Procurement physiognomies and creative accounting in Nigerian listed health care firms

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Abstract

Purpose – This paper aims to examine the influence of procurement physiognomies on the creative accounting (CA) of listed health-care firms in Nigeria from 2016 to 2020.

Design/methodology/approach – This paper used positivist paradigm. Annual reports and accounts, questionnaire and e-mails were used to obtained and extract quantitative data. The data were analyzed using OLS regression.

Findings – The study found that, procurement planning, e-procurement and procurement legislation compliance possessed negative weighty consequence on CA of quoted Nigerian health-care corporations while outsourcing, procurement staff competency and strategic supplier partnership possess positive substantial impact on the firms' CA. The article concluded that procurement physiognomies play an important role in managing CA of health-care firms.

Research limitations/implications – This study findings are only applicable to listed health-care firms in Nigeria. It only used six procurement attributes. The research implication is that researchers are to use the findings in conducting further studies on procurement physiognomies and CA to help in coming up with ways of curbing irregularities in the organizations.

Practical implications – The health-care firms are to use the findings to come up with policies that ensure malpractices in procurement are curbed and CA is minimized to its barest level. Its societal implication is that the public is to use the findings in changing societal attitudes toward earnings manipulation.

Social implications – Its societal implication is that the public is to use the findings in changing societal attitudes toward earnings manipulation.

Originality/value – To the best of the authors' knowledge, this article is the first to evaluate the influence of procurement physiognomies on CA in Nigerian-listed health-care companies. Many researchers neglect how procurement is used to carry out a lot of CA and this study focuses on a mechanism for curtailing corruption.

Keywords Procurement physiognomies, Creative accounting, Procurement planning, E-procurement, Nigerian-listed health-care firms, Procurement staff competency, Procurement planning, Outsourcing, Procurement legislation compliance

Paper type Research paper

1. Introduction

Over decades, creative accounting (CA) is being used to conceal the truth about the actual financial information of organizations by showing alternate truth via systematic manipulations. These fabrications are sometimes being committed through procurement activities. Procurement management (PM) has developed as vital method for businesses pursuing to become competitive in the future. Procurement involves the entire procedure of obtaining services and/or property. It commences when a firm has acknowledged a need and decided on its procurement necessity. Procurement lingers through the procedures of assessment of risk, looking for and appraising alternate solutions, contract award, delivery of and imbursement for the services and/or goods and anywhere appropriate, the continuing managing of contract and deliberation on options connected to the contract (Waters *et al.*, 2004). Procurement also spreads to the final discarding of Good at the termination of its life span (Waters *et al.*, 2004). Moreover, it is even extended to cover assets under or to be leased as provided by the adoption of International Financial Reporting Standard 16 (IFRS 16) commencing from January 1, 2019.

In health-care sector, procurement is a vital component of well-organized drug-management and supply and is serious for entire points of medical care firms or establishments. An

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operative procurement procedure guarantees the readiness of the needed drugs in the appropriate amounts, obtainable at the precise period, for the appropriate patient and at realistic amounts and at familiar values of quality (WHO, 2007). In addition, the elementary ethics of upright procurement practice comprise accountability, where operative mechanisms oblige to be intact to empower procuring organizations spend the limited funds prudently, knowing obviously that they are answerable and responsible for any unethical activities to the shareholders. It is expected to be done under competing supply that needs the procurement be executed by competition except there are undoubted motives for single sourcing and constancy which stresses the equal dealing with entire bidders regardless of ethnicity, race, relation attachment or regionalism (Abdulkadir, 2019).

Among the prime rules of procurement is, at least, it is significant to reason in relations to the full cost of possession. This comprises not only the acquisition value but including resources and period which are consumed in the chase of the possession. By understanding the phases contained in procurement, it is probable to get an improved understanding of the actual charge involved with getting any service or property (Bailey *et al.*, 2004). Numerous public procurement (PP) events experience inattention, meager co-ordination, deficiency in direction, absence of transparency and open competition, divergent stages of corruption and most prominently not possessing a cadre of skilled and competent procurement experts, that are capable to conduct and accomplish the procurements in specialized, cost-effective and timely manner. Strict and bureaucratic structures of procurement back by intolerable contract interruptions, possibility of manipulation of contract awards, amplified costs and absence of reasonable competition, altogether of which generate the perception in the populace that communal spending is small, unproductive, luxurious and frequently corrupt (Shehu, 2020). A manager, who practices post-conservative logic when determining on CA is anticipated to study the stakes and rights of the statements' users, above the lawful necessities, thus, tackling the responsibility of the wellbeing of entire individuals and for the defense of all rights (Ali and Ibrahim, 2019).

Procurement physiognomies have been viewed as procurement attributes or qualities that contribute to efficient procurement operations, supply chain (SC) performance and assist in curtailing irregularities in procurement process. These attributes range from procurement planning, procedures, legislations and standards, outsourcing, staff competency, audit quality and automation (Kavacs, 2004). Others include but not limited to SC finance, procurement resource allocation, procurement performance, supplier relationship management, inventory management to mention but a few. This study, therefore, concentrates on procurement planning, e-procurement, procurement regulatory compliance (PRC), outsourcing, procurement staff competency (PSC) and strategic supplier partnership (SSP) because they are attributes that can easily be explored to engage in corruption and thereby use CA to cover it. Thus, examining whether good procurement practices checkmate the creative or unethical accounting by management when preparing financial statements of firms in the Nigerian health sector. The CA can be done through computation of certain key ratios, stock misstatement as it contains a substantial percentage of organization's properties and has diverse recognized inventory valuation approaches or/and management exploiting gaps in accounting standards to deceptively depict a favorable performance of the company (Shehu, 2020).

In view of the preceding discussion, firms may have the tendency of exploring many loopholes in the procurement practices and laws to manage earnings especially during pandemics and other unanticipated natural phenomena. Therefore, covid-19 pandemic has really affected many economic, social and environmental activities for individuals, corporate bodies and society at large and this led to poor performances in many business activities due to restrictions imposed by governments and regulatory authorities. The pandemic caught numerous firms unaware and unprepared. It serves as a means which the management of some corporate bodies explored to commit their unscrupulous activities of earnings manipulation which might likely be covered through CA (Abbas and Shehu, 2022a, 2022b). Lockdowns have been witnessed across the globe which had negatively influenced SCs. Several firms were unable to produce to full capacity due to shortages in their raw material inventories and semi-finished inventory. This could be attributed to poor procurement planning, lack of collaborative supplier partnership and incompetent procurement manpower.

Moreover, the management of some firms in Nigeria especially the health-care corporate bodies could see the covid-19 pandemic as an avenue to unleash their corruptive activities and cover them using CA methods. This is because the society needed much health-care services and the services in place were very limited since the health-care facilities have been overwhelmed (Abbas, 2021). It is worth noting that for several years, individuals and companies use procurement as a corridor for channeling irregularities and misstatements in the accounts of their businesses and cover it using CA, and as such the pandemic might be used to cover poor performance since lockdowns were imposed in numerous countries. In addition, due to the high rate of demand, they may use that to satisfy their interest of manipulating accounts.

The researchers made tremendous efforts to search for literature that addressed the central issue of this study. However, it was discovered that, the studies were lacking and most of the literature reviewed (such as Jiang, 2020; Lanier *et al.*, 2019; Sedyaningrum *et al.*, 2019; Abbey and Otieno, 2019; Skoda and Vyklyuk, 2018; Abdul-Rahman *et al.*, 2018; Marques and Pinto, 2018) did not examine the effect of procurement physiognomies on CA. Besides, similar study is lacking in Nigeria and the periods covered by the studies were not extended to 2020. In terms of approach, the studies used qualitative approach, but this research filled the gap by examining the variables quantitatively.

The core aim of this article was to investigate the influence of procurement physiognomies on CA of Nigerian-listed health-care firms. Accordingly, the detailed objectives of the paper are to: evaluate the impact of procurement planning on CA in the Nigerian-listed health-care firms; assess the influence of electronic procurement on CA of Nigerian quoted health-care firms; to ascertain the extent to which PRC affects CA in the Nigerian-listed health-care firms; to examine the influence of outsourcing on CA in the Nigerian-listed health-care firms; to determine the impact of PSC on CA in the Nigerian-listed health-care firms; explore the influence of SSP on CA of registered quoted health-care firms in Nigeria. Practically, the

achievement of these objectives would assist in curtailing corruption in the health-care firms in Nigeria right from procurement planning to supplier collaborations and service delivery. Theoretically, its achievement would help in enriching literature in SC.

This article is anticipated to immeasurably add value to the prevailing literature. Despite having innumerable research done on procurement process and firm performance by countless scholars, none among the research (such as Eliah and Issa, 2020; Adeniyi *et al.*, 2020; Jiang, 2020; Lanier *et al.*, 2019; Sedyaningrum *et al.*, 2019; Abbey and Otieno, 2019; Skoda and Vyklyuk, 2018; Abdul-Rahman *et al.*, 2018; Marques and Pinto, 2018; Agburu *et al.*, 2017; Osebhawe, 2017; and Goel, 2014) have precisely and empirically investigated the influence of procurement physiognomies on CA in the Nigerian-listed health-care firms. This has formed a substantial knowledge gap and consequently forms the foundation for this research. The study will be significant to researchers, regulatory bodies such as NAFDAC and SON, health-care companies, policy makers and many other stakeholders.

2. Literature review

In this section, related recent literature in respect of all the variables of the study were appraised and theoretical framework for the article will also be framed and justified. It is worth noting that scanty literature exists on the relationship between the individual procurement physiognomies and CA. Therefore, this study reviewed empirical literature categorically.

CA has been defined as a pretend through which determined intrusion was completed in stated numbers to get the preordained outcomes (Skoda and Vyklyuk, 2018; Abbas and Shehu, 2022a, 2022b). This study defined CA as an act of concealing true performance or information by a firm or its agent to deceive stakeholders or achieve a particular goal. Procurement is the procedure involved in gaining a commodity or services (Adeniyi *et al.*, 2020). Smith *et al.* (2004) see procurement as procedure entailed within purchase of services or commodities at the finest likely full cost of acquisition in correct number and quality and within appropriate advantage or utilization of consumer through agreement. Electronic procurement is utilization of ICTs within PP. Electronic procurement may rise openness, enable contact to public tenders, lessen straight dealings amid procurement representatives and firms and permit flexible discovery of anomalies and corruption (OECD, 2016). Outsourcing is the shifting of in-house offered events by delegating it out to outside parties (Agburu *et al.*, 2017). This study defined outsourcing as an act of delegating the procurement of Goods and services of a firm to an external party. Competency is seen as an ability, capability or a fundamental feature of a person that is casually connected to active or greater performance. It denotes performance delivery, applied knowledge and skills and the conduct mandatory to get activities completed very well (Armstrong and Baron, 1995).

The Figure A1 shows the direct relationship between procurement planning, electronic procurement, procurement legislation compliance (PLC), outsourcing, PSC, SSP and CA. The link between the explained variable and the explanatory variables is that, it is expected that the procurement physiognomies will greatly help in curbing bad CA.

Empirically, the study examines the effect of procurement planning, electronic procurement, PLC, outsourcing, PSC, SSP on CA of listed Nigerian health-care entities.

2.1 Procurement planning and creative accounting

Effective procurement planning may help in curbing aggressive earnings management (EM) in quoted firms. Seth (2022) assessed the degree of corruption in Malaysia through the evaluation of how succeeding administrations have curbed the issue with the utilization of variety of measures. The paper found that, corruption remains spread due to inefficient execution and political interference to interrupt execution against corruption criminals, particularly known personalities, and the diverse effect of corruption stoppage measures such as effect procurement planning. In a different study, Abdul-Rahman *et al.* (2018) examined how total cost of ownership moderate dynamic procurement transformation. Government linked firms have been stimulated to implement the Red Book as their main source of information in changing their PM and minimize total cost of ownership. However, it is worth noting that, inadequate empirical literature exists on the subject matter and, hence, this necessitates a study of this nature. Therefore, this study hypothesized that:

H_1. Procurement planning owned no weighty impact on CA of Nigerian public quoted health-care firms.

2.2 Electronic procurement and creative accounting

To curb irregularities, Davis *et al.* (2022) examined the conditions in developing economies that blockchain technology (BT) can alleviate corruption of multinational companies. The study found that BT is hypothesized to have different curbing influences on the socialization, justification and institutionalization of fraud. This current study addresses how CA is being used to cover unethical practices in procurement. From another research, Marques and Pinto (2018) made a wide-ranging scrutiny of MA (municipal auditing), using its numerous stages: purchasing, choice on selection conditions, choosing, render and paying for services and view offered. The study found that most towns gain auditing services via direction choosing and auditors were selected according to the lowermost fee choosing condition. It was clear that there is scanty literature in this area and the existing studies did not evaluate the effect of procurement physiognomies on CA. Therefore, this research hypothesized that:

H_2. Electronic procurement possessed no substantial influence on CA of Nigerian-quoted health-care companies.

2.3 Procurement regulatory compliance and creative accounting

From a different attribute, Adeniyi *et al.* (2020) evaluated obedience to the procurement regulation within the local government environment of a developing country, challenges to obedience and feasible resolutions. The article found an incomplete compliance to the procurement sections in the local government. From a differed study, Abdi and Juma (2022) scrutinized how PRC can be used when procurement experts in Tanzania aim to amplify value for money by exploring procurement planning. The research found that PRC

suggestively mediates the association between procurement planning and value for money in procurement. From another dimension, Amoah and Steyn (2022) evaluated the problems of construction experts in obeying their code of ethics and averting corrupt practices. It was discovered that construction specialist experience numerous unprincipled matters in their obligations like overstated tender values, overvaluing the charges, tender-based bribes, kickbacks for projects, unscrupulous approaches of project accomplishment and usage of lesser grade resources than stated. The study concluded that, matters like greediness, embracement of corruption as normal practice, inadequate knowledge about the ethical code and peer pressure generate problem in stopping unethical practices amongst construction experts. This study is different because it looked at the issue beyond compliance with procurement legislations. This study, therefore, hypothesized that:

H_3. PRC possessed no crucial impact on CA of Nigerian publicly registered health-care corporations.

2.4 Outsourcing and creative accounting

Agburu *et al.* (2017) determined the consequence of outsourcing approaches on the profitability of SMEs. The study discovered contracting out of back-office events, contract out of key events, subcontracting of supporting events possessed substantial consequence on firm's performance of SMEs whereas contract out of accounting works possessed substantial influence on performance in SMEs. In different view, Osebhawe (2017) explored the approaches procurement administrators use to lessen values and contract delivery interruptions. The article revealed that change execution approaches and approaches for dropping price and contract fulfillment postponements might aid firm managers who want enhanced procurement procedure modification to outline long period objectives and afterward plan rearward to detect prerequisites to attain the chosen modification. This study is different as it evaluates the effect of outsourcing on CA rather than profitability. Therefore, the study hypothesized that:

H_4. Outsourcing has no substantial effect on CA of Nigerian-listed health-care firms.

2.5 Procurement staff competency and creative accounting

Eliah and Issa (2020) assessed the impact of staff competency on performance of PM unit within public sectors in Tanzania. Specifically, it scrutinized capable employees, skilled workers and training of procurement manpower on performance of procurement role. The study found experienced and skilled procurement manpower to be impacting procurement performance. However, the study did not examine the effect beyond performance, that is, by evaluating how management used techniques in manipulating those earnings. In a different view, Jiang (2020) evaluated motivations, meaning and techniques of CA. The research suggested that shareholders should compute depreciation that would mirror the most actual condition of the company by themselves. Company might use first-in-first-out while use last-in-first-out at other times. Truly, first-in-first-out can best mirror the real condition of the company's stock. Stakeholders should concentrate on stock when it is significant for them. From another angle, Lanier *et al.* (2019) scrutinized SC supremacy in the setting of real EM. The study studied whether influential key clients in SC used their status to involve in real EM to a bigger level than lower influential companies. The study revealed that foremost clients used their SC influence in participating in further real EM. Skoda and Vyklyuk (2018) inspected some approaches of inspiring, detecting and lessening manipulation mechanisms in financial accounting information. The study encouraged the necessity for safety in accounting in the forthcoming, for producing confidence via a truthful image instead of considerable rises, strengthening, hence, the clue based on which an open and transparent firm is a harmless one, wherever expectation is probable to translate to truth. Goel (2014) assess the excellence of informed statistics and scrutinized occurrence of EM of the business corporations within India via the aid of profit model of Beneish. It was found that the likelihood of manipulation rises with infrequent rises in receivables, lessening asset quality and worsening gross margins. Jensen and Payne (2003) developed and test a model of audit procurement as a control mechanism used within an agency framework to control audit quality and the associated audit charges. It was found that audit procurement and the specific essentials of audit procurement are related with the appointment of auditors with advanced degree of industry proficiency- suggestive of sophisticated audit quality.

However, from the foregoing it was obvious that the studies did not examine the effect of procurement physiognomies on CA and studies in Nigeria on the subject matter are lacking. It is, therefore, hypothesized by this study that:

H_5. PSC has no weighty impact on CA of Nigerian-listed health-care firms.

2.6 Strategic supplier partnership and creative accounting

In a different study, Sedyaningrum *et al.* (2019) scrutinized the consequence of SSPs on the SC integration, SC performance and agriculturalists performance. Using questionnaires to collect data, the study found SSP has no substantial consequence on SC integration, SC performance and agricultural corporate bodies' performance. Abbey and Otieno (2019) evaluated the influence of procurement efficiency on performance of Ugandan Foam mattress companies. Using regression and correlation, the study found that procurement performance has momentously inclined the performance of Ugandan foam mattress manufacturing companies. From another perspective, Agus *et al.* (2008) scrutinized significance of SSP in SCM in relation with performance of product quality and performance of business in manufacturing sector of Malaysia using SEM. Discoveries of the study offer an outstanding demo in the significance of SSP in SCM Malaysian manufacturing firms on improving performance of commodity quality and performance of business. Strategic collaboration with suppliers empowers firms to labor more efficiently with limited significant suppliers that are prepared to share obligation for the victory of the goods. From the studies reviewed, it clear that studies of this nature are lacking in Nigeria. The study, therefore, hypothesized that:

H_6. SSP has no important effect on CA of Nigerian-listed health-care firms.

From the 23 empirical studies (such as Eliah and Issa, 2020; Adeniyi *et al.*, 2020; Jiang, 2020; Lanier *et al.*, 2019; Sedyaningrum *et al.*, 2019; Abbey and Otieno, 2019; Skoda and Vyklyuk, 2018; Abdul-Rahman *et al.*, 2018; Marques and Pinto, 2018; Agburu *et al.*, 2017; Osebhawe, 2017; Goel, 2014; and Jensen and Payne, 2003) reviewed which spanned between 2003 and 2020, it was evident that no study was conducted on procurement physiognomies and CA and most of the studies conducted in similar area did not use the variables used in this study. Moreover, the period of the studies did not reach 2020, and in Nigeria studies of this nature are lacking. This study is aligned with signaling theory and agency theory. The signaling theory posits that firm's management ought to select how and whether to signal (or send) information and the shareholders and other stakeholders ought to decide how to interpret the information. The signaling theory was aligned with this study because organizations conceal the truth by disclosing different truths via organized manipulations. It was also aligned with agency theory because when managers of a firm discharged their responsibility of ensuring compliance, accountability and transparency of activities in their firms to protect interests of stakeholders, that would lead to the reduction of CA.

In conclusion, a study of this nature is necessary to assist in coming up with policies that would curtail corruption in both public and private entities.

3. Methodology

This research is steered around the horizon of quantifiable approach with a logical examination paradigm of positivism that perceives realism via the appreciations of the scholar. Through this, positivists normally engage the process of the physical science that was deep-rooted on hypothetico-deductive method and empirical epistemology to reach an effective inference around the phenomenon under consideration. However, this study was correlational research that links procurement physiognomies and discretionary accruals (DACC). The study used all the 10 health-care corporations publicly registered on Stock Exchange of Nigeria (NSE) at the year ended December 31, 2020 as its population. Annual reports and accounts, questionnaire and e-mails (10 respondents were involved in the administration of the Questionnaires and e-mails across the firms) were used to collect and extract data in connection with the variables of the article within a period of five years (2016–2020) and the data were analyzed using longitudinal balanced panel multiple linear regression (two-stage least square) as the method of analyzing data for this study. The reason for this method is it possessed the capacity to examine the arithmetical connection among two or more variables and facilitates the estimate of the anticipated result. Moreover, it is a technique that can be used to compute residuals of the CA. All ethical issues have been properly addressed and confidential information has been kept as secret.

The model of Kim *et al.* (2012) was adopted in this study to extract the residuals of the DACC which indicate the level of CA in the firms. The model was chosen because it was discovered to have higher explanatory power than their first model and is one of the accrual models with few impregnable criticisms (Shehu, 2020). The model without and with modifications are presented as follows:

$$\mathrm{TA_{it}/At-1} = \beta_0 + \beta_1 \Delta \mathrm{REV_{it}/At-1} + \beta_2 \Delta \mathrm{NREC_{it}/At-1} + \beta_3 \mathrm{PPE_{it}t-1/At-1} + \varepsilon_{it} \quad (1)$$

$$\mathrm{TA_{it}/At-1} = \beta_0 + \beta_1 \Delta \mathrm{REV_{it}/At-1} + \beta_2 \Delta \mathrm{NREC_{it}/At-1} + \beta_3 \mathrm{PPE_{it}t-1/At-1} + \beta_4 \mathrm{INTG_{it}t-1/At-1} + \mathrm{e_{it}} \quad (2)$$

Where:
TA = total accruals;
T = total asset;
a = constant;
$\beta_1 - \beta_4$= parameters;
$t-1$ = previous year (lag 1);
ΔREV denotes variation in revenue;
Δ REC denotes variation in receivables;
PPE symbolizes plant, property and equipment;
INTG signifies intangible assets;
t means time;
i symbolizes firm; and
ε denotes residual.

The below model will examine hypotheses of the article as shown underneath:

$$\mathrm{DACC_{it}} = \alpha + \beta_1 \mathrm{PP_{it}} + \beta_2 \mathrm{EP_{it}} + \beta_3 \mathrm{PLC_{it}} + \beta_4 \mathrm{OSG_{it}} + \beta_5 \mathrm{PSC_{it}} + \beta_5 \mathrm{SSP_{it}} + \varepsilon_{it} \quad (3)$$

Where:
DACC = discretionary accruals;
α = intercept;
$\beta_1 - \beta_5$ denotes beta parameters;
i t means firm across time;
PP = procurement planning;
EP = electronic procurement;
PLC = procurement legislation compliance;
OSG = outsourcing;
PSC = procurement staff competency;
SSP = strategic supplier relationship; and
ε = error term.

From Table 1, the residuals of the absolute figures of modified Kim *et al.* (2012) were obtained to measure DACC. For PP, proportion of the five steps of procurement planning followed was taken over the total five steps which include: evaluate/itemize the wants or requirements; determine the amounts and projected prices; identify when the supplies may be required for usage; determine the inter-associations among or between the needs; and merge alike needs (Table 1). EP was dichotomized where if a firm engages in e-purchase, a value of 1 was given otherwise 0 (Table 1). PLC has been measured as proportion of compliance with the three acceptable procurement procedure principles for selection process and these procedure principles comprise of: first, the procedure for choosing the concessioner has established adequate justice, transparency and chance for competition; second, the procedure remained free of deception, exploitation and further forbidden practices in submission with entirely relevant acts and regulations; and third, the result in terms of the concession treaty itself is just and rational beneath the precise situations of the project in terms of cost, quality and hazard distribution in

Table 1 Variable measurement

Variable acronym	Variable name	Measurement	Source
DACC	Discretionary accruals	Residuals of the absolute values of modified Kim *et al.* (2012)	Kim *et al.* (2012)
PP	Procurement planning	Proportion of procurement planning steps followed over the total five steps	Shehu (2020)
EP	Electronic procurement	Dichotomy – for e-purchase 1 otherwise 0	Miko and Abbas (2020)
PLC	Procurement legislation compliance	Proportion of compliance with the three acceptable procurement procedures principles for selection process	Shehu (2020)
OSG	Outsourcing	Outsource procurement 1 otherwise 0	Miko and Abbas (2020)
PSC	Procurement staff competency	Dichotomy – presence of professional HOD of procurement 1 otherwise 0	Shehu (2020)
SSP	Strategic supplier relationship	Dichotomy – supplier maintained for 5 years is 1 otherwise 0	Shehu (2020)

Source: Table created by Authors, 2021

relation to marketplace practice or can be re-balanced or re-negotiated as deem right (Table 1).

For OSG, if a firm outsourced its procurement to a third-party, a value of 1 was given but if it procures goods or services itself, then a value of 0 is given (Table 1). With regards to PSC, dichotomy was used where the presence of head of procurement department with professional membership of a recognized body attracts a value of 1 otherwise 0 (Table 1). Lastly, SSP was also measured using dichotomy where if supplier has been maintained for five years and above, a value of 1 was given otherwise 0 (Table 1).

4. Finding and discussion

Segment four handles the presentation of descriptive statistical (STD deviation, mean, VAR, maximum, minimum, skewness) results, correlation matrix and regression results. Analysis, interpretation and discussion of findings are also handled under this section.

From Table 2, the mean and standard deviation values of DACC are 0.19 and 0.09, respectively, it has a variance value of 0.01. Its maximum and minimum numbers stood at 0.40 and 0.00 correspondingly. The skewness estimate of −0.55 which is closed to 0 and 1 and kurtosis value of 3.15 which is closed to 0 and 3 indicated that the data for the variable was normally distributed. The average, STD deviation and variance figures of the variable imply that deviation among the health-care firms is lower since value of STD deviation is lower than mean. Procurement planning possessed average figure of 0.90, STD dev. value of 0.13 and variance estimate as 0.02. Minimum, maximum, skewness and kurtosis values of the variable are 0.6, 1, −0.84 and 2.65, respectively. Based on the statistics, a lower deviation exists among firms in terms of procurement planning and also the skewness and kurtosis values signified that the data for the variable was normally spread. E-procurement has average, STD deviation, variance, maximum and minimum figures of 0.72, 0.45, 0.21, 1 and 0, respectively. It signifies that, there is a lower deviation among the health-care companies in terms of e-procurement. The minimum and maximum values imply that, some companies are involved in e-purchase while some are not carrying out e-purchase. The skewness and kurtosis values of −0.98 and 1.96, respectively, show data of the variable was normally dispersed.

Table 2 Descriptive figures

VRB	Average	SD	Variance	Min	Max	Skewness	Kurtosis
DACC	0.19	0.09	0.01	0.00	0.40	−0.55	3.15
PP	0.90	0.13	0.02	0.6	1	−0.84	2.65
EP	0.72	0.45	0.21	0	1	−0.98	1.96
PLC	0.97	0.10	0.01	0.67	1	−2.67	8.11
OSG	0.84	0.37	0.13	0	1	−1.85	4.44
PSC	0.68	0.47	0.22	0	1	−0.77	1.60
SSP	0.46	0.50	0.25	0	1	0.16	1.03

Source: Generated by Authors from Stata 13.1 output, 2021

Descriptive statistics Table 2 displays PLC has an average, STD deviation, VAR, maximum, minimum, skewness and kurtosis values of 0.97, 0.10, 0.01, 1, 0.67, −2.67 and 8.11, respectively. The statistics implied that the deviation among the firms is very low in terms of PLC. Also, the data was normally distributed. Outsourcing possessed average figure of 0.84 and a STD deviation and variance values of 0.37 and 0.13, respectively, which signify that the deviation among the firms is low in respect of outsourcing. The variable has lowest number of 0 and highest figure of 1 which indicates some firms have outsource their procurement services while some have procurement department within their firms. The skewness and kurtosis values of −1.85 and 4.44, respectively, indicate that the data was normally spread. PSC possessed an average number of 0.68, STD deviation and variance values of 0.47 and 0.22, respectively, which indicates that PSC has a lower deviation among the firms. The smallest and maximum number of PSC stand as 0 and 1 correspondingly which signifies that some firms' heads of procurement are not members of procurement professional bodies while some have professional bodies' members as their heads of procurement. Based on the skewness and kurtosis values of −0.77 and 1.60, respectively, the was normally distributed. SSP has a mean value of 0.46 which indicates that on average 46% of the suppliers of the firms are maintained for 5 years and beyond. The standard deviation and variance values of 0.50 and 0.25, respectively, imply that a higher deviation exists among the firms in terms of procurement SSP for the reason that the STD deviation is bigger than the average estimate. Lowest and maximum values of 0 and 1 individually indicate some firms did not maintain their suppliers for more than five years while some maintained for five years and above and this is in agreement with the outcome of Adeniyi *et al.* (2020). The skewness and kurtosis values of 0.16 and 1.03 signifies that the data was normally distributed.

From Table 3, discretionary accrual has a negative significant relation with procurement planning while from another side it

Table 3 Correlation matrix

Variable	DACC	PP	EP	PLC	OSG	PSC	SSP
DACC	1.000						
PP	−0.346	1.000					
	0.014						
EP	−0.165	−0.089	1.000				
	0.252	0.538					
PLC	−0.141	−0.167	0.089	1.000			
	0.329	0.247	0.538				
OSG	0.442	−0.355	−0.272	−0.146	1.000		
	0.001	0.012	0.056	0.313			
PSC	−0.017	−0.088	0.718	0.200	−0.299	1.000	
	0.905	0.541	0.000	0.164	0.035		
SSP	0.209	−0.065	0.129	0.174	−0.035	−0.055	1.000
	0.145	0.653	0.373	0.227	0.809	0.704	

Source: Generated by Authors from Stata 13.1 output, 2021

has negative and insignificant connection with electronic procurement, PLC and PSC. The association between DACC and outsourcing is positive and significant while its relationship with SSP is positive and insignificant.

From Table 3, procurement planning has a negative and insignificant association with electronic procurement, PLC, PSC and SSP while its relationship with outsourcing is negative and significant. Electronic procurement has a positive insignificant relationship with PLC and SSP while its relationship with PSC is significantly positive. On a different angle, the variable possessed substantial negative relationship with outsourcing. PLC has a negative insignificant relationship with outsourcing while its relationship with PSC and SSP is positively insignificant. Outsourcing and PSC has a significant negative association while OSG and SSP has an insignificant negative relationship. PSC is insignificantly related with SSP negatively and this is contrary to reality.

The regression results Table 4 displays the degree of impact between the explanatory and explained variables, and the study's hypotheses were tested at either 1%, 5% or 10% level of significance portraying 90%–99% level of confidence.

Table 4 Regression results

Variable	Coeff.	*t*-Value	*p*-Value	VIF	Tolerance value	Model
PP	−0.16	−1.80	0.08	1.27	0.79	
EP	−0.08	−2.40	0.02	2.27	0.44	
PLC	−0.20	−1.86	0.07	1.16	0.86	
OSG	0.08	2.53	0.02	1.37	0.73	
PSC	0.08	2.42	0.02	2.35	0.42	
SSP	0.06	2.61	0.01	1.12	0.89	
***R*-square**						0.40
Adj *R*-sq						0.32
***F*-statistics**						4.81
Sig-value						0.00
Hettest 0.20			0.66			

Source: Generated by Authors from Stata 13.1 output, 2021

4.1 Procurement planning and creative accounting

From the Table 4, procurement planning possessed coefficient estimate of −0.16 and *t*-value figure of −1.80 that was substantial at 10%. It indicates the variable was negatively substantial in influencing the CA of health-care firms publicly registered on NSE in Nigeria. This denotes that, for every improvement in procurement planning of the firms, their CA reduces by 16%. Therefore, a well-planned procurement curbs the level of unethical accounting in health-care firms. This is in accordance with the researchers' initial expectation that when the steps in procurement planning are properly followed, that would lead to mitigation of earnings manipulation. It is also in accordance with reality, signaling theory and agency theory, that when managers of a firm discharged their responsibility of ensuring compliance, accountability and transparency of activities in their firms to protect interests of stakeholders, that would lead to the reduction of CA and that is portraying a signal that the managers may not potentially engage in opportunistic activities. It was also in contrast with the finding of Adeniyi *et al.* (2020). The finding gives a proof of discarding the *H1* of this article that states that "Procurement planning has no significant effect on creative accounting in the Nigerian listed health care firms."

4.2 Electronic procurement and creative accounting

From Table 4, electronic procurement has beta figure of −0.08 and *t*-number of −2.40 that was substantial at 5% (0.02). It shows that electronic procurement has significant adverse impact on unethical accounting of health-care companies in Nigeria which indicates that electronic accounting declines the degree of CA. This is in accordance with the study's preceding belief that when a firm engages in electronic procurement a lot of irregularities may be eliminated because it improves transparency, accountability and visibility. It is in agreement with the agency theory and reality that when managers focus in protecting the interest of their principals, they introduce operations and methods that curb CA using procurement activities. The finding forms the basis for rejection of *H2* of this article that says, "Electronic procurement has no significant impact on creative accounting in the Nigerian listed health care firms."

4.3 Procurement regulatory compliance and creative accounting

From Table 4, PRC has coefficient figure of −0.20, *t*-estimate of −1.86 and sig-number of 0.07. It signifies PLC possessed negative substantial effect on CA of Nigerian-listed health-care businesses at 10% significant level. The outcome was not surprising as it is in accordance with prior belief of the study that when procurement legislations are properly and adequately complied with, that may lead to the elimination of CA. The discovery was in accordance with signaling theory, theory of agency and reality for the reason that managers have responsibility of ensuring compliance with prevailing legislations to achieve the goals of their diverse stakeholders and curb CA. The outcome was in contrast with the discovery of Adeniyi *et al.* (2020). The finding gives a proof of discarding the *H3* of the study that says, "Procurement regulatory compliance has no significant effect on creative accounting in the Nigerian listed health care firms."

4.4 Outsourcing and creative accounting

Outsourcing positively and substantially impact on CA of health-care organizations within Nigeria at 5% level of significance. This can be seen from the coefficient of determination figure of 0.08 and *t*-number of 2.53 and *p*-value figure of 0.02 in Table 4. It signifies that when a health-care firm in Nigeria outsource procurement of Goods or services to a third-party, their CA increases by 8%. The finding is not in accordance with the study's priori belief but in accordance with Agburu *et al.* (2017). Therefore, the *H4* of this article which says, "Outsourcing has no significant influence on creative accounting in the Nigerian listed health care firms" is hereby rejected.

4.5 Procurement staff competency and creative accounting

From Table 4, PSC has beta estimate of 0.08 and *t*-value figure of 2.42 that was substantial at 0.02 (5%). It indicates PSC has a positive substantial impact on the CA of Nigerian health-care firms which means when the firms procurement departments are head by professional procurement officers that increases their level of CA. This finding is opposing the article's prior expectancy. However, it is in accordance with signaling theory and reality that, a professional procurement officer knows the loopholes that could be explored to commit CA because of experience and expertise and might hide the truth to prevail alternative performance through systematic manipulations. It was similarly conflicting the agency theory and Eliah and Issa (2020). This led to rejection of *H5* of the research that states, "Procurement staff competency has no significant influence on creative accounting in the Nigerian listed health care firms."

4.6 Strategic supplier partnership and creative accounting

From Table 4, SSP possessed positive substantial consequence on the CA of Nigerian-listed health-care firms at 1%. This can be clearly observed from the beta estimated figure of 0.06 that has a *t*-estimate of 2.61 with *p*-value 0.01. This implies that when a supplier is maintained for more than five years that leads to a slight rise in firms CA by 6%. This is very possible in reality because a very long-term relationship could lead to connivance in committing irregularities in a firm. The outcome happened to be in contrast with the discovery of Sedyaningrum *et al.* (2019) and Agus *et al.* (2008). The *H6* (SSP has no significant influence on CA in the Nigerian-listed health-care firms) of this study is hereby discarded.

From Table 4, all the VIF values are consistently greater than 1 and less than 10 and the entire tolerance values are less than 1. This is an indication of the absence of multicollinearity. Also, the Hettest chi^2 value of 0.20 that has a significance figure of 0.66 implies the absence of heteroscedasticity. Cumulatively, the *R*-square value of 0.40 confirms the association amid the explained variable and the independent variable is up to 40%. The adjusted *R*-square value of 0.32 revealed that procurement physiognomies have explained the total variation in CA to a degree of 32% and the outstanding 68% is enclosed in the other aspects not considered in this paper. *F*-statistics value of 4.81 with significance value of 0.00 indicated that, the variables of the paper have been well selected, joint and properly used. Therefore, the model of the study is well fitted.

5. Conclusion and recommendations

This paper examined the consequence of procurement physiognomies on CA of quoted Nigerian health-care corporations. Based on discoveries of the research, it was obviously evident that procurement planning, electronic procurement, PLC, outsourcing, PSC and SSP play a very important role on CA. Therefore, effective procurement planning and compliance to procurement legal framework contribute immensely to curbing CA. Electronic procurement could serve as a monitoring mechanism for reducing the level of procurement irregularities in the firms because it promotes transparency and accountability. Professional competent procurement staff have the ability and tendency of identifying fraudulent activities in the procurement process and with this, the level of CA in the health-care firms could be greatly reduced but adequate control needs to be exercise on them to ensure they do not use their expertise to commit frauds. Moreover, the procurement of goods, services and works by the firms could greatly contribute to dealing away with frauds and other forms of regularities in their procurement processes.

This study contributes to existing literature as studies on procurement characteristics and CA are generally lacking. The study contributes to exploring the area of CA, which is core to accountants, but a lot of irregularities are being committed under the umbrella of procurement and studies in the field of procurement and SC management tends to neglect this unintentionally or intentionally due to the technicalities involve. Therefore, this study contributes to serving as a stimulant to subsequent research in this area.

Based on the outcomes and conclusions drawn out of the results, the following improvements are recommended:

The management of listed Nigerian health-care corporations ought to ensure that all the basic steps involved in procurement planning are properly followed to ensure seamless procurement activities within the health-care sector; the health-care firms' managers should try as much as possible to deploy e-procurement as it greatly helps in curbing CA and promoting accountability and transparency; the management of the firms should ensure total compliance with procurement procedures and other procurement legislation as it will substantially contributes to mitigating manipulative accounting practices.

The health-care firms' management should be discouraged from outsourcing their procurement activities because it rises the level of unethical accounting being carried out in the firms; the management should deploy adequate monitoring mechanisms to ensure that professional heads of procurement department are sufficiently monitored to prevent committing unethical accounting practice due to their expertise. The management should checkmate their activities on regular basis; the management of the health-care firms should formulate policies that would make it compulsory for them not to maintain a supplier for a very long period especially beyond five years. The maintenance of a supplier for long period of time leads to too much closeness and the tendency for connivance to commit fraud.

Further studies could put emphasis on how technological innovations, firms' internal policies and professional code of conducts contribute to curbing irregularities in the procurement process of health-care sector and other sectors of the Nigerian economy. Also, studies on the effect of procurement process audit on CA of firms should be encouraged as the audit may be

used as an umbrella to hide irregularities through connivance with the auditors.

5.1 Research limitations/implications

The findings of this study are only applicable to listed health-care corporate bodies in Nigeria. The research only used six procurement attributes and, therefore, more physiognomies need to be explored to find out their contributions towards CA. The research implication of this study is that researchers are to use the outcome of this research in conducting further studies on procurement physiognomies and CA to help in coming up with ways of curbing reporting irregularities in organizations. More theories are to be tested on the subject matter to help bridge the gap between theory and practice. This will assist in enriching the body of knowledge. The findings of this study have validated agency theory because the theory linked the variables. When managers focus effectively on the procurement physiognomies, it helps immensely in curbing CA.

5.2 Practical/social implications

The health-care firms in Nigeria are to use the outcome of this research when coming up with policies in relation to procurement and accounting. They are to come up with policies that ensure malpractices in procurement are curbed and CA is minimized to its barest level. This will help in boosting the firms' economic performance and improve their commercial activities by mitigating leakages. This could be achieved by formulating policies to mandate the adoption of e-procurement and hiring of only competent procurement staff in the firms. The implication of this study to society is that the public is to use the findings of this research in assisting the government and firms' management in coming up with policies that change societal attitudes towards earnings manipulation. By formulating such policies, the society will continue to have access to efficient health-care facilities and that would improve the quality-of-life in the environment.

References

Abbas, U. (2021), "Pharma-grade warehouse in KADHSMA: does centralized warehouse contribute to drugs-availability?", MSc Thesis Submitted to Heriot Watt University, Edinburgh.

Abbas, U. and Shehu, U.H. (2022a), "Board powers and unethical accounting of public quoted corporations in Nigeria", *Gusau Journal of Accounting and Finance*, Vol. 3 No. 2, pp. 1-19.

Abbas, U. and Shehu, U.H. (2022b), "Mediating effect of audit committee on board dynamic and creative accounting in Nigerian firms", *Gusau Journal of Accounting and Finance*, Vol. 3 No. 1, pp. 1-20.

Abbey, K. and Otieno, G.O. (2019), "Procurement performance and profitability in foam mattress firms in Uganda", *African Journal of Business Management*, Vol. 13 No. 18, pp. 630-635.

Abdi, I.C. and Juma, I.I. (2022), "Obtaining the best value for money through procurement planning: can procurement regulatory compliance intervene?", *Journal of Money and Business*, Vol. 2 No. 2, pp. 133-148, doi: 10.1108/JMB-11-2021-0056.

Abdulkadir, R. (2019), "Supply chain seminar", Held at Naira Hotel on 15/04/2019.

Abdul-Rahman, N., Pyeman, J., Ismail, N.K. and Ahmad, M.A. (2018), "The moderating role of total cost of ownership in dynamic procurement transformation", *International Journal of Education and Research*, Vol. 6 No. 5, pp. 121-136.

Adeniyi, O., Damilola, L.O., Idowu, A.O. and Kolawole, S.B. (2020), "Compliance with the stipulated procurement process in local governments: a case from a developing nation", *International Journal of Procurement Management*, Vol. 13 No. 5, pp. 678-700.

Agburu, J.I., Calvin, N.A. and Shadrach, A.I. (2017), "Effect of outsourcing strategies on the performance of small and medium scale enterprises (SMEs)", *Journal of Global Entrepreneurship Research*, Vol. 7 No. 1, pp. 1-34.

Agus, A., Khan, Z.M.M. and Hassan, Z. (2008), "The importance of strategic supplier partnership in supply chain management in enhancing product quality performance and business performance", *KL Conference*, Vol. 6, pp. 1-8.

Ali, A.B. and Ibrahim, Y.H. (2019), "Earnings management as an ethical issue in view of Kohlbergs's theory of moral reasoning", *Journal of Financial Crime Emerald Publishing Limited*, available at: www.emerald.com/insight/1359-0790.htmon29/06/2021.

Amoah, C. and Steyn, D. (2022), "Barriers to unethical and corrupt practices avoidance in the construction industry", *International Journal of Building Pathology and Adaptation*, Vol. 41 No. 6, pp. 2398-4708, doi: 10.1108/IJBPA-01-2022-0021.

Armstrong, M. and Baron, A. (1995), *Job Evaluation Handbook*, Institute of Personnel Development, London.

Bailey, P., Farmer, A.O., Jessop, D. and Jones, D. (2004), *Purchasing Principles and Management*, eighth edition, Great Britain, Prentice Hall.

Davis, M., Taro, T.L. and Tolstoy, D. (2022), "Can blockchain-technology fight corruption in MNEs' operations in emerging markets?", *Review of International Business and Strategy*, Vol. 32 No. 1, pp. 39-56, doi: 10.1108/RIBS-12-2020-0155.

Eliah, E.A. and Issa, H.A. (2020), "The influence of staff competency on performance of procurement management units in Tanzanian training institutions: case study of vocational education and training authority", *International Journal of Economics, Commerce and Management*, Vol. 3 No. 12, pp. 372-382.

Goel, S. (2014), "The quality of reported numbers by the management: a case testing of earnings management of corporate India", *Journal of Financial Crime*, Vol. 21 No. 3, pp. 355-376.

Jensen, K.L. and Payne, J.L. (2003), "Audit procurement: managing audit quality and audit fees in response to agency costs", *A Workshop at University of OK*, pp. 1-53.

Jiang, Y. (2020), "Meanings, motivations and techniques of earnings management", *Advances in Social Science, Education and Humanities Research*, Vol. 496, pp. 141-146.

Kavacs, A. (2004), *Definition and Characteristics of Procurement Systems in Enhancing Procurement Practices*, Springer, Boston, doi: 10.1007/978-1-4419-8947-5_11.

Kim, J.H., Yoon, S.S. and Woodruff, G. (2012), "On the models and estimation of discretionary accruals", available at: www.kaa-edu.or.kr/online3/2014_1/2.%20Soon%20Suk%20Yoon.pdf, (accessed 2 March 2020).

Lanier, D., Wempe, T.F. and Swink, M. (2019), "Supply chain power and real earnings management: stock market perceptions, financial performance effects, and implications for suppliers", *Journal of Supply Chain Management*, Vol. 55 No. 1, pp. 1-47.

Marques, A. and Pinto, A. (2018), "Procurement practices and the municipality auditing market", *Journal of Accounting, Auditing & Finance*, Vol. 34 No. 4, pp. 1-22.

Miko, N.U. and Abbas, U. (2020), "Procurement practices and supply chain performance in Kaduna state university", *KASU Journal of Supply Chain Management*, Vol. 1 No. 2, pp. 1-15.

OECD (2016), "Preventing corruption in public procurement".

Osebhawe, D.A. (2017), "Pathways for improving Nigeria's procurement system", Walden Dissertations and Doctoral Studies, pp. 1-159.

Sedyaningrum, M., Prasetya, A. and Kholid, M.M. (2019), "The effect of strategic supplier partnership on supply chain integration, supply chain performance and farmers performance", *Wacana*, Vol. 22 No. 1, pp. 1-9.

Seth, D.J. (2022), "Challenges in combating corruption in Malaysia: issues of leadership, culture and money politics", *Public Administration and Policy*, Vol. 25 No. 2, pp. 136-149, doi: 10.1108/PAP-01-2022-0002.

Shehu, U.H. (2020), "Deceptive accounting", working paper, Federal University Kashere, Gombe, 20 January.

Skoda, M. and Vyklyuk, Y. (2018), "Detecting creative accounting practices and their impact on the quality of accounting information", available at: www.researchgate.net/publication/325169675on29/06/2021

Smith, J., Zheng, B., Love, P.E. and Edwards, D.J. (2004), "Procurement of construction facilities in Guangdong province, China: factors influencing the choice of procurement method", *Facilities*, Vol. 22 Nos 5/6, pp. 141-148.

Waters, H.R., Laura, L.M. and Laurel, H. (2004), "Quality-based purchasing in health care", *International Journal of Health Planning and Management*, Vol. 19 No. 4, pp. 365-381.

WHO (2007), *The World Health Report 2007: A Safer Future: Global Public Health Security in the 21st Century*, WHO Press, Switzerland.

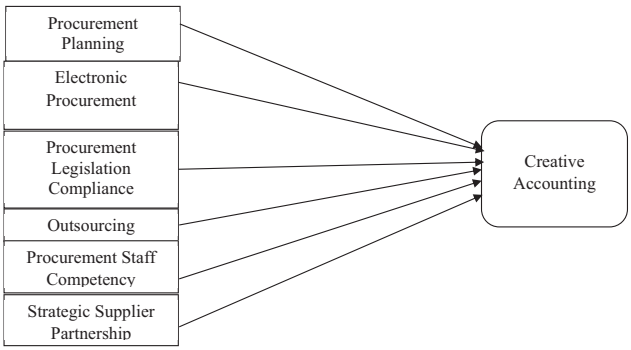
Further reading

Abbas, U. (2020), "The moderating effect of gender on audit committee attributes and earnings management", *Scholedge International Journal of Business Policy & Governance ISSN 2394-3351*, Vol. 7 No. 3, pp. 48-62.

Degeorge, F., Patel, J. and Zeckhauser, R. (1999), "Earnings management to exceed thresholds", *The Journal of Business*, Vol. 72 No. 1, pp. 1-33.

Appendix

Figure A1. Conceptual framework



Source: Created by Authors, 2021

Stata output

```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   13.1   Copyright 1985-2013 StataCorp LP
  Statistics/Data Analysis            StataCorp
                                      4905 Lakeway Drive
     MP - Parallel Edition            College Station, Texas 77845 USA
                                      800-STATA-PC        http://www.stata.com
                                      979-696-4600        stata@stata.com
                                      979-696-4601 (fax)

3-user 8-core Stata network perpetual license:
       Serial number:  501306208483
         Licensed to:  IDRE-UCLA
                       IDRE-UCLA

Notes:
      1.  (/v# option or -set maxvar-) 5000 maximum variables

. edit

. *(9 variables, 50 observations pasted into data editor)

. summarize dacc pp ep plc osg psc ssp, detail

                            dacc
-------------------------------------------------------------
      Percentiles      Smallest
 1%       .000076       .000076
 5%       .012654       .010099
10%       .045445       .012654       Obs                  50
25%       .161316       .021975       Sum of Wgt.          50

50%      .2058565                     Mean           .1905353
                       Largest       Std. Dev.      .0860271
75%       .235201       .290731
90%      .2859885       .303598       Variance       .0074007
95%       .303598       .304796       Skewness      -.5458331
99%       .398467       .398467       Kurtosis       3.154321

                             pp
-------------------------------------------------------------
      Percentiles      Smallest
 1%            .6             .6
 5%            .6             .6
10%            .8             .6       Obs                  50
25%            .8             .6       Sum of Wgt.          50

50%            1                       Mean                .896
                       Largest       Std. Dev.      .1292995
75%            1              1
90%            1              1       Variance       .0167184
95%            1              1       Skewness      -.8408203
99%            1              1       Kurtosis       2.645752

                             ep
-------------------------------------------------------------
      Percentiles      Smallest
 1%            0              0
 5%            0              0
10%            0              0       Obs                  50
25%            0              0       Sum of Wgt.          50

50%            1                       Mean                 .72
                       Largest       Std. Dev.      .4535574
75%            1              1
90%            1              1       Variance       .2057143
95%            1              1       Skewness      -.9799579
99%            1              1       Kurtosis       1.960317

                            plc
-------------------------------------------------------------
      Percentiles      Smallest
 1%         .667           .667
 5%         .667           .667
10%        .8335           .667       Obs                  50
25%            1           .667       Sum of Wgt.          50

50%            1                       Mean                .9667
                       Largest       Std. Dev.      .1009142
75%            1              1
90%            1              1       Variance       .0101837
95%            1              1       Skewness      -2.666667
99%            1              1       Kurtosis       8.111111
```

(*continue*)

osg

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	50
25%	1	0	Sum of Wgt.	50
50%	1		Mean	.84
		Largest	Std. Dev.	.370328
75%	1	1		
90%	1	1	Variance	.1371429
95%	1	1	Skewness	-1.854852
99%	1	1	Kurtosis	4.440476

psc

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	50
25%	0	0	Sum of Wgt.	50
50%	1		Mean	.68
		Largest	Std. Dev.	.4712121
75%	1	1		
90%	1	1	Variance	.2220408
95%	1	1	Skewness	-.7717436
99%	1	1	Kurtosis	1.595588

ssp

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	50
25%	0	0	Sum of Wgt.	50
50%	0		Mean	.46
		Largest	Std. Dev.	.5034574
75%	1	1		
90%	1	1	Variance	.2534694
95%	1	1	Skewness	.1605145
99%	1	1	Kurtosis	1.025765

```
. pwcorr dacc pp ep plc osg psc ssp, star (0.05) sig
```

	dacc	pp	ep	plc	osg	psc	ssp
dacc	1.0000						
pp	-0.3461*	1.0000					
	0.0138						
ep	-0.1652	-0.0891	1.0000				
	0.2516	0.5384					
plc	-0.1409	-0.1667	0.0891	1.0000			
	0.3291	0.2473	0.5384				
osg	0.4420*	-0.3546*	-0.2722	-0.1455	1.0000		
	0.0013	0.0115	0.0559	0.3134			
psc	-0.0173	-0.0884	0.7181*	0.2001	-0.2994*	1.0000	
	0.9049	0.5414	0.0000	0.1636	0.0347		
ssp	0.2093	-0.0652	0.1287	0.1739	-0.0350	-0.0551	1.0000
	0.1446	0.6528	0.3731	0.2272	0.8092	0.7041	

(***continue***)

```
. reg dacc pp ep plc osg psc ssp

      Source |       SS       df       MS              Number of obs =      50
-------------+------------------------------           F(  6,    43) =    4.81
       Model |  .145647425     6  .024274571           Prob > F      =  0.0008
    Residual |  .216984874    43   .00504616           R-squared     =  0.4016
-------------+------------------------------           Adj R-squared =  0.3181
       Total |  .362632298    49  .007400659           Root MSE      =  .07104

------------------------------------------------------------------------------
        dacc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pp |  -.1595231   .0884341    -1.80   0.078    -.3378675    .0188214
          ep |   -.080929   .0336788    -2.40   0.021    -.1488488   -.0130093
         plc |  -.2014397   .1081723    -1.86   0.069      -.41959    .0167105
         osg |   .0810587   .0320811     2.53   0.015      .016361    .1457564
         psc |   .0798831   .0330196     2.42   0.020     .0132928    .1464733
         ssp |   .0557022   .0213262     2.61   0.012     .0126938    .0987106
       _cons |    .438436   .1582334     2.77   0.008     .1193279     .757544
------------------------------------------------------------------------------

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of dacc

         chi2(1)      =     0.20
         Prob > chi2  =   0.6569

. xtset firmid year
       panel variable:  firmid (strongly balanced)
        time variable:  year, 2016 to 2020
                delta:  1 unit

. xtreg dacc pp ep plc osg psc ssp, fe

Fixed-effects (within) regression               Number of obs      =        50
Group variable: firmid                          Number of groups   =        10

R-sq:  within  = 0.3676                         Obs per group: min =         5
       between = 0.0830                                        avg =       5.0
       overall = 0.1623                                        max =         5

                                                F(6,34)            =      3.29
corr(u_i, Xb)  = -0.6453                        Prob > F           =    0.0115

------------------------------------------------------------------------------
        dacc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pp |   -.199052   .1303209    -1.53   0.136     -.463896     .065792
          ep |  -.1257437   .0497665    -2.53   0.016    -.2268814    -.024606
         plc |   -.305305    .137665    -2.22   0.033    -.5850739    -.025536
         osg |  -.0032784   .0519578    -0.06   0.950    -.1088694    .1023126
         psc |   -.012778   .0755475    -0.17   0.867    -.1663089    .1407529
         ssp |   .0992431   .0345857     2.87   0.007     .0289565    .1695296
       _cons |   .7203508   .1894994     3.80   0.001     .3352417     1.10546
-------------+----------------------------------------------------------------
     sigma_u |  .07520633
     sigma_e |  .06757172
         rho |  .55331944   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(9, 34) =     1.93                 Prob > F = 0.0810

. est store fe
```

(***continue***)

```
. xtreg dacc pp ep plc osg psc ssp, re

Random-effects GLS regression                   Number of obs      =        50
Group variable: firmid                          Number of groups   =        10

R-sq:  within  = 0.2597                         Obs per group: min =         5
       between = 0.7022                                        avg =       5.0
       overall = 0.4016                                        max =         5

                                                Wald chi2(6)       =     28.86
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0001

------------------------------------------------------------------------------
        dacc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pp |  -.1595231   .0884341    -1.80   0.071    -.3328508    .0138047
          ep |   -.080929   .0336788    -2.40   0.016    -.1469383   -.0149198
         plc |  -.2014397   .1081723    -1.86   0.063    -.4134535     .010574
         osg |   .0810587   .0320811     2.53   0.012     .0181809    .1439365
         psc |   .0798831   .0330196     2.42   0.016     .0151659    .1446002
         ssp |   .0557022   .0213262     2.61   0.009     .0139036    .0975008
       _cons |    .438436   .1582334     2.77   0.006     .1283042    .7485677
-------------+----------------------------------------------------------------
     sigma_u |           0
     sigma_e |  .06757172
         rho |           0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. est store re

. hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re          Difference          S.E.
-------------+----------------------------------------------------------------
          pp |   -.199052    -.1595231       -.0395289        .0957233
          ep |  -.1257437     -.080929       -.0448147        .0366394
         plc |   -.305305    -.2014397       -.1038652        .0851494
         osg |  -.0032784     .0810587        -.084337        .0408707
         psc |   -.012778     .0798831       -.0926611        .0679495
         ssp |   .0992431     .0557022        .0435409         .027228
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =    -0.26     chi2<0 ==> model fitted on these
                                         data fails to meet the asymptotic
                                         assumptions of the Hausman test;
                                         see suest for a generalized test

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        dacc[firmid,t] = Xb + u[firmid] + e[firmid,t]

        Estimated results:
                         |       Var      sd = sqrt(Var)
                ---------+------------------------------
                    dacc |    .0074007        .0860271
                       e |    .0045659        .0675717
                       u |           0                0

        Test:   Var(u) = 0
                                 chibar2(01) =      0.00
                              Prob > chibar2 =    1.0000


. vif

    Variable |       VIF        1/VIF
-------------+----------------------
         psc |      2.35     0.425392
          ep |      2.27     0.441354
         osg |      1.37     0.729614
          pp |      1.27     0.787646
         plc |      1.16     0.864227
         ssp |      1.12     0.893331
-------------+----------------------
    Mean VIF |      1.59
```

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