EVALUATING THE EFFECT OF POWER SUPPLY OUTAGE ON SMALL AND MEDIUM ENTERPRISES PERFORMANCE: (A CASE OF KADUNA NORTH, KADUNA SOUTH AND SABON GARI LOCAL GOVERNMENT IN KADUNA STATE)

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Abstract

The objective of this paper is to evaluate the effect of power supply outage on the performance (productivity and profitability) of small and medium enterprises in Kaduna North, South and Sabon gari local Government. The study used Multiple Regression Methods in the form of Ordinary Least Square and cross sectional data from 311 SMEs. The result of the finding reveals that 90.91% of the enterprises indicated that power supply outage was the major constrained to their performance, with an average of 180 hour of power outage per month lasting for 6 hours per day, causing the enterprises an average of N240, 000:00 monthly. On the willingness to pay, the findings shows that a total of 286 enterprises (91.96%) agreed to pay an increase of 50% addition to the current tariff charge to receive constant power supply. The findings also shows that power supply outage have negative effect on the productivity and positive effect on profitability. The study recommend that, with the recent bill singed in to law in 2023, which gives state right to generate, transmit and distribute electricity, Kaduna state should revisits it abandoned independent power project plant of 215mw generating capacity, reactivate it and generate electricity in order to increase the electricity supply in the state to bridge the demand gaps of 300mw which was not supply by the national grid, so that the SMEs in the state will enjoy uninterrupted power supply to enable them function efficiently and also the use of renewable energy by the SMEs as an alternatives to generating set.

Key words: Performance; Power outage; Willingness to pay.

1.0 Introduction

The importance of electricity to the economic development of any nation cannot be overemphasized. Subair and Oke (2008) admitted that electricity supply which is mainly utilized for driving machines for the production of various items is a strong factor that will enhance the productivity of manufacturing sector and thereby contributing significantly to the development of the economy. Power supply outage has over the years constituted a major source of concern to many developing countries including Nigeria, Akuru and Okoro (2024). The consequence of it has not only affected the household customers and the service sector alone, it was also found to have negative impacts on the performance of manufacturing companies Aliyu, Ramli, and Saleh (2013). Sinan, (2020), power supply outage is perhaps the

greatest infrastructure problem confronting the SMEs sector and the typical Nigerian firms experience power failure or voltage fluctuations about fifteen times per week, each lasting for about two to six hours, without the benefit of prior warning. This imposes a huge cost on the SMEs arising from idle workers, spoiled materials, lost output, damage equipment and restart costs. Small and medium manufacturing enterprises are the worst affected by these challenges pose by the electricity power outage problems.

Given the prevalence of power outages, firms in the country have adopted different strategies to cope with this electricity power outage supply. Some of these response adjustments include choice of business, choice of location, output reduction, factor Substitution and self generation. While all these strategies are observable among the SMEs firms, the most commonly adopted strategy by firms is investments in alternative generation (i.e., complementary capital). Many electricity users –both households and firms now find it necessary to make their own generation in part or in whole to make up for the inadequate provision resulting from the inefficiencies of the public power system. As a matter of fact, many end users of electricity (from small to large enterprises) now operate small to medium-sized plants with capacities ranging between 1 MW and 700 MW for own generation, Karekezi and Kimani (2002). Therefore, this study focus on evaluating the effect of this energy short fall on SMEs in Kaduna state, taken a case study of Kaduna North, Kaduna south and Sabon Gari local government, which have the implication for capacity utilization, employment and revenue generation. That is the reason for carrying out this study. The objective of this study is to evaluate the effect of power supply outage of SMEs in the selected study areas and to determine the willingness to pay by SMEs to secure uninterrupted power supply from national grid.

2. Literature Review

2.1 Theoretical literature review

This study has attracted some basic theoretical review, reflecting issues bordered on electricity and manufacturing productivity growth. Specifically, to consider in this study, the theories include, supply side channel theory, the traditional theory of cost and modern theory of cost and the Schumpeterian theory of capitalist development and the investment decision theory.

2.1.1 Supply Side Channel Theory

One of the major inputs to thermal electricity generation has been fossil fuel (oil). Be it gas, light crude oil or diesel, are all derivative of fossil fuel. Since electricity is a factor of production in most sectors and industries, arise in electricity prices increases the companies' production costs and thus, stimulates reduction in output, Jimenez-Rodriguez and Sachez (2004). Given a firm's resource constraints, the increase in the prices of electricity as an input of production reduces the quantity it can produce. Moreover, workers and producers will counter the declines in their real wages and profit margins, putting upward pressure on unit labour costs and prices of finished goods and services.

From this perspective of the theory of supply, electricity, a key resource input for manufacturing activities when in shortage of supply compels firms to consider other alternative sources of energy which may be expensive. Given the resource constraints that face all firms, increase in the cost of power as a production input reduces the quantity of goods the firm can produce. Firms may also postpone investment decisions which have the greater propensity to affect their performance. Given this line of theoretical argument, the expectation (apriority) is that shortage of power supply will have a negative impact on performance of manufacturing companies.

2.1.2 Traditional theory of cost and Modern theory of cost

On the other hand, the traditional theory of cost admits that the optimal level of output is attainable at a single level of output above which costs began to rise. Therefore, the output capacity is fully utilized at a point where the marginal cost curve cuts the average cost curve at the minimum while the former start rising. Under the traditional theory of cost, firms do not build plants with varying productive capacity, thus excess capacity is often a phenomenon experienced by firms. Excess capacity according to Bannock, et al (1998) cited in Olayemi, (2020) is the difference between the amounts produced by a firm or group of firms and the higher amount they could most efficiently produce. For instance, if a firm produces 1,000 cars at a cost of N5, 000 each, but the lowest cost output would be 1,300 cars at N4, 000 each. Therefore, there is excess capacity of 300 cars. Bannock et al (1998), asserts that sustained excess capacity is also a feature of firms in monopolistic competition, while it will only exist in the short run under perfect competition.

Excess capacity could also mean the difference between the actual output and maximum possible output of a firm, industry, or economy at large, when there are unemployed resources. However, the modern theory of cost, in its own description, assumed that firms build their plants with some flexibility in their productive capacity and making it possible for such firms

to have reserve capacity. In furtherance to that, the theory also asserts that firms who utilize two-third and three quarters of their adequate supply of power are considered to be efficient. The reserve capacity under the modern theory of cost implies that some outputs can be produced at a single cost. Whichever positions or arguments put forward by each of the theories considered in this study, they are not permanently meant to bridge the gap between the electricity supply and manufacturing productivity growth especially in Nigeria. The permanent solutions should be sought in the total revolution and overhauling of the power sector, to allow the optimal use of the equipment in the manufacturing sector in the country. For instance, inadequate supply of power makes the manufacturing sectors in Nigeria go for power generator and the cost of running such leads to increase in cost of production such as money spent on petrol, diesel etc. This increase in cost has sent many manufacturing firms out of business and eventually reduces the productivity of the manufacturing sector in the economy, Olayemi, (2020).

2.1.3 Schumpeterian theory of capitalist development and investment decision theory

In its contention, that innovations and inventions are a major catalyst of economic development, to therefore inform the need of government, Non-Governmental Organization (NGO), entrepreneurs/owners of manufacturing firms to device possible alternative ways of sourcing energy and of adopting manufacturing machines/equipments that will require little electric power to function in order to reduce the adverse effect of erratic power supply on the productivity of manufacturing firms in the country.

Making an investment decision is critical to business activities as it relates to or affects the overall business objectives. The profitability level of a firm depends on how good or bad its investment decision is. While a good investment decision increases the profitability and enhances the financial viability of firms, poor choice of investment reduces the financial capability and sometimes causes firms to be liquidated. Investment in fixed capital, often referred to as business fixed investment, has both the relative costs and (expected) benefits that often influence firm's decision to embark on such spending. The user or rental cost of investment is affected by the price of capital, the real interest rate and the depreciation rate. The real cost of a unit of capital to a firm is the ratio of rental cost to the price of a unit output produced from the capital installed. On the other hand, the benefit of a unit of capital is the marginal product of output derived from adding it to the production process. Like the cost, the extent to which a firm benefit from capital investment depends on the existing capital level, the amount of labour employed and the level of technology. A rational firm would invest in capital

if the marginal product of capital exceeds or equals the associated marginal cost, and vice versa, Jorgenson, (1963). In other words, in making an investment decision, firms would equate the expected marginal benefit from that investment to the marginal cost of the investment.

Investing in backup generation is not costless and therefore has to be taken judiciously. A firm experiencing power outages would have to consider the marginal benefit of investing in backup and the marginal cost of purchasing and running the plant. For instance, a firm experiencing frequent power outages would have to decide whether (1) to invest in backup generation and be able to continue operations in the event of outages but at the required costs, or (2) not to invest in backup generation and shut down operations during power outages. A firm can choose the first option if it considers it to be a rational decision to own a generator in order to be able to continue operations during outages. On the contrary, another firm may consider the second alternative to be its rational and optimal decision. The latter might consider the costs of owning and operating a generator (i.e., the user cost) to be too high compared to the gain from continuing operations in the events of outages. Investment in new capital stock with respect to changes in its determinants may be limited if the fixed adjustment costs are too great to justify the potential gains, Nickell, (1978). Therefore, a rational firm would equate at the margin the expected cost of generating a kWh of its own electricity to the expected benefit from that kWh, Bental and Ravid, (1982). That gain consists of the continued operation that the self-generated electricity makes possible, and the damage to equipment stock that would have been caused by a power outage.

2.2 Review of Empirical Literature

Studies have been conducted by many scholars in the field of Development economics on the issues related to power supply outage on small and medium enterprises performance.

A study conducted by Doe and Asamoah (2024), on electric power fluctuation on profitability and competiveness using cross sectional survey and mixed method approach with sample size of 70 SMEs reveals that without reliable power supply, SMEs are unable to produce an increased quantity and quality product leading to poor sales which at long run affect their profitability. According to Busani (2024), in his study on do power cuts affect productivity in manufacturing firm in Nigeria using OLS and Tobit models, his findings revealed that the power cuts have negative and significant effect on the productivity particularly to the small firms.

Christian and Imoh (2021), examine the effect of electricity supply on the performance of Small and Medium-Scale Enterprises, using cross sectional survey with 240 data, the data was

analyzed using SPSS and regression method. Their findings show that, insufficient electricity supply has a negative effect on the performance of the SMEs in the study areas. The study recommends that government should insure power supply reliability and encourage both private and public to invest in electricity infrastructure. Akinyemi et al (2021), examine the impact of Electricity Supply on the Performance of Small and Medium-Scale Enterprises (SMEs) in Nigeria using cross sectional survey techniques. The data was analyzed using Statistical Package for Social Science (SPSS), variance analysis (ANOVA), Correlations and Ordinary Least Squares (OLS) techniques. A total of 120 questionnaires were distributed, of which 90 were compiled and analyzed. The findings showed that there is significant impact of electricity supply on the performance of SMEs. The study recommends that investment in independent power projects should be encourage by both public and private individuals to boost electricity supply in the area.

Afukonyo (2023), investigated the impact of inadequate power supply on small and medium scale Enterprises. The study used 30 structured questionnaires to collect primary data from the selected SMEs. The study identified that power supply outage has a negative impact on SMEs making them to spend about 20%-30% on backup energy. The studies also revealed that epileptic power supply affect the operational performance of SMEs. Therefore, the study recommended the state to provide sufficient power supply to the SMEs in the area to enhanced economic activities.

Study conducted by Lassana (2019), on the cost of power outages of manufacturing SMEs productivity in Senegal using panel data and stochastic frontier model, revealed that power outages have negative significant effect on the productivity of SMEs, and small firms appear to be affected more than the large firms. The finding further reveals that firms with generators were successful in countering the adverse effect of power outages on productivity.

Also, a study conducted by Stephene and Milton (2020), on the cost of power outages on enterprises performance in Kenya, investigated the effect of power outages on firm performance using World Bank Enterprises survey data for (2018), employing instrumental variables regression as well as between power outages and firm profitability. Also, their finding shows a positive relationship between efficiency levels, energy utilization and firm profit. They recommend government to increase investment on electricity generation and address inefficiency within the power sector to ensure reliability supply and enhance enterprises performance. Aremu and Adeyemi (2023), in their studies on SMEs survival strategy for employment generation in Nigeria, their findings revealed that SMEs in Nigeria cannot run profitable business on power generating sets in a highly competitive and open economy like

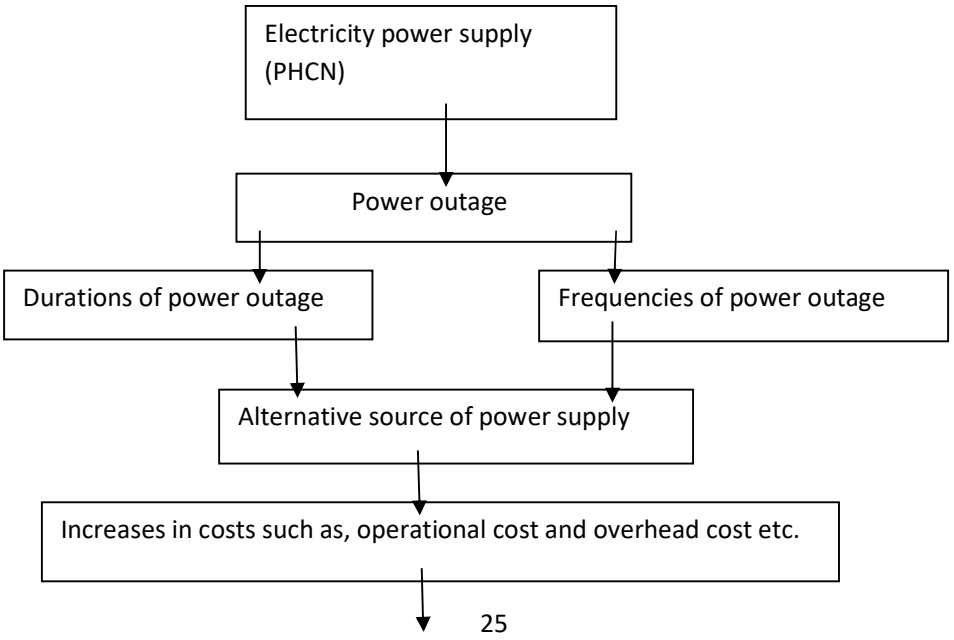
Nigeria because of the high cost of fuel and maintenance. A study conducted by Abdisa (2019) on power outage and its economic cost on firm performance in Ethiopia using survey data; the findings revealed that power outages affect the firm productivity negatively while large firms are most affected.

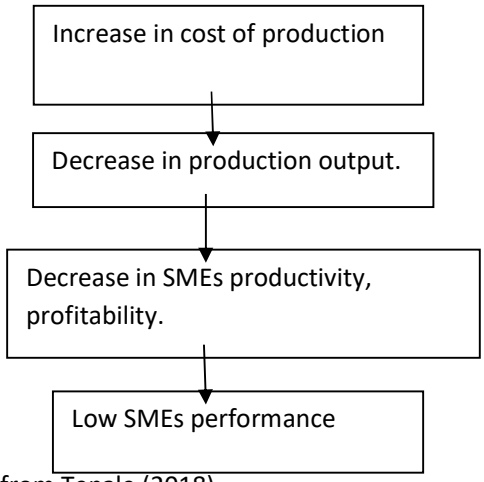
Another study conducted by Fredrik et al (2020), in Ethipia using stated preference survey and sample drawn using firms from manufacturing sectors in Addis Ababa on willingness to pay for an uninterrupted power supply. Their research found that the willingness to pay, and thus the cost of power outages, is substantial. The estimated willingness to pay for a reduction of one power outage corresponds to a tariff increase of 16%. The willingness to pay for reducing the average length of a power outage by one hour corresponds to a 33% increase. And the compensating variation for a zero-outage situation corresponds to about three times the current electricity cost. From the literature reviews, a lots of issues have been discussed on the effect of power outage supply on firms performance, such studies includes Christian and Imoh (2021), Stephine and Milton (2020), Busani (2024), Lassana (2019), Akinyemi ei al (2021) and Afukonyo (2023).

Although, many studies have been conducted on the effect of power outages on SMEs performance, little or no studies reviews consider the willingness to pay for an increase in tariff charged by PHCN for uninterrupted power supply in the study areas and Kaduna state at large. Therefore, this research study arms at filling this gap.

3. Methodology

Figure 1.0 Conceptual Framework of the Study





Source: Adopted from Tenale (2018)

Figure 1.0 above show the relationship between electricity supply as the independent variable and SMEs productivity and profitability as performance (proxy) of SMEs dependent variable. The figure postulate that SMEs performance depends on regular electricity supply and it cost. Power outage depending on it duration and frequency compels SMEs to resort the use of alternative source of power in their production process.

3.1 Theoretical framework of the study

From the literature reviewed, it can be said that electricity supply has an effect on the performance of manufacturing firms. Poor quality and quantity of electricity supply to firms negatively affect the performance of SMEs firms. All SMEs selected for this study relies on the national grid for the supply of electricity to run their plants and machinery to produce output.

The demand for electricity supply in the study areas exceeds that which is supplied by the national grid. This is evident in the recent power outages experience Kaduna state. Because demand is not met, the PHCN resort to power rationing. With this rationing practice, some consumers go off electricity supply for a period of time while other consumers enjoy electricity supply. During the rationing, affected SMEs may not produce. In addition, the PHCN does not announced the time for the rationing, making it difficult for the SMEs to plan production. SMEs operations are disrupted. This leads to losses in production hours, materials damaged, equipment damaged etc which translates into cost to the business. SMEs that are able to afford and run backup generator or find alternative source of electricity supply may have an

uninterrupted production. This however comes at an extra cost to the SMEs which may reduce their output and profit margin. The theoretical frame work of this research was based on Investment decision theory, due to the fact that one of the objectives of this study is to determine the effect of power supply outage cost on SMEs. The theory encouraged the SMEs to make investment on backup generators, because investment in this generation enables the SMEs to continue their business activities when there is a power supply outage and also to prevent damage on the equipment stock that would have been caused by power outage from the national grid, this also help in reducing the forgone cost (output) which the SMEs will have incurred as a result of power outage.

3.1.2 Research Design

The study adopted the stratified random sampling technique in determining the sample for the study; the enterprises were stratified into size: Micro, Small and Medium. The enterprises are stratified according to the activities involved: welding and metal fabrication, Machine Spare parts production and Pure Water production, Electrical/Electronic services, Tailoring services, Barbing saloon, Hair dressing saloon, Typing and photo copy services, Internet café services and pure water production. The state was also divided into zones; from each zone one local government was selected base on the concentration of the number of SMEs.

A total of 365 SMEs drawn from the respective selected local governments was served with copies of the questionnaires base on 35%, 35% and 30% respectively, in which 311 were retrieved. This approach was similar to the one adopted by Martin (2013), in his study on Economic and social costs of power outages; the case study of Pakistan. Sinan (2011), in his study on Evaluation of power outage costs for industrial and service sector in Finland.

3.2 Model specification

Situating this study into positivist philosophy which allows for objectivity in explaining relationship among social processes and between variables, the study estimates the functional form for the study as below:

$$Y = f(PS, Reg, Z) \text{ ---------- } (1)$$

Where outcome variable is a function of the main explanatory variables and other covariates, Ordinary Least Square method (OLS) is used to show the relationship between the dependent variables (firm performance) and the explanatory variables (power supply) and other covariates. This method is adopted because OLS is very simple to use, and produces the best possible coefficient estimates when your model satisfies the OLS assumption for linear

regression. Equation (1) above, evaluate the influence of power supply on firm performance. Where Y, is captured as the dependent variable such as performance of the firm (measured in terms of profitability of the firms), and PS is captured as power supply, Reg is represented as the region of the firm and Z captures the other covariates variables such as FO is the female ownership, MRK is the market size, LS is the legal status of the firm and EDU is the education level of workers in the firm.

3.3 The empirical model

From equation (1) the empirical model can be specify as:

$FP_i = \beta_0 + \beta_{1i} PS + \beta_{2i} FO + \beta_{3i} LS + \beta_{4i} MRK + \beta_{5i} AGE + \beta_{6i} Reg + \beta_{7i} EDU + \mu$ ---- (2)

Where the variables are as explained before as *FP* is the firm performance, *PS* is the power supply, *FO* is the female ownership, *MRK* is the market size *and LS* is the legal status of the firm. *REG* is the region of the firm, *EDU* is the education level of workers in the firm, is the error term.

Adopting Frederick and Josephine (2016),we specified our model as,

$Y = f(PS, Reg, Z)$ ---------- (1)

Writing equation (1) as

$FP = f(EC, IM)$ -------- (3)

Where,

FP = firm performance (SMEs) proxy (productivity and profitability).

EC = Electricity supply

IM = other input

$EC = f(DPO + FPO + CET)$ --------- (3.1)

$IM = f(OC + CASP + OHC)$ --------- (3.2)

Equation (3.10.1) and (3.10.2) becomes

$Y = f(DPO + FPO + CET + OC + CASP + OHC)$ ---------- (4)

β_0, β_1, and β_2 are parameters.

When adopting similar model, the empirical model can be specify as

$FP_i = \beta_0 + \beta_{1i} DPO + \beta_{2i} FPO + \beta_{3i} CET + \beta_{4i} OC + \beta_{5i} CASP + \beta_{6i} OHC + \mu$ ------ (5)

Where,

DPO = Duration of power outage

FPO = Frequency of the power supply outage

CET = Cost of electricity charge (tariff)

OC = Operational cost (fuel and maintenance cost)

CAST = Cost of alternative source of power

OHC = Overhead cost (labour cost and wages)

μ = Error term

3.4 Source of data, Sample size and Method of data analysis

The study used a non-probability sampling procedure in the form of purposive sampling technique. A primary data was obtained with aid of Structure questionnaire. A sample size of 365 of small and medium enterprises from 7421 population sample, random sampling procedure was used in distributing the questionnaires to SMEs in the metropolis so that each enterprise would have equal chance. This research study used econometric approaches using primary source of data for more reliable results. The model was estimated based on the ordinary least squares OLS whereby the parameters or the coefficient of the multiple regressions was obtained and their statistical reliability tested based on the t-ratio, Adjusted R2 and F statistic. In order to obtain accurate and reliable results; the approach requires the researcher to reach out to a large number of customers in order to eliminate the problem of zero responses, Hachimenus et al (2016).

4.0 Result and Discussion

This section presents the analyses of the result of the study.

Table 4.1, Categories of the enterprise operators

Enterprises	Frequencies	Percentages (%)
Metal fabrication	32	10.2
Electrical/Electronic repairs	31	10.0
Barbing saloon	34	10.9
Hair dressing saloon	23	7.4
Internet cape services	32	10.3
Tailoring and fashion	34	10.9
Wood and furniture	31	10.0
Typing and photo coping	29	9.3
Machine spare part production	33	10.6
Pure water production	32	10.3
Total	311	100

Source: Field survey

Table 4.1 above provides a detailed on the characteristics of the enterprises samples within the study areas. A total of 365 questionnaires were distributed, and total of 311 was

retrieve which represent an 85.2%. Also, the table shows the number of each enterprises sample and it percentages from the overall total sample.

4.2 Duration of power outage and hours of operation

Table 4.2 Duration of power outage and hours of operation

Enterprises	Hours of operation	Hours of outage	Hours with grid	Hours with backup	Percentage (%)
Metal fabrication	12	8	4	8	17.02
Internet and Hair dressing	10	6	4	6	12.77
Pure water production	18	12	6	12	25.53
Machine spare parts and furniture	10	6	4	6	12.77
Typing/photo coping and electrical/electronic repairs	8	4	4	4	8.51
Barbing saloon and tailoring	15	11	4	11	23.40
Total		47			100

Source; field survey

The table 4.2above provides a detailed analysis of the relationship between the duration of power outages and operational hours for SMEs in the study area. The data demonstrates that power outages range from 12 to 4 hours on a daily basis, indicating a significant impact on activities and production efficiency of these enterprises. The temporal analysis of the outages reveals that longer durations of power interruptions are directly correlated with negative effects on various operational aspects of SMEs.

4.3. Analysis of Power Supply Outages on the SMEs Performance in the study areas

Table 4.3 Impact of Power Outage on (performance) proxy

	productivity		profitability	
Variables	Co- efficient	p-value	Co- efficient	p-value
CONSTANT	1.7943	0.000	173820.7	0.061
NHDPO	-0.0009	0.174	24.511	0.506
CFG	-4.98e	0.083	0.2109	0.165
LC	-1.06e	0.081	0.0282	0.379
PHCN	7.26e	0.427	0.2540	0.601
CASP	-5.84e	0.328	0.5593	0.072
R^2=	0.921		0.2134	

F-CAL=	2.10		5.62	
F-(tab)=	0.0118		0.00009	
Obs=	305		305	
Average VIF	2.15		2.15	
Average Tolerance	0.67		0.62	

Source; Computation using StataCorp 14.0 (2015).

The estimated results on productivity and profitability are presented in the Table 4.3. It was found that the intercept was 1.797 and 173820.7 meaning that when NHPDO, CFG, PHCN and CASP are zero, productivity and profitability will increases to about 179.7% and N17, 382 respectively.

A glance from the Table 4.2 shown that, both NHDPO, CFG, LC and CASP all have negatives coefficient values (-0.00009,-4.98,-1.06 and -5.72 respectively) which indicates a negatives impact on the productivity of the enterprises, with CFG and LC been statistical significant at 5% except PHCN which is not statistical significant at 5% level and with positive coefficient. The result indicates that an increase in these variables will result to a decrease in productivity by 0.09%, 498%, 106% and 762%. This result shows that power outage cost affect the productivity of the enterprises. This explained why electricity is important to the production process, this result agreed with Abdisa (2018), on power outage and its economic cost on firm performance in Ethiopia using survey data; that power outages affect the firm productivity negatively.

On the other hand, as it was observed that, the profitability results indicates that all the variables analyze shows a positive relationship between cost of power outages and the profitability of the enterprises, as seen from their coefficient values (NHPDO 24.511, CFG 0.21099, LC 0.02820, PHCN 0.25408 and CASP 0.5593 respectively) and are not statistical significant at 5% level except CASP, which was statistically significant at 5% level. Their positive impact indicates an increase in NHPDO, CFG, LC, PHCN and CASP by N1, 00 will increases the profitability by N2, 451.1, N21.099, N2.820, N25.408 and N55.93 respectively. Prior to expectation, this results shows a positive relationship between power outages and enterprises profitability, this findings agreed with Stephene and Milton (2020), in their study on cost of power outages on enterprises performance in Kenya, investigated the effect of power outages on firm performance using World Bank Enterprises survey data for (2018), employing instrumental variables regression as well as between power outages and firm profitability. That there was a positive relationship between efficiency levels, energy utilization and firm profit. Also from the Table above, the coefficient of determination of both productivity and

profitability was $F^2 = 0.921$ and $R^2 = 0.213$ with a (p-values of 0.000) respectively. This shows that 92% and 21% variation in productivity and profitability explained the variation in NHPDO, CFG, LC, PHCN and CASP. That is number of hours per day of outage, cost of fueling of generators, labour cost, and tariff from power holding company of Nigeria PLC. The implication is that, the productivity and profitability (SMEs) was significantly affected by the cost of power outages supply in the study areas.

Test of hypothesis, the null hypothesis says that, an effect of power supply outage has no significant effect on production and profitability. Conventionally, the decision was to accept the F-statistics as a good model, if the critical F-value was less than the calculated F-value. From the analysis, the calculated F-valued for productivity was 2.10 and profitability was 5.62 respectively. And their respective critical values are 0.012 and 0.0001 at 5% significant with p-values (0.000).Therefore, these indicates that the impact of power outage supply have significant effect on both profitability and productivity on the SMEs in the study areas. This allows the researcher to accept the alternative hypothesis on both productivity and profitability, and reject the null hypothesis. The study also employed the used of Vector Inflective Factors (VIF) and Tolerance (1/VIF) to measure how much behaviors (variance) of an independent variable influence, or inflated by an interaction/correlation with the other independent variable. According to Amponsah (2018), found no problem with multicollinearity provided the (VIF) of the independent variables were less than 10 and the tolerance coefficient values is greater than 0.1. Accordingly a glance from the results shows that, the (VIF) average coefficient values was2.15 and 2.15, Tolerance average coefficient values was0.67 and 0.62 for both productivity and profitability respectively. This means that the variables are linear combination of other independent variables. This indicates that there were no problems about the relationship between dependent and independent variables.

4.4. Analysis of the Willingness to pay by SMEs to secure uninterrupted power supply from nation grid.

The tables below present the responds of the SMEs in the study areas, towards paying additional charges (tariff) for the improved power supply. Accordingly, majority of the respondent (91.96%) indicates that their enterprises would be able and willing to pay more for improved power supply. However, about (8.04%) of the respondent indicates that they would not be willing to pay for various reasons, this include of those that can effort to pay, but don't believed that additional charges would lead to an improvement of the power supply.

Table 4.4 Willingness to pay for constant power supply

ALTERNATIVES	FREQUENCY	PERCENTAGE
YES	286	91.96
NO	25	8.04
TOTAL	311	100

Source: field survey

This also means that, they do not believe that the nation's utility is efficient and reliable. Therefore, it was concluded as the analysis of the results has shown, that majority of the enterprises are willing to pay an increase of (50%) of tariff charge for improved and constant power supplied in the study areas. This study agreed with Bothwell and Micheal, (2018) in their studies of Willingness to pay for improved electricity supply reliability in Zambia; A survey of Urban enterprises in Lusaka and Kitare, who's discovered that about (67%) of the enterprises agreed to pay an additional tariff charge of more than (50%), while (33%) of the respondent were not willing to pay an additional tariff charges.

4.5 Discussion of the Findings

Based on the survey carried out by this study, it was discovered that duration of power outages, cost of fueling generators, labour cost and cost of alternatives source of power have negative impacts on the enterprises productivity. This shows that the cost of self generation increases production costs which eventually affect the enterprises productivity. This findings agreed with Abdisa (2019) that the cost of power supply outage affect firm productivity negatively, and the use of back up supply increases the cost of business than using grid electricity in all the countries. It also agreed with Lassana (2019) that the cost of power supply outage have negative effect on productivity of SMEs. the result also shown that number of hour of outage (duration of outage), cost of fueling of generators, labour cost, tariff charge as well as cost of alternative source of power positively affect the profitability of the enterprises. This agreed with Stephene and Milton (2020) in their study on the cost of power outages on enterprises performance in Kenya, that there was a positive relationship between efficiency level, energy utilization and firm profit. The implication of this is that SMEs performance (productivity and profitability) are affected as a result of cost in mitigating power outage from national grid.

Also, the study analyses the SMEs willingness to pay for improved and constant power supply, in our analyses, majority of the respondent (286) 91.96% agreed and are willing to an increase of 50% to the current tariff charged by PHCN. This study agreed with , Fredick et al (2020) that the correspondents are willing to pay an increase in tariff of 16% for reduced the

average length of a power outage and Bothwell and Micheal (2018) that correspondents are willing to pay an increase in tariff charge of more than (50%) for improved and reliable power supply. The implication of this is that SMEs under study are ever ready to pay for an increased tariff charged as long as power supply would be reliable and constant. This shows that it's cheaper for the enterprises to operate on PHCN tariff charged than to operates on self generation.

5.0 Conclusion

In conclusion, the study sought to evaluate the affects power supply outage on the performance (productivity and profitability) on SMEs in a bid to possible policy solutions to curb power outage. Customer surveys, from a sample of 311 from the SMEs were used. It was discovered from the result that power supply outage significantly affects the performance (productivity and profitability) of SMEs and also found that 91.96% of the enterprises have agreed to paid an extra charged on the current tariff charged to enjoyed an uninterrupted power supply from the National grid

5.1 Recommendations

The study conducted reveals some results and based on the results, the following policy recommendations have been offered as a guide to both the government and the SMEs.

1. Kaduna State Government should collaborate with private individuals who are interested in investing in electricity generation, generate the power and sold at a subsidy to the SMEs under government supervision.
2. Attention should be channel towards improving the electricity through investments in electricity generation in renewable energy to the SMEs as an alternatives to generating set.

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