Roles of Oil Subsidy Removal on Transportation Cost and Water Factory in Cross River South, Nigeria

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Abstract
This study investigates the key determinants of performance among water factory small and medium enterprises, with a focus on the effects of market accessibility, transportation costs, cost of living, policy interventions, and financial fluctuations. The analysis reveals that proximity to markets significantly enhances enterprise performance, underscoring the importance of efficient logistics and infrastructural development. While transportation costs, cost of living, and short-term profit fluctuations show limited influence, supportive government policies, particularly the removal of oil subsidies, positively impact enterprise outcomes. The findings highlight that accessibility and policy frameworks are central to the growth and sustainability of these enterprises. Based on the results, the study recommends investments in infrastructure, sustained policy support, targeted financial programs, and further research into managerial capacity and market dynamics to strengthen the resilience and competitiveness of water factory enterprises.

1.1 Introduction

The removal of fuel subsidy in Nigeria in 2023 represents a major structural reform with profound implications for production, pricing, and the survival of Small and Medium Enterprises (SMEs). Prior to its removal, fuel subsidy functioned as an implicit support mechanism that kept energy and transportation costs relatively low across sectors. However, the deregulation of petroleum prices led to a sharp increase in fuel costs, with petrol prices rising to over ₦1,000 per litre in many parts of the country by 2024. This dramatic increase has triggered widespread inflationary pressures, as energy constitutes a critical input in virtually all economic activities. Empirical data indicate that the macroeconomic consequences of subsidy removal have been significant. Nigeria's inflation rate rose from 28.9 percent in December 2023 to 34.19 percent by June 2024, marking one of the highest levels recorded in decades. This surge in inflation has been largely attributed to rising fuel prices, which have increased transportation costs, production expenses, and the general cost of living. For instance,

urban transport fares nearly doubled immediately after the subsidy removal, increasing from ₦649.59 in May 2023 to ₦1,285.41 in June 2023. Such increases have cascading effects on supply chains, raising the cost of raw materials and finished goods across industries. (Okoruwa 2024)

Within this macroeconomic environment, SMEs, particularly water factory businesses, are disproportionately affected due to their heavy dependence on fuel-powered energy sources. In Nigeria, unreliable electricity supply forces many SMEs to rely on petrol or diesel generators for production. Studies show that fuel subsidy removal significantly increases production and logistics costs, thereby reducing profitability and operational efficiency of small businesses. Water factory SMEs in Cross River South are especially vulnerable, as their operations involve energy-intensive processes such as water purification, pumping, packaging, and distribution. (Abiodun & Ajuwon 2025).

Furthermore, the removal of fuel subsidy has intensified transportation and distribution costs, which are central to the water supply chain. Research indicates that rising fuel prices directly lead to increased transportation costs, which in turn elevate the prices of goods and services while reducing consumer purchasing power. This is particularly critical for sachet and bottled water businesses, where profit margins are already thin and demand is highly sensitive to price changes. As household incomes decline and living costs rise, consumption patterns shift, leading to reduced demand for non-essential goods, including packaged water. In addition, the broader economic environment reflects worsening welfare conditions. Evidence shows that fuel subsidy removal has contributed to declining household incomes, increased poverty levels, and reduced standards of living. Nationally, rising costs associated with subsidy removal have been linked to increased food prices and economic hardship, with millions of Nigerians facing heightened vulnerability due to inflationary shocks. These conditions further constrain the market for SMEs, including water factories, as consumers prioritize basic necessities over discretionary spending. Despite these short-term challenges, proponents argue that subsidy removal improves fiscal sustainability and government revenue. For instance, Nigeria's fiscal deficit reduced from 5.4 percent of GDP in 2023 to about 3.0 percent in 2024 following reform measures. However, while such macroeconomic gains may be beneficial in the long run, the immediate burden on SMEs, especially in energy-dependent sectors; raises critical concerns about business sustainability, employment, and local economic development. (Ozuma 2024)

In Cross River South, where SMEs constitute a major source of livelihood and access to potable water is essential, the impact of subsidy removal is both economic and social. The rising cost of fuel not only increases production and distribution expenses but also threatens the affordability and accessibility of clean water. Consequently, water factory SMEs face a dual challenge of maintaining profitability while ensuring product affordability in an increasingly constrained economic environment.

In summary, the removal of fuel subsidy in Nigeria has generated significant cost-push inflation, increased operational expenses, and reduced consumer demand, all of which adversely affect water factory SMEs in Cross River South. These developments underscore the need for targeted policy interventions, including improved power supply, financial support mechanisms, and energy alternatives, to mitigate the adverse effects of subsidy removal and promote the sustainability of SMEs

1.2 Statement to the Problems

The removal of fuel subsidy in Nigeria in 2023 has generated significant macroeconomic shocks, particularly in the form of rising energy costs, inflation, and declining purchasing power. Empirical evidence shows that petrol prices increased by over 200 percent, rising from about ₦206 per litre in 2022 to over ₦671 in 2023, and further exceeding ₦1,100 per litre in 2024. Similarly, other studies indicate that fuel prices surged by nearly 300 percent following

subsidy removal, creating widespread cost pressures across sectors. These increases have translated into higher production and transportation costs, which disproportionately affect Small and Medium Enterprises (SMEs), especially those that are energy-intensive. At the macroeconomic level, the inflationary impact of subsidy removal has been severe. Nigeria's inflation rate rose sharply from 28.9 percent in December 2023 to 34.19 percent by June 2024, marking one of the highest levels in recent decades. Projections also indicated that inflation could exceed 32 percent in 2024 due to rising fuel costs and supply chain disruptions. This persistent inflation has eroded consumer purchasing power, reduced household welfare, and constrained demand for goods and services. Consequently, SMEs; particularly those operating in low-income regions—face declining sales and shrinking profit margins. (Chukunalu & etel 2025).

Despite the central role of SMEs in employment generation and local economic development, evidence suggests that the subsidy removal created a structural break in SME performance beginning in May 2023, largely driven by inflationary pressures and rising input costs. While some firms attempt to transfer increased costs to consumers, this strategy is often ineffective in contexts where consumers are already financially constrained. Indeed, rising living costs have contributed to worsening welfare conditions, with over 31.8 million Nigerians experiencing acute food insecurity due to increased prices of transportation and essential goods (Abiodun & Ajuwon, 2025)

In Cross River South, the situation is even more critical for water factory SMEs, which depend heavily on fuel-powered generators due to unreliable electricity supply. The surge in fuel prices directly increases the cost of water production processes such as pumping, purification, packaging, and distribution. At the same time, higher transportation costs inflate the price of distributing sachet and bottled water to consumers. Given that water is a basic necessity but also a price-sensitive commodity, these rising costs create a dilemma for producers: increasing prices may reduce demand, while maintaining prices erodes already thin profit margins. Furthermore, the broader economic environment has intensified operational challenges for SMEs. Large firms in Nigeria recorded significant financial losses, estimated at over ₦418 billion in early 2024; due to high costs and economic instability following subsidy removal. If large corporations face such pressures, the implications for smaller, less resilient water factory SMEs are even more severe. Many of these businesses lack access to credit, alternative energy sources, and financial buffers needed to withstand such shocks. Despite the growing body of literature on fuel subsidy removal and its macroeconomic effects, there remains a limited number of empirical studies focusing specifically on sectoral impacts particularly on water factory SMEs in Cross River South. Most existing studies generalize the effects on SMEs without adequately capturing location-specific dynamics, energy dependency, and the unique challenges faced by water production businesses. This creates a critical research gap in understanding how subsidy removal affects production costs, pricing strategies, and business sustainability within this sector (Ilodigwe 2023)

Therefore, the problem this study seeks to address is the lack of in-depth empirical evidence on how fuel subsidy removal has affected the operational performance, cost structure, and survival of water factory SMEs in Cross River South. Without such evidence, policymakers may be unable to design targeted interventions to mitigate the adverse effects of subsidy removal on this critical sector.

2.0. Literature Review

2.1. Theoretical Literature

2.1.1 Cost Push Inflation Theory

Cost Push Inflation Theory, was first formally developed by Richard Lypsen in 1960, Cost push inflation theory explains inflation as a result of rising production costs rather than excess

demand. In this theory, inflation occurs when the overall prices of goods and services increase because the cost of production- such as wages, raw materials, energy, and taxes-rises, and producers pass these costs onto consumers. Increase in cost of production (e.g., wages, oil prices, taxes). Producers raise prices to maintain profit margins. This leads to a general rise in price level (inflation), even if demand has not increased. Wage–push: powerful labor unions negotiating higher wages. Profit–push: firms with monopoly/oligopoly power raising prices. Supply shock: sudden rise in raw material or energy costs (e.g., oil price shocks of 1973). Imported inflation: increase in cost of imports due to exchange rate depreciation. Implication of the model: Policies to reduce demand (like raising interest rates) may not solve cost–push inflation because it is supply-driven. Government may need supply-side policies (subsidies, tax reduction, wage controls, productivity growth). Cost-push inflation often leads to **stagflation** (inflation and unemployment), as seen in the 1970s.

Assumption: producers do not absorb cost increases but transfer them to consumers. Economy is not necessarily at full employment (inflation can occur with stagnation). Wages and prices can be inflexible downward, creating a spiral. While the bottleneck discovered by Monetarists (e.g., Friedman, 1968) argue inflation cannot persist without monetary expansion; cost shocks only cause a one-time rise in prices unless money supply grows. Overemphasizes union power and underestimates the role of aggregate demand. In summary**:** Cost–push inflation theory says inflation is caused by rising production costs (wages, raw materials, taxes), not necessarily by excess demand.

Relation of cost push inflation to the current study, Oil subsidy removal in Nigeria has a strong link with cost-push inflation, and this relationship is transmitted to small and medium enterprises in Cross River South mainly through higher transportation and energy costs**.** When petrol prices rise after subsidy removal, transporters increase fares, logistics costs rise, and the prices of raw materials and finished goods become more expensive to move across Calabar and surrounding communities. This pushes up the cost of production for small and medium enterprises; especially those involved in trading, agro-processing, hospitality, and light manufacturing, leading to cost-push inflation. For small and medium enterprises in Cross River South, transportation cost becomes a major channel through which subsidy removal affects business performance. Many small and medium enterprises depend on road transport for supplies coming from other states (e.g., Lagos, Onitsha, Aba, Kano), and they also rely on local transport to distribute goods to customers. When transport costs increase, SMEs face higher input costs and higher distribution costs. Since many small businesses operate with low capital and thin profit margins, they often cannot absorb these costs. The result is higher selling prices, reduced competitiveness, and weaker sales. Cost-push inflation further worsens SME outcomes by reducing consumers' purchasing power. As prices rise generally, households cut back on non-essential spending, and demand falls for many SME products and services. This creates a double burden: SMEs face rising costs while also experiencing declining sales volumes. In Cross River South, where a large share of business activity is informal and cash-based, inflation also increases uncertainty, discourages investment, and limits the ability of SMEs to plan, expand, or hire workers.

2.1.2 Market failure Theory

The Pigovian Theory, originally developed by Arthur Pigou (1920), provides a strong justification for government intervention when markets fail to allocate resources efficiently. In many developing economies, small and medium enterprises (SMEs) operate in environments characterized by imperfect markets, including credit constraints, limited access to information, weak infrastructure, and high transaction costs. Due to information asymmetry, banks and investors often perceive SMEs as high-risk borrowers, which restricts their access to affordable finance. As a result, SMEs tend to underinvest relative to their true potential contribution to

the economy. Importantly, SMEs generate substantial positive externalities that private markets often undervalue. These include employment creation, poverty reduction, innovation, skills development, and regional economic development. Since private actors cannot fully capture these broader social benefits, the market may underprovide investment and support for SMEs despite their strategic importance for national development. In such circumstances, government intervention becomes justified as a corrective mechanism. Subsidies, for example, are a practical tool for addressing this inefficiency. By lowering the cost of production and operation through tax relief, grants, credit guarantees, low-interest loans, or support for energy and transport, subsidies help SMEs expand output, compete more effectively with larger firms that benefit from economies of scale, and contribute to inclusive growth. Targeted subsidies for SMEs in disadvantaged regions can also reduce income inequality and promote balanced development across regions.

Closely related, Market Failure Theory further explains why free markets may not always achieve efficiency or equity. Market failure occurs when the assumptions of perfect competition do not hold, such as in cases of monopoly or oligopoly, incomplete markets, and weak institutions. The theory assumes rational economic actors, but even rational decisions can produce unintended consequences. It also assumes full and equal information; however, information asymmetry often leads to credit rationing against SMEs. Furthermore, market efficiency assumes that transactions affect only buyers and sellers, yet externalities both negative (e.g., pollution) and positive (e.g., SME job creation) are frequently ignored. Market failure also arises where property rights are weak or poorly enforced, especially in common resources, and where markets underprovide public goods such as infrastructure, transport systems, and shared business development services (e.g., training facilities). In addition, the assumption of costless exchange is unrealistic in many SME environments, where high transaction costs such as loan applications, compliance burdens, and regulatory barriers limit market participation.

From this perspective, government policies such as subsidies, regulation, taxation, and direct provision of infrastructure are justified. For example, Pigouvian taxes are recommended to correct negative externalities, while subsidies and incentives are appropriate for activities with positive spillovers, including SME development, education, and innovation. Similarly, where market power distorts prices, antitrust laws, price controls, and competition policies become necessary. Since SMEs often face high production and transport costs, especially in regions with poor infrastructure, targeted subsidies for energy, transport, and logistics can enhance productivity and competitiveness. However, subsidies should be carefully designed and targeted toward correcting specific failures such as credit gaps, infrastructure deficiencies, or innovation constraints, rather than serving as broad handouts.

Despite its usefulness, Market Failure Theory also acknowledges limitations. While government intervention may correct market inefficiencies, governments can also fail due to corruption, poor policy design, bureaucracy, political interference, and misallocation of resources. For instance, subsidies intended for SMEs may be captured by elites or diverted to unproductive firms. Additionally, the theory is mainly concerned with efficiency (Pareto optimality) and may overlook broader goals such as equity, social justice, and sustainability. Measuring market failures, especially externalities, can also be difficult, making corrective interventions challenging to implement accurately. Furthermore, markets are dynamic and may self-correct over time. Austrian economists such as Hayek (1945) argue that what appears to be market failure may represent temporary imbalances that innovation can resolve; for example, SMEs facing credit constraints may later access alternative financing through microfinance institutions, cooperatives, or fintech platforms without direct government subsidies.

2.1 Empirical Literature

Ilodigwe (2023) examined the negative impact of fuel subsidy removal on SMEs in Anambra State, Nigeria using a mixed-method approach involving questionnaires and in-depth interviews from 105 SMEs. The study found that subsidy removal significantly increased production costs, reduced profit margins, and lowered sales due to declining consumer purchasing power. For water factory SMEs, this implies higher costs of pumping water, packaging, and distribution. The study recommended government intervention through cost-relief policies and energy support schemes.

Adeniyi and Mukoro (2025) investigated the cost of running businesses and SME performance in Delta State using survey data from 523 respondents and chi-square analysis. Findings showed that subsidy removal raised fuel and transportation costs, leading to increased product prices and reduced demand. For water factories, rising diesel costs for boreholes and logistics directly affect profitability. The authors recommended industrial clusters with stable electricity and policy support to cushion SMEs.

Ekaette et al. (2025) assessed entrepreneurial survival and MSME growth post-subsidy removal using regression analysis on data from 367 firms nationwide. The study revealed that increased fuel prices led to higher production and operating costs, negatively affecting output and growth. For water factories, this translates to higher costs of filtration, pumping, and packaging processes. The authors recommended adaptive strategies such as energy efficiency and diversification.

Oladimeji (2025) examined fuel subsidy removal and performance of SMEs in Lagos using survey design and a sample of 387 firms. Findings showed that logistics and overhead costs increased significantly, reducing SME performance. Water factory SMEs are particularly affected due to heavy reliance on transportation for distribution. The study recommended improved transport systems and favorable monetary policies to reduce operational burdens.

Iwuchukwu and Nwankwo (2017) investigated fuel subsidy removal and SME performance in Nigeria. Using empirical analysis, the study found that subsidy removal reduced some inefficiencies and could improve profitability in certain cases due to better pricing mechanisms. However, for water SMEs, benefits depend on the availability of alternative energy sources. The study recommended efficient fuel market reforms and improved infrastructure.

Omotosho (2015) analyzed the political economy of fuel subsidy removal and found that it disproportionately affects small businesses and low-income groups through rising costs. Water factory SMEs, which serve low-income consumers, experience reduced patronage when prices increase. The study recommended targeted subsidies or social protection for vulnerable sectors.

Ayanlowo et al. (2025) conducted an econometric study on petroleum subsidy removal and macroeconomic indicators in Nigeria using time-series regression (2000–2024). The study found that subsidy removal contributes to inflationary pressure and economic instability. For water SMEs, inflation increases costs of inputs like packaging materials and fuel, thereby reducing profit margins. The study recommended gradual policy implementation and inflation control measures.

Similarly, Adeniyi and Mukoro (2025) conducted a survey-based study in Delta State and reported that the removal of fuel subsidies significantly increased the cost of running businesses, especially in terms of transportation and energy expenses. The study revealed that SMEs responded by increasing product prices, which in turn reduced customer patronage. In the context of water factories, where demand is highly price-sensitive, such cost increases can lead to reduced sales volume and profitability.

Using time-series analysis, Chukunalu et al. (2025) investigated inflation and SME growth before and after subsidy removal and identified a structural break in SME performance following the policy implementation in 2023. The study concluded that inflationary pressures triggered by subsidy removal negatively affected SME output. This has direct implications for

water factory SMEs, as rising costs of inputs such as packaging materials and fuel reduce operational efficiency and competitiveness.

In another study, Ekaette et al. (2025) employed regression analysis to assess entrepreneurial survival in the post-subsidy removal era. The findings indicated that increased fuel prices significantly constrained business expansion and growth. Water production firms, which depend on continuous energy supply, are particularly vulnerable to such cost shocks, thereby affecting their long-term sustainability.

Oladimeji (2025) further corroborated these findings by analyzing SMEs in Lagos State and reporting that subsidy removal increased logistics and overhead costs, leading to a decline in business performance. The study emphasized that transportation costs play a critical role in determining SME profitability, a factor that is highly relevant for water factory SMEs engaged in daily distribution of sachet and bottled water.

3.1 Research design

This study adopted the survey research design to establish the impacts of oil subsidy removal and transportation cost on small and medium enterprises in Cross River South. The survey research design entails the selection and study of samples chosen from the population to discover the relative incidence, distribution and interrelations of the variables (Ndiyo, 2005). The design is used to study both small and large population to discover relative incidence, distribution and interaction between psychological and social variables.

Survey research has a feature of lack of control and the researcher is therefore interested in observing what is happening to the variables under investigation. The survey design is relevant in studies where questionnaires are utilized for the purpose of data collection. The study used the survey design due to its compatibility with the study situation which is evaluative and opinion oriented, therefore, enable the research discover the inter-relations between variables and the use of questionnaires and interviews as means of data collection.

3.2 Study area

ross River South comprises seven local government areas, each with distinct geographical, cultural, and economic characteristics. **Calabar Municipality** and **Calabar South** are coastal urban centers, predominantly inhabited by the Efik people, and are known for rich cultural festivals such as the Calabar Carnival and traditional Ekpe society activities. Their economies are driven by trade, government services, tourism, education, and fishing. **Akamkpa** and **Odukpani**, located inland, are mainly populated by the Ejagham and Bahumono communities, with cultural practices centered on traditional rites and masquerades; their residents engage primarily in farming, timber, and small-scale trading. **Akpabuyo**, a coastal-riverine area neighboring Calabar, is largely Efik and Efut, with fishing, farming, and commerce as dominant occupations**. Biase**, an inland and more rural LGA, is home to Bahumono and Efik communities who focus on agriculture and local trade. Lastly, **Bakassi**, a coastal peninsula bordering the Atlantic Ocean and Cameroon, is inhabited by Efik and Efut people and is renowned for fishing, aquaculture, salt production, and cross-border trade. Together, these seven LGAs reflect a mix of urban and rural settings, diverse cultures, and economic activities that define Cross River South (Aye, 1967)

3.3 Population of the Study

According to MEDA (2024), the distribution of registered Small and Medium Enterprises (SMEs) across selected local government areas in Cross River South varies considerably. Calabar Municipality has the highest number with 1,500 registered SMEs, followed by Calabar South with 900. In the other areas, Akamkpa has 450 SMEs, Odukpani 400, Akpabuyo 350, Biase 300, and Bakassi 172, bringing the total number of registered SMEs in these areas to

4,072. This data highlights the concentration of SMEs in urban centers compared to more rural local government areas.

TABLE 1: Distribution of the registered SMEs

S/N	L.G.A	REG.SMEs
1	Calabar Municipality	1500
2	Calabar South	900
3	Akamkpa	450
4	Akpabuyo	350
5	Biase	300
6	Bakassi	172
7	Odukpani	400
8	Total	4072

Microfinance Enterprises Development Agency 2024.

3.4 Population Size

The study population consists of 4,072 registered SMEs in Cross River South (MEDA, 2024). The sample size will be determine using Taro and Yamane's (1967) formula at 5% level of precision. Based on the computation, a sample size of 364 respondents will be obtain. This size was considered adequate to ensure representativeness of the population while maintaining manageability in terms of data collection.

$$n = \frac{N}{1+N(e^2)}$$

Where:

n = sample size
N = population size
e = margin of error (usually 0.05 for 5%, 0.02 for 2%, etc.)
Substituting into the above formular

$$n = \frac{4072}{1 + 4072(0.05)^2}$$

$$n = \frac{4072}{1 + 4072(0.0025)}$$

$$n = \frac{1+10.18}{}$$

$$n = \frac{4072}{11.18}$$

$$n = 364.$$

Therefore, sample size estimated = 364 for Cross River South.

3.5 Sampling Size

TABLE2: Distribution of Actual Sample Size in L.G.A

S/N	L.G.A	ESTIMATED
1	Calabar Municipality	135
2	Calabar South	80
3	Akamkpa	40
4	Akpabuyo	33
5	Biase	25
6	Bakassi	15
7	Odukpani	36
8	Total	364

Author`s Computation 2026

3.6 Sources of Data

The study relied solely on primary data, which consist of first-hand information obtained directly from respondents during fieldwork. The primary data were collected through structured questionnaires and personal interviews administered to selected small and medium enterprise (SME) operators. These instruments generated original responses on the effects of oil subsidy removal and transportation costs on employment, sales growth, and profitability, thereby providing relevant and specific information for the study.

TABLE 3: Percentage Distribution of the sample Sizes for Each L.G.A

S/N	L.G.A	ESTIMATED %
1	Calabar Municipality	36.82
2	Calabar South	22.10
3	Akamkpa	11.05
4	Akpabuyo	8.60
5	Biase	7.36
6	Bakassi	4.22
7	Odukpani	9.82
8	Total	100

Author`s Computation 2026.

3.7Model Specification

The probit regression model is expressed as:

$Q = f(A, L^{\beta}, K^{\varphi})$ …… (3.1)

Q = f(DIST, TC, OSR, PL, COL)

- - - - - (3.2)

Where:

Q = outcome variable

A = Technology

L = Labour

K = Capital

β & φ = Returns to scale

DIST = Distance

TC = Transport Cost

OSR = Oil Subsidy Removal

PL = Profit and Loss

COL = Cost of Living

Water Factory SMEs Equations

The water factory equation illustrates the relationship between water factory SMEs and oil subsidy removal, alongside other relevant variables. This framework is anchored in Market Failure and Cost-Push Inflation theories. According to the Market Failure Theory, developed by Arthur Pigou, the free market often fails to allocate resources efficiently, resulting in negative externalities that reduce the satisfaction of goods and services for the final consumer. In this context, capitalists are unable to introduce or sustain oil subsidies (OSR) that could help lower the high cost of living (COL). As a result, the economic burden on consumers increases, while higher transportation costs further erode business profits,(PL) negatively affecting the sustainability of water factory SMEs. The equation is specified:

WFSMEs = f((DIST, TC, OSR, PL, COL) ------- (3.3)

WFSMEs = = β0 + β1DIST + β2TC+ β3OSR+ β4PL+ β5 COL - - - - -(3.4)

Probit (EMPL) = β0 + β1DIST + β2TC+ β3OSR+ β4PL + β5 + ε - - - - - (3.5)

Measurement of Variables

WFSMEs = Water Factory SMEs, it is measure by liters per day of the bottles produced.

DIST = Distance, it is measure by KM per hour.

TC = Transport Cost, it is measure by fuel consumption per trip.

OSR = Oil Subsidy Removal, it is measure through the income gap; before and during the oil subsidy removal.

PL = Profit and Loss, it is measure by net profit.

4.1 Presentation of Data and Analysis

Table 4

Questionnaire	Responses	Total	Percentage (%)
Number of questionnaires returned	353	353	96.9
Number of questionnaires not returned	11	11	3.02
Total	364	364	100

The table 4.1 presents a summary of the questionnaire administration and retrieval rate for the study. Out of 364 questionnaires distributed, 353 were successfully returned, representing 96.9. percent of the total, while only 11 percent questionnaires were not returned, accounting for 3.03 percent. This indicates a very high response rate, suggesting that the data collected is reliable and adequate for meaningful analysis and interpretation of the study finding.

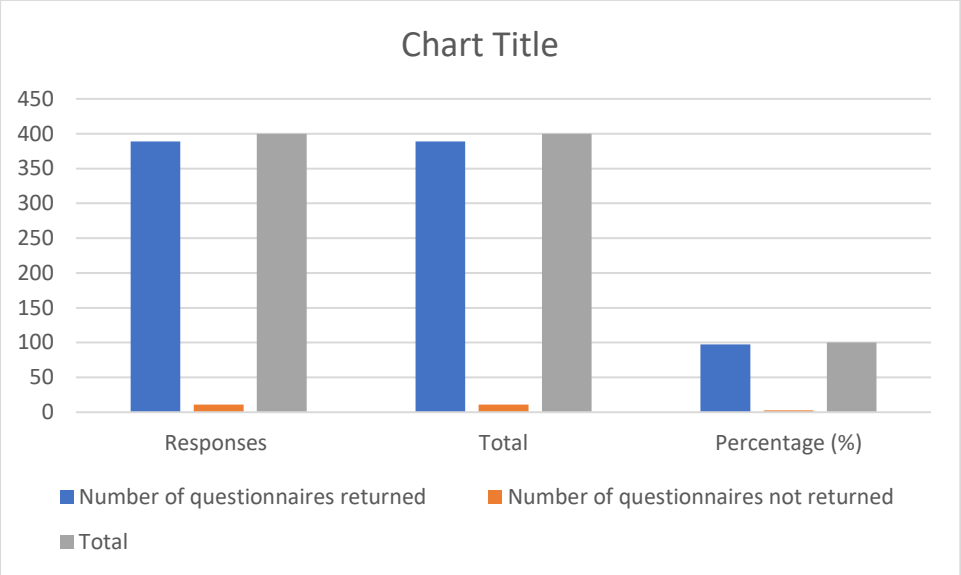

Figure 1: A bar chart showing the number of questionnaires returned and not returned and its percent.

The above bar chart 4.1.1 presents the distribution of questionnaires administered, returned, and not returned, including their percentage. From the figure, it is clear that a very large proportion of the questionnaires were successfully retrieved, while only a small number were not returned. This indicates a high response rate, suggesting that the data collected for the study is reliable and adequate for the meaningful analysis. Overall, the figure confirms that the respondents participated actively in the survey, with minimal loss of questionnares.

Table 5

Dependent Variable: WF
Method: ML - Binary Probit (Newton-Raphson / Marquardt steps)
Date: 03/21/26 Time: 04:05
Sample: 1 86
Included observations: 86
Convergence achieved after 7 iterations
Coefficient covariance computed using observed Hessian

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	5.204840	2.619804	1.986729	0.0470
DST	-0.271466	0.124827	-2.174739	0.0296
TC	-0.171699	0.132665	-1.294229	0.1956
OSR	0.336778	0.116562	2.889270	0.0039
COL	0.015853	0.056020	0.282987	0.7772
PL	-0.118453	0.071494	-1.656833	0.0976

McFadden R-squared	0.723794	Mean dependent var	0.883721

S.D. dependent var	0.322439	S.E. of regression	0.291991
Akaike info criterion	0.625653	Sum squared resid	6.820719
Schwarz criterion	0.796886	Log likelihood	-20.90307
Hannan-Quinn criter.	0.694566	Deviance	41.80613
Restr. deviance	61.82457	Restr. log likelihood	-30.91228
LR statistic	20.01843	Avg. log likelihood	-0.243059
Prob(LR statistic)	0.001240		
Obs with Dep=0	10	Total obs	86
Obs with Dep=1	76		

Source: Researcher'scomputation,2026.

The regression results reveal that Distance (DST) exerts a negative and statistically significant effect on Water Factory SMEs (WF). Specifically, a one-unit increase in distance leads to a decrease of approximately 0.271466 units in WF. This relationship is statistically significant at the 5 percent level, as evidenced by a p-value of 0.029, which is less than the conventional threshold of 0.05. This finding suggests that increased distance likely reflecting higher logistical constraints; adversely affects the performance of water factory SMEs.

Similarly, Transportation Cost (TC) exhibits a negative relationship with WF, with a unit increase in TC reducing WF by 0.171699 units. However, this effect is statistically insignificant, given its p-value of 0.29, which exceeds the 5 percent significance level. This implies that, although transportation cost appears to have a dampening effect, there is insufficient statistical evidence to conclusively establish its influence within the model. In contrast, Oil Subsidy Removal (OSR) demonstrates a positive and statistically significant impact on WF. A unit increase in OSR is associated with an increase of 0.33677 **units** in water factory SMEs. The corresponding p-value of 0.003 confirms significance at the 5 percent level, indicating that OSR plays a meaningful role in shaping SME outcomes; possibly through improved resource allocation or policy-driven market adjustments.

Furthermore, Cost of Living (COL) shows a negative coefficient of 0.15853, indicating that higher living costs tend to reduce water factory performance. Nonetheless, this variable is statistically insignificant, as reflected by its high p-value of 0.777, suggesting that its effect is weak and not reliably different from zero in this model. Likewise, Profit and Loss (PL) carries a negative coefficient of 0.118453, implying a reduction in WF. However, this effect is also statistically insignificant, with a p-value of 0.097, which exceeds the 5 percent threshold, although it may be marginally significant at the 10 percent level.

Regarding the overall model fit, the McFadden R-squared value of 0.7291 indicates a strong explanatory power, implying that approximately 72.91 percent of the systematic variation in water factory SMEs is explained by the included independent variables. The remaining 27.09 percent is attributed to other factors not captured in the model, as represented by the stochastic error term.

Finally, the Likelihood Ratio (LR) statistic has a p-value of 0.001240, which is well below the 5 percent significance level. This confirms that the model, as a whole, is statistically significant**,** and the joint effect of the explanatory variables on water factory SMEs is meaningful.

5.1 Summary

This study examined the key factors influencing the performance of water factory small and medium enterprises. The analysis indicates that greater distance from markets has a negative effect on enterprise performance, highlighting the importance of accessibility and efficient logistics. Transportation costs and cost of living showed limited influence, suggesting that

these factors may not strongly constrain enterprise operations in the current context. In contrast, policy interventions such as the removal of oil subsidies positively affect enterprise performance, demonstrating the role of supportive government policies in enhancing business outcomes. Short-term profit and loss fluctuations appear less critical in determining the overall performance of these enterprises. Overall, the model shows that a substantial portion of variation in enterprise performance is explained by the factors considered, while other unobserved elements also contribute.

5.2 Conclusion

The findings suggest that accessibility and supportive policy frameworks are central to the growth and sustainability of water factory enterprises. While financial and cost factors may influence operations, their impact is less pronounced, indicating that infrastructural and policy environments are more decisive in shaping enterprise success. Ensuring proximity to markets and maintaining effective policy support are therefore essential for fostering SME growth.

5.3 Recommendations

1. Improve Market Accessibility**:** Investment in transportation and infrastructure is crucial to reduce logistical barriers and enhance enterprise efficiency.
2. Sustain Policy Support**:** Government interventions, such as strategic subsidy reforms, should be maintained to create an enabling environment for enterprise growth.
3. Enhance Financial Resilience**:** Targeted financial programs, including access to credit and cost-reduction initiatives, can strengthen enterprise stability even where short-term profit fluctuations are less significant.
4. Further Research**:** Additional studies should explore other factors such as managerial capacity, market demand, and innovation to better understand the drivers of enterprise performance.

By focusing on these areas, policymakers and stakeholders can create conditions that support the sustainable growth and competitiveness of water factory enterprises.

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