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Content

Editorial

We are glad to publish vol 32 issue 2 of the *African Journal of Management Research (AJMR)* (December 2025) as the year 2025 ends. We have now returned to two issues per volume after a few years of doing one issue. We thank all authors from all over the continent who continue to show great interest in our journal. We are very grateful.

For this issue, we publish papers from Kenya, Nigeria and Ghana. The papers interrogate topical and pressing issues on o*ptimal location of thermal power plants*; f*ree senior high school policy in Ghana*; *multi-directional efficiency analysis of life and non-life insurers; behavioural biases and personal factors on credit decision-making; electronic banking and financial Inclusion; rural financial innovations; performance management, organizational learning and operational efficiency; supervisor, co-worker safety support and safety performance; and work-family conflict and workplace deviant behaviour among police personnel.* Authors of these papers employed interesting methodologies which should prove useful to readers.

We are extremely grateful to our reviewers, who continue to do excellent work for AJMR, in spite of their heavy daily schedules. Happy reading and please stay tuned for more interesting management research findings in the African context in subsequent issues. We wish our readers a fruitful 2026.

Optimal Location of Thermal Power Plants: Closer to Demand Centers or Fuel Depots?

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Abstract
The location of a thermal power plant in a country with dispersed demand centers and limited fuel supply sources is an important decision as it greatly impacts electricity supply cost. This study develops an optimization model to support decision making concerning the location of new and existing thermal plants by a centralized planner. The model offers a platform for decision makers to navigate the trade-off between locating a thermal plant either close to fuel depots to reduce fuel transportation cost or close to demand centers to reduce transmission losses and cost. The proposed model is inspired by the decision of the government of Ghana to relocate an existing thermal plant close to a major demand center yet far away from its fuel source. The model is unique as hitherto such decisions have been analyzed mainly using a Multi Criteria Decision Making model that is unable to accurately capture the magnitude of the important factors. Results from applying the model to the relocation problem of the government of Ghana while supportive of the government's decision, also sees the cost of electricity supply increasing by about 0.06% (roughly US$1.5 million annually over a 10-year period). A suggested relocation by the model will reduce electricity supply cost by about 0.1% compared to the government's decision.

Key words: Demand centers, fuel depots, location, transmission cost, transmission losses.

1.0 Introduction
This research was motivated by the announcement of the Government of Ghana (GOG) in 2021 to relocate a 250 MW thermal power plant from the country's coastal region to a place close to the second largest city located about 250km away in a bid to reduce transmission losses and stabilize electricity supply to the northern part of the country (Dapaah, 2022). The announcement of the relocation decision

generated heated debates between those in favour and against. Proponents of the decision, such as the Volta River Authority (VRA), a government institution in charge of electricity generation, argued that the relocation is critical to the provision of electricity to the middle and northern parts of the country and promises to boost electricity export in the West African sub-region. Opponents, however, argued it is a politically motivated decision which will lead to high cost of electricity supply (Zurek, 2022). The Africa Centre for Energy Policy (ACEP) as well as the main opposition party raised issues with the cost of relocation and warned that such a move could exacerbate the financial woes of the energy sector (ACEP, 2022). Opponents further warned of the associated fuel transportation costs since the plant will be located far away from its fuel source. The debate raged further when the GOG signed a contract to build a new 350MW thermal plant (Abbey, 2023) also to be located close to the second largest city. This contract added to the suspicion of GOG making politically motivated decisions since the location in question (for both the relocation and the new plant) is in the stronghold of the ruling governing party. Interestingly, prior to these two major decisions, all thermal plants in Ghana have been located along or close to the coast where fuel for the power plants is first delivered.

This is an interesting and classic case of a facility location problem when demand centers are far away from where a power plant sources its fuel. For such demand centers, a trade-off must be made between siting the plant closer to the fuel source and transmitting the electricity generated to the demand centers and siting the plant close to the demand centers and transporting the fuel to where the plant is located. In the end, since all that matters is electricity delivered to the consumer, this research intends to analyze the location problem based on the cost of electricity supply. If the cost of electricity supply under the GOG's location plan is not significantly different from that under the status quo, then the GOG's decision cannot be necessarily classified as politically motivated especially if it can help improve the quality of electricity supply. The issues under contention are encountered on a regular basis in less endowed countries, especially when electricity demand from constituents of a ruling party increases significantly and the government faces political pressure to address it. This research therefore attempts to provide a method that considers the major factors in such a facility location problem as faced by GOG. Several costs are considered, including cost related to transmission of electricity, transmission losses, fuel transportation, and relocation. Thus, the research develops an optimization model where the objective is to minimize the cost of electricity supply of a country based on the optimal location of the generation plants at the central planner's disposal. The developed optimization model can be used to support the location of new and the relocation of existing thermal plants. The model will be helpful especially to less endowed countries where thermal generators due to their less capital cost (relative to other sources such as hydro) are a very attractive choice (Afful-Dadzie et al., 2017). The rest of the paper is organized as follows. A literature review is presented in section two followed by the methodology in section three. This is then followed by a case study involving Ghana in section four. Section five presents the results of the case study followed by a conclusion in section six.

2.0 Literature Review

Location problems are well studied in the literature and are mostly aimed at addressing the question of where an

economic activity, for example a factory, should be located and why. Two theories, the Alfred Weber's location theory (also known as the least cost approach), and the August Losch's theory of location serve as the foundation for the location problem studied in this work. Weber's theory of industrial location at a minimum, bases the location decision of a goods-producing firm on transportation and labour costs. It asserts that a firm must be located close to the market and raw material sources (i.e. geographical context) in a manner that minimizes transportation costs of raw materials and finished products. For example, a thermal plant could be located close to demand centers such that transmission cost and losses are minimized or close to a fuel depot such that the transportation cost of the fuel for electricity generation is minimized. Weber's theory, however, does not explicitly factor into account demand. Losch's theory on the other hand places much emphasis on demand or sales and considers locating an industry in an area generating the highest sales revenue. In the electricity sector for instance, Losch's theory will demand that a thermal plant is located close to areas of high demand, such as industrial zones and cities.

Several studies have been conducted on the location of power plants. However, these have mainly been focused on renewable energy technologies such as solar, wind and biomass, with very few on thermal power plants. Given that many less developed countries tend to favour thermal plants due to their affordability in terms of acquisition, it is important that research on location of thermal power plants is given much attention. In general, studies on the location of power plants either approach the analysis using a Multi-Criteria Decision Making (MCDM) or an optimization model. MCDM approaches tend to dominate and are popular among studies on location of renewable energy generators. Studies that employed MCDM based approaches include Wang and Xin (2011), Sun and Qin (2015), Kashawn, Solange, and Legena (2022), Choudhary and Shankar (2012), Siefi, et al. (2017), Gumussoy, Onen, and Yalpir (2024), Azevêdo, Candeias, and Tiba (2017).

The popularity of MCDM techniques stems from its ease of application where all that is needed is the ability to rate a factor between 0 and 100 or 0 and 1 on how good or bad a factor is in relation to a chosen location. Unfortunately, this is also one of its many shortcomings. An MCDM method is unable to explicitly consider the magnitude of quantitative factors, uncertainty in factors, and multiperiod considerations. In addition, an MCDM method cannot explicitly consider the fact that a power plant can be used to serve more than one demand center. Furthermore, the output from an MCDM method cannot be easily translated into a monetary figure to understand the overall benefit or cost thereof arising from the choice of location. However, these shortcomings involving important considerations in thermal power plant site selection can easily be accounted for with the use of an optimization model. Few studies have employed optimization techniques for the location of power plants. Among these, the seminal paper by Ravindran and Hanline (1980) used a Mixed-Integer Linear Programming (MILP) optimization to determine the best optimal site choice for a coal blending plant, whereas Ilbahar et al. (2021) uses a Fuzzy Linear Programming to optimize the location of a waste-to-energy plant. The major factors considered by these authors include fixed and variable cost of transporting fuel to the plants, distance between cities, annual investment of plant capacity cost, annual operating and maintenance cost, and unit price of electricity. Rentizelas and Tatsiopoulos

(2010) also applied a multistage Non-Linear Programming optimization, Genetic Algorithms, and Sequential Quadratic Programming models for the optimal location of a bioenergy plant, whereas Duarte et al. (2014) and Xie, Zhao, and Hemingway (2010) used a Mixed-Integer Linear Programming (MILP) model to analyze the selection of the best location for a biofuel plant. Among the factors considered by these authors include equipment operating and maintenance cost, fixed and variable investment cost of electricity transmission line, fuel transportation cost from a chosen site, electricity transmission cost, and percentage of electricity transmission losses.

The studies in the literature that employ optimization techniques for power plant location mainly focus on location of new power plants without considering relocation of existing plants. Many of these studies do not also explicitly capture transmission losses in the amount of electricity delivered. This paper analyzes the thermal power plant location problem considering these and other important factors such as proximity of power plant locations to demand centers and fuel sources.

3.0 Methodology: Thermal Power Plant Location Model

The optimization model for the location and relocation of thermal power plants is presented next. Table 1a, 1b and 1c presents the nomenclature detailing the meaning of the decision variables and parameters of the model. A simple schematic diagram of three power plants, three fuel depots, three location sites, and three demand centers, depicting the setup of the location problem analyzed in this research is also shown in Figure 1. Note that within the planning period, Figure 1 is meant to be expanded with new power plants to meet increasing future demand. These future plants will also be considered for location at one of the candidate sites.

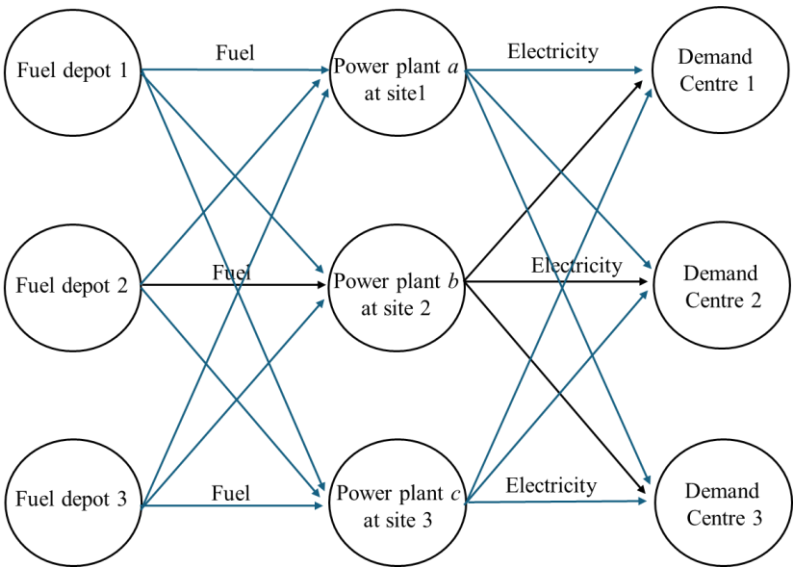

Figure 1: A network diagram of a power system made up of three thermal plants located at three different sites, drawing fuel from three depots to generate electricity for three demand centers

Table 1a: Nomenclature

	Indices
i	Set of existing thermal power plants
p	Set of future thermal power plant types
h	Set of hydro power plants
j	Set of demand centres
k	Set of fuel depots
n	Set of candidate sites
t	Set of years within the planning period
	Decision variables
$\boldsymbol{X_{in}}$	Binary variable indicating whether plant *i* is to be relocated to site *n*
$\mathbf{Y_{injt}}$	Power transmitted by existing thermal plant *i* (relocated to site *n*) to demand center *j* in period *t* [MWh]
$\mathbf{Y_{pnjt}}$	Power transmitted by future thermal plant *p* located at site *n* to demand center *j* in period *t* [MWh]
$\mathbf{Y_{hjt}}$	Power transmitted from hydro power plant *h* to demand center *j* in period *t* [MWh]
$\mathbf{Z_{inkt}}$	Quantity of fuel sourced by existing thermal plant *i* (relocated to site *n*) from fuel depot *k* in period *t* [MMBtu]
$\mathbf{Z_{pnkt}}$	Quantity of fuel sourced by future thermal plant *p* (located at site *n*) from fuel depot *k* in period *t* [MMBtu]
$\mathbf{G_{pnt}}$	Number of thermal plant type *p* to be sited at location *n* in period *t*
$\mathbf{W_{pnt}}$	Total capacity of future thermal plant type *p* to be located at site *n* in period *t* [MW]

Table 1b: Nomenclature

	Parameters
TC	Cost of transmitting 1MWh of power over a unit distance [$/MWh/km]
v	Percentage of transmission loses over a unit distance [%]/km
$\mathbf{CO_{it}}$	Variable operating and maintenance cost of existing thermal plant *i* in period *t* [$/MWh]
$\mathbf{CO_{pt}}$	Variable operating and maintenance cost of future thermal plant type *p* in period *t* [$/MWh]
$\mathbf{CO_{ht}}$	Variable operating and maintenance cost of hydro plant *h* in period *t* [$/MW]
$\mathbf{CC_i}$	Annualized capital cost of existing thermal plant *i* [$/MW/Year]
$\mathbf{CC_p}$	Annualized capital cost of future thermal plant type *p* [$/MW/Year]
$\mathbf{CC_h}$	Annualized capital cost of hydro plant *h* [$/MW/Year]
$\mathbf{FT_i}$	Annualized fixed operating and maintenance cost of existing thermal plant *i* [$/MW/Year]
$\mathbf{FT_p}$	Annualized fixed operating and maintenance cost of future thermal plant type *p* [$/MW/Year]
$\mathbf{FT_h}$	Annualized fixed operating and maintenance cost of hydro plant *h* [$/MW/Year]
$\mathbf{W_i}$	Capacity of existing thermal plant *i* [MW]
$\mathbf{W_h}$	Capacity of hydro plant *h* [MW]
$\boldsymbol{W_p^{max}}$	Maximum rated capacity of future thermal plant type *p* [W]

Table 1c: Nomenclature

$\mathbf{CF_{it}}$	Capacity factor of existing thermal plant *i* in period *t*	[%]
$\mathbf{CF_{pt}}$	Capacity factor of future thermal plant type *p* in period *t*	[%]
$\mathbf{CF_{ht}}$	Capacity factor of hydro plant *h* in period *t*	[%]
$\boldsymbol{\eta_{it}}$	Thermal efficiency of plant *i* in period *t* [%]	
$\boldsymbol{\eta_{pt}}$	Thermal efficiency of plant type *p* in period *t*	[%]
$\mathbf{MTG_{it}}$	Minimum electricity generation by existing thermal plant *i* in period *t*	[%]
$\mathbf{MTG_{pnt}}$	Minimum electricity generation by future thermal plant type *p* located at site *n* in period *t*	[%]
$\mathbf{MHG_{ht}}$	Minimum electricity generation by hydro plant *h* in period *t*	[%]
$\mathbf{E_{jt}}$	Amount of electricity demanded by demand center *j* in period *t*	[MWh]
Q	Cost incurred for transporting 1 MMBtu of natural gas over a unit distance	[$/MMBtu/km]
$\mathbf{B_{in}}$	Cost of relocating existing thermal plant *i* to candidate site *n*	[$]
$\mathbf{L_{nj}}$	Distance between candidate site *n* and demand center *j*	[km]
$\mathbf{L_{hj}}$	Distance between hydro plant *h* location and demand center *j*	[km]
$\mathbf{D_{kn}}$	Distance between fuel depot *k* and candidate site *n*	[km]
$\boldsymbol{\lambda}$	Number of hours in a year	[hours]
C	Conversion rate from MMBTU to MWh (set at 3.412142)	

The Mixed Integer Linear Programming (MILP) model for the power plant location problem is made up of Equations (1)-(8). For simplicity, the model considers only thermal and hydroelectric plants. However, the model can be expanded to include other generator types such as solar and wind. Note that only thermal plants are subjected to location or relocation since it is impractical to attempt to relocate a hydroelectric plant. However, the presence of hydroelectric plants influences the location/relocation decision. In addition, it is assumed that a plant can be relocated only once within the planning period, and the relocation if needed will occur at the beginning of the planning period. Each of the different costs in the objective function are discounted to the beginning of the planning period with an interest rate of $\boldsymbol{r}$ % per period.

$$\text{Min Z} = \sum_{t=1}^{T} \frac{1}{(1+r)^{t-1}} \Big[\Big\{ \sum_{j=1}^{J} \sum_{\text{n}=1}^{N} \sum_{\text{i}=1}^{\text{I}} TC * \text{L}_{\text{nj}} * \text{Y}_{\text{injt}} + \sum_{j=1}^{J} \sum_{\text{n}=1}^{\text{N}} \sum_{\text{p}=1}^{P} TC * \text{L}_{\text{nj}} * \text{Y}_{\text{pnjt}} + \sum_{j=1}^{J} \sum_{\text{h}=1}^{\text{H}} TC * \text{L}_{\text{hj}} * \text{Y}_{\text{hjt}} \Big\} + \Big\{ \sum_{j=1}^{J} \sum_{\text{n}=1}^{\text{N}} \sum_{\text{i}=1}^{\text{I}} \text{CO}_{\text{it}} * \text{Y}_{\text{injt}} + \sum_{j=1}^{J} \sum_{\text{n}=1}^{\text{N}} \sum_{\text{p}=1}^{\text{P}} \text{CO}_{\text{pt}} * \text{Y}_{\text{pnjt}} + \sum_{j=1}^{J} \sum_{\text{h}=1}^{\text{H}} \text{CO}_{\text{ht}} * \text{Y}_{\text{hjp}} \Big\} + \Big\{ \sum_{k=1}^{K} \sum_{n=1}^{N} \sum_{\text{i}=1}^{I} Q * \text{D}_{\text{nk}} \text{Z}_{\text{inkt}} + \sum_{k=1}^{K} \sum_{n=1}^{N} \sum_{\text{p}=1}^{P} Q * \text{D}_{\text{nk}} \text{Z}_{\text{pnkt}} \Big\} + \Big\{ \sum_{\text{n}=1}^{\text{N}} \sum_{\text{i}=1}^{\text{I}} \text{B}_{\text{in}} * \text{X}_{\text{in}} \Big\} + \Big\{ \sum_{\text{i}=1}^{\text{I}} (\text{CC}_{\text{i}} + \text{FT}_{\text{i}}) * \text{W}_{\text{i}} + \sum_{\text{n}=1}^{\text{N}} \sum_{\text{p}=1}^{\text{P}} (\text{CC}_{\text{p}} + \text{FT}_{\text{p}}) * \text{W}_{\text{pnt}} + \sum_{\text{h}=1}^{\text{H}} (\text{CC}_{\text{h}} + \text{FT}_{\text{h}}) * \text{W}_{\text{h}} \Big\} \Big] \quad (1)$$

Subject to the following constraints:

$$\sum_{n=1}^{N} X_{in} = 1 \qquad \forall i \qquad (2)$$

$$\sum_{n=1}^{N}\sum_{i=1}^{I} Y_{injt} * (1 - v * L_{nj}) + \sum_{n=1}^{N}\sum_{p=1}^{P} Y_{pnjt} * (1 - v * L_{nj}) + \sum_{h=1}^{H} Y_{hjt} * (1 - v * L_{hj}) = E_{jt} \qquad \forall j, \forall t \qquad (3)$$

$$\sum_{j=1}^{J} Y_{injt} \leq \lambda * CF_{it} * W_i * X_{in} \qquad \forall i, \forall n, \forall t \qquad (4a)$$

$$\sum_{j=1}^{J} Y_{injt} \geq MTG_{it} * \lambda * CF_{it} * W_i * X_{in} \qquad \forall i, \forall t \qquad (4b)$$

$$\sum_{j=1}^{J} Y_{pnjt} \leq \lambda * CF_{pt} * W_{pnt} \qquad \forall p, \forall n, \forall t \qquad (5a)$$

$$\sum_{j=1}^{J} Y_{pnjt} \geq MTG_{pnt} * \lambda * CF_{pt} * W_{pnt} \qquad \forall p, \forall n, \forall t \qquad (5b)$$

$$W_{pnt} = W_{pn(t-1)} + G_{pnt} * W_p^{max} \qquad \forall p, \forall n, \forall t \qquad (5c)$$

$$\sum_{j=1}^{J} Y_{hjt} \leq \lambda * W_h * CF_{ht} \qquad \forall h, \forall t \qquad (6a)$$

$$\sum_{j=1}^{J} Y_{hjt} \geq MHG_{ht} * \lambda * W_h * CF_{ht} \qquad \forall h, \forall t \qquad (6b)$$

$$\sum_{j=1}^{J} Y_{injt} * \frac{C}{\eta_{it}} \leq \sum_{k=1}^{K} Z_{inkt} \qquad \forall i, \forall n, \forall t \qquad (7a)$$

$$\sum_{j=1}^{J} Y_{pnjt} * \frac{C}{\eta_{pt}} \leq \sum_{k=1}^{K} Z_{pnkt} \qquad \forall p, \forall n, \forall t \qquad (7b)$$

$$Y_{inj}, Y_{hj}, Z_{inkt}, Z_{pnkt}, UE_{jt}, W_{pnt} \geq 0 \text{ ; } X_{in} \text{ binary; } G_{pnt} \text{ integer} \qquad \forall i, \forall p, \forall h, \forall n, \forall j, \forall k, \forall t \qquad (8)$$

The overarching goal of the central planner of the power system is to ensure that power plants are placed at locations such that the total cost to the system is minimized. This objective is captured with Eqn (1) which is made up of five major terms (differentiated with curly bracket), namely (1) transmission cost, (2) variable operation and maintenance cost, plus transmission loss costs, (3) fuel transportation cost, (4) relocation cost, and (5) capital cost, plus fixed maintenance and operation cost, in that order. The content in the first curly bracket of Equation (1) is the transmission cost of power taken from the plants (i.e. existing thermal, future thermal, and hydro).

The content in the second curly bracket is made up of two types of cost, the variable maintenance and operation cost (including fuel cost), and the cost of power lost during transmission. The third curly bracket in Equation (1) is made up of the cost of transporting fuel from depots to thermal plants. This cost is divided into two parts, one for existing thermal plants and the other for future thermal plants. The fourth curly bracket of the objective function is the cost of relocating existing plants, whereas the fifth is the fixed and capital cost of the plants.

Since $\boldsymbol{X_{in}}$ is binary, Eqn (2) ensures that a plant is located at only one candidate location site. On other hand, Eqn (3) is the power supply balance constraint for a demand center, where the amount of electricity sent is such that it is enough to meet demand after factoring in transmission losses. Equations 4-8 relate to electricity supply by generators and their technical specifications. For existing thermal plants, Eqns (4a, 5a, and 6a) ensure that the sum of the supply from a thermal plant to the demand centers is within the capacity of the plant. The right-hand-side of Eqn (4a) is multiplied by the binary variable $\boldsymbol{X_{in}}$ to ensure that an existing thermal plant produces electricity from

only the site it is located. Note that new thermal plants do not need such a constraint since their generation depends on the capacity accumulated at a site. Also, Eqns (4b, 5b, and 6b) allow for a minimum amount of electricity to be generated by a plant if so desired, for example, perhaps by agreement. The Eqn (5c) serves to track the cumulative capacity of a future thermal plant type (e.g. combine circle gas turbine) at a particular site over time. The constraint capturing the conversion of fuel to electricity by the existing and future thermal plants is given by Eqn (7a) and Eqn (7b) respectively. The model is concluded with the non-negativity constraint of Eqn (8).

4.0 Case study based on Ghana

This section presents a real-world case study applying the location problem model presented in section three. As explained in the introduction section, this research is motivated by the decision of the Government of Ghana (GOG) to relocate an existing thermal plant about 250km away from its current location. This decision attracted several criticisms, especially that there has not been any noticeable problem with regards to the transmission of electricity to the demand center in question. This research therefore sought to analyze GOG's relocation decision using the model developed in section three. The analysis is performed over a 10-year period for better understanding of the short to long term impact of the decision. Since the relocation occurred in 2024, the model has been analyzed for the period 2024-2033. To begin with, a brief background of the electricity generation sector of Ghana is presented.

4.1 Background of the electricity generation sector of Ghana

Ghana is located in West Africa with a population of over 34 million in 2023 (World Bank, 2024). It had a total of 5639 MW (5180 MW) of installed (dependable) capacity in 2023 and generated a total of 24,264 GWh of electricity with a transmission loss of 3.9%. Ghana's electricity generation capacity mix as of 2023 is made up of hydroelectric (28.1%), thermal (69.6%), and solar (2.34%). However, solar accounts for a little over 0.5% of actual electricity generation. Table 2 gives a breakdown of Ghana's electricity generation types and their installed and dependable capacities. Ghana's electricity generation sector comprises of both government and independent power producers. The independent power producers hold at least 50% share of the sector. In 2022, the GOG decided to relocate the Ameri power plant (bold in Table 2) to a location close to the second biggest city in Ghana which is more than 250km away. This is after the ownership of the plant was transferred to the GOG through a Build-Operate-Transfer (BOT) agreement in 2022. Many called the relocation decision politically motivated and one that will lead to an increase in electricity cost since the fuel needed for the generation would have to be transported over long distances. To assuage such concerns, the GOG also commissioned a company to construct a gas pipeline to transport natural gas close to the original location of the plant in question to the new planned location. Fundamentally, this raises the question as to whether it is ideal siting a thermal power plant close to a demand center or to a fuel depot. The GOG's relocation problem is a classic case that can be analyzed using the model from section three. The next sub-section presents the data for the case study.

4.2 Data Presentation

This section presents the data used for the case study including assumed parameters.

4.2.1 Plant Capacity, Efficiency, and Costs

The capacity and efficiency data on existing and planned future thermal plants in Ghana as at end of 2023 is presented in Table 2. In all, there are 17 existing thermal plants. There is also an agreement in place for a 370 MW and 350 MW thermal plants to come on stream by 2026 (Abbey, 2023). These two are thus included in the model as future plants and enforced to be available for generation by 2026. The capacity factor of thermal plants in Ghana tends to be very high per their usage rate and are therefore assumed to be 0.85 for all the thermal plants. The efficiencies of the thermal plants can also be found in Table 2 based on their heat rates in ECG (2023).

Table 2 does not include data on Ghana's hydroelectric plants since this is not the focus of the study. However, the role of hydroelectric plants must be accounted for in the case study since they form a major part of the Ghana's electricity system. Since the two hydro plants of Akosombo (1020 MW) and Kpong (160 MW) are located in close proximity to each other and with roughly similar capacity factor, they are lumped together and referred to as Hydro1 with capacity factor of 0.75 according to data in ECG (2023). The remaining hydro plant by name Bui (404 MW) is referred to in the case study as Hydro2 with a capacity factor of 0.31 according to data in ECG (2023).

Table 2: Data on Ghana's thermal power plants in 2023 as used in the model.

Thermal Power Plants	Model Name	Installed Capacity (MW)	Dependable Capacity (MW)	Thermal Efficiency	Variable Cost ($/MWh)	Capital Cost ($/MW)	Fixed O&M Cost ($/MW/yr.)
Existing							
Takoradi Power Company (TAPCO)	Plant 1	330	315	0.40	73	1201000	14,760
Takoradi International Company (TICO)	Plant 2	340	330	0.43	73	1201000	14,760
Tema Thermal 1 Power Plant (TT1PP)	Plant 3	110	100	0.30	210	785,000	7,330
Tema Thermal 2 Power Plant (TT2PP)	Plant 4	80	70	0.29	73	1201000	14,760
Kpone Thermal Power Plant (KTPP)	Plant 5	220	200	0.29	210	785,000	7,330
Ameri Plant (AMERI)	**Plant 6**	**250**	**230**	**0.30**	**73**	**785,000**	**7,330**
Cenit Energy Ltd (CENIT)	Plant 7	110	100	0.29	210	785,000	7,330
Sunon Asogli Power Plant 1 (SAPP1)	Plant 8	200	190	0.36	73	1221000	14,760
Sunon Asogli Power Plant 2 (SAPP2)	Plant 9	360	340	0.44	73	1201000	14,760
Karpowership (KARP)	Plant 10	470	450	0.40	73	1201000	14,760
Trojan	Plant 11	44	40	0.29	73	1201000	14,760
Amandi (Twin City)	Plant 12	210	201	0.44	73	1221000	14,760
AKSA	Plant 13	370	330	0.40	73	1201000	14,760
Cenpower	Plant 14	360	340	0.43	73	1201000	14,760
Early Power (EALP)	Plant 15	200	190	0.45	73	1221000	14,760
Genser (GENS)	Plant 16	181	158	0.30	73	1221000	14,760
Takoradi T3 (TICO 3)	Plant 17	132	120	0.4	73	1201000	14,760
Sub total (existing thermal)		3967	3704				

Table 2 Source: ECG (2024); ECG (2023), Abbey (2023); EIA (2022), Vaillancourt (2014).

Table 2 also presents the variable cost, capital, and fixed operations and maintenance cost for the respective plants for the year 2023.

Table 3: 2024 Projected Electricity Demand for demand centers in Ghana

Location	Centre	Demand (GWh)
Accra	Center 1	6824
Tema	Center 2	6071
Kumasi	Center 3	3107
Takoradi (Tadi)	Center 4	4328
Sunyani	Center 5	1055
Tamale	Center 6	855
Bolgatanga	Center 7	314
Wa	Center 8	203
Koforidua	Center 9	869
Ho	Center 10	701
Cape Coast	Center 11	1260
Aflao	Center 12	2178

Source: GridCo (2022)

4.2.2 Electricity Demand and Demand Centers

There are in all 65 bulk supply points in the Ghana electricity system. These were aggregated around major regional capital cities, the industrial enclave of Tema, and Aflao the border town with Togo through which Ghana sells electricity primarily to Togo and Benin. These together result in twelve demand centers as shown in Table 3. The location decision problem is run using demand projections for Ghana in GridCo (2022). This projection runs from 2022-2031. The projection is extended to cover 2032 and 2033 using the annual demand increase of approximately 6.8% for 2022-2031. Using this projection, the demand for the twelve demand centers is estimated based on their proportions with respect to the 2023 national demand. The projected electricity demand by the twelve demand centers for 2024 is presented in Table 3.

Table 4: Re-location Cost of existing thermal power plants

Plant	Cost ($,000,000)
Plant 1	76.4
Plant 2	78.7
Plant 3	25.5
Plant 4	18.5
Plant 5	50.9
Plant 6	57.9
Plant 7	25.5
Plant 8	46.3
Plant 9	83.3
Plant 10	108.8
Plant 11	10.2
Plant 12	48.6
Plant 13	85.6
Plant 14	83.3
Plant 15	46.3
Plant 16	41.9
Plant 17	30.5

Source: EPRI (2014); ECG (2021)

4.2.3 Sites and Re-location Cost of Plants

There are in all seven selected candidate sites at which both the existing and future thermal plants can be relocated/located. These include the industrial enclave of Tema, and the mining towns of Obuasi and Tarkwa. The remaining sites are Takoradi, Kumasi, Sunyani, and Tamale, representing the coastal, middle, upper middle, and northern belts of Ghana. The candidate sites were selected based on the major electricity load centers in Ghana as found in GridCo(2020). Accra was not included as a candidate site since it is very close to Tema. The case study places a focus on Kumasi, the area at which plant 6 is to be relocated from its original location of Takoradi.

Table 4 gives estimated relocation cost (in millions of US dollars) of the plants from their original location to the seven candidate sites.

The data on relocation cost was taken from EPRI (2014) for a similar study that intended to relocate a 799 MW natural gas combined circle plant from Barcelona, Spain, to Buenos Aires, Argentina at an estimated cost of approximately US$143 million on a bare-erected, overnight basis. This cost excluded shipping at US$7.5 million, engineering and construction management at US$15 million, and contingency cost of US$25 million. Though plant relocation, if any, will be carried out within Ghana (a distance far less than from Spain to Argentina), shipping cost is not based on only distance covered, but other factors such as weight, distance to loading point, loading, unloading, and returning, a quarter of the shipping cost from Spain to Argentina was charged for transportation within Ghana. The final relocation cost therefore amounted to approximately US$0.2314 million per Megawatt. As a comparison, the cost is US$0.2290 if shipping cost is assumed to be zero, thus underscoring the reasonableness of the estimated relocated cost. Using this and plant capacity in Table 2 resulted in the total relocation cost as presented in Table 4. Note that the relocation cost is zero when a plant is not to be relocated.

4.2.4 Distance between Fuel Depots and Candidate sites

The distance between the two depots and the sites where the plants are located and where future plants will be located are shown in Table 5. These were determined based on Google map estimates. The two fuel depots are in Tema (a port city and an industrial enclave) and Atuabo where Ghana's gas processing plant is located. Note that Depot 1 is located at Site 1 whereas Depot 2 is located very close to Site 2 and Site 3. This data is important in accounting for the cost of transporting fuel from the depots to the sites where plants are located.

Table 5: Distance between fuel depots and candidate sites where thermal plants are to be located.

	Distance (km)						
Site	Tema	Tadi	Tarkwa	Kumasi	Obuasi	Sunyani	Tamale
Model Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Depot 1 (Tema)	0	253	334	275	299	396	598
Depot 2 (Atuabo)	252	98.7	85.3	287	205	397	676

Source: Google map

Table 6: Transmission distance (in km) between Thermal plant's candidate site and Demand Center

	Distance (km)											
	Centre 1	Centre 2	Centre 3	Centre 4	Centre 5	Centre 6	Centre 7	Centre 8	Centre 9	Centre 10	Centre 11	Centre 12
Site 1	30	0	275	252	396	599	743	735	101	163	174	157
Site 2	227	253	288	0	410	665	827	738	292	382	82	409
Site 3	308	334	204	85.3	310	579	741	664	379	463	163	491
Site 4	248	275	0	287	124	378	539	449	192	333	209	432
Site 5	227	299	59.4	205	180	434	596	507	234	375	175	410
Site 6	370	396	123	397	0	319	481	354	313	454	331	544
Site 7	651	598	390	676	328	0	163	305	595	496	597	600
Hydro1	**102**	**72**	**273**	**318**	**358**	**492**	**654**	**717**	**62**	**74**	**233**	**168**
Hydro2	**461**	**462**	**236**	**504**	**133**	**267**	**429**	**285**	**404**	**524**	**440**	**600**

Source: Google map

4.2.5 Distance (in km) between location of power plants and demand centers

The distance between the sites hosting the power plants and the demand centers is given in Table 6, where the location name is the same as the plant name for the hydro plants. Like the distance between depots and sites in Table 5, the data in Table 6 is important in accounting for the cost of transmitting electricity to the demand centers as well as losses during transmission.

4.2.6 Transmission Losses

From the data in the 2024 Ghana Energy Statistics, the average transmission losses from 2000-2023 is 4.06% of the total electricity transmitted. Per data from ETSAP (2014), there is approximately 7% loss over 1000km for an HVAC line. This translates to an average transmission loss of 0.007% per km. From Table 6, the average distance between candidate sites and demand centers is approximately 350km. By ESTAP (2014), this will amount to an average loss of 2.45% for an HVAC line which is extremely low when compared to the 4% average loss of Ghana over an average transmission distance of 350 km. Therefore, the percentage transmission loss per kilometer is set to 0.01% for the case study.

4.2.7 Transmission Service Charge

According to PURC (2023), the transmission tariff in the second quarter of 2023 in Ghana was GHp8.6647/kWh. With an exchange rate of GHC11.388 to a US$1 in June 2023, this amount is equivalent to US$0.00761/kWh or US$7.61/MWh. With an average distance of 350km from the plants to the demand centers, this translates to US$0.0217/MWh/km

4.2.8 Fuel Transportation Cost

According to Molnar (2022), the tariff rate for transporting natural gas through a pipeline range from a low of $0.5/mmbtu/1000 km and a high of

$1/mmbtu/1000 km. This research uses the higher value of $1/mmbtu/1000 km given that costs tend to be higher in developing countries such as Ghana, and to ensure that a decision to relocate a plant far away from a depot (and transport fuel to it) when made is not in doubt.

4.2.9 Assumptions

It is assumed that there will be only one relocation/location to be carried out per plant within the 10-year planning period. This assumption is made to ensure that plants are not subjected to relocation each period, a situation that will be impractical in the real world. If this is not the case, then Equation (2) can be expanded to accommodate such flexibility. Also, the plant GENSER at Site 3 is primarily for supporting mining operations and therefore not subjected to relocation.

The problem was programmed using the General Algebraic Modeling System (GAMS) optimization software package and solved using the ILOG CPLEX 12.6.0.0 solver.

5.0 Results

5.1 Location of Existing Thermal Plants

The results of the recommended locations within the ten-year period 2024-2033 for the existing and future thermal plants in the Ghanaian electricity system are presented in column 4 of Table 7a, and Table 7b respectively. Column 3 of Table 7a gives the current[1] location of the existing thermal plants in the Ghanaian electricity system. These are Tema (Site 1), Takoradi (Site 2), and Tarkwa (Site 3). In all, the model recommends relocating only one of the existing thermal plants, which is Plant 17 from Site 2 to Site 6. The remaining plants are not subject to relocation, implying that their current locations are appropriate when considering the model's constraints. Plant 6 (Ameri) which is the subject of contention between the Government of Ghana (GOG) and some civil society organizations, think-tanks, and the opposition political party is not recommended to be relocated from Site 2. Currently, Plant 6 has been relocated to Site 4 (Kumasi) as was planned by the GOG. Thus, the model's recommendation of keeping Plant 6 at Site 2 does not agree with the GOG's choice of Site 4. However, from Table 5 and Table 6, it can be deduced that Site 4 (also Center 3) and Site 6 (also Center 5) are just 124km apart. In addition, Site 6 located in the middle of the country is closer to the upper half of the country than Site 4. Thus, the model's relocation of Plant 17 to Site 6 not only goes to support the GOG's motive but suggest that the GOG carries out the relocation even further away from Depot 2 than planned. Though Plant 17 (132 MW) is smaller compared to Plant 6 (250 MW), the difference is made up with new thermal plants as explained in the next subsection. Given that Site 6 is far away from Depot 2 than Site 4, the foregoing analysis suggests that for demand centers that are far away from the fuel depots along the coast, their electricity demands should be met with plants sited closer to them than with electricity transmitted over long distances from the coast. Table 7a also presents information on the demand centers to be served by the plants after the relocation exercise. As can be seen, those existing plants not subject to relocation are dedicated to serving mainly the demand centers of 1, 2, 4, and 11 which are either located along or closer to the coastal belt of Ghana.

[1] This is before the government relocated Plant 6 to Site 4

Table 7a: Existing and recommended location of thermal plants in the Ghanaian electricity system from 2024 to 2033. Also included are the demand centers to be served by the power plants.

Plant Name	Plant Number	Current location	Recommended Location	Centers served
TAPCO T1	Plant 1	Site 2	Site 2	1, 4, 11
TICO T2	Plant 2	Site 2	Site 2	1, 4,11
TT1PP	Plant 3	Site 1	Site 1	1, 2
TT2PP	Plant 4	Site 1	Site 1	1, 2
KTPP	Plant 5	Site 1	Site 1	1, 2
AMERI	Plant 6	Site 2	Site 2	1,3, 4,11
CENIT	Plant 7	Site 1	Site 1	1, 2
SAPP1	Plant 8	Site 1	Site 1	1, 2
SAPP2	Plant 9	Site 1	Site 1	1, 2
KARPOWER	Plant 10	Site 2	Site 2	1, 3, 4
TROJAN	Plant 11	Site 1	Site 1	1, 2
AMANDI	Plant 12	Site 2	Site 2	1, 3, 4, 11
AKSA	Plant 13	Site 1	Site 1	1, 2
CENPOWER	Plant 14	Site 1	Site 1	1, 2
EARLY POWER	Plant 15	Site 1	Site 1	1, 2
GENSER	Plant 16	Site 3	Site 3	3, 4, 11
TAKORADI T3	Plant 17	Site 2	Site 6	5
Hydro1			N/A	2,3,5,6,9,10,12
Hydro2			N/A	5,6,7,8

The exception is Center 3 (Kumasi) which is located in the middle of the country. The demand centers located in the middle belt and up north of the country (i.e., centers 3, 5, 6, 7, and 8) are to be served primarily with the Hydro2 located in the north of the country and with future thermal plants. This indirectly implies that the Ghanaian system should prioritize siting thermal plants closer to demand centers than fuel depot's locations. The centers served based on the model's output are in line with current plant dispatch operations of the Ghanaian electricity system.

5.2 Location of Future Thermal Plants

The results of the recommended locations for the ten-year period 2024-2033 for the future thermal plants in the Ghanaian electricity system are presented in Table 7b. The numbers in bracket alongside the name of the plants indicates the number of such plant types recommended at a particular site. In all, a combine circle gas turbine is preferred over an open-circle gas turbine.

Three CCGT2 plants of 370 MW capacity for a total of 1110 MW are to be located at Site 1, whereas one CCGT3 of 450 MW is to be located at Site 4 by 2026. Another CCGT1 plant of 300 MW capacity is recommended to be sited at Site 7 (Tamale) which is further up north of the country by 2026. Note that these sites are selected for the location of future plants primarily due to growing demand from centers around them than for their proximity to fuel depots. This can be inferred from the recommendation to site a CCGT3 and a CCGT1 respectively at Site 4 (Kumasi), and Site 7 (Tamale) which are far away from the fuel depots but closer to the middle and northern belt of Ghana. The result in Table 7b also indicates that for the next 10-year period, no thermal plant should be located at Site 2 (Takoradi) which happens to be very close to fuel depot 2. These together thus reinforces the earlier argument that for the Ghanaian electricity system, siting thermal plants closer to the demand centers appears beneficial to siting them closer to the fuel depot locations. Were this not the case, only Site 1 and Site 2 would have been recommended for hosting the future thermal plants since these locations are home to a fuel depot. From Table 7b and given the capacity of CCGT1 (300 MW), CCGT2 (370 MW) and CCGT3 (450 MW), the total new capacity needed to meet projected demand for the Ghanaian electricity system is 1860 MW over the 10-year period or roughly 186 MW annually. This is in tandem with projections in GridCo (2022). Currently, the GOG has signed an agreement to build two new thermal plants; a 350 MW and a 370 MW (for a total of 720 MW) Combine Circle Gas Turbine plants by 2026 Abbey (2023). This agrees with the recommendations in Table 7b of a CCGT3 (450 MW) plant at Site 4 and another CCGT1(300 MW) plant at Site 1 for a total capacity of 750 MW by 2026.

Table 7b: Number of new thermal plant types, their location, and at which year to bring on board the Ghanaian electricity system.

	Plant Location		
Year	*Site 1*	*Site 4*	*Site 7*
2026		CCGT3(1)	CCGT1 (1)
2031	CCGT2(1)		
2032	CCGT2 (1)		
2033	CCGT2(1)		

5.3 Operational Cost Impact of Thermal Plant Relocation

This section looks at the benefit to be attained when comparing the status quo, the GOG's relocation plan, and the model's recommended relocations/locations. Since the model was designed to ensure that electricity demand at all centers is met, the analysis will focus on only the total cost of electricity supply over the 10-year period.

5.3.1 Total Cost: Model versus Status Quo

The objective function value based on the model's recommendations as found in column 4 of Table 7a is US$20.481 billion. The model was also run under the status quo (when the existing locations in column 3 of Table 7a is followed) and resulted in an objective function value of US$20.493 billion. This translates to a present value savings of approximately US$12 million over the 10-year period even after accounting for the relocation cost. This savings is equivalent to an amount of US$1.63 million annually at an interest rate of 6% per annum. This means the suggested relocations by the model leads to less cost (about 0.06%) compared to maintaining the thermal plants at their current locations. This also supports the earlier assertion for the Ghanaian electricity system to site thermal plants closer to

demand centers and transport the needed fuel to them than to just site them along the coast because of their proximity to the fuel depots.

5.3.2 Total Cost: Model versus GOG's Relocation Decision

The model was run under the GOG's decision of relocating the Ameri power plant (Plant 6) to Site 4 (Kumasi) to understand the extent of the benefit, if any of the GOG's decision. The objective function resulted in a value of US$20.504 billion over the 10-year period resulting in an extra cost of US$23 million (or US$3.12 million annually at an interest rate of 6% per annum) when compared to the model's recommendation. This also implies the suggested relocations by the model leads to less cost (about 0.1%) than the GOG's relocation decision.

5.3.3 Total Cost: GOG's versus Status Quo

From section 5.3.1 and 5.3.2, the total cost of electricity provision for the 10-year period is US$11 million more under the GOG's decision than under the status quo. At an interest rate of 6% per annum, this translates to an extra cost of approximately US$1.5 million annually. Thus, based on the costs and factors considered in this case study, the GOG's decision is slightly more costly (about 0.06%) than the case of maintaining Plant 6 at Site 2. Note that the model does not consider the cost saved due to improved electricity delivery as touted by the GOG for intending to move Plant 6 to Site 4. If the savings or benefits to be accrued from improvement in service delivery is comparable or exceeds US$1.5 million annually, then the GOG's decision is worthwhile. Otherwise, it is better the status quo is maintained.

Table 8: Comparison of relocation, transmission, transmission losses, and fuel transportation costs for the three decisions of maintaining the status quo, going by the GOG's decision, and the recommendation from the model

	Cost (US$ million)		
Cost Type	*Model*	*GOG*	*Status Quo*
Relocation	30.547	57.854	0
Transmission	356	341	393
Transmission losses	49.245	46.724	58.650
Fuel transportation	166	178	155
Total	601.812	623.678	606.920

Table 8 breaks down the various cost related to relocation, transmission, transmission losses and fuel transportation. This gives an insight into the trade-off made by each of the model as to relocate a plant closer to demand centers that are far away from the two fuel depots. Both the model's recommendation and the GOG's decision leads to transmission and transmission losses costs that are less than that of the status quo. This is because of the relocation that shortens the transmission distance, and therefore lesser transmission related costs. However, the opposite is true for the fuel transportation cost. This cost increases by virtue of relocating plants away from the fuel depots which is more under the GOG than under the model or status quo. Comparing the costs under the model and the GOG, it can be inferred that the model's choice of relocating Plant 17 to Site 6 instead of the GOG's decision of relocating Plant 6 to Site 4 is strategic. This is because, whiles the decision will leads to higher transmission related costs, it will compensate this with a lower fuel transportation cost. This illustrates the

trade-off underlying the relocation problem. Note that the costs in Table 8 includes those from future thermal plants. Also, since the status quo does not involve any relocation, there is therefore no cost incurred on relocation.

6.0 Conclusion

This paper presented a locational decision model for assessing the relocation of existing thermal plants and the siting of future ones with an objective to reduce cost of electricity supply. The model is motivated in part by the decision of the government of Ghana to relocate a thermal plant which led to considerable debate among Ghanaian politicians and energy policy think-tanks. Analysis of the results from applying the model to the government of Ghana's decision reveals that whiles cost of electricity supply will increase the additional cost is not significant when compared to the benefit thereof as touted by the government. Even better, a new relocation plan recommended by the model will lead to a reduction in electricity supply cost, indicating the usefulness of the model. Overall, in the case of the Ghanaian electricity system, it is better to have thermal plants sited closer to demand centers that are far away from fuel depot locations and transport fuel to power them. Doing so reduces cost attributed to transmission losses.

The paper contributes to literature on optimal location of resources in general, allowing for the consideration of important factors that are treated subjectively in other models such as MCDM models. Power plant location decisions are generally treated in the literature with MCDM. However, the ability of MCDM to consider important factors such as transmission cost, transmission losses, and fuel transportation cost is limited. Also, many Generation Expansion Planning studies if ever includes location, does so with a focus on future plants. This is perhaps one of the few studies to provide an optimization model for the relocation of existing thermal plants and the location of future ones. The inclusion of relocation of existing plants thus makes the model unique. In addition, the consideration of fuel depot location, and cost related to fuel transportation and transmission losses makes the model outputs more objective than the subjective ones generated based on MCDM approaches. The proposed model contributes to practice. In the case of the relocation decision by the government of Ghana, such a model could be used to provide further evidence of cost justification to quell the doubts of stakeholders.

A limitation of the developed model is that it assumes relocation of existing thermal plants take place at the beginning of the planning period. Future work should be able to expand on this to make it possible to determine the exact period an existing plant should be relocated given demand projections and other relevant factors. Future works could also consider the case where demand centers compete for electricity due to insufficient capacity. This will require considering the economic contribution of demand centers.

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REFERENCES

Abbey, E. E. (2023). 2 Power pacts to generate 750mw - Energy Minster. *Graphic Online*. November 10, 2023. https://www.graphic.com.gh/news/general-news/ghananews2-power-pacts-to-generate-750mw-energy-minster.html

ACEP (2022) *Cautionary note to the ministry of energy on the Ameri power plant. Available* at: https://citibusinessnews.com/wp-content/uploads/2022/08/PRESS-STATEMENT-CAUTIONARY-NOTE-TO-THE-MINISTRY-OF-ENERGY-ON-THE-AMERI-POWER-PLANT-.pdf (Accessed: 15th July, 2023)

Afful-Dadzie, A., Afful-Dadzie, E., Awudu, I., & Banuro, J. K. (2017). Power generation capacity planning under budget constraint in developing countries. Applied energy, 188, 71-82.

Azevêdo, V. W. B., Candeias, A. L. B., & Tiba, C. (2017). Location study of solar thermal power plant in the state of Pernambuco using geoprocessing technologies and multiple-criteria analysis. *Energies*, *10*(7), 1042.

Choudhary, D., & Shankar, R. (2012). An STEEP-fuzzy AHP-TOPSIS framework for evaluation and selection of thermal power plant location: A case study from India. *Energy*, *42*(1), 510-521.

Dapaah, E. (2022): GRIDCo heightens advocacy for relocation of AMERI plant to Kumasi. Citi Business News. September 28, 2022. https://citibusinessnews.com/2022/09/gridco-heightens-advocacy-for-relocation-of-ameri-plant-to-kumasi/#:~:text=The%20250%2DMegawatt%20(MW),the%20northern%20sector%20of%20Ghana

Duarte, A. E., Sarache, W. A., & Costa, Y. J. (2014). A facility-location model for biofuel plants: Applications in the Colombian context. *Energy*, 72, 476-483.

EIA (2022, March). Cost and Performance Characteristics of New Generating Technologies. Energy Information Administration, Annual Energy Outlook 2022.

Electric Power Research Institute (EPRI) (2014). *Gas Turbine Combined Cycle Relocation Study*. June 2014. Available at: https://www.epri.com/research/products/3002003656 (Accessed: 20th June, 2023)

Energy Commission, Ghana (ECG) (2024). National Energy Statistics Bulletin 2024. https://www.energycom.gov.gh/newsite/index.php/planning/energy-statistics#

Energy Commission, Ghana (ECG) (2023). *Integrated Power Sector Plan for Ghana* Available at: https://www.energycom.gov.gh/newsite/index.php/planning/ipsmp-data# (Accessed: 15th July, 2023)

GridCo (2022). Twenty Twenty-Two Electricity Supply Plan for the Ghana Power System. The Energy Commission, Ghana. https://gridcogh.com/wp-content/uploads/2022/07/2022-Electricity_Supply_Plan-1.pdf.

GridCo (2020). Twenty Twenty-Two Electricity Supply Plan for the Ghana Power System. The Energy Commission, Ghana. https://gridcogh.com/wp-content/uploads/2022/05/2020-Electricity-Supply-Plan.pdf

Gumussoy, A. D., Onen, V., & Yalpir, S. (2024). Combined use of BWM-TOPSIS methods in the selection of thermal power plant installation site in the Karapinar/Turkiye Region, at risk of sinkhole formation. *Environmental Monitoring and Assessment*, *196*(1), 1-23.

https://www.eia.gov/outlooks/aeo/assumptions/pdf/table_8.2.pdf/

Ilbahar, E., Kahraman, C., & Cebi, S. (2021). Location selection for waste-to-energy plants by using fuzzy linear programming. *Energy*, 234, 121189.

Kashawn, H., Solange, K., & Legena, H. (2022). Site selection of ocean thermal energy conversion (OTEC) plants for barbados. *Renewable Energy*, *201*, 60-69.

Molnar, G. (2022). Economics of gas transportation by pipeline and LNG. In *The Palgrave handbook of international energy economics* (pp. 23-57). Cham: Springer International Publishing. https://link.springer.com/chapter/10.1007/978-3-030-86884-0_2#Sec10

Public Utilities Regulatory Commission (PURC) (2023). *2023 First Quarter Natural Gas , Electricity & Water Tariff Decision*. Available at: https://www.purc.com.gh/attachment/237449-20230714080734.pdf (Accessed: 3rd August, 2023)

Ravindran, A., & Hanline, D. L. (1980). Optimal location of coal blending plants by mixed-integer programming. *AIIE Transactions*, 12(2), 179-185. https://doi.org/10.1080/05695558008974505.

Rentizelas, A. A., & Tatsiopoulos, I. P. (2010). Locating a bioenergy facility using a hybrid optimization method. *International Journal of Production Economics*, 123(1), 196-209.

Siefi, S., Karimi, H., Soffianian, A., & Pourmanafi, S. (2017). GIS-based multi criteria evaluation for thermal power plant site selection in Kahnuj County, SE Iran. *Civil Engineering Infrastructures Journal*, *50*(1), 179-189.

Sun, W., & Qin, M. (2015). Research on Thermal Power Plant Location Based on Rough Set and Interval-valued Fuzzy Number. In *2015 International Conference on Social Science, Education Management and Sports Education* (pp. 1263-1266). Atlantis Press.

Vaillancourt, K (2014). Electricity Transmission and Distribution. IEA ETSAP Technology Brief April, 2014. https://iea-etsap.org/E-TechDS/PDF/E12_elt&d_KV_Apr2014_GSOK.pdf

Wang, T., & Xin, B.C. (2011). Thermal power plant sitting based on TOPSIS method. *Procedia Engineering*, *15*, 5384-5388.

World Bank (2024). World Bank Open Data, Ghana Data. https://data.worldbank.org

Xie, Y., Zhao, K., & Hemingway, S. (2010). Optimally locating biorefineries: a GIS-based mixed integer linear programming approach. 51st Annual Transportation Research Forum, Arlington, Virginia, March 11-13, 2010. https://ageconsearch.umn.edu/record/207234/?v=pdf

Zurek, K. (2022): Abandon expensive plan to relocate AMERI Plant to Kumasi - CSOs to Energy Ministry. Graphic Online. August 11, 2022. https://www.graphic.com.gh/news/general-news/abandon-expensive-plan-to-relocate-ameri-plant-to-kumasi-csos-to-energy-ministry.html

Systematic Review of Free Senior High School Policy in Ghana

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Abstract

This paper presents a systematic review of the Free Senior High School (FSHS) policy implemented in Ghana since 2017. Guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, this review synthesizes evidence from 34 peer-reviewed studies published between 1989 and 2023. The analysis is theoretically informed by the Education Production Function (EPF) and Social Justice Theory, particularly the Capability Approach. These frameworks enable a multidimensional understanding of how policy inputs translate into educational outcomes and how equitably those outcomes are distributed across diverse student populations. The findings reveal that while the FSHS policy has improved enrolment and access, particularly among low-income households, it has also created challenges such as overcrowding, teacher shortages, and disparities in educational quality. The study recommends policy adjustments to improve sustainability, equity, and system-wide efficiency in equity-driven educational reform in sub-Saharan Africa.

Key words: Free SHS, Ghana, access, equity, education policy, systematic review, educational efficiency.

1.0 Introduction

Access to quality secondary education remains a significant development priority for many countries, particularly in sub-Saharan Africa. In Ghana, this imperative is enshrined in Article 25(1)(b) of the 1992 Constitution, which mandates the progressive introduction of free secondary education. Responding to this constitutional requirement and the global commitment to Sustainable Development Goal 4—ensuring inclusive and equitable quality education—the Government of Ghana launched the Free Senior High School (FSHS) policy in 2017. The policy provides full tuition and related support services for all public SHS students, with the aim of improving access, reducing inequality, and enhancing

national human capital. Despite its ambitious goals, the implementation of the FSHS policy has generated substantial debate regarding its long-term sustainability, quality outcomes, and unintended consequences. While there is evidence of increased enrolment, concerns remain about overcrowding, inadequate infrastructure, and widening disparities between urban and rural schools. These tensions highlight the need for a systematic review of existing literature to assess the actual impact of the policy and inform future decision-making.

This review seeks to critically evaluate the effects of Ghana's FSHS policy across four key dimensions: access, equity, quality, and efficiency. By systematically analyzing empirical and theoretical contributions from 2017 to 2025, the study aims to identify prevailing trends, implementation challenges, and policy gaps. The overarching research question guiding this review is: What has been the impact of Ghana's Free Senior High School policy on access, equity, quality, and efficiency in secondary education since its inception? To address this question, we employed a structured PRISMA-based methodology to select, analyze, and synthesize relevant literature. The findings of this review will provide insights for policymakers, educators, and researchers seeking to understand the broader implications of fee-free secondary education reforms in Ghana and similar contexts

2.0. Review of Related Literature

This section provides a critical overview of existing literature on free secondary education, focusing on global perspectives, Ghana's educational reform trajectory, and recent empirical studies on the Free Senior High School (FSHS) policy. The review identifies key gaps that justify the need for this systematic analysis.

2.1. Global Perspectives on Fee-Free Secondary Education

Numerous studies highlight that while such policies increase enrolment and reduce financial burdens on households, they also introduce systemic challenges such as overcrowded classrooms, inadequate infrastructure, and overburdened teachers (Aluko & Adan, 2015; Kalunda & Otanga, 2015). Recent evidence from sub-Saharan Africa highlights that fee-free secondary education policies have substantially increased enrollment while posing challenges for educational quality and equity. In Kenya, the Free Secondary Education (FSE) policy led to higher student enrollment and improved gender parity, yet overcrowded classrooms and inadequate teacher resources negatively affected learning outcomes (Mwangi, 2021). Uganda's Universal Secondary Education (USE) initiative similarly increased participation, particularly for girls, and contributed to delayed marriages and enhanced economic opportunities, though infrastructure and teacher shortages remain critical challenges (Kazibwe, 2022). In Tanzania, the Fee-Free Basic Education (FFBE) policy increased access, but school supervision and educational quality were constrained by delayed fund disbursements and resource limitations (Mwila, 2023; Sanchawa, 2025). Rwanda's abolition of secondary school fees improved enrollment rates, though rural-urban disparities persist, indicating a need for targeted interventions (Ndayishimiye, 2024). Senegal's policy expansion in the 2020s increased enrollment, yet overcrowding and inadequate teaching materials continue to hinder learning (Diouf, 2021). Liberia's post-conflict free secondary education program enhanced access, but challenges in teacher quality and infrastructure remain (Jallah, 2020). Seychelles, by offering free secondary education up to age 18,

demonstrates that sustained investment and well-resourced systems can achieve both high enrollment and educational quality (Bettencourt, 2022).

2.2. Educational Policy and Reform in Ghana

Ghana has a long history of educational reform aimed at improving access, equity, and quality. The 1961 Free Universal Primary Education Act, the Dzobo reforms of 1974, and the FCUBE initiative launched in 1995 are key milestones that sought to democratize access to education (Adu-Gyamfi et al., 2016; Akyeampong, 2009). However, these reforms often struggled with implementation setbacks due to funding gaps, regional inequalities, and limited infrastructure (Donkoh et al., 2021; Mohammed & Kuyini, 2021). The introduction of the FSHS policy in 2017 under the New Patriotic Party (NPP) government marked a significant expansion of these earlier efforts. Building on the 2015 Progressive Free SHS program, the FSHS removed nearly all cost barriers at the secondary level by covering tuition, boarding, meals, and learning materials. The policy aimed to enhance access, especially for students from disadvantaged regions, while also improving equity and national human capital development (MOE, 2017).

2.3. Empirical Studies on Ghana's Free SHS Policy

A growing body of empirical research has evaluated the implementation and outcomes of the Free Senior High School (FSHS) policy in Ghana. These studies span various themes, including access, quality, equity, efficiency, and policy sustainability.

Asante (2022) examined the effects of fee abolition on secondary school enrolment across sub-Saharan Africa and found that cost elimination policies significantly boosted enrolment, especially among marginalized groups. In Ghana, enrolment into senior high schools increased by 11% in the 2017–2018 academic year following the launch of the FSHS policy (MOE, 2017). According to administrative data, nearly 470,000 students were enrolled in that academic year alone, breaking previous national records.

Asante, Nkansah, and Agbee (2024) conducted a comparative policy analysis of the Progressive Free SHS and the full FSHS policy, highlighting tensions between centralized implementation, school-level autonomy, and stakeholder engagement. Their work also underscores equity issues—particularly how elite urban schools may disproportionately benefit from the policy, despite efforts such as reserving 30% of places for public JHS graduates. Complementing this, Asante, Gajduschek, and Bartha (2024) explored the political economy dynamics behind the policy's emergence. Their study revealed that political commitment, electoral strategy, and ideology—more than technocratic planning—were instrumental in shaping the rollout and framing of the FSHS as a "sacred promise" to citizens.

Operational studies such as Mohammed and Kuyini (2021) provide insight into challenges encountered by schools. They note infrastructure deficits, strained teacher capacity, logistical delays, and the complexities introduced by the double-track system as key issues affecting quality. These findings are echoed by Chanimbe and Dankwah (2021), who observed that the double-track system, while expanding access, compromised contact hours, increased administrative burdens, and created uncertainty among both students and teachers.

Moreover, the Ghana Statistical Service (GSS, 2007; World Bank, 2011) and MOE reports highlight persistent regional

disparities in educational access, especially between the northern and southern regions. While the FSHS policy aims to equalize opportunity, poverty and distance to school continue to deter rural families from full participation. Studies also point to significant opportunity costs for low-income households in sending children to distant boarding schools (Adongo et al., 2022; Fentiman et al., 1999). The policy's emphasis on full cost absorption—including tuition, meals, and exam fees—has reduced financial barriers significantly. However, the increased enrolment has not always been matched by corresponding expansion in infrastructure, leading to issues such as overcrowding, classroom conversions, and reduced instructional time. These constraints challenge the sustainability of the policy's intended gains in educational quality and equity (UNESCO, 2017; Daily Graphic, 2018).

2.0. Theoretical Framework

This systematic review is anchored in two complementary theoretical lenses: the Education Production Function (EPF) and Social Justice Theory which is the Capability Approach. The EPF framework conceptualizes education as a system in which specific inputs, such as financial investment, infrastructure, teacher quality, and policy interventions, generate outputs like student enrolment, learning achievement, and retention (Hanushek, 1986). In the context of Ghana's Free Senior High School (FSHS) policy, this framework explains how removing direct cost barriers, providing free meals, and supplying teaching and learning materials have contributed to increased access to secondary education. However, it also underscores that without proportional investment in physical and human resources, increased enrolment may compromise educational quality. This is evident in the policy's implementation challenges, such as the introduction of the double-track system, overcrowded classrooms, and heightened teacher workloads, which collectively impact learning conditions and overall effectiveness (Mohammed & Kuyini, 2021). The EPF therefore offers critical insights into the trade-offs between access, quality, and efficiency in the delivery of free secondary education in Ghana.

Complementing the EPF's economic perspective, this review employs Amartya Sen's Capability Approach (Sen, 1999) and Nancy Fraser's Social Justice Theory (Fraser, 2008) to examine issues of equity, inclusion, and fairness in educational outcomes. These frameworks emphasize that providing access is insufficient if students, particularly those from rural, low-income, or marginalized communities, lack the real capabilities to benefit from education meaningfully. Fraser's tripartite model of redistribution, recognition, and representation is especially relevant. It assesses whether resources are allocated equitably, whether diverse cultural identities are acknowledged, and whether marginalized voices are included in decision-making processes. Together, these frameworks inform the review's analytical structure by examining access through the lens of financial barrier removal (EPF). They also examine equity through the Capability and Social Justice perspectives, quality through resource–demand dynamics (EPF), and efficiency through a combined evaluation of input–output relationships and fairness in outcomes.

3.0. Methodology

This study employed a systematic review design guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Moher et al., 2015) to examine the impact of Ghana's

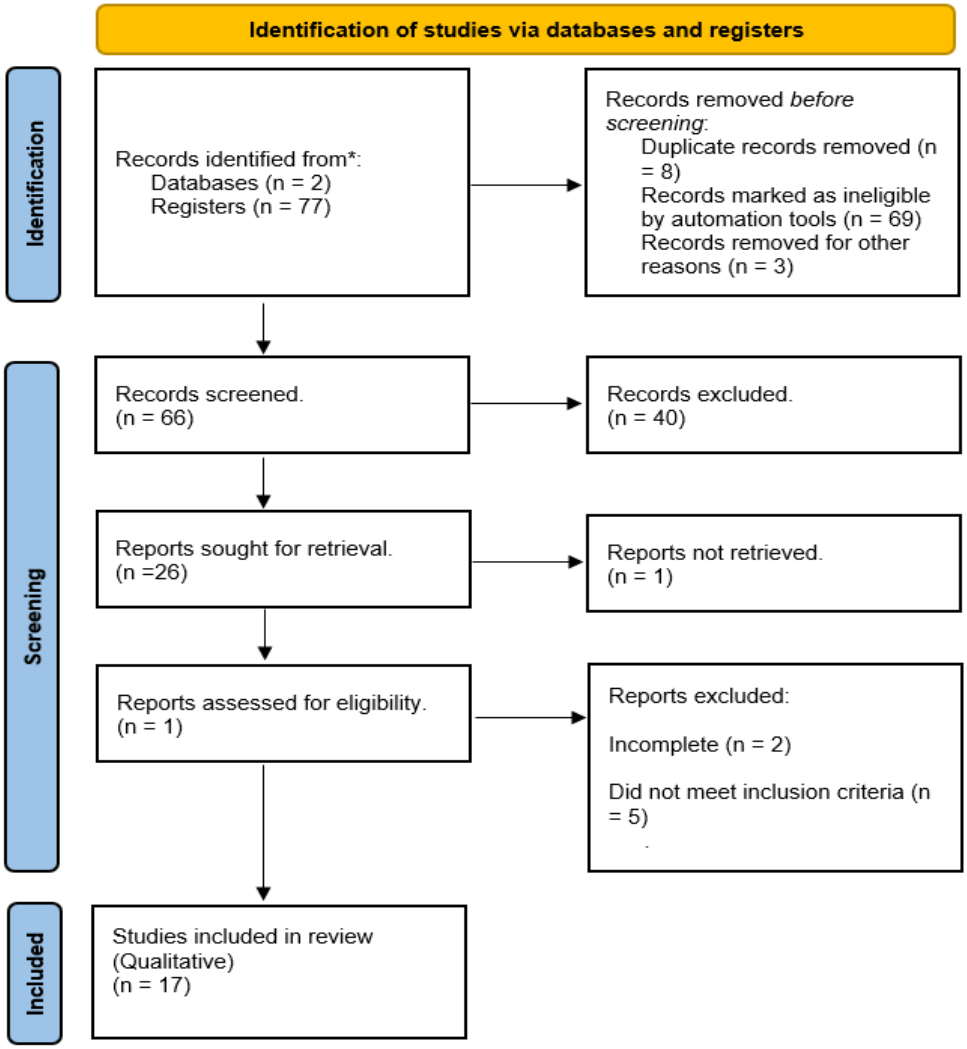
Free Senior High School (FSHS) policy on access, equity, quality, and efficiency. A review protocol was developed to enhance transparency and replicability, specifying inclusion and exclusion criteria, quality assessment procedures, and thematic synthesis strategies. An extensive literature search was conducted using Google Scholar and ResearchGate for studies published between 2017 and 2025, employing keywords such as "Free Senior High School," "Ghana," "access," "equity," "educational quality," "policy impact," and "efficiency," with Boolean operators (AND, OR) to refine results, alongside manual reference checks to identify additional relevant studies. Articles were selected based on a structured checklist: (1) explicit focus on the FSHS policy or comparable fee-free secondary education reforms, (2) empirical, theoretical, or policy-focused with clear methodological descriptions, (3) published in English in peer-reviewed journals and (4) relevance to one or more dimensions of access, equity, quality, or efficiency.

Table 1: Summary of Methodology

Component	Description / Criteria
Research Design	Systematic review guided by PRISMA framework (Moher et al., 2015)
Review Protocol	Specifies inclusion/exclusion criteria, quality assessment, and thematic synthesis strategies
Literature Search	**Databases:** Google Scholar, ResearchGate; **Timeframe:** 2017–2025; **Keywords:** "Free Senior High School," "Ghana," "access," "equity," "educational quality," "policy impact," "efficiency"; **Boolean operators** (AND, OR) used; Manual reference checks also performed
Inclusion Criteria	1. Explicit focus on FSHS policy or comparable fee-free secondary education reforms 2. Empirical, theoretical, or policy-focused with clear methodology 3. Published in English in reputable journals 4. Relevance to access, equity, quality, or efficiency
Exclusion Criteria	1. Not focused on secondary education 2. Lacked relevance to key dimensions 3. Not relevant to the research question
Quality Assessment	Critical Appraisal Skills Program (CASP) Qualitative Checklist; evaluates clarity of methodology, sample selection, rigor of data collection, validity of findings, and relevance to FSHS policy outcomes
Data Extraction	Coded for: authorship, publication year, study type, methodology, sample characteristics, policy focus, key qualitative findings
Study Selection Process	1. Initial screening of titles/abstracts by 2 independent reviewers 2. Full-text review by 3 additional reviewers 3. Consensus resolution among 5 reviewers

Excluded studies were those outside the scope of secondary education, those that lacked relevance to the research objectives. Studies that did not meet the inclusion criteria in terms of population, setting, or methodological rigor were also excluded. Quality assessment of the included studies was conducted using the Critical Appraisal Skills Program (CASP) Qualitative Checklist (CASP, 2024). The assessment applied criteria adapted from established systematic review standards, evaluating clarity of methodology, sample selection, data collection procedures, and validity of findings. Data extraction involved coding each study for authorship, publication year, study type, methodology, sample characteristics, policy focus, and key qualitative findings (Tawfik et al., 2019).

Figure 1:. Reporting items for the systematic review (adapted the Preferred Reporting Items for systematic review



The study selection process involved three phases. First, initial screening of titles and abstracts was conducted by two independent reviewers. Second, a full-text review was performed by three additional reviewers to assess methodological rigor and relevance. Third, discrepancies were resolved through consensus among all five reviewers. Google Scholar and ResearchGate were included to capture grey literature and recent publications, thus improving the comprehensiveness of the search. The 2017–2025 timeframe was selected to capture studies following the introduction of the FSHS policy, ensuring that the review reflects current and relevant evidence.

4.0 Results

The results of this systematic review are presented using the PRISMA flow diagram to illustrate the article selection process (see Figure 1). The diagram outlines the number of studies identified, screened, assessed for eligibility and included in the review.

Articles search

A total of 1,465 papers were initially identified across Google Scholar and ResearchGate using the specified keywords and Boolean operators. Google Scholar yielded more papers (889) than ResearchGate (576), reflecting its broader coverage of scholarly publications. After removing duplicates, irrelevant records, and studies not meeting inclusion criteria through manual screening and reference checks, 17 studies were included in the final qualitative synthesis.

Table 2: Articles search

Keyword/Phrase	Google Scholar	ResearchGate
"Free Senior High School" AND "Ghana" AND "access"	123	78
"Free Senior High School" AND "Ghana" AND "equity"	97	64
"Free Senior High School" AND "Ghana" AND "educational quality"	88	59
"Free Senior High School" AND "Ghana" AND "policy impact"	102	47
"Free Senior High School" OR "Ghana" OR "access" OR "equity"	158	134
"Free Senior High School" OR "Ghana" OR "policy impact" OR "educational quality"	141	99
"Ghana" AND "Free Senior High School" AND NOT "policy impact"	76	53
"Ghana" AND "educational quality" AND NOT "access"	65	42

Table 3: Summary of article search

Database	Date of Search	Papers Obtained
Google Scholar	28/09/25	889
ResearchGate	28/09/25	576

Quality Assurance

The included studies were assessed using a nine-question framework adapted from (Butler et al., 2016) , with each question reflecting a specific aspect of study quality relevant to the Free Senior High School (FSHS) policy in Ghana: Q1 – clear research objectives, Q2 – relevance to FSHS policy, Q3 – appropriateness of study design, Q4 – transparency in data collection, Q5 – validity and reliability of measures, Q6 – adequacy of sample size, Q7 – appropriateness of data analysis, Q8 – discussion of limitations, and Q9 – contribution to understanding policy impacts (access, equity, quality, efficiency). Each study was scored 1 for positive and 0 for negative responses, and total scores classified studies as high (9), moderate (7-8), or low (<7) quality, with contribution scores reflecting each study's impact on the review's findings. Table 9 presents the scores, quality classifications, and contributions for the 17 studies included in this review. This is shown in Table 4.

Table 4: Quality Assurance of Included Studies (Baima et al., 2020)

#	Citation (Author, Year)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Total	Quality Classification
1	Akuffo (2025)	1	1	1	1	1	1	1	1	1	9	High
2	Casely-Hayford et al. (2025)	1	1	1	1	1	1	1	0	1	8	Moderate
3	Dwomoh et al. (2022)	1	1	1	1	1	1	0	1	1	8	Moderate
4	Mohammed & Kuyini (2021)	1	1	1	1	1	1	1	1	1	9	High
5	Dzikunu & Ansah (2023)	1	1	1	1	1	1	0	0	1	7	Moderate
6	Fuseini (2025)	1	1	1	1	1	1	1	1	0	8	Moderate
7	Azagsiba et al. (2025)	1	1	1	1	1	1	1	1	1	9	High
8	Asumadu (2019)	1	1	1	1	1	0	1	1	1	8	Moderate

Note: 1- yes; 0=No

Table 5a: Data Extraction

#	Citation (author, year)	Title	Type of Paper	Methodology (qual component)	Key Qualitative Findings (quality/ equity focus)	Theoretical Lens
1	Akuffo (2025)	In pursuit of equity in upper secondary education: the curious case of Ghana's Free Senior High School policy	Peer-reviewed article	Grounded-theory qualitative: interviews with policymakers; document analysis	Increased enrolment but "equity blind spots" remain; regional, school-level, and gendered exclusions; policy assumptions neglect prerequisites for quality expansion	Policy equity/ social justice
2	Casely-Hayford et al. (2025)	The intended and unintended effects of secondary school fee abolition: evidence from Ghana's Free SHS policy	Peer-reviewed article	Mixed methods with stakeholder interviews and qualitative policy analysis	Strong access gains; implementation pressures, resource shortages, uneven benefits across regions and schools—threatening quality	Policy evaluation; distributive equity
3	Dwomoh et al. (2022)	The impact of the Free SHS policy and double-track system on quality education outcomes: a quasi-experimental policy evaluation (Ghana)	Peer-reviewed policy evaluation (mixed methods)	Quasi-experimental quantitative analysis plus stakeholder interviews and qualitative evaluation	Overcrowding, reduced contact time under double-track, teacher shortages, uneven resource distribution—differential declines in quality across schools	Distributive equity; inputs outcomes

Table 5b: Data Extraction

4	Mohammed and Kuyini, (2021)	An evaluation of the Free Senior High School Policy in Ghana	Peer-reviewed article (policy evaluation)	~65 semi-structured interviews with stakeholders; documentary analysis (qualitative evaluation)	Fee removal welcomed; poor responsiveness in infrastructure delivery and delayed materials; equity and quality gaps persist between better-resourced and weaker schools	Policy evaluation; equity & responsiveness
5	Dzikunu and Ansah (2023)	Free Senior High School program implementation in Ghana: an assessment	Journal article	Multi-site exploratory case study: interviews, observations, checklists (38 respondents)	Access improved; quality hampered by overcrowded classrooms, delayed textbooks, inadequate labs/dorms, increased teacher workload	Implementation & equity lens
6	Fuseini (2025)	Free Senior High School devours basic education in Ghana	Peer-reviewed article	Qualitative policy critique with document analysis and interviews	Free SHS diverted resources from basic education; primary education quality deteriorated; system-wide quality concerns	Systems perspective; resource allocation & equity

Table 5c: Data Extraction

7	Azagsiba et al. (2025)	A qualitative assessment of the Free Senior High School (Free SHS) policy on education in the Upper West Region of Ghana	Journal article	Interviews & focus-group discussions (students, teachers, parents, officials); thematic analysis	Increased enrolment among disadvantaged students; persistent quality deficits: overcrowding, limited materials, teacher overload, poor facilities	Social justice in education
8	Asumadu (2019)	Implementation of Free Senior High School Policy: The Case of SHS in Denkyembour District	Peer-reviewed article / institutional research	Case study interviews and observations (qualitative)	Early implementation challenges: space, teacher recruitment, stakeholder coordination; sustaining quality amid rapid enrolment increases	Implementation & distributive equity
9	Asante et al. (2022)	(De)centralisation in fee-free policymaking process: Comparative review of progressive free senior high and free senior high school policies in Ghana	Peer-reviewed article	Policy document analysis and stakeholder reflections	Governance tensions between centralization and decentralization; implications for equitable resource allocation	Governance / decentralization theory

Table 5d: Data Extraction

10	Chanimbe (2019)	Support mechanism in the implementation field: A stakeholder collaboration to mitigate the adverse effects of the free SHS policy in Ghanaian schools	Journal article	Interviews with school stakeholders (teachers, parents, administrators)	Stakeholder collaboration reduces implementation challenges; enhances equity in resource-constrained schools	Stakeholder collaboration / social capital lens
11	Chanimbe and Prah (2020)	Distribution mechanisms of Ghana's free senior high school policy: The equity dimensions and ameliorating measures	Peer-reviewed article	Policy analysis + qualitative administrator perspectives	Reveals inequitable distribution of school places and resources; suggests quota-based corrective measures	Equity in education / distributive justice lens
12	Wilson and Somhlaba (2017)	Ghanaian school-going adolescents' self-perceived barriers regarding access to quality education in the Northern Region	Education as Change	Qualitative interviews	Adolescents identify inadequate resources and socio-cultural challenges affecting quality	Quality & Equity
13	Takyi et al. (2019)	The effects of multi-track year-round education on the delivery of senior high school education in Ghana	Journal article	Interviews, document analysis	Multi-track system increased access but created strain on quality and teacher workload	Educational delivery /quality lens

Table 5e: Data Extraction

14	Alando (2025)	Contribution of Free Senior High School Policy to Students' Academic Performance and Progression in the Northern Region of Ghana: A Review	Review Article	Document and policy analysis with qualitative synthesis	FSHS policy improved access and progression, but disparities in infrastructure and teacher deployment affect equity in learning outcomes.	Equity and Access Framework
15	Opoku (2024)	A Comprehensive Analysis of the Free Senior High School (SHS) Policy in Ghana Using Policy Triangle Framework	Policy Analysis	Document analysis + stakeholder perspectives (qualitative synthesis)	Identifies interplay between policy context, content, actors, and processes shaping implementation; equity gaps persist between urban and rural schools.	Walt & Gilson's Policy Triangle Framework
16	Yeyie (2024)	Perceptions of Social Studies Teachers on Teaching Rationale in New Juaben Senior High Schools, Ghana: A Qualitative Study	Empirical Research Article	Qualitative interviews with teachers	Teachers emphasize civic engagement and critical thinking but face curriculum overload and limited resources, affecting instructional quality.	Interpretivist Lens
17	Quansah et al. (2024)	Qualitative Insights into School Improvement Practices: Stakeholder Perceptions in Ghanaian Junior High Schools	Empirical Research Article	Qualitative case study with focus groups & interviews	Stakeholders (teachers, parents, administrators) stress collaborative practices and leadership involvement as crucial for improving school quality and equity.	Stakeholder Theory / School Improvement Framework

5.1. Access to Education

Qualitative evidence from Ghana demonstrates that free secondary education policies substantially improve access and enrollment, particularly among marginalized groups. In Ghana, the Free Senior High School (FSHS) policy increased student enrollment, reducing financial barriers and boosting participation in districts where cost was a major obstacle (Azagsiba et al., 2025; Duah et al., 2023; Tseer et al., 2024).

"If it weren't for Free SHS, I would likely be working instead of attending school. My family couldn't afford the fees, so this policy changed my life. The fact that I only need to acquire my consumables made it a bit easier for my parents to get me enrolled into secondary school. So, to me it is a good policy despite the visible problems we are facing as students" (Key Informant, October, 2024). (Azagsiba et al., 2025)

However, this expansion has placed pressure on teaching and learning, with larger class sizes, increased teacher workload, and declines in performance in core subjects under double-track systems, illustrating the access–quality trade-off (Dwomoh et al., 2023; Tseer et al., 2024).

"The double-track system increased our workload significantly. I find myself teaching throughout both batches due to shortages in subject-specific teachers. Holidays feel like a luxury, especially for those of us with additional responsibilities." (FGD, statement from a female participant, KALISCO, 2023) (Tseer et al., 2024).

Rural areas in Ghana similarly recorded higher transitions from junior to senior high, though access remained constrained by distance and poor transport (Chanimbe & Dankwah, 2021). Akyeampong (2009) demonstrates that historical rural–urban disparities, rooted in earlier educational reforms, continue to influence enrolment patterns and opportunities under FSHS, with students in remote areas facing structural disadvantages. Asante et al. (2024) underscore governance tensions, showing that the balance between centralized policymaking, which standardizes access, and decentralized decision-making, which allows context-specific adjustments, affects equitable allocation of resources across regions, often leaving disadvantaged schools under-resourced.

5.2. Educational Equity

Urban schools and well-resourced institutions continue to attract more competitive students, often benefiting disproportionately from the policy due to better infrastructure and academic performance records (Asante et al., 2024). In contrast, students in rural and underserved areas face structural barriers such as overcrowded classrooms, limited teaching staff, and substandard facilities, which affect their ability to benefit equally from the policy (Mohammed & Kuyini, 2021).

Research on Ghana's Free Senior High School (FSHS) policy highlights persistent equity challenges despite expanded access. Chanimbe and Prah (2020) show that the distribution of school places and resources remains inequitable, recommending quota-based measures to improve fairness. Matey (2020) finds that while families benefit financially from fee-free education, hidden costs, overcrowding, and rural–urban disparities continue to limit equitable educational outcomes.

One of the headmasters said: "*I have seen on many occasions when parents and guardians whose wards were placed outside their home districts and region simply declined the offer of admission.' He added: 'The children of such parents end up not*

attaining secondary education" (Mohammed & Kuyini, 2021).

Studies also highlight that although access increased for female students, challenges such as early pregnancy and household responsibilities continue to affect retention, particularly in rural communities (Ahonsi et al., 2019).

"My family influenced my delay in marriage because I was always advised to further my education and be a better person before getting married. – FGD 12-17 Unmarried, Sabare" (Ahonsi et al., 2019).

Multiple studies report that infrastructural deficits, overcrowded classrooms, and overburdened teachers undermine the quality of education (Azagsiba et al., 2025). Regional disparities remain pronounced, with rural and northern areas experiencing limited access to educational resources and uneven implementation of policy intentions (Akuffo, 2025; Casely-Hayford, 2025).

Governments make a farce out of education policy routines, unfortunately, there is no democratic solution to this… our policies are inherently problematic. We as policymakers can bridge the geographical and gender gap with good policies if we want to, but we pretend to have such conversations, and that is what we call policy talk, knowing that nobody is ready to do the difficult job of bridging the disparities (Policymaker, NGOs) (Akuffo, 2025)

Interviews with teachers and headteachers reveal concerns about the double-track system's strain on resources, which can compromise learning outcomes and exacerbate inequities (Dzikunu & Ansah, 2023; Mensah, 2019).

"My school for instance has not been provided with adequate materials and logistics. We were only supplied some few materials and logistics". (Head teacher 1) (Mensah, 2019).

"……Nobody takes care of the students; sometimes you see them in town almost all the time. Availability of Teaching /Learning Materials is another challenge, but if they are putin place, I think it will be okay (HM3)". (Dzikunu & Ansah, 2023)

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Policy analyses indicate that although FSHS emphasizes equity in principle, political agendas and resource allocation challenges affect its practical realization, often privileging urban or well-resourced schools over marginalized communities (Akuffo, 2025; Fuseini, 2024). Studies also show that social location and context, such as rural and urban settings, influence experiences of inclusion, with distance learning initiatives highlighting inequities for students in remote areas (Opoku, 2025). Teacher wellbeing emerges as a critical factor in the success of FSHS, as overworked educators face challenges in maintaining quality while accommodating rising enrolment (Tseer, 2024).

"Before the Free SHS, our classrooms had about 45–50 students. Now, it's not uncommon to find over a hundred students in a class. It's challenging to provide individual attention and maintain an effective learning environment." (PI, statement from a male teacher, TAMASCO, 2023) (Tseer, 2024).

Adolescents in Northern Ghana face financial, infrastructural, and socio-cultural barriers to quality secondary education, with limited resources, overcrowded or poorly equipped schools, and gender disparities restricting equitable access and learning outcomes (Wilson & Somhlaba (2017).

"Yes, like you need some books but you do not get the money [from parents] to buy it, unless you save some of your money and buy. At times you find it difficult to save that kind of money so you just borrow from your [peers] (Sanni, 19-year-old male, Grade 12)" (Wilson & Somhlaba (2017).

5.3. Quality of Education

Multiple studies report that the double-track system—introduced in 2018 to manage overcrowding—led to reduced contact hours, inconsistent teaching schedules, and learning interruptions (Chanimbe & Dankwah, 2021). The increase in class sizes, coupled with a shortage of trained teachers and inadequate teaching materials, has affected the quality of instruction in many schools. Empirical accounts describe the conversion of libraries, dining halls, and even laboratories into makeshift classrooms due to space limitations (Mohammed & Kuyini, 2021). Similarly, research by Alando (2025) found a significant decline in quality education outcomes and academic performance due to the double-track system, with challenges including financial constraints and infrastructure deficits. Moreover, a study by (Opoku, 2024) highlighted that the system led to reduced contact hours between teachers and students, forcing educators to rush through lessons. Lastly, a study by (Takyi et al., 2019b) discussed the implications of multi-track year-round education on Ghana's educational system, noting its effects on instructional time and teacher-student interactions.

Studies examining the Free Senior High School (Free SHS) policy reveal that while enrollment has increased, particularly among economically disadvantaged students, infrastructural deficits, overcrowded classrooms, and insufficient learning materials constrain the quality of education (Azagsiba et al., 2025; Mensah et al., 2019).

"The free SHS policy is good but it is affecting the quality of education as a result of poor students with poor grades getting admission under the policy. A student with aggregate 40 has been posted to my school to offer Science and I don't need a prophet to tell me that this student will not excel in science". (Head teacher 4) (Mensah et al., 2019).

Wilson and Somhlaba (2017) emphasizes that socio-economic disparities and gendered expectations, such as early school dropouts among girls, further exacerbate inequitable access. Teacher-related factors, including agency, professional development, and engagement in school improvement practices, are central to educational effectiveness, with evidence showing that empowered and supported teachers enhance learning outcomes (Adams et al., 2025; Yeyie, 2024; Quansah et al., 2024).

"I will meet my teachers personally and each will set his targets for me. I will monitor the progress of the targets or the contract and give feedback to the teacher……As SISOs, we must get involved in the setting of performance targets by teachers. I believe that will go a long way to improve students' performance. (SS-1) (Quansah et al., 2024)

Omari (2023) notes that while teachers recognize the benefits of integrating technology, lack of training and institutional support limits effective implementation.

"Students struggle to understand when you teach abstractly. If there are no teaching aids such as ICT tools, teaching becomes like a story to them [students]. When technologies such as computers and a projector are used to display videos, students gain a clear understanding of what is taught, and they may even assist you [teacher] in teaching". (FT-Esi_ I) (Omari., 2023)

5.4. Efficiency and Sustainability

A comprehensive analysis of qualitative studies on Ghana's Free Senior High School (FSHS) policy reveals significant concerns regarding its efficiency and long-term sustainability. The rapid expansion of enrolment has placed substantial strain on school infrastructure, with many institutions facing acute shortages of classrooms, dormitories, and laboratories ((Azagsiba et al., 2025; Addai & Adzahlie-Mensah, 2024).

The introduction of the double-track system, intended to manage overcrowding, has led to reduced contact hours, inconsistent teaching schedules, and learning interruptions (Mohammed & Kuyini, 2021; Tseer, 2024). These operational challenges are compounded by escalating student-to-teacher ratios, which have increased to 30:1, thereby straining teaching quality and threatening the sustainability of access gains (Akuffo, 2025). Essuman (2018) emphasizes tensions between sustainability and access, warning that inadequate funding and planning could exacerbate disparities. Financially, the policy's reliance on finite oil revenue and unpredictable donor support raises sustainability concerns, as it is perceived as a costly and poorly planned initiative (Akuffo, 2025; Casely-Hayford, 2025).

The free SHS is helping parents who are not financially strong to send their wards to school. Previously, some students with better grades were unable to attend SHS because of financial constraint, but now, because of free SHS, they can enroll their wards. – SHS student (male), Eastern Region (Casely-Hayford, 2025).

The policy's implementation has also led to increased teacher workloads, delays in funding, and overburdened infrastructure, particularly in rural areas (Opoku, 2025). Empirical accounts describe the conversion of libraries, dining halls, and laboratories into makeshift classrooms due to space limitations, reflecting challenges in balancing access and quality (Mohammed & Kuyini, 2021; Akuffo, 2024). Despite the policy's positive impact on enrolment rates, there is limited evidence to establish a direct link between FSHS and improved learning outcomes, highlighting the need for a more sustainable and efficient approach to education financing, resource allocation, and teacher support (Akuffo, 2025; Tseer, 2024; Addai & Adzahlie-Mensah, 2024; Casely-Hayford, 2025; Opoku, 2025).

"it is necessary to ensure an equitable distribution of resources based on the unique needs of learners and schools. Ghana's learners are from diverse backgrounds, which requires the provision of equal opportunities to all, and that all strive to care for each other both personally and professionally (p. 21)" (Addai & Adzahlie-Mensah, 2024).

6. Discussion

Four studies show that the FSHS policy increased secondary school access by removing tuition and related costs, leading to higher enrollment, especially among low-income and rural groups (Azagsiba et al., 2025; Duah et al., 2023; Tseer et al., 2024; Asante, 2022).Comparative evidence from sub-Saharan Africa indicates similar outcomes following fee abolition in Kenya, Uganda, and Malawi, where enrollment growth, gender parity, and household prioritization of education were observed (Aluko & Adan, 2015; Mwangi, 2021; World Bank, 2015; Kazibwe, 2022). However, 4 studies report unintended consequences, including increased class sizes, teacher workload, and reduced instructional time under the double-track system implemented to accommodate rising student numbers (Dwomoh et al., 2023; Chanimbe & Dankwah, 2021;

Mohammed & Kuyini, 2021; Tseer et al., 2024). Evidence indicates that these structural constraints compromise learning outcomes and are consistent with the input-output trade-offs described in the Education Production Function (EPF) framework (2 studies) (Kalunda & Otanga, 2015; Kattan & Burnett, 2004). Geographic disparities remain pronounced: students in northern and rural regions experience long travel distances, poor transport, and limited access to well-resourced schools. Governance tensions between centralized standardization and decentralized decision-making further exacerbate inequities (Akyeampong, 2009; Wilson, 2017; Asante et al., 2024; Akuffo, 2025).

Evidence indicates that increased access under FSHS does not equate to equitable outcomes. Urban schools benefit from better resources, while rural schools face overcrowding and poor facilities (Asante et al., 2024; Akuffo, 2025; Mohammed & Kuyini, 2021). Gender barriers and teacher strain further limit rural girls' retention and equitable learning (Ahonsi et al., 2019; Kim, 2016; Wilson, 2017; Tseer, 2024; Mensah, 2019). These patterns align with cross-national evidence from Uganda and Tanzania, where enrollment increases under fee-free policies did not eliminate region- or gender-based disparities in learning outcomes (Nishimura & Yamano, 2013; Kattan & Burnett, 2004). Social Justice Theory, including Sen's Capability Approach (Sen, 1985) and Fraser's framework of redistribution, recognition, and representation (Fraser et al., 2004), provides a lens to interpret these findings, emphasizing that access alone does not guarantee capability development or meaningful educational achievement (Mohammed & Kuyini, 2021; Ahonsi et al., 2019; Akuffo, 2025).

A synthesis of studies indicates a decline in instructional quality concurrent with FSHS-driven enrollment expansion. The double-track system has reduced teacher-student contact time, disrupted continuity, and repurposed learning spaces such as libraries and dining halls (Chanimbe & Dankwah, 2021; Mohammed & Kuyini, 2021; Alando, 2025; Takyi et al., 2019). Evidence consistently highlights teacher capacity, agency, and engagement in school improvement as critical mediators of quality outcomes (Quansah et al., 2024; Yeyie, 2024). Socio-economic disparities further limit student engagement, with learners from low-income households facing restricted access to essential resources (Wilson, 2017; Ahonsi et al., 2019). Comparative evidence from Kenya, Nigeria, and Liberia demonstrates that enrollment increases without proportional investment in infrastructure, pedagogical support, and teacher development can result in stagnant or declining learning outcomes despite higher enrollment (Kalunda & Otanga, 2015; Obasi, 2000; Jallah, 2020).

Lastly, short-term efficiency strategies, including the double-track system, have improved classroom utilization (Mohammed & Kuyini, 2021; Tseer, 2024). However, long-term sustainability remains limited due to heavy dependence on petroleum revenues, donor contributions, and internally generated funds, exposing the policy to fiscal fluctuations (MOE, 2017; Casely-Hayford, 2025). Administrative inefficiencies, including delayed disbursements, weak monitoring, and limited school autonomy, further constrain effective implementation (UNESCO, 2017; Awal & Oduro, 2017). Reviewed studies recommend medium-term financing strategies, targeted student support, public-private partnerships, and digital resource management systems to enhance sustainability and efficiency (Addai & Adzahlie-Mensah, 2024; Asante,

Gajduschek, & Bartha, 2024).

7. Conclusion

Ghana's Free Senior High School (FSHS) policy constitutes a landmark intervention in the nation's educational landscape, offering substantial opportunities to democratize access and promote social mobility. However, its long-term effectiveness cannot be measured solely by enrolment figures. It is contingent upon the integration of systemic reforms that address persistent infrastructural, pedagogical, and socio-cultural inequities. Sustainable impact requires that increases in student numbers be matched by proportional investments in school facilities, teaching personnel, and professional development. Context-sensitive support for learners in marginalized, rural, and northern regions is also essential. Embedding principles of equity, inclusion, and social justice is necessary to ensure that access translates into meaningful educational outcomes, enabling students not only to attend school but to fully engage, learn, and progress. Additionally, the financial sustainability of the FSHS policy depends on good governance, diversified funding mechanisms, and performance-based resource allocation to mitigate risks associated with reliance on volatile petroleum revenues and external donor support. Strategic coordination between central and local education authorities, coupled with data-driven monitoring and stakeholder participation, is critical to addressing regional disparities and improving policy responsiveness. When these elements are effectively implemented, the FSHS policy has the potential to evolve beyond a politically driven initiative into a durable, high-quality, and equitable education system. It can serve as a model for secondary education reform across sub-Saharan Africa.

8. Recommendations

To ensure sustainability and maximize impact, the Ministry of Education should prioritize targeted investments in infrastructure and human resources, while local education authorities implement context-specific support for marginalized learners, including transportation, school feeding, and remedial programs. School leaders should engage in teacher performance management and professional development, and teachers' unions should advocate for manageable workloads and wellbeing initiatives to enhance instructional effectiveness. Policymakers must develop diversified, medium- to long-term funding strategies, reducing reliance on petroleum revenues and donor support, while NGOs, donors, and civil society can complement government efforts through capacity-building, infrastructure development, and programs targeting gender and socio-economic disparities. Ongoing research and evaluation are essential to monitor policy impacts, inform evidence-based adjustments, and ensure that access translates into meaningful educational outcomes. When these measures are effectively implemented, the FSHS policy has the potential to evolve into a durable, high-quality, and equitable education system, serving as a model for secondary education reform across sub-Saharan Africa.

REFERENCES

Adams, F., Li, Q., & Mu, H. (2025). Teacher agency in Ghanaian schools: Impact of career choice motivations and perceptions of the teaching profession. *Behavioral Sciences, 15*(7), 895.

Addai, Y. S., & Adzahlie-Mensah, V. (2024). Promoting equity in education: Lessons from Ghanaian education policy texts. *British Journal of Education, 12*(7), 24–42.

Adongo, A. A., Dapaah, J. M., & Wireko, D. (2022). The influence of family size on academic performance of high school students in Ghana. *SN Social Sciences, 2*(9), 1–26.

Akuffo, A. G. (2025). In pursuit of equity in upper secondary education: The curious case of Ghana's free senior high school policy. *Australian Educational Researcher, 52*(3), 2255–2280.

Akyeampong, K. (2009). Revisiting free compulsory universal basic education (FCUBE) in Ghana. *Comparative Education, 45*(2), 175–195.

Alando, B. (2025). Contribution of Free Senior High School policy to students' academic performance and progression in the Northern Region of Ghana: A review. *International Journal of Research and Innovation in Social Science, IX*(VIII), 1522–1534.

Ameko, S. K. (2021). *Senior high school teachers' perception of students' learning styles in selected schools in Greater Accra Region, Ghana* (Master's thesis, University of Ghana).

Asante, G. (2022). The effects of cost elimination on secondary school enrolment in Sub-Saharan Africa. *Educational Review, 76*(3), 561–585.

Asante, G., Gajduschek, G., & Bartha, A. (2024). A social problem or a sacred promise? Explaining the mechanisms driving fee-free educational policy change in Ghana. *Policy Studies*, 1–20.

Asante, G., Nkansah, G. B., & Agbee, D. (2022). (De)centralisation in fee-free policymaking process: Comparative review of Progressive Free Senior High and Free Senior High School policies in Ghana. *Policy Futures in Education.*

Asumadu, E. (2019). *Challenges and prospects of the Ghana free senior high school (SHS) policy: The case of SHS in Denkyembour district.* University of Ghana.

Azagsiba, A. T., Baataar, C., & Saani, I. (2025). A qualitative assessment of the Free Senior High School (Free SHS) policy on education in the Upper West Region of Ghana. *IJFMR.*

Baima, G., Forliano, C., Santoro, G., & Vrontis, D. (2020). Intellectual capital and business model: A systematic literature review to explore their linkages. *Journal of Intellectual Capital, 22*(3), 653–679.

Boatman, A., & Long, B. T. (2016). Does financial aid impact college student engagement? Evidence from the Gates Millennium Scholars Program. *Research in Higher Education, 57*(3), 322–352.

Bryman, A., Becker, S., & Sempik, J. (2008). Quality criteria for quantitative, qualitative and mixed methods research: A view from social policy. *International Journal of Social Research Methodology, 11*(4), 261–276.

Butler, A., Hall, H., & Copnell, B. (2016). A guide to writing a qualitative systematic review protocol to enhance evidence-based practice in nursing and health care. *Worldviews on Evidence-Based Nursing, 13*(3), 241–249.

Casely-Hayford, L., Gruijters, R. J., Adjei, L. O., & Yeboah, V. A. (2025). The intended and unintended effects of secondary school fee abolition: Evidence from Ghana's free senior high school policy. *Comparative Education.*

Chanimbe, T. (n.d.). Support mechanisms in the implementation field: A stakeholder collaboration to mitigate the adverse effects of the Free SHS policy in Ghanaian schools.

Chanimbe, T., & Dankwah, K. O. (2021). The 'new' Free Senior High School policy

in Ghana: Emergent issues and challenges of implementation in schools. *Interchange, 52*(4), 599–630.

Chanimbe, T., & Prah, P. K. W. (2020). Distribution mechanisms of Ghana's Free Senior High School policy: The equity dimensions and ameliorating measures. *Interchange, 51*(4), 441–467.

Critical Appraisal Skills Program. (2024). *Qualitative studies checklist – CASP.*

Connolly, M., Kruse, S., James, C., & Eddy-Spicer, D. H. (2018). *The SAGE handbook of school organization.* SAGE Publications.

Deininger, K. (2003). Does cost of schooling affect enrollment by the poor? Universal primary education in Uganda. *Economics of Education Review, 22*(3), 291–305.

Denny, K., Doyle, O., McMullin, P., & Sullivan, V. (2014). Money, mentoring and making friends: The impact of a multidimensional access program on student performance. *Economics of Education Review, 41,* 121–138.

Donkoh, R., Wing-On, L., & Donkor, J. (2021). Educational development issues in Ghana in light of educational policy and planning. *International Journal of Educational Development in Africa, 5*(1).

Duah, R. K., Oppong, K., Gyabaah, Y., Mensah, B., Poku, A. A., & Damte, F. K. (2023). Effects of increasing student enrollment on teaching and learning in Senior High Schools in Ghana: The Free Senior High School policy in retrospection. *Social Education Research, 4,* 227–239.

Dynarski, S., & Scott-Clayton, J. (2013). Financial aid policy: Lessons from research. In L. Barrow, T. Brock, & C. Rouse (Eds.), *Postsecondary education in the United States* (pp. 67–91). Princeton University: The Future of Children, 23(1).

Ekundayo, O. S. (2018). The right to free and compulsory primary education in Ghana: Lessons for other African countries. *Journal of Law, Policy and Globalization, 69,* 90–97.

Elfert, M., & Ydesen, C. (2023). UNESCO, the OECD and the World Bank: A global governance perspective. In *Educational governance research* (Vol. 24, pp. 23–50). Springer.

Fraser, N., Dahl, H. M., Stoltz, P., & Willig, R. (2004). Recognition, redistribution and representation in capitalist global society: An interview with Nancy Fraser. *Acta Sociologica, 47*(4), 374–382.

Fuseini, I. (2025). Free senior high school devours basic education in Ghana: Rescue the children. *Quality Education for All, 2*(1), 19–34.

Graham, B., White, C., Edwards, A., Potter, S., & Street, C. (2019). School exclusion: A literature review. *Educational Review.*

King, K. (2017). Lost in translation? The challenge of translating the global education goal and targets into global indicators. *Compare: A Journal of Comparative and International Education, 47*(6), 801–817.

Kattan, R. B., & Burnett, N. (2004). *User fees in primary education: An economic and political issue.* World Bank Education Advisory Service.

Mensah, D. K. D. (2019). Teachers' perspective on implementation of the double track senior high school system in Ghana. *International Journal of Emerging Trends in Social Sciences, 5*(2), 47–56.

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., et al. (2016). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Revista Española de Nutrición Humana y Dietética, 20*(2), 148–160.

Mohammed, A. K., & Kuyini, A. B. (2021). An evaluation of the Free Senior High School policy in Ghana. *Cambridge Journal of Education, 51*(2), 143–172.

Nishimura, M., & Yamano, T. (2013). Emerging private education in Africa: Determinants of school choice in rural Kenya. *World Development, 43,* 266–275.

Obasi, I. N. (2000). The universal basic education (UBE) programme in Nigeria: Problems and prospects. *African Journal of Education Management, 8*(2), 115–129.

Okrah, A. K., & Ameko, S. K. (2024). Students' perception on free senior high school policy and electoral choices in the 2024 election in Ghana. *African Journal of Politics and Administrative Studies, 17*(2).

Opoku, A. A. (2024). A comprehensive analysis of the Free Senior High School (SHS) policy in Ghana using policy triangle framework.

Penuel, W. R., Riedy, R., Barber, M. S., Peurach, D. J., LeBouef, W. A., & Clark, T. (2020). Principles of collaborative education research with stakeholders. *Review of Educational Research, 90*(5), 627–674.

Popkewitz, T. S. (2004). *The alchemy of the modern: Globalization and the reform of education.* Routledge.

Patrick, Y. (2024). Perceptions of social studies teachers on teaching rationale in New Juaben Senior High Schools, Ghana: A qualitative study. *Social Education Research, 5,* 341–357.

Quansah, M., Erastus, E., Dr, Y., Schools, G. J. H., Ghanaian, I., & Schools, J. H. (2024). Qualitative insights into school improvement practices: Stakeholder perceptions in Ghanaian Junior High Schools. *The Qualitative Report, 29*(10), 2658–2682.

Salifu, I., Boateng, J. K., & Kunduzore, S. S. (2018). Achieving free compulsory universal basic education through school feeding programme: Evidence from a deprived rural community in northern Ghana. *Cogent Education, 5*(1), 1–15.

Sen, A. (1985). *Commodities and capabilities.*

Takyi, S. A., Azerigyik, R. A., & Amponsah, O. (2019a). The effects of multi-track year-round education on the delivery of senior high school education in Ghana: Lessons from global MT-YRE systems. *International Journal of Educational Development, 71,* 1–11.

Takyi, S. A., Azerigyik, R. A., & Amponsah, O. (2019b). The effects of multi-track year-round education on the delivery of senior high school education in Ghana: Lessons from global MT-YRE systems. *International Journal of Educational Development, 71,* 102120.

Tawfik, G. M., Dila, K. A. S., Mohamed, M. Y. F., Tam, D. N. H., Kien, N. D., Ahmed, A. M., & Huy, N. T. (2019). A step by step guide for conducting a systematic review and meta-analysis with simulation data. *Tropical Medicine and Health, 47*(1), 1–9.

Tseer, T., Ngmenkpieo, F., & Damwah, A. K. (2024). Unpacking the dynamics of educational access and teacher wellbeing in Ghana's free senior high school policy. *Social Sciences & Humanities Open, 10,* 100984.

UNESCO. (2000). *World education report.* Paris: UNESCO.

UNESCO. (2013). *Education for All Global Monitoring Report.*

UNESCO. (2016). *Leaving no one behind: How far on the way to universal primary and secondary education?*

Verspoor, A. M. (2008). *At the crossroads: Choices for secondary education in Sub-Saharan Africa.* World Bank Publications.

Walle, A. D., Shibabaw, A. A., Tilahun, K. N., Atinafu, W. T., Adem, J. B., Demsash, A. W., et al. (2023). Readiness to use electronic medical record systems among healthcare professionals in Ethiopia. *Informatics in Medicine Unlocked, 36.*

Wilson, A., & Somhlaba, N. Z. (2017). Ghanaian school-going adolescents' self-perceived barriers of access to quality education: A qualitative study. *Development Southern Africa, 34*(5), 652–665.

World Bank. (2015). *Poverty reduction in Ghana: Progress and challenges.*

World Bank. (2017). *At the crossroads: Choices for secondary education and training in Sub-Saharan Africa.*

Zoula Lor. (2015). Students speak up on impact of financial aid. http://www.mnprivatecolleges.org/newsletter/april-2015-newsletter/students-speak-impact-financial-aid

Multi-Directional Efficiency Analysis of Ghanaian Life and Non-Life Insurers in the Presence of Undesirable Output.

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Abstract

The study evaluates the input/output efficiencies of insurers in Ghana, highlighting the misleading results in insurance efficiency assessment when undesirable outputs are excluded from efficiency estimations. Using a panel data set of 30 life and non-life insurers from 2008 to 2019, the multi-directional efficiency analysis is used to assess aggregated and disaggregated efficiency levels. Robust econometric regression models (pooled ordinary least squares and two-step system Generalized Method of Moment (GMM)) are also used to investigate the external factors that affect comprehensive efficiencies.

Investment income was identified as the worst-performing insurer output variable, reducing the overall efficiency of insurers. Claims, representing an undesirable variable, was identified as the best-performing variable in raising overall efficiency, followed by labour. Life insurers are observed to be performing significantly better than their non-life counterparts on their aggregated and disaggregated efficiency. Finally, the previous year's overall performance of insurers and the level of competition are identified as the determinants of insurance efficiency.

Key words: claims, insurance, multi-directional efficiency analysis, second-stage analysis, undesirable output.

1. Introduction

The insurance sector is a key driver of economic growth because it fosters investment, ensures efficient resource allocation, encourages cost reduction through liquidity creation, provides financial assistance to people and businesses during losses, and generates employment (Lee et al., 2013). Still, the Ghanaian insurance sector has been fraught with several challenges, including premium undercutting, motor insurance fraud, and

inefficiency (NIC 2017). Consequently, significant regulatory reforms have occurred, namely, the segregation of life and non-life insurers, the abolition of premium credit in the insurance market, an increase in minimum capital requirements for all insurers, efficiency improvements, and risk management (Kusi et al., 2020; NIC, 2018). Despite these efforts, insurance penetration is minimal in the country (NIC 2019, 2011), highlighting the prevailing challenges in reaching broader markets in Ghana. Given the role of the insurance sector, the competitive landscape, reforms, the role of claims, and the implications for business failure, researchers, managers, and policy makers have taken an interest in assessing the efficiency of insurers (Eling & Jia, 2018; Kaffash et al., 2020). However, despite the number of Ghanaian insurance efficiency studies (Owusu-Ansah et al., 2010; Ansah-Adu et al., 2012; Kusi et al., 2020) that have examined some of these reforms, there is a dearth of study on the input/output efficiency of Ghanaian life and non-life insurers.

Insurance in Ghana commenced in 1924, dominated by foreign insurers primarily providing coverage to British nationals (Ansah-Adu et al., 2012; Alhassan et al., 2015). Local coverage started in 1955 with the establishment of the Gold Coast Insurance Company to provide life policies to its citizens and other African nationals. In 1958, another local insurance company was established to mainly underwrite fire and motor insurance businesses in the country, leading to major consolidation efforts that necessitated the creation of the State Insurance Corporation (SIC). Subsequently, several legislative efforts were taken that laid the foundation for a regulated, growth-oriented sector. The Insurance Act 2003 allowed insurers to operate as composite insurers until it was replaced with the Insurance Act 2006 (Act 724), which required the separation of life and non-life insurance businesses. Currently, the industry operates under the Insurance Act 2021, which seeks to protect the introduction of new compulsory insurances. The industry is currently fraught with several efficiency estimation challenges, particularly with the role of claims and the efficiency performance of life and nonlife insurers (Alhassan & Biekpe, 2016; Alhassan et al., 2015).

Data Envelopment Analysis (DEA) has been widely used for assessing the efficiency of insurers (Kaffash et al., 2020) but has been criticized as providing partial insights into the aggregated efficiency of firms instead of a completely disaggregated efficiency that captures the contribution of individual-specific inputs and outputs (Asmild & Matthews, 2012; Kapelko & Lansink, 2017; Tziogkidis et al., 2020). Underpinned by the decision theory of Hansson (2005), claims of a particular insurer can contribute significantly more to the overall efficiency than other inputs, labour, or other outputs, and net premiums. Thus, it is necessary to select benchmarks such that the non-radial adjustments to the inputs and outputs correspond to the potential improvements identified by considering the improvement potential in the variables separately (Asmild & Matthews 2012). It is worth noting that previous insurance efficiency studies based on Charnes et al. (1978) have modelled claims as an input (Gaganis et al., 2013; Wu et al., 2007). However, similar to the production processes in the energy and banking sectors, insurance production is undertaken with the motive of generating more benefits (creating positive value and destroying negative value) than costs (consuming positive value and generating negative value) but also produces bad

output, an undesirable output. Even so, claims, an undesirable output of insurers, have not been incorporated as a negative by-product in the modelling behavior of insurance firms.

The selection of claims as an input or output has been argued in different insurance studies. There is no obvious trend in the literature specifying the ideal use of claims for appropriate insurance efficiency assessment (Gaganis et al., 2013). Studies like Gaganis et al. (2013), Rai (1996), Wu et al. (2007), Yang (2006), and Yao et al. (2007) captured claims as an input, with the analogy that claims form part of insurers' expenses and thus must be minimized, while overlooking the theoretical grounding of the multi-criteria theory (MCPT), which distinguishes between desirable outputs (benefits) and undesirable outputs (costs or losses). Whereas claims are the results of fulfilling insurance contracts, non-performing loans are the results of bank lending, and management is not interested in increasing them, even though they qualify as output variables (Diacon et al., 2002; Reyna & Fuentes, 2018). Although both remain integral to the service delivery process, they signify performance losses rather than profits. Thus, ignoring the undesirable nature of claims in efficiency assessment may distort conclusions.

To the best of our knowledge, this is the first study to examine the disaggregated view of insurance efficiency estimates via the contributions of individual inputs/outputs using the innovative MEA and also assess the possible impact of an undesirable output in insurance efficiency examination. We select benchmarks such that the non-radial adjustments to the inputs and outputs correspond to the possible improvements identified by considering the individual improvement potential in the variables. Given the non-parametric nature of MEA scores and their sensitivity to extreme data points, outliers, and sampling variations, the study further investigates the determinants of overall efficiencies using robust econometric regression models. In this regard, we contribute to the literature as we mathematically model claims as an undesirable output using the non-radial, non-oriented, multi-directional efficiency (MEA) of Bogetoft and Hougaard (1999) and Asmild et al. (2003). Again, we contribute by investigating the variable-specific efficiencies of some life and non-life insurers in Ghana. Finally, we contribute by assessing the impact of external factors on the overall efficiency using robust econometric regression models.

We find that the use of claims as a desirable output does not provide the appropriate claim performance level for insurers. Second, the sole use of the comprehensive efficiency of insurers does not provide accurate information on the utilization and generation of the input and output variables of insurers, respectively. Third, Ghanaian life insurers are more efficient than Ghanaian non-life insurers. Finally, the level of competition in the insurance industry has the highest impact on the performance of Ghanaian insurers, followed by the previous year's performance of insurers.

The rest of the study is organized on the following lines. The next section reviews related literature. Sections 3 and 4 describe the dataset of the Ghanaian insurance sector and the MEA model, respectively. The last two sections present the study findings and conclusion, respectively.

2. Relevant literature review

Insurance efficiency analysis has attracted

significant interest in developing countries like Canada, India, and the Gulf Cooperation Council Countries (GCC) (Al-Amri et al., 2012, Siddiqui 2021). However, very few studies have been undertaken in sub-Saharan Africa (SSA). In one of such studies, Sharew and Fentie (2018) used DEA to empirically assess the efficiency of Ethiopian insurance companies. The study findings revealed less than 100% scale and overall efficiency score for Ethiopian insurers. Company size and branches were shown as significant determinants of the Ethiopian insurance efficiency. Similarly, Wasseja and Mwenda (2015) used DEA to assess the insurance efficiency of life assurance companies in Kenya. Their results highlighted a statistically significant decline in efficiency from 2004 to 2009 in Kenya. The regression analysis on the external factors revealed a significant impact of firm size and stock exchange listing on the technical efficiency of insurance firms in Kenya. Fotova et al. (2024) recently examined insurance efficiency in developing countries. Employing the input-oriented BCC DEA model, the study findings highlighted unstable, fluctuating efficiency levels within the North Macedonia insurance sector. Their findings emphasized the need for productivity and sustainability-enhancing reforms in developing countries. In the Ghanaian context, Ansah-Adu et al. (2011) used a cross-sectional dataset of 30 insurers to investigate the cost efficiency of Ghanaian insurers from 2006 to 2008. Their results showed that life insurers had higher average efficiency scores than non-life insurers. Danquah et al. (2018) also sampled 30 insurers to investigate the cost efficiency of Ghanaian insurers from 2005 to 2014. The study findings highlighted the low performance perception in the Ghanaian insurance sector. In terms of external factors, size, market share, capitalization, reinsurance, regulation, and business type were shown to explain cost efficiency.

The production of undesirable outputs from the agricultural, energy, and manufacturing sectors has received much attention from environmental policymakers (Khan et al. 2018; You and Yan 2011). Several studies have been carried out to effectively assess their performance while considering the production of these undesirable outputs (Bi et al., 2014; Zhu et al., 2019). Yang (2006) introduced a new two-stage DEA model that assessed systematic efficiency for the Canadian Life and Health (L & H) insurance industry. The study results demonstrated that the Canadian L & H insurance industry operated fairly during the period under study, 1996-1998. Another insurance efficiency study investigated whether the capital market considered insurance efficiency, sampling 52 countries from 2002 through 2008 (Gaganis et al., 2013). The study used the stochastic frontier analysis to estimate profit efficiency and controlled for country-specific characteristics. Claims were used as an input variable following Rai (1996) assertion of claims as an integral and important part of the annual expenses of insurers and the purpose of the study. The efficiency scores were further regressed with the stock returns and the results revealed a positive and statistically significant relationship between the current and past profit efficiency scores and market-adjusted stock returns.

Over the years, various techniques have been developed to measure efficiency performance in the presence of undesirable outputs (Chen et al., 2017; Dyckhoff & Allen, 2001; Sueyoshi & Goto, 2010; Maghbouli et al., 2014) due to the inability of the traditional DEA to compute efficiency scores in the presence of undesirable variables (Färe & Grosskopf,

2004; Seiford & Zhu, 2002). Asmild and Matthews (2012) is the first study that used MEA to assess the efficiency performance of Chinese banks while capturing one of its output variables as an undesirable output, non-performing loans. Following Thanassoulis et al. (2008), non-performing loans, an undesirable output, was used as an input in addition to three other inputs, namely labour, fixed assets, and bank deposits. The study findings were in contrast with popular findings, as JSBs were shown to be more efficient than the SOBs. Zhu et al. (2019) used an improved MEA approach to evaluate energy efficiency while considering the slack problem of production. Their findings revealed the country's provincial energy to be olive-shaped with significant spatial imbalance. In addition, their findings identified a large potential value for CO_2 emission in the Central region, with a relatively large energy-saving potential for the two other regions, Western and Eastern. In another study, Bi et al. (2014) aimed to gain deeper insight into the regional energy and environmental efficiency of the Chinese transportation sector. The authors adopted the modified MEA model to investigate the levels and patterns of efficiency. The results showed numerous efficient regions with a greater chance of reducing CO_2 emissions and energy consumption.

3. Methodological framework

3.1 Multi-directional Efficiency Analysis

Multi-directional efficiency analysis (MEA) is a DEA modification that separates the issue of benchmark selection from the issue of efficiency measurement (Bogetoft & Hougaard, 1999; Kapelko & Lansink, 2017; Labajova et al., 2016). The model was postulated by Bogetoft and Hougaard (1999), who provided an axiomatic foundation that supports the implicit benchmark selection over the potential improvement selection approach. Asmild et al. (2003) further operationalized the potential improvement approach with DEA and proposed the name multi-directional efficiency analysis (MEA).

The model consists of two stages: ideal reference point identification and improvement potential point selection for each input/output variable (Asmild et al., 2003; Asmild & Matthews, 2012). Unlike DEA, the selection of input reduction and output expansion benchmarks for MEA is based on the specified improvement potential related to each input and output separately (Asmild et al., 2003; Asmild et al., 2016). In an MEA input-oriented analysis, the largest reduction potentials for each input are identified and combined with the minimum possible input usage in each dimension to identify the ideal reference point (Asmild et al., 2003; Asmild & Pastor, 2010). The difference between the unit under analysis and the ideal reference point is used to find the directional vector of each unit (Asmild & Pastor, 2010).

Bogetoft and Hougaard (1999) and Asmild et al. (2003) have discussed some desirable properties of the MEA model over the traditional DEA. First, unlike DEA, which selects both weakly and strongly efficient benchmarks, MEA selects only strongly efficient benchmarks. Second, because of its non-radial improvement approach, MEA explicitly recognizes improvement potentials between input and output dimensions. Third, MEA can be extended to estimate efficiency under input orientation, output orientation, and non-orientation (input reduction and output augmentation simultaneously). Fourth, MEA can be extended to include discretionary and non-discretionary variables simultaneously. Finally, MEA can be run under both the constant return to

scale and variable return to scale (VRS) technology; it is invariant to affine transformation under the VRS technology.

3.2 Multi-directional Efficiency Analysis Model

The study formalized an MEA model in line with Asmild and Matthews (2012) and Zhu et al. (2019) to investigate the input/output insurance efficiency of Ghanaian life and non-life insurers. $(\boldsymbol{x_{i0}, y_{r0}, c_{k0}})$ is chosen as the production plan for $\boldsymbol{decision\ making\ unit_0\ DMU_0}$. For each input, desirable output, and undesirable output variable, an ideal reference point is obtained. Then, the MEA efficiency of each variable for the production unit $(\boldsymbol{x_{i0}, y_{r0}, c_{k0}})$ is derived as shown in **expression (1).**

$\boldsymbol{\beta_{r0}, \beta_{k0}, \beta_{i0}}$ measures the proportion by which the desirable outputs are added while the undesirable outputs and inputs are contracted in the same proportion (Bogetoft & Hougaard 1999; Tziogkidis et al., 2020). Using the optimal solution, $(\boldsymbol{\lambda_j^*, \beta_{i0}^*, \beta_{r0}^*, \beta_{k0}^*})$, from equation (6), the benchmark selection for the target unit $(\boldsymbol{x_{i0}, y_{r0}, c_{k0}})$ is determined as $(\boldsymbol{x_{i0}^*, y_{r0}^*, c_{k0}^*})$.

3.3 Robust Econometric model

The sensitivity of non-parametric efficiency models (DEA) to outliers and sampling variations makes it unsuitable to solely depend on efficiency scores to make statistical inferences (Daraio & Simar, 2007). Besides, environmental variations around firms cannot be overlooked, considering their direct impact on firm performance (Dyson et al. 2001). As a result, the assessment of the robustness of non-parametric efficiency scores, second-stage analysis, cannot be ignored during efficiency assessment.

With a baseline panel model (c.f. equation 2) an array of econometric techniques are employed to establish the strength of the results with the insurance-specific factors.

Expression (1)

$$\boldsymbol{max(\beta_{i0} + \beta_{r0} + \beta_{k0})}$$

$$\textbf{subject to} \begin{cases} \boldsymbol{\sum_{j=1}^{n} \lambda_j x_{ij} \le x_{i0} - \beta_{i0}(x_{i0} - d_{i0}^*), i = 1, \dots, m} \\ \boldsymbol{\sum_{j=1}^{n} \lambda_j y_{rj} \ge y_{r0} - \beta_{r0}(\delta_{i0}^* - y_{r0}), r = 1, \dots, s_1} \\ \boldsymbol{\sum_{j=1}^{n} \lambda_j c_{kj} = c_{k0} - \beta_{k0}(c_{k0} - \phi_{i0}^*), k = 1, \dots, s_2} \\ \boldsymbol{\lambda_j \ge 0, j = 1, \dots, n} \end{cases} \quad (1)$$

$$\boldsymbol{Eff_{i,t} = \beta_1 comp_{i,t} + \beta_2 lev_{i,t} + \beta_3 size_{i,t} + \beta_4 solv_{i,t} + \beta_5 roa_{i,t} + \beta_6 type_i + \beta_7 Underisk_{i,t} + \delta Eff_{i,t-1} + \sum_{t=2008}^{2019} Year_t + \sum_{i=1}^{30} Insurer_i + \varepsilon_{i,t} \quad \varepsilon_{i,t} \sim N(0, \sigma_\varepsilon^2)} \quad (2)$$

where;

$\boldsymbol{Eff_{i,t}}$ = MEA efficiency score of insurer $\boldsymbol{i}$ at time $\boldsymbol{t}$;

$\boldsymbol{\beta_{i,i=1,\ldots,7}}$ and $\boldsymbol{\delta}$ are parameters to be estimated to assess the extent to which each explanatory variable influences the dependent variable;

$\boldsymbol{comp_{i,t}}$ = competition among insurers proxied as the Boone indicator for insurers $\boldsymbol{i}$;

$\boldsymbol{Eff_{i,t-1}}$ = the previous year's MEA efficiency score;

$\boldsymbol{lev_{i,t}}$ = leverage ratio of insurer $\boldsymbol{i}$ at time $\boldsymbol{t}$;

$\boldsymbol{type_i}$ = dummy variable with a value of 1 if the insurer deals with life business and 0 otherwise; $\boldsymbol{size_{i,t}}$ = size;

$\boldsymbol{solv_{i,t}}$ = solvency of insurer $\boldsymbol{i}$ at time $\boldsymbol{t}$ proxied with the z-score;

$\boldsymbol{roa_{i,t}}$ = profitability of insurer; $\boldsymbol{i}$ at time $\boldsymbol{t}$ proxied as the return on assets;

$\boldsymbol{Underisk_{i,t}}$ = underwriting risk of insurer $\boldsymbol{i}$ at time $\boldsymbol{t}$; $\boldsymbol{\sum_{t=2008}^{2019} Year_t}$, $\boldsymbol{\sum_{i=1}^{30} Insurer_i}$, $\boldsymbol{\varepsilon_{i,t}}$ are the time-dependent effect, the unobserved individual-specific effect, and the error term, respectively. These assume that the residuals are normally distributed with a zero mean and a constant standard deviation, $\boldsymbol{\varepsilon_{i,t} \sim N(0, \sigma_\varepsilon^2)}$. The subscripts: $\boldsymbol{i}$ and $\boldsymbol{t}$ denote the insurers being considered and the time period of the study, respectively.

Several econometric tests are undertaken to determine the appropriate and robust static regression model (pooled ordinary least squares (POLS), fixed/random effect model (FE/RE), random effect heteroskedasticity and autocorrelation-consistent (RE-HAC), panel-corrected standard errors regression (PCSE), and the Driscoll-Kraay standard error (SCC)) for the study, in addition to the two-step systems GMM (an instrumental variable regression) to cross-check the robustness of the MEA efficiency scores. The two-step system GMM is used to estimate the dynamic frontier with time-invariant technical efficiency (Bhattacharyya, 2012), like the MEA. Even though the static panel models control for unobserved heterogeneity and ensure unbiased estimates, they do not make room for endogenous regressors, which are common in real market systems. In addition to the above reasons, the two-step system GMM is suitable for small spans (T) and large units (Jin et al., 2021); thus, the two-step system GMM is chosen as the preferred model.

4. Data and variable selection

Following the separation of the composite insurers into life and non-life groups in December 2006, both life and non-life insurers were sampled to assess the group/individual comprehensive and variable-specific efficiency differences. Hence, 13 life and 17 non-life insurers that had been in operation from 2008 to 2019 were sampled for the study. The study data was retrieved from the statement of financial position and comprehensive income in the audited annual reports submitted to the National Insurance Commission (NIC).

4.1 Output

Outputs chosen for this study are based on the value-added approach since it reflects the basic services offered by insurers: risk-pooling and risk-bearing, intermediations, and real financial services related to insured losses. Investment income, net premium, and claims are chosen as outputs for the study despite the prevailing criticisms by Cummins and Weiss (2013) and Alhassan and Ohene-Asare (2016) on the use of net premium as an output, while a revenue, a product of price and output.

Following the return insurers receive from investment income and the opportunity

insurers have to receive premiums in advance, in addition to their ability to make returns from premiums before the occurrence of a covered loss, investment income ($\boldsymbol{Y1}$) and net premiums ($\boldsymbol{Y2}$) are used as desirable outputs in this study (Cooper et al., 2011; Seiford & Zhu, 2002) whereas, claims ($\boldsymbol{C1}$) is used as an undesirable output (bad output).

4.2 Input

Three inputs are chosen to compute comprehensive and variable-specific efficiency scores: fixed assets ($\boldsymbol{X1}$), labour ($\boldsymbol{X2}$) and equity capital ($\boldsymbol{X3}$).

4.3 Variable Description

Table 1 reveals some pertinent observations in the Ghanaian insurance industry. First, the standard deviation of the insurers exceeds their mean values (both inputs and outputs). This is to say, insurers operating in Ghana vary in the size of inputs used and outputs produced. Second, there is a 0.01%, 1%, and 5% significant difference in the amount generated from net premium, claims, and investment income, respectively. Third, non-life insurers were observed to have insignificantly higher levels of inputs, labour costs, fixed assets, and equity capital than life insurers. However, the sampled life insurers generated significantly larger levels of desired and undesirable outputs, net premium, investment income, and claims than non-life insurers.

Table 1: Descriptive statistics of input/output (pooled data and business type, 2008 - 2019)
All monetary values are in GHS.

		Fixed capital	Labour	Equity capita	Net premium	Investment income	Claims
		$X1$	$X2$	$X3$	$Y1$	$Y1$	$C1$
Pooled	Count	360	360	360	360	360	360
	Mean	4920182	14340536	28640604	31835053	9223024	13885505
	Std Dev	8443171	47262441	44835844	53498534	19289031	25518283
	Min	12664	6425	16874	361428	17285	36212
	Max	97518606	873230010	397215400	416881000	132015000	211855714
Time difference	F-statistics	46.45***	2.225	33.75***	57.7***	5.326*	9.745**
Business type groupings							
Life	Count	156	156	156	156	156	156
	Mean	4137251	11572050	27217164	43804573	9223024	20336154
	SD	6574524	14033169	40311535	75200414	19813382	35465612
	Max	42544569	68561000	220703000	416881000	94960139	211855714
	Min	12664	6425	211551	457873	37387	42728
Non-life	Count	204	204	204	204	204	204
	Mean	5518894	16457613	29729118	22681891	7008989	8952656
	SD	9603867	61559293	48078595	23437303	18624616	11609174
	Max	97518606	873230010	397215400	111847000	132015000	60889727
	Min	22648	96064	16874	361428	17285	36212
Group means	T-statistic	-1.618	-1.0969	-0.5387	3.3848**	2.5087**	3.8542***

**p-value < 0.05; **p-value < 0.01; ***p-value < 0.001; N/S – not statistically significant; Min, Max and SD mean minimum, maximum and standard deviation respectively.*

Table 2: Tests of returns to scale

H_0: ψ is CRS	Significance level	Mean of ratios	Ratio of means	Mean of ratios minus 1	Conclusion
Test statistic		0.9442	0.9477	-0.0142	Fail to reject CRS
Critical Value	5%	0.6610	0.7294	-0.0369	Fail to reject CRS
	1%	0.5430	0.5257	-0.0534	Fail to reject CRS

In line with Ohene-Asare, Asare, and Turkson (2019), non-life insurers were shown to have higher levels of operating expenses and equity capital than life insurers. However, these findings were not consistent with the phenomenal growth observed in life businesses compared to non-life businesses (Alhassan et al., 2015).

Unlike previous efficiency and dynamic productivity studies that failed to statistically test the nature of returns to scale (Lozano & Soltani, 2020; Ohene-Asare et al., 2019), the return to scale technology of the Ghanaian insurance industry is tested following Ohene-Asare et al. (2017) and Tortosa-Ausina et al. (2012) to avoid biased and misleading conclusions on the efficiency scores (Dyson et al., 2001; Simar & Wilson, 2002). The three different RTS tests (mean of ratios, ratio of means, and mean of ratios minus 1) are performed to determine the appropriate RTS technology for the Ghanaian insurance industry. The null hypothesis of all three tests shows the production technology to be globally constant return to scale (CRS) (see Table 2).

5. Findings and discussion

5.1 Claims as undesirable output

To assess the effect of an undesirable output on the MEA efficiency of insurers, claims is used as a desirable and undesirable output in the efficiency analysis. As MEA efficiency scores are measured relative to a common pooled frontier, a combined meta-analysis of all the observations from all years (2008–2019) is measured against a common meta-frontier and then classified across time, firms, and groups for feasible and practical comparisons. Table 3a and 3b presents the number of times insurers were efficient on claims and the corresponding efficiency percentage for the study period.

From Table 3a and 3b, Enterprise Life (Enter L) scored the highest (99%) on claim efficiency, whereas MetLife scored the second highest (98%) when claims were considered as an undesirable output. However, these efficiency scores changed when claims were considered as a desirable output (MetLife - 100%, Enterprise Life – 87%). Likewise, the average insurer recorded lower efficiency scores when claims were considered desirable rather than undesirable. This conclusion implies that had we used claims as a desirable output, misleading results could have emerged. Another potentially practical justification for considering claims as an undesirable output emanates from the rankings of the efficiency scores. Specifically, the rankings of 21 out of 30 insurers changed between the two models (desirable and undesirable claims). Star Life (Star L), for instance, was ranked 5th when claims were considered as an undesirable output but ranked 2nd when claims were considered as a desirable output. Glico Life (Glico L) ranked 9th (least ranked) when claims were undesirable and 6th when claims were desirable. These findings suggest that the claims efficiency could be underestimated or overestimated depending on whether it was considered desirable or undesirable. Comparing desirable claims efficiency with undesirable claims efficiency revealed that insurers were

88% efficient under undesirable claims efficiency but 66% efficient under desirable claims efficiency (using the median efficiency). To test for the significant difference in the ranks rather than averages of efficiency between undesirable claims efficiency and desirable claims efficiency, the non-parametric Wilcoxon signed-rank test was used and corroborated with the dependent t-test (parametric test). The p-value (0.00) of the Wilcoxon signed-rank test statistic (W = 45230) confirmed a significant difference between the rankings of desirable and undesirable claims efficiency estimates at the 0.1% level of significance.

With the confirmed significant difference between the rankings of the two efficiencies, insurance efficiency is proven to differ when claims is treated as a desired or undesired output. The violin plot is used in Figure 1 to illustrate the kernel density graphs or box plots because it presents a five-point summary of the claim efficiency estimates in addition to the distribution of the efficiency estimates (Färe et al., 2015; Liu et al., 2021). Besides the density traces of the violin plot, it provides new information on the shape of the distribution for the claims efficiencies (Hintze and Nelson 1998). In addition, the violin plot can portray the presence of clusters in the nonparametric data, and the densities can showcase the peaks, bumps, and valleys in the distribution. It combines the merits of the box plots with density traces in one diagram by making the width of the box proportional to the estimated density (Färe et al., 2015). With the confirmed significant difference between the rankings of the two efficiencies, insurance efficiency is proven to differ when claims is treated as a desired or undesired output. The violin plot is used in Figure 1 to illustrate the kernel density graphs or box plots because it presents a five-point summary of the claim efficiency estimates in addition to the distribution of the efficiency estimates (Färe et al., 2015; Liu et al., 2021).

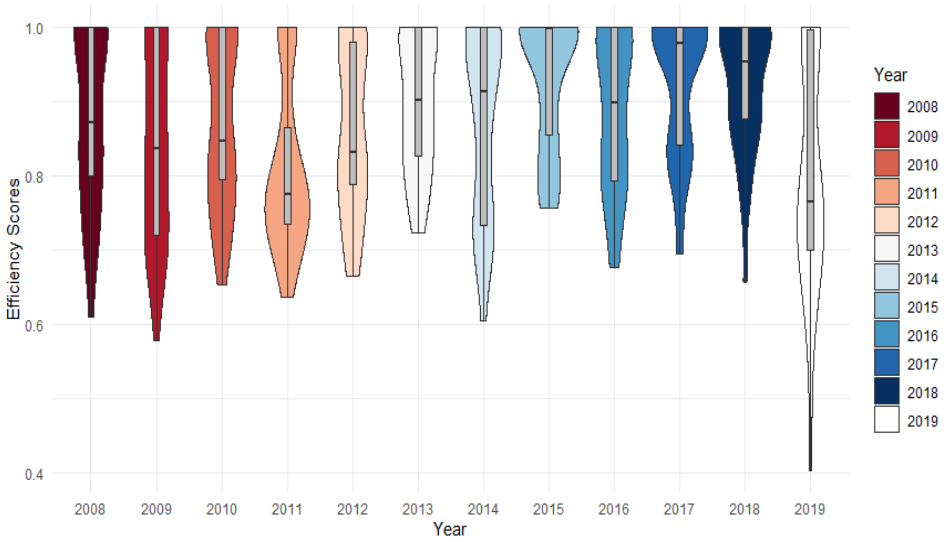


Figure 1: Claims efficiency for insurers across the years

The violin plot is used in Figure 1 to illustrate the kernel density graphs or box plots because it presents a five-point summary of the claim efficiency estimates in addition to the distribution of the efficiency estimates (Färe et al., 2015; Liu et al., 2021). Besides the density traces of the violin plot, it provides new information on the shape of the distribution for the claims efficiencies (Hintze and Nelson 1998). In addition, the violin plot can portray the presence of clusters in the nonparametric data, and the densities can showcase the peaks, bumps, and valleys in the distribution. It combines the merits of the box plots with density traces in one diagram by making the width of the box proportional to the estimated density (Färe et al., 2015). From Figure 1, the same median efficiency (the thick black line in the interquartile range of the boxplot) was the same for 2016 and 2013, even though fatter densities were illustrated in 2013. Notably, different proportions of insurers achieved full efficiency within a single year. In 2019 and 2011, a relatively small proportion of insurers achieved full claim efficiency, while a greater proportion of insurers reached full claims efficiency in 2015, 2017, and 2018. The minimum claims efficiency varied across the years, in contrast to the maximum claims efficiencies that remained stable throughout the entire sample period. In 2019, the lowest minimum claim efficiency was shown to be obtained by some insurers, with the highest minimum claim efficiency recorded in 2015. In 2019, most insurers performed poorly, as evidenced by the thin densities of the claim distribution. The fatter densities, the highest minimum claim efficiency, and the shorter claim efficiency signify the good performance of the sampled insurers in 2013 and 2015.

5.2 Variable-specific efficiencies

To assess the variable-specific efficiencies, the vectors of variable-specific efficiencies (c.f. eqns. 7-10) for each observation are considered. Figure 2 presents the average variable-specific and comprehensive efficiencies across the insurers as measured against the pooled frontier. First, Figure 2 reveals that larger parts of insurers' variables are performing MEA efficiently on the combined variables in the insurance sector, as efficiency scores are more than 50% generally. The result implies that there is less potential to cut inputs and undesirable outputs or raise desirable outputs. However, investment income inefficiency is the primary cause of comprehensive MEA inefficiency, as shown in Figure 2. It is also observed that the average aggregated or integrated MEA efficiencies and investment income efficiencies are generally lower than those of the other variable-specific efficiency scores across insurance firms. The similar pattern of lower investment income efficiencies appears to underlie the lower comprehensive efficiencies. Overall, we observe that insurers generally perform well on the variable-specific efficiency scores, with the exception of investment income, when compared to the average comprehensive MEA efficiencies.

Second, Figure 3 depicts the violin plots for the disaggregated efficiency scores. Except for the efficiency distribution of investment income, a similar spread and distributional pattern are shown for all the variables. This pattern confirms the lower average efficiencies recorded on investment income across the years. Claims are shown to have the fattest density followed by labour and equity capital. The relatively small spread on the claims' efficiency density reveals the higher efficiencies recorded by insurers. The wider spread in net premium efficiency distribution, coupled with their thin densities, reveals the relatively lower

efficiencies recorded by some insurers. Overall, insurers have demonstrated strong performance across all variables, with the exception of investment income.

Table 3a: Average claims efficiency scores (and rankings) for claims as a desirable and an undesirable output (2008 - 2019).

	Claims as an undesirable output				Claims as a desirable output			
Insurer	**Claims Efficiency**	**No. of years claims is efficient out of 12 years**	**Percentage of times efficient**	**Rank**	**Claims Efficiency**	**No. of years claims is efficient out of 12 years**	**Percentage of times efficient**	**Rank**
Activa I	0.83	1	8.30%	9th	0.37	1	8.33%	8th
CDH L	0.76	1	8.30%	9th	0.51	0	0.00%	
Donewell IC	0.84	2	16.70%	8th	0.46	1	8.33%	8th
Donewell L	0.87	5	41.70%	5th	0.75	5	41.67%	5th
Enter L	**0.99**	**10**	**83.30%**	**2nd**	**0.87**	**7**	**58.33%**	**3rd**
Enterprise IC	0.85	5	41.70%	5th	0.81	5	41.67%	5th
Equity IC	0.93	6	50.00%	4th	0.4	0	0.00%	
Ghana L	0.84	5	41.70%	5th	0.65	3	25.00%	6th
Ghana UA	0.79	1	8.30%	9th	0.61	1	8.33%	8th
GhanaUnion L	0.95	5	41.70%	5th	0.44	0	0.00%	
Glico GI	0.78	1	8.30%	9th	0.55	0	0.00%	
Glico L	**0.82**	**1**	**8.30%**	**9th**	**0.85**	**3**	**25.00%**	**6th**
Met L	**0.98**	**11**	**91.70%**	**1st**	**1**	**12**	**100.00%**	**1st**
Metropolitan IC	0.83	2	16.70%	8th	0.8	3	25.00%	6th
NSIA GC	0.86	3	25.00%	7th	0.33	0	0.00%	
Phoenix IC	0.86	0	0.00%		0.57	0	0.00%	
Phoenix L	0.87	6	50.00%	4th	0.75	6	50.00%	4th
Prime I	0.82	4	33.30%	6th	0.3	0	0.00%	
Provident IC	0.83	1	8.30%	9th	0.3	0	0.00%	
Provident L	0.91	5	41.70%	6th	0.87	5	41.67%	5th

*< 0.01; ***p-value < 0.001; Min, Max, SD means minimum, maximum and standard deviation respectively*

Table 3b: Average claims efficiency scores (and rankings) for claims as a desirable and an undesirable output (2008 - 2019).

	Claims as an undesirable output				Claims as a desirable output			
Insurer	Claims Efficiency	No. of years claims is efficient out of 12 years	Percentage of times efficient	Rank	Claims Efficiency	No. of years claims is efficient out of 12 years	Percentage of times efficient	Rank
Quality IC	**0.84**	**0**	**0.00%**		**0.42**	**0**	**0.00%**	
Quality L	**0.86**	**3**	**25.00%**	**7th**	**0.70**	**2**	**16.67%**	**7th**
Regency AI	**0.92**	**5**	**41.70%**	**5th**	**0.54**	**2**	**16.67%**	**7th**
SIC IC	**0.79**	**1**	**8.30%**	**9th**	**0.33**	**0**	**0.00%**	
SIC L	**0.90**	**8**	**66.70%**	**3rd**	**0.94**	**8**	**66.67%**	**2nd**
Star AC	**0.92**	**3**	**25.00%**	**7th**	**0.59**	**2**	**16.67%**	**7th**
Star L	0.89	5	41.70%	5th	0.95	8	66.67%	2nd
Unique IC	**0.82**	**4**	**33.30%**	**6th**	**0.51**	**2**	**16.67%**	**7th**
Vanguard AC	**0.9**	**3**	**25.00%**	**7th**	**0.80**	**3**	**25.00%**	**6th**
Vanguard L	**0.93**	**8**	**66.70%**	**3rd**	**0.83**	**8**	**66.67%**	**2nd**
Mean	0.87				0.67			
Median	0.88				0.66			
SD	0.12				0.28			
Min	0.40				0.02			
Max	1				1			
Count	360				360			
Test of means	T-test	13.351***						
	Wilcoxon test	45230***						

*< 0.01; ***p-value < 0.001; Min, Max, SD means minimum, maximum and standard deviation respectively*

To further assess the variable-specific efficiencies, all observations from every year are combined into one dataset for the pooled meta-analysis, as shown in Figure 4. We observe relatively stable variable-specific efficiency patterns for each variable (except investment income) as time progresses. Still, investment income efficiency was observed to be substantially increasing during the 2008-2019 period. However, we observe a slow decline in the variable-specific efficiencies after 2018. This finding reveals an equal level of performance on these variables across the years, except for 2018. Again, the average comprehensive MEA and investment income efficiencies are generally lower than those of the other variable-specific scores. This showed investment income inefficiency to be a strong contributor to

the overall MEA inefficiency. The substantial increase in efficiency levels across the study period reveals improvements in investment income and insurer performance at large. In contrast to other variables, we observe a sharp decrease in investment income efficiency from 2017. Once again, the relationship between investment income and comprehensive efficiency is evident, following the same trends and patterns.

5.3. Life and non-life efficiencies

The pooled meta-analysis of all the study observations is considered as one dataset. The MEA efficiency scores of the life and non-life insurers are compared and presented in Figure 5. The plots show unimodality for life and bimodality for non-life insurers' integrated efficiencies. More skewness is observed in life than in non-life efficiencies. The violin plots of the efficiencies of life insurers showed fatter densities between the 50% and 70% average efficiency levels, whereas no efficiency densities were shown for non-life insurers beyond the 70% average efficiency level. This suggested that whereas a greater percentage of life insurers recorded average comprehensive efficiency above 50%, no non-life insurer recorded average comprehensive efficiency beyond 70%. Further observation reveals a bump in the violin plot of the non-life insurers between 50% and 25% average efficiency, suggesting that the majority of the non-life insurers recorded comprehensive average efficiency scores between 50% and 25%. Generally, non-life insurers performed more poorly than life insurers during the study period.

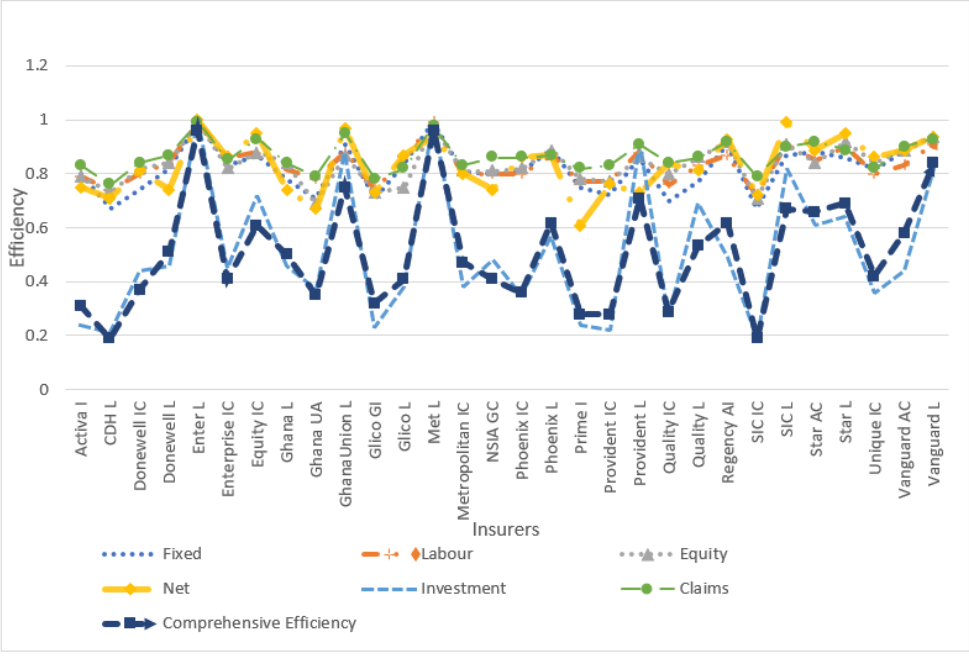
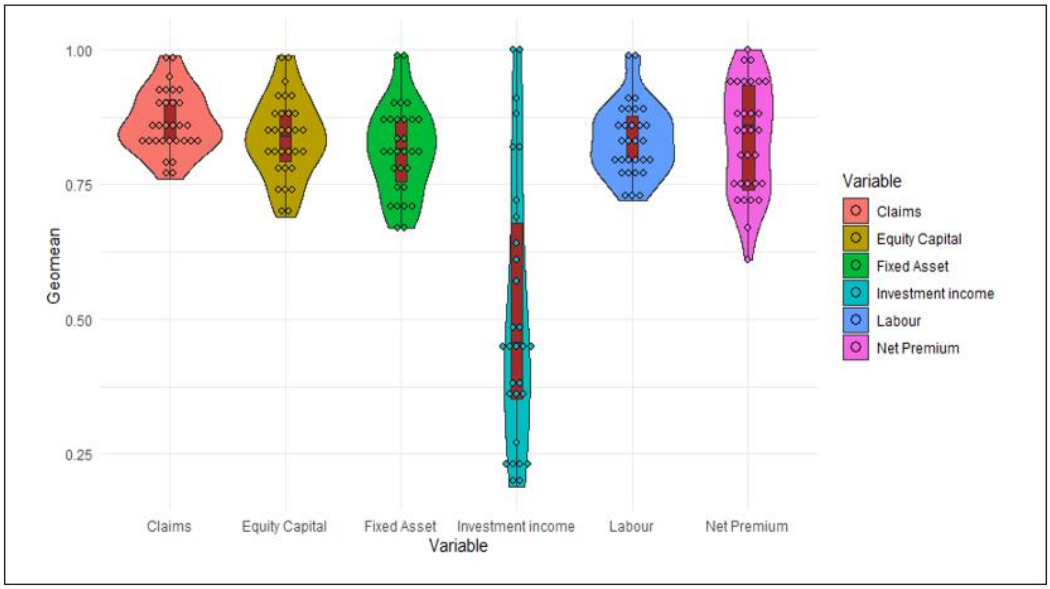


Figure 2: Average variable-specific and comprehensive efficiencies across insurers (2008 – 2019



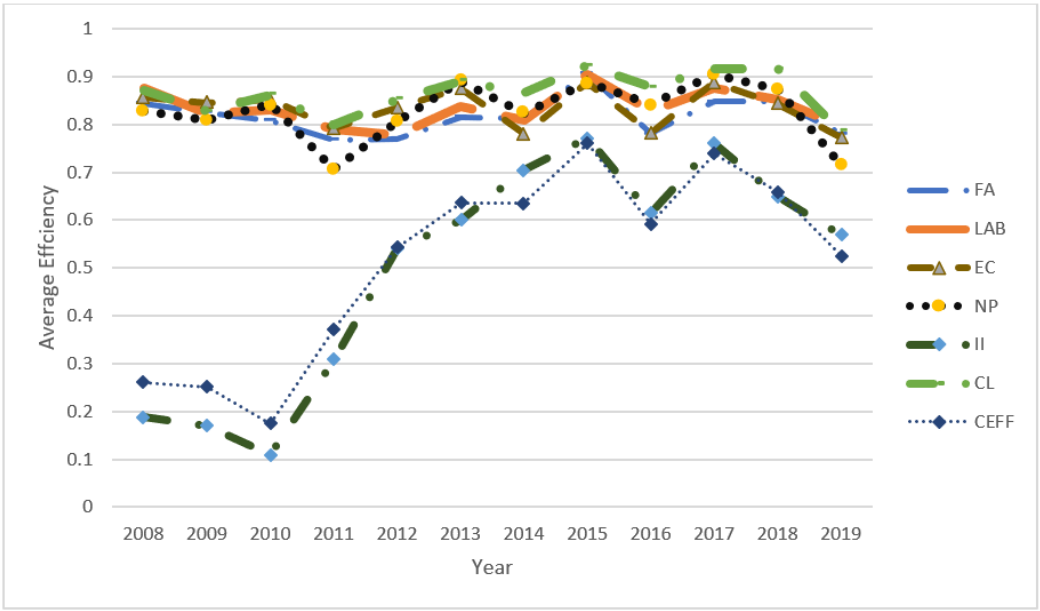


Figure 4: Average efficiencies scores over the years (2008 – 2019)

Once again, Figure 6 illustrates the violin charts showing the pooled average of disaggregated efficiency scores over 12 years, categorized and compared between life and non-life insurers. Figure 6 reveals that the life insurers exhibit a wide spread of all variable-specific efficiency scores, with the exception of net premium efficiencies. On the other hand, the variables show a relatively shorter spread for non-life insurers, with the exception of investment income efficiencies. These results suggest that the performance levels among life insurers vary widely (0.20, 1), while non-life insurers exhibit a relatively narrower range (0.20, 0.95). The non-life insurers exhibit relatively thick variable-specific efficiency distributions. Except for investment income, the bumps in the variable-specific efficiencies of the non-life insurers are shown to be around lower levels of efficiency, signifying lower levels of efficiency scores. However, the life insurers' variable-specific efficiencies showed bumps around higher efficiency levels. Overall, the life insurers outperformed non-life insurers on all variables.

A detailed examination of the pooled average variable-specific efficiency differences between life and non-life insurers for each of the input and output variables is illustrated in Figure 6 to examine the levels and patterns of efficiency differences between the life and non-life insurers. Figure 7 depicts the average efficiency scores for each insurer type in each year for each of the variables measured relative to the meta-frontier, with the life insurers being consistently more efficient than the nonlife insurers on investment income, fixed assets, equity capital, and labour, with no clear difference between them on claims and net premium during the study period. Based on the patterns, life insurers outperformed non-life insurers in fixed assets, labour, equity capital, and investment income.

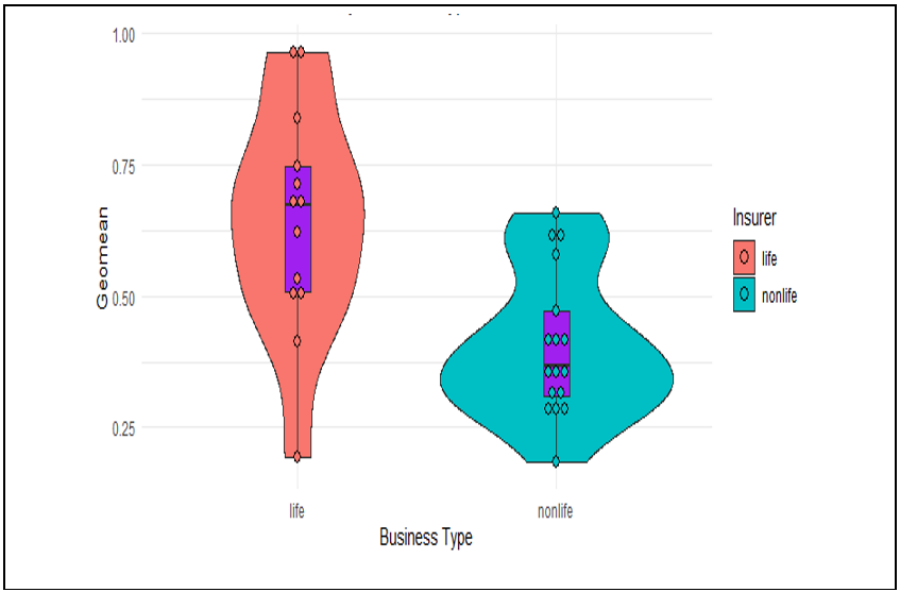


Figure 5: Distribution of average efficiency by business types (2008 -2019)

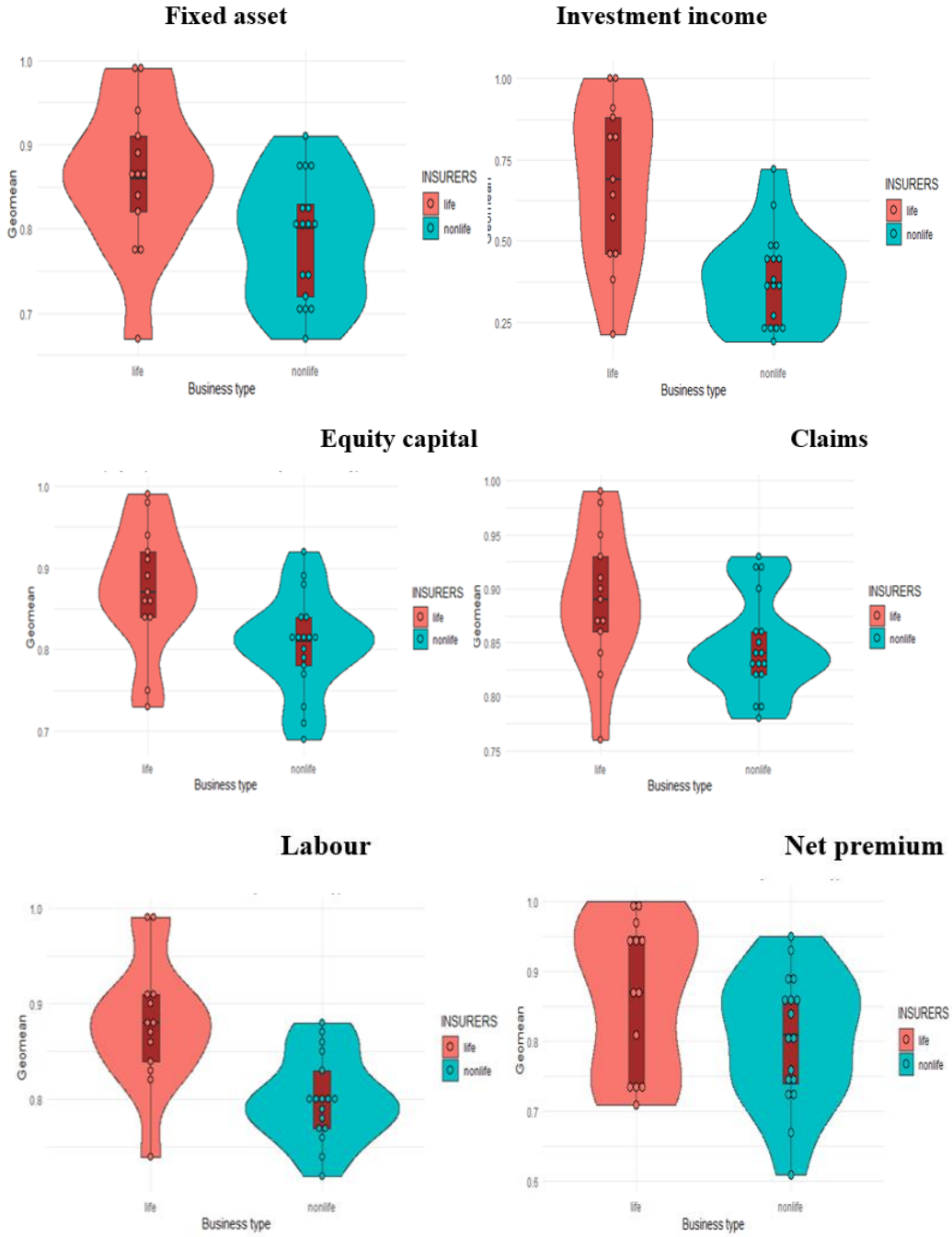


Figure 6: Average efficiency scores for each insurer type

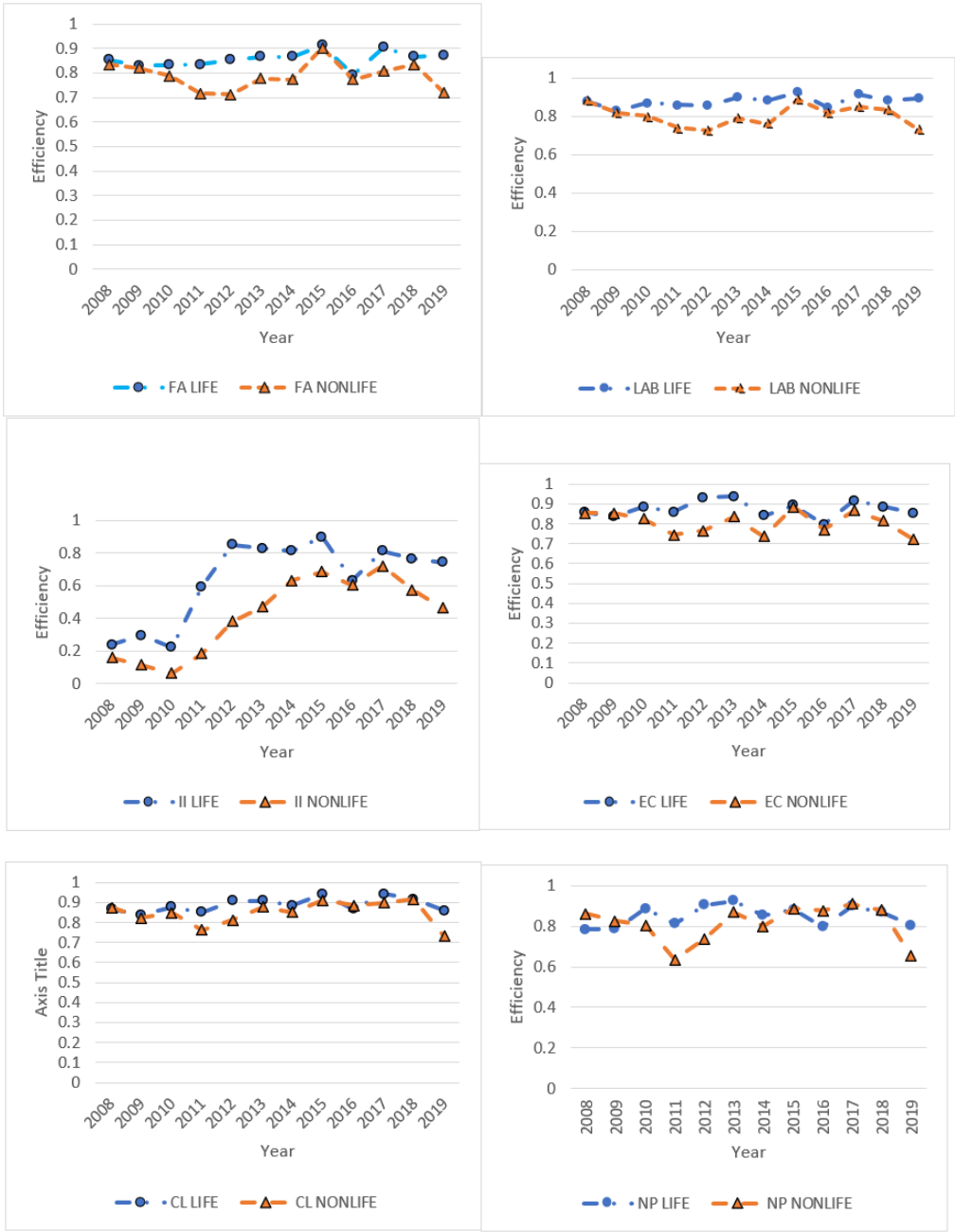


Figure 7: Variable-specific efficiencies of life and non-life insurers

5.4 Determinants of MEA efficiency

In line with Chowdhury and Zelenyuk (2016), the Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) of the three models were estimated to identify the simplest parsimonious model for the study. Based on their results (see Table 5a and 5b, model 8 is chosen as the appropriate regression model for the study.

After dropping the insignificant variables, all the significant variables remained significant in all the models. First, the lag of the aggregate efficiency scores has a significantly positive impact on aggregate efficiency. This signifies that an insurer's previous year's overall efficiency score positively impacts its current overall performance at a 0.1% significance level. This finding is consistent with Sultana and Rahman (2020), who identified a positive relationship between the cost efficiency of banks in Bangladesh and its lag. Second, the Boone Indicator (BI) significantly impacted the level of competition among insurers.

Size, solvency, ROA, type of insurer, and underwriting risk were all observed to have an insignificant impact on the comprehensive efficiency of insurers. This suggests that changes in these exogenous variables do not affect the performance of Ghanaian insurers. These findings contradict Ohene-Asare et al. (2019), Ansah-Adu et al. (2012), and Alhassan et al. (2015). However, it is consistent with Ansah-Adu et al. (2012) on the impact of the type of insurer.

Table 5a: Total sample regression results

Dependent Variable: Eff	**Pooled OLS**	**Fixed Effect**	**Randon Effect**	**RE-HAC**	**RE Beck Katz-PCSE**	**RE Driscoll-SCC**	**Two steps System GMM**			**Expected signs**
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	**(8)**	(9)	
Lag (Eff)							0.125***	**0.3527*** **	0.189***	
							(0.032)	**(0.117)**	(0.041)	
Comp	0.183***	0.180***	0.181***	0.181***	0.181***	0.181***	0.109***	**0.473***	0.101***	+
	(0.038)	(0.034)	(0.034)	(0.053)	(0.035)	(0.027)	(0.018)	**(0.206)**	(0.017)	
Lev	0.005	0.005	0.005	0.005	0.005	0.005		**-**	0.000	+
	(0.006)	(0.006)	(0.006)	(0.008)	(0.008)	(0.017)		**-**	(0.000)	
Size	-0.01	-0.013	-0.012	-0.12	-0.012	-0.012	-0.007	**-0.025**	-0.001	±
	(0.012)	(0.012)	(-0.012)	(0.009)	(0.013)	(0.013)	(0.008)	**(0.015)**	(0.008)	
Solv	0.013	0.012	0.012	0.012	0.012	0.012	-0.001	**-0.002**	-0.0107	±
	(0.007)	(0.008)	(0.007)	(0.007)	(0.09)	(0.012)	(0.008)	**(0.010)**	(0.009)	
ROA	-0.085	-0.077	-0.079	-0.079	-0.079	-0.079	-0.011	**0.001**	-	+
	(0.098)	(0.095)	(0.094)	(0.120)	(0.130)	(0.218)	(0.061)	**(0.006)**	-	
TOIlife	0.784***	-	-	-	-	-	0.005*	**0.556**	0.003	±
	(0.217)	-	-	-	-	-	(0.002)	**(0.289)**	(0.002)	
TOInon-life	0.574**	-	0.212***	-0.212***	-0.212***	-0.212***		**-**	-	
	(0.215)	-	(0.054)	(0.0480)	(0.063)	(0.049)		**-**	-	
Urisk	-0.126**	-0.135**	-0.132***	-0.132	-0.132*	-0.132		**-0.114**	-0.021	±
	(0.04)	(0.04)	(0.039)	(0.091)	(0.053)	(0.181)	-0.005 (0.027)	**(0.931)**	(0.020)	
Intercept			0.821***	0.821***	0.821***	0.821***		**-**	-	
			(0.211)	(0.167)	(2.0628)	(0.185)		**-**	-	

Table 5a: Total sample regression results

Diagnostic Tests	POLS	Fixed Effect	Random Effect	RE-HAC	RE-PCSE	RE SCC	Two step System GMM		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
R-squared	0.168	0.112	0.133						
F-Statistic	193.322***	6.796***	54.093***						
Chow test for poolability	0.032(1.33)								
DWH Test (RE verse FE)			0.9807 (54.109)						
Breusch-Godfrey test for serial correlation			0.00 (46.714)						
Breusch-Pagan test for cross-sectional dependence (RE)			0.00 (730.5)						
Pesaran CD test for cross-sectional dependence (RE)			0.00 (6.984)						
AR(1)							0.0656	**0.1471**	0.4182
AR(2)							0.0646	**0.1471**	0.4182
J Hansen							0.0613	**0.9586**	0.138
Wald test							0.000	**0.00**	0.00
No. of insurers	30	30	30						
Observations	360	360	360				360	**360**	360
Number of instrument							43	**47**	49
AIC							173	**171.7386**	171.8821
BIC							208.084	**202.8274**	202.971

*Note: Robust Standard errors in parentheses. *p-value < 0.1; **p-value < 0.05; ***p-value < 0.*

6. Conclusion

This study aimed to analyze the input/output insurance efficiency of Ghanaian life and non-life insurers. The study mathematically modeled claims as an undesirable output using the non-radial non-oriented multi-directional efficiency (MEA) of Bogetoft and Hougaard (199) and Asmild et al. (2003). We selected benchmarks such that the non-radial adjustments to the inputs and outputs correspond to the possible improvements identified by considering the individual improvement potential in the variables. Using a panel data set of 30 life and non-life insurers from 2008 to 2019, we assessed the aggregated and disaggregated efficiency levels.

The findings of the study have brought to the fore important issues that require ample consideration in insurance efficiency assessment. First, insurance efficiency is proven to differ when claims is treated as a desired or undesired output. Hence, the appropriate definition for claims must be used in insurance efficiency estimation to avoid misleading efficiency scores. Second, the sole use of the comprehensive efficiency of insurers does not provide accurate information on the utilization and generation of the input and output variables, respectively. Third, Ghanaian life insurers are more efficient than Ghanaian non-life insurers, they outperform non-life insurers on the utilization of inputs and the generation of investment income. Finally, the level of competition in the insurance

industry has the highest impact on the performance of Ghanaian insurers, followed by the previous year's performance of insurers. However, size, solvency, type of insurer, and underwriting risk do not have a significant impact on the efficiency of Ghanaian insurers.

The results imply that insurers in Ghana do not efficiently manage investment income, thus, investment income in both life and non-life insurance firms can be improved to substantially improve their aggregate efficiency. The findings show that claims significantly influence efficiency scores when treated as an undesirable output, highlighting the need for accurate variable definition when assessing insurance efficiency. The NIC can consider adopting efficiency models that account for the negative effect of claims on insurance efficiency estimation. Again, the high efficiency scores of life insurers compared to non-life insurers suggest that life insurers are better at managing the insurance production process and generation of investment income. These advantages could be due to their longer investment duration and more predictable cash flows than the non-life insurers.

Future research can be undertaken to assess the input/output-specific dynamic productivity change and cost efficiency of Ghanaian insurers in the presence of undesirable outputs with the novel MEA model. Additionally, future studies can evaluate how insurer variables contribute to overall efficiency, aiming to identify the specific impacts of these variables on comprehensive efficiency. Hence, NIC must enact policies to guide the selection and management of investment products in the Ghanaian insurance industry. Much attention should be paid to the amount of investment income reported by insurers in their quarterly reports; such information will help the NIC identify potential downfalls with investment income generation. Moreover, the NIC should organize investment training sessions for insurers. The NIC should obligate both non-life and life insurers to invest with well-performing financial institutions.

REFERENCES

Al-Amri, K., Gattoufi, S., & Al-Muharrami, S. (2012). Analyzing the technical efficiency of insurance companies in GCC. *The Journal of Risk Finance*, *13*(4), 362-380.

Alhassan, A. L., Addisson, G. K., & Asamoah, M. E. (2015). Market structure, efficiency and profitability of insurance companies in Ghana. *International Journal of Emerging Markets*, *10*(4), 648-669.

Alhassan, A. L., & Biekpe, N. (2016). Determinants of life insurance consumption in Africa. *Research in International Business and Finance*, *37*, 17-27.Alhassan, Abdul Latif, George Kojo Addisson, and Michael E. Asamoah. 2015. "Market Structure, Efficiency and Profitability of Insurance Companies in Ghana." *International Journal of Emerging Markets* 10 (4): 648–69. https://doi.org/10.1108/IJoEM-06-2014-0173.

Alhassan, A. L., & Ohene-Asare, K. (2016). Competition and bank efficiency in emerging markets: empirical evidence from Ghana. *African Journal of Economic and Management Studies*, *7*(2), 268-288.

Andoh, C., & Yamoah, S. A. (2021). Reinsurance and financial performance of non-life insurance companies in Ghana. *Management and Labour Studies*, *46*(2), 161-174.

Ansah-Adu, K., Andoh, C., & Abor, J. (2011). Evaluating the cost efficiency of insurance companies in Ghana. *The Journal of Risk Finance*, *13*(1), 61-76.

Asmild, M., Baležentis, T., & Hougaard, J. L. (2016). Multi-directional productivity change: MEA-Malmquist. *Journal of Productivity Analysis*, *46*, 109-119.

Asmild, M., Hougaard, J. L., Kronborg, D., & Kvist, H. K. (2003). Measuring inefficiency via potential improvements. *Journal of productivity analysis*, *19*, 59-76.

Asmild, M., & Matthews, K. (2012). Multi-directional efficiency analysis of efficiency patterns in Chinese banks 1997–2008. *European Journal of Operational Research*, *219*(2), 434-441.

Asmild, M., & Pastor, J. T. (2010). Slack free MEA and RDM with comprehensive efficiency measures. *Omega*, *38*(6), 475–483. https://doi.org/10.1016/j.omega.2009.12.004

Bhattacharyya, A. (2012). Adjustment of inputs and measurement of technical efficiency: A dynamic panel data analysis of the Egyptian manufacturing sectors. *Empirical economics*, 42(3), 863-880.

Bi, G., Wang, P., Yang, F., & Liang, L. (2014). Energy and environmental efficiency of China's transportation sector: a multidirectional analysis approach. *Mathematical Problems in Engineering*, *2014*(1), 539596.

Bogetoft, P., & Hougaard, J. L. (1999). Efficiency evaluations based on potential (non-proportional) improvements. *Journal of Productivity Analysis*, *12*, 233-247.

Charnes, A, W.W Copper, and E Rhodes. 1978. "Measuring the Efficiency of Decision Making Units." *European Jornal of Operational Research* 2: 429–44.

Chen, L., Wang, Y. M., & Lai, F. (2017). Semi-disposability of undesirable outputs in data envelopment analysis for environmental assessments. European Journal of Operational Research, 260(2), 655–664. https://doi.org/10.1016/j.ejor.2016.12.042

Chowdhury, H., & Zelenyuk, V. (2016). Performance of hospital services in Ontario: DEA with truncated regression approach. *Omega*, *63*, 111-122.

Cooper, W. W., Seiford, L. M., & Zhu, J. (Eds.). (2011). Handbook on data envelopment analysis.

Cummins, J. D., & Weiss, M. A. (2013). *Analyzing firm performance in the insurance industry using frontier efficiency and productivity methods* (pp. 795-861). Springer New York.

Daraio, C., & Simar, L. (2007). *Advanced robust and nonparametric methods in efficiency analysis: Methodology and applications*. Springer Science & Business Media.

Danquah, M., Otoo, D. M., & Baah-Nuakoh, A. (2018). Cost efficiency of insurance firms in Ghana. *Managerial and Decision Economics*, *39*(2), 213–225. https://doi.org/10.1002/mde.2897

Diacon, S. R., Starkey, K., & O'Brien, C. (2002). Size and efficiency in european long-term insurance companies: an international comparison. *Geneva Papers on Risk and Insurance: Issues and Practice*, *27*(3), 444–466. https://doi.org/10.1111/1468-0440.00184

Dyckhoff, H., & Allen, K. (2001). Measuring ecological efficiency with data envelopment analysis (DEA). *European Journal of Operational Research*, *132*(2), 312-325.

Dyckhoff, H. (2018). Multi-criteria production theory: foundation of non-financial and sustainability performance evaluation. *Journal of Business Economics*, *88*(7), 851-882.

Dyson, R. G., R. Allen, A. S. Camanho, V. V. Podinovski, C. S. Sarrico, and E. A. Shale. 2001. "Pitfalls and Protocols in DEA." *European Journal of Operational Research* 132 (2): 245–59. https://doi.org/10.1016/S0377-2217(00)00149-1.

Eling, M., & Jia, R. (2018). Business failure, efficiency, and volatility: Evidence from the European insurance industry. *International Review of Financial Analysis*, *59*, 58-76.

Eling, M., & Luhnen, M. (2010). Efficiency in the international insurance industry: A cross-country comparison. *Journal of Banking & Finance*, *34*(7), 1497-1509.

Färe, R., & Grosskopf, S. (2004). Modeling undesirable factors in efficiency evaluation: Comment. *European Journal of Operational Research*, *157*(1), 242–245. https://doi.org/10.1016/S0377-2217(03)00191-7

Färe, R., Grosskopf, S., Maudos, J., & Tortosa-Ausina, E. (2015). Revisiting the quiet life hypothesis in banking using nonparametric techniques. *Journal of Business Economics and Management*, *16*(1), 159-187.

Fotova Čiković, K., Cvetkoska, V., & Mitreva, M. (2024). Investigating the efficiency of insurance companies in a developing country: A data envelopment analysis perspective. *Economies*, *12*(6), 128.

Gaganis, C., Hasan, I., & Pasiouras, F. (2013). Efficiency and stock returns: Evidence from the insurance industry. *Journal of Productivity Analysis*, *40*, 429-442.

Hansson, S. O. (1994). Decision theory. *A brief introduction. Department of Philosophy and the History of technology. Royal Institute of Technology. Stockholm.*

Hintze, J. L., & Nelson, R. D. (1998). Violin plots: a box plot-density trace synergism. *The American Statistician*, *52*(2), 181-184.

Kaffash, S., Azizi, R., Huang, Y., & Zhu, J. (2020). A survey of data envelopment analysis applications in the insurance industry 1993–2018. *European journal of operational research*, *284*(3), 801-813.

Kapelko, M., & Oude Lansink, A. (2017). Dynamic multi-directional inefficiency analysis of European dairy manufacturing firms. *European Journal of Operational Research*, *257*(1), 338-344.

Khan, S. A. M. N., Ramli, R., & Baten, M. D. (2018). A slack based enhanced DEA model with undesirable outputs for rice growing farmers efficiency measurement. *International Journal of Supply Chain Management*, *7*(1), 194-200.

Kusi, B. A., Alhassan, A. L., Ofori-Sasu, D., & Sai, R. (2020). Insurance regulations,

risk and performance in Ghana. *Journal of Financial Regulation and Compliance*, *28*(1), 74-96.

Labajova, K., Hansson, H., Asmild, M., Göransson, L., Lagerkvist, C. J., & Neil, M. (2016). Multidirectional analysis of technical efficiency for pig production systems: The case of Sweden. *Livestock Science*, *187*, 168–180. https://doi.org/10.1016/j.livsci.2016.03.009

Lee, C. C., Chiu, Y. B., & Chang, C. H. (2013). Insurance demand and country risks: A nonlinear panel data analysis. *Journal of International Money and Finance*, *36*, 68-85.

Liu, J., Gong, Y., Zhu, J., & Titah, R. (2022). Information technology and performance: Integrating data envelopment analysis and configurational approach. *Journal of the Operational Research Society*, *73*(6), 1278-1293.

Lozano, S., & Soltani, N. (2020). Efficiency assessment using a multidirectional DDF approach. *International Transactions in Operational Research*, *27*(4), 2064-2080.

Maghbouli, M., Amirteimoori, A., & Kordrostami, S. (2014). Two-stage network structures with undesirable outputs: A DEA based approach. *Measurement: Journal of the International Measurement Confederation*, *48*(1), 109–118. https://doi.org/10.1016/j.measurement.2013.10.032

NIC 2011. "2011 Annual Report of the Insurance Industry, Ghana." https://nicgh.org/wp-content/uploads/2020/10/2019-NIC-Annual-Report.pdf.

NIC 2017. "2017 Annual Report & Financial Statements." https://nicgh.org/wp-content/uploads/2019/02/2017_NIC_Annual-Report.pdf.

NIC 2018. "National Insurance Commission Annual Report." https://nicgh.org/wp-content/uploads/2020/01/2018-NIC-Annual-Report.pdf.

NIC 2019. "2019 Annual Report of the Insurance Industry, Ghana." https://nicgh.org/wp-content/uploads/2020/10/2019-NIC-Annual-Report.pdf.

Ohene-Asare, K., Asare, J. K. A., & Turkson, C. (2019). Dynamic cost productivity and economies of scale of Ghanaian insurers. *The Geneva Papers on Risk and Insurance-Issues and Practice*, *44*(1), 148-177.

Ohene-Asare, K., Turkson, C., & Afful-Dadzie, A. (2017). Multinational operation, ownership and efficiency differences in the international oil industry. *Energy Economics*, *68*, 303-312.

Owusu-Ansah, E., I. Dontwi, B. Seidu, G. Abudulai, and C. Sebil. 2010. "Technical Efficiencies of Ghanaian General Insurers." *American Journal of Social and Management Sciences* 1 (1): 75–87. https://doi.org/10.5251/ajsms.2010.1.1.75.87.

Rai, A. (1996). Cost efficiency of international insurance firms. *Journal of Financial Services Research*, *10*(3), 213-233.

Reyna, A. M., & Fuentes, H. J. (2018). A cost efficiency analysis of the insurance industry in Mexico. *Journal of Productivity Analysis*, *49*(1), 49-64.

Seiford, L. M., & Zhu, J. (2002). Modeling undesirable factors in efficiency evaluation. *European Journal of Operational Research*, *142*(1), 16–20. https://doi.org/10.1016/S0377-2217(01)00293-4

Sharew, A., & Fentie, G. (2018). Data Envelopment Analysis on Efficiency of Insurance Companies in Ethiopia. *American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS)*, *48*(1), 138-170.

Siddiqui, S. A. (2024). The effect of branch office locations on technical efficiency: Evidence from the Indian life insurance industry. *Global Business Review*, *25*(6), 1559-1575.

Simar, L., & Wilson, P. W. (2002). Non-parametric tests of returns to scale. *European Journal of Operational Research*, *139*(1), 115-132.

Simar, L., & Wilson, P. W. (2011). Inference by the m out of n bootstrap in nonparametric frontier models. *Journal of Productivity Analysis*, *36*, 33-53.

Sueyoshi, T., & Goto, M. (2010). Measurement of a linkage among environmental, operational, and financial performance in Japanese manufacturing firms: A use of Data Envelopment Analysis with strong complementary slackness condition. *European Journal of Operational Research*, *207*(3), 1742–1753. https://doi.org/10.1016/j.ejor.2010.07.024

Sultana, I., & Rahman, M. M. (2020). Determinants of bank cost efficiency: empirical evidence from Bangladesh. *International Journal of Banking and Finance*, *15*(1), 39-71.

Thanassoulis, E., Portela, M. C., & Despic, O. (2008). Data envelopment analysis: the mathematical programming approach to efficiency analysis. *The measurement of productive efficiency and productivity growth*, 251-420.

Tortosa-Ausina, E., Armero, C., Conesa, D., & Grifell-Tatje, E. (2012). Bootstrapping profit change: An application to Spanish banks. *Computers & operations research*, *39*(8), 1857-1871.

Tziogkidis, P., Philippas, D., Leontitsis, A., & Sickles, R. C. (2020). A data envelopment analysis and local partial least squares approach for identifying the optimal innovation policy direction. *European Journal of Operational Research*, *285*(3), 1011-1024.

Wasseja, M. M., & Mwenda, S. N. (2015). Analysis of the effiency of life assurance companies in Kenya using the DEA-Model. *American Journal of Mathematics & Statistics*, *5*, 60-71.

Wu, D., Yang, Z., Vela, S., & Liang, L. (2007). Simultaneous analysis of production and investment performance of Canadian life and health insurance companies using data envelopment analysis. *Computers & operations research*, *34*(1), 180-198.

Yang, Z. (2006). A two-stage DEA model to evaluate the overall performance of Canadian life and health insurance companies. *Mathematical and computer modelling*, *43*(7-8), 910-919.

Yao, S., Han, Z., & Feng, G. (2007). On technical efficiency of China's insurance industry after WTO accession. China Economic Review, 18(1), 66–86. https://doi.org/10.1016/j.chieco.2006.10.005

You, S., and H. Yan. 2011. "A New Approach in Modelling Undesirable Output in DEA Model." i*Journal of the Operational Research Society* 62 (12): 2146–56. https://doi.org/10.1057/jors.2011.1.

Zhu, L., Wang, Y., Shang, P., Qi, L., Yang, G., & Wang, Y. (2019). Improvement path, the improvement potential and the dynamic evolution of regional energy efficiency in China: Based on an improved nonradial multidirectional efficiency analysis. *Energy Policy*, *133*, 110883.

Influence of behavioural biases and personal factors on credit decision-making: Should the banks be concerned?

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Abstract

This study investigates the impact of behavioural biases and some human factors on the decision-making of bank credit managers in the Greater Accra Region of Ghana. It uses partial least squares and independent samples t-test methods to examine the impact of psychological biases and personal factors on bank credit decision-making. Except for the level of education of loan applicants, the study found a positive and significant influence of all explanatory variables on bank credit decision-making. Furthermore, the results suggest that female credit managers are more risk-averse than their male counterparts. However, the study found no significant difference between overconfidence of male and female credit managers. One area that has been ignored by previous studies is the influence of psychological biases on bank credit decision-making, especially in an emerging economy such as Ghana. To the best of our knowledge, this study is the first to examine the impact of psychological biases on bank credit decision-making in Ghana. The findings are likely to enhance the decision-making of bank credit managers, particularly in Ghana. Going forward, measures aimed at educating bank credit managers on the effect of psychological biases and human factors on credit decisions are recommended.

Key words: overconfidence, risk aversion, status quo, bank credit decision, Ghana

Introduction

The global financial crisis of the late 2000s disrupted the operation of the banking industry globally, exposing the susceptible nature of the sector. One of the key factors that has been documented to have caused the crisis is poor credit decisions in the banking sector (D'Angelo et al., 2018). It is reported that credit decisions and their resultant huge non-performing loans recorded by banks globally are primarily a result of weaknesses of the Basel Accord II. Consequently, the Ghanaian banking

industry introduced Basel Accord III, which is perceived to have more rigorous capital and liquidity requirements to ensure industry stability and restore the confidence of depositors and other stakeholders in the industry. In addition, the Ghanaian banking industry has experienced a series of reforms, such as the Financial Sector Adjustment Programme (FINSAP) in 1983, and the Bank Cleaning Exercise of 2017 aimed at correcting recurring underperformances that have led to an increase in non-performing assets and liquidity challenges. These measures were intended to enhance the solidity of banks by introducing a stricter creditworthiness assessment system and a set of measures targeted at boosting the stability and liquidity of the banking system.

Irrespective of the stringent measures employed by the central bank of Ghana, the Bank of Ghana (BoG), to clean up the banking sector and make it more robust and high performing, the ugly head of non-performing loans and its resultant liquidity problems continue to occur. Regardless of the credit appraisal methods and procedures employed, banks in Ghana continue to record high non-performing loans. There is a general perception that adverse selection exhibited by credit officers due to their inability to effectively assess the creditworthiness of loan applicants to a significant extent creates the mounting non-performing loans and liquidity challenges. Unfortunately, previous studies have failed to acknowledge the tendency of behavioral and personal biases to influence irregularities in credit decision-making. The bulk of extant literature focuses on the impact of psychological biases on investment behavior and financial decision making of individuals (Bakar & Yi, 2016; Merkle, 2017; Tetteh & Hayfron, 2017; Pikulina et al., 2017; Tetteh et al., 2024), and the few that focused on banks limited their attention to saving patterns (Avdeenko et al., 2019; Tetteh & Boachie, 2021)

Not enough attention has been given by scholars to the behavioral approach of credit officers to granting of loans. There is an empirical documentation, even though scanty, which explains that the crisis in the banking industry could be caused to an appreciable degree by psychological biases exhibited by credit officers during the decision-making stage (Lee & Lee, 2012; Liu et al., 2015). Some studies also suggest that psychological biases and human factors play crucial roles in the decision-making of bank credit officers (Skala, 2008; Storey, 2004; D'Angelo et al., 2018). It appears that a behavioral analysis of the lending process may be required to ascertain whether banks may have turned down excellent interest income prospects as a result of the influence of behavioral biases exhibited by bank credit officers in the process of evaluating loan applications. Similarly, some less viable projects may have been financed because of the same or similar biases.

Empirical studies have found that human beings are not entirely rational. In most cases they are influenced by emotions and behavioral prejudices that tend to influence their decisions, which result in undesirable results (Garling et al., 2009). The emphasis of the behavioral approach to the study of finance is primarily centered on the capital markets. The extant literature is not extensive when it comes to the study of credit decision-making in the banking sector. Without doubt, credit decision-making is a crucial area for research in the management of depository financial institutions since return on credit is the principal source of bank income (Tursoy, 2018).

An empirical study on the behavioral pattern of bank credit officers' decision-

making is therefore imperative since the viability of banks depends mainly on interest income from loans. This study, therefore, seeks to investigate whether these recurrent irrational credit appraisals, which often lead to huge loan losses, could also be influenced by psychological biases and human factors in the lending decision-making by bank credit officers and managers in Ghana.

This paper is structured as follows: the second section reviews pertinent literature in the subject area, followed by the methodology employed for this research. Results and discussion of findings are captured in the fourth section. The final segment covers the conclusion and implications of the study findings.

Literature Review

Theoretical Background

The Prospect Theory introduced by Kahneman & Tversky (1979) for the analysis of decision-making under risk is regarded as the path-breaking work in behavioral finance. Behavioral finance asserts that the individual often makes financial decisions based on emotions and cognitive biases, and therefore often acts against their own best interest. This assertion suggests that a second look must be taken at the rationality assumption that is held strongly by scholars of traditional to shape the behavior of participants in the financial market. Classical finance strives to propagate the principle of rationality through theories like the Portfolio Theory by Markowitz (1952), Capital Assets Pricing Model by Sharpe (1964), Arbitrage Pricing Theory of Ross (1976), and Efficiency Market Hypothesis by Fama (1970). However, proponents of the behavioral approach to finance contend that rather than acting rationally, financial market participants often succumb to psychological biases and emotions (Barberis & Thaler, 2003; Kaniel et al., 2012). Scholars have shown empirically that a significant association exists between irrational conduct and psychological biases such as overconfidence, loss aversion, and mental accounting (De Vries & Gerber, 2017; Bouteska & Regaieg, 2020).

The emphasis of the behavioral approach to the study of finance is primarily centered on the capital markets. The extant literature is not extensive when it comes to the study of credit decision-making in the banking sector. Without doubt, credit decision-making is a crucial area for research in the management of depository financial institutions since return on credit is the principal source of bank income (Tursoy, 2018). Over the years, emphasis has been placed on the quantitative approach to the management of bank credit. However, the persistent creation of bad loans has called for a more behavioral view on the credit decision process. William & Wong (1999) have stressed that trait and psychological biases lead managers to believe that they have a greater chance of influencing risk outcomes and that this belief leads them to choose riskier courses of action. These decisions are mostly not beneficial to organizations since they deviate from rationality and ultimately yield undesired results (De Vries et al, 2008). The effect of traits and psychological biases on credit decision making in banks has attracted a number of behavioral finance scholars, such as Apergys et al. (2012) and Bacha & Azouzi (2019).

Effect of behavioural biases and personal factors, and hypotheses development.

Over-confidence

Individuals that exhibit overconfidence bias overestimate their own abilities and competence (Camerer & Lovallo, 1999). The existing literature on the behavioural

approach to studying financial decision making appears to focus more on overconfidence (Baker et al., 2004). In the view of De Bondt and Thaler (1994), overconfidence is the most robust part of psychological judgement. Overconfidence can create mispricing and can lead individuals to ascribe good results to their own actions and unfavourable outcomes to actions from others or from external circumstances (Daniel et al., 1998).

A number of researchers have investigated the effect of overconfidence on credit decision-making and bank performance in general. Skala (2008) and Ho et al. (2016), for instance, report that cognitive bias in the form of overconfidence influences bank managers' decision-making. In their view, people tend to exhibit excessive confidence when feedback on information is delayed/or when a decision is withheld or inconclusive. Furthermore, Bacha & Azouzi (2019) assert that overconfident loan officers tend to over rely on their skills and intuitions which have the propensity to form their opinion about expected risks and losses. These findings have been reiterated by other scholars such as Kollin-Ondolos et al. (2022), who found that behavioural biases such as overconfidence and optimism have a positive influence on bank officers' credit decision-making.

Overconfidence, according to Black & Gallemore (2013), is a possible determinant of delayed recognition of loan losses. They established that overconfident bank managers have the tendency to incorporate low current and future non-performing loans in their provisions for loan loss than other bank managers.

Graham et al. (2013) emphasize that managers under the influence of overconfidence tend to possess an unrealistic, superior view of their abilities in relation to other managers and subordinates. This belief encourages them to place more emphasis on their own judgement in decision-making and overestimate their problem-solving capabilities, thereby engaging in overly complex transactions (Libby & Rennekamp, 2012; Cain & McKeon, 2016). According to McNamara & Bromiley (1997), credit officers tend to be influenced by behavioural biases since they are under constant pressure to increase loan volume to meet profit targets. In their study on intuition and emotion in bank loan officers' credit decisions, Lipshitz & Shulimovitz (2007) discovered that gut feelings were perceived to be key drivers in the assessment of the worthiness of loan applications than the use of relevant financial data. Some empirical studies have established that bank credit officers are influenced not only by behavioural factors but also rational factors as a result of the credit assessment process employed by banks (Kollin-Ondolos et al., 2022).

It is imperative to stress that scholars such as Keiber (2006) and Bouteska & Regaieg (2020) have indicated that overconfidence is not necessarily negative. It is not the level of overconfidence that defines optimality, but the nature of the information available. Overconfidence is favorable to the investor in the presence of positive information on an investment and, conversely, in the case of negative information.

Based on the review of literature on the influence of overconfidence in decision making, the study proposes the following hypothesis:

H1: Overconfidence has a significant effect on bank credit decision-making.

Risk aversion

Risk aversion is the preference for an outcome that is certain rather than gambling with a higher or equal expected value. There is the tendency for people to favor the avoidance of loss above the

acquisition of a gain (Kahneman & Tversky, 1979). Individual factors such as level of education, occupational standing, and age influence one's level of risk aversion.

Extant studies have found that risk aversion has a significant effect on the financial decisions of managers (Graham et al., 2013). With the use of a sample of 100.Tunisian bank branches, Azouzi & Bacha (2023) established that risk aversion is one of the paramount biases that influence credit risk assessment.

Risk aversion bias tends to cause people to overestimate risks, be doubtful about their estimations, and try to play it safe to reduce the probability of their loss. In the views of Bouteska & Regaieg (2020), the uncertainty regarding the importance of available information results in risk aversion. This situation makes the manager take a cautious stance, thereby deciding not to make any decision that has the probability of endangering his position or rank. This implies that risk-averse managers generally have the tendency to employ suitable tools that will help them accentuate professional stability.

Given the discussion on extant literature above, this study suggests the following hypothesis:

H2: Risk aversion has a significant influence on bank credit decision-making.

Appearance

According to some previous studies, attractive people are seen to be more efficient and more confident (Andreoni & Regan, 2008; Olivola & Totorov, 2010). This finding has been reiterated by Ravina (2012) in his study on personal characteristics of borrower in the United States. Beautiful and good-looking loan applicants even though default more often, are 11.7% more likely to get a loan, pay lower or similar interest rates as average looking applicant. In addition, using the logistic regression model, D'Angelo et al (2018) established a positive influence of appearance on credit decision making.

These findings indicate that loan applicants are likely to be influenced by borrowers with good appearance in their creditworthiness assessment.

Based on the reviewed literature, the author proposes the following hypothesis:

H3: Appearance has a significant effect on bank credit decision-making.

Level of Education

There is also a notion that bank officers' decisions regarding loan applications are significantly influenced by the educational level of applicants. This assumption can lead to the approval of credit for less qualified customers and denying the credit-worthy customers credit. Li et al. (2020), for instance, found that loan applicants with high level of education and income levels are more likely to be charged lower interest rates. Again, Zarook et al. (2013) found a significant positive link between level of education and access to credit. It is worth noting that other studies found no significant impact of customer education level on bank credit decision-making (Ogubazghi & Muturi, 2014; D'Angelo et al., 2018).

H4: Level of education of a loan applicant has a significant impact on bank credit decision-making.

Ethnicity

Ethnicity has become a variable of interest to some researchers in recent times in the area of credit decision-making. Analyzing credit score and other risk factors, Bayer et al. (2016) found that there is a clear cognitive bias towards ethnic differences in

the evaluation of loan applications by bank officers. Again, Martinez et al. (2020) found evidence of the influence of ethnicity on access to credit in Bolivia. His findings suggest the existence of discrimination in favour of non-ethnic women in Bolivia.

In a study on access to bank loans by small and medium enterprises in Trinidad and Tobago, Storey (2004) revealed a clear ethnic disparity in the decision on the issuance of loans. Similarly, Fafchamp (2000) identified ethnic bias in the attribution of supplier credit. However, some studies have found no significant impact of ethnicity on credit decision-making (D'Angelo et al., 2018)

In an effort to address the issue of ethnicity in bank credit decision-making, this study sets forth the following hypothesis:

H5: Ethnic affiliation has a significant influence on bank credit decision-making.

Status Quo

Status quo bias, which has been a topic of interest in recent times in psychology and other social sciences is a cognitive bias that involves people desiring that situations remain unchanged. Making decisions can be challenging (Iyengar & Lepper, 2001), and in some cases, decision makers may opt to do nothing (Baron & Ritov, 2004) or continue on their existing course of action because it is easier (Samuelson & Zeckhauser, 1988). Eidelman & Crandall (2009) in addition, found that status quo alternatives often require less mental effort. Their finding has been reiterated by Brown & Kagel (2009), who established that status quo prevails in situations when selecting high-performing stocks is relatively easy.

Researchers have discovered that the extent to which people are subjected to a status quo bias is proportional to the number of alternatives at their disposal (Kempf & Ruenzi, 2005). Individuals who are prone to the status quo bias often has the tendency to select sub-optimal alternatives simply because it has been selected before. Again, in their research on pension accounts of investors in the USA, Agnew et al. (2003) discovered inertia in asset allocation. In addition, Barber et al. (2009) discovered that investors display a proclivity to repurchase stocks they had previously purchased. Again, Agarwal et al. (2011) found a similar tendency to purchase previously acquired funds among hedge fund investors.

A significant number of studies have linked status quo bias exhibited by investors to some prevailing conditions. For instance, Li et al. (2009) found that status quo bias has an influence on investors who exhibit negative emotions more than those who exhibit positive emotions.

Based on the above review, this study posits the following hypothesis:

H6: Status quo bias has a significant effect on bank credit decision-making.

Comparison: Overconfidence and Risk Aversion by Gender

A significant number of studies have linked different degrees of overconfidence to gender issues. These empirical studies support the notion that men exhibit greater levels of confidence than women given the same level of expertise and circumstances (Eckel & Grossman, 2002; Croson & Gneezy, 2009). According to Palvia et al. (2015), female bank managers typically evaluate risks more cautiously. They asserted that differences in gender-based behavior are perceived to strongly influence information processing, conservatism, diligence, and risk aversion. Their findings have been reiterated by Ackah et al. (2019). Again, women typically exhibit lower levels of overconfidence than males, primarily as a result of the intense pressures they encounter from perceived gender

inequalities and work-life disparities (Harris et al., 2006; Palvia et al., 2015).

It is worth emphasizing that other studies, such as Eagly (2005) and Brescoll (2016) that focus on gender issues have established that, female managers respond differently to emotions than their male counterparts, and these differences may be due to gender stereotypes. In addition, extant studies suggest that gender differences in risk perception may stem from differences in education and business experiences (Ackah et al., 2019). Men are generally regarded as more risk-takers than women in making financial decisions and therefore have the tendency to take risky decisions. From the discussion above, this study proposes the following hypotheses:

H7: Male bank credit officers are influenced more by overconfidence bias than their female counterparts.

H8: Male bank credit officers are influenced more by loss aversion bias than their female counterparts.

Methodology

This study used a quantitative survey method to gather information from participants (bank credit managers and officers) to validate the research model, in line with some previous studies on the effects of behavioral biases (Graham et al., 2013; Harris et al., 2006). It aims at investigating the effect of behavioral biases and personal factors on bank credit decision-making. To achieve this, questionnaires were distributed to bank credit managers and officers in the Greater Accra Region of Ghana.

In the first section of the survey, respondents were asked to provide personal information, such as their age, gender, and level of education (Appendix 1). The second portion gathered information on the influence of psychological biases (six constructs) on credit officers' decision-making regarding bank loan applications (Appendix 2). On a Likert scale with a range of 1 (Strongly Disagree) to 5 (Strongly Agree), respondents were asked to rate their level of agreement (or disagreement) with the statements.

Sample Size

This study relied on the Cochran (1977) formula for determining sample size when the population is unknown, since the number of credit managers in the Greater Accra Region of Ghana was not known at the time of writing this research. A sample size of 384 was obtained. The formula is given as:

$n = z2pq/e2$

where

n = the sample size, z = is the Z-score = 1.96,

p = is the estimated proportion of the study variable = 50%,

q = 1 - p = 50%, e = is the margin of error =5%.

Data Gathering Approach

Data for the study was collected with the assistance of bank credit managers. Through a written request, the intention to conduct the survey was communicated to the management of one hundred and fifteen (115) bank branches. Copies of the questionnaire (virtual links) were sent online to these bank branches, who in turn sent the questionnaire to the emails of other bank branches and credit managers, as well as to WhatsApp group pages with memberships of bank credit managers. The survey captured at least two branches of each of the twenty-three banks operating in the Greater Accra Region.

Potential impact of sampling bias on the generalizability of the findings The convenience sampling method was used in

this study. Branch and credit managers selected by convenience sampling may make choices differently from the broader population of bank credit managers in Ghana. This bias is probably going to restrict how far the results of the study can be applied. The study covered credit managers and officers from at least eight branches of all banks that operate in the Greater Accra Region in order to reduce the effect of convenience sample bias. This approach allowed for a survey of credit managers with a range of backgrounds and experiences as well as viewpoints on credit decision-making (Creswell & Poth, 2017).

Convenience sampling may not provide the statistical rigor of probability sampling, but it may be a useful practical option for examining bank credit managers' behavioural biases and personal factors. Accessibility and the wider exploratory nature of this study serve as justifications for the approach.

Questionnaire Administration

The questionnaire was initially pre-tested to secure high internal consistency, assess the cogency of the questionnaire design, make the necessary corrections, and fill the gaps that were not previously identified. Four research assistants (teaching assistants) were trained to administer the modified questionnaires to bank credit managers in the region. A total of 431 questionnaires were administered to bank managers and credit officers. Four hundred and ten (410) questionnaires out of the completed questionnaires had complete and accurate responses, making them usable for the study. This figure, which is 26 respondents more than the calculated sample size, was considered suitable and therefore used as the sample of credit managers for the study. Data collection spanned 6th August, 2023 to 17th November, 2023.

Background information

From Appendix I, slightly more than half of the respondents (52%) were females, whereas the rest (48%) were males. This indicates that more than half of the respondents are female credit managers. Forty-eight percent (48.3%) of the respondents were under the age of 40, whereas the rest, which is almost 52 percent (51.7%), were above 40 years. Eight in ten (80%) respondents had university qualifications, whereas the remaining 20% were holders of professional qualifications. Table 1 also indicates that the majority of the correspondents, approximately 68%, have over eleven years or more experience in bank credit management. This suggests that the respondents are knowledgeable enough to respond to the questionnaire administered to them.

Variables employed for the study

With reference to previous research such as Bacha (2011) and Marques et al. (2012), this study used credit decision-making as the dependent variable. This procedure favours an assessment in which credit decision-making is influenced by the behavioural biases of the bank credit officers. This approach was captured in the survey, and the credit officers were asked to select the approach that best fits their decision-making. Examining this decision-making approach helps the bank to put in place an effective and more reliable tool that helps in qualitative assessment of loan applications and loan decision making, devoid of behavioural biases, than relying heavily on financial statements and business plans of borrowers, which provide little information on the assessment of credit risk of banks (Bacha & Azouzi, 2019).

The study employed behavioral biases of overconfidence, risk aversion, status quo, and other factors, namely ethnicity, level of

education, and appearance, as the independent variables. The biases of overconfidence and loss aversion have been found to be robust in driving decision-making in the extant literature (Libby & Rennekamp, 2012; Brescoll, 2016).

Data Analysis

In the analysis, partial least squares (PLS) were employed (SmartPLS Release: 3.2.7 (Ringle et al., 2015)). This technique is suitable since both sample size and data distribution have little impact on PLS (Hair et al., 2011). PLS technique of bootstrap t-values (5000 sub-samples) was used to test the significance of each path (Tortosa et al., 2009). The independent samples t-test was also employed to examine the differences in credit decision-making between male and female credit managers under the influence of overconfidence and risk aversion biases.

Results and Discussion

Common method bias tests: Harman's Single-Factor Test and Kock's Procedure

The results of Harman's single-factor test (Table 1) reveal that the first factor accounts for 44.7% of the total variance, while the remaining factors collectively explain 55.3%. As the proportion of variance explained by the first factor is below the commonly accepted 50% threshold, this suggests that common method bias (CMB) is unlikely to be a significant concern in the data. Although the first factor explains a relatively larger share of the variance compared to the others, its dominance is not substantial enough to indicate serious bias. This implies that while minor common method variance may exist, it does not appear to threaten the validity of the findings.

The scree plot (Figure 1) further supports this conclusion. It illustrates that the first factor contributes a markedly higher eigenvalue (3.31) relative to subsequent factors, after which the eigenvalues flatten out. Nonetheless, since the variance explained by the first factor is less than 50%, the results confirm that common method bias is not a major issue in this study.

Table 1: Harman's single-factor test

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	3.231	1.737	0.447	0.447
Factor2	1.494	0.702	0.299	0.746
Factor3	0.792	0.216	0.099	0.845
Factor4	0.576	0.115	0.068	0.913
Factor5	0.461	0.109	0.052	0.965
Factor6	0.352	0.258	0.022	0.987
Factor7	0.094	.	0.013	1.000

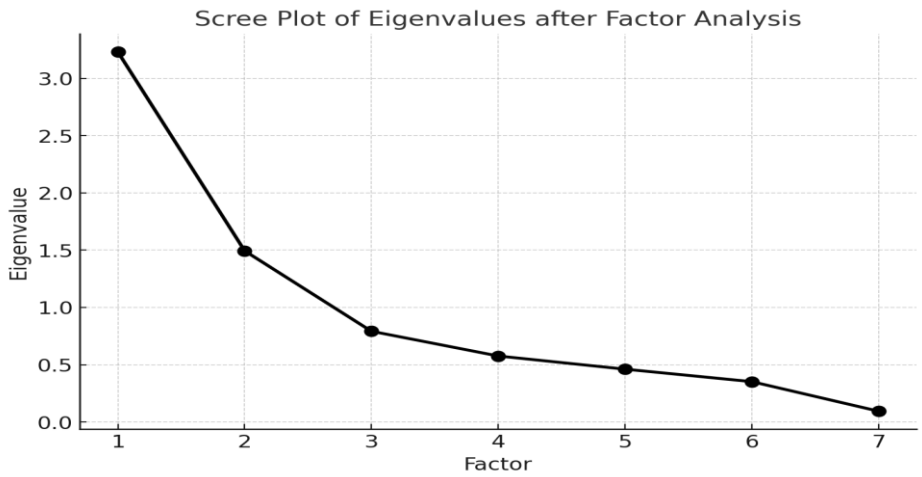

Figure 1: Scree plot - Common method bias test

Kock's full collinearity test was conducted as an additional diagnostic to assess the presence of common method bias (CMB) and to enhance the robustness of the study's findings. Results from the test (Table 2) indicate that the factor (status quo) recorded a variance inflation factor (VIF) slightly above the recommended threshold of 3.3, with a value of 3.31. All other constructs had VIFs below 3.3, ranging from 2.64 to 3.25. According to Kock's (2015) criterion, when the majority of constructs exhibit VIFs below 3.3, common method bias is not considered a major concern.

The marginally elevated VIF observed for one construct suggests only a minimal likelihood of shared method variance. On the whole, these results imply that common method bias can largely be ruled out, and any potential bias present is negligible and insufficient to undermine the validity of the findings. Furthermore, the average VIF value of 2.99 supports this conclusion, as it falls well within acceptable limits.

In addition, the results indicate no evidence of multicollinearity among the constructs. Following Hair et al. (2016), VIF values below 5.0 are deemed acceptable in multivariate analyses, further confirming that both multicollinearity and common method bias are not problematic in this study. Consequently, the measurement model can be considered robust and the results reliable.

Table 2: Kock's procedure (Full collinearity test)

Dependent factor	Mean VIF	Interpretation
Factor 1	3.31	Acceptable
Factor 2	3.25	Acceptable
Factor 3	3.15	Acceptable
Factor 4	2.64	Acceptable
Factor 5	2.67	Acceptable
Factor 6	3.13	Acceptable
Factor 7	2.79	Acceptable

Confirmatory Factor Analysis

Confirmatory factor analysis was used to evaluate the scales of the questionnaire by assessing their convergent and discriminant validity (Hair et al., 2016). The constructs, item loadings, and bootstrap t-values (5000 sub-samples) (Tortosa et al., 2009) are shown in Table 3. Based on the results, all seven constructs had Cronbach's alpha values over 0.70, indicating reliability. Additionally, as demonstrated in Table 4, each of the seven constructs had average variance extracted estimates and composite reliability estimates higher than 0.5 and 0.7 respectively, thus showing convergent validity (Hair et al., 2016).

Table 3: Principal Component Analysis

Factors	Measurement Items	Loadings	t-values
Overconfidence	OC1	0.751	11.328
	OC2	0.662	7.359
	OC3	0.643	7.209
	OC4	0.786	31.234
	OC5	0.749	17.064
Risk Aversion	RA1	0.929	78.128
	RA2	0.787	19.578
	RA3	0.945	87.332
Appearance	AP1	0.843	44.247
	AP2	0.949	83.210
	AP3	0.886	63.231
	AP4	0.896	71.132
Level of Education	LE1	0.932	73.213
	LE2	0.758	28.685
	LE3	0.881	65.281
	LE4	0.827	47.983
Ethnicity	ET1	0.917	86.493
	ET2	0.818	24.195
	ET3	0.937	88.230
Status Quo	SQ1	0.953	68.332
	SQ2	0.909	32.218
Bank Credit Decision–Making	CD1	0.721	17.627
	CD2	0.846	72.056
	CD3	0.802	28.323
	CD4	0.682	22.364
	CD5	0.908	88.321

Note: All bootstrap t-values are significant at 0.01 level of significance

Table 4: Summary Convergence and Discriminant Validity

Construct	Convergence Validity			Heterotrait-Monotrait Ratio (HTMT) Inference Criterion						
	A	**C.R**	**AVE**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1 Overconfidence	0.812	0.843	0.519							
2 Risk Aversion	0.868	0.919	0.792	0.373						
3 Appearance	0.916	0.941	0.800	0.407	0.542					
4 Level of Educ.	0.875	0.913	0.726	0.286	0.599	0.925				
5 Ethnicity	0.872	0.921	0.796	0.395	0.092	0.518	0.569			
6 Status Quo	0.850	0.929	0.867	0.214	0.386	0.557	0.606	0.341		
7 Credit Decision	0.852	0.895	0.633	0.501	0.600	0.794	0.757	0.595	0.713	

Discriminant Validity Test

Discriminant validity was tested using the heterotrait-monotrait criterion suggested by Henseler et al. (2015). From Table 4, the heterotrait-monotrait of correlations (HTMT) inference shows that all the correlations were less than +1. This demonstrates that each measurement construct in the model is unique and different from the others. Discriminant validity has therefore been established.

Descriptive Statistics

From the application of the measurement model analysis, means and standard deviations were calculated as part of descriptive statistics, as shown in Table 5. The highest means were obtained for status quo and risk aversion (both approximately 4), showing that the managers agreed that status quo and risk aversion were important factors. Again, from the descriptive statistics results, ethnicity is reported to be more unstable with a standard deviation figure of 1.04, followed by appearance and level of education. Status quo was the least volatile among the seven factors employed for the study, with a standard deviation of 0.55.

Table 5: Descriptive Statistics

Constructs	*N*	Min	Max.	Mean	S.D
1 Overconfidence	410	1.000	4.400	3.47	0.63
2 Risk Aversion	410	2.000	4.750	3.60	0.64
3 Appearance	410	1.000	3.750	2.57	0.86
4 Level of Education	410	1.000	4.000	2.68	0.82
5 Ethnicity	410	1.000	4.000	2.76	1.04
6 Status Quo	410	2.330	4.330	3.65	0.55
7 Bank Credit Decision	410	1.860	4.140	3.31	0.65

Table 6: Predictive Accuracy (R^2), Predictive Relevance (Q^2) and Effect Sizes (f^2)

Constructs	R^2	Q^2	f^2(Bank Credit Decision)
1 Overconfidence	_	_	0.06(Small)
2 Risk Aversion			0.11(Small)
3 Appearance			0.03(Small)
4 Level of Education			0.00(None)
5 Ethnicity			0.12(Small)
6 Status Quo			0.21(Medium)
7 Bank Credit Decision	0.719	0.412	_

Structural Model Analysis

A structural model was created to investigate the possible effect of overconfidence, risk aversion, status quo, appearance, level of education and ethnic affiliation on bank credit decision making. An examination of the structural model's prediction accuracy (R^2) revealed a significant (72%) explanatory power for bank credit decision-making (Hair et al., 2016). Additionally, the model showed predictive relevance since the Q^2 – value of 0.412 is above 0 (Chin, 2010; Hair et al., 2016). Finally, the effect sizes (f^2) of independent variables indicates that status quo had a medium effect size on bank credit decision whereas overconfidence, risk aversion, appearance, and ethnicity all had small effect sizes on bank credit decision making. The level of education however, had no effect size on bank credit decision making as shown in Table 6.

Hypothesis Testing

The structural model showing the hypothesis test results is presented in Figure 2 and Table 7. The results support five of the six hypotheses. Specifically, there is a positive and significant association between status quo, overconfidence, risk aversion, appearance, and ethnic affiliation of customers, and bank credit decision-making of loan managers. Table 7 provides a further summary of the findings based on the proposed hypotheses. Comparatively, status quo has the most significant influence on bank credit decision-making, followed by ethnicity, risk-aversion appearance, overconfidence, and the level of education in descending order of importance.

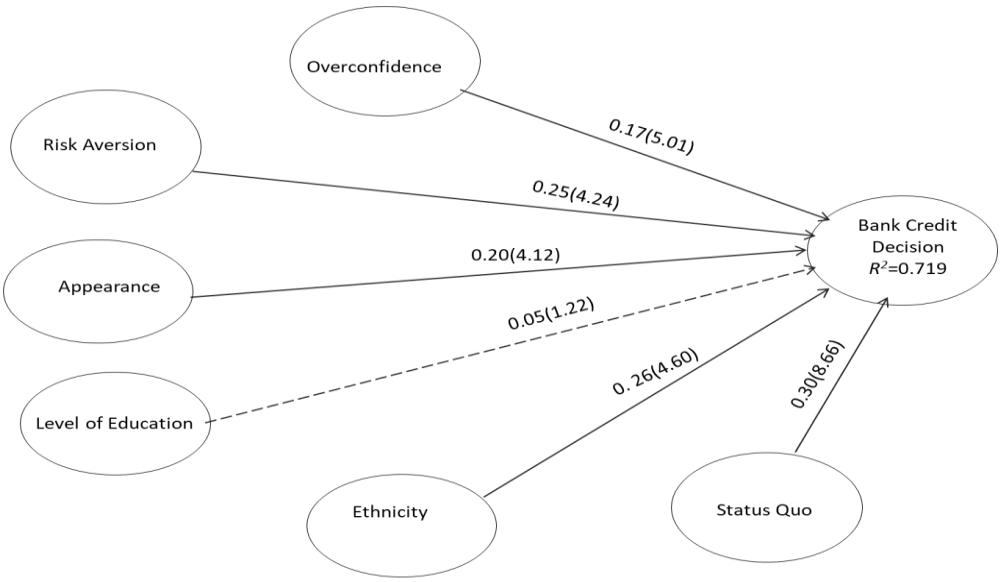

Figure 2: Structural Path: Determinants of bank credit decision-making

Table 7: Structural path results

Hypothesis	Structural path		Path coefficient	t-value (Boots-trap)	Hypothesis results
H1	Overconfidence ⟶	Bank Credit Decision	0.166***	5.005	Supported
H2	Risk Aversion ⟶	Bank Credit Decision	0.251***	4.239	Supported
H3	Appearance ⟶	Bank Credit Decision	0.198***	4.122	Supported
H4	Level of Educ ⟶	Bank Credit Decision	0.054	1.216	Not supported
H5	Ethnicity ⟶	Bank Credit Decision	0.259***	4.603	Supported
H6	Status Quo ⟶	Bank Credit Decision	0.296***	8.661	Supported

Note:***t-values are significant at $p<0.001$

Comparing Male Versus Female Credit Officers - Overconfidence and Risk Aversion

The independent samples t-test was performed, as shown in Table 8, to examine whether considerable differences exist between male credit officers and their female counterparts with regard to overconfidence and risk aversion.

There was no significant difference between males and females with regard to overconfidence ($p>0.05$), hypothesis H7 is therefore not supported, as Table 8 suggests. On the other hand, female credit officers were significantly more risk-averse when making bank credit decisions than

their male counterparts ($p<0.05$), thus lending support to hypothesis H8.

Table 8: Males versus Females-Independent samples t-test

Variable	Mean		t	Df	P
	Male	Female			
Overconfidence	3.48	3.46	0.26	408	0.795
Risk Aversion	3.65	3.83	-2.32	408	0.021*

Significant at $p<0.05$

Discussion

The study examined the influence of psychological biases and some human factors on bank credit officers' decisions regarding lending in the Greater Accra Region of Ghana. The results of this study proffer compelling evidence that behavioural biases and human factors significantly influence bank credit decision-making among credit managers and officers in Ghana's banking sector. The results from Harman's single-factor and Kock's full collinearity tests (Tables 1 and 2) confirm the absence of serious common method bias (Podsakoff et al., 2003; Kock, 2015). The variance presented by the first factor (status quo) (44.7%) falls below the 50% threshold, and all variance inflation factors (VIFs) are within acceptable limits, reinforcing the robustness of the model (Hair et al., 2016).

Each of the seven explanatory variables registered Cronbach's alphas greater than 0.70 (Table 3), which is the lower limit of acceptability recommended by Nunnally (1978) and Hair *et al.* (2016). These results indicate strong internal consistency of the construct measurements. In addition, a considerable explanatory power for the endogenous constructs (R^2 = 72%) is shown in the results (Table 6).

The results of the structural model reveal that five of the explanatory variables, namely overconfidence, risk aversion, status quo, ethnic affiliation, and appearance, have a significant influence on bank credit decisions (Figure 2 and Table 7). The study results generally confirmed five of the first six hypotheses of the study. The effect of level of education of loan applicants on bank credit decision-making was found not to be significant and therefore does not support H4. The non-significant role of **level of education** suggests that educational qualifications of customers alone may not serve as a significant influence on bank credit decision-making.

Among the three behavioural biases studied, status quo bias was found to have the most significant effect on credit decision making as compared to the influence of overconfidence and risk aversion (Figure 2, Tables 6 and 7). The dominance of the **status quo bias** suggests the tendency of credit officers to rely on prior experiences with familiar customers rather than continuously reassessing customers' creditworthiness for each new application. This finding supports the views of Samuelson & Zeckhauser (1988) and Polites & Karahanna (2012), who asserted that decision-makers often prefer the existing situation to avoid uncertainty and cognitive effort. Practically, this bias is likely to lead to the approval of loans for previously trusted clients despite possible

changes in their financial condition, potentially increasing default risk.
The significant effect of **risk aversion** suggests that credit officers exhibit cautious tendencies in granting loans, preferring safer clients with lower perceived risk. This aligns with empirical studies such as Azouzi & Bacha (2023). It is worth noting that such risk aversion might safeguard the institution against bad debts, but could also reduce credit flow to creditworthy borrowers

The significant impact of **appearance** and **ethnicity** on credit decisions may suggest the presence of implicit bias or heuristic-driven judgment. Credit officers may associate certain social cues, appearances, or ethnic identities with creditworthiness. Such subjective evaluations tend to reinforce social inequities and discrimination in access to credit (Berger et al., 2014).

Again, the study found that female credit officers are more risk-averse in their credit decision-making than their male counterparts (Table 8). This finding reinforces the findings of previous studies by Eagly (2005) and Brescoll (2016). It also buttresses the perception of gender differences well situated in the Ghanaian culture that men tend to be risk-takers than women. The study, however, could not establish any significant difference between the male and female credit officers with regard to the influence of overconfidence bias on credit decision making. This finding may suggest that, despite the behavioral bias of overconfidence having an impact on credit decision-making, the effect of this bias may be mitigated by the stringent procedures that credit officers must adhere to when making decisions.

The study contributes to the limited African-centred literature on behavioural biases in banking by offering empirical evidence from Ghana, where the cultural and institutional environment may magnify or moderate such biases. The findings of this study generally reiterate the findings of previous studies, such as Lipshitz & Shulimovitz (2007), and Mushinada & Veluri (2019). In essence, this study provides both theoretical and practical contributions. Theoretically, this study extends behavioural finance literature to institutional credit decision-making within an African context, reinforcing that cognitive biases persist even among trained professionals. Practically, it highlights the need for behavioural sensitivity and structured credit assessment tools to ensure equitable and rational financial decision-making

Conclusion, Implications, and Suggestions for Future Studies

The study emphasizes the propensity of behavioral biases to influence bank credit managers, depriving them of the thorough decision-making process imperative for optimal results. The findings show that psychological biases that manifest in bank credit managers' decision-making impair their capacity to make rational decisions, as emphasized by Lipshitz & Shulimovitz (2007). These results confirm that even professional credit officers are not entirely rational actors, as their judgments are shaped by psychological and social influences.

This study contributes to behavioral finance literature in the African context by extending the study of behavioral finance to bank credit decision-making and provides actionable insights for fostering efficiency and professionalism in credit decision-making.

The findings of this research accentuate areas that require critical attention from

bank management, credit managers, and policy makers for effective strategies to be employed to reduce the impact of psychological biases and to enhance bank credit decision-making.

The findings underscore the importance of incorporating behavioral awareness into banking practice and regulation. Knowledge of psychological biases and their impact on the conduct of bank credit officers have the propensity to improve bank credit decision-making. Adequate knowledge of the influence of psychological biases on bank credit decisions may be useful in reducing loan losses caused by sub-optimal decisions taken by credit managers. Given the risky nature of banking, it is essential that behavioral bias issues receive the highest premium possible. Bank credit officers are perceived to frequently employ shortcut approaches or heuristics in their decision-making, which usually yield poor outcomes. Banks should institutionalize continuous professional development programs that expose credit officers to behavioral finance concepts. Training modules should highlight how biases such as status quo, risk aversion, and representativeness affect loan judgments, helping officers identify and mitigate their influence.

Regular audits of loan approval decisions should be conducted to identify patterns of bias. This can guide targeted interventions where systemic tendencies such as favoritism toward repeat clients are identified.

Management of banks and Regulators, such as the Bank of Ghana, could develop behavioral audit guidelines for financial institutions to ensure credit decisions adhere to rationality, transparency, and inclusivity, thereby enhancing confidence in the banking system.

Financial institutions should design inclusive credit policies that explicitly address and monitor potential psychological biases. Transparency in credit evaluation criteria can enhance social trust, corporate profitability, and liquidity

The findings and the ensuing implications primarily apply to bank credit officers in the Greater Accra Region, which is the most densely populated and has the highest economic activity (PHCG, 2021). However, other bank credit officers can rely on the findings to help them improve their credit decision-making. The authors suggest that to ensure representativeness, subsequent studies of this nature should cover the whole country of Ghana.

Future studies should explore how cultural dimensions such as collectivism and power distance interact with behavioural biases in credit decision-making within African contexts. Replicating this study across other Ghanaian regions and sectors, such as microfinance and credit unions, would enhance generalizability and provide comparative insights. We suggest that subsequent research could adopt longitudinal or experimental approaches to establish causal relationships between specific biases and credit performance outcomes over time.

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REFERENCES

Ackah, C.G., Aikins, E.R., Sarpong, T.T. & Asuman, D. (2019). Gender differences in attitudes toward risk: evidence from entrepreneurs in Ghana and Uganda, *Journal of Developmental Entrepreneurship*, 24(1), https://dx.doi.org/10.1142/S1084946719500055

Agarwal, V., Daniel, N.D. & Naik. N.Y. (2011). Do Hedge Funds Manage Their Reported Returns?, *The Review of Financial Studies*, 24(10), 3281 – 3320.

Agnew, J., Balduzzi, P. & Sundén, A. (2003). Portfolio Choice and Trading in a Large 401(k) Plan, *The American Economic Review*, 93(1), 193–215.

Andreoni, J. & Regan, P. (2008). Beauty, Gender and Stereotypes: Evidence from Laboratory Experiments, *Journal of Economic Psychology*, 29, 73-93.

Apergys, N., Artikis, P. & Mamatzakis, E. (2012). Is weather important for US banking? A study of bank loan inefficiency, *Journal of Applied Finance and Banking*, 2(3), 1-38.

Aydeenko, A., Bohne, A. & Frölic, M. (2019). Linking savings behavior, confidence and individual feedback: A field experiment in Ethiopia, *Journal of Economic Behavior and Organization,* 167(3), 122-151.

Azouzi, MA., & Bacha, S. (2023). Do Behavioral Biases Affect Credit Risk Assessment Methods?. *Iranian Journal of Management Studies*, 16 (2), 501-514.

Bacha, S. (2011). Impact of decision-making reasoning on credit risk management", *Journal of Business Studies*, 3(1), 246-259

Bacha, S. & Azouzi, M.A. (2019). How gender and emotions bias the credit decision-making in banking firms, *Journal of Behavioural and Experimental Finance,* 22(1), 183-191.

Baker M., Ruback, R. & Wurgler, J. (2004). *Behavioral Corporate Finance: A Survey*. NBER Working Paper No. 10863, National Bureau of Economic Research, Inc. Cambridge, MA, USA

Barber, B.M., Odean, T. & Zhu, N. (2009). Systematic noise, *Journal of Financial Markets*, 12(4), 547-569.

Barberis, N. & Thaler, R. (2003). A survey of behavioral finance, in G. Constantinides, M. Harris, and R. Stulz (Eds), *Handbook of the Economics of Finance*, North-Holland, Amsterdam.

Bakar, S. & Yi, A.N.C. (2016). The Impact of Psychological Factors on Investors' Decision Making in Malaysian Stock Market: A Case of Klang Valley and Pahang, *Procedia Economics and Finance*, 35, 319-328.

Baron, J. & Ritov, I. (2004). Omission bias, individual differences, and normality, *Organizational Behaviour and Human Decision Processes*, 94(2), 74-85.

Bayer, P., Ferreira, F. & Ross, S.L. (2016). *What Drives Racial and Ethnic Differences in High Cost Mortgages? The Role of High Risk Lenders*. National Bureau of Economic Research, No. 22004, 175-205.

Berger, A. N., Kick, T., Schaeck, K., 2014. Executive board composition and bank risk taking. *Journal of Corporate Finance*, 28(3), 48-65

Black, D. & Gallemore, J. (2013). *Bank executive overconfidence and delayed expected loss recognition*, Working Paper, Fuqua School of Business, Duke University. Durham, USA

Bouteska, A. & Regaieg, B. (2020). Loss aversion, overconfidence of investors and their impact on market performance evidence from the US stock markets, *Journal of Economics, Finance and Administrative Science*, 25(50), 451-478.

Brescoll V.L. (2016). Leading with their hearts? How gender stereotypes of emotion lead to biased evaluations of

female leaders, *The Leadership Quarterly*, 7(3), 415-428,

Brown, A.L. & Kagel, J.H. (2009). Behavior in a simplified stock market: The status quo bias, the disposition effect and the ostrich effect, *Annals of Finance*, 5(1), 1–14.

Cain, M.D. and McKeon, S.B. (2016). CEO Personal Risk-Taking and Corporate Policies, *The Journal of Financial and Quantitative Analysis*, 51(1), 139–164.

Chin, W.W. (2010). How to write up and report PLS analyses, in Esposito V.V., Chin, W., Henseler, J. and Wang, H. (Eds), *Handbook of Partial Least Squares, Springer Handbooks of Computational Statistics*, Springer, Berlin, Heidelberg, doi: 10.1007/978-3-540-32827-8_29.

Camerer, C. & Lovallo, D. (1999). Overconfidence and excess entry: an experimental approach, *American Economic Review*, 89(1), 306 -318.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*, 2nd ed., Mahwah:

Lawrence Erlbaum Associates.

Creswell, J.W., & Poth, C.N. (2017), *Qualitative inquiry and research design: choosing* among five approaches, 4th ed., SAGE Publications,

Croson, R. & Gneezy, U. (2009). Gender differences in preferences, *Journal of Economic Literature,* 47(2), 448 – 474.

D'Angelo, E., Mustilli, M. & Piccolo, R. (2018). Is the Lending Decision-Making Process Affected by Behavioral Biases? Evidence from Southern Italy, *Modern Economy*, 9(1), 160-173.

Daniel, K., Hirshleifer, D. & Subrahmanyam, A. (1998). Investor psychology and security market under- and overreactions, *Journal of Finance,* 53(6), 1839–1885.

De Bondt W.F.M. & Thaler, R.H. (1994). *Financial Decision-Making in Markets and Firms: A Behavioral Perspective*, NBER Working Papers 4777, National Bureau of Economic Research, Inc., Cambridge, MA, USA.

De Vries, E. & Gerber, C. (2017). The familiar versus the unfamiliar: Familiarity bias amongst individual investors, *Acta Commercii - Independent Research Journal in the Management Sciences,* 17(1), 1-10.

De Vries, M., Holland, R.W. & Wineman, C. (2008). Fitting decisions: Mood and intuitive versus deliberative decision strategies, *Cognition and Emotion,* 22(5), 931-943.

Eagly A.H. (2005). Achieving relational authenticity in leadership: does gender matter? *Leadership Quarterly,* 16(3), 459–474.

Eckel, C.C. & Grossman, P.J. (2002). Sex differences and statistical stereotyping in attitudes toward financial risk, *Evolution and Human Behavior*, 23 (4), 281-295.

Eidelman, S. & Crandall, C.S. (2009). A psychological advantage for the status quo. In J. T. Jost, A. C. Kay, and H. Thorisdottir (Eds.), *Social and psychological bases of ideology and system justification*, Oxford University Press, pp. 85–105.

Fama, E. (1970). Efficient capital markets: a review of theory and empirical work, *Journal of Finance*, 25(2), 383-417.

Fafchamp, M. (2000). Ethnicity and Credit in African Manufacturing, *Journal of Development Economics*, 61(1), 205-235.

Garling T., Kirchler, E., Lewis A. & van Raaij, F. (2009). Psychology, Financial Decision Making, and Financial Crises, *Psychological Science in the Public Interest,* 10(1), 1-47.

Graham, J.R., Harvey, C.R. & Puri. M. (2013). Managerial attitudes and corporate actions", *Journal of Financial Economics*, 109(1), 103–121.

Hair, J. F., Hult, G.T.M., Ringle, C.M. & Sarstedt, M. (2016). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* 2nd ed., Thousand Oaks, CA: Sage.

Hair, J.F., Ringle, C.M & Sarstedt. M. (2011). PLS-SEM: Indeed a silver bullet, *Journal of Marketing Theory and Practice*, 19(2), 139–151.

Harris, C.R., Jenkins, M. & Glaser, D. (2006). Gender differences in risk assessment: Why do women take fewer risks than men?, *Judgment and Decision Making*, 1(1), 48-63.

Henseler, J., Ringle, C.M. & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modelling", *Journal of the Academy of Marketing Science*, 43(1), 115-135.

Ho, P-H., Huang, C-W., Lin, C-Y. & Yen, J-F. (2016). CEO overconfidence and financial crisis: Evidence from bank lending and leverage, *Journal of Financial Economics*. 120(1), 194-209.

Iyengar, S. & Lepper, M. (2001). When choice is demotivating: Can one desire too much of a good thing?, *Journal of Personality and Social Psychology*, 79(6), 995-1006.

Kahneman, D., & Tversky. A. (1979). Prospect Theory: An Analysis of Decision under Risk, *Econometrica*, 47(2), 263-292.

Kaniel, R., Liu, S.G., Saar, & Titman, S. (2012). Individual Investor Trading and Return Patterns around Earnings Announcements, *The Journal of Finance,* 67(2), 639-680.

Keiber, K. (2006). *Managerial Compensation Contracts and Overconfidence*, *EFMA Behavioral Finance* Symposium Paper, http://efmaefm.org/0EFMSYMPOSIUM/durham-2006/sympopart.shtml.

Kempf, A. & Ruenzi, S. (2005). *Status Quo Bias and the Number of Alternatives -An Empirical Illustration from the Mutual Fund Industry*, CFR-Working Paper No. 05-07. Centre for Financial Research (CFR) Cologne, Gemany.

Kock, N. (2015). *Common method bias in PLS-SEM: A full collinearity assessment approach. International Journal of e-Collaboration, 11*(4), 1–10..

Kollin-Ondolos, N., Tuyon, J., Mohammed, R.U., & Ahmad, Z. (2022), Bounded rationality in bank credit decisions for SME lending: Evidence from bankers in Malaysia, *Journal of Risk Management in Financial Institutions*, 15(4), pp. 362-390.

Lee, E. & Lee. B. (2012). Herding behaviour in online P2P lending: An empirical investigation, *Electronic Commerce Research and Applications*, 11(5), 495-503.

Li, J., Ren, G., Ma, Q. & Liu, L. (2009). An experimental study on investors' status quo bias and its determinants, *Frontiers of Business Research in China*, 3(4), 543-565.

Li, X., Deng, Y. & Li, S. (2020). Gender differences in self-risk evaluation: evidence from the Renrendai online lending platform, *Journal of Applied Economics*, 23(1), 485-496.

Libby, R. & Rennekamp, K. (2012). Self-Serving Attribution Bias, Overconfidence, and the issuance of Management Forecasts, *Journal of Accounting Research*, 53(4), 913-913.

Lipshitz R. & Shulimovitz, N. (2007). Intuition and Emotion in Bank Loan Officers' Credit Decisions, *Journal of Cognitive Engineering and Decision Making*, 1(2), 212-233.

Liu, D., Brass, D., Lu, Y. & Chen, D. (2015). Friendships in online peer-to-peer lending: Pipes, prisms, and relational herding, *MIS Quarterly,* 39(3), 729-742.

Markowitz, H. (1952). Portfolio Selection, *The Journal of Finance*, 7(1), 77-91.

Marques, A.I., Garcia, V., & Sanchez, J.S. (2012). Two-level classifier ensembles for credit risk assessment, *Expert Systems with Applications*, 39(12), 10916-10922.

Martinez, R.G., Aguilera-Lizarazu G, Rojas-Hosse A. & Aranda B.P. (2020). The interaction effect of gender and ethnicity in loan approval: A Bayesian estimation with data from a laboratory field experiment, *Review of Development Economics*, 24(3), 726–749.

McNamara, G. & Bromiley, P. (1997). Decision Making in an Organizational Setting: Cognitive and Organizational Influences on Risk Assessment in Commercial Lending, *The Academy of*

Management Journal, 40(5),1063 – 1088.

Merkle, C. (2017). Financial overconfidence over time: Foresight, hindsight, and insight of investors, *Journal of Banking & Finance*, 84(3), 68-87.

Mushinada, V.N.C. & Veluri, V.S.S. (2019). Elucidating investor's rationality and behavioural biases in Indian stock market, *Review of Behavioral Finance*, 11(2), 201–219.

Nunnally, J.C. (1978). *Psychometric theory*, 2nd ed, McGraw-Hill, New York, NY.

Ogubazghi, S.K. & Muturi, W. (2014). The Effect of Age and Educational Level of Owner/Managers on SMMEs' Access to Bank Loan in Eritrea: Evidence from Asmara City, *American Journal of Industrial and Business Management*, 4(11), 632-643.

Olivola, C.Y. & Todorov, A. (2010). Fooled by first impressions? Re-examining the diagnostic value of appearance-based inferences, *Journal of Experimental Social Psychology*, 46(2), 315-324.

Palvia, A.A., Vähämaa, E. & Vähämaa, S. (2015). Are Female CEOs and Chairwomen More Conservative and Risk Averse? Evidence from the Banking Industry during the Financial Crisis, *Journal of Business Ethics*, 131(3), 577-594.

Pikulina, E., Renneboog, L. & Tobler, P. (2017). Overconfidence and investment: An experimental approach, *Journal of Corporate Finance*, 43(3), 175-192.

PHCG (2021). Population and Housing Census of Ghana, 2021 https://statsghana.gov.gh/gssmain/fileUpload/pressrelease/2021%20PHC%20General%20Report%20Vol%203A_Population%20of%20Regions%20and%20Districts_181121.pdf (Accessed on 24/05/2023)

Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., & Podsakoff, N.P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903.

Polites, G.L. & Karahanna, E. (2012). Shackled to the Status Quo: The Inhibiting Effects of Incumbent System Habit, Switching Costs, and Inertia on New System Acceptance. *MIS Quarterly*, 36(1), 21-42

Ravina, E. (2012). Love and Loans: The effect of Beauty and Personal Characteristics in Credit Markets, Working Paper, Columbia Business School, New York.

Ringle, C., Da Silva, D. & Bido, D. (2015). Structural equation modeling with the SmartPLS, *Brazilian Journal of Marketing*, 13(2), pp. 56-73.

Ross, S.A. (1976). The Arbitrage Theory of Capital Asset Pricing, *Journal of Economic Theory*, 13(3), 341 – 360.

Samuelson W. & Zeckhauser, R. (1988). Status quo bias in decision making", *Journal of Risk and Uncertainty*, 1, 7-59.

Sharpe, W.F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk, *The Journal of Finance*, 19(3), pp. 425-442.

Skala, D. (2008). Overconfidence in Psychology and Finance – an Interdisciplinary Literature Review, *Bank and Credit,* 39(4), pp. 33-50.

Storey, D. (2004). Racial and Gender Discrimination in the Micro Firms Credit Market? Evidence from Trinidad and Tobago, *Small Business Economics*, 23(5), 401-422.

Tetteh, J.E. & Boachie, C. (2021). Are the saving decision patterns of bank customers also clouded by psychological biases? Evidence from Ghana, *Review of Behavioral Finance*, 15(1), 1-18.

Tetteh, J.E. & Hayfron, A.E. (2017). Investor Behavioural Pattern: An Empirical Study of the Ghana Stock Market. *Journal of Applied Business and Economics,* 19(8), 69-78.

Tetteh, J.E., Adu-Darko, E, & Agyirey-Kwakye, B. (2024). Influence of Overconfidence and Loss Aversion on Financial Decision-Making of Teachers in Ghana: The moderating role of Financial

Literacy, African *Review of Economics and Finance*, 16(2), 254-279.

Tortosa, V., Moliner, M.A. & Sánchez, J. (2009). Internal market orientation and its influence on organizational performance, *European Journal of Marketing*, 43(11/12), 1435-1456.

Tursoy, T. (2018). Risk management process in banking industry, MPRA Paper No.86424, Munchen Personal Repec Archive, Munchen https://mpra.ub.uni-muenchen.de/86427/10.13140/RG.2.2.14737.74085.

Williams, S. & Wong. Y.W. (1999). The effects of mood on managerial risk perceptions: Exploring affect and the dimensions of risk, *Journal of Social Psychology,* 139(3), 268-287.

Zarook, T., Rahman, M.M. & Khanam, R. (2013). Management Skills and Accessing to Finance: Evidence from Libya's SMEs, *International Journal of Business and Social Science*, 4(7), 106-115.

Appendix 1: Demographic Information of Respondents

Variable	Frequency	Percent
Gender		
Male	197	48
Female	213	52
Age group		
30 years and below	52	12.7
31-40 years	146	35.6
41-50 years	138	33.7
51-60 years	74	18
Educational Level		
University Qualification (Diploma/First Degree/ Postgrad Degree)	328	80
Professional Qualification (ICA, CIB, CIM)	82	20
Discipline		
Banking	164	40
Accounting	98	24
Economics	102	25
Other (Law, Business Mgt, Sociology etc)	46	11
Profession/Position		
Bank Credit Officer	208	50.7
Bank Credit Manager	126	30.7
Bank Manager	76	18.5
Years of Bank Credit Management Experience		
6 - 10 years	132	32.2
11 – 20 years	121	29.5
21 years and above	157	38.3
Level of ICT Knowledge		
I possess some level of computer skills	30	7.3
I possess good computer skills	260	63.4
I possess excellent computer skills	120	29.3
Total	410	100.0

Appendix 2: Scales of variables in the model.

Factors	Construct	Item Description
Overconfidence	OC1	I have an outstanding experience in granting of loans.
	OC2	I can easily detect loan application that will go wrong
	OC3	I have confidence on my knowledge and skills in deciding on loan applications.
	OC4	I hardly seek opinions from fellow credit officers (to avoid conflicting opinions).
	OC5	I use a single or few sources of information that I have confidence in when deciding on loan applications.
Risk Aversion	RA1	I periodically make enquiries from credit management experts in my loan issuance decisions.
	RA2	I take a considerable period of time within to take decisions on loan applications.
	RA3	If I receive new information on a loan applicant I wait for a while before taking a decision.
Appearance	AP1	Applicants with good appearance are perceived to be more confident and proactive
	AP2	I perceive applicants with good appearance to be credit worthy.
	AP3	Appearance of applicants to a larger extent influence my decision on loan a applications.
	AP4	Applicants with good appearance are less likely to default in loan payment
Level of Education	LE1	I perceive educated loan applicants to be credit worthy than the less educated ones
	LE2	Level of education of loan applicants is one of the factors that determine my decision on loan applications.
	LE3	Applicants with high education are knowledgeable and are less likely to default in loan payment
	LE4	Applicants with high education are perceived to be more confident and productive
Ethnicity	ET1	I am likely to favor loan applicants who are members of my relations, friends etc.
	ET2	Members of my ethnic groups are less likely to be denied loan if information available is not adequate.
	ET3	I feel bad when I am not able to approve loan application to members of my ethnic group and affiliations.
Status Quo	SQ1	I continue to grant credit to customers because they have been faithful in repayment of loans.
	SQ2	Some particular customers have received loans from my bank since I became credit officer and I will continue to meet their working capital needs.
Bank Credit Decision	CD1	My loan decisions are based on the long-term relationship of customer with the bank.

	CD2	I am likely to grant credit to a customer might be less credit worthy as a result of non-availability of adequate information.
	CD3	My loan decisions are based primarily on current publicly available information about the customer in my loan decision making.
	CD4	I make decisions based on my independent assessment because I have outstanding experience, knowledge and skills.
	CD5	My loan decision making is at times influenced by my emotions and intuitions

Electronic Banking and Financial Inclusion in Nigerian Financial System

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Abstract

In this study, the effect of electronic banking on financial inclusion in Nigeria was examined. In particular, the effect of total volume of Automated Teller Machine, total volume of transaction of Nigerian instant payment system, and total volume of transaction by internet banking on financial inclusion in Nigeria was investigated. Between 2012 and 2024, a sample of twelve listed deposit money banks was investigated using descriptive statistics, correlation analysis, and pooled last square regression. The various analyses were used to investigate the connection between financial inclusion in Nigeria and electronics banking. The empirical findings showed the variables had a substantial impact on financial inclusion in Nigeria. We recommend among others; that management of deposit money banks in Nigeria should allocate more resources towards financial innovation and enhancement of the existing infrastructures since they have been found to improve financial inclusion.

Key words: Automated Teller Machine, Deposit Money Banks, Electronic Banking, Financial Inclusion, Nigeria

Introduction

Financial inclusion seeks to ensure that individuals have access to affordable and useful financial products and services that are well aligned to their needs (Jepchumba & Simiyu, 2019). Accessibility and ownership of a formal account with a financial institution is the first broader perspective of financial inclusion. Financial inclusion seeks to ensure that the excluded and underserved population is able to access and use formal financial services and products (Asli, Klapper & Singer, 2017). In industrialized nations like United States of American, Japan and China, there is higher financial literacy which is directly linked with high probability of utilization of fintech services. Most people in these developed countries have greater financial literacy hence high probability of using fintech services particularly electronic banking (Yoshino, Morgan & Long, 2020, Chen & Yuan, 2021). However, in most developing countries in Asia and Africa, most people living in rural areas are financially excluded from formal financial services (Cicchiello, Kazemikhasragh,

Monferrá & Girón, 2021; Abdi, Hussein & Kadir, 2022).

It is important for developing countries to extend financial technologies products like ATM and electronic banking channels to rural areas to address financial exclusion issues (Isukul & Tantua, 2021). In Nigeria, ATM, internet banking and mobile money have accelerated the pace of financial inclusion among people in the country. Financial inclusion is one of the objectives of the Central Bank of Nigeria's cashless policy introduced in the year 2011. The policy is intended to drive the development and modernization of the payment system in Nigeria in one hand, reduce the cost of banking services on the other hand and thirdly to drive financial inclusion by providing more efficient transactions options and greater reach. Thus, the adoption of the cashless policy has led to remarkable increase in the level of technology (electronic banking) acceptance by deposit money banks in Nigeria and it is evidenced by the increase in the number of automated teller machines, point-of-sales facilities, internet banking, mobile banking, among others (Ene, Abba & Fatokun, 2019).

Electronic banking is a form of financial innovation among financial institutions that include such elements as adoption if automated teller machines (ATMs), mobile banking and internet banking to provide services and products to customers. The adoption of electronic banking allows customers to access and utilize financial services and products from financial institutions more easily and conveniently as opposed to transacting through physical banking halls (Kariuki, Kimundi & Makambi, 2018). For quite some time, electronic banking has existed among financial institutions through channels as automated teller machines (ATMs) and mobile phone banking. However, with advancement in technology, the internet has transformed and revolutionized the way financial institutions execute their transaction hence internet banking (Jepchumba & Simiyu, 2019).

The key indicators when it comes to financial inclusion are accessibility, safety and utilization besides fairness. Financial inclusion aims at allowing the unbanked population of the people in the country to access formal financial services (Cihak, Mare & Melecky, 2016). It essence is to lower the transaction costs incurred by people when accessing financial services and products. Given that financial institutions are highly regulated, their transaction costs are relatively lower as compared to what shylocks offer (Kariuki, et al., 2018). Financial inclusion allows people to gain basic financial knowledge and information like financial literacy and the need to save and make investment (Ndegwa & Koori, 2019).

Although the relationship between electronic banking and the financial inclusion has drawn significant attention in several nations, the empirical evidence is conflicting. Mago and Chitokwindo (2014), Asare and Sakoe (2015), Nwude, Igweoji and Udeh (2020) and Abdi, et al., (2022), for example, came to the conclusion that there is a significant relationship between electronic banking and the financial inclusion, whereas Ene, et al., (2019) and Osuji, Erhijakpor and Mgbeze (2022) found that automated teller machines do not significantly impact financial inclusion. Difference in variables used, scope of the studies, the estimation techniques adopted and how the process was followed, variable measurement bias, could be responsible for these mixed findings, as such there is need for more study. The relationship between electronic banking and financial inclusion,

as a result, has not been clarified and is still up for debate among researchers. Furthermore, the majority of the Nigerian studies (Ene, et al., 2019; Nwude et al., 2020, Ezekiel, 2021 and Osuji, et al., 2022) undertaken did not use the most recent data through 2024. The influence of electronic banking on the financial inclusion in Nigeria was thus investigated in this study using the most recent data. By analyzing the impact of electronic banking on the financial inclusion in Nigeria, this study aimed to bridge these gaps.

The rest of the paper is organized as follows; section two is review of literature. Section three describes the methodology employed. Section four discusses the empirical results and analysis while section five concludes the study.

Literature Review

Theoretical Review

Different theories have been used to explain financial inclusion by researchers. Some of these theories are the diffusion of innovation theory, the technology acceptance theory and financial intermediation theory.

Diffusion of innovation Theory

The diffusion of innovation theory was developed by Rodgers (1962) and it provides a discussion of how new innovations get to be adopted by the users as time gets to lapse. The theory further provides a clarification of the actions of the end users during adoption of the new innovations like electronic banking in the financial institution. This theory defends the position that organizations take part in the dissemination of innovation so as to acquire competitive benefit, minimize charges and safeguard their tactical spots. The philosophy as suggested by Rogers expounds on in what manner a novelty is dissolved amongst consumers over a specific period (Liu & Li, 2009). The underpinning demonstrates that the adopters' partakers of any advancement in technology assume a bell-shaped scatter curve which can be categorized into five portions to group consumers by way of innovativeness (Rodgers, 1962). Rogers categorized clients as pacesetters, initial adopters, primary majority, late majority and dawdlers. The relevance of the theory to the study is that it explains that forces that drive deposit money banks in Nigeria to adopt electronic banking channels like ATMs with the aim of enhancing financial inclusion.

Technology Acceptance Theory

According to Davies (1989) it is an information systems theory that models how users come to accept and use a technology and behavioural intention is a factor that leads people to use technology. The behavioural intention is influence by the attitude which is the general impression of the technology. Davies suggested that Perceived usefulness (PU) and Perceived ease-of-use are factors that influence users' decision. Perceived usefulness (PU) is the degree to which a person believes that using a particular system would enhance their job performance" It means whether or not someone perceives that technology to be useful for what they want to do. (Davies, 1989) Perceived ease-of-use (PEOU) is the degree to which a person believes that using a particular system would be free from effort, if the technology is easy to use, then the barriers conquered. It's not easy to use and the interface is complicated, no one has a positive attitude towards it (Davies, 1989).

Financial Intermediation Theory

The theory of financial intermediation was developed by Gurley and Shaw (1960), the financial intermediation theory considers financial institutions as intermediaries whose role is to mobilize deposits and savings from surplus units that are

accumulated and latter loaned out in areas with deficit in form of credit facilities. This way, the financial institutions are able to realize financial inclusion.

Empirical Review

In this segment, the review of past empirical studies will be carried out to provide justification for the need for this study. For instance, Mago and Chitokwindo (2014) examined the impact of electronic banking on financial inclusion in Zimbabwe, with a focus on mobile banking in the Masvingo province. The research adopted a qualitative research methodology and a survey design. They found that electronic banking significantly impacts financial inclusion in Zimbabwe. Their results show that low-income people are willing to adopt mobile banking, thereby enhancing financial inclusion.

Bansal (2014) utilized a qualitative research method to study the role of technology in achieving financial inclusion in rural India. The paper attempted to examine the contributions of information and communication technology towards achieving financial inclusion and reducing financial exclusion in the country and analyzed different application of information and communication technology which banks are adopting. The study found that modern information and communication technology can act as a tool to develop a platform which helps to extend financial services to remote areas. The study specifically identifies mobile banking and automated teller machines as two promising options for achieving financial inclusion.

Asare and Sakoe (2015) examined the effects of electronic banking on financial services in Ghana using qualitative research method. The study found out that the advent of electronic banking in Ghana has enhanced accessibility to a wide range of banking products and also delivery of banking services has been made increasingly faster to cover a wide range of customers or people referred by existing customers. Therefore, the study concluded that electronic banking has fundamentally changed the business of banking in Ghana from a financial intermediary to a financial shopping mall providing a one-stop-shop for various financial services.

Ene, Abba and Fatokun (2019) examine the impact of electronic banking on financial inclusion in Nigeria. The study used the total number of automated teller machines and point-of-sale devices in Nigeria as proxies for electronic banking and the proportion of banked adult population to total bankable adult population in Nigeria as proxy for financial inclusion. The study adopted multiple regression analysis. It was observed that automated teller machines do not significantly impact financial inclusion while point-of-sale devices significantly impact financial inclusion in Nigeria.

Nwude, Igweoji and Udeh (2020) investigate the effect of e-banking on banks performance and financial inclusion in Nigeria for the period 2007-2017. The result of the regression analysis revealed that electronic banking has made positive and significant contribution in promoting financial inclusion in Nigeria. Wanjiku (2020) covered commercial banks in Kenya and sought to link technological banking innovations and financial inclusion. The variables covered in this study were internet, electronic, agency and mobile banking and all were seen to influence financial inclusion. Nazaritehrani and Mashali (2020) did an analysis whose focus was on e-banking channel development and the implication on market shares of developing nations. Among the variables that were covered in this study include point of sales, mobile, internet and ATM banking and these were found to have

positive influence on market share of the banks.

Shihadeh (2021) used the case of Palestine to explore how financial inclusion impacts on performance of banks. The inquiry showed that penetration of banks, adoption of ATMs could enhance the performance of banks. Ezekiel (2021) examined ATMs and their contributions towards financial inclusion using the case of Nigeria. The findings were that penetration of ATMs is a significant predictor of financial inclusion among commercial banks. Sabwa (2021) analyzed mobile banking and the role it plays on financial inclusion borrowing evidence from Kenyan banks. The findings were that mobile banking is a significant predictor of financial inclusion among banks in Kenya.

Gharbi and Kammoun (2022) examine the relationship between digital banking and financial inclusion in Tunisia using four indicators of inclusive development: access, use, quality and efficiency of financial services. By developing a questionnaire survey of Tunisian bank employee, the researchers found a positive relationship between digital banking and financial inclusion in Tunisian.

Abdi, Hussein and Kadir (2022) investigate the effect of automated teller machines and mobile banking on financial inclusion among commercial banks in Somalia. A descriptive survey design was adopted targeting 6 commercial banks in Somalia that had successfully rolled out electronic banking while the respondents covered the Banks staff, like managers and officers from each institution respectively and census was used. Primary data was collected on automated teller machines, mobile banking and customer deposits with the aid of the questionnaire. The analysis was conducted through the Statistical Packages for Social Sciences version 24 utilizing descriptive statistics (means and standard deviations) and inferential statistics (correlation and regression analysis). The study found out that automated teller machines and mobile banking are significant predictors of financial inclusion among commercial banks in Somalia. Thus, electronic banking is a significant enabler of financial inclusion of commercial banks.

Osuji, Erhijakpor and Mgbeze (2022) investigate the connection between Nigerian financial inclusion and electronic banking. The amount of transactions made in Nigeria on ATMs, point-of-sale systems, web-enabled applications, and mobile devices served as proxies for electronic banking in the study, and the ratio of the adult population with bank accounts to the total adult population in Nigeria served as a proxy for financial inclusion. The study used multiple regression analysis with the E-Views 9 program, adopting correlational and ex-post facto research approaches. It was discovered that while the volume of transactions made through point-of-sale and mobile devices is strongly correlated with financial inclusion, those made through automated teller machines and web-based channels do not affect financial inclusion.

Methodology

The longitudinal research design, which is widely relevant in the management and social sciences, was chosen for this study. The researcher does not have the option to change or control the independent variables when using a longitudinal research design since reactions to a factor and its impact on specific individuals are being researched. Due to the independent variables' inherent immiscibility or the fact that their manifestations have already taken place, it is impossible to modify them. All deposit money banks that were listed on the

floor of the Nigerian Exchange Limited as of December 31, 2024, make up the study's population. As of the end of 2024, there were 13 deposit money banks listed on the Nigerian Exchange Limited. The sample filtering method was also applied to the selection of banks, with the requirement that the banks must have continuous data from 2012 to 2024 and be listed as of December 31st, 2024 as the sample size selection criterion. The sample size for this study is comprised of twelve (12) deposit money banks that matched the inclusion criteria. The secondary data was gathered from published financial reports of the deposit money banks in the study. This study is limited to Nigeria amongst other developing countries in Africa, because of its population size.

Model Specification

The specified model examines the effect of electronic banking on the financial inclusion in Nigeria. This study adapts the model of Ene et al., (2019) with some slight modification in terms of the variables utilized to proxy electronic banking and financial inclusion in this particular research. Ene et al., (2019) model is specified as:

$$FIN_t = \beta_0 + \beta_1 ATM_t + \beta_2 POS_t + \beta_3 MPP_t + \varepsilon_t \quad \ldots\ldots (1)$$

where:
FIN = financially included adult population in the country for period t.
ATM = Number of automated teller machines of banks in the country for period t.
POS = Number of point-of-sales machines of banks in the country for period t.
MPP = Mobile phone penetration in the country for period t. (Is a control variable, reason been that mobile phone penetration affects financial inclusion)
β_0 = Intercept
β_1, β_2 are coefficient of the independent variables
ε = Residual or error term for period
t = period

The above model was modified by measuring electronic banking by total volume of ATM transaction, total volume of transaction of NIP payment and total volume of transaction by internet banking while financial inclusion is measure by ratio of total number of deposits per 100,000 individuals.

The model for this study can be specified in functional form as:

$$FINCL = f(VATM, VNIP, VINT, MPP) \quad \ldots\ldots (2)$$

Transforming equation (2) into its panel data form, the model takes the following specification:

$$FINCL_{it} = \beta_0 + \beta_1 VATM_{it} + \beta_2 VNIP_{it} + \beta_3 RVINT_{it} + \varepsilon_{it} \quad \ldots\ldots (3)$$

where,
$FINCL_{it}$ = ratio of total number of deposits per 100,000 individuals *in Nigeria* for period *t*
$VATM_{it}$ = Total volume of transaction by ATM of bank i for period t.
$VNIP_{it}$ = Total volume of transaction of NIP payment of bank i for period t.
$VINT_{it}$ = Total volume of transaction by internet banking of bank i for period t.

β_0, β_1, β_2, β_3 are Parameters to be estimated
ε = Error term
i represents bank i, while t represents time between 2012 – 2024.

Measurement of Variables

Table 1 lists the definitions of the model's variables as well as the previous researcher that utilized the data.

Table 1: Measurement of the variables

S/N	Variable	Variable Type	Measurement	Sources
1	Financial inclusion (FINCL)	Dependent Variable	Measured as the ratio of total number of deposits per 100,000 individuals	Abdi et al., (2022)
2	Volume of transactions by ATM (VLATM)	Independent Variable	Measured as total volume of ATM transactions in Nigeria	Ene et al., (2019)
3	Volume of transactions by NlP (VLNIP)	Independent Variable	Measured as total volume of NIP payment transactions	Wanjiku (2020)
4	Volume of internet banking (VINT)	Independent variable	Measured as total volume of internet banking transactions	Wanjiku (2020)

Source: Author's Compilation, (2025).

The à priori expectation is, $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$.
According to theory, financial inclusion should be positively impacted by the total volume of ATM, total volume of transaction of NIP payment and total volume of transaction by internet banking

Results and Discussions

The annual data stream collected from audited financial reports of the listed deposit money banks in the study from 2012 to 2021 are presented and analyzed in this section. Table 2 shows the result of the descriptive statistics.

Table 2: Descriptive Statistics

	FINCL	VATM	VNIP	VINT
Mean	930.5868	8.732564	8.865128	7.095043
Median	923.2300	8.770000	8.190000	7.150000
Maximum	1431.900	8.940000	89.18000	8.130000
Minimum	644.4400	8.470000	6.430000	3.360000
Std. Dev.	277.0875	0.177449	7.605648	0.755963
Skewness	0.526598	-0.053747	10.20889	-0.926911
Kurtosis	1.907797	1.355557	108.1481	6.357997
Jarque-Bera	11.22287	13.23927	55930.96	71.72492
Probability	0.003656	0.001334	0.000000	0.000000
Sum	108878.7	1021.710	1037.220	830.1200
Sum Sq. Dev.	8906190.	3.652631	6710.122	66.29172
Observations	117	117	117	117

Source: Researchers computation (2025) using E-views 9.0 Econometric Software.

Note:
FINCL – Financial inclusion (Measured in millions and in percentage)
VATM – Volume of automated teller machines (Measured in millions and percentage)
VNIP – Volume of Nigeria instant payment system (Measured in millions and in percentage)
VINT – Volume of internet transfers (Measured in millions and in percentage)

According to the descriptive statistics shown in Table 2, the average deposit accounts per 100,000 persons is 930, which is very low and suggests the low level of use of banking sector services in Nigeria. Other variables in the Table indicate that average volume of ATM transaction is 8.73, which suggests a relatively low level of ATM use across the deposit money banks in Nigeria, using the millennium development goal (MDG) standard of per 100,000 persons, for measuring financial inclusion. On the other hand, volume of NIP payment transactions for the period was 8.86 percent on average which is not too high. This indicates low levels of utilization of NIP payment transaction across the banks. The internet banking variable indicates an average of 7.09, which is less than the median value of 7.15 used for the measurement. This suggests that the volume of internet banking did not perform well in terms of volume of transaction over the period. FINCL and VNIP were positively skewed while VATM and VINT are negatively skewed. The Jarque-Bera coefficient for all the variables is significant at the 1 percent level, indicating high level of heterogeneity among the dataset. Thus, the application of panel data estimation technique is appropriate in the study.

Correlation Analysis

It is critical to investigate the degree and direction of link between the variables in the study in advance. These investigations are carried out using correlation analysis. Table 3 shows the results of the correlation tests.

Table 3: Correlation Matrix

Correlation Probability	FINCL	VATM	VNIP	VINT
FINCL	1.000000			

VATM	0.323397	1.000000		
	0.0000	-----		
VNIP	0.270292	0.217017	1.000000	
	0.0032	0.0188	-----	
VINT	0.397376	0.374998	0.228182	1.000000
	0.0000	0.0000	0.0133	-----

Source: Researchers computation (2025) using E-views 9.0 Econometric Software.

NOTE: The variables below are measured in percentages.
FINCL – Financial inclusion
VATM – Volume of automated teller machines
VNIP – Volume of Nigeria instant payment system
VINT – Volume of internet transfers
The correlation result in table 3 show that VATM, VNIP and VINT have strong significant positive relationship with FINCL. This implies that increase in these variables significantly improved FINCL during the studied period as indicated by their corresponding positive coefficients. The correlation among the independent

variables also follow the same pattern that is significant positive relationship. Meaning that, an increase in these variables significantly and positively stimulates each other as shown by their corresponding positive values. Furthermore, table 3 also revealed the absence of multi co-linearity problem among explanatory variables since no correlation coefficient between explanatory variables is > 0.80 as suggested by Gujarati (2008).

Analysis of the Panel Least Square Estimates

Due to endogeneity problems, the Panel least Square estimates are not particularly suitable for policy recommendations. The panel data analysis technique is used to estimate the associations in order to get around this problem. The Hausman test for random effects is the accepted test to choose which panel analysis approach to use. Table 4 summarizes the findings of the tests conducted on the FINCL equation. The result for the FINCL equation shows that the 5.95 Chi-square estimation values failed the test, proving that the random-effect model is suitable for estimating the equations among the cross-sections in terms of FINCL behavior. Therefore, the FINCL equation is estimated using the random-effect method.

Table 4: Summary of Hausman Test for Cross-Section Random Effects

Test Summary	Chi-sq. statistic	Chi-sq. d.f	Prob.
Cross-section random	5.95	3	0.11

Source: Researchers computation (2025) using E-views 9.0 Econometric Software.

Random Effects Model

Based on the findings in Table 4, the statistic offers scant support for the null hypothesis that the random effect model leads in misspecification. Given that we are unable to disprove the null hypothesis that unobserved firm-specific heterogeneity is uncorrelated with regressors, we would be focusing our study on the random effect model's estimations. This suggests that there is a random effect in the behaviour of FINCL among the cross-sectional deposit money banks. The Random-effect technique is therefore the most effective course of action. We present the random-effects estimates in this investigation and use the findings to derive conclusions. Table 5 presents the outcome of the random effects model.

Note: The chi-square for the model is also called the discrepancy function, likelihood ratio chi-square, or chi-square goodness of fit. In AMOS, the ch-square value is called CMIN.
If the chi-square is not significant, the model is regarded as acceptable. That is, the observed covariance matrix is similar to the predicted covariance matrix-that is, the matrix predicted by the model.
If the chi-square is significant, the model is regarded, at least sometimes, as unacceptable. However, many researchers

disregard this index if either the sample size exceeds 200 or so and other indices indicate the model is acceptable. In particular, this approach arises because the ch-square index presents several problem:

- Complex models, with many parameters, will tend to generate an acceptable fit
- If the sample size is large, the model will usually be rejected, sometimes unfairly
- When the assumption of multivariate normality is violated, the chi-square fit index is inaccurate. The Satorra-Bentler scaled ch-square, which is available in EQS, in EQS, is often preferred, because this index penalizes the chi-square for kurtosis.

The relative chi-squre is also called the normed chi-square. The value equals the chi-square index divided by the degrees of freedom. This index might be less sensitive to sample size. The criterion for acceptance varies across researchers, ranging from less than 2 to less than 5.

Table 5: Random-Effects Results for FINCL

Dependent Variable = ROA			
Variables	Coeff.	t-stat	Prob.
C	-8036.522	-10.65615	0.0000
VATM	913.9402	8.875552	0.0000
VNIP	2.127897	1.781231	0.0776
VINT	136.3209	5.625111	0.0000
R^2	0.889996		
$Adj\ R^2$	0.887076		
F-stat	304.7458		
Prob.	0.000000		
D.W.stat.	1.525267		

Source: Researchers computation (2025) using E-views 9.0 Econometric Software.

FINCL – Financial inclusion
VATM – Volume of automated teller machines
VNIP – Volume of Nigeria instant payment system
VINT – Volume of internet transfers

We present the random-effects estimates in this investigation and use the findings to derive conclusions. Table 5 presents the outcome of the random effects model. There exists a significant linear association between financial inclusion and the independent variables because the F-value of 304.74 is significant at the 1% level. This validates the premise that there is a significant linear relationship between the explanatory variables when they are combined and financial inclusion, the dependent variable. The estimated model might not contain autocorrelation, according to the D.W. statistic value of 1.5 which can be approximated to 2. D.W. statistics is used to test the co-relation between explainary varbles and the dependent variable. It is within the range of 1-2.

By examining the individual coefficients of the variables in terms of magnitude, signs, and significance, one may discover the

specific contribution of each explanatory variable to the behaviour of financial inclusion (FINCL). In line to what was anticipated a priori, Table 5 findings suggest that VATM, VNIP and VINT have a positive relationship with financial inclusion (FINCL). Additionally, the results in Table 5 show that the coefficients of VATM and VINT have significant positive effects on FINCL, This has the inference that VATM and VNIP are the two key electronic banking factors that affect financial inclusion (FINCL) in Nigeria.

Discussion of Findings

The results obtained in the empirical analysis are far reaching and give impressive directions. First, the correlation test is the relatively low between the dependent and independent variables and also among the explanatory variables. This indicates that the explanatory variables are not mutually exclusive in explaining financial inclusion and thus do not substitute for each other.

In the same vein, the empirical results show that total volume of ATM transaction and total volume of internet transactions are the two key electronic banking factors that exert significant positive influence on financial inclusion in Nigeria, which conforms to that of Rodgers (1962) diffusion of innovation theory in the literature, whom report that new innovations get to be adopted by the users and ease of use as time gets to lapse. The implication of this finding is that increase in that total volume of ATM transaction and total volume of internet banking transactions will improve financial inclusion in Nigeria. Thus, ATM and electronic banking is a significant enabler of financial inclusion in Nigeria. However, total volume of NIP payment transactions though exerts a positive relationship on financial inclusion and the impact is significant. This outcome is similar to previous findings by Mago and Chitokwindo (2014), Ene et al., (2019), Wanjiku (2020), Ezekiel (2021), Gharbi and Kammoun (2022) and Abdi, et al., (2022) who also found varied impacts of volume of ATM transaction, volume of internet banking transactions on financial inclusion.

Conclusion And Recommendation

Achieving financial inclusion has been the target of governments around the world, especially underdeveloped and developing economies. Thus, financial inclusion is seen by researchers as one of the key drivers of economic growth and development which informed this research effort. Towards contribution to existing knowledge, this paper sets out to empirically investigate the impact of electronic banking on financial inclusion in Nigeria over the period 2012 - 2024. Using correlation analysis and panel OLS regression technique, the empirical analysis reveals that total volume of ATM transaction and total volume of internet banking transactions of listed deposit money banks has a significant and positive impact on financial inclusion in Nigeria. However, total volume of NIP payment transaction has no significant impact on financial inclusion. The study therefore concludes that electronic banking is a key driver of financial inclusion in Nigeria within the period under study.

Based on the empirical findings of this study, the following policy recommendations are suggested for policy action:

i. Management of deposit money banks in Nigeria should allocate more resources towards financial innovation and enhancement of the existing ATM and electronic banking channels and infrastructures since they have been found to improve financial inclusion.

ii. Deposit money bank should ensure that automated teller machines provide convenience for customers by installing more of them since they have been found to be a major driver of financial inclusion in Nigeria. Also, deliberate policy that will enhance the performance of automated teller machines of banks should be made by the apex regulator of the Nigerian banking system. This policy should among others, ensure that automated teller machines installed by banks meet international best standards.

iii. Central Bank of Nigeria should intensify its campaign for the acceptance of electronic banking by the bankable population since it has been identified as one of the key drivers of financial inclusion in Nigeria.

The study's policy implications may be limited to Nigeria due to its conclusions' reliance on that country's specific environment. Therefore, future studies in this field, particularly those involving African nations, should use a panel data technique or conduct cross-country investigations and consider applying system GMM. Insights on the impact of electronic banking across African nations would be useful for policymakers.

REFERENCES

Abid, H. & Noreen, U. C. (2006) Ready to E-Bank: An Exploratory Research on Adoption of E-

Banking and E-Readiness in Customers among Commercial Banks in Pakistan. (Working Paper Series).

Ajide, K. B. (2017). Determinants of Financial Inclusion in Sub-Saharan Africa Countries: Does Institutional Infrastructure Matter? *CBN Journal of Applied Statistics, 8*(2), 69 – 89.

Asare, M., & Sakoe, J. (2015). The effects of electronic banking on financial services in Ghana. *Research Journal of Finance and Accounting, 6*(2), 147-154.

Asli, D.-K., Klapper, L., & Singer, D. (2017). Financial Inclusion and Inclusive Growth: A Review of Recent Empirical Evidence. World Bank Group: Policy Research Working Paper.

Bansal, S. (2014) Perspectives of Technology in Achieving Financial Inclusion in Rural India. Procedia Economics and Finance, 11, 472-480.

Central Bank of Nigeria (2022). CBN Annual Reports and Statement of Account, Available at https://www.cbn.gov.ng/

Chakrabarty, K. C. (2010). Inclusive Growth—Role of Financial Sector. National Finance Conclave, Bhubaneswar, 27 November 2010, 23-39.

Chen, W., & Yuan, X. (2021). Financial inclusion in China: an overview. Frontiers of Business Research in China, 15(1), 1 - 21.

Cicchiello, A. F., Kazemikhasragh, A., Monferrá, S., & Girón, A. (2021). Financial inclusion and development in the least developed countries in Asia and Africa. *Journal of Innovation and Entrepreneurship, 10*(1), 1-13.

Cihak, M., Mare, D., & Melecky, M. (2016). The Nexus of Financial Inclusion and Financial Stability: A Study of Trade-Offs and Synergies. World Bank: Policy Research Working Paper.

Daniel, E. (1999). Provision of Electronic Banking in the UK and the Republic of

Ireland. *International Journal of Bank Marketing, 17*,(1)72-82. https://doi.org/10.1108/02652329910258934

Davis, F.D. (1989) Perceived Usefulness Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(1), 319-340.https://doi.org/10.2307/249008.

Ene, E., Abba, G., & Fatokun, G. (2019). The impact of electronic banking on financial inclusion in Nigeria. *American Journal of Industrial and Business Management*, 9(2), 1409 - 1422. doi: 10.4236/ajibm.2019.96092.

Ezekiel, O. K. O. H. (2021). Automated teller machine (ATM) penetration and financial inclusiveness in Nigeria: A tripod banking system approach. *Indian Journal of Economics and Business, 20*(3), 14 - 27.

Isabwa, H. K. (2021). Effect of mobile banking on financial inclusion among commercial banks in Kenya. *International Journal of Business, Management and Economics, 2*(3), 184-197.

Isukul, A., & Tantua, B. (2021). Financial inclusion in developing countries: applying financial technology as a Panacea. In Economic Growth and Financial Development (1-21). *Springer, Cham.and Entrepreneurship, 10*(1), 1-13.

Jepchumba, P., & Simiyu, D. (2019). Electronic banking adoption and financial performance of commercial banks in Kenya, Nairobi City County. *International Journal of Finance and Accounting, 4*(2), 19 – 38.

Kariuki, C., Kimundi, G., & Makambi, S. (2018). The Nexus between Financial Inclusion and Financial Stability: Credit, Savings and Asset Quality of Kenyan Banks.

Leeladhar, V. (2005). Taking Banking Services to the Common Man.

Mago, S. and Chitokwindo, S (2014) The Impact of Mobile Banking on Financial Inclusion in Zimbabwe: A Case for Masvingo Province. Mediterranean Journal of Social Sciences, 5, 221-230.

Mago, S., & Chitokwindo, S. (2014). The impact of mobile banking on financial inclusion in Zimbabwe: A Case for Masvingo Province. *Mediterranean Journal of Social Sciences, 5*(2), 221-230.

Mohan, R. (2006). Economic growth, financial deepening and financial inclusion. Annual Bankers Conference, Hyderabad, 3 November 2006, 72-95.

Nazaritehrani, A., & Mashali, B. (2020). Development of E-banking channels and market share in developing countries. *Financial Innovation, 6*(1), 1-19.

Ndegwa, M. W. & Koori, J. (2019). Financial inclusion and performance of deposit taking savings and credit cooperative societies in Meru County, Kenya. *International Academic Journal of Economics and Finance, 3*(4), 286-307

Nwude, E. C., Igweoji, N. B., & Udeh, S. N., (2020). the role of electronic banking as a tool to financial inclusion in Nigeria. *Noble International Journal of Business and Management Research,4*(1), 1-08.

Nwude, E. C., Igweoji, N. D., & Udeh, S. N. (2020). The role of electronic banking as a tool to financial inclusion in Nigeria. *Noble International Journal of Business and Management Research, 4*(1), 01-08.

Osuji, C. C., Erhijakpor, A. O. E. & Mgbeze, J. C. (2022). Electronic Banking Platforms and Financial Inclusiveness Index in Nigeria. *International Journal of Management and Commerce Innovations, 10*(1), 463 – 470.

Raghuram Committee (2008). A Hundred Small Steps - A report of the committee on financial sector, India.

Sethi, D., & Acharya, D, (2018). Financial inclusion and economic growth linkage: Some cross country evidence, *Journal of Financial Economic Policy,10*(3), 369-385,

Sabwa, O. (2021). Financial inclusion and banks' performance: Evidence from Palestine. *Investment Management and Financial Innovations, 18*(1), 126-138

Thorat, U. (2007). financial inclusion - The Indian experience. HMT- DFID Financial Inclusion Conference, London, 19 June 2007, 22-33.

Tiwari, R.,. & Buse, S. (2007). The mobile commerce prospects: A strategic analy- sis of opportunities in the banking sector. Hamburg University Press, Hamburg.

Wanjiku, N. G. (2020). Technological banking innovations and financial inclusion by commercial banks in Nairobi City County, Kenya (Doctoral Dissertation, Kenyatta University).

Yoshino, N., Morgan, P. J., & Long, T. Q. (2020). Financial literacy and fintech adoption in Japan. ADBI Working Paper 1095. Tokyo: Asian Development Bank Institute.

Scaling up Rural Financial Innovations for the Transformation of Inclusive Financial System: Micro-Financing Option in South West, Nigeria

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Abstract
There is growing evidence that designing financially sustainable models which increase outreach and scale of operations for the poor significantly contributes to the productivity of the rural areas. The situation in Nigeria is complex, as financial innovations have not been as effective as hoped in driving an inclusive financial system and providing easy access to financial services for the poor, primary due to challenges like low financial literacy, infrastructure gaps, and a high population growth rate that outpaces financial inclusion growth. Therefore, this study examined the impact of rural financial innovations on the transformation of the inclusive financial system in Nigeria. The study used primary data collected through interviews conducted with local villagers, MFI officials, village/local leaders, and religious personalities. Also, in analyzing the primary data, the study used descriptive and inferential statistics, probit and tobit regression techniques. The study concluded that the financial inclusion agenda has been considered and adopted in a concerted manner. The study recommended that the Central Bank of Nigeria should create a comprehensive regulatory framework for digital banking, which focuses on existing community resources and potentials to stimulate rural financial innovations for a transformative and inclusive financial system.

Key words: Digital banking; Inclusive financial system; Micro financing option; Rural financial innovations; Transformation of financial inclusion

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Introduction

Scaling up rural financial innovations is crucial for achieving sustainable and equitable development, particularly when an inclusive financial system is

driven by innovations. An inclusive financial system provides the users with appropriate financial services, enabling them to become financially secured, economically buoyant, and better able to plan for the future (Nino-Zarazua, Larquemin, and Castellani, 2024).

However, formal financial institutions have faced enduring challenges in providing financial services to the poor, with these difficulties attributed to a range of factors beyond just program design and targeting shortcomings. Systemic failures have prevented the poor, particularly in the rural areas, from achieving full financial inclusion, hindering their access to, usage of, and the quality of financial services they receive.

Evidence from literature has shown that a high percentage of people living in rural areas and those experiencing severe poverty are excluded formal financial services (Eze and Alugbuo, 2021). This is corroborated by Henning-Smith, Evenson, Corbett, Kozhimannil, and Moscovice (2017) that rural dwellers face challenges in accessing financial services due to barriers like banks and branches closures, long distances to reach banking institutions, and poor rural public transportation system. Despite financial services being accessible, some rural dwellers view conventional banking services as expensive and outrageous. This is confirmed by Simatele and Maciko (2022) that high bank charges discourages rural dwellers to patronize formal financial services.

The introduction of technology has reduced costs, making it easier and more affordable to provide financial services to rural populations (Simatele, Dube and Khumalo, 2021). Stringent conditions for opening bank accounts make it difficult for many rural dwellers to become customers. This low patronage has resulted in the closure of many bank branches in rural areas. This led to a surge in informal services providers, who created a wide-ranging of alternative financial services to satisfy the financial needs of rural areas (Rai, Dua, and Yadav, 2019).

In order to promote financial inclusion, both the government and non-governmental agencies have established microfinance programmes and institutions. These initiatives also include government policies and strategies designed to improve the productivity of micro, small and medium-scale enterprises (SMEs) (Kumar, Khurana and Sharma, 2022).

Basically, this requires a closer review of the distribution of their existing products and service areas and how they overlap with communities. Some microfinance institutions (MFIs) have stepped in to service rural poor clients who demand financial services at reasonable costs leading to the development of rural microfinance as a new market niche (Al-Amin and Mamum, 2022). This new niche has the potential to provide millions of rural poor dwellers, who reject conventional microfinance services, access to their compliant financial services that meet their specific needs (Imran, Haq, and Ozcatalbas, 2022).

Also, the surge in the availability of digital financial innovations (Internet and mobile communications) brought about by financial inclusion strategy has made some MFIs' transactions more digitized and convenient, enlarged financing channels, and provided more start-up and working capital for small and medium enterprises. Digital financial inclusion leverages modern technology like mobile phones and the internet to effectively extend financial services to previously unbanked

and under banked populations, enabling them to access a range of banking options through digital channels (Siddik and Kabiraj, 2020; Aziz and Naima, 2021 & Ratnawati, 2021).

Despites all these efforts, there are structural constraints limiting the implementation of digital financial services such as digital literacy, inadequate internet infrastructure, and inability to afford smartphones by rural dwellers (Khobragade et al., 2024 &Vo, Nguyen and Van, 2021).

Digital financial services and online banking offer a crucial alternative for providing financial services in rural areas that lack brick-and-mortar bank branches. However, the adoption of these services faces significant challenges, including internet connectivity, low digital literacy, and lack of trust.

In developing countries, the emergence of digital financial services, especially through mobile technology, has been a transformative force for financial inclusion. Mobile phones are successively bridged infrastructural and geographical gaps by enabling rural population to access essential financial services like savings, credit, and payments without needing a bank account. This approach has been particularly effective, with platforms like M-Pesa in Kenya serving as a prominent example. (Aziz and Naima, 2021). In Nigeria the internet-powered branchless banks (neobanks), such as Waya, Kuda, Opay, VBank, Moniepoint are increasingly popular, offering unified online banking services with convenience and low costs.

Demirgüç-Kunt, Klapper, Singer, Ansar and Hess, (2017) emphasized further that these platforms removed some of the barriers associated with traditional banking in rural areas. Koomson, Martey and Etwire (2023) argued that easy accessibility to digital savings and credit which are important channels for inclusive financial services, can help to reduce rural-urban migration by addressing some of its underlying causes.

Digital banking necessitated comprehensive digital financial literacy, which includes possessing knowledge and understanding of financial services, their utilization, and effective financial management. Furthermore, continuous education and guidance on various digital financial schemes and facilities that can be accessed are essential for users to stay informed and make sound decisions (Singh, 2022).

In developing countries, women often face barriers to access financial services due to socio-cultural customs, such as limited mobility, decision-making power, and ownership of assets, as well as lower digital literacy levels. Additionally, infrastructural gaps, like unreliable internet connectivity and high costs of mobile devices like smartphones, further restrict access to digital financial services, especially in rural areas. Poor infrastructure and unreliable internet connectivity disproportionate impact rural communities, hindering the adoption of digital payments and online financial services. (Mujeri and Azam, 2018 & Aziz and Naima, 2021).

In Nigeria, the growth of digital banking, including neobanks, occurred alongside the increased adoption of point-of-sale services (POS) terminals and automated teller machines (ATM). While POS and ATMs were earlier drivers of electronic payment, neobanks emerged later, using technology to create a new model of branchless banking. These digital-first services, along with widespread POS and ATMs agent networks, are crucial for expanding financial inclusion and reducing poverty in rural areas (Iriobe, Williams,

Ayodele and Taofeek, 2021).

Neobanks have disrupted the financial sector by offering a seamless online banking experience, low transaction fees, and innovative services that improve accessibility, usage and quality to consumers.

Recognizing and addressing limitations in previous studies, this research examined the benefits of neobanks' financial innovations. It specifically considered the characteristics and the local contexts of the communities within the study areas. The approach provided more robust results, suitable for policy making. This departure filled existing research gaps and formed a significant part of our contribution to knowledge.

Therefore, this study examines the role of financial innovations (cutting-edge technologies) in transforming the inclusive financial system and addresses their limitations in serving rural areas.

The rest of the paper are as follows: Section two deals with literature review, while section three is methodology, section four presents research findings and section five contains conclusion and recommendations.

Literature Review

Theoretically, financial literacy theory of financial inclusion forms the bedrock of rural financial innovation in the transformation of inclusive financial system. Naturally, finance influences not only the efficiency of resource allocation throughout the economy but also the comparative economic opportunities of individuals from relatively rich to poor households. Stein and Yannelis (2020) argument is that the accessibility of financial services and products can be seen as an investment in human capital, as it can equip individuals with the necessary resources and tools to enhance their economic situation (Huang, Gu, Lin, Alharthi, and Usman , 2023). This may be difficult due to lack of financial literacy among the rural dwellers. However, given the phasing out of bank branches and lacking of brick-and-mortar banking services in the rural areas in Nigeria there is need for high level of financial literacy to be inculcated into the lives of rural people so as to be able to cope with new high tech development in financial innovation in Nigeria. Although, the technological and information innovation brought about by financial inclusion has made transactions more digitized, convenient, and broadened financing channels (Bastante, 2020) but the use of technology is proportionally related to age and education level (Piotrowska, 2024). Definitely, financial literacy theory of financial inclusion assumption is that financial inclusion should be achieved through education that increases the financial literacy of citizens. Corroborating this, evidence from sub-Saharan Africa indicates that adults with a tertiary or higher education are over four times more likely to have access to formal bank accounts compared to those with only a primary or lower level of education (UNDP, 2016). Desai, Bhatt and Raval (2023) stress further that illiteracy is a significant obstacle to financial inclusion in rural areas. Often, illiteracy rates are inversely connected with the inclusiveness of financial services and products levels (Elzahi, 2022). For instance, majority of rural dwellers are illiterates and this is a great barrier to the inclusiveness of financial services in rural areas (Hassan, 2022; Hassouba, 2023 & Mossie, 2023). This is further reiterated by Liew (2020); Morgan and Long (2020); Chowdhury and Chowdhury (2023) & Hossain, Ibrahim

and Uddin (2023) that people who lack literacy find it difficult to manage their finances, get financial services, and comprehend financial goods. The pro arguments of the financial literacy theory are that the digital financial services of the online intelligent payment system serves as the framework that many enterprises relying on as transaction method, which significantly contributes to employment and entrepreneurship (Rotatori, Lee and Sleeva, 2021 & Senyo, Gozman and Karanasios, 2023). Also, at the micro level, financial inclusion has reshaped all walks of life. So, financial inclusion demonstrates the characteristics of digital transactions, intelligent products, and humanized services, which encourage enterprises to introduce and develop new technologies, and even reshape business models. Moreover, the expansion of financing channels makes enterprises more willing to invest in new technologies and equipment. Therefore, digital savings and access to digital credit are important channels for inclusive financial services to promote entrepreneurship (Koomson, Martey and Etwire, 2023). While the strong argument against the theory is that having financial literacy cannot guarantee that people will use financial services, most especially when they lack money, which is capacity to partake in one or more transactions. This is a typical rural areas trait where majority of the households are poor. It implies that being financial literate without money (capacity) cannot make one to participate in the financial sector. This argument and observation are very relevant to Nigeria situation where majority of populace are poor and not financially buoyant.

Empirical Review

Empirically, many studies have shown the linkage between financial literacy and financial performances, financial security, self-confident, and improved quality of life (Kaiser, Lusardi, Menkhoff, and Urban 2022; Loomis 2018). In Kenya Jack and Suri, (2014) & Fanta and Makina, (2019) found that M-Pesa App improves household income and reduce poverty. In their studies, Critchfield, Dey, Mota, and Patrabansh, 2019) observed that even though the online platforms and mobile apps provide financial services at lower fees but rural dwellers prefer to patronize bricks and mortar banks. Also, Kemal (2019) study established that there is a positive relationship between mobile banking, financial inclusion and economic growth in Pakistan. In addition, Aziz and Naima, (2022) found that mobile banking improves the financial access of rural dwellers in South Africa. Furthermore, Sharif, Naghavi, Hassam and Waheed (2022) observed that education reduced the gender gap in financial inclusion in low-income countries. In another perspective, Bhuiyan, Uddin and Milon (2023) study found that adoption of ICT infrastructure which facilitates the growth of digital financial services promote growth in developing countries. In their study, Sarfo, Musshoff and Webe (2023) results showed that financial literacy has a positive and significant impact on farmers' awareness of digital credit, and the improvement in education level increase people's efficiency in using the conveniences created by financial inclusion. Similarly, Sarwar, Diepeveen and Moreno (2023) established that the use of digital financial services in cash transfer has facilitated easy accessibility to financial services by the neglected rural areas. More so, Orazi, Lisana, and Vigiers (2025) results showed that age, income, education and gender of the mobile

account ownership improve digital financial inclusion that promotes inclusive growth in four Latin American nations ((Argentina, Brazil, Colombia, and Peru). Finally, Sarker and Rahman (2025) study observed that digital banking transformation bridged the financial gaps but there are problems of lack of infrastructure, digital illiteracy and gender inequalities in Bangladesh.

This study deviated from previous studies by examining three dimensions of financial inclusion: accessibility, usage, and quality of financial services on digital banking. Accessibility refers to the physical and digital availability of financial services, usage captures the frequency and extent to which these services are employed, and quality pertains to the appropriateness of services in meeting users' needs. These dimensions shape the ability of marginalized populations to participate in the formal economy and improve their financial well-being.

Also, taking into cognizance that mobile and internet banking are crucial to empowering marginalized communities in Nigeria, so rural dwellers with internet access can enjoy online banking services without leaving their localities. In addition, the study considered the benefits of these neobanks' financial innovations based on characteristics of each community and their local contexts in the study areas. From this perspective, financial exclusion gaps are significantly bridged. Therefore, addressing key challenges like accessibility (smartphone possessions) usage (internet facilities) and quality of the services (satisfaction) as barriers serve as innovative solutions that prioritize the unique needs of underserved populations. Consequently, these formed part of our contributions to existing knowledge.

Methodology

The study delved more on the local circumstances of the communities within the study area to determine their varying financial needs in terms of facilities on ground in order to develop the suitable local financial innovations for proper transformation of inclusive financial system in Nigeria using micro financing option.

Data Collection Procedures

The information was collected by trained staff who had prior meetings with local villagers, local government officials, village/local leaders, and farmers/artisans in the study area. During the meetings, these respondents verbally agreed to participate. Also, because local communities were intimately familiar with their own needs and economic situations, their active participation and engagement proved vital to the study's success.

The primary data was sourced with the use of interviews carried out by well-trained staff in the study area covering the six states making up the South West zone in Nigeria. The zone comprised of Oyo, Ogun, Ondo, Osun, Ekiti and Lagos states. Twenty (20) respondents were selected from each of the three (3) villages selected from each state, making a total of three hundred and sixty (360) respondents for the study. The reason for choosing South West zone is because it has the highest number of banks and microfinance banks in Nigeria. As at June, 2021 the total number of microfinance banks registered with Central Bank of Nigeria was 876 out of which 324 were from South West zone. Also, out of 4,437 commercial bank branches in Nigeria as at July 2023, South-West zone having 1920 branches, being a highly concentrated area of bank branches in Nigeria (The Nigerian Financial Services

Market Report, 2023).
The interviews provided detail information on the respondents and contains a large set of questions regarding the account ownership in terms of accessibility (smartphone possessions), usage (availability of internet facilities) and quality of the services (satisfaction) as barriers affecting them. Also, their social-economic characteristics including age, income, gender, occupation, other sources of microfinance, proximity to banks (distance), bank charges (cost), household savings, digital financial services (Waya, Kuda, Opay, VBank, and Moniepoint) and financial literacy (education) were used for the estimation in this study.

Method of data analysis

The study used Probit model to determine the relationship between dimensions of inclusive financial system and a number of socioeconomic and rural financial services characteristics. The outcome response variable is coded as one or zero; 1 for yes and 0 for no. The perception of barriers to using financial services is coded as a binary variable, where a value of '1' indicates the individual perceives a barrier, and a value of '0' indicates the individual does not. The unit of analysis in this study is the individual. Probit was used to estimate the probability that an individual with certain socioeconomic characteristics is affected by key challenges like accessibility (smartphone possessions), usage (availability of internet facilities) and quality of the services (satisfaction) as barriers. Addressing these barriers served as innovative solutions that prioritize the unique needs of underserved populations. The model is expressed as follows:

$$y_i^* = x'\beta + u_i \quad (1)$$

The probit models take as the dependent variable, y_i, the perception of barriers of access, usage and quality of financial services (1 if the person perceives the barriers and 0 if not) by respondent ; the unit of the study is the individual. It assumed that the perception of barriers to access, usage and quality depend on a latent variable y* which is determined by a set of exogenous variables, included in vector x', so that:

$$y_i = 1\ if\ y_i^* > 0;\ \ y_i = 0\ if\ y_i^* \leq 0 \quad (2)$$

where the subscript i represents individuals. The vector represents the parameters of the model and u is a normal distribution error term of average 0 and variance 1.
In line with our conceptual framework calibration and the theoretical arguments, the author specifies the equation based on adopting and modifying works of Sarwar, Diepeveen and Moreno (2023) by including age of the household, education, access to other sources of micro-financing (informal) etc. as the case may be arising from the Probit regression specification above, the Probit model for this study is however operationalized empirically in this study stated as follows:

$$Y_1 = \alpha_1 + \beta_{11}X_1 + \beta_{21}X_2 + \cdots\cdots\cdots\cdots\cdots\cdots + \beta_n X_n \quad (3)$$

$$Y_2 = \alpha_2 + \beta_{12}X_1 + \beta_{22}X_2 + \cdots\cdots\cdots\cdots\cdots\cdots + \beta_n X_n \quad (4)$$

$$Y_3 = \alpha_3 + \beta_{13}X_1 + \beta_{23}X_2 + \cdots\cdots\cdots\cdots\cdots\cdots + \beta_n X_n \quad (5)$$

The study model is specified as follows:

$$Yi = f\,(AGE, OTH\_SOURS\_MF, COST, DISTANCE, EDU\_HH, GEND\_HH, HH\_OCCUP, INCOME\_HH, DFS, SAVINGS) \quad (6)$$

Thus, financial inclusion system is a binary variable that takes the value 1 if the person fulfills at least one of the three conditions, and 0 otherwise. This dependent variable Y_i is the perception of attributes (barriers) to the use of financial services, 1 if the person perceives the barriers and 0 if not); the unit of the study is the individual. Thus Y_1, Y_2, and Y_3 are probability of rural dwellers perception of barriers to access micro-finance: (i) accessibility (smartphone possession); (ii) usage (availability of internet facilities) and (iii) quality (satisfaction).

X_j……X_n represent vector of the explanatory variables

β_i……..β_n represent the parameter or coefficients

ε represents the independent distributed error term and α_1, α_2 and α_3 show the intercept or constraint term.

In line with the study, three micro level models are stated as follows:

Model 1 (Objective 1): Accessibility (smartphone possession)

$$ACCESS_1 = \alpha_1 + \beta_{1,1} AGE_1 +, \beta_{2,1} EDU_{HH_2} + \beta_{3,1} GEND_{HH_3} + \beta_{4,1} HH_{OCCUP_4} + \beta_{5,1} INCOME_{HH_5} + \beta_{6,1} OTH_{SOURS_{MF_6}} + \beta_{7,1} COST_7 + \beta_{8,1} DISTANCE_8 + \beta_{9,1} DFS_9 + \beta_{10,1} SAVINGS_{10} + \varepsilon_i \quad (7)$$

Model 2 (Objective 2): Usage (availability of internet facilities)

$$USAGE_2 = \alpha_2 + \beta_{1,2} AGE_1 +, \beta_{2,2} EDU_{HH_2} + \beta_{3,2} GEND_{HH_3} + \beta_{4,2} HH_{OCCUP_4} + \beta_{5,2} INCOME_{HH_5} + \beta_{6,2} OTH_{SOURS_{MF_6}} + \beta_{7,2} COST_7 + \beta_{8,2} DISTANCE_8 + \beta_{9,2} DFS_9 + \beta_{10,2} SAVINGS_{10} + \varepsilon_i \quad (8)$$

Model 3 (Objective 3): Quality (satisfaction)

$$QUALITY_3 = \alpha_3 + \beta_{1,3} AGE_1 +, \beta_{2,3} EDU_{HH_2} + \beta_{3,3} GEND_{HH_3} + \beta_{4,3} HH_{OCCUP_4} + \beta_{5,3} INCOME_{HH_5} + \beta_{6,3} OTH_{SOURS_{MF_6}} + \beta_{7,3} COST_7 + \beta_{8,3} DISTANCE_8 + \beta_{9,3} DFS_9 + \beta_{10,3} SAVINGS_{10} + \varepsilon_i \quad (9)$$

Variables identification

The model considers both endogenous and exogenous variables. With respect to endogenous variables, the analysis of barriers to financial services using endogenous variables is based on the research survey question referring to the reasons for not having an account with a financial institution. These questions are classified into 3 categories according to the options in the answer: (i) Accessibility (do not possess smartphone) (ii) usage (no internet facilities or infrequent internet services) and (iii) quality of the financial services (not satisfied).

The endogenous variables include:

ACCESS = Accessibility (smartphone possessions)

USAGE = Availability of internet facilities

QUALITY = Quality of financial services (satisfaction)

The Probit models are fitted to estimate these categories using the exogenous variables described below. The exogenous variables considered are those that in accordance with the literature and availability of research survey data that may influence financial inclusion.

The Exogenous (Explanatory) Variables include:

Household Characteristics:

AGE = Age of the head of household (years)

EDU_HH = Education of the head of household (years)

GEND_HH = Gender of the head of household (male = 1, female = 0)

HH_OCCUP = Occupation of the head of household (farming = 1, non-farm = 0)

INCOME_HH = Head of the household income

Micro financing variables

OTH_SOURS_MF = Other Sources of Micro-financing

COST = Cost of transactions

DISTANCE = Geographical distribution of micro-financing

DFS = Digital financial services

*SAVINGS*_HH = Head of Household Savings

4.0 Findings

4.1 Descriptive and Inference analysis

The table 4.1 below contained the results of the study survey carried out on 360 households in six states in the south west of Nigeria. Although, evident from literature have shown that digital financial inclusion enhances the provision of financial services to unbanked and under banked (Siddik and Kabiraj, 2020 & Ratnawati, 2021) by using digital technology such as mobile phones, the Internet, and other electronic channels (Aziz and Naima 2021). However, our study survey results validated Aziz and Naima (2021) and Mujeri and Azam (2018) findings that infrastructural gaps, such as unreliable internet connectivity and high smartphone costs limit access in rural areas.

For example, the results in table 4.1 above and figures 1, 2 and 3 below showed that 210 (58.33% of 360) households have no internet facilities in their areas, while 148 (41.11% of 360) households do not have smart phones and 230 (68.89% of 360) households are not satisfied with the financial services being rendered in the study area. The inability to have good usage (satisfaction) was majorly caused by lack or infrequent internet facilities (quality) and non-possession or ineffective smart phones (access). This is also manifested in table 4.2 below which showed that out of 210 households that lacked internet facilities 115 (54.25% of

212) households have smart phones while out of 150 households that have internet facilities 53 (35.81% of 148) households do not have smart phones.

Table 4.1: Summary of Survey Data

Variables	Measures	Responses	Percent	Observations
Quality	No internet	0	58.33	210
	Having internet	1	41.67	150
Access	No smartphone	0	41.11	148
	Having smartphone	1	58.89	212
Usage	Not satisfied	0	63.89	230
	Satisfied	1	36.11	130
Age of the households	18-25 years	1	11.11	40
	26-35 years	2	33.06	119
	36-45 years	3	7.22	26
	46-55 years	4	12.78	46
	56-65 years	5	33.06	119
	66 and above	6	2.78	10
EDU_HH (Educational Qualification)	Primary	1	31.67	114
	Secondary	2	54.44	196
	Tertiary	3	13.89	50
GEND_HH	Male	1	59.72	215
	Female	2	40.28	145
HH_OCCUP	Farming	1	51.39	185
	Others	2	48.61	175
INCOME_HH	US$3.36 - US$10.07	1	37.50	135
	US$10.08 - US$16.78	2	21.67	78
	US$16.79 - US$26.85	3	16.94	61
	US$26.86 - US$40.27	4	10.56	38
	US$40.28 - US$46.98	5	6.38	23
	Above US$46.98	6	6.94	25
OTH_SOURCE_MF	Micro finance banks	1	32.50	117
	Money lenders	2	16.94	61
	Friends/Relatives	3	10.54	38
	Savings group/club	4	28.61	103
	Cooperative Society	5	10.83	39
	Rotational credits	6	0.56	2
COST Bank charges	High charges	1	80.00	288
	Multiple charges	2	20.00	72
DISTANCE (Distance to the nearest bank)	Less than 15 minutes	1	17.22	62
	Between 15 and 25 minutes	2	0.28	1
	Between 25 and 50 minutes	3	48.06	173
	More than 50 minutes	4	34.44	124
DFS (Digital financial services)	Waya	1	3.89	14
	Kuda	2	5.00	18
	Opay	3	65.28	235
	VBank	4	9.44	34
	Moniepoint	5	16.39	59
Savings	No savings A/C	1	38.33	138
	Having savings A/C	2	61.67	222

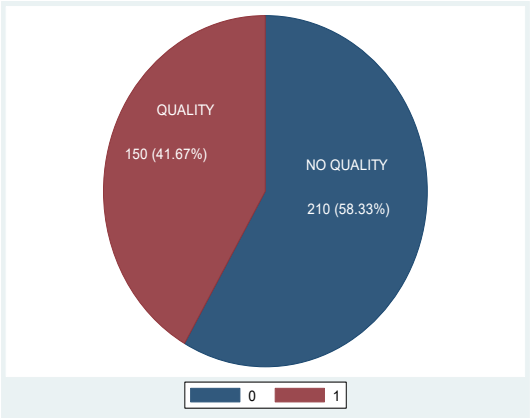


Figure 2: Access

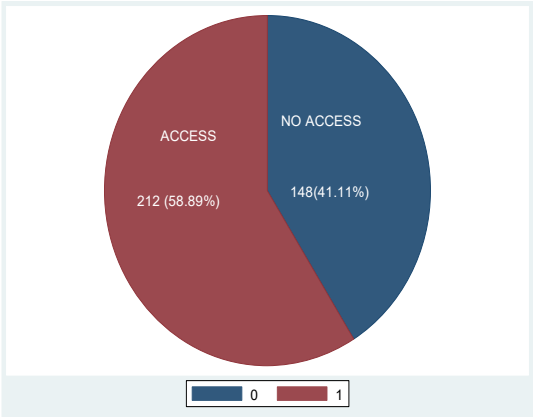


Figure 1: Quality

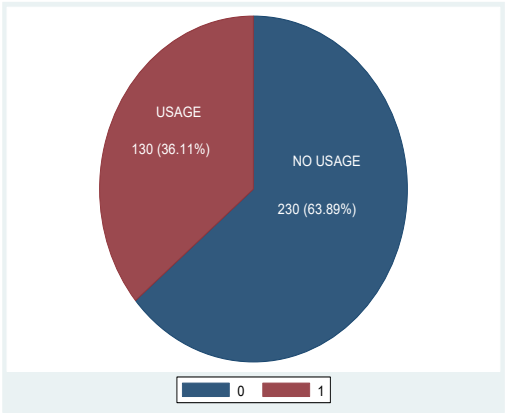


Figure 3: Usage

Also, the results showed that out of 150 that have internet facilities only 65 (50% of 130) households are satisfied with the financial service being provided. In addition, the results showed that out of 212 households that possessed smart phones 130 (56.96% of 230) households are not satisfied with the financial services rendered in the study area. In the appendix table 1 below the spearman's rank correlation results corroborated that there is a positive weak correlation (0.1271*) relationship between quality and usage but highly significant. Also, there is a positive weaker correlation (0.0992) between quality and access and (0.0522) between access and usage. All these accounted for lack of infrastructural facilities which are

hindering the easy accessibility to digital banking in most of the rural areas under the study. This is confirmed by Bhuiyan, Uddin and Milon (2023) study, which found that adoption of ICT infrastructure which facilitates the growth of digital financial services promote growth in developing countries Therefore, these infrastructural gaps must be fixed immediately.

Majority of the households within the average age ranging from 26 to 65 years (310) (Fig. 4) engaged in farming (185 (51.39%)), which is the characteristic of rural areas (Fig. 5). Within this age range of 310 households, even though 174 (56.13%) have smart phones (Table 4.3) but only 116 (37.42%) have access to internet facilities (Table 4.3) and 199 (86.52%) households are not satisfied with the service provided (Table 4.3 below). This is confirmed by a negative but weak correlation (- 0.1948*) between quality and age but highly significant (appendix table 1 below). Also, out of 212 (58.89%) that possessed smart phones 99 (46.7%) are farmers and 113 (53.3%) are in other occupations. The results in appendix table 1 below also confirmed a positive but weaker correlation (0.0458) between access and occupation. This circumstance explained the reason why majority of rural households, most especially farmers, do not have access to financial services.

Table 4.2: Measures of Association: Quality by Access; Quality by Usage; Access by Usage

Quality by Access				Quality by Usage				Access by Usage			
	Access		Total		Usage		Total		Usage		Total
Quality	1	0		Quality	0	1		Access	0	1	
0	115	95	210	0	145	65	210	1	131	81	212
%	54.25	64.19	58.33	%	63.04	50	58.39	%	56.96	62.31	58.89
1	97	53	150	1	85	65	150	0	99	49	148
%	45.75	35.81	41.67	%	36.96	50	41.67	%	43.04	37.69	41.11
Total	212	148	360	Total	230	130	360	Total	230	130	360
%	100	100	100		100	100	100		100	100	100

Source: Author's Compilation (2025)

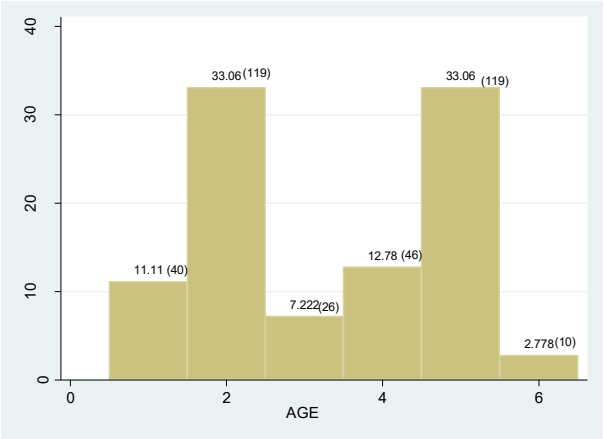


Fig. 4: Age

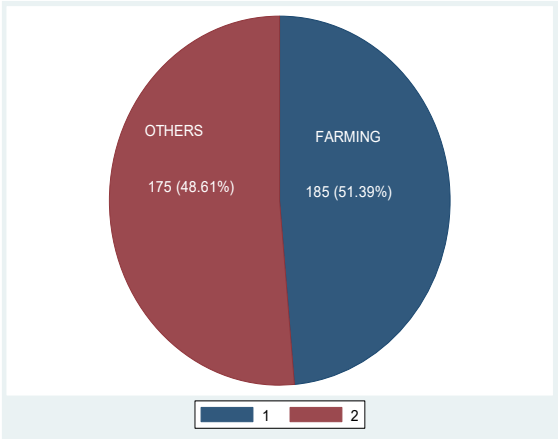


Fig. 5: Occupation

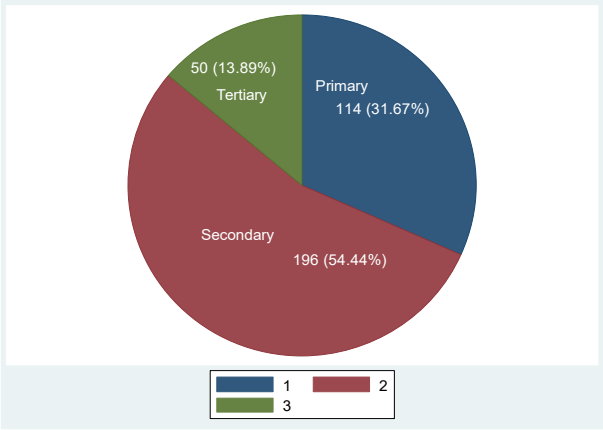
Source: Author's Compilation (2025)

Table 4.3: Measures of Association: Access by Age; Quality by Age; Usage by Age

Access by Age			Quality by Age			Usage by Age		
	Age	Total		Age	Total		Age	Total
Access	26 – 65 years	310	Quality	26-65 years	310	Usage	26 – 65 years	310
1	174	174	1	116	116	0	199	199
%		56.13	%		37.42	%		86.52

Source: Author's Compilation (2025)

Regarding educational qualification, majority of the households (196 (54.44%) have secondary school background with only 50 (13.89%) households have tertiary qualification and the remaining 141 (31.67%) households have primary school certificate (Fig. 6 below). Also, there is a positive weak correlation (0.1103*) between access and education but significant (appendix table 1 below). Hence, the low level of education limits their accessibility to financial services. This is in line with the argument that people who lack literacy find it difficult to manage their finances, get financial services, and comprehend financial goods (Liew, 2020; Morgan and Long, 2020; Chowdhury and Chowdhury, 2023 & Hossain, Ibrahim and Uddin, 2023). The gender inequality is evident in the larger percentage of the households of 215 (59.72%) are male and only 145 (40.28%) are female (Fig. 7). Even their educational background worsens the situation, with only 82 female households having secondary education out of the total of 196 (Table 4.4 below). Also, there is a positive but weaker correlation (0.0602) between education and gender (appendix table 1 below). This is supported by Sarker and Rahman (2025) findings that digital banking transformation bridged the financial gaps but there are problems of lack of infrastructure, digital illiteracy and gender inequalities in Bangladesh.



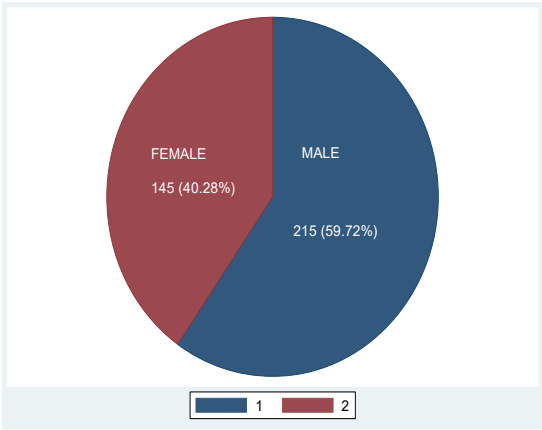


Fig 6: Education
Source: Author's Compilation (2025)

Fig 7: Gender

Table 4.4: Measures of Association: Education and Gender; Cost and Other sources of finance

	Education					Cost
Gender	2	1	3	Total	Other sources finance	1& 2
1	114	73	28	215	1	117 (32.50%)
%	53.02	33.95	13.02	100	4	103 (28.61)
2	82	41	22	145	2	61 (16.94%)
%	56.55	28.28	15.17	100	5	39 (10.56%)
Total	196	114	50	360	3	38 (10.56%)
%	54.44	31.67	13.89	100	6	2 (0.56%)

Source: Author's Compilation (2025)

Also, the study results showed that most of the households are patronizing microfinance banks (117 (32.5%)) and other informal financial institutions (243 (67.5%)) (Fig. 8 below) mainly because of high banks charges (288 (80%)) and multiple fees (72 (20%)) (Fig. 9 below). This is further breakdown in table 4.4 above that 117(32.50%), 103(28.61%), 61(16.94%), 39 (10.56%), 38 (10.56%) and 2 (0.56%) households patronized microfinance banks, savings group/club, money lenders, cooperative society, friends/relatives and rotational credits respectively. This is confirmed by the results in appendix table 1 below that there is a negative weak correlation (-0.1142*) between other sources of finance and cost but significant. This negative relationship shows that people prefer to patronize

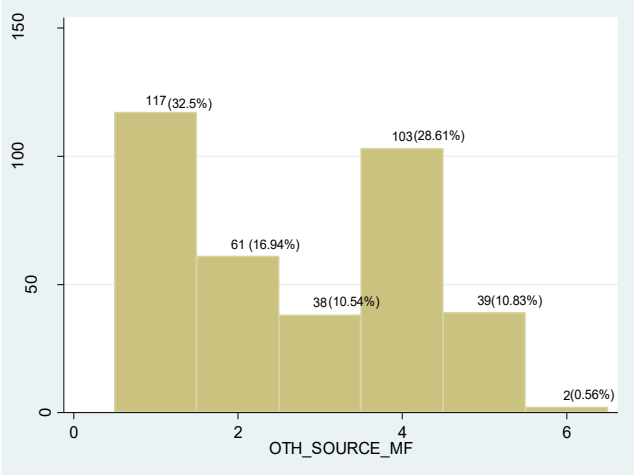


Fig. 8: Other sources of finance
Source: Author's Compilation (2025)

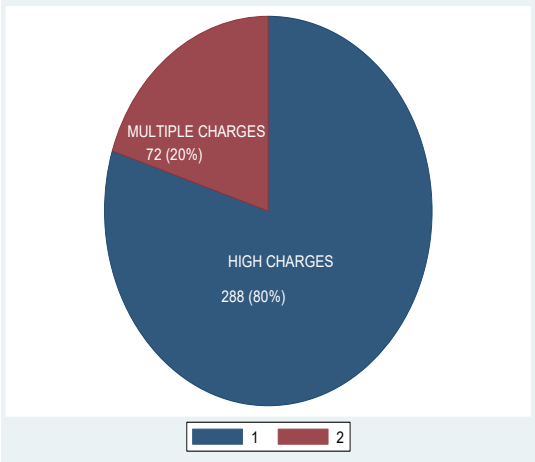


Fig. 9: Bank charges

informal financial institutions than formal banks in the rural areas due to banks high and multiple charges. This is confirmed by Simatele and Maciko (2022) findings that high bank charges are discouraging rural dwellers to patronize formal financial services.

Travelling long distance discouraged many households to patronize banks and majority of the households, 297 (82.50%) travelled up to 50 minutes or more to the nearest banks (Fig. 10 below). Also, the results in appendix table 1 below showed that there is a positive but weaker correlation (0.0204) between access and distance. This is affirmed by Henning-Smith, Evenson, Corbett, Kozhimannil, and Moscovice (2017) study that the need to travel greater distances to the nearest bank is made worse by the lack of good public transportation in many rural areas.

These barriers have restricted the rural communities to be using informal financing and digital banking platforms for their financial transactions. Opay is a popular digital banking platform being used by 235 (65.28%) households and followed by moniepoint of 59 (16.39%) households (Fig. 11 below). The results in table 4.5 below also showed that majority of the households (137 (58.30%)) with smartphones are using Opay and followed by 34 (59%) households using moniepoint. In addition, in table 4.5 below due to travelling long distance to the banks majority of the households (198 (84.5%)) preferred using digital banking Opay and Moniepoint platforms. This is confirmed by Demirgüç-Kunt, Klapper, Singer, Ansar and Hess, (2017) that digital banking platforms removed some of the barriers associated with traditional banking in rural areas. In the same vein, Sarwar, Diepeveen and Moreno (2023) study established that the use of digital financial services in cash transfer has facilitated easy accessibility to financial services by the neglected rural areas. Also, the results in appendix table 1 below showed that there is a positive but weaker correlation (0.0493) between distance and digital financial services. The implication of this is that the longer the

distance to the banks the more of digital financial services that are utilized by the households. This requires urgent action in the improvement of innovative ICT infrastructures, which can facilitate the growth of digital financial services in the rural areas.

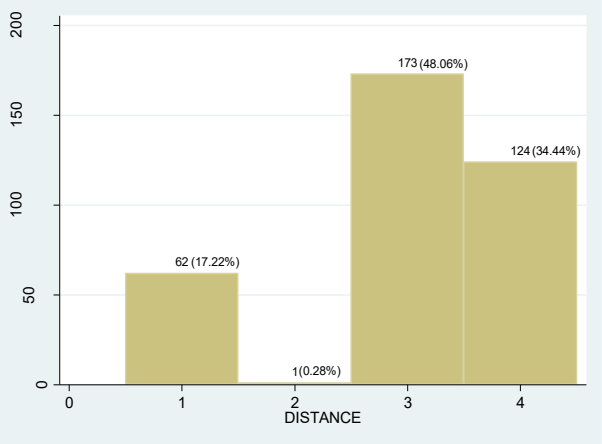


Fig. 10: Distance
Source: Author's Compilation (2025)

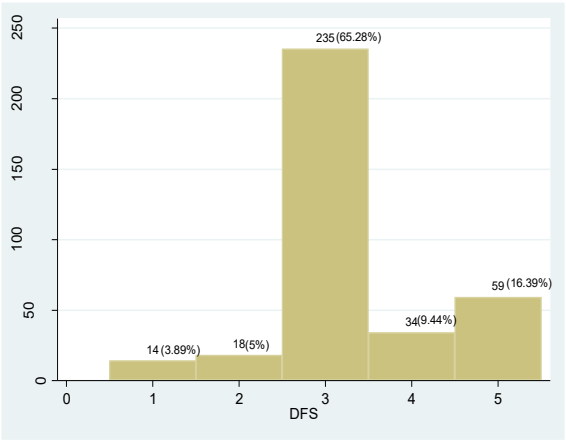


Fig. 11: Digital financial services

Table 4.5: Measures of Association: Digital financial services (DFS) and Access

	Digital financial services (DFS)							Digital financial services (DFS)				
Access	3	5	4	2	1	Total	Distance	3	5	4	2	1
1	137	34	26	8	7	212	3	117	27	22	3	4
%	58.3	57.6	76.5	44.4	50.0	58.9		49.8	45.8	64.7	16.7	28.6
0	98	25	8	10	7	148	4	81	23	8	7	5
%	41.7	42.4	23.5	55.6	50.0	41.1		34.5	39.0	23.5	38.9	35.7
Total	235	59	34	18	14	360	1 &2	37	9	4	8	5
%	100	100	100	100	100	100		15.7	15.2	11.8	44.4	35.7

Source: Author's Compilation (2025)

Figure 12 below showed that 222 (61.67%) households-maintained savings account with microfinance banks and other informal financial institutions because of long distance and high charges while only few of them maintained savings account with formal banks. Also, the results in table 4.6 below showed that out of 212 households that have smart phones only 143 (67.45%) households have savings A/C, out of 150 households that have internet facilities only 85 (56.67%) households have savings A/C and out of 230 households that are not satisfied with the formal banks financial services 128 (55.65%) of them have savings account with informal financial institutions. This is established in the results of table 4.7 below which showed the association of savings A/C and digital financial services (DFS), with majority of the households prefer using Opay155 (69.82%) and moniepoint 40 (18.02%) financial platforms. This is asserted by Mujeri and Azam (2018) & Aziz and Naima (2021) that infrastructure gaps such as unreliable internet connectivity and high smartphone costs limit access in rural areas. Therefore, scaling up innovative ICT infrastructures will facilitate the growth of digital financial services in the rural areas.

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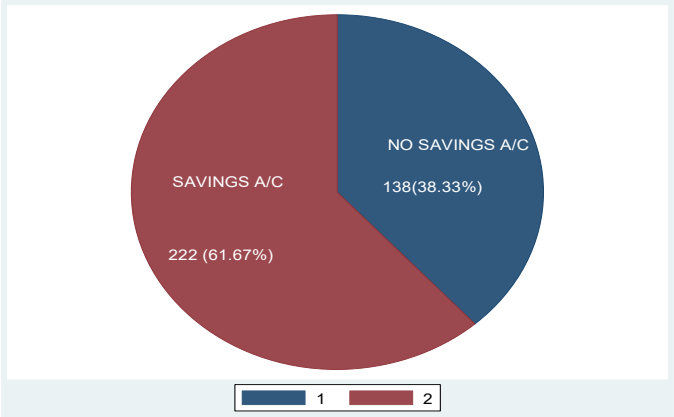

Fig. 12: Savings A/C
Source: Author's Compilation (2025)

Table 4.6: Measures of Association: Access by Savings; Quality by Savings; Usage by Savings

Access by Savings			Quality by Savings			Usage by Savings		
	Savings	Total		Savings	Total		Savings	Total
Access	2 1		Quality	2 1		Usage	2 1	
1	143 69	212	1	85 65	150	0	128 102	230
%	67.45 32.55	100	%	56.67 43.33	100	%	55.65 44.34	100

Source: Author's Compilation (2025)

Table 4.7: Measures of Association: Savings by DFS

	Digital financial services (DFS)				
Savings A/C	3	5	4	2	1
Total					
2	155	40	24	0	3
222					
%	69.82	18.02	10.81	0.00	1.35
100					

Source: Author's Compilation (2025)

4.2 Probit and Tobit Regression Results

The probit and tobit results indicate quality, access and usage as distinct variables that influence the barrier to access financial services by the households in the rural areas. In this study we used 5 percent level of significant to determine the correlations between factors that could affect the probability of accessing financial services by the rural households in Nigeria.

4.2.1 Quality

In the table 4.8 below, the Pseudo-R^2 (0.4124) at 1% significance level indicates that the independent variables included in the probit model explain significant proportion of the variations in financial innovation to drive inclusive financial system in Nigeria. It signifies that those variables in the model explain high level of the probabilities by which rural innovations can transform inclusive financial system. Also, a high p-value of 0.2424 in a Pearson goodness-of-fit indicates that the model fits the data well because it suggests the observed data is not significantly different from the data predicted by the model. Therefore, high p-value of 0.2424, which is greater than the typical significance level of 0.05 means the null hypothesis cannot be rejected, which in this case the model's distribution matches the observed data's distribution. In addition, the correct prediction rate obtained from probit model is 68.61%. This indicates that the probit model predicts 93% of the cases correctly. As for the tobit regression, the scale of 0.961962 is a coefficient that indicates the direction and magnitude of the relationship between the predictor variable and the response variable, and its value of ~0.96 suggests a strong and positive relationship. The p-value of 0.0000, which is actually (<0.0005) indicates a highly statistically significant result. Furthermore, the results in table 4.8 below explained that age and savings of the households are negatively related to quality but significant. The spearman rank correlation coefficient of -0.1948 also confirmed that there is a negative weak correlation between quality and age but highly significant. As for the savings, the coefficient of -0.0869 shows a negative weaker correlation between quality and savings (appendix table 1 below). A negative relationship explained that a 1% increase in age and a 1% increase in savings result in a 0.19% decrease and 0.35% decrease in quality, respectively. This is confirmed by the results of the study survey in Table 1 above that out of 129 (35.84%) households from the age of 56 and above only 29 (19.37%) of them have access to internet facilities (quality) (table 4.9 below). Also, the study survey results

(Table 1) confirmed that out of 222 (61.67%) households that have savings A/C only 85 (38.29%) have access to internet facilities (quality) (Table 4.9). Also, digital financial services (DFS), distance and other source of microfinance (OTH_SOURCE_MF) are positively related to quality. These indicate that a 1% increase in digital financial services, a 1% increase in distance and a 1% increase in other source of micro finance leads to 0.14% increase, 0.18% increase and 0.13% increase in quality, respectively. This is confirmed by the spearman rank correlation coefficients of 0.1056*, 0.1616* and 0.1152*, which showed that digital financial services, distance and other source of micro finance have positive but weak correlation with quality respectively and they are significant (appendix table 1 below). This is established by Demirgüç-Kunt, Klapper, Singer, Ansar and Hess, (2017) that digital banking platforms removed some of the barriers associated with traditional banking in rural areas. In the same vein, Sarwar, Diepeveen and Moreno (2023) study affirmed that the use of digital financial services in cash transfer has facilitated easy accessibility to financial services by the neglected rural areas. In addition, we applied tobit regression estimation technique for the robustness of the results in order to make sure that the results of probit regression are not biased by the truncation of the study explained variables. In the Table 4.8 it is perceived that in terms of signs and level of significance the coefficients of the explanatory variables under probit and tobit are the same except cost, which is an additional variable from tobit and significant. The results showed that a1% increase in cost result to a 0.25% increase in internet facilities (quality). The implication of this is that high or multiple cost discourages people to patronize banks and shift their loyalty to digital banking services, which motivate the providers in improving the quality of the services, most especially in the upgrading of internet facilities. This is confirmed by Simatele and Maciko (2022) that high bank charges are discouraging rural dwellers to patronize formal financial services. However, introduction of technology has cut down the charges on digital banking service, making it easier and cheaper in the provision of financial services to the rural dwellers (Simatele, Dube and Khumalo, 2021). Also, digital technologies are facilitating access to financial services and represent complement or alternative to traditional financial arrangements, which could not provide access point to the financially excluded group. Therefore, the policy implication is to make adequate provision for ICT infrastructure to drive digital banking services in rural areas.

Table 4.8: Probit and Tobit Regression Results for Quality

	Probit			Tobit		
Variable	Coefficient	Std. Error	Prob.	Coefficient	Std. Error	Prob.
AGE	-0.185188*	0.047304	0.0001	-0.155608*	0.040074	0.0001
COST	0.288904	0.175986	0.1007	0.250651***	0.147372	0.0890
DFS	0.141032***	0.076895	0.0666	0.108871***	0.063596	0.0869
DISTANCE	0.184473**	0.075005	0.0139	0.158042**	0.064885	0.0149
EDU_HH	-0.173434	0.117770	0.1408	-0.145333	0.100576	0.1485
GEND_HH	0.214966	0.145485	0.1395	0.169333	0.121900	0.1648
HH_OCCUP	-0.170744	0.150896	0.2578	-0.142642	0.128672	0.2676
INCOME_HH	-0.004587	0.044842	0.9185	-0.002278	0.038169	0.9524
OTH_SOURCE_MF	0.134262**	0.054532	0.0138	0.094683**	0.044524	0.0335
SAVINGS_HH	-0.354233**	0.156183	0.0233	-0.290593**	0.130396	0.0258
C	-0.479792	0.537453	0.3720	-0.237280	0.463614	0.6088
Pseudo-R^2 Pearson Classification Prediction	0.4124; p-value (0.0000) Chi-square = 327; p-value = 0.2424 68.61%			Scale 0.961962		0.0000

Source: Author's Compilation (2025)

Table 4.9: Measures of Association: Quality by Age; Savings by Quality

AGE							Quality			
Quality	2	5	4	1	3	6	Savings	0	1	Total
1	44	22	32	27	18	7	2	137	85	222
150										
%	29.33	14.67	21.33	18.0	12.0	4.7	%	61.71	38.29	100
100										

Source: Author's Compilation (2025)

4.2.2 Access

In the Table 4.10, the Pseudo R^2 (0.4457) at 5% significance level, which explained high value of variation indicating a better fit. Also, the Pearson goodness-of-fit test with p-value of 0.2956, which is greater than the typical significance level of 0.05 suggests that there is enough evidence to support that the model provides a good fit to the data. In addition, the correct prediction rate obtained from probit model is 62.78%. This indicates that the probit model predicts 60.56% of the cases correctly. As for the tobit regression, the scale of 0.760686 is a coefficient that indicates the direction and magnitude of the relationship between the predictor variable and the response variable, and its value of ~0.96 suggests a strong and positive relationship. The p-value of 0.0000, which is actually (<0.0005) indicates a highly statistically significant result. The results in table 4.10 below further indicate that the cost is negatively related to access but highly significant. This negative relationship indicates that a 1% increase in cost result to a 0.51% decrease in access. This is confirmed by Simatele and Maciko (2022) that high bank charges are discouraging rural dwellers to patronize formal financial services. Also, both gender and savings have positive and significant relationship with access, a 1% increase in gender and a 1% in savings leads to a 0.26% increase and a 0.27% increase in access, respectively. The results in appendix table 1 below also confirmed that there is a positive but weaker correlation (0.0876) between gender and access and for savings it is a positive weak correlation (0.1424*) but highly significant.

4.10: Probit and Tobit Regression Results for Access

	Probit			Tobit		
Variable	Coefficient	Std. Error	Prob.	Coefficient	Std. Error	Prob.
AGE	-0.027653	0.046223	0.5497	-0.015218	0.028696	0.5959
COST	-0.508860*	0.173949	0.0034	-0.352417*	0.115176	0.0022
DFS	0.022952	0.076760	0.7649	0.016468	0.048604	0.7347
DISTANCE	-0.011611	0.074389	0.8760	-0.008699	0.046684	0.8522
EDU_HH	0.141381	0.117092	0.2273	0.082273	0.072977	0.2596
GEND_HH	0.261736***	0.142894	0.0670	0.163836***	0.089038	0.0658
HH_OCCUP	-0.006628	0.149472	0.9646	-0.009746	0.092659	0.9162
INCOME_HH	0.036937	0.044914	0.4109	0.022465	0.027872	0.4202
OTH_SOURCE_MF	-0.030476	0.053468	0.5687	-0.016591	0.033142	0.6167
SAVINGS_HH	0.266163***	0.151885	0.0797	0.167141***	0.097542	0.0866
C	-0.158172	0.530399	0.7655	0.178608	0.340916	0.6003
Pseudo-R^2	0.4457; p-value (0.0167)					
Pearson	Chi-square = 322.88; p-value =					
Classification	0.2956 60.56%			Scale		
Prediction				0.760686		0.0000

Source: Author's Compilation (2025)

4.2.3 Usage

In the Table 4.8, the Pseudo-R^2 (0.3462) at 5% level of significant indicates overall satisfaction variability values for the model. It represents that those variables placed in the model explain high level of the probabilities by which rural innovations can transform inclusive financial system. Also, the Pearson goodness-of-fit test with a high p-value of 0.1607, which is greater than the typical significance level of 0.05 suggests that the observed data is consistent with the distribution predicted by the model. In addition, the correct prediction rate obtained from probit model is 62.78%. This indicates that the probit model predicts 62.78% of the cases correctly. As for the tobit regression, the scale of 1.095224, which is a coefficient that indicates the direction and magnitude of the relationship between the predictor variable and the response variable, and its value of ~1.10 suggests that there is a strong and positive relationship among the variables. The p-value of 0.0000, which is actually (<0.0005) indicates a highly statistically significant result. Furthermore, the coefficients of age and savings have positive relationship with usage and significant. The results indicate that a 1% increase in age and a 1% increase in savings result to a 0.09% increase and a 0.36% increase in access, respectively. This is confirmed by the results in appendix table 1 below that there is a positive correlation (0.1218*) between age and usage and significant, also there is a positive correlation (0.1645*) between savings and usage and highly significant.

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Table 4.11: Probit and Tobit Regression Results for Usage

	Probit			Tobit		
Variable	Coefficient	Std. Error	Prob.	Coefficient	Std. Error	Prob.
AGE	0.087842***	0.046106	0.0568	0.089145***	0.046013	0.0527
COST	-0.000378	0.179820	0.9983	0.017650	0.181097	0.9224
DFS	-0.051973	0.079534	0.5135	-0.047580	0.080275	0.5534
DISTANCE	0.081967	0.077850	0.2924	0.091126	0.078805	0.2475
EDU_HH	0.002389	0.117162	0.9837	0.010503	0.114963	0.9272
GEND_HH	-0.042189	0.142755	0.7676	-0.031401	0.141208	0.8240
HH_OCCUP	0.163295	0.149157	0.2736	0.162134	0.147786	0.2726
INCOME_HH	-0.026813	0.045078	0.5520	-0.025397	0.044766	0.5705
OTH_SOURCE_MF	0.028704	0.053970	0.5948	0.025825	0.053940	0.6321
SAVINGS_HH	0.364761**	0.156795	0.0200	0.366373**	0.158200	0.0206
C	-1.531827	0.576702	0.0079	-1.545795	0.598988	0.0099
Pseudo-R^2 Pearson Classification Prediction	0.3462; p-value (0.0390) Chi-square = 334.65; p-value = 0.1607 62.78%			Scale 1.095224		0.0000

Source: Author's Compilation (2025)

From the three regression results above, it is observed that savings A/C has a consistent positive and significant relationship with the access, quality and usage. Therefore, informal financial institutions savings accounts can be encouraged through high mobile phone penetration, which can accelerate growth in electronic transactions. This can be done by providing ICT infrastructure that can aid digital banking services in rural areas.

Conclusion

Given the large number of rural dwellers unable to access financial services due to constraints like inadequate internet connectivity and technological infrastructure, government and stakeholders should support rural MFIs by enabling them to channel resources to service those in need. Scaling up rural micro finance through digital banking offers a significant opportunity, as evidence suggests it can help millions of rural dwellers escape poverty. However, this requires prior investment in digital infrastructure (like mobile networks and internet) and financial literacy programmes to ensure users can understand and utilize digital tools effectively. Using probit regression method of analysis the study found that a 1% increase in age and a 1% increase in savings A/C results in a 0.19% decrease and a 0.35% decrease in quality, respectively. Also, a 1% increase in digital financial services, a 1% increase in distance and a 1% increase in other source of micro finance results to a 0.14% increase, a 0.18% increase and a 0.13% increase in quality, respectively. For robustness of the study, tobit regression method was used and cost was identified as additional variable, which showed that a 1% increase in cost leads to a 0.25% increase in internet facilities (quality). This has a unique policy implication for both the government and stakeholders. The probit regression carried out on access showed that a 1% increase in cost leads to a 0.51% decrease in access. Also, a 1% increase in gender and a 1% increase in savings A/C result to a 0.26% increase and a 0.27% increase in access, respectively. Using probit regression on usage the results indicate that a 1% increase in age and 1% increase in savings A/C leads to a 0.09% increase and a 0.36% increase in access, respectively. Therefore, it is pertinent for financial service providers to explore creative technological methods for delivering services that meet local needs and address service gaps in the rural areas.

Recommendations

In order to ensure that the rural poor are well targeted, the following recommendations are made:

The Central Bank of Nigeria should create a comprehensive regulatory framework for digital banking, which focuses on existing community resources and potentials to stimulate rural financial innovations for a transformative and inclusive financial system.

The providers of financial services should be mandated to introduce new technology which can reduce the charges, making it easier and cheaper in the provision of financial services to the rural dwellers.

Users of digital financial services should be encouraged to have knowledge and understanding of comprehensive digital financial literacy, their utilization, and effective financial management.

There is need to designing financial sustainable models that can increase outreach and scale up operations for the

poor in terms of increasing the provision of ICT infrastructure that can aid digital banking services in rural areas.

Proper incentives must be put in place to encourage the establishment of additional digital service providers in the rural areas.

REFERENCES

Al-Amin, M. & Mamun, H. A. (2022) Exploring the impact of microfinance on socio-economic development: Empirical evidence from Balunnaghar village. *International Journal of Social Science and Human Research*, 5(4). 1278-128.

Aziz, A. and Naima, U. (2021). Rethinking digital financial inclusion: Evidence from Bangladesh. *Technology in Society*, 64, 101509.

Bastante, M. (2020). Estudio Fintech 2020. In: Banco Interamericano de Desarrollo. Ecosistema Argentino. Julio. https://marcelobastante.com/wp/wp-content/uploads/2020/12/Estudio-Fintech-2020-Ecosistema-Argentino.pdf

Bhuiyan, M. R. I.; Uddin, K. S. and Milon, M. N. U. (2023). Prospective areas of digital economy in the context of ICT usages: An empirical study in Bangladesh. *FinTech*, 2(3). 641-656.

Chowdhury, E. K. and Chowdhury, R. (2023). Role of Financial Inclusion in Human Development: Evidence from Bangladesh, India and Pakistan. *Journal of the Knowledge Economy*, 1-26. http://dx.doi.org/10.1007/s13132-023-01366-x

Critchfield, T.; Dey, J.; Mota, N. and Patrabansh. S. (2019). Mortgage Experiences of Rural Borrowers in the United States. Cityscape, 21 (2). 9–32.

Demirgüç-Kunt, A.; Klapper, L.; Singer, D.; Ansar, S. and Hess, J. (2017). The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution. World Bank Group.

Desai, R.; Bhatt, K. and Raval, A. (2023). Financial Literacy and Its Impact on Financial Inclusion: Moderating Role of Gender. *The Journal of Wealth Management*.

Elzahi Saaid Ali, A. (2022). The Challenges Facing Poverty Alleviation and Financial Inclusion in North-East Kenyan Province (NEKP). In Empowering the Poor through Financial and Social Inclusion in Africa: An Islamic Perspective (pp. 25-47). Cham: Springer International Publishing.

Eze, E. and Alugbuo, J. C. (2021). Financial inclusion and poverty reduction in Nigeria: A survey- based analysis. *GSC Advanced Research and Reviews*, 7(03). 75–84.

Fanta, A. B. and Makina, D. (2019). The relationship between technology and financial inclusion: Cross-sectional evidence. In extending financial inclusion in Africa (pp. 211-230). Academic Press

Hassan, A. (2022). Challenges to Implementing Financial Inclusion in Sub-Rural Areas in Bauchi State (Doctoral dissertation). American University of Nigeria)

Hassouba, T. A. (2023). Financial inclusion in Egypt: the road ahead. Review of Economics and Political Science, (ahead-of-print).

Henning-Smith, C.; Evenson, A.; Corbett, A.; Kozhimannil, K. and Moscovice, I. (2017). Rural Transportation: Challenges and Opportunities. University of Minnesota Rural Health Research Center.

Hossain, M. M.; Ibrahim, Y. and Uddin, M. M. (2023). Finance, financial literacy and small firm financial growth in Bangladesh: The effectiveness of government support. *Journal of Small Business and Entrepreneurship*, 35(3). 336-361. https://doi.org/10.1080/08276331.2020.1793097

Huang, W.; Gu, X.; Lin, L.; Alharthi, M. and Usman, M. (2023). Do financial inclusion and income inequality matter for human capital? Evidence from sub Saharan economies. *Borsa Istanbul Review*, 23(1). 22-33. https://doi.org/10.1016/j.bir.2022.09.002

Imran, M.; Haq, S. U. and Ozcatalbas, O. (2022). Role of microcredit in sustainable rural development', in D. O. Özçatalbaş (Ed.), Sustainable Rural Development, IntechOpen, London.

Iriobe, G.; Williams, T. H.; Ayodele, T. and Taofeek, A. (2021). Financial technologies' evolution and traditional banking: A study of retail payments in Nigeria. *Global Journal of Business, Economics and Management*, 11(3).163-177. https://doi.org/10.18844/gjbem.v11i3.5369

Jack, W. and Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. *American Economic Review*, 104(1). 183-223.

Kaiser, T.; Lusard;i, A.; Menkhoff, L. and Urban, C. (2022). Financial Education Affects Financial Knowledge and Downstream Behaviors. *Journal of Financial Economics*, 145 (2.A). 255–72.

Kemal, A. A. (2019). Mobile banking in the government-to-person payment sector for financial inclusion in Pakistan. *Information Technology for Development*, 25(3). 475-502.

Koomson, I.; Martey, E. and Etwire, P. M. (2023). Mobile money and entrepreneurship in East Africa: the mediating roles of digital savings and access to digital credit. Information Technology People, 36:996–1019. https://doi.org/10.1108/ITP-11-2021-0906

Khobragade, A.; Balachandran, R.; Gupta, B.; Saroy, R.; Awasthy, S.; Singh, G. and Dhal, S. (2024). Mobile banking adoption for financial inclusion: insights from rural West Bengal. *Journal of Social and Economic Development*, 1-19.

Kumar, L.; Khurana, S. and Sharma, D. (2022). Fostering green finance for sustainable development: A focus on textile and leather small medium enterprises in Pakistan. *Sustainability,* 14(19). 11908.

Kumar, P.; Pillai, R.; Kumar, N. and Tabash, M. I. (2023). The interplay of skills, digital financial literacy, capability, and autonomy in financial decision making and well-being. *Borsa Istanbul Review*, 23(1). 169-183. https://doi.org/10.1016/j.bir.2022.09.012

Liew, T. P.; Lim, P. W. and Liu, Y. C. (2020). Digital financial literacy: A case study of farmers from rural areas in Sarawak. *International Journal of Education and Pedagogy*, 2(4). 245-251. https://myjms.mohe.gov.my/index.php/ijeap/article/view/11612

Loomis, J. M. (2018). Rescaling and Reframing poverty: Financial Coaching and the Pedagogical Spaces of Financial

Inclusion in Boston, Massachusetts. *Geoforum,* 95, 143–52.

Morgan, P. J. and Long, T. Q. (2020). Financial literacy, financial inclusion, and savings behavior in Laos. *Journal of Asian Economics*, 68, 101197. https://doi. org/10.1016/j.asieco.2020.101197

Mujeri, M. K. and Azam, S. (2018). Role of Digital Financial Services in Promoting Inclusive Growth in Bangladesh: Challenges and Opportunities. Institute for Inclusive Finance and Development, Working Paper, 55.

Nino-Zarazua, M.; Larquemin, A., and Castellani, D. (2024). Implementing Financial Health: Creating Mutual Success for Financial Service Providers and Clients. (Centre for Development Studies Report; Vol. July.

Orazi, S.; Lisana, M.B. and Vigiers, H. P. (2025). Digital financial inclusion in Latin America: An application of classification models. *In: Entramado*, 21(1).1-15. https://doi.org/10.18041/1900-3803/entramado.1.12332

Rai, K., Dua, S., and Yadav, M. (2019). Association of financial attitude, financial behaviour and financial knowledge towards financial literacy: A structural equation modeling approach. *FIIB Business Review*, 8(1), 51-60.

Ratnawati, K. (2020). The impact of financial inclusion on economic growth, poverty, income inequality, and financial stability in Asia. *The Journal of Asian Finance, Economics and Business (JAFEB)*, 7(10). 73-85

Rotatori, D.; Lee, E. J. and Sleeva, S. (2021). The evolution of the workforce during the fourth Industrial Revolution. *Human Resources Development International*, 24:92–103. https://doi.org/ 10.1080/13678868.2020.1767453

Piotrowska, A. (2024). Determinants of consumer adoption of biometric technologies in mobile financial applications. *In: Economics and Business Review*, 10(1). p. 81-100. https://www.ceeol.com/search/article-detail?id=1239518

Sarfo, Y.; Musshoff, O. and Weber, R. (2023). Farmers' awareness of digital credit: Does f inancial literacy matter? *Journal of International Development*, 1–9. https://doi.org/10.1002/jid.3774

Sarker, S. and Rahman, I. (2025). Digital Financial Inclusion in Bangladesh: Unlocking Opportunities for Marginalized Populations. *Asian Journal of Economics, Business and Accounting*, 25(3). 206-220. ISSN: 2456-639X

Sarwar, M. B.; Diepeveen, S. and Moreno, D. B. (2023). Cash transfers and digital financial inclusion: regional evidence from Asia Pacific with a focus on Bangladesh, Cambodia, and Nepal. ODI Report

Senyo, P. K.; Gozman, D. and Karanasios, S. (2023). Moving away from trading on the margins: Economic empowerment of informal businesses through Financial Technology. *Information System Journal*, 33:154–184. https://doi.org/10.1111/isj.12403

Sharif, S.P.; Naghavi, N. and Hassam Waheed, E. (2022). The role of education in filling the gender gap in financial inclusion in low-income economies. *International Journal of Emerging Markets*, 18:1–36.

Siddik, M. N. A. and Kabiraj, S. (2020). Digital finance for financial inclusion and inclusive growth. In Digital transformation in business and society: *Theory and cases*, 155-168.

Simatele, M., & Maciko, L. (2022). Financial inclusion in Rural South Africa: A qualitative approach. *Journal of*

Risk and Financial Management, 15(9). 376. https://doi.org/10.3390/jrfm15090376

Simatele, M. C; Dube, Z and Khumalo, S. (2021). How digital finance affects poverty: The transmission mechanism view. In (Ed.), Financial inclusion: basic theories and empirical evidence from African countries. https://doi.org/10.4102/aosis.2021.BK255.

Singh, S. (2022). A study on Financial Inclusion for Rural Development in India with reference to Tourism Sectors. *Research Review International Journal of Multidisciplinary*, 7(2). 33–39. https://doi.org/10.31305/rrijm.2022.v07.i02.006

Yasir, A.; Ahmad, A.; Abbas, S.; Inairat, M.; Al-Kassem, A. H. and Rasool, A. (2022). How Artificial Intelligence Is Promoting Financial Inclusion? A Study on Barriers of Financial Inclusion. In 2022 International Conference on Business Analytics for Technology and Security (ICBATS) (pp. 1-6). IEEE.

Vo, D. H.; Nguyen, N. T. and Van, L. T. H. (2021). Financial inclusion and stability in the Asian region using bank-level data. *Borsa Istanbul Review*, 21(1). 36 - 43.

Appendix

Table: Spearman rank correlation

	QUALITY	ACCESS	USAGE	AGE	EDU_H	GEND_H	H_OCCUP	INCOME~H	OTH_SO~F	COST	DISTANCE	DFS	SAVING~H
QUALITY	1.0000												
ACCESS	0.0992	1.0000											
	0.0600												
USAGE	0.1271*	0.0522	1.0000										
	0.0158	0.3230											
AGE	- 0.1948*	0.0381	0.1218*	1.0000									
	0.0002	0.4706	0.0208										
EDU_HH	-0.1175*	0.1103*	0.0682	0.0777	1.0000								
	0.0257	0.0364	0.1967	0.1411									
GEND_HH	0.0527	0.0876	0.0075	0.1336*	0.0602	1.0000							
	0.3191	0.0970	0.8867	0.0112	0.2544								
HH_OCCUP	-0.0799	0.0458	0.0948	0.0353	0.4146*	0.0168	1.0000						
	0.1305	0.3862	0.0724	0.5040	0.0000	0.7502							
INCOME_HH	0.0181	-0.0027	-0.0464	-0.0490	-0.0910	-0.1087*	-0.0131	1.0000					
	0.7322	0.9588	0.3805	0.3537	0.0846	0.0392	0.8050						
OTH_SOURCE~F	0.1152*	0.0056	0.1067*	0.2133*	0.1094*	0.0095	0.1669*	0.0228	1.0000				
	0.0288	0.9154	0.0430	0.0000	0.0379	0.8571	0.0015	0.6669					
COST	0.0845	-0.1750*	-0.0434	0.0051	-0.1290*	0.0850	-0.0695	0.0145	-0.1142*	1.0000			
	0.1094	0.0009	0.4119	0.9236	0.0143	0.1076	0.1885	0.7833	0.0302				
DISTANCE	0.1616*	0.0204	0.0713	-0.1570*	0.0776	0.0023	0.0836	0.0086	0.3135*	-0.1097*	1.0000		
	0.0021	0.6991	0.1769	0.0028	0.1420	0.9655	0.1131	0.8704	0.0000	0.0375			
DFS	0.1056*	0.0754	0.0281	-0.0230	0.1230*	0.1070*	0.0646	-0.1264*	0.1791*	-0.1061*	0.0493	1.0000	
	0.0453	0.1531	0.5946	0.6637	0.0196	0.0424	0.2216	0.0164	0.0006	0.0443	0.3513		
SAVINGS_HH	-0.0869	0.1424*	0.1645*	0.0571	0.2679*	0.0883	0.1705*	-0.0907	0.2205*	-0.1914*	0.2209*	0.2124*	1.0000
	0.0997	0.0068	0.0017	0.2798	0.0000	0.0942	0.0012	0.0856	0.0000	0.0003	0.0000	0.0000	

Performance Management, Organizational Learning and Operational Efficiency in Universities in Kenya

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Abstract

Performance management has been extensively studied with differing ideas of what it is. Universities implemented performance management for efficiency. Performance management's influence on operational efficiency with organizational learning as a mediator was investigated and confirmed by the study. Institutional and social cognitive theories grounded the study. Performance management was operationalized using the performance Management Behavior Questionnaire. Organizational learning applied the Dimensions of Learning Organization Questionnaire. A cross-sectional descriptive census survey design was carried out on a population of 72 universities with a response rate of 58. Data envelopment analysis showed that technical efficiency declined. There was no sustainability of performance management initiatives. A careful balance between quality and entrepreneurism within the university as well in the proliferation of universities and careful attention to sustainability of organizational learning were recommended.

Key words: Data Envelopment Analysis, Operational Efficiency, Organizational Learning, Performance Management, Universities.

Introduction

Over the years, there have been numerous costly performance management strategies in universities, yet monumental challenges with operational efficiency are still prevalent (Aversano et al. (2017). It involves goal setting, communication, monitoring of set targets and rewarding outcomes (Armstrong, 2019) and should lead to employee empowerment and significant improvements to performance and operational efficiency (Biondi & Russo, 2022; Kipesha & Msigwa, 2013). Universities in Kenya are facing the same dilemma,

mainly dwindling funding from public coffers and drastic decrease of eligible student numbers in the sector due to stringent examination management practices by the Kenyan Government through the Kenya National Examinations Council (Mungai et al. 2021; Wangenge-Ouma, 2008).

Nguyen-Duc et al. (2023) held that a critical success factor for organizational efficiency and effectiveness is organizational learning. This study investigated organizational learning as a mediator in the performance management, operational efficiency relationship. A greater number of organizations have adopted learning to remain competitive and enhance operational efficiency (Do et al. 2022; Senge, 1990). Various dimensions of organizational learning capabilities are practiced to some level in universities especially transfer of knowledge and leadership oriented towards learning (Ju et al. 2021).

Individual and group/team are levels where organizational learning occurs (Argote et al. 2021; Popova-Nowak & Cseh, 2015). Individuals learn by identifying gaps in performance and looking for ways to achieve optimal performance. This information is then converted into knowledge that is disseminated and becomes part of the norms in the university. Organizational learning leads to potential organizational behavior shifts, hence operational efficiency. Organizational learning is critical for sustaining organizational initiatives leading to desired objectives (Nzuve & Omolo, 2012).

Institutional theory is the major theory underpinning performance management and operational efficiency. An institution receives and gives information and stimuli from and to numerous sources both internal and external. Over time, this new information gives rise to shifts in how things are done altering behavior and patterns of thinking (Risi et al. 2023; Scott, 2017). The other theory is the social cognitive theory which proposes that actors must feel they can influence their actions. It is premised on the assumption that learning is conditioned on observation of others and a sense of mastery over oneself and the conditions prevailing (Almulla & Al-Rahmi, 2023; Bandura ,2011).

The value of the work is derived from a gap identified between the literature review and implemented outcomes (Argote et al. 2021). Literature on the existing body of knowledge on performance management, organizational learning and operational efficiency as well as institutional and social cognitive theories will be built on. Sustainability of the implemented approaches and the outcomes is another identified gap that will be addressed. A multi theoretical approach and the data envelopment analysis model were employed to establish whether the variables in this study influence operational efficiency and add unto empirical studies in this area. This investigation was a reference point for other researchers. The thesis also informed policy makers on how to achieve operational efficiency through performance management while taking into account organizational learning.

Literature Review

Performance management in varying forms was one of the strategies that have been implemented towards operational efficiency in universities (Camilleri, 2021). It takes cognizance of the employee's abilities through performance planning, implementation, feedback, evaluation, and rewards (Armstrong, 2019; DeNisi et al. 2021). Different types of performance management are used in universities with scope varying among different actors,

depending on diverse external and internal factors with the ultimate aim of enhancing operational efficiency. The operationalization of performance management was adapted from Kinicki et al. (2013) validated Performance Management Behavior Questionnaire, which has five elements; goal setting, communication, performance expectations, monitoring and rewards or sanctions. Performance management involves bringing together all parties to set challenging yet attainable goals which are clearly communicated, managing performance, monitoring and tying rewards to performance.

Higher education institutions have missions that promote learning yet they seldom use organizational learning as a means to improve the institution as a whole (Hertel & Barbara, 2023). Organizational learning methodically generates, preserves and transmits knowledge in the organization (Huber, 1991; Zhang et al. 2023). The aim of learning is to remain flexible in a fluid internal and external environment and to sustain a competitive edge. Organizational learning focuses on knowledge use within a university with learning occurring when information exploitation leads to shifts in potential behaviors (Popova-Nowak & Cseh, 2015). Tan and Olaore (2022) held that a critical success factor for organizational efficiency and effectiveness is organizational learning which is also a source of competitive advantage. Various dimensions of organizational learning capabilities are practiced to some level in universities especially transfer of knowledge and leadership oriented towards learning (Rose et al. 2020).

Learning is routine-based, experiential, target oriented and happens through encoding inferences from experience into policies, procedures and habits (Schulz, 2017). Behavior is also routine based (Cyert & March, 2015). What happens or has happened influences the future. This research operationalized organizational learning using the Dimensions of Learning Organization Questionnaire by Marsick and Watkins (2015) with the indicators being continuous learning, inquiry and dialogue, collaboration and team learning, systems thinking, shared vision, environmental scanning and strategic leadership as indicators.

Operational efficiency is defined as continuous improvement over time by performing the same activities in an enhanced manner (Chowdhury, 2024). It allows an organization to improve input output ratio by downscaling defects or producing better products in a shorter cycle (Bai et al. 2024). It is shown as the ratio between output and input that is used to run a business operation. It is the production of better quality output as effectively as possible (Halkos et al. 2016). New processes are then designed to overcome the mapped inefficient process. Assessment of input output conversion rate is important for production process improvement and management control (Camanho et al. 2024).

This research assumes that the technology within the decision-making units or universities has not changed over the four-year period for data envelopment analysis. Teaching and research efficiency was the focus of the study. Flegg et al. (2004) input and outputs model was adapted. Inputs were academic and academic equivalent staff, number of full time and full-time equivalent students and aggregate expenditure excluding staff costs. Outputs were number and quality of undergraduate graduands, post graduate degrees awarded, capitation, research grants received and consultancy fee generated**.** Published audited accounts for the respective years,

University Funding Board, Ministry of Education and State Corporation Advisory Committee filled returns and graduation booklets were utilized for obtaining secondary data.

Empirical evidence on the performance management, operational efficiency relationship has generated conflicting results. Bristol-Alagbariya et al. (2022), Van Thiel and Leeuw (2002) showed that performance management directed and measured strategic effort thus reducing inefficiency. Newberry (2002) and Newberry and Pallot (2005) reviewed performance management in New Zealand central government departments and established short term efficiency gains without long term sustainability or effectiveness. On the other hand, performance management led to reduced cycle time, costs as well as better quality goods (Rummler & Branche, 2012). Comparative efficiency in libraries in universities in the United States was tested applying data envelopment analysis. The study established that proper performance measurement and management was an important contributor to operational efficiency (Lee et al. 2013).

Contrarily, Handoyo et al. (2023); Verbeeten (2008) held that there were many instances of unintended performance management side effects including additional internal bureaucracy, a lack of innovation, a reduction of system or process responsibility, tunnel vision, sub-optimization and gaming of performance measures, and measure-fixation and thus operational efficiency was negatively correlated. A study by Van Helden (2005) on performance and operational efficiency concluded that attribution remains a big challenge for performance as well as operational efficiency. There was no statistical evidence that performance management led to operational efficiency (Davis & Albright, 2004). This is made worse if the focus is on rewards rather than training and development.

Ortenblad and Koris (2014) identified 73 publications on organizational learning in higher education with most of those publications being prescriptive as opposed to empirical. This is attributable to having several structural and cultural characteristics of universities that inhibit learning at the organizational level. High levels of specialization and structural differentiation among academic departments, research institutes or centers and administrative units as well as cultural values and reward systems that promote individual accomplishment. There are also weak feedback loops regarding performance and outcomes that often render universities difficult for organizational learning (Elrod et al. 2024).

Research Methodology

The primary aim was to establish the mediation role of organizational learning on performance management and operational efficiency.

The specific objectives were to;

i. Establish the influence of performance management on operational efficiency.
ii. Determine mediation role of organizational learning on performance management and operational efficiency.

The corresponding hypothesis were;

H_1: Performance Management influences Operational Efficiency.

H_2: Organizational Learning mediates Performance Management and Operational Efficiency.

Positivistic philosophy was adopted to test the various theories and empirically test for construct linkages. Descriptive cross-sectional survey research design was

employed. This research design was considered most appropriate given the breadth of the investigation, the nature of the statistics as well as the analysis performed (Blumberg et al. 2014). Primary and secondary data sources were used (Saunders & Darabi, 2024; Saunders & Thornhill, 2011). Primary data was collected using semi structured questionnaires through the drop and pick later method. Secondary longitudinal data was collected to measure operational efficiency was employed. Data envelopment analysis was employed using longitudinal data for the years 2016/2017 to 2019/2020.

A census was done on 72 Universities which constituted the population of the study. This was appropriate as the estimated time and cost were within the researcher's budget (Kothari, 2004). A pilot study on 10 universities revealed structural, logical, and typo weaknesses and errors in the questionnaire, which were corrected to make the instrument more effective before dissemination. The main change was to have operational efficiency measures collected solely from secondary data. The key target respondents of the study were the registrar, administration, or equivalent. Validated models applied from other studies included the Performance Management Behavior Questionnaire (Kinicki et al. 2013), Dimensions of Organizational Learning Questionnaire (Marsick & Watkins, 2015). Data Envelopment Analysis for operational efficiency for the financial years 2016/2017 to 2019/2020 from published annual accounts and graduation booklets was uploaded into data envelopment analysis programme (DEAP) for input output analysis.

All the administered questionnaires were serialized for tracking purposes and for follow-up to ensure completeness of the census. The returned questionnaires were then cleaned, coded and entered into excel ready for uploading into SPSS. Secondary data after verification was uploaded into Data Envelopment Analysis Programme (DEAP) for Data Envelopment Analysis (DEA). The questionnaire, the primary data collection instrument, was administered over six months from July 2019 to December 2019. Out of the census population of 72 universities, a response rate of 58 was achieved. This represented 80% response rate. This is favorable to other studies done in the university sub sector. Gudo and Olel (2011) looked at university expansion in Kenya from a quality perspective and achieved a response of 47%. The 80% response rate was considered adequate, as a response rate of between 30% and 50% is acceptable, especially where a study's key respondents' group is senior management (Saunders & Thornhill, 2011). The 5 Point Likert Type Scale was adopted with 1 being to a minimal extent and 5 to a very great extent.

Cronbach alpha coefficient for all the variables was 0.797 confirming consistency and reliability. Construct validity was achieved by use of validated models from other studies (Butt et al. 2023). In addition, research supervisors evaluated the constructs for face validity and guided formulation of the instrument improving its content validity. At the pre-testing stage, the instrument was further subjected to review and modification, considering the views of the expert respondents in organizational theory and behavior on the wording, structure, and content of the instrument. Ambiguous and unclear questions were rewritten, and others were dropped based on the guidance of the supervisors and researcher colleagues (Blumberg et al. 2014).

Test of Statistical Assumptions

Linearity, normality, multicollinearity, and homogeneity diagnostic tests were carried out as shown in table 1. The Shapiro Wilks test had a P-value above 0.05 for all the variables thus confirming normality. ANOVA tested for linearity confirming linear relationships between each predictor variable and response variable as the P value was above 0.05. The Levene test of homogeneity of variances confirmed homoscedasticity for all the variables with a value also above 0.05. The Variance Inflation Factor (VIF) tested for multicollinearity. The multicollinearity assumption has a threshold of the VIF value of 10 maxima. In this study, VIF was below the threshold thus no multicollinearity and all the predictor variables could be used in the model. These outcomes show that the data was fit for regression analysis.

Confirmatory factor extraction was done to confirm the structures of the three study variables performance management, organizational learning and operational efficiency. Using principal component factor analysis and eigenvalue$\geq$ 1, each variable was reduced into appropriate factors. Performance management employed the Performance Management Behaviour Instrument which was reduced into five factors based on eigenvalue>1 with factors accounting for 50.980 percent cumulative variance. The factors were goal setting, communication, performance expectations, monitoring and rewards and sanctions. Organizational learning was reduced into seven factors accounting for 56.978 percent of the cumulative variance.

Table 1: Diagnostic Test Results

	Normality (Shapiro Wilks Test)	**Linearity (ANOVA)**	**Homogeneity (Leven Test)**	**Multicollinearity (VIF Test)**
The threshold assumption is met if	$p > 0.05$	$p > 0.05$	$p > 0.05$	VIF 10 max
Performance Management	.756	.065	.059	1.882
Organizational learning	.081	.077	.099	1.729
Operational Efficiency	.598	.089	.159	1.767

Source: Researcher, (2024)

Hypothesis Testing
H_1: performance management influences operational efficiency

An overall composite index for performance management was computed from the five dimensions of the Performance Management Behaviour Questionnaire namely goal setting, communication, performance expectations, monitoring and rewards or sanctions, which each had its own measures. Data envelopment analysis was used to compute the weighted arithmetic mean which is the composite index for operational efficiency. The year 2019/2020 composite index of 0.786 was the one used for regression purposes as the primary data was also collected in the same year. Simple linear regression tested the hypothesis.

H_2: Organizational learning mediates the relationship between performance management and operational efficiency.

An organizational learning composite index was computed from the seven dimensions of the dimensions of organizational learning questionnaire namely continuous learning, inquiry and dialogue, collaboration and team learning, shared vision, systems thinking, environmental scanning and strategic leadership. Baron and Kenny's (1986) four step method tested this hypothesis. Step one involved regressing operation efficiency on performance management. The process moved to step two if step one yielded statistically significant results, but terminated if the results are not significant. In the latter case it would be concluded organizational learning does not mediate the relationship between performance management and operational efficiency. In step two, organizational learning was regressed on performance management. The process moved to step three if significance as the necessary condition for mediation existed, and if it is not significant the process stopped.

In step three, the influence of organizational learning on operational efficiency was tested using a simple linear regression. A statistically significant effect of organizational learning on operation efficiency was a necessary condition in testing for the mediation in step four. Finally, step four tested the influence of performance management on operational efficiency while controlling for the effect of organizational learning. Full mediation was realised if the effect of performance management on operational efficiency was significant in the presence of organizational learning. However, partial mediation is declared if, with organizational learning controlled, the effect of performance management on operational efficiency was not significant but has a value greater than zero.

Results and Discussion
Performance Management

This study focused on five dimensions of Performance Management Behavior Questionnaire namely goal setting, communication, performance expectations, monitoring, rewards and sanctions. Confirmatory factor analysis results indicated that goal setting, communication, performance expectations, monitoring are major predictors of performance management as compared to provision of consequences like performance based rewards and sanctions which had quite low mean.

Organizational Learning

Organizational learning was operationalized in this study using the Dimensions of Organizational Learning

Questionnaire developed and validated by Marsick and Watkins (2015).

Continuous Learning, Inquiry and Dialogue

The results showed that the university work environment allowed for open discussion on mistakes made with the aim of learning, management made available to employees financial and other resources to support learning and also enabled development of skills needed for future work tasks. However, there were three measures that had a very low mean and therefore needed intervention in continuous learning namely staff helped each other to learn with a low mean of 2.22, standard deviation of 0.867 and a coefficient of variation of 0.24 while staff identification of skills needed for future work tasks was also too low with 2.96 (standard deviation 1.010, coefficient of variation 0f 0.26).

Inquiry and dialogue were important indicators of organizational learning. The findings show that management treated staff with respect, thus encouraging contribution towards improving the university. Staff also treated each other with respect. There was need however, to expend more effort on building trust in the university as minimal effort was spent on building trust. Management needed to address accommodating alternative views during decision making. Staff should also be encouraged more to interrogate policies and practices and recommend appropriate changes as the mean was quite low.

Collaboration, Team Learning and Systems Thinking

Collaboration and team learning indicators results were in line with literature review. Work and projects were flexible and organized around teams. Members of teams/groups treated each other as equals. There was also focus by the teams/groups on the task at hand and delivery of the objectives. Group/ team discussions and decisions are based on the information available. The respondents however felt that teams/groups were not rewarded for their achievements as a team or group and there was skepticism that management will act on group/team recommendations.

Organizational learning requires the development of systems to capture learning. Universities regularly used two-way communication, such as suggestion systems, electronic bulletin boards, or open meetings. There were systems to measure performance gaps. There was also up-to-date database of employee skills. However, staff experienced difficulties accessing timely and relevant information for decision making. Making lessons learned available to all staff also remains a challenge. Management should focus on these two areas for effective organizational learning.

Shared Vision and Strategic Leadership

Universities invited employees to contribute to the organization's vision (mean 3.24; standard deviation 1.401; coefficient of variance 0.21). This was critical as it enhanced ownership of the university's agenda. Resources were availed to employees by universities to accomplish tasks (mean 3.22; standard deviation 1.073; coefficient of variance 0.21). Recognition of staff for taking initiatives however had a low mean compared to the other measures (mean 2.89; standard deviation 1.509; coefficient of variance 0.26). Mechanisms for recognizing staff for good results must be enhanced urgently. The results also showed that the respondent institutions had no flexibility on mode of delivery on pre negotiated assignments (mean 2.13; standard deviation 1.271; coefficient of

variance 0.25). This may be beneficial in some aspects as it implied that procedures are widely understood and accepted. It, however, required management to be aware of this inflexibility and where the situation called for it, managed flexibility was introduced to achieve particular desired ends.

Leadership in the university generally supported requests for learning opportunities and training (mean 3.20; standard deviation 1.360; coefficient of variance 0.29). There was also empowerment of others within the universities to drive the vision. Leaders continually looked for opportunities to learn (mean 3.52; standard deviation 0.960; coefficient of variance 0.24). These measures were encouraging for universities and needed to be continually monitored so as not to derail organization learning and affect negatively the relationship between performance management and operation efficiency.

Operational Efficiency

The study used secondary data to calculate operational efficiency for the 2016/2017 to 2019/2020 financial years. The inputs for the study adopted from (Flegg et al. 2004) were academic and academic equivalent staff, undergraduate students, postgraduate students and aggregate expenditure. The outputs were research, consultancy and other incomes, undergraduate degrees awarded adjusted for quality and postgraduate degrees. Published annual reports, graduation booklets and records from the University Funding Board proved instructive in getting the data for DEA analysis. Validation was done by cross checking the data from the Ministry of Education and State Corporation Advisory Committee. Data envelopment analysis allowed for the determination of technical efficiency of each university for each financial year.

Table 2 shows the least performing university had 38.87% technical efficiency score compared to the best relative in 2016/2017. This minimum score increased to 40.02% in 2018/2019. This low conversion ratio of teaching, research and consultancy inputs to outputs is alarming. There is urgent need to reevaluate approaches to improving this ratio by considering the optimum mix of inputs for the low performing universities.

Performance Management and Operational Efficiency

The influence of performance management and operational efficiency was tested using simple linear regression with the following hypothesis as shown in table 3;

H_1: performance management influences operational efficiency

Table 2: Technical Efficiency

Financial year	Unweighted Arithmetic mean	Weighted Arithmetic mean	Standard Deviation	Minimum
2016/2017	0.700	0.766	0.144	0.3887
2017/2018	0.661	0.684	0.132	0.4119
2018/2019	0.675	0.694	0.123	0.4002
2019/2020	0.730	0.786	0.131	0.4006

Source: Researcher, (2024)

Table 3: Test Results for the Effect of performance management and operational efficiency

Model	R	*Adjusted* R *Square*	*Std. Error of the Estimate*	*F Change*	*Sig. F Change*
1	.567[a]	0.319	0.936	200.908	0.000
Model		*def.*	*Mean Square*	*Sig.*	
1	Regression	1	181.249	.000[b]	
	Residual	412	0.875		
	Total	413			
Model		*Standardized Coefficients* Std. Error	*Sig* Beta		
1	(Constant)	0.051		0.000	
	PM	0.071	-0.567	0.000	

Source: Researcher, (2024)

Table 3 shows that the correlation coefficient for the relationship between performance management and operational efficiency was R=.567 indicating a positive relationship. The coefficient of determination (R^2) = 0.321 which indicates that 32.1 % of the variation in operational efficiency is due to changes in performance management. 67.9% is attributable to other factors not in this study. Analysis of variance (F=200.908, P-value = .000<0.05) confirmed the overall significance of the regression model. Thus, the regression model was fit for prediction. The results further indicated that beta coefficient for performance management and operational efficiency was significant (β=-0.567, t = -14.107, P-value=0.000<0.05), suggesting that for every one unit increase in performance management, operational efficiency decreased by 0.567 units, holding other factors constant. The hypothesis performance management influences operational efficiency was thus confirmed. The predictive model of performance management on operational efficiency was of the form;

OE = 3.210 – 0.567 PM,

Where, OE stands for operational efficiency and PM stands for performance management.

Performance Management, Organizational Learning and Operational Efficiency

The mediating role of organizational learning on performance management and operational efficiency was tested using Baron & Kenny (1986) four step method;

H_2: Organizational learning mediates the relationship between performance management and operational efficiency.

Results from the four steps are presented in Table 4.

Step one: Operational efficiency was regressed on performance management.

Table 4: Effect of Performance Management on Operational Efficiency

Model	R	*Adjusted R Square*	*Std. Error of the Estimate*	*F Change*	*Sig. F Change*
1	.567[a]	0.319	0.936	200.908	0.000
Model		Df	Mean Square	Sig.	
1	Regression	1	181.249	.000[b]	
	Residual	412	0.875		
	Total	413			
Model		Standardized Coefficients		Sig.	
		Std. Error	Beta		
1	(Constant)	0.051		0.000	
	Performance Management	0.071	-0.567	0.000	

Source: Researcher, (2024)

The results in Table 4 show a statistically significant and positive relationship between performance management and operational efficiency (R=.567). The coefficient of determination (R^2 = 0.319) shows that performance management explains 31.9% variation in operational efficiency (R^2 = 0.321, F=200.908, P<0.05). The regression model is statistically significant overall, as shown by F Ratio (F=200.908, P<0.05). The beta coefficient (β=-0.567) shows that for every one-unit increase in performance management, operational efficiency decreases by 0.567 units, holding other factors constant. The model's beta coefficient is also individually significant (P-value = 0.000<0.05). The first step in testing for the mediation of organizational learning in the relationship between performance management and operational efficiency is confirmed. Thus, the testing process proceeds to step two.

Step Two: Organizational learning was regressed on performance management.

Performance management significantly influences organizational learning (R^2 = 0.159). This finding indicate that performance management explains 15.9% variance in organizational learning. The regression model is statistically significant (F=80.989, P-value=0.00<0.05). There is a positive significant relationship between performance management and organizational learning (β= 0.425, t = 9.089, p-value = .000<.05). Having met step two mediation, the process proceeds to step 3.

Table 5 Effect of Performance Management on Organizational Learning

Model	R	Adjusted R Square	Std. Error of the Estimate	F Change	Sig. F Change
1	.425[a]	0.157	0.895	80.989	0.000
Model		*Df*	*Mean Square*	*Sig.*	
1	Regression	1	71.598	.000[c]	
	Residual	412	0.823		
	Total	413			
Model		*Standardized Coefficients*	*Sig.*		
		Std. Error	Beta		
1	(Constant)	0.045		1.000	
	Performance Management	0.045	0.425	0.000	

Source: Researcher, (2024)

Table 6: The Effect of Organizational Learning on Operational Efficiency

Model	*R*	*Adjusted R Square*	*Std. Error of the Estimate*	*F Change*	*Sig. F Change*
1	.081[a]	0.004	0.480	3.093	0.009
Model		*Df*	*Mean Square*	*Sig.*	
1	Regression	2	1.023	.009[d]	
	Residual	411	0.331		
	Total	412			
Model		*Standardized Coefficients*	*Sig.*		
		Std. Error	Beta		
1	(Constant)	0.028		0.000	
	Organizational learning	0.028	-0.086	0.009	

Source: Researcher, (2024)

In step three, operational efficiency was regressed on organizational learning. The results are presented in Table 6

The results in Table 6 indicates that organizational learning had a weak relationship with operation efficiency (R=0.081). Specifically, organizational learning explains 0.60% variation in operational efficiency (R^2 = 0.006). The model had F value of 3.093 with P value = 0.009 < 0.05, indicating that the model was

statistically significant overall. Beta coefficient (β= -0.081) shows that for every one unit increase in organizational learning, operational efficiency decreases by 0.081 units, other factors held constant. Organizational learning is individually statistically significant in the model (p-value = 0.009<0.05). The finding thus satisfies the third necessary condition for proceeding to step four of the test. Step four tested the influence of performance management on operational efficiency while controlling for the effect of organizational efficiency. The results are presented in Table 7.

Table 7 shows the relationship between performance management and organization learning on operational efficiency with a correlation coefficient of 0.578 with an increase of 0.011 from 0.567 when performance management was the only predictor in the regression model. The coefficient of determination increased to 0.329. Specifically, 32.9 % of the variation in operational efficiency was accounted for by the changes in performance management and organizational learning leaving 67.91% explained by other factors not in this study. The model is significant overall (F= 101.124, P-value = 0.000<.05) and thus suitable for analysis of the data.

Table 7: Multiple Regression Results for the effect of Performance Management and Organizational Learning on Operational Efficiency

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.578[a]	0.329	0.324	0.949	0.329	101.124	2	411	0

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	181.625	2	90.812	101.124	.000[b]
	Residual	372.681	411	0.898		
	Total	554.306	413			

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.209	0.046		69.163	0		
	Performance Management	-1.086	0.965	-0.551	-1.048	0.055	0.832	1.2
	Organization Learning	-0.09	0.082	-0.049	-1.101	0.272	0.832	1.2

a. Dependent Variable: Operational Efficiency
b. Predictors: (Constant), Performance Management, Organizational Efficiency
Source: Researcher, (2024)

The beta coefficient for performance management (β= -0.551, t= -1.048, p-value = 0.055>0.05) is not significant. The beta coefficient for organizational learning (β = -0.090, t = -1.101, p-value = .272> 0.05) is not significant. Thus, satisfying the condition which states that if the effect of mediating variable is controlled, then the effect of the independent variable on the dependent variable should not be significant if there is a mediator. The results provide evidence that organizational learning partially mediates the relationship between performance management and operation efficiency since the effect of performance management on operational efficiency has a positive value, although not significant.

Conclusion

The study showed some universities had relatively low technical efficiency and demonstrated to what extent investing on the variables of this study would positively impact operational efficiency in universities. The least performing university had 38.87% technical efficiency score compared to the best relative in 2016/2017. This minimum score increased to 40.02% in 2018/2019. This low conversion ratio of teaching, research and consultancy inputs to outputs is alarming. There is urgent need to reevaluate approaches to improving this ratio by considering the optimum mix of inputs for the low performing universities.

Mediation of organizational learning on the performance management and operational efficiency relationship was confirmed using Baron and Kenny (1986) four step regression method. Organizational learning was operationalized in this study using the Dimensions of Organizational Learning Questionnaire (Marsick & Watkins, 2015). A majority of the measures had relatively high means indicating good alignment of theory and empirical practice. The study findings however showed that t staff did not develop future skills and cooperation in learning had low means and thus needed more attenction.

Alternative, diverse views were considered when making decisions that had effect on the operations of the university and staff were encouraged to interrogate policies and practices and recommend appropriate changes also had low means. The most alarming measure in this category was that effort was spent on building trust in the university which had the lowest mean in organizational learning. Trust is essential for any initiative to be successful. Other measures that had low means were that staff had access to timely and relevant information for decision making and lessons learned are made available to all staff. Management made available financial and other resources for learning and the work environment allowed for open discussion on mistakes with the aim of learning from them was also aligned well with literature review.

Performance management and operational efficiency were positively correlated with a correlation coefficient of 0.567. The coefficient of determination was $R^2 = 0.321$ at a p value <0.05. Performance management accounts for 32.1% of change in operational efficiency. 67.9% is attributed to other factors. Arbo and Benneworth, (2007); Brudan, (2010); Ivaldi et al. (2022) also established that performance management influences operational efficiency. This is also in tandem with institutional theory which suggest that a single performance management dimension or combinations of the construct influences the performance management and operational efficiency relationship more than others (Denisi et al. 2021). The hypothesis that performance management influences

operational efficiency was thus confirmed. Hypothesis two (H_2) was that organizational learning mediated the relationship between performance management and operational efficiency was also confirmed. Baron and Kenny's (1986) four step path analysis was employed. There was a partial mediation of organizational learning between performance management and operational efficiency. The influence of performance management on operational efficiency is indirect through organizational learning dimensions and therefore organizational learning is a necessary condition for the influence of performance management on operational efficacy.

Recommendations

Sustainability of Performance Management Initiatives

Data envelopment analysis showed that the rapid expansion in number of universities across counties in Kenya for the last few decades may not have achieved increasing returns to scale in the university sector as majority of the universities were operating at non optimal returns to scales for the four years under study. Technical efficiency also remained quite low in some universities despite heavy investment over the years in performance management. The universities have however spurred economic growth in the counties of location especially nearby towns and cities. The situation is made worse by lack of specialization of the universities in particular subject areas.

A number of performance management initiatives have been implemented over the years. Though the problem of attribution exists, operational efficiency measures were not commensurate with the level of investment over the years. This study confirmed that organizational learning mediated the performance management, operational efficiency relationship. The study therefore recommends adoption of organizational learning. In addition, the study recommends the adoption of the Marsick and Watkins (2015) model to implement organizational learning in universities. Institutional theory is also recommended for entrenchment of new knowledge into policies and procedures for sustainability of performance management initiatives. Deinstitutionalization strategies of inhibitors of implemented or intended initiatives should be carefully utilized also for sustainability. All agents must be aware of the institutional theory dynamics and act to enhance performance management and operational efficiency through organizational learning.

Rewards and Sanctions

The Performance Management Behaviour Questionnaire showed that performance planning, communication, setting performance standards and monitoring was executed relatively well in line with literature review. Rewards and sanctions in universities was not as envisioned in literature. Strengthening rewards for good performance while sanctioning inadequate performance was recommended as a way of strengthening performance management and organizational learning.

This is made especially difficult as salaries are union based. There are rewards including recognition that come from being specialists in a particular area either as an individual, team or faculty. The culture of excellence in particular faculties attract research, faculty as well the best students. To achieve this level of excellence that is self-propelling towards rewards takes time and is almost at the mastery level. The study proposes commensurate rewards at every level including the beginner's level.

Organizational Learning

Disciplines all over the world are now more porous and open, willingly sharing and learning across universities. Levels of learning have collapsed. Publications of latest research are more accessible. This openness, willingness to share, platforms that capture and embed learning allow for learning within and across disciplines. Unfortunately, there is perception that management and management strategies are for administrative thus limiting learning. A shared vision is a critical component of learning. To enhance compliance, administrators tend to prescribe policies and reports that must be accomplished by all cadre of staff including faculty. These tend to be viewed as intrusive to the real work. This perception sometimes leads to reports that are misleading and inaccurate for compliance.

The study recommends a strategy that ties benefits of learning to performance management strategies. Faculty should be enticed into cooperating or buying in rather than imposed upon. Communication on the expectations though important is not always enough as shown by the study. Research grants, promotions and other rewards should be tied to performance management strategies implementation. In addition, entrenchment of new knowledge from organizational learning should be the norm to avoid information hoarding.

Contributions of the study

A positive relationship between performance management and operational efficiency was confirmed. There have been vast resources that have been committed to performance management by universities over the years. Goal setting, communication, performance expectation, monitoring, rewards and sanctions need to be continuously studied to ensure alignment between performance management initiatives and operational efficiency. Managers should, therefore, be deliberate and aware of the changing environment within and without the university, with an eye on doing more and better for less. This study further suggests an indirect relationship between performance management and operational efficiency. The study findings indicate an indirect relationship between performance management and operational efficiency when organizational learning was introduced as a mediator and that organizational learning states partially mediate this relationship.

Institutional and social cognitive theories are supported by the findings. Without institutionalization, sustainability of performance management and organizational learning will not be sustainable. The nature or type of the university, county, and size significantly affect the variables in this study. When implementing a performance management system or addressing operational efficiency, the university must consider formulating a policy that allows for greater success given the context. Data envelopment analysis exploration of technical efficiency and returns to scale also leads to the conclusion that policy needs to address how to make universities a better fit for initiatives aimed at boosting operational efficiency.

Limitations of the study research

The use of a cross-sectional survey design except for data on operational efficiency data envelopment analysis, which dealt with data for 4 years from 2016/2017 to 2019/2020. The current study did not, therefore, take into account the longitudinal aspect for the other 2 variables, so the results obtained in this study would be enhanced if the study were repeated using longitudinal data for all the variables. The other limitation is that over time,

universities in Kenya have invested in several performance management initiatives, including performance contracting, ISO, and management objectives. This study did not address the operational efficiency of each initiative. This gives rise to attribution problem. The study also had senior administrative managers as respondents. There may be different results if the respondents were faculty, students, or staff at lower cadres.

Suggestions for further research

This study focused on operational efficiency but did not distinguish technical and scale efficiency as well as teaching and research efficiency in each university as opposed to the sector as a whole. The study does not consider the particular university's objectives, which influences how the factors under study are implemented. The study suggests addressing this shortcoming, especially in specialized universities.

It is suggested that further exploration of social efficiency, which looks at aspects of customer and societal satisfaction, be undertaken. Another recommended area of further study is the consideration of faculties and disciplines when computing operational efficiency. Cost and research incomes vary across different disciplines with universities offering medical and related courses having higher operational efficiency (Thanassoulis, 2011). This was not considered in this study and would be useful when considering operational efficiency of universities in Kenya.

REFERENCES

Aguinis, H., Joo, H., & Gottfredson, R. K. (2012). Performance management universals: Think globally and act locally. *Business Horizons*, *55*(4), 385-392.

Almulla, M. A., & Al-Rahmi, W. M. (2023). Integrated social cognitive theory with learning input factors: The effects of problem-solving skills and critical thinking skills on learning performance sustainability. *Sustainability*, *15*(5), 3978.

Arbo, P., & Benneworth, P. (2007). Understanding the regional contribution of higher education institutions: A literature review.

Argote, L., Lee, S., & Park, J. (2021). Organizational learning processes and outcomes: Major findings and future research directions. *Management science*, *67*(9), 5399-5429.

Armstrong, R. (2019). Revisiting strategy mapping for performance management: a realist synthesis. *International Journal of Productivity and Performance Management*, *68*(4), 721-752.

Aversano, N., Manes-Rossi, F., & Tartaglia-Polcini, P. (2017). Performance measurement systems in universities: a critical review of the Italian system. *Outcome-based performance management in the public sector*, 269-287.

Bai, C. A., Sarkis, J., & Xue, W. (2024). Improving operational efficiency and effectiveness through blockchain technology. *Production Planning & Control*, *35*(9), 857-865.

Bandura, A. (2011). The social and policy impact of social cognitive theory. *Social psychology and evaluation*, 33–70.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical

considerations. *Journal of personality and social psychology*, *51*(6), 1173.

Biondi, L., & Russo, S. (2022). Integrating strategic planning and performance management in universities: a multiple case-study analysis. *journal of management and governance*, *26*(2), 417-448.

Blumberg, B., Cooper, D., & Schindler, P. (2014). *EBOOK: Business research methods*. McGraw Hill.

Brudan, A. (2010). Rediscovering performance management: systems, learning, and integration. Measuring Business Excellence, 14(1), 109–123.

Butt, N. S., Bashir, M. A., Alzahrani, S. H., Gazzaz, Z. J., & Malik, A. A. (2023). Evaluation of construct validity and reliability of the Arabic and English versions of biggs study process scale among Saudi University students. *Sage Open*, *13*(2), 21582440231181090.

Chowdhury, R. H. (2024). AI-driven business analytics for operational efficiency. *World Journal of Advanced Engineering Technology and Sciences*, *12*(2), 535-543.

Camanho, A. S., Silva, M. C., Piran, F. S., & Lacerda, D. P. (2024). A literature review of economic efficiency assessments using Data Envelopment Analysis. *European Journal of Operational Research*, *315*(1), 1-18.

Camilleri, M. A. (2021). Using the balanced scorecard as a performance management tool in higher education. *Management in Education*, *35*(1), 10-21.

Cyert, R., & March, J. (2015). Behavioral theory of the firm. In *Organizational Behavior 2* (pp. 60-77). Routledge.

Davis, S., & Albright, T. (2004). An investigation of the effect of balanced scorecard implementation on financial performance. Management accounting research, 15(2), 135–153.

DeNisi, A., Murphy, K., Varma, A., & Budhwar, P. (2021). Performance management systems and multinational enterprises: Where we are and where we should go. *Human Resource Management*, *60*(5), 707-713.

Do, H., Budhwar, P., Shipton, H., Nguyen, H. D., & Nguyen, B. (2022). Building organizational resilience, innovation through resource-based management initiatives, organizational learning and environmental dynamism. *Journal of Business Research*, *141*(C), 808-821.

Elrod, S., Lawson, A., & Salomone, S. (2024). Leading Systemic Change: Using the Change Leadership Toolkit for Long-Lasting Results. Change: The Magazine of Higher Learning, 56(3), 46-52.

Flegg, A. T., Allen, D. O., Field, K., & Thurlow, T. W. (2004). Measuring the efficiency of British universities: a multi-period data envelopment analysis. *Education Economics*, *12*(3), 231-249.

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The qualitative report*, *8*(4), 597-606.

Gudo, M. C. O., & Olel, M. A. (2011). Students' admission policies for quality assurance: Towards quality education in Kenyan Universities. *International Journal of Business and Social Science*, *2*(8).

Halkos, G. E., Matousek, R., & Tzeremes, N. G. (2016). Pre-evaluating technical efficiency gains from possible mergers and acquisitions: evidence from Japanese regional banks. *Review of Quantitative Finance and Accounting*, *46*(1), 47-77.

Hertel, J. P., & Millis, B. (2023). *Using simulations to promote learning in higher education: An introduction*. Routledge.

Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. *Organization science*, *2*(1), 88-115.

Ivaldi, S., Scaratti, G., & Fregnan, E. (2022). Dwelling within the fourth industrial revolution: organizational learning for new competences, processes and work

cultures. *Journal of Workplace Learning*, *34*(1), 1-26.

Kinicki, A. J., Jacobson, K. J., Peterson, S. J., & Prussia, G. E. (2013). Development and validation of the performance management behavior questionnaire. *Personnel psychology*, *66*(1), 1-45.

Kipesha, E. F., & Msigwa, R. (2013). Efficiency of higher learning institutions: Evidences from public universities in Tanzania. *Journal of Education and practice*, *4*(7), 63-73.

Kithinji, M. M. (2023). Higher Education Policy and Reforms in Kenya. In *The Palgrave Handbook of Contemporary Kenya* (pp. 29–41). Cham: Springer International Publishing.

Lee, C. W., Kwak, N. K., & Garrett Jr, W. A. (2013). A comparative appraisal of operational efficiency in US research-university libraries: A DEA approach. In *Applications of Management Science* (pp. 117–130). Emerald Group Publishing Limited.

Marsick, V. J., & Watkins, K. (2015). *Informal and incidental learning in the workplace* (Routledge Revivals). Routledge.

Mukhwana, E. J., Kande, A., & Too, J. (2017). Transforming university education in Africa: Lessons from Kenya. *African journal of rural development*, *2*(3), 341-352.

Mungai, D. K., Maina, M., & Kungu, J. N. (2021). Effect of internal control systems on financial performance of public universities in Kenya. *Research Journal of Finance and Accounting*, *12*(16), 80-94.

Newberry, S. (2002). Intended or unintended consequences? Resource erosion in New Zealand's government departments. *Financial Accountability & Management*, *18*(4), 309-330.

Newberry, S., & Pallot, J. (2005). New Zealand public sector management and accounting reforms. International Public Financial Management Reform: Progress, Contradictions and Challenges. J. Guthrie, C. Humphrey, LR Jones and O. Olson (Eds.). Greenwich, Information Age Publishing, 169-195.

Nzuve, S. N., & Omolo, E. A. (2012). A study of the practice of the learning organization and its relationship to performance among Kenyan commercial banks. *Problems of Management in the 21st Century*, *4*(2), 45-56.

Onyango, J. A., Keraro, V., Irungu, A., & Aluoch, M. (2015). Adequacy of the Commission on Revenue Allocation Parameters for Equitable Revenue Sharing with Counties in Kenya. *International Journal of Innovative Finance and Economic Research*, *3*(4), 1628.

Örtenblad, A. (2018). What does "learning organization" mean?. *The Learning Organization*, *25*(3), 150-158.

Örtenblad, A., & Koris, R. (2014). Is the learning organization idea relevant to higher educational institutions? A literature review and a "multi-stakeholder contingency approach". International Journal of Educational Management, 28(2), 173-214.

Popova-Nowak, I. V., & Cseh, M. (2015). The meaning of organizational learning: A meta-paradigm perspective. *Human Resource Development Review*, *14*(3), 299-331.

Rose, A. L., Dee, J., & Leisyte, L. (2020). Organizational learning through projects: a case of a German university. *The Learning Organization*, *27*(2), 85-99.

Rummler, G. A., & Brache, A. P. (2012). *Improving Performance: How to Manage the White Space on the Organization Chart. The Jossey-Bass Management Series*. Jossey-Bass, Inc., 350 Sansome Street, San Francisco, CA 94104.

Saunders, M. N., & Thornhill, A. (2011). Researching sensitively without sensitizing: Using a card sort in a concurrent mixed methods design to research trust and distrust. *International*

Journal of Multiple Research Approaches, *5*(3), 334-350.

Saunders, M. N., & Darabi, F. (2024). Using multi-and mixed methods research designs. In *Field guide to researching employment and industrial relations* (pp. 71-87). Edward Elgar Publishing.

Schwadel, P., & Dougherty, K. D. (2010). Assessing critical informant methodology in congregational research. Review of Religious Research, 366–379.

Scott, W. R. (2017). Institutional theory: Onward and upward. *The Sage handbook of organizational institutionalism*, *900*, 853-871.

Tan, F. Z., & Olaore, G. O. (2022). Effect of organizational learning and effectiveness on the operations, employees productivity and management performance. *Vilakshan-XIMB Journal of Management*, *19*(2), 110-127.

Thanassoulis, E., Kortelainen, M., Johnes, G., & Johnes, J. (2011). Costs and efficiency of higher education institutions in England: a DEA analysis. *Journal of the Operational Research Society*, *62*(7), 1282–1297.

Van Dooren, W., Bouckaert, G., & Halligan, J. (2015). *Performance management in the public sector*. Routledge.

Van Helden, G. J. (2005). Researching public sector transformation: the role of management accounting. *Financial Accountability & Management*, *21*(1), 99-133.

Van Thiel, S., & Leeuw, F. L. (2002). The performance paradox in the public sector. *Public performance & management review*, *25*(3), 267-281.

Vaske, J. J., Beaman, J., & Sponarski, C. C. (2017). Rethinking internal consistency in Cronbach's alpha. *Leisure sciences*, *39*(2), 163-173

Verbeeten, F. H. (2008). Performance management practices in public sector organizations: Impact on performance. *Accounting, Auditing & Accountability Journal*, *21*(3), 427-454.

Wangenge-Ouma, G. (2008). Globalization and higher education funding policy shifts in Kenya. *Journal of higher education policy and management*, *30*(3), 215-229.

Supervisor, Co-Worker Safety Support and Safety Performance at the Workplace: Does Organisational Commitment Matter?

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Abstract

The purpose of the study was to examine the effect of supervisor and co-worker safety support on safety performance at the Ghana National Fire Service in Tamale: the mediating effect of organisational commitment. The study used the quantitative research approach with the explanatory research design. Out of a total of 227 questionnaires issued to respondents, 214 were deemed usable for the analysis of the study. The analytical tools employed for this study were the partial least square regression. The SPSS was employed for descriptive analysis and the research objectives of the study. The study concluded that supervisor and co-worker safety support had a positive effect on safety performance. The second objective also showed that organisational commitment has a positive influence on safety performance. The final objective showed that organisational commitment mediates the relationship between supervisor and co-worker safety support and safety performance. It was therefore recommended that, the management of the Ghana National Fire Service unit in Tamale should prioritize the establishment and maintenance of supportive relationships among supervisors and co-workers.

Key words: Supervisor Safety Support, Co-worker Safety Support, Safety Performance, Organisational Commitment, Ghana National Fire Service

Introduction

Occupational safety is a critical concern in high-risk environments, such as Ghana National Fire Services, where the inherent nature of the work involves substantial risks and challenges. This therefore demands stringent safety protocols, and a supportive organisational environment is paramount to mitigate these risks effectively (Smith, 2019). Supervisor

safety support encompasses the proactive efforts made by supervisors to prioritize and actively endorse safety practices among their subordinates (Smith & Johnson, 2016). When supervisors exhibit a strong commitment to safety by providing clear instructions, regular training, and resources necessary for maintaining safety protocols, employees are more likely to internalize these values and incorporate them into their daily routines (Smith & Johnson, 2016).

Co-worker safety support forms the bedrock of a collaborative and safety-oriented workplace culture which translates into mutual encouragement and assistance among colleagues to adhere to safe behaviors (Jones & Brown, 2019).

Organisational commitment represents an employee's emotional connection, identification, and loyalty to their workplace (Meyer & Allen, 1991). In the context of firefighters, strong organisational commitment translates into a deep sense of responsibility towards ensuring the safety of their colleagues, themselves, and the community they serve. A supportive organisational culture, characterized by dedicated supervisors, cohesive teamwork, and high levels of organisational commitment, is fundamental in fostering a safe working environment for firefighters, ultimately ensuring the well-being of all stakeholders involved.

Despite the existing body of research into the distinct connections between supervisor and co-worker safety support, organisational commitment, and safety performance in various occupational settings, a critical gap persists in comprehending the intricate interplay of these factors within the unique context of Ghana National Fire Services, especially in regions like Tamale. The unique issues faced by Tamale's firefighters, such as limited resources, cultural influences, and specific organisational setups, call for a deeper understanding of how safety support from supervisors and colleagues impacts safety performance in this region.

Given the limited research specific to Tamale's Ghana National Fire Service, this study aims to fill this gap by examining the effect of supervisor and co-worker safety support on safety performance, determine the effect of organisational commitment on safety performance, and examine the mediating role of organisational commitment.

This study would be of great significance to the Tamale Ghana National Fire Service as it can inform the development of targeted safety training programs and policies tailored to the unique challenges faced by firefighters in Tamale based on the understanding of how support provided by supervisors and co-workers influences safety performance. Also, by recognizing the crucial role of supervisor and co-worker safety support and the mediating effect of organisational commitment, individual firefighters can gain insights into the factors that influence their safety performance. This study will also contribute greatly to literature by bringing out insights from a unique cultural setting on the interplay of supervisor and co-worker safety support, along with organisational commitment, and their influence on the safety performance of firefighters.

Theoretical Review

Social Exchange Theory

Social Exchange Theory (Blau, 1964; Emerson, 1976) provides a useful framework for understanding the reciprocity of workplace relationships. It argues that employees engage in social interactions with the expectation of mutual benefit, whereby supportive behaviours from supervisors and colleagues are reciprocated with positive organizational

outcomes. In the Ghana National Fire Service (GNFS), safety support from supervisors and co-workers can be viewed as exchanges that encourage firefighters to reciprocate through enhanced safety compliance and performance.

However, findings on this relationship are not always consistent. While Eisenberger et al. (1986) showed that perceived support leads to stronger organisational commitment and better performance, Lee and Kim (2018) noted that the influence of supervisor support may diminish over time if organisational systems do not reinforce it. Similarly, a study by Boso, Danso, and Abor (2017) in Ghana found that although supervisor support fosters employee commitment, resource shortages and bureaucratic inefficiencies can weaken the link between support and performance. These contradictions suggest that contextual factors such as culture and resource availability shape the strength of exchange relationships.

In this study, Social Exchange Theory underpins the proposition that safety support (independent variable) fosters organisational commitment (mediator), which then enhances safety performance (dependent variable).

Social Support Theory

Social Support Theory (Cobb, 1976; House, 1981) emphasises the role of emotional, informational, and instrumental support in shaping individual well-being and behaviour. In high-risk settings such as firefighting, support from supervisors and co-workers can take the form of encouragement, shared expertise, or practical assistance during emergency operations. Such support helps to reduce stress, build solidarity, and promote adherence to safety protocols (Thompson & Prottas, 2006).

Empirical evidence, however, reveals mixed results. Smith and Johnson (2016) reported a strong link between supervisor support and employee safety behaviours, yet Huang and Zhang (2020) observed that support alone was insufficient unless accompanied by a broader safety climate. African studies also highlight these nuances. For instance, Kheni, Gibb, and Dainty (2008), examining Ghanaian construction workers, found that while peer and supervisor support improved compliance, organisational weaknesses such as poor training and lack of equipment limited overall safety outcomes. This shows that social support can reinforce commitment and safety, but only when combined with structural support mechanisms.

Within this study, Social Support Theory directly links supervisor and co-worker support to both organisational commitment and safety performance. It provides the psychological rationale for why firefighters who receive consistent support are more committed to their organisation and more likely to prioritise safe practices.

Supervisor and Co-worker Safety Support and Safety Performance

Supervisor and co-worker safety support are widely acknowledged as determinants of workplace safety performance, particularly in high-risk sectors. Smith and Johnson (2015) found a positive association between support and safety behaviours, but contrasting evidence exists. For example, Christian, Bradley, Wallace, and Burke (2009) showed that individual personality traits and risk perceptions sometimes outweigh supervisory influence, highlighting a methodological limitation in studies that treat support as the sole predictor of safety.

In the African context, Gyekye and Salminen (2009) demonstrated that

Ghanaian workers who perceive fairness and support from supervisors report fewer accidents, confirming the role of contextual and cultural variables. These findings suggest that while supervisor and peer support are important, they must be situated within broader organisational and cultural systems.

Organisational Commitment and Safety Performance

Meyer and Allen's (1991) three-component model remains the dominant framework for analysing organisational commitment. Affective commitment fosters voluntary adherence to safety standards, continuance commitment ensures compliance due to cost-related considerations, and normative commitment motivates employees to act out of obligation. Clarke (2006) argued that high organisational commitment enhances safety culture, but some studies contradict this. For instance, Meyer, Stanley, and Vandenberg (2013) found that continuance commitment sometimes relates negatively to innovative and proactive safety behaviours.

African evidence adds further nuance. Umugwaneza, Nkechi, and Mugabe (2019) reported that organisational commitment in Rwandan service organisations positively influenced employee safety behaviours, but only where management demonstrated fairness and transparency. This highlights the methodological limitation of assuming a uniform effect across contexts.

Mediating Role of Organisational Commitment

Chen and Wang (2016) demonstrated that supervisor and co-worker safety support influence safety performance indirectly through employees' safety knowledge and motivation, suggesting organisational commitment plays a mediating role. While their findings emphasise the positive influence of commitment, they also caution that mediation may vary by context. Supporting this, Niu and Liu (2022) argued that in Asian settings, cultural values moderated how commitment influenced safety behaviour.

In Ghana, Gyekye (2005) observed that employees' organisational commitment was a significant predictor of compliance with safety regulations in manufacturing firms, suggesting that commitment may amplify the impact of supervisor and peer support on safety performance. Thus, in the GNFS context, organisational commitment is conceptualised as the psychological mechanism through which safety support translates into improved safety performance.

Conceptual framework

The conceptual framework of this study is anchored in both Social Exchange Theory (Blau, 1964; Emerson, 1976) and Social Support Theory (Cobb, 1976; House, 1981). Social Exchange Theory suggests that supportive actions from supervisors and co-workers are perceived as valuable resources that employees feel obliged to reciprocate. In the Ghana National Fire Service (GNFS), when firefighters receive guidance, training, and encouragement from their supervisors and peers, they are more likely to demonstrate stronger organisational commitment (Eisenberger et al., 1986). This commitment, in turn, translates into higher safety performance, as employees repay the organisation through safer and more responsible behaviours.

Social Support Theory further explains the psychological and emotional mechanisms underpinning these relationships. Supervisor support provides informational and instrumental assistance, while co-worker support enhances emotional encouragement and solidarity. Together,

these forms of support foster a sense of belonging, reduce occupational stress, and strengthen organisational commitment (Thompson & Prottas, 2006). Organisational commitment then motivates firefighters to adhere to safety norms and engage in proactive safety behaviours (Meyer & Allen, 1991; Clarke, 2006). The framework therefore proposes that supervisor and co-worker safety support influence safety performance both directly and indirectly through organisational commitment, with both theories jointly explaining how supportive workplace relationships shape safety outcomes in the GNFS context.

Research methods

Research design

In line with this and the objectives of the study, the used a cross-sectional survey to aid the researcher to obtain information. The cross-sectional survey design was adopted for this study because it allowed for the collection of data from a relatively large number of participants at a single point in time, making it both cost-effective and time-efficient. This design was particularly suitable for examining the relationships between supervisor support, co-worker support, organisational commitment, and safety performance since it enabled the researcher to capture employees' perceptions and attitudes as they existed in their natural work settings. This research design was primarily informed by the intention of the researcher to give account of the various issues that were examined in the study

Sampling procedure

Sampling is a statistical approach of acquiring a representative population to take information or data concerning a whole population by analyzing only a portion of it (Babbie, 2007). Regarding this study, a census sampling technique was utilized because of the generally small population size. Considering this, a sample

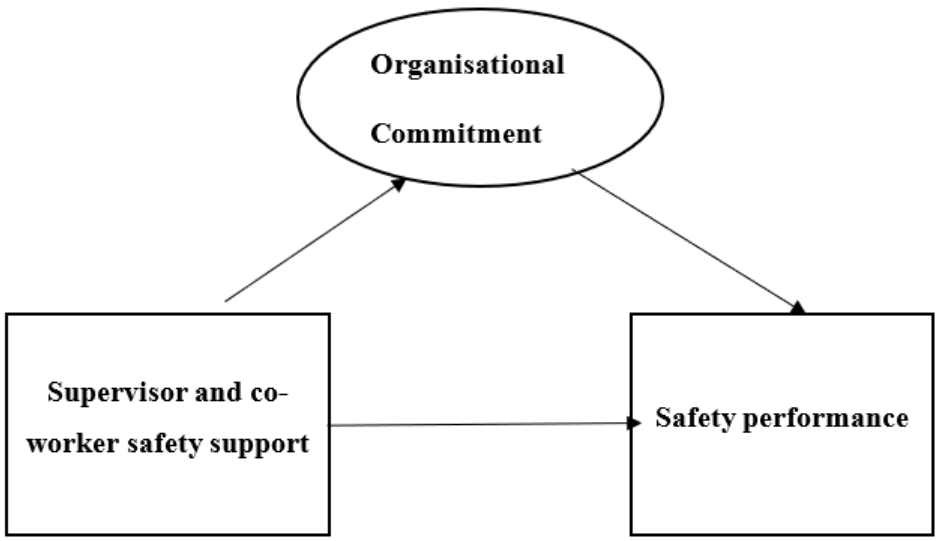

Figure 1: Conceptual Framework
Source: Authors' construct (2023)

size of two hundred and twenty-seven (227) was utilized which is comprised of staff at the study area.

Instrument and data collection

Primary data collection was done through structured questionnaire. The questionnaire was made up of four subdivisions. These subdivisions were in line with the specific objectives of this study. Section A of the questionnaire measured the Demographic data of the respondents and had three variables in all. Section B of the questionnaire measured the supervisor and co-worker support at the Ghana National Fire Service unit in Tamale. Section C of the questionnaire measured the safety performance at the organisation. And finally, section D measured the organisational commitment at the Ghana National Fire Service unit in Tamale.

The study employed well-established and validated measurement scales adopted from prior empirical research. Supervisor safety support and co-worker safety support were measured using items adapted from Hofmann and Morgeson (1999), while organisational commitment was assessed using the widely cited scale developed by Meyer and Allen (1991). Safety performance was measured with items adapted from Neal and Griffin's (2006) safety performance framework, which captures both safety compliance and safety participation behaviors. All items were measured on a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. For example, items under supervisor safety support included statements such as *"My supervisor encourages safe working practices"*, while co-worker safety support included *"My colleagues help me when I have difficulties following safety procedures."* Organisational commitment items included *"I feel emotionally attached to this organisation"*, whereas safety performance items captured behaviors such as *"I consistently use the correct safety procedures."* These scales were carefully adapted to fit the Ghanaian workplace context while retaining their original psychometric properties.

Pre-testing

Prior to the main data collection, the questionnaire was pre-tested with 30 employees working in the Ghana National Fire Service in cape Coast, who shared similar characteristics with the study population. The aim was to evaluate the clarity, relevance, and appropriateness of the items. Feedback from the pre-test led to minor revisions in wording and sequencing, which improved comprehension and reduced ambiguity.

For validation, content validity was ensured through expert review by two university professors specialising in organisational behavior and one industry practitioner in workplace safety, all of whom confirmed that the items adequately captured the constructs of supervisor support, co-worker support, organisational commitment, and safety performance. A pilot test involving 20 respondents was subsequently conducted to assess reliability and construct validity. Results showed that all constructs achieved acceptable reliability thresholds, with Cronbach's alpha values ranging from 0.78 to 0.89 and composite reliability (CR) scores above 0.80. In addition, average variance extracted (AVE) values exceeded 0.50 for all constructs, indicating satisfactory convergent validity. These results confirmed that the measurement scales were both reliable and valid for the study context, justifying their use in the main survey.

Response Rate

A total of 227 questionnaires were issued from which all 227 were filled and returned to the researcher. However, per critical

examination of the returned questionnaires, 214 were deemed usable for the study, which represents a response rate of 94.3%. This means the usable questionnaires for the analysis of the study were two hundred and fourteen (214) as shown in Table 1.

Table 1: Response rate

Questionnaire	Count	Percentage (%)
Returned and Usable	214	94.3
Returned and Unusable	13	5.7
Total	227	100

Source: Field survey (2023)

Data processing and analysis

According to Vonrhein et al. (2011) data analysis entails simplifying data and explaining it in a manner that seeks to answer the research questions posed. Data analysis was also defined by Yan, Wang, Zuo and Zang, (2016) as the process of bringing order, structure and meaning to the mass of information collected as stated in Mertens (2005).

The statistical tools employed for this study were Statistical Package for Services Solution (SPSS) version 26. The SPSS was employed for descriptive analysis and the PLS SMART 3 (SEM) was adopted to examine the correlation and regression analysis for the study based on the research questions of this study. The descriptive statistics (frequencies and percentages) were employed to determine the characteristics of the respondents.

Common Method Bias (CMB)

To mitigate the risk of common method bias (CMB) in the PLS-SEM analysis, both procedural and statistical remedies were employed. Procedurally, respondents were assured of anonymity and confidentiality to minimize evaluation apprehension, and the items were carefully constructed to reduce ambiguity and leading questions. Additionally, predictor and criterion variables were placed in different sections of the questionnaire to psychologically separate them. Statistically, Harman's single-factor test was conducted, and the results indicated that no single factor accounted for the majority of variance, suggesting that CMB was not a major concern.

Results

Sample characteristics

Demographic information of the respondents is presented in Table 2. The result relating to the sex distribution of the respondents show that majority of administrative staff in the Ghana National Fire Service are males (60.7%). The remaining 39.3% of the respondents are female staff. The age distribution of the workers was between 31 and 40 years (44.4%). This is followed by those below the age of 30 (30.0%) and then those in the 41-50 years range (25.2%). The remaining 1.4% are above 51 years.

With the educational qualification, 29.9% of the respondents had their diploma education whilst 55.1% have had their 1st degree. The remaining 15.0% of the respondents have their 2nd degree education.

Table 2: Demographic characteristics

Variable	Options	Frequency	Percentage
Sex	Male	130	60.70%
	Female	84	39.30%
Age	Below 30 years	62	30.00%
	31-40 years	95	44.40%
	41-50 years	54	25.20%
	Above 51 years	3	1.40%
Level of Educational	Diploma	64	29.90%
	1st Degree	118	55.10%
	2nd Degree	32	15.00%
	Professional	0	0.00%
Marital Status	Married	119	55.60%
	Single	57	26.60%
	Divorced	27	12.60%
	Other	11	5.10%
Working experience	1-5 years	91	42.50%
	6-10 years	60	28.00%
	11-15 years	44	20.60%
	Above 16years	19	8.90%
Total		214	100.00%

Source: Field survey (2023)

Measurement model assessment

The results in Table 3 indicate that all latent variables in this study are reliable, as they all ranged between 0.727 and 0.873, loading well above the 0.7 thresholds. In addition, the convergent validity of the measures in the model was evaluated with the Average Variance Extracted (AVE). From Table 3, the AVE results range between 0.540 and 0.702. As proposed by Hair et al. (2019), an AVE of 0.50 or higher indicates that the construct explains 50% or more of the variance of the items that make up the construct. From Table 4, the AVE values of each construct (latent variable) are higher than the value of the correlation

between the constructs, thereby suggesting the requirement of discriminant validity is established. The results in table 5 shows that all HTMT values are well below the threshold of 0.850, indicating that discriminant validity has been established for this study. Having established internal consistency, reliability, convergent and discriminant validity, the structural model was assessed.

Table 3: Reliability and validity assessment

Items	Loadings	No. of items	CA	CR	AVE
SAFETY PERFORMANCE (SP)		6(10)	0.915	0.93	0.702
SP1	0.84				
SP3	0.873				
SP4	0.811				
SP5	0.867				
SP7	0.851				
SP9	0.78				
ORGANISATIONAL COMMITMENT (OC)		4(10)	0.732	0.82	0.54
OC3	0.727				
OC4	0.724				
OC6	0.762				
OC9	0.725				
SUPERVISOR AND CO-WORKER SAFETY SUPPORT (SCP)		9(10)	0.934	0.95	0.656
SS1	0.769				
SS2	0.744				
SS3	0.75				
SS4	0.795				
SS5	0.833				
CS1	0.853				
CS3	0.855				
CS4	0.864				
CS5	0.819				

Source: Field Survey (2023)

Note: SP- Safety Performance; OC- Organisational Commitment; SCP- Supervisor and Co-Worker Safety Support; SS- Supervisor Support; CS- Co-worker support.

The indicators (SP2, SP6, SP8, OC1, OC2, OC5, OC7, OC8, and CS2) were initially part of the measurement model before refinement in SmartPLS 3.0. However, during the model evaluation process, these indicators were removed because they did not meet the recommended factor loading thresholds or demonstrated cross-loadings that affected construct validity. The justification is based on established PLS-SEM criteria, as outlined below.

1. Indicator Retention and Deletion Criteria

In SmartPLS 3.0, reflective measurement model evaluation follows specific statistical standards (Hair et al., 2019; Sarstedt et al., 2022):

- Indicator Loading (λ): Retained indicators must have loadings ≥ 0.70, indicating that more than 50% of the variance in the indicator is explained by the latent construct. Indicators with loadings between 0.40 and 0.69 may be deleted if their removal leads to an improvement in Composite Reliability (CR) and Average Variance Extracted (AVE). Indicators with loadings below 0.40 are automatically deleted, as they fail to represent the construct adequately.

Based on these guidelines, indicators SP2, SP6, SP8, OC1, OC2, OC5, OC7, OC8, and CS2, were deleted because their loadings fell below 0.70 or negatively impacted the overall AVE and CR values. The final retained indicators thus represent the most reliable and valid measures of their respective constructs.

Table 4: Fornell Larcker criterion

Constructs	1	2
1. SP	0.838	
2. OC	0.651	0.735
3. SCP	0.698	0.697

Source: Field Survey (2023)

NB: Diagonal values in bold= square root of AVE; Off diagonal elements= correlation between constructs. SP- Safety Practices; OC- Organisational Commitment; SCP- Supervisor and co-worker safety practices

Table 5: Heterotrait-Monotrait Ratio (HTMT)

	1	2	3
1. Safety Performance			
2. Organisational Commitment	0.738		
3. Supervisor And Co-Worker Support	0.659	0.783	

Source: Field Survey (2023)

Structural model assessment

Hair et al (2019) proposed the following standard assessment criteria to be considered in a structural model assessment in PLS-SEM; Coefficient of determination (R^2), the blindfolding-based cross-validated redundancy measure (Q^2), the effect size (f^2), as well as the statistical significance and relevance of the path coefficients. The model indicating the various paths is shown in figure 2. The assessment of the structural model begins with assessing lateral collinearity among the constructs.

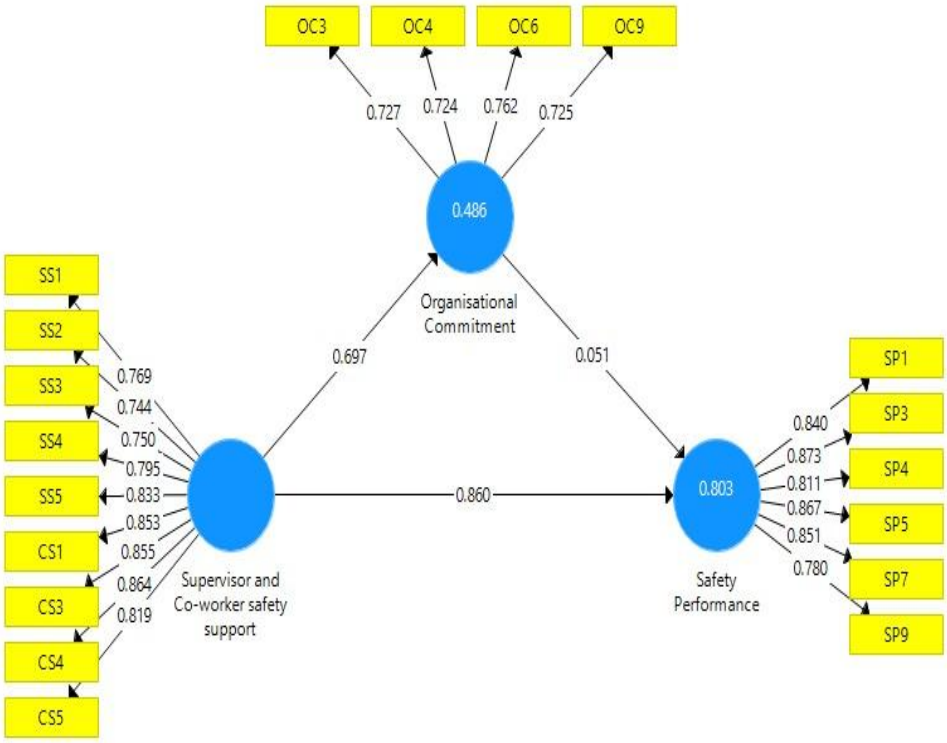

Figure 2: Model
Source: PLS Output (2023)

Table 6: Collinearity statistics (VIF)

	SAFETY PERFORMANCE	ORGANISATIONAL COMMITMENT	SUPERVISOR AND CO-WORKER
SP			
OC	2.77		
SCP	2.77	1	

Source: Field Survey (2023)

Collinearity Assessment

The results in Table 6 that VIF in all cases is less than 3. That VIF in all cases is less than 3, indicating that lateral multicollinearity is not a problem in this study (Hair et al., 2019). Also, the assessment of the structural paths and the model's explanatory power is presented in Table 7 regarding figure 2. Table 7 shows that Organisational Commitment (OC) has a moderate effect on Safety Performance (SP) (f^2=0.007). Also, the results show that Supervisor and co-worker safety support has a large effect size on Safety performance (f^2=1.934) and a large effect on Organisational Commitment (f^2=0.946). In addition to explanatory power, the predictive accuracy was assessed using the Q^2 (Geisser, 1974; Stone, 1974). As a guideline, Hair et al. (2019***)*** proposes that Q^2 values should be larger than zero for a specific endogenous construct to indicate predictive accuracy of the structural model for the construct. Specifically, Q^2 values higher than 0, 0.25 and 0.5 shows small, medium and large predictive relevance. The results show Q^2 values of 0.220 for Safety performance and 0.555 for organisational commitment. The model met the general requirement that Q^2 should be greater than 0. In addition, all predictors in the model had close to a medium predictive relevance on the endogenous variables.

Mediating analysis

The results from Table 8 show that the indirect effect (SCP -> OC -> SP) is statistically significant (β = 0.416, $p<0.05$: Table 8: Figure 2). Following the procedure defined by Nitzl, Roldán and Cepeda (2016), given that the direct effect is significant, the nature of the mediation effect of organisatioal commitment on the relationship between supervisor and co-worker safety support and safety performance among Ghana National Fire Service personnels in Tamale is a complimentary mediation.

Table 7: Structural model results (Direct effect)

Structural Path	Path Coefficient	T Statistics (|O/STDEV|)	*P* Value	R^2	f^2	Q^2	Conclusion
OC -> SP	0.551	5.074	0.007	0.634	0.01	0.22	Supported
SCP -> SP	0.697	13.246	0	0.465	1.93	0.22	Supported
SCP -> OC	0.86	14.871	0	0.634	0.95	0.56	Supported

Note: SP- Safety Practices; OC- Organisational Commitment; SCP- Supervisor and co-worker safety practices

Source: Field Survey (2023)

Table 8: Mediating analysis

PATH	Path coeff.	T Statistics (|O/STDEV|)	P-Values	Conclusion
SCP -> OC -> SP	0.416	5.495	0.000	Supported

Note: *SCP -> OC -> SP- Relationship between supervisor and co-worker safety support and safety performance through the mediating role of organisational commitment*
Source: Field Survey (2023)

Discussion

The findings of the structural model revealed that supervisor and co-worker safety support significantly predicted the safety performance of staff at the Ghana National Fire Service in Tamale. This positive and significant relationship indicates that as employees perceive higher levels of safety support from supervisors and colleagues, their safety performance is enhanced. This outcome is consistent with earlier studies by Hofmann and Morgeson (1999) and Neal and Griffin (2006), which emphasized the centrality of social support in shaping safety-related behaviors in high-risk environments. The present study, therefore, confirms and extends these prior findings by demonstrating that such supportive dynamics are equally critical in the Ghanaian firefighting context, where team cohesion and trust are essential for operational safety.

Regarding the second objective, the results indicated that organisational commitment also had a positive and significant influence on safety performance. Although the effect size was modest, the finding aligns with Meyer and Allen's (1991) framework, which positions commitment as a predictor of discretionary work behaviors, including compliance and participation in safety practices. This result also supports Pienaar and Willemse (2008), who found that organisational commitment fosters compliance with safety protocols in high-stress occupational settings. However, the relatively smaller effect size compared to supervisor and co-worker support suggests that while commitment is important, immediate sources of social support may exert stronger motivational influence on frontline safety performance.

Finally, the study revealed that organisational commitment partially moderated the relationship between supervisor and co-worker support and safety performance. This partial mediation suggests that while direct social support is critical for safety, its impact is amplified when employees are emotionally attached and committed to their organisation. This finding extends previous research by highlighting the complementary roles of social support and commitment in shaping safety behaviors. Whereas prior studies (e.g., Neal & Griffin, 2006; Christian et al., 2009) emphasized either social support or organisational commitment independently, this study demonstrates that their interaction creates a stronger foundation for sustaining safety performance. In the Ghanaian context, where firefighting personnel often face resource constraints and operational risks, such a synergistic effect underscores the importance of both supportive relationships and organisational loyalty in driving safe practices.

Conclusion

With respect to the first objective, it is concluded that supportive relationships between supervisors, co-workers, and

firefighters significantly enhance safety performance within the Tamale Ghana National Fire Service. In relation to the second objective, this study concluded that organisational commitment plays a crucial impact on safety performance within the Tamale Ghana National Fire Service. The research shows that when firefighters are emotionally connected and committed to their organisation, their dedication translates into heightened safety performance. From the third research objective, it was concluded that organisational commitment underscores the mediating role in the relationship between supervisor and co-worker safety support and safety performance within the Tamale Ghana National Fire Service.

Implications

This implies that when members of a Ghana National Fire Service unit perceive a high level of support in terms of safety measures and from their co-workers, it directly contributes to maximizing their safety performance. The correlation between safety and co-worker safety support and safety performance underscores the importance of fostering a culture of safety within Ghana National Fire Service units (Syed-Yahya, Noblet, Idris & Lee, 2022). By understanding and nurturing these relationships, Ghana National Fire Service units can create an environment where firefighters feel secure, supported, and motivated to perform at their best, ultimately leading to improved outcomes during emergencies and overall safety for everyone involved.

Furthermore, the study's findings highlight the critical role of organisational commitment in shaping the safety performance of fire personnel in Tamale. Organisational commitment, in this context, refers to the employees' loyalty, identification with the organisation's goals, and the willingness to go above and beyond their formal job requirements for the organisation's benefit (Umugwaneza, Nkechi & Mugabe, 2019). The level of dedication and attachment that fire personnel have towards their organisation directly impacts their safety performance. Fire departments can invest in programs that promote a sense of belonging, job satisfaction, and mutual respect among their employees. These efforts could include regular training sessions, team-building activities, and recognition programs that acknowledge and appreciate the dedication and hard work of the personnel.

Lastly, the study also revealed that organisations should not only focus on providing adequate support from supervisors and co-workers but also work on fostering a sense of commitment among employees (Niu & Liu, 2022). By enhancing organisational commitment, organisations can maximize the positive impact of safety support, leading to improved safety performance among employees. This finding emphasizes the importance of not only promoting a supportive work environment but also nurturing a strong organisational culture and commitment, which collectively contributes to enhancing overall safety outcomes within the workplace.

These findings align with previous research in organisational psychology and safety management, emphasizing the significance of social support and organisational culture in shaping employee behaviour and performance (Ji, Wei & Chen, 2019; Freitas, Silva & Santos, 2019).

Recommendations

From the first research objective, the study revealed that supervisor and co-worker safety support significantly influenced safety performance among personnel of the

Ghana National Fire Service. This finding points to the critical role of supportive workplace relationships in enhancing safety-related behaviors. Based on this, it is recommended that management strengthens a supportive safety culture by providing supervisors with training in effective safety leadership and encouraging peer-to-peer accountability systems. Initiatives such as team-based safety drills, peer mentoring, and regular safety briefings could be institutionalised to ensure that both supervisors and co-workers consistently reinforce safe practices in their daily operations.

Based on the second research objective, the results also showed that organisational commitment positively influenced safety performance, although the effect was modest compared to social support. This suggests that while commitment alone may not drive safety behavior as strongly as interpersonal support, it remains an important factor in ensuring long-term adherence to safe practices. To enhance commitment, leadership should introduce initiatives that foster employee loyalty and attachment to the organisation. Transparent communication of safety policies, recognition and reward schemes for employees who demonstrate exemplary safety behavior, and clear career development opportunities would
make personnel feel valued, which in turn would strengthen their dedication to organisational safety objectives.

Finally, from the third research objective, the study further established that organisational commitment partially mediated the relationship between supervisor and co-worker safety support and safety performance. This implies that while direct social support from supervisors and peers is critical, its positive effect on safety performance is amplified when employees also feel a strong commitment to the organisation. It is therefore recommended that the Ghana National Fire Service integrate both support mechanisms and commitment-building strategies within its safety management framework. Combining supervisor-led safety coaching with organisational initiatives such as employee welfare programs, participatory decision-making, and the communication of shared values would create a synergistic effect, ensuring that the benefits of supervisor and co-worker support are maximized through a loyal and committed workforce.

Limitations and directions for future studies

The mediating effect of organisational commitment, the results cannot be generalized to all Ghana National Fire Service units in Ghana. This is because, the study relied on the opinions and suggestions of staff of a specific Ghana National Fire Service unit in Tamale. In addition, the researcher considered only one mediating variable to improve staff performance. It is therefore suggested that further research be conducted in other Ghana National Fire Service units in different regions in Ghana, and also consider other mediating variables can be considered to understand the mechanisms of diverse roles of other variables in such relationships.

REFERENCES

Babbie, E. R. (2007). The practice of social research (11th ed.). Belmont, CA: Wadsworth.

Blau, P. M. (1964). Exchange and power in social life. New York: John Wiley.

Chen, Y., & Wang, W. C. (2016). Supervisor-co-worker safety support and safety performance: The mediating role of safety knowledge and safety motivation. *Journal of Safety Research*, 57, 41-51.

Christian, M. S., Bradley, J. C., Wallace, J. C., & Burke, M. J. (2009). Workplace safety: a meta-analysis of the roles of person and situation factors. *Journal of applied psychology*, *94*(5), 1103.

Clarke, S. (2006). The relationship between safety climate and safety performance: A meta-analytic review. *Journal of Occupational Health Psychology*, 11(4), 315-327.

Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine*, 38(5), 300-314.

Eisenberger, R., Huntington, R., Hutchison, S., & Sowa, D. (1986). Perceived organisational support. *Journal of Applied Psychology*, 71(3), 500-507.

Emerson, R. M. (1976). Social exchange theory. *Annual Review of Sociology*, 2(1), 335-362.

Geisser, S. (1974). A predictive approach to the random effect model. *Biometrika*, *61*(1), 101-107.

Gyekye, S. A. (2005). Organisational justice: Antecedents and consequences of ghanaian industrial workers. *International Journal of Organisation Theory & Behavior*, *18*(2), 177-205.

Gyekye, S. A., & Salminen, S. (2009). Perceived organisational support: An African perspective. *Journal of Applied Social Psychology*, *39*(11), 2651-2668.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, *31*(1), 2-24.

Hofmann, D. A., & Morgeson, F. P. (1999). Safety-related behavior as a social exchange: The role of perceived organisational support and leader–member exchange. *Journal of applied psychology*, *84*(2), 286.

House, J. S. (1981). Work stress and social support. Addison-Wesley.

Huang, Y. H., & Zhang, S. C. (2020). The role of perceived supervisor co-worker safety support in enhancing safety performance: A qualitative study. *Safety Science*, 124, 104604.

Jones, M., & Brown, J. (2019). The role of co-worker safety support in promoting safe behavior: A social exchange perspective. *Journal of Safety Research*, 71, 79-88.

Lee, J., & Kim, S. (2018). An investigation into the long-term effects of supervisor-co-worker safety support on occupational accidents. *Safety Science*, 110, 208-215.

Mertens, D. M. (2005). Research methods in education and psychology: Integrating diversity with quantitative and qualitative approaches (2nd ed.). Thousand Oaks, CA: Sage.

Meyer, J. P., & Allen, N. J. (1991). A three-component conceptualization of organisational commitment. *Human Resource Management Review*, 1(1), 61-89.

Meyer, J. P., Stanley, L. J., & Vandenberg, R. J. (2013). A person-centered approach to the study of commitment. *Human Resource Management Review*, *23*(2), 190-202.

Neal, A., & Griffin, M. A. (2006). A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels. *Journal of applied psychology*, *91*(4), 946.

Nitzl, C., Roldan, J. L., & Cepeda, G. (2016). Mediation analysis in partial least squares

path modeling: Helping researchers discuss more sophisticated models. *Industrial management & data systems*, *116*(9), 1849-1864.

Niu, L., Liu, Y. (2022). The influence of leader bottom-line mentality on miners' safety behavior: a moderated parallel mediation model based on the dual-system theory. *International journal of environmental research and public health*, *19*(18), 11791.

Pienaar, J., & Willemse, S. A. (2008). Burnout, engagement, coping and general health of service employees in the hospitality industry. *Tourism Management*, *29*(6), 1053-1063.

Smith, J. (2018). Supervisor safety support and workplace safety climate: A meta-analytic review. *Journal of Occupational Health Psychology*, 23(4), 482-496.

Smith, J., & Johnson, S. (2016). The influence of supervisor safety support on employee safety behavior: A social exchange perspective. *Journal of Applied Psychology*, 101(4), 533-546.

Smith, T. D., & Johnson, M. L. (2015). The impact of supervisory support on employee safety behavior: A longitudinal study. *Journal of Occupational Health Psychology*, 20(2), 167-180.

Stone, M. (1974). Cross-validatory choice and assessment of statistical predictions. *Journal of the royal statistical society: Series B (Methodological)*, *36*(2), 111-133.

Syed-Yahya, S. N., Noblet, A. J., Idris, M. A., & Lee, M. C. C. (2022). Examining the role of supervisory and co-worker safety support in mediating the relationship between safety climate and safety performance. *Safety science*, *155*, 105880.

Thompson, C. A., & Prottas, D. J. (2006). Relationships among organisational family support, job autonomy, perceived control, and employee well-being. *Journal of Occupational Health Psychology*, 11(1), 100-118.

Uehara, E. (1990). Dual exchange theory, social networks, and informal social support. *American Journal of Sociology*, *96*(3), 521-557.

Umugwaneza, C., Nkechi, I. E., & Mugabe, J. B. (2019). Effect of workplace safety and health practices on employee commitment and performance in steel manufacturing companies in Rwanda. *European Journal of Business and Management Research*, *4*(5).

Vonrhein, C., Berg, S., Chirgadze, Y., Fedorov, E., & Lebedev, A. (2011). Techniques for the analysis of protein-ligand data in multi-model scenarios – Central Changes at CSOLID. *Computational Methods for Data Evaluation, Processing and Analysis* (pp. 1-49). CRC Press.

Yan, Y., Wang, H., Zuo, Y., & Zang, J. (2016). Quantitative and qualitative analysis in the evaluation of summit metabolism for interpreting soil processes and properties. *Quantitative and Qualitative Analysis*, 50(3), 685-698.

Exploring the Link between Work-Family Conflict and Workplace Deviant Behaviour among Police Personnel: The Mediating Role of Psychosocial Work Factors

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Abstract

This study examines the impact of Work-Family Conflict (WFC) and Family-Work Conflict (FWC) on Workplace Deviant Behaviour (WDB) and the mediating role of psychosocial work factors (PWFs) among personnel of the Ghana Police Service, underpinned by the Situational Action Theory (SAT) and the Conservation of Resources (COR) Theory. A cross-sectional survey design was employed, with data collected from 412 police personnel using structured questionnaires. Findings revealed a counter-intuitive effect: WFC negatively predicted WDB, contrary to patterns typically reported in literature. In contrast, FWC positively predicted WDB. Support from superiors and coworkers, empowering and fair leadership, and innovative climate partially mediated the relationship between WFC and WDB, while support from friends and social climate showed no mediation but significant moderation effects. Furthermore, social climate partially mediated the relationship between FWC and WDB. The study extends literature by examining both directions of WFC and their behavioural consequences within a non-Western, high-stress occupational setting. It also highlights the protective role of PWFs in mitigating WDB, offering practical insights for leadership and policy interventions in law enforcement agencies.

Key words: Work-Family Conflict, Workplace Deviant Behaviour, Psychosocial Work Factors, Situational Action Theory (SAT), Conservation of Resources (COR) Theory, Ghana Police Service.

Introduction

With today's family structure becoming more egalitarian coupled with smaller family sizes, dual-

earner households, and longer hours at work (Xin, Zheng & Xin, 2020), work-family conflict (WFC) remains an essential issue at the workplace and particularly for police personnel because the contemporary police officer juggle family and work responsibilities which consequently lead to role conflict and necessitate work and family imbalance (Bowen & Zhang, 2020; Nohe et al., 2015). WFC is the psychological strain resulting from the conflicting demands of work and family roles (Aboobaker, Manoj & Zakkariya, 2019;). This conflict arises when the responsibilities of one domain interfere significantly with those of the other (Nohe, Meier, Sonntag & Michel, 2015), making it difficult for individuals to fulfil their roles at work and home (Altura, Rao & Virick, 2021; Labrague, Ballad & Fronda, 2021). This family and work imbalance occasions WFC and family-work conflict (FWC).

WFC exists when an employee's work activities and stress prevent them from performing their family obligations, leading to consequential impact on personal, work-related and non-work-related outcomes (Netemeyer, Boles & McMurrian, 1996). The inability to perform family obligations due to work roles leads to poor life and job satisfaction, high turnover, and poor psychological and physical well-being (Viegas & Henriques, 2021). Furthermore, employee motivation and engagement diminish, and the stress induced by the conflict can lead to negative job attitudes (Misfin, Singh & Phoolka, 2024). FWC occurs when family responsibilities and demands hinder work obligations (Ahmad & Islam, 2019). Thus, FWC occurs when family obligations, such as caregiving or household duties, create challenges in meeting work expectations, leading to reduced productivity or workplace stress. Past studies indicate that FWC negatively affects emotional health, physical well-being, and life satisfaction, ultimately lowering productivity and job performance (Singh & Nayak, 2015; Tsang, Liu & Nguyen, 2023).

An, Liu, Sun and Liu (2020) note that when employees struggle to balance their work and family responsibilities, they are more likely to engage in behaviours that deviate from acceptable standard organisational norms. Workplace deviant behavior (WDB) refers to voluntary actions by employees that violate organizational norms, policies, or expectations and thereby threaten the well-being of the organization, its members, or both (Robinson & Bennett, 1995). Such behaviours may be interpersonal, directed toward other individuals or organizational, directed toward the institution itself. WDB is intentional, discretionary, and represents a departure from accepted standards of conduct within the workplace and includes behaviours like making fun of co-workers, stealing, wasting resources, and causing intentional errors (Marasi, Bennett & Budden, 2018). WDB poses a severe threat to service delivery in both the public and private sectors. WDB, including actions like stealing, hostility towards colleagues, and withholding effort, has significant impacts on organisations in the form of corporate scandals and corruption (Bennett, Marasi & Locklear, 2018). The demanding and complex nature of law enforcement work, combined with increasing workplace pressures and low remuneration, exacerbate engagement in workplace deviance (López-Cabarcos, López-Carballeira & Ferro-Soto, 2023).

Globally, there has been an increasing concern regarding police misconduct because of the surge in corruption, excessive use of coercive power, and misuse of authority (Boateng, Makin, Abess & Wu, 2019). In Ghana, police misconduct remains a canker bedevilling the Ghana

Police Service (GPS) (Boateng et al., 2019). With a long history of corruption, abuse of authority, misapplication of rules, and use of brutal force, efforts must be made to determine the antecedents of these WDB among personnel (Boateng et al., 2019; Afro Barometer Survey, 2014).

Past studies have also confirmed the negative impact of WFC on employee deviance. However, these studies have mainly focused on employees in the banking, healthcare, and educational sectors (e.g., Gamor, Amissah, Amissah & Nartey, 2018; Kissi-Abrokwah, Andoh-Robertson, Tutu-Danquah & Agbesi, 2015), with limited attention given to police officers, especially in Ghana. This study addresses this gap by examining the impact of WFC on WDB among police personnel in Ghana. Integrating the Situational Action Theory (SAT) and the COR Theory, this study, helps in clarifying the significance of personal resources in mitigating the impact of WFC on WDB.

Literature Review

The SAT emphasises that crime occurs when an individual with a certain propensity for criminal behaviour encounters a situation that provides the opportunity or motivation to commit a crime (Opp, 2020; Wikström & Kroneberg, 2021). Central to SAT are the concepts of moral action, where behaviour is guided by an individual's moral values, and the moral filter, which determines whether a person perceives an action as right or wrong (Opp, 2020). The theory also highlights the significance of situational contexts and social controls, which can either inhibit or facilitate criminal behaviour, depending on how they interact with individual propensities.

Ametorwo, Ofori, Annor and Dartey-Baah (2021) examined the relationship between WFC and organisational and interpersonal deviance among Ghanaian bank employees and found that both WFC and FWC conflict predicted WDB, highlighting that dynamic employee behaviour and environmental changes could alter these relationships over time.

Chen, Zhang, Wang & Zheng (2020) also explored the impact of WFC on emotional responses, workplace deviance, and well-being among construction professionals and discovered a positive correlation between WFC and criminal behaviour and a negative correlation with job satisfaction. The study also found that WFC had different effects on attitudes and behaviour than family conflicts, underscoring the complex nature of these relationships.

Furthermore, Faiz, Rubbab and Kayani (2020) investigated the relationship between WFC and WDB and found via a structural equation modelling of time-lagged design data from 147 nurses that WFC is indirectly, yet positively, associated with WDB, with stress and burnout acting as sequential mediators. The study highlighted how WFC triggers stress, which then leads to burnout, resulting in WDB, emphasizing the pathway from conflict to WDB. Based on the above review, the study hypothesises that:

H1: WFC will have a positive impact WDB among police personnel.

Farooq et al. (2023) explored non-work factors and their impact on WDB using the Gioia qualitative research approach among 25 employees from public and private organisations in Pakistan. The study found commuting factors (e.g., traffic issues and road conflicts), social factors (e.g., FWC and strained relationships), and individual lifestyle factors (e.g., attitude, physical inactivity, and sleep deprivation) as significant contributors to WDB.

Moreover, Lin and Bai (2023) applied the

COR theory to develop and test a dual spillover spiralling model, which examines how family incivility influences WDB. Using a three-wave survey of 455 employees and their co-workers across 60 teams, they found that family incivility increases WDB by escalating FWC (resource loss spiral) and reducing family-to-work enrichment (resource gain spiral). However, these negative effects were weakened when supervisors exhibited family-supportive behaviours. The current study, therefore, predicts that:

H2: FWC will have a positive impact on WDB among police personnel.

The Role of Psychosocial Work Factors

Psychosocial work factors refer to the psychological and social conditions within the workplace that influence employee well-being, motivation, and behaviour. These factors encompass elements such as leadership style, social support, workplace culture, and job demands, all of which can significantly shape how employees experience and cope with stress and how individual and workplace factors contribute to deviant behaviours (Rugulies, 2019). Thus, Dipboye (2018) asserts that common stressors in the environment that can trigger stress responses include lack of social support, work overload, limited control or autonomy, role stress, injustice, workplace politics, shift work, interpersonal conflicts, downsizing, and WFCs, and employees who perceive a lack of support from coworkers, supervisors, or the organisation are vulnerable to stress.

The COR theory offers a comprehensive framework for understanding how stress arises when individuals perceive a threat or loss of valuable resources. The theory posits that individuals are motivated to acquire, retain, and protect resources they value, with a natural tendency to be more sensitive to resource loss than to resource gain (Hobfoll et al., 2018; Holmgreen et al., 2017). Stress arises when key resources are threatened, lost, or when significant effort is made without gaining necessary resources (Hobfoll et al., 2018).

COR theory also suggests that individuals not only utilise key resources to cope with stress but also to build a reserve of resources for future challenges, such that the acquisition and retention of personal, social, and material resources give individuals, families, and organisations a sense of capability in managing stressful situations (Hobfoll et al., 2018; Sonnentag, 2018). Therefore, PWFs such as support from supervisors, coworkers, friends, and relatives, as well as fair and empowering leadership, help employees cope with work and family interference, build a reserve of resources for future challenges, and enhance employees' sense of capability in managing stress and consequently reducing deviant behaviours (Hobfoll et al., 2018; Liao et al., 2019).

Imam et al. (2025) examined how supervisor incivility in the banking sector leads to increased employee interpersonal deviance toward customers and co-workers, as well as elevated WFC and found that supervisor hostility triggers a chain reaction where employees who experience incivility are more likely to engage in deviant behaviours and experience greater WFC. Siddiqi et al. (2025) examined the impact of perceived supervisory and coworker support on WFC among nurses in Bangladesh, using a sample of 386 nurses from five selected hospitals and found that both supervisory and coworker support significantly reduce WFC.

Additionally, Schneider and Weigl (2018), in a systematic review, synthesised quantitative evidence on how PWFs affect the mental well-being of emergency

department providers. Among the three broad categories (i.e., patient/task-related, social, and organisational factors), workplace psychosocial factors such as peer support, leadership structures, and reward systems showed some of the strongest associations with both positive well-being outcomes and reduced affective symptoms. Based on these findings, this study hypothesizes that:

H3: Psychosocial work factors will mediate the impact of WFC on Workplace Deviant Behaviour
H4: Psychosocial work factors will mediate the impact of FWC on Workplace Deviant Behaviour

Methodology

This study employed a cross-sectional design to collect quantitative data from personnel of the GPS. The population for this study was police officers of the Greater Regional Command of the GPS. The Greater Accra Regional Command of the Service plays a critical role in law enforcement within the country's most urbanised and densely populated region, making it a strategically important and high-demand jurisdiction. The Command, headquartered at Accra Central near Tudu and Kantamanto, comprises 14 Police Divisions, 43 Districts, and 108 Police Stations and Posts (GPS, 2017).

The respondents in this study were selected using the simple random technique. Using statistical power analysis to ensure adequate representation for meaningful analysis, data was collected from 412 police officers across various districts and the headquarters of the Greater Accra Regional Police Command. The demographic details of the respondents are presented in Table 1 below.

Table 1: Participant Demographics (N=412)

Variable	Frequency	Percentage (%)
Gender		
Female	147	35.7
Male	265	64.3
Age		
20-29 years	108	26.1
30-39 years	165	40.2
40-49 years	117	28.5
50-59 years	22	5.2
Education Qualification		
SSCE/ WASSCE	129	31.3
Diploma/ HND	103	25.0
First Degree	135	32.8
Masters	45	10.9
Tenure		
Less than 5 years	63	15.3
5- 10 years	148	36.1
11-19 years	111	26.9
20- 29 years	81	19.7
30 years and above	9	2.0
Marital Status		
Single	135	32.8
Married	253	61.4
Separated/ divorced	22	5.3
Widowed	2	0.5

Data collection instrument

WFC and FWC were assessed with the Work-Family Conflict and Family-Work Conflict Scales developed by Netemeyer et al. (1996). The scale is a 10-item scale answered on a 6-point Likert scale ranging from "Strongly Agree" (scored as 6) to "Strongly Disagree" (scored as 1) with a Cronbach's alpha of .82 to .90 (Netemeyer et al. 1996). Sample items on the scale include "*The demands of my work interfere with my family life*" and "*Family-related strain interferes with my ability to perform job-related duties*". The present study found Cronbach's alpha of .92 and .88 for the Work-Family Conflict and Family-Work Conflict scales, respectively.

Workplace Deviant Behaviour (WDB) among police personnel was assessed using the 8-item Workplace Deviant Behaviour Scale (WDBS) developed by Aquino et al. (1999). The items on WDBS were answered on a 5-point Likert scale ranging from "Never" (scored as 1) to "More than 20 times" (scored as 5). A sample item on the WDBS is "*Purposely ignored my boss' or supervisor's instructions*". Aquino et al. (1999) report Cronbach's alpha of .73 for the WDBS. The present study found a Cronbach's alpha of .74 for the WDBS.

Support from superiors, support from coworkers, support from friends and relatives, empowering leadership, fair leadership, social climate, and innovative climate (i.e., psychosocial work factors) were assessed using seven (7) subscales from the General Nordic Questionnaire for Psychological and Social Factors at Work (QPS(Nordic)) developed by Wannstrom et al. (2009). Wannstrom et al. (2009) report a Cronbach alpha of .86, .84, .77, .86, .79, .80, and .69 for the support from superiors (three items) support from coworkers (two items), support from friends and relatives (three items), empowering leadership (three items), fair leadership (three items), social climate (three items), and innovative climate (three items), respectively. All the items on these items (e.g. "*My immediate superiors treat the workers fairly and equally*" and "*I can talk with my spouse or any other close person about my work-related problems*") were answered on a 5-point Likert scale ranging from "Very seldom" (scored as 1) to "Very often" (scored as 5). The present study found a Cronbach's alpha of .82, .70, .70, and .84, .70, .80 and .78 for the support from superiors, support from coworkers, support from friends and relatives, empowering leadership, fair leadership, social climate, and innovative climate, respectively.

Data Collection Procedure

Prior to the commencement of data collection, an introductory letter from the University of Ghana Business School (UGBS) was submitted to the National Police Headquarters to request official clearance. Following approval, the Director-General (Human Resources) issued a clearance letter introducing the research team and encouraging personnel to participate in the study. The researchers personally delivered this letter along with the survey instruments to selected police stations. Participants were allowed to complete the questionnaires at their convenience, and the completed forms were collected on a predetermined date agreed upon during the initial delivery. Data collection took place between June 5 and August 4, 2023.

Data Analysis

Data was analyzed using IBM SPSS Statistics version 27.0. To explore the effects of the independent variables on the dependent variable, linear regression analysis was employed. Additionally, mediation analysis was carried out using Process Macro Version 4.2, developed by

Andrew F. Hayes (2022). Harman's single-factor test showed that the first unrotated factor accounted for only 20.1% of the variance, far below the 50% threshold, indicating that common method bias is not a significant concern in this study.

Results

The descriptive statistics showed that WFC recorded the highest mean (M = 3.85, SD = 1.73), indicating that participants experienced considerable interference from work demands on family life. FWC was moderate (M = 3.04, SD = 1.48), suggesting a relatively lower spillover from family responsibilities to work.

Table 2: Correlation Among Study Variables

Variables	1	2	3	4	5	6	7	8	9	10
1. Work-Family Conflict	1									
2. Family-Work Conflict	.50**									
3. Workplace Deviant Behaviour	-.11*	.05								
4. Support from Superior	-.12*	-.03	-.20**							
5. Support from Coworkers	-.06	-.06	-.25**	.46**						
6. Support from Friends and Relatives	-.01	0.03	-.12*	.32**	.70**					
7.Empowering Leadership	-.12*	-.05	-.15**	.67**	.46**	.36**				
8. Fair Leadership	-.19**	.05	-.07	.61**	.44**	.43**	.70**			
9. Social Climate	.06	.20**	-.20**	.48**	.31**	.33**	.49**	.59**		
10. Innovative Climate	-.09	.03	-.19**	.62**	.50**	.39**	.69**	.57**	.60**	
11. Psychosocial Work Factors	-.10*	.03	-.21**	.82**	.66**	.60**	.85**	.82**	.72**	.83**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

WDB had a low mean (M = 1.58, SD = 0.55), reflecting generally low levels of misconduct among respondents while the composite PWFs mean (M = 3.44, SD = 0.75) reflects a generally favourable but varied psychosocial environment across the organizations studied.

Results of the Pearson's Product-Moment Correlation, presented in Table 2 showed that WDB has significant negative correlations with several PWFs: support from superiors (r = –.20), coworker support (r = –.25), empowering leadership (r = –.15), social climate (r = –.20), and innovative climate (r = –.19). This indicates that employees who perceive greater support, fair treatment, and a positive working environment are less likely to engage in WDB. However, the correlation between fair leadership and deviant behaviour was not statistically significant (r = –.07). Additionally, WFC and FWC showed a moderate positive correlation (r = .50), indicating that individuals who experience more conflict from work interfering with family are also likely to report more family-related pressures affecting their work. WFC had a significant negative correlation with WDB (r = –.11) while FWC had a positive but non-significant correlation with WDB (r = .05).

The correlation matrix (Table 2) further revealed that WFC is significantly and negatively related to empowering leadership (r = –.12, p = .00) and fair leadership (r = –.19, p = .00). WFC also showed small, negative correlations with support from superiors (r = –.12, p = .02), coworkers (r = –.06, p = .20), and innovative climate (r = –.09, p = .07). Its correlation with support from friends and family was negligible and non-significant (r = –.01, p = .80), indicating minimal influence from external social support. In contrast, FWC demonstrated weaker and mostly non-significant negative correlations with empowering leadership (r = –.05, p = .35), fair leadership (r = .05, p = .30), support from superiors (r = –.03, p = .50), coworker support (r = –.06, p = .24), and innovative climate (r = .03, p = .55). However, FWC showed a small but significant positive correlation with social climate (r = .20, p = .00).

Hypotheses Testing

To examine the impact of the independent variables (WFC and FWC) on the outcome variable (deviant behaviour), a hierarchical regression analysis was conducted to investigate the effects of WFC and FWC on WDB among police personnel, while controlling for demographic variables (marital status, gender, rank, education, tenure, and age). In Step 1, demographic factors did not significantly predict WDB, $R^2 = .02$, $F(6, 405) = 1.02$, $p = .41$. In Step 2, the inclusion of WFC resulted in a small increase in explained variance, $\Delta R^2 = .01$, F change $(1, 404) = 3.77$, $p = .05$, which was marginal and did not reach statistical significance. In Step 3, however, the addition of FWC significantly improved the model, $\Delta R^2 = .02$, F change $(1, 403) = 7.38$, $p = .01$. The final model accounted for 4.1% of the variance in WDB (Adjusted $R^2 = .02$), with the Durbin–Watson statistic (1.57) suggesting no major concerns with autocorrelation.

The 3-step hierarchical multiple regression, presented in Table 3, showed in Step 1 that the demographic controls did not significantly predict WDB, explaining only 2% of the variance ($R^2 = .02$).

Table 3: Hierarchical Regression Predicting Deviant Behaviour

Predictor	Step 1 β	Step 2 β	Step 3 β
Control Variables			
Gender of respondents	–.02	–.02	–.01
Age of respondent	.07	.08	.14
Educational background	.01	.01	.01
Tenure	–.16	–.17	–.21*
Position rank	–.06	–.06	–.04
Marital status	.01	.00	.03
Main Predictors			
FWC	–	.07	.16**
WFC	–	–.10	–.18**

*p < .05, **p < .01, ***p < .001

In Step 2, when FWC was introduced, it did not significantly predict WDB (β = .07; Table 3), and the increase in variance explained was negligible. In contrast, when WFC was entered, it had a marginal negative effect on WDB (β = –.10, p = .05; Table 3), suggesting that higher WFC was weakly associated with lower deviance, although the effect fell short of conventional significance.

In Step 3, both WFC and FWC were entered simultaneously. At this stage, the model improved significantly (ΔR^2 = .02, p < .01), explaining 4.1% of the variance in WDB. Specifically, WFC emerged as a significant negative predictor (β = –.18, p < .01; Table 3), contrary to H1, which had posited that WFC would have a significant positive impact on WDB. Conversely, FWC emerged as a significant positive predictor of WDB (β = .16, p < .05; Table 3), supporting H2.The results largely provided support for hypothesis three, which proposed that PWFs would mediate the impact of WFC on deviant behaviours. First, support from superiors significantly mediated the relationship between WFC and WDB. The mediation analysis revealed a significant indirect effect of WFC on deviant behaviour through support from superiors (Effect Size = .01, LLCI = .00, ULCI = .02, Table 4) with the direct effect of WFC on deviant behaviour remaining significant (Effect Size = -.04, p = .01, Table 4), indicating the presence of partial mediation. Support from coworkers also significantly mediated the relationship between WFC and WDB. The mediation analysis revealed a partial mediation effect with a significant indirect effect of WFC on deviant behaviour through coworker support (Effect Size = .01, BootLLCI = .00, BootULCI = .02, Table 4), and a significant direct effect of WFC on deviant behaviour (Effect Size = -.04, p = .01, Table 4). The findings also showed that empowering leadership significantly mediates the relationship between WFC and WDB. The mediation analysis demonstrated partial mediation, with a significant indirect effect of WFC on deviant behaviour through empowering leadership (Effect Size = .01, BootLLCI = .00, BootULCI = .01, Table 4) and a significant direct effect of WFC on deviant behaviour (Effect Size = -.04, p = .01, Table 4).

Table 4: Mediation Results for Psychosocial Work Factors in the Relationship Between Work–Family Conflict and Workplace Deviant Behaviour

Mediator	Direct Effect	Indirect Effect	95% Confidence Interval (Lower–Upper)	T-Statistic	Mediation Conclusion
Support from Superior (SS)	-.04	.01	.00 – .02	–2.72	Partial Mediation
Support from Coworkers (C–W)	-.04	.01	.00 – .02	–2.58	Partial Mediation
Empowering Leadership (EL)	-.04	.01	.00 – .01	–2.61	Partial Mediation
Fair Leadership (FL)	-.04	.01	.00 – .01	–2.50	Partial Mediation
Innovative Climate (IC)	-.04	.01	.00 – .01	–2.56	Partial Mediation
Support from Friends & Relatives (FnR)	-.03	.00	.00 – .00	–0.25	No Mediation
Social Climate (SC)	-.03	.00	-.01 – .00	1.17	No Mediation

Fair leadership also had a significant mediation effect on the relationship between WFC and WDB. The significant direct effect of WFC on WDB (Effect Size = -.04, p = .01, Table 4) as well as the significant indirect effect (Effect Size = .01, BootLLCI = .00, BootULCI = .01, Table 4) indicates partial mediation, emphasizing that WFC may increase WDB by undermining perceptions of fair leadership. The results also demonstrated that innovative climate partially mediates the relationship between WFC and WDB. While WFC had a significant direct effect on WDB (Effect Size = -.04, p = .01, Table 4), the indirect effect through innovative climate was also significant (Effect Size = .01, BootLLCI = .00, BootULCI = .01, Table 4), suggesting that WFC increases WDB in part by diminishing perceptions of an innovative climate.

In relation to the mediation effect of Support from Friends and Relatives on the WFC-WDB relationship, the results indicated non-mediation (Effect Size = .00, BootLLCI = .00, BootULCI = .00, Table 4). However, a moderation effect was discovered with a significant interaction effect (Effect Size = .04, p = .03, LLCI = .00, ULCI = .07, Table 5), indicating that the strength of the relationship between WFC and WDB depends on the level of support individuals receive from their networks. Similarly, the results did not support the mediation role of social climate in the relationship between WFC and WDB (Effect Size = .00, BootLLCI = -.01, BootULCI = .00, Table 4). However, it significantly moderated the impact of WFC on WDB with a significant interaction effect (Effect Size = -.05, p = .01, LLCI = -.08, ULCI = -.01, Table 5) which suggests that when social climate is strong, the influence of WFC on deviant acts is reduced, highlighting its protective role in workplace dynamics.

Table 5: Moderation Results for the Role of Support from Friends and Relatives (FnR) and Social Climate (SC) on the Relationship between Work-Family Conflict (WFC) and Workplace Deviant Behaviour (WDB)

Model	Coefficients	T	Sig.	LLCI	ULCI
Constant	2.38	10.15	.00	1.92	2.84
Work-Family Conflict	-.15	-2.70	.01	-.26	-.04
Support from friends and relatives	-.20	-2.99	.00	-.34	-.07
Interaction Term (WFC x FnR)	.04	2.16	.03	.00	.07
Constant	1.59	6.73	.00	1.13	2.05
Work-Family Conflict	.12	1.95	.05	.00	.23
Social Climate	.04	.52	.60	-.10	.18
Interaction term (WFC x SC)	-.05	-2.55	.01	-.08	-.01

Table 6: Mediation Results for the Role of Psychosocial Work Factors in the Relationship Between Family-Work Conflict and Workplace Deviant Behaviour

Direct Effect	Indirect Effect	95% Confidence Interval (Lower–Upper)	T-Statistic	Mediation Conclusion
.02	.00	.00 – .01	.94	No Mediation
.01	.01	.00 – .02	.79	No Mediation
.02	.00	-.01 – .00	1.15	No Mediation
.02	.00	.00 – .01	.92	No Mediation
.04	-.05	-.03 – -.01	1.94	Partial Mediation
Fair Leadership (FL)	.02	.00	-.01 – .00 1.05	No Mediation
Innovative Climate (IC)	.02	.00	-.01 – .01 .06	No Mediation

Hypothesis four, which predicted that PWFs would mediate the impact of FWC on WDBs largely not supported by the results, although social climate partially mediated the relationship between FWC and WDB. The indirect effect of FWC on WDB through social climate was statistically significant (Effect Size = –.02, BootLLCI = –.03, BootULCI = –.01, Table 6), while the direct effect also remained marginally significant (Effect Size = .04, p = .05, Table 6). This suggests that although FWC directly contributes to WDB, part of its influence operates indirectly by

diminishing perceptions of a positive social climate, which otherwise acts as a protective factor against deviant acts.

Although support from superiors had a significant negative effect on WDB (Effect Size = -.10, p = .00), the indirect effect of FWC on WDB through superior support was not significant (Effect Size = .00, BootLLCI = .00, BootULCI = .01, Table 6). The direct effect of FWC on WDB was also not significant (Effect Size = .02, p = .35, Table 6), indicating no meaningful mediation. Furthermore, though the indirect effect of FWC on WDB through coworker support was statistically significant (Effect Size = .01, BootLLCI = .00, BootULCI = .02, Table 6), the effect size was negligible while, the direct effect of FWC on WDB insignificant (Effect Size = .01, p = .43, Table 6), co-worker support does not serve as a substantial mediator in the relationship between FWC and WDB. Support from friends and relatives did not show any mediation effect either in the relationship between FWC and WDB. The indirect effect of FWC on WDB through support from friends and relatives was not significant (Effect Size = .00, BootLLCI = -.01, BootULCI = .00, Table 6). Similarly, the direct effect of FWC on WDB was also not significant (Effect Size = .02, p = .25, Table 6).

Since the indirect effect of FWC on WDB through empowering leadership was not significant (Effect Size = .00, BootLLCI = .00, BootULCI = .01, Table 6), and the direct effect of FWC on WDB was also not significant (Effect Size = .02, p = .36, Table 6), the results indicate that empowering leadership does not significantly mediate the relationship between FWC and WDB in this model. However, while fair leadership did not also show a significant mediation effect on the FWC-WDB relationship (Effect Size = .00, BootLLCI = -.01, BootULCI = .00, Table 6), the results demonstrate that fair leadership significantly moderates the impact of FWC on WDB. The significant interaction term (Effect Size = –.07, p = .00, LLCI = –.12, ULCI = –.03, Table 7) indicates that higher levels of fair leadership may weaken the positive relationship between FWC and WDB, suggesting a buffering effect.

Table 7: Moderation results for the role of Fair Leadership (FL) and Innovative Climate (IC) on the relationship between Family-Work Conflict (FWC) and Workplace Deviant Behaviour (WDB)

Model	Coefficients	T	Sig.	LLCI	ULCI
Constant	.94	3.94	.00	.47	1.42
Family-Work Conflict	.27	3.60	.00	.12	.42
Fair Leadership	.17	2.42	.02	.03	.31
Interaction Term (FWC x FL)	-.07	-3.42	.00	-.12	-.03
Constant	1.40	6.03	.00	.94	1.86
Family-Work Conflict	.18	2.56	.01	.04	.32
Innovative Climate	.03	.46	.65	-.09	.15
Interaction Term (FWC x IC)	-.04	-2.33	.02	-.08	-.01

Similarly, although the indirect effect of innovative climate on the FWC-WDB relationship was insignificant (Effect Size = .00, BootLLCI = -.01, BootULCI = .01, Table 6), the findings show that innovative climate significantly moderates the impact of FWC on WDB. The significant interaction term (Effect Size = –.04, p = .02, LLCI = –.08, ULCI = –.01, Table 7) reveals a buffering effect, where a stronger innovative climate weakens the positive impact of FWC on WDB (Effect Size = .18, p = .01, Table 7).

Findings and Discussions

The primary objective of this study was to examine the relationship between WFC, FWC, and interpersonal WDB among police personnel in Ghana, while also exploring the mediating roles of PWFs.

Control variable estimations showed that demographic characteristics, including gender, age, education, marital status, tenure, and rank, have no significant impact on either WFC or FWC. This suggests that, within the GPS, experiences of work–family interference are largely shaped by structural and occupational demands rather than by personal or demographic differences since police work is characterized by highly standardized schedules, unpredictable duties, and uniform exposure to operational stressors, which may attenuate demographic variation in WFC and FWC (Akoensi & Annor, 2021; Shockley et al. 2017).

Contrary to the first hypothesis (H1), the study found that WFC had a significant negative relationship with WDB. This surprising finding challenges the widely held assumption that increased WFC directly escalates workplace misconduct (Faiz et al., 2020; Ametorwo et al., 2021).

This could be attributed to the highly regulated and disciplined structure of police work which may compel officers to maintain professional conduct. Conversely, in organisations with robust accountability systems, officers are more likely to conform to professional standards, regardless of personal stressors, ultimately decreasing WDB (Huff et al., 2018). Additionally, Miao and Wang (2017) emphasize the complex nature of WFC, which can yield both beneficial and detrimental effects depending on the context. Their study revealed that while professional control can intensify the stress caused by WFC, it may also enhance compliance with job responsibilities and reduce unethical behaviour. Specifically, the strict paramilitary structure of the GPS emphasises discipline and obedience, deterring deviance even under heightened work demands (Akoensi & Annor, 2021; Akoensi, 2018). Hence, the strict institutional culture and high cost of misconduct can reduce situational inducements for rule-breaking even under stress (Opp, 2020; Wikström & Kroneberg, 2021).

In contrast, hypothesis two (H2) was supported, as FWC exhibited a significant positive relationship with deviant workplace behaviour ($\beta = .16$, $p < .05$; Table 3). This finding aligns with previous research such as those of Lin and Bai (2023) and Jiang, Chen, Ning and Liu (2022) that suggests family obligations disrupting work responsibilities may increase stress, leading to counterproductive work behaviour. From the SAT perspective, FWC may create conditions that weaken an individual's moral filter-the cognitive mechanism that guides rule-consistent behaviour (Wikström & Kroneberg, 2021). Heightened stress and emotional pressure stemming from family-related demands may impair one's capacity for self-regulation, thereby increasing the likelihood of perceiving deviant actions as viable or justifiable solutions in the moment (Opp,

2020). Thus, FWC may not merely add stress but may also alter the individual–environment interaction in ways that make deviance more situationally attractive or less morally inhibited, consistent with SAT's core propositions.

The mediating role of PWFs was partially confirmed across both WFC and FWC conditions. Support from superiors and coworkers, empowering leadership, fair leadership and innovative climate all partially mediated the relationship between WFC and WDB indicating their mitigating effects. Grounded in COR Theory, the findings underscore the critical role of coworker support in mitigating stress-induced deviant behaviour by helping individuals conserve and replenish valuable emotional and social resources. In high-stress environments such as policing, where WFC depletes key resources like time, energy, and emotional well-being, peer support acts as a protective buffer. This aligns with Hobfoll et al. (2018) and Holmgreen et al. (2017), who emphasise that resource loss is more salient than gain, making supportive work relationships vital in preserving well-being. Therefore, fostering strong coworker support can be a strategic intervention to reduce WFC and promote healthier, more adaptive workplace behaviours.

The findings are also consistent with Siddiqi et al. (2025), who found that coworker support reduces WFC and its associated risks among nurses. This study reinforces the importance of coworker relationships as a valuable psychosocial resource. Moreover, although support from friends and relatives and social climate did not show significant mediation effects, their significant moderating roles reinforce the findings of Sonnentag (2018) and Rodríguez et al. (2024), which emphasize the importance of external social networks and workplace climate in providing emotional resources that help employees manage WFC. The absence of significant mediation may be attributed to the indirect nature of these supports in influencing core stress outcomes. Unlike immediate workplace support, such as that from supervisors or coworkers, external social support and organisational climate may not directly alter the internal cognitive-emotional processes through which WFC leads to outcomes like WDB or strain (Hobfoll et al., 2018). As noted by Anand and Vohra (2022), in collectivist cultures (like Ghana), where familial and professional roles are closely intertwined, support from close relations plays a vital role in managing WFC. Their study, however, showed that while perceived supervisor and coworker support significantly predicted WFC, broader organisational support and family role overload had no significant impact, highlighting the particular importance of immediate and relational workplace support in shaping WFC experiences in collectivist settings.

In the case of FWC, PWFs played a more limited mediation role with only social climate showing a significant mediation effect. This suggests that while FWC is a significant antecedent to deviance, it is more resistant to traditional PWFs. This may be because family-originating pressures are harder for the organisation to control directly. For instance, Lee and Lee (2021) noted that despite increasing attention to work–family balance in South Korea, improvements remain limited, partly due to an overly organisation-centred approach. Their study highlighted the often-overlooked negative effects of excessive organisational commitment (OC), including WFC, work-life imbalance, stress, and poor health, revealing that while moderate OC can be beneficial, excessively

high OC results in negative spillover from work to family life. They highlight the need for organisations to support employees in balancing family roles without compromising their strong commitment to work.

The protective role of social climate however indicates that FWC can erode perceptions of a positive social environment, which otherwise reduces negative behaviours. This aligns with prior studies, such as Kalinienė et al. (2021) who emphasised the importance of supportive organisational climates in reducing stress-related outcomes. Moreover, both fair leadership and an innovative climate significantly moderated the impact of FWC on WDB, reinforcing evidence from studies like Siddiqi et al. (2025) and Brewer et al. (2023) that highlight the buffering effects of equitable leadership and adaptive, resource-rich environments.

Overall, these results support the broader theoretical view that while resource depletion from WFC and FWC can lead to stress and potentially WDB, the presence of psychosocial work resources can meaningfully mitigate these effects. These findings echo the assertions of Schneider and Weigl (2018), who argue that constructive leadership, paired with strong organisational support, is key to preserving employee well-being and mitigating negative behavioural outcomes.

Implications of the Study

The findings of this study carry several important implications for policy, leadership practice, and organisational interventions, particularly within the context of high-stress professions such as law enforcement. Theoretically, the findings of this study extend the COR theory by demonstrating how resource loss through WFC and FWC can manifest in negative workplace outcomes such as WDB, particularly within high-stress occupational contexts like policing. The evidence that WFC has a significant but negative relationship with deviance contradicts conventional expectations and highlights the complex interplay between institutional regulation and personal stress responses. This paradox reinforces the argument by Miao and Wang (2017) that contextual factors, such as strong professional control systems, can shape how individuals react to resource loss. Moreover, the findings underscore the role of institutional discipline and accountability appears to moderate typical COR theory dynamics, showing that not all resource losses automatically lead to deviance, depending on the organisational context (Hobfoll et al., 2018).

Additionally, the partial mediating and moderating role of PWFs emphasise the value of resource clusters that help individuals cope with stress (Hobfoll et al., 2018). These findings advance COR theory by empirically illustrating how organisational and social support systems can serve as protective buffers against deviant outcomes in the presence of WFC. However, the diminished buffering effect of these same resources on FWC-related deviance suggests that COR theory must account for the origin of conflict (work versus family) and the boundaries of organisational influence. As Lee and Lee (2021) noted, organisational strategies that focus solely on internal dynamics may be insufficient to mitigate the external pressures stemming from family demands. Thus, the study contributes to theoretical refinement by highlighting the asymmetry in how work- and family-originating conflicts interact with resource availability and a need for models that incorporate the domain-specific nature of resource threats and the context-sensitive efficacy of organisational supports.

Practically, the differential impact of WFC and FWC on WDB reveals that while FWC has a stronger direct and positive impact on deviance. This suggests that interventions aimed at improving work-life balance must address both directions of conflict and not solely focus on work-related demands.

The significant mediating and moderating roles of PWFs underscore their importance as organisational resources. These factors not only reduce the direct effects of WFC and FWC on WDB but also enhance employees' resilience by preserving emotional and social resources, as supported by COR theory. Organizations, especially within the public sector, should therefore invest in building supportive workplace environments, including strong peer networks, transparent and fair leadership practices, and cultures that encourage innovation and employee autonomy. The protective role of fair leadership and innovative climate in buffering the effects of FWC on deviance offers actionable insights for leadership development. Leaders should be trained to demonstrate fairness, supportiveness, and flexibility in managing employee concerns, particularly those involving family responsibilities to strengthen trust and morale and mitigate stress-induced WDBs.

The study also recommends that organisational strategies targeting work-family integration should be holistic, encompassing both internal workplace dynamics (e.g., leadership, coworker relations, and climate) and external support systems (e.g., family outreach, counselling services). Especially in settings like the GPS, where the demands of the job often conflict with personal life, structured programs such as flexible scheduling, employee assistance programs (EAPs), and wellness initiatives can play a critical role in reducing deviance and promoting well-being.

Conclusions

The findings present a nuanced understanding of how conflict across work and family domains influences workplace behaviour in a highly structured and disciplined professional environment. Contrary to initial expectations, WFC demonstrated a significant negative relationship with interpersonal WDB. This unexpected finding suggests that within the rigid institutional framework of the GPS, officers may suppress deviant tendencies despite experiencing personal stress, potentially due to heightened professional accountability and discipline. In contrast, FWC had a significant positive relationship with deviance, affirming that family-related stressors are more likely to spill over into work settings, thereby increasing the risk of interpersonal misconduct.

PWFs played a partial mediating role, especially in the WFC context. Support from coworkers, empowering and fair leadership, and an innovative climate were effective in buffering the negative consequences of WFC on interpersonal behaviour. These findings validate the COR theory, which posits that access to social and emotional resources can mitigate stress-induced outcomes like deviance. However, in the case of FWC, most psychosocial factors showed limited mediation effects, implying that family-based stressors are less amenable to workplace interventions. Nonetheless, the partial mediation of social climate and the moderating effects of fair leadership and innovation-oriented environments suggest that fostering a supportive and equitable work culture can reduce the behavioural impact of FWC.

In sum, the study underscores the importance of context in understanding WFC and FWC. It highlights the differential influence of work- and family-originating conflicts on WDB and the

crucial role of immediate workplace support systems. These findings contribute to the broader literature by demonstrating that while structured environments may suppress deviant responses to WFC, FWC remains a significant risk factor for interpersonal WDB.

Limitations and suggestions for future research

Although the study offers important insights into the link between WFC and interpersonal WDB, its cross-sectional design restricts the ability to establish causality, as it captures data at a single point in time and does not reflect how these relationships may change over time. This approach overlooks the dynamic and evolving nature of WFC and its behavioural consequences. Future studies could employ longitudinal methods to capture the nature of WFC and FWC and their impact on WDB over time to provide a clearer understanding of causal relationships and how fluctuations in PWFs influence behavioural outcomes across different life circumstances.

Additionally, the study's reliance on self-reported measures introduces the risk of biases such as social desirability or memory recall errors, which may influence the accuracy of the responses. Future research could consider using multi-source data, such as supervisor or peer evaluations, alongside self-reports. Incorporating objective behavioural measures or administrative records could also help mitigate biases like social desirability and enhance the validity of the findings.

REFERENCES

Aboobaker, N., Manoj E., & Zakkariya K.A. (2019). Workplace spirituality, employee well-being and intention to stay: A multi-group analysis of teachers' career choice. *International Journal of Educational Management, 33*(1), 28–44. https://doi.org/10.1108/IJEM-02-2018-0049

Afro Barometer Survey (2014). *Let the People Have a Say: Afrobarometer Round 6 Survey in Ghana, 2014*. Retrieved from https://www.afrobarometer.org/wp-content/uploads/2022/02/gha_r6_sor.pdf on March 3, 2025.

Ahmad, R., & Islam, T. (2019). Does work and family imbalance impact the satisfaction of police force employees? A "net or a web" model. *Policing: An International Journal, 42*(4), 585–597.

Akoensi, T. D., & Annor, F. (2021). Work–family conflict and job outcomes among prison officers in Ghana: a test of mediation and moderation processes. *International Criminology*, *1*(2), 135-149.

Altura, T. G., Rao, A. N., & Virick, M. (2021). Proactive personality as a double-edged sword: The mediating role of work–family conflict on employee outcomes. *Journal of Career Development, 48*(6), 849–862. https://doi.org/10.1177/0894845319899984

Ametorwo, A. M., Ofori, D., Annor, F., & Dartey-Baah, K. (2021). Work-family conflict as antecedent to workplace deviance: A study among bankers. *African Journal of Management Research*. https://doi.org/10.4314/ajmr.v27i2.7

An, J., Liu, Y., Sun, Y., & Liu, C. (2020). Impact of work–family conflict, job stress and job satisfaction on seafarer

performance. *International Journal of Environmental Research and Public Health*, *17*(7).

Anand, A., & Vohra, V. (2022). The impact of role overload and social support on work-family conflict in a collectivist culture. *South Asian Journal of Management, 29*(2).

Aquino, K., Lewis, M. U., & Bradfield, M. (1999). Justice constructs, negative affectivity, and employee deviance: A proposed model and empirical test. *Journal of organizational Behaviour*, *20*(7), 1073-1091.

Barnett, R. C., & Gareis, K. C. (2006). Role theory perspectives on work and family. *The work and family hanWDBook: Multi-disciplinary perspectives and approaches*, 209-221.

Bennett, R. J., Marasi, S., & Locklear, L. (2018). Workplace deviance. In *Oxford Research Encyclopedia of Business and Management*. Oxford University Press. https://doi.org/10.1093/acrefore/9780190224851.013.111

Boateng, F. D., Makin, D. A., Abess, G., & Wu, G. (2019). Speaking out: Officers speaking about police misconduct in Ghana. *Police Journal, 92*(2), 121–135. https://doi.org/10.1177/0032258X18768384

Bowen, P., & Zhang, R. P. (2020). Cross-boundary contact, work-family conflict, antecedents, and consequences: Testing an integrated model for construction professionals. *Journal of Construction Engineering and Management, 146*(3). https://doi.org/10.1061/(asce)co.1943-7862.0001784

Brewer, L. E., Beal, H. K. O., Cross, C. J., Gull, S. J., & Burrow, L. (2023). Quarantine mothering and working at home: how institutions of higher education supported (or failed to support) academic mothers. *Journal of the Motherhood Initiative for Research and Community Involvement*, *14*(1), 20-20.

Chen, Y., Zhang, F., Wang, Y., & Zheng, J. (2020). Work–family conflict, emotional responses, workplace deviance, and well-being among construction professionals: A sequential mediation model. *International Journal of Environmental Research and Public Health*, *17*(18), 1–19.

Dipboye, R. L. (2018). Occupational stress. In *The Emerald Review of Industrial and Organisational Psychology* (pp. 213–263). Emerald Publishing Limited.

Faiz, S., Rubbab, U. & Kayani, N. (2020). Impact of work-family conflict on deviant workplace behavior through stress and burnout: A sequential mediation model. *Journal of Business and Tourism, 06*.

Farooq, W., Khalid B., O., Ishaq, R., & Kashif, S. (2023). Investigating the non-work antecedents of workplace deviance. *Cogent Business and Management*, *10*(1).

Gamor, E., Amissah, E. F., Amissah, A., & Nartey, E. (2018). Factors of work-family conflict in the hospitality industry in Ghana. *Journal of Human Resources in Hospitality and Tourism*, *17*(4), 482–501.

Ghana Police Service (GPS, 2017). *Accra Region*. Retrieved from https://police.gov.gh/en/index.php/accra-region/ on June 9, 2025.

Hobfoll, S. E., Halbesleben, J., Neveu, J.-P., & Westman, M. (2018). Conservation of resources in the organisational context: The reality of resources and their consequences. *Annual Review of Organisational Psychology and Organisational Behavior, 5*(1), 103–128. https://doi.org/10.1146/annurev-orgpsych

Holmgreen, L., Tirone, V., Gerhart, J., & Hobfoll, S. E. (2017). Conservation of resources theory. In *The HanWDBook of Stress and Health* (pp. 443–457). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118993811.ch27

Huff, J., White, M. D., & Decker, S. H. (2018). Organizational correlates of police

deviance: A statewide analysis of misconduct in Arizona, 2000-2011. *Policing: An International Journal*, *41*(4), 465-481.

Imam, H., Bilal, N., & Sekiguchi, T. (2025). When rudeness goes home: The impact of supervisor incivility on employees' work–family conflict. *Future Business Journal, 11*(1), 1–11.

Jiang, D., Chen, Q., Ning, L., & Liu, Q. (2022). Work-family conflict and counterproductive behavior of employees in workplaces in China: Polynomial regression and response surface analysis. *The Journal of Asian Finance, Economics and Business, 9*(6), 95–104.

Kalinienė, G., Lukšienė, D., Ustinavičienė, R., Škėmienė, L., & Januškevičius, V. (2021). The burnout syndrome among women working in the retail network in associations with psychosocial work environment factors. *International Journal of Environmental Research and Public Health, 18*(11), 5603.

Kissi-Abrokwah, B., Andoh-Robertson, T., Tutu-Danquah, C., & Agbesi, C. S. (2015). *Journal of Education and Practice www.iiste.org ISSN* (Vol. 6, Issue 1). Online. www.iiste.org

Labrague, L. J., Ballad, C. A., & Fronda, D. C. (2021). Predictors and outcomes of work–family conflict among nurses. *International Nursing Review*, *68*(3), 349–357.

Lee, H., & Lee, S. Y. (2021). Is more commitment always better? A study on the side effects of excessive organisational commitment on work–family conflict. *Review of Public Personnel Administration, 41*(1), 25–56.

Liao, E. Y., Lau, V. P., Hui, R. T. Y., & Kong, K. H. (2019). A resource-based perspective on work–family conflict: Meta-analytical findings. *Career Development International, 24*(1), 37–73.

Lin, L., & Bai, Y. (2023). The dual spillover spiraling effects of family incivility on workplace interpersonal deviance: From the conservation of resources perspective. *Journal of Business Ethics, 184*(3), 725–740. https://doi.org/10.1007/s10551-022-05123-z

Marasi, S., Bennett, R. J., & Budden, H. (2018). The structure of an organization: Does it influence workplace deviance and its dimensions? *Journal of Managerial Issues, 30*(1).

Miao, C. F., & Wang, G. (2017). Effects of work–family interface conflicts on salesperson behaviors: A double-edged sword. *Journal of the Academy of Marketing Science*, *45*(5), 762-783.

Misfin, E. W., Singh, M., & Phoolka, S. (2024). Impact of family and work conflicts on job satisfaction, life satisfaction and health of female teachers in Ethiopia: the moderating role of resilience. *Cogent Business and Management*, *11*(1).

Netemeyer, R. G., Boles, J. S., & McMurrian, R. (1996). Development and validation of work-family conflict and family-work conflict scales. *Journal of Applied Psychology, 81*(4), 400–410. https://doi.org/10.1037/0021-9010.81.4.400

Nohe, C., Meier, L. L., Sonntag, K., & Michel, A. (2015). The chicken or the egg? A meta-analysis of panel studies of the relationship between work-family conflict and strain. *Journal of Applied Psychology, 100*(2), 522–536. https://doi.org/10.1037/a0038012

Robinson, S. L., & Bennett, R. J. (1995). A typology of deviant workplace behaviors: A multidimensional scaling study. *Academy of management journal*, *38*(2), 555-572.

Rodríguez, W. A., Zhou, Z. E., Busse, K., & Che, X. (2024). Family-to-work conflict and instigated incivility: The role of negative affect and family supportive supervisor behaviours. *Stress and Health, 40*(1), e3282.

Rugulies, R. (2019). What is a psychosocial work environment?. *Scandinavian journal of work, environment & health*, *45*(1), 1-6.

Schneider, A., & Weigl, M. (2018). Associations between psychosocial work factors and provider mental well-being in emergency departments: A systematic review. *PLoS ONE, 13*(6), e0197375.

Shockley, K. M., Shen, W., DeNunzio, M. M., Arvan, M. L., & Knudsen, E. A. (2017). Disentangling the relationship between gender and work–family conflict: An integration of theoretical perspectives using meta-analytic methods. *Journal of applied psychology*, *102*(12), 1601.

Siddiqi, K. O., Hashim, R. A., Mahmood, R., & Rahman, M. H. (2025). Does supervisory and co-worker support reduce work-family conflict among nurses in Bangladesh? The moderating effect of technostress. *Employee Responsibilities and Rights Journal, 37*(1), 29–51.

Singh, R., & Nayak, J. K. (2015). Mediating role of stress between work-family conflict and job satisfaction among the police officials: Moderating role of social support. *Policing, 38*(4), 738–753. https://doi.org/10.1108/PIJPSM-03-2015-0040

Sonnentag, S. (2018). The recovery paradox: Portraying the complex interplay between job stressors, lack of recovery, and poor well-being. *Research in Organisational Behavior, 38*, 169–185.

Tsang, S. S., Liu, Z. L., & Nguyen, T. V. T. (2023). Family–work conflict and work-from-home productivity: do work engagement and self-efficacy mediate? *Humanities and Social Sciences Communications*, *10*(1).

Viegas, V., & Henriques, J. (2021). Job stress and work-family conflict as correlates of job satisfaction among police officials. *Journal of Police and Criminal Psychology, 36*(2), 227–235. https://doi.org/10.1007/s11896-020-09388-w

Wang, S. P., Chen, M. S., & Li, M. J. (2018). Key factors affecting deviant workplace behavior. *African Journal of Business Management, 12*(10), 258–266.

Wannstrom, I., Peterson, U., Asberg, M., Nygren, A. & Gustavsson, J. P. (2009). Psychometric properties of scales in the General Nordic Questionnaire for Psychological and Social Factors at Work (QPSNordic): Confirmatory factor analysis and prediction of certified long-term sickness absence. *Scandinavian Journal of Psychology, 50*(3), 231–244.

Wikström, P.-O. H., & Kroneberg, C. (2021). *Annual Review of Criminology Analytic Criminology: Mechanisms and Methods in the Explanation of Crime and its Causes*.

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African Journal of Management Research seeks to publish works that test, advance and develop models, frameworks and concepts in the broad areas of management, organisation, finance, public sector management, marketing and decision systems. The Journal is international and multidisciplinary, which means that topics and themes appropriate for African Journal of Management Research will come from and cut across organisational/institutional sectors (public, private, non-for-profit) and address matters of theory, research and practice from a variety of management and organizational disciplines (finance, operations, human resource, organisational behaviour, marketing, services). The Journal's multidisciplinary character means it seeks to promote the interplay and nexus between organisational functionality, management practice and economic / national development. The Journal's aim is to facilitate greater understanding of organisational processes, managerial processes and functions and critical firm level challenges facing developing and emerging areas.

Papers will have strong theoretical foundations, solid and defensible methodological frameworks with clear empirical stance. In this regard, *African Journal of Management Research* is mainly empiricist. Our definition of 'empiricist' in this context is not to exclude the phenomenological. Rather those papers will have sound quantitative and/or qualitative data, rigorous design and demonstration of exploring and advancing knowledge of the world 'as-is'. The Journal will periodically accept prescriptive, theoretical and conceptual papers (the world-as-should-be) which in its view present sufficiently ground-breaking discourse of theory, models and methodological paradigms, reviews of the literature or practice which lead to new understandings.

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The Journal published two issues a year - June and December. It has the following typical structure:

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The Journal's circulation is worldwide. It pursues a policy of double-blind peer-review. Papers are likely to vary in length from 5000-7500 words. Papers outside this range may only be considered under special circumstances.

Papers are invited from the general academic, research and practitioner community in Africa and around the world; the journal will occasionally issue calls for papers along particular thematic lines or request peer commentaries on topical issues.

Notes to Contributors

Authors are to note that should the Editor deem it necessary, the Journal may call for data file/analyses and/or research instruments for separate or simultaneous review. It is a condition of acceptance for review, that the paper is not under consideration elsewhere and that the data are not being repeated from a previous work (except that clear and demonstrable alternate issues, concepts or extensions are being developed, in which case due reference and notification must be made to said previous work). The Journal has an internet Editor. The following are the key submission requirements:

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- Title Page (title, author's name/s, institutional affiliation, full contact details - phone, fax, email and post) must be prepared separate from the body of the paper. Titles must be as concise as possible and not more than 15 words. Authors must avoid any reference to themselves no matter how tangential in the body of the text.
- Avoid the use of foot or end notes.
- Tables, Figures and Diagrams must be camera ready and sharp, set within the text; numbered, titled at the bottom without spacing from table, figure or diagram, all in font size 10. Voluminous descriptive data tables are not encouraged, except that they have direct bearing on the discourse and need to be referred to. Parsimony in use of tables and figures is preferred.
- All articles should include in the methodology, clear statement of where and when data were collected. The use of student populations, where the matter at hand does not relate to student issues is not encouraged.
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