

# The Impact of Power Fluctuation on Small and Medium-sized Enterprises Operation and Profitability : Evidence from Cape Coast, Ghana

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## ABSTRACT

The main aim of this study is to analyze the impact of electricity fluctuation on Small and Medium scale enterprises (SME) operation and profitability in Ghana. This study contributes to the industrialization of the economy of Ghana through the growth of SMEs by investigating the effect of the electricity fluctuation on the SMEs performance. The study employed the quantitative research design in the collation and analysis of data through closed-ended questionnaires. Descriptive statistics, correlation analysis, and regression analysis were carried out using Statistical Package for Social Sciences software (SPSS) to estimate the relationship between variables. The overall results of this study show that there is a significant effect of electricity fluctuation on SME operation and profitability. The study recommends that strategic measures should be introduced to provide sustain the national power supply. This will help improve SMEs performance (operation and profitability) which would decrease unemployment and sustain the economy in the long run.

**Keywords :** Electricity fluctuation, operation, profitability, SMEs, Ghana.

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## I. INTRODUCTION

Small and medium-sized enterprises (SMEs) provide significant contributions to the economic growth in every country through the creation of employment opportunities, income, and revenue generation to companies and the government at large (Ndubisi, Zhai, & Lai, 2021). This implies that Small and medium-sized enterprises (SMEs) play an important

role in reducing the rate of poverty in the country. SME's play a major role in ensuring the growth and development of economies (Kayanula & Quartey, 2000; Obi et al., 2018; Zafar & Mustafa, 2017)

However, it is worth noting that the ability of these SMEs to enhance the economic growth of countries largely depends on their level of production or operations. When businesses are not performing well, the economy also fails to grow. For this study,

Electricity shall be used to describe energy. In Ghana, the electricity supply serves as the backbone for all the various sectors especially the services and the manufacturing sectors (Fashina et al., 2019).

According to Akyuz, Zackariah, and Opusunju (2020), access to a dependable electrical power supply is widely considered to be essential to the operations of most small and medium-scale enterprises. There has been increasing empirical evidence that electricity matters for the performances of SMEs. Electricity influences productivity. In other words, electricity is said to be the lubricant that greases the SME's production machinery (Gaganis, Pasiouras, & Voulgari, 2019). The huge problem these businesses faced with the electricity interruption was how abrupt it was, leading to uncertainty in production where manufacturing firms cannot predict with accuracy the time of occurrence of the power outage (Tettey, 2018). It is against this background that the study seeks to investigate how this load management had been affecting the operations and performances of Small and medium-sized enterprises in Ghana (Akpabli, 2019).

The main aim of this study is to analyze the impact of electricity fluctuation on SME operation and profitability in Ghana. This study shall contribute to the industrialization of the economy of Ghana through the growth of SMEs by investigating the effect of the electricity fluctuation on the SMEs performance as well as the other factors that impede the growth of these SMEs.

This study shall provide policymakers, governmental agencies, and other interested bodies with a better understanding of how the fluctuation affects the operations of businesses in the country. For policymakers, the findings shall equip them with the knowledge that will help them in making critical decisions in terms of drafting economic policies. This research attempts to provide evidence of the problems

that Small and medium-sized enterprises owners face as a result of electricity fluctuation. This shall consequently provide policymakers a clear understanding of the problems these operators are facing and the need for swift and permanent measures to ensure an uninterrupted supply of electricity.

## II. LITERATURE REVIEW

### 1) **The Effect of Electricity supply on SMEs operations and profitability**

It is the wish of entrepreneurs and every country that their SMEs enjoy constant growth. This is because SMEs play a vital role in the economic development of the individuals and the country at large (Beck & Cull, 2014). As such most countries gear their resources towards the growth of SMEs. Despite these efforts, several challenges relating to electricity factors have resulted in stunted growth in SMEs. Various researches have been done in the area of examining how electricity supply influences small business operations in a country. Aliero and Ibrahim (2012) investigated the causal relationship between the power sector and SMEs growth in Nigeria using time series data of energy consumption which include petroleum, gas, coal, and electricity from 1970-2009 (Amadi, 2019). Using the augmented Dickey-Fuller unit root tests and Johansen co-integration tests, the study found that petroleum, coal, and electricity consumption led to SMEs growth, but without feedback. According to the study, it reveals that electricity supply acts as a key factor to the growth of SMEs for most developing countries.

The Centre for Policy Analysis (CEPA, 2007) identified that the 2007 power rationing exercise in Ghana led to an increase in the costs of local manufacturing. Sufficient and affordable supply of electricity has had a decisive significance for economic activities and economic growth can or may

be restricted by resource energy (Pichler & Concha Velasquez, 2010).

Developing countries are mostly faced with electricity supply issues. As such, the rate at which SMEs in developing countries fail is higher than in developed countries (Arinaitwe, 2006; Leal Filho et al., 2019). Similarly, a study conducted revealed that SMEs in Indonesia was fighting stiff competition from foreign products and firms who can produce better quality products while the high cost of electricity accounted for about 62 percent of the respondents' identification of barrier factors against SMEs (Boakye, Twenefour, & McArthur-Floyd, 2016).

Without any shadow of a doubt, electricity is an important variable which is undoubtedly used in all parts of the world as a key element for economic development. A study by (Doe & Emmanuel, 2014; Forkuoh & Li, 2015), investigated the relationship between electricity and the growth of SMEs in the Kumasi Metropolitan Assembly in Ghana. Their results after the study indicated that electricity is important in the activities of SMEs increasing productivity, hence a negative correlation between power outages and the performances of SMEs.

In conformity, Bevrani, Tikdari, and Hiyama (2010) earlier reiterated that a consistent power supply boosted the activities of SMEs and in essence, power fluctuations negatively contribute to business loss and closure. The persistent power fluctuations may cause a cascading failure and system collapse. Cissokho and Seck (2013), emphasized that since electricity was a significant component of virtually any production process, limited supply has the potential to, directly and indirectly, affect the economic activities of firms.

## 2) The Effect of Electricity fluctuation on SMEs operations and profitability

Inconsistent power supply is a common issue in developing countries and its existence always brings a feeling of dismay to most, especially businesses who

are housed in buildings that do not have an alternative source of power generation. SMEs usually feel the impact of the loss of power the most in developing economies. This is because these small businesses do not have the adequate infrastructure that will enable them to cope with the constant loss of electrical power (Paul, 2020).

There are two forms of fluctuation that businesses mostly suffer from; poor quality, and power outages (Bwalya Umar et al., 2021; Lineweber & McNulty, 2001). In the situation where there are fluctuations in the power voltage which could lead to severe damage to machinery and equipment, and there is a corresponding higher cost of frequent repair and replacement, then it could be said that there is a poor quality of electrical power. However, in the case of power outages, there is a complete loss of power from maybe one second to hours.

Power outage is determined by its frequency and the duration of loss of power. Sometimes to businesses measure power outages based on how severe the issue is or the losses associated with the power failure (Sankaran, 2017). Power outages affect both developed and developing economies. However, developing economies turn to suffer most from power outages due to the insufficient provision of power. As such, SMEs in these economies turn to also suffer the consequences of the power outages.

Small enterprises are less resilient and most of them are not insured or have limited capacity to invest in alternative energy sources. As such, fluctuation affects the operations and financial viability of these small businesses (Alfred Mwila et al., 2017). The presence of power rationing or fluctuation leads to a fall in the productivity of SMEs which consequently leads to poor performance due to the inability of these businesses to provide the required customer services (Alban D. Mchopa, Isaac Kazungu, & Moshi, 2014). Moreover, the decline in the productivity level affects the income level of these businesses thereby making them incur lots of losses. SMEs are severely affected

by unanticipated power crisis and this mostly lead to a behavioral adjustment of SMEs (Siyal et al., 2014).

*H1: Electricity fluctuations (EF) have adverse effects on Small and medium-sized enterprises' operations and profitability (SME OP).*

### III. METHODOLOGY

#### *Study Area*

The research was conducted in Cape Coast, the capital city of the Central Region of Ghana. Cape Coast Metropolis is one of the most important districts in Ghana but yet the smallest in the country (Owusu, Eshun, Asare, & Aikins, 2018). It has 415 square kilometers of total land surface area and also covers an area of 122 square kilometers (Ibisch et al., 2016).

The study employed the quantitative research design in the collation and analysis of data through closed-ended questionnaires. This study seeks to investigate the effect of electricity fluctuation on SME operation and profitability. A survey research design was employed because it allows researchers to sample people’s opinions and obtain comments or information from a significant number of respondents. It is also noted that the sole aim of the survey study is to examine current opinions, behavior, and other characteristics of a group (Onodugo, Ugwuonah, & Ebinne, 2010).

A total of 600 respondents formed the population for the study, which targeted SMEs within Cape Coast relying mainly on the electricity for operation out of

which 250 were selected for the study. A small business questionnaire (SBQ) was used to gather primary data from the selected 250 SMEs. After screening the data gathered 200 (80%) were valid and usable. Descriptive statistics, correlation analysis, and regression analysis were carried out using Statistical Package for Social Sciences software (SPSS) version 25 to estimate the relationship between variables.

**Table 1 :** Respondents' Social Profiles

Variables	Characteristics	Frequency	Percentage
Gender	Male	104	52
	Female	96	48
Age	30-35	65	32.5
	36-40	23	11.5
	41-45	42	21.0
	46 and above	70	35.0
Marital Status	Married	58	29.0
	Widowed	54	27.0
	Unmarried	38	19.0
Occupation	Divorced	50	25.0
	Production	39	19.5
	Storage	91	45.5
	Service delivery	70	35.0

Out of the 200 respondents, 52% are males, 35% are above 45 years. Also, 19.5% are into production, 45.5% in storage, and 35% into service delivery.

### IV. RESULTS

#### *Factor Analysis and Reliability*

Results of KMO and Bartlett's test reveal that variables are highly significant. Cronbach's alpha was used to measure the internal consistency of each identified construct. The reliability of each construct was acceptable,

while Cronbach's alpha per the statistical rule of thumb was above 0.7. Thus, all measures used in the main study achieved adequate levels of reliability. Generally, all scales achieved satisfactory levels of reliability as recommended.

The dependent variable (SME OP) and the Electricity Fluctuation (EF) produce outstanding reliability with Cronbach Alpha 0.963. In conclusion, the entire variable falls good in reliability scores. The thumb rule suggests that the Cronbach Alpha coefficient represents:  $0.7 <$  is very robust.

**Table 2 : Reliability Statistics of the Data**

SN	Variables	Cronbach's Alpha	Number of items	Number of respondents
1	EF	0.963	9	200

**Table 3 : Validity Statistics of the Data**

KMO AND BARTLETT'S TEST		
KAISER-MEYER-OLKIN MEASURE OF SAMPLING ADEQUACY.		0.817
BARTLETT'S TEST OF SPHERICITY	APPROX. CHI-SQUARE	1071.655
	DF	34
	SIG.	.000

**Correlation Analysis**

Table 4 below shows a complete relationship between both the dependent variable and the independent variables. The displayed variables are Electricity Fluctuation and SME operation and profitability characterized by EF and SME OP respectively.

The power irregularity among the small and medium enterprises causes excessive business loss since all these businesses heavily rely on power to execute their business. The outcome of correlation the Electricity Fluctuation (EF) and Small Medium enterprises operation and profitability recorded 0.873. This shows a strong relationship between the two variables. Meaning power irregularity significantly affects their operation and profitability.

**Table 4 : Correlation analysis of Electricity Fluctuation on Small and Medium enterprises operation and profitability.**

	SME OP	EF
Pearson Correlation	SME OP 1.000	EF .873
	EF .873	1.000

Source: generated by the researchers from data collected and analyzed using SPSS (version25.0)

**Table 5 :** Regression analysis of Electricity Fluctuation on Small and Medium enterprises operation and profitability.

MODEL	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(CONSTANT)	.408	.063		6.466	.000		
Electricity Fluctuation	.520	.041	.565	12.731	.000	.320	3.128

a. Dependent Variable: SME OP

Source: generated by researchers from data collected and analyzed using SPSS (version25.0)

Concerning the coefficient values, the predictors revealed EF holds a high correlation coefficient with the dependent variable (SME OP). From table 5, EF has a coefficient of 0.520 indicating a strong influence on SME OP. This means that an additional unit of EF will lead to an adverse effect of about 0.520 on the influence of the SME OP.

**V. FINDINGS**

Results from this study support the hypothesis that electricity fluctuations have adverse effects on their operation and profitability reveal that, SMEs in Ghana particularly on Cape Coast suffer from frequent power fluctuations (announced and unannounced), a. The main areas affected by the fluctuations are service delivery, storage, and production. The costs incurred include canceled orders due to delays, high maintenance costs, and high expenditure on alternative power. It is found in this research that power fluctuations known or not had adverse effects on the operation and profitability of the SMEs surveyed.

The results also confirmed that power fluctuations adversely affect the performances of firms in the selected firms in Cape Coast with highly significant values. Undoubtedly, the role of electricity in the economic sector of the country is prodigiously significant for growth and development. This has been sufficiently captured in the mission statement of the state-owned electricity distributor, Electricity of Ghana (ECG), ‘to provide quality, reliable and safe electricity services to support the economic growth and development of Ghana’ (ECG, 2014).

However, it is crucial to note that accomplishing this mission statement is necessary for many reasons as stated by (Ofosu-Ahenkorah, Essandoh-Yeddu, Amankwah, & Dzobo, 2008); electricity is the main driver for industrial development, electricity serves as a raw material for most small and medium businesses and finally, electricity is used in every home for domestic purposes and to enhance the quality of life. Economically, this implies that a persistent power outage in the supply of electricity tends dwindling the economy of the country. As stated by Ofosu-Ahenkorah et al. (2008), a reliable electricity supply to SMEs, is a pivotal contributor towards the sustenance of Ghana’s middle-income status. Energy holds a decisive significance for economic activity in that, economic growth is determined by the energy resource of the country (Doe & Emmanuel, 2014). In other words, there is a symbiotic relationship between electricity and business. To explicate, the energy supply is significant as it is used for varied purposes ranging from production, storage, powering of office equipment, and product display. Hence, we argue that electricity is an essential commodity for all industry types including manufacturing, service, and distribution. This assertion conforms to an earlier claim by Gils et al, 2019, that various sectors of the economy such as manufacturing and transport use enormous amounts of electricity for production and also storage (Gils, Pregger, Flachsbarth, Jentsch, & Dierstein, 2019).

In conformity with the finding of the study, Doe (2014), asserts that the adverse effect of power outages will be a

massive hike of prices on the general public and other businesses as well as degradation of the quality of supply and customer service (Doe & Emmanuel, 2014). He investigated the effect of electric power fluctuations on the profitability and competitiveness of SMEs: A study of SMEs within the Accra Business District of Ghana (Doe & Emmanuel, 2014). The study found that without reliable energy supply, SMEs are unable to increase in quantities as well as in quality leading to poor sales, hence, low level of EF profitability. The study continued to assert that low profitability negatively affects the Return on Assets (ROA) and Return on Investment (ROI) of SMEs. Obviously, with high profitability, it is expected that ROA and ROI will be high and vice-versa.

In Greater Kumasi, Ghana, Forkuoh, Li, Affum-Osei, and Quaye (2015), investigated the electricity power insecurity and SMEs growth: A case study of the cold store operators in the Asafo Market area. The finding which conforms to the current study indicated that power outages harmed SMEs growth, while the cost of operating businesses saw a significant increase under the fluctuation. Again, the cost of alternative sources of power brings higher operational costs in return. The cost of electricity supply in Ghana seems higher than in developed countries, with fewer and costly alternative energy supplies.

## VI. CONCLUSION AND IMPLICATION

The results of the research confirmed that power outages or fluctuation adversely affect performances of firms in the selected cities of Cape Coast with highly significant values. Undoubtedly, the role of electricity in the economic sector of the country is prodigiously significant for growth and development.

Respondents believed that their productivity was adversely affected by the consistent power fluctuation. They argued that fluctuation management is not a panacea to resolving the current electrical issues. However, the result also revealed a significant relationship between the fluctuation and that of the operational cost of SMEs in Cape Coast. fluctuation increased the operational cost of SMEs, although business owners believed that resorting to another alternative source of power supply, they unreservedly

bemoaned the expensive nature of resorting to another alternative source.

Ghana's energy sector has come under pressure to find a lasting solution to the menace facing the sector. However, the paradigm had always been on identifying the main causes as well as finding the right solution to the menace. Yet, little or no attention is given to the effect the load managements have on the performance of SMEs who have proven to contribute highly to the economic growth of the country. Empirical evidence from the study shows that Ghana is losing a lot with the persistent and occurrences of fluctuation preventing activities of high production from SMEs. Future policies will be directed towards making available cheaper alternative power supply as the government work round the clock in finding lasting solution to power fluctuation.

## Conflicts of Interest

The authors declare that they have no competing interests.

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