate such distortions, which could be inimical to the smooth working of the institutions. Second-best theory states that, given a problem, the introduction of another problem will help to eliminate the earlier problem. In this case, corruption is assumed to be efficient in improving and increasing economic growth.

Lui [2] provides the theoretical framework for this model. He hypothesises that the size of bribes by different economic agents represents the opportunity cost of not engaging corruption- related activities. The more efficient agents are more able or willing to buy less effective red tape, which is reflected in lower 'time tax'. This theory was, however, not without criticism, a common phenomenon in economics. Authors such as Kaufmann and Wei [3] argue that Lui's [2] theory treated regulatory burden as exogenous and independent of the incentives for officials to take bribes. It is possible to modify the incentives of the bureaucrat using specific measures. Thus, Lui's theory was termed a partial equilibrium in nature.

Generally, it is argued that the reason why corruption is not exogenous is that those who benefit from it are likely to work hard to preserve the statuesquo or aggravate it. Hence, Aidt and Dutta [4] argued that, even if corruption helps to overcome regulatory cumbersomeness in the short term, it creates more incentives for more of such regulations in the long run. Micro-level empirical evidence opposes this theory; corruption is found to increase time spent by managers dealing with red tape [3].

Baumol [5] argues that corruption may distort allocation of resources through an increase in the returns to rent-seeking relative to productive activities. An environment prone to rampant corruption may encourage individuals to reduce interaction with the state, thus delaying expansion and resort to operating in the informal sector of the economy or forgoing entrepreneur.

Simeon et al. [6] corroborate this argument in their finding that corruption and large unofficial economies will make entry of new firms difficult. This is what we will term the 'distortion hypotheses of corruption.

However, the Simeon et al. [6] argument will be irrelevant in public institutions that are 'naturally' a monopoly. This is because whether there is corruption or not, the law does not permit private investment in such institutions. A good example is the customs service or administrations. No private individual or entity will be allowed to have a private customs service for the country. Part of the argument in Baumol [5], such as the disincentive to be entrepreneurial, which we can term 'intrapreneur' in public agency, is valid to some extent. When you have the wrong people in the right place, creativity will be difficult to come by. This could explain why, generally, in Africa, civil service is characterised by inefficiency.

According to the distortion hypothesis, corruption distorts the allocation of entrepreneurial or 'intrapreneurial' talents by ensuring that the entrepreneur or intrapreneur devotes greater effort to obtaining

licensees and preferential access to the market than to improving productivity. It is hypothesized that when entrepreneurial talent is directed towards increase productivity, the rate of innovation, creativity and investment is likely to increase with positive consequences for productivity and income growth. Corrupt environment could affect technological progress and investment (key sources of productivity). Money meant for investment in key infrastructures needed for efficient working of public servants will be diverted into private pocket and vested interested will lobby to retain regulatory cumbersome that do encourage corruption.

In addition to distortion hypothesis, there is the discretion theory of corruption. Proponents of this theory believe that corruption could result from the 'discretionary' power of state to allocate resources as it deems fit, thereby increasing the risk of misallocation or 'expropriation' and decrease 'appropriability' of returns to investment, innovation, creativity and hard work. This is common in countries where appointment to important government agencies, such as Customs, is at the discretion of the government. A corrupt government is more likely to breed corrupt officials. In Nigeria, the power to appoint the Comptroller General of Customs rest exclusively on the President without any provision for screening by the National Assembly as at May 2017. However, a new law is in place to reverse this.

Literature Review

Benazic [7] focuses on finding the determinants of relative efficiency of regional organizational units of Croatia's customs administration. To do this, he uses data envelopment analysis and the results show the need for the administration to introduce a different organizational structure.

Muhlis and Ahmet [8] investigated the effects of corruption on government revenue in Turkey between 1980 and 2001. They used data from the Turkish economy to test their hypothesis that corruption is associated with low general budget revenue (GBR), tax revenue (TR), direct tax and indirect tax. To test this, they applied a simple ordinary least-squares (OLS) technique, with the results confirming their hypotheses. De Rosa, Gooroochurn and George [9] and Yan and Oum [10] evaluated the impact of corruption on productivity in Eastern Europe and airport efficiency in US respectively. The results show a negative relationship between corruption and efficiency and productivity. In a related study, Dal Bo and Rossi [11] maintained that inefficient firms are strongly associated with more corruption. Randrianarisoa et al. [1] in their study, showed strong evidence of negative impacts of corruption on airport operating efficiency using panel data for selected European airports between 2003 and 2009.

Olken and Pande [12] reviewed the evidence of corruption in developing countries, with a focus on bribes to government officials and theft of government resources by public officials. The paper tried to answer the questions of how much corruption were there, what were the 'efficiency consequences of corruption' and what were the determinants of the level of corruption in developing countries. There is strong evidence of the response of corruption to 'standard economic incentive theory', although the effects of anti-corruption policies attenuate as officials find alternative strategies to pursue rents.

Methodology

This study is focused on Nigeria, Ghana, Chad, Cameroon and the Benin Republic for the period 2007–2015 and uses panel data. The choice of the years and countries is informed by the availability of data due to the year the corruption index was introduced and because these countries have either land or water borders with one another. The data for this study was obtained mainly from secondary sources, particularly from World Development Indicators, World Economic Forum, Executive Opinion Survey and Worldwide Governance Indicators.

Model specification

To evaluate the effects of corruption on the efficiency of customs services in Nigeria, Benin, Chad, Ghana and Cameroon, we specify a regression analysis that shows the linear relationship between efficiency of custom clearance processes and the corruption index and a set of other variables. As data on corruption in the customs service in the countries under study is not available, we used data of the total-economy aggregate corruption index as proxy for corruption in the agency.

The general belief among economists is that corruption affects output through the distortion of resource allocation. This view is in sharp contrast to the 'second-best' theory put forward by economic historians and political scientists that, in an economy with rigid bureaucracy, corruption may be beneficial in that it serves to 'grease the wheel' of bureaucracy. We looked at its applicability at the micro level of the public sector and model agency in a similar manner to a typical firm in an economy. We broke down Customs' service functions into its components-capital (physical and human) and effectiveness-recognising that effectiveness is the portion of growth in the administration that cannot be explained by the amount of inputs used in production.

We developed and modified the growth model of corruption to reflect the micro view, in line with the objective of the study. We indexed all variables using i (i=1,…,N) for each country and t for the time period (t=1,…,T).

Following Dal Bo and Rossi [11] we started with the production function for customs services. We assumed the agency uses capital, labour and managerial effort in the form of clearing services, supervision and coordination of the use of these factors. The clearance process is determined by the rate at which capital and labour are transformed into services. We, therefore, assumed that variations in the effectiveness of customs services are largely connected with the use of labour (officials in the customs service). Hence, we stated that the customs service is efficient if it is minimising the use of labour and the time needed for clearing goods given its capital stock. In this sense, we have assumed that capital is exogenous, and we wrote the production function as follow:

$$Q=A(e_s)f(l) \quad (1)$$

Where e_s=effort devoted to clearance and duty collection, supervision and coordination and it has the effect of raising total effectiveness A(.). The number of customs officers is denoted byl. we assumed that $A_{es}>0$, $A_{eses}<0$, $f_1>0$ and $f_{11}<0$.

We further assumed that the effort, (e), depends on the level of corruption in the country. One key part of this model is that the head of the customs service, the Comptroller General of Customs (CGC), cares about the total financial rewards, y, and the effort, e, they exert:

$$y-\varphi(e) \quad (2)$$

Where the cost of effort φ (.) is increasing and convex.

The CGC cares about the total revenue because (in Nigeria for example) the administration retains a certain percentage of the revenue collected each year and remits the remainder to the government account. This percentage contributes to their settlement of current and capital expenditures. In addition, the government sets an annual

revenue generation target, hence they are concerned about the amount of revenue they generate in order to meet the targets set for them. We assume this is the case for all customs administrations in the selected countries under study. From the foregoing, we can say that the CGC cares directly about profits (a case similar to the owner of a private firm), even though they are not the owner of the agency. Thus, y= π, and π is given as:

$$\pi=D(e_d, c)Q - wl \quad (3)$$

Where w is wages paid to customs officials, and D(.) is the duty charged by customs as a result of the clearing function.

Equation (3) captures the fact that duties charged by the customs service depends on its efforts, e_p, and the degree of corruption in the country (c). Q (fixed) is the value of service rendered by customs officials. In a highly corrupt country, the clearance process is assumed to be cumbersome and exporters and importers are most likely to pay to avoid the frictions created by regulations to facilitate clearance of their goods. In a similar vein, traders are most likely to negotiate with customs officials to avoid duties by paying part of it to the customs officials as a bribe to obtain clearance. Delays in clearance of goods and evasion of duties will negatively impact the efficiency of customs services.

We further assume that the effort of the customs officials depends on factors such as skills, education, regulations, and the quality of facilities at their disposal (in this case we take quality of port facilities as our variable of interest). This is because we lack the necessary data on skills, education and other facilities, such as computers, vehicles and communication equipment, at land border units. Hence, the focus in this study is to analyse the effects of corruption, quality of port facilities, and the interaction between quality of port facilities and corruption on the effectiveness of the customs service.

Model's key assumption

Corruption improves the marginal effectiveness of customs services.

The model's key assumption implies that our model is in line with the distortion theory of corruption. In order words, corruption negatively affects the absolute effectiveness of customs clearance process.

Econometric specifications of the model

We specify the empirical model as follow

$$Q= A_{it} +\beta_1 l_{it} \quad (4)$$

Since the focus in this study is to analyse the effects of corruption, quality of port facilities, and the interaction between quality of port facilities and corruption on the effectiveness of customs service (a_{it}), we estimate the following equations:

$$A_{it}=\alpha_{IT}+\beta_{1it}X_{it} +Y_{it}\beta_{2it} + \beta_{3it}X_{it}Y_{it} + \mu_{it} \quad (5)$$

Where X_{it}=corruption index

y_{it}=quality of port facilities

μ_{it}=error terms

β's =are the coefficients of our variables.

Substituting equation (5) into equation (4) yields:

$$Q_{it=} \alpha_{it} + \beta_1 X_{it}+ \beta_2 y_{it} +\beta_{3it}X_{it}Y_{it}+\beta_4 L_{it}+ \mu_{it} \quad (6)$$

Dependent Variable=Efficiency of customs clearance	
Independent Variables	**Estimate**
Corruption	0.832587*(0.431536)
Quality of port facilities	0.21755** (0.121534)
Corruption*Quality of port facilities	0.242492* (0.118784)
R^2	0.072708
Adjusted R^2	0.003161
Number of observations	45
Note: Dependent variable=Efficiency of customs clearance. Standard errors are in parenthesis. * means significant at 5% and ** means significant at 10% level.	

Table 1: Result 1 of the regression analysis.

Independent Variables	Coefficients
Control of corruption	–0.725951* (0.30515)
Quality of port facilities	–0.194874* (0.092696)
Regulatory quality	0.445001 (0.423118)
R^2	0.255809
Adjusted R^2	0.111105
Number of observations	45
Note: Dependent variable=Efficiency of customs clearance process. Standard errors are in parenthesis. * means significant at 5% and ** means significant at 10% level.	

Table 2: Result 2 of the regression analysis.

Dependent Variable=Efficiency of customs	Dependent Variable=Efficiency of customs
Control of Corruption (Cor)	–2.560868* (0.607087)
Quality of Port Facilities	0.323422* (0.149437)
Cor*PortFac	0.558083*** (0.152999)
Government effectiveness	–0.302876 (0.325324)
R^2	0.445468
Adjusted R^2	0.318718
Number of Observations	45
Note: Dependent variable=Efficiency of customs. Standard errors are in parenthesis. *** means significant at 1% level, ** significant at 10% level and * significant 5% level.	

Table 3: Robustness regression result.

Independent Variables	Coefficients
Control of Corruption (cor)	–2.584270***(0.609352)
Quality of Port Facilities	0.247850 (0.153731)
Cor*Port Fac	0.519492***(0.152931)
Regulatory Quality	0.275202 (0.375481)
R^2	0.440325
Adjusted R^2	0.312400
Number of Observations	45
Note: Dependent variable=Efficiency of Customs. Standard errors are in parenthesis. *** means significant at 1% level, ** significant at 10% level and * significant 5% level.	

Table 4: Robustness regression result.

Independent Variables	Coefficients
Efficiency of Customs clearance Process	–0.130042***(0.030460)
Quality of Port Facilities	0.142394***(0.024286)
Cor*port Fac	0.219058***(0.014393)
R^2	0.994829
Adjusted R^2	0.993823
Number of Observations	45
Note: Dependent variable=Control of corruption. Standard errors are in parenthesis. *** means significant at 1% level, ** significant at 10% level and * significant 5% level.	

Table 5: Reveres relationship result.

Independent variables	Coefficients
Efficiency of customs clearance process	–0.187132* (0.078662)
Quality of port facilities	–0.185620***(0.039112)
Regulatory Quality	0.408593***(0.207195)
R^2	0.965304
Adjusted R^2	0.958557
Number of Observations	45
Note: Dependent Variable=Control of corruption. Standard errors are in parenthesis. *** means significant at 1% level, ** significant at 10% level and * significant 5% level. Source: Eviews.	

Table 6: Reveres relationship result 2.

Independent variables	Coefficients
TAC	–0.658060* (0.273476)
Quality of port facilities	–0.678930*** (0.225529)
TAC*Quality of port facilities	0.225011*** (0.0077779)
R^2	0.188975
Adjusted R^2	0.128148
Number of observations	45
Note: Dependent variables=efficiency of Customs service. Standard errors are in parenthesis. *** means significant at 1% level, ** significant at 10% level and * significant 5% level. Source: Eviews.	

Table 7: Alternative use corruption index result.

where β_{1it} and β_{2it} measures the partial effects of X_{it} and Y_{it} in period t for i country, while β_{3it} measures the effect of the interaction term on the dependent variable. The assumption is that the effects of a change in X are the same for all countries and all periods.

If we treat α_{it} as N fixed unknown parameters, then equation (5) will be called a standard fixed effect model. Conversely, if we treat individual effects α_{it} as random, then it is called random effects model. This implies that the intercept terms vary over the countries (and sometimes it is allowed to vary over time).

We shall estimate equation (5) and analyse how it affects the growth/improvement of a customs service. Hence, we assume that corruption and other factors under study have an indirect effect on the service rendered by the customs service.

Hausman test model

Hausman test is referred to in econometrics as a test for model misspecification. It refers to the test that tells us whether the fixed and random effect estimations are significantly different. Following Marno [13],

$$H=(\check{}\beta_{FE}-\beta_{re})\ [V\{\beta_{FE}\}-V\{\beta_{RE}\}]^{-1}(\beta_{FE}-\beta_{RE})$$

Where Vs denote estimate of the true covariance matrices, βs denote estimate of fixed effects and random effects as indicated by FE and RE respectively as subscripts. The null hypothesis says that plim $(\beta_{FE}-\beta_{RE})=0$, while the alternative hypothesis says that random effects are inconsistent. The test has an "asymptotic Chi-squared distribution with *K* degrees of freedom, where *K* is the number of elements in β"[13].

Results and Discussion

The coefficient of corruption is negative and significant at the 5 per cent level. The implication is that corruption is negatively related with the effectiveness of customs services in the selected countries. This result violates the second-best theory and confirms the distortion theory of corruption. The result is in line with Salinas-Jimenez and Salinas-Jimenez [14], Dal Bo and Rossi [11], Yan and Oam [10], D'Amico [15] and Mo [16].

As shown in Table 1, a unit change in corruption will lead to an 83 per cent change in the effectiveness of customs service if the quality of port facilities is zero. Countries with a high corruption index will experience a decrease in the effectiveness of their customs service. The coefficient of quality of port facilities is positive and significant at 10 per cent. This implies that when the quality of port facilities improves, customs' efficiency rises.

In the random effect model, there is also a positive relationship between the interaction terms and the efficiency of customs services and it is significant at 5 per cent. We adopted the random effect model because our Hausman test result rejected the alternative hypothesis in favour of the null hypothesis and we concluded that random effect estimation is efficient and consistent. The economic magnitude of the effect is large: an improvement in one point in the corruption index is associated with a 10 per cent decrease in the effectiveness of customs service if the quality of port facilities is zero, if all else is equal.

Table 2 summarizes the estimation of another specification that does not include the interaction term but includes the regulatory quality. Removing the interaction term and adding regulatory quality changes the sign of the coefficient of the quality of port facilities while the sign of the coefficient of corruption remains the same, although its magnitude slightly decreases. The explanatory power rises compared to the specification in Table 1.

Robustness checks

To further prove the validity of the results, we estimated five different specifications. In specification (1) we used control of corruption index, quality of port facilities, interaction between quality of port facilities and corruption and government effectiveness as independent variables. In (2) we used control of corruption index, quality of port facilities, interaction between quality of port facilities and control of corruption and regulatory quality as our independent variables; and in (3) we estimate the reverse relationship between effectiveness of customs service and other independent variables. In this case, control of the corruption index is our dependent variable while efficiency of customs clearance process, quality of port facilities and interaction between port facilities are our explanatory variables. In (4) control of corruption is our dependent variable while efficiency of customs clearance process, quality of port facilities, and regulatory quality are our independent variables; in (5) we use transparency, accountability and corruption (TAC) index, quality of port facilities, and interaction between TAC and quality of port facilities as our independent variables.

We estimated an alternative model in which the dependent variable is the efficiency of Customs service with control of corruption index, quality of port facilities, interaction term (between corruption and port facilities) and government effectiveness. Results corresponding to this specification are reported in Table 3.

The coefficient of corruption is negative and significant at 5 per cent, thus providing additional support to the earlier result that higher corruption at country level has a negative impact on the efficiency of customs service contrary to the prediction of second-best theory. The absolute value of the coefficient of corruption is very high and this is not unconnected with the inclusion of both government effectiveness and interaction term. The coefficient of the quality of port facilities is positive and significant at 5 per cent. The implication is that the efficiency of customs service will improve as the quality of port facilities improve. This also lends credence to the result obtained from our earlier specification above. The coefficient of government effectiveness

is negative and insignificant. The coefficient of interaction term is positive, which implies that corruption and quality of port facilities are positively related. Part of the results of Tanzi and Davoodi [17] show that there is a positive relationship between government expenditures and corruption index; however, corruption index is negatively related to the quality of infrastructures. An economic interpretation of our result may be that if government expenditure rises with high corruption, the quality of infrastructure should improve, albeit slowly.

In the second specification, we included regulatory quality and removed government effectiveness while maintaining other independent variables as in our main specification. Table 4 summarises the result for this specification. The coefficient of corruption index is still negative and significant at 1 per cent, with high magnitude in absolute terms. All other coefficients of the explanatory variables are positive and significant except regulatory quality, which has insignificant coefficient. The explanatory power is 44 per cent (approximately), which is not statistically different from 46 per cent (approximately) obtained in specification (1).

Here we estimate the reverse relationship between effectiveness of customs service and other independent variables. In this case, control of corruption index is our dependent variable while efficiency of customs clearance process, quality of port facilities and interaction between port facilities are our explanatory variables. As shown in Table 5, the coefficient of efficiency of customs clearance process is negative and highly significant at 1 per cent. This is an additional support to our result that there is an inverse relationship between corruption and efficiency of customs service. Whichever way the model is specified, high corruption reduces the effectiveness of customs service. Any country among the selected countries that works to reduce corruption in the country will experience improvement in the effectiveness of customs services. All the coefficients of other explanatory variables in this specification are positive and significant at 1 per cent. The explanatory power is high as 99 per cent (approximately).

In the fourth specification, we removed interaction term and included regulatory quality. This result is almost the same (Table 6). The coefficient of corruption is still negative and significant at 5 per cent. The signs of the coefficient of quality of port facilities change to negative and highly significant at 1 per cent. This is in line with the result obtain by Tazi and Davoodi [17]. Higher country level corruption reduces the quality of port facilities and vice versa, if all else is equal. The coefficient regulator, quality, is positive and highly significant at 1 per cent. The implication of this is that corruption is likely to be higher in a country with improved ability of government to formulate and implement sound policies and regulations. These policies and regulations are like frictions that breed corruption.

We want to ensure that our results are not limited to a particular measure of corruption. Therefore, we now report results using transparency, accountability and Corruption Perceptions Index (CPI) provided by the World Development Indicator (WDI) [18]. We would worry less if we could replicate our basic regressions and obtain almost similar results. This will help clear doubt as to the measure of corruption used in our analysis. We present the random effect of this specification, based on the result of Hausman test, in Table 7. The coefficients of corruption and quality of port facilities are negative and significant at 5 per cent and 1 per cent. Meanwhile, the coefficient of the interaction term is positive, as obtained in the main specification. Hence, our findings using different measures of corruption are similar with what we obtained with the control of corruption index.

Conclusion

The level of corruption among public officials is alarming especially in Nigeria. Recently, vanguard [19] Nigeria reported that between June 2015 and May 2016, over N400 billion was paid as bribe to public officials, quoting National Bureau of Statistics as their source. In the said report, tax and customs officials was ranked 4th, accounting for about 27% of the total bribe paid between the periods under survey. This is a payment for unproductive services and it calls for serious concern.

In this study we presented what we believe is the first attempt at using micro-level data to test a theory of how corruption affects the customs clearance process in some selected countries in Africa. We test hypothesis from a simple model in which corruption causes a diversion of effort needed for the clearance functions away to unproductive services of negotiating bribe payment.

Our finding is that corruption strongly reduces the effectiveness of customs services. This result is in line with De Rosa et al. [9], Mo [16] and Gamberoni et al. [20]. We also find that improvement of quality of Port infrastructures will improve the effectiveness of customs service in the selected countries. The estimated magnitude of the coefficient of corruption is large in economic terms given the level of port infrastructures.

The relationship we identify between corruption and effectiveness of customs service is robust. We use alternative measure of corruption to validate our result. We then, include other independent variables into our model and found that the coefficient is not only negative but also significant. Hence the inclusion of these variables does not change the signs and the significant of the coefficient of corruption. Our finding suggests that the coefficient of interaction term between Quality of port infrastructures and control of corruption is positive and significant. This implies that the effect of the control of corruption on the effectiveness of customs service will increase as the quality of port facilities increases, and that the effect of quality of port facilities on the effectiveness of customs service will increases with increase in the control of corruption.

Although using country using country-level data on corruption may not be ideal as having agency-level data on how corrupt is the environment facing public agencies, we strongly believe that relevance of the findings is noteworthy and will open a new chapter on the economics of corruption in the public sector especially in Africa.

We recommend formulation of effective policies, legislation and provision of appropriate facilities to reduce country-level corruption. In addition, we suggest institutional reforms devoid of unnecessary bureaucracy in the customs administrations of the selected countries.

Despite the positive results in this study, we advise that caution should be observed in interpreting the results due to the small number of observations.

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