CATRA RESEARCH INSTITUTE
ISSN 2720 - 9644 (print)
ISSN 2721 - 0871 (online)
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INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
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THE IMPACT OF FAILURE TO MAKE PAYMENT BEHAVIOUR ON THE PROFITABILITY OF SOUTH AFRICAN MUNICIPAL ELECTRICITY SUPPLIERS

Volume: 5
Number: 3
Page: 586 - 602

Kansilembo ALIAMUTU[1], Msizi MKHIZE[2]
[1,2]Department of Financial Accounting, School of Accounting, Economics and Finance, University of KwaZulu Natal, South Africa
Corresponding author: Kansilembo Aliamutu
Email: freddyali6@gmail.com

Article History:
Received: 2023-11-14
Revised: 2024-02-12
Accepted: 2024-05-10

Abstract:
Failure to make payments for labor remains a source of concern in the provision of municipal services in South Africa. According to the literature, the tradition of failure to make payment rates from the apartheid period, when widespread civic resistance expressed itself via refusing rate paying. The research investigates the influence of South Africa's failure to make payment behavior on municipal profitability. The random-effects model evaluates the connection between profitability and failure to make payments for 28 municipalities from 2007 to 2022. The findings show that failure to make payments has adverse effects on profitability. R291 lowers profitability with each R1000 higher number of unpaid debts written down. Furthermore, national government funds, the total number of users, and the proportion of home units getting free basic electricity positively impact profitability. These findings support the necessity for more inventive techniques to transform failure to make a payment into a payment behavior.

Keywords: Electricity Supply, Municipal Profitability, Bad Debts, Failure to Make Payment Behaviour and Grant

INTRODUCTION

The accumulation of user debt keeps jeopardizing the viability of public services being provided in South African municipalities (Hanto et al., 2022). South African municipalities owe around R170 billion to homes, companies, and government entities for service delivered (Van der Waldt & Fourie, 2022). In this respect, households account for most of the debt, costing nearly R120 billion, followed by corporations, which owe approximately R25 billion, along with the government, which owes approximately R10 billion (Wang et al., 2013). High levels of household debt raise the likelihood of bad debts, causing municipalities to have difficulty paying the debts they owe for vast amounts of water and electricity (T. Sindane & S. Modley, 2022). In 2020, for instance, South African municipalities owed Eskom (the electricity provider) R46.1 billion, R31 billion of past-due debt. Municipalities frequently claim they cannot repay their debt commitments because their users do not pay them (Giddy et al., 2022). It has severe consequences for the long-term viability of municipal service delivery. In the case of electricity, for instance, Eskom has threatened to cease delivering electricity to towns that owe the power firm money.

Although several variables are listed for rising user debt and consequent bad debts wiped down by governments, the behavior of failure to make payment for service is frequently recognized as a crucial contributor. According to Alao et al. (2022), the practice of failure to make payments for services provided by the government dates to the apartheid period. When there was widespread civil disobedience represented through a rejection of payment costs, which was dominating, while this may be considered a historical phenomenon, particular factors are consistently cited as

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significant causes of the behavior of failure to make payments in post-apartheid South Africa (Ali et al., 2023). There is proof that socioeconomic characteristics, including unemployment, low income, educational attainment, and racial grouping, impact failure to pay for municipal services (Thusi & Selepe, 2023). Additional causes involve expectations of lifestyle and culture, discontent with the provision of services, municipal employee fraud, rising municipality service costs, insufficient communication, and issues in the municipal decision-making system (Amankwaa et al., 2023).

In some research, failure to make payment is seen as "individuals revolting over the commercialization of daily living" (Graczyk et al., 2023). Even though the behavior of failure to make payments has gained significant coverage in South African literature, most available research employs qualitative methodologies and focuses on individual opinions and assessments of the phenomenon (Magagula et al., 2022). Only some research has used quantitative methods to investigate this phenomenon. Those that apply quantitative methods mainly utilize survey data and report on descriptive and inferential statistics (Ochinanwata et al., 2023). Most significantly, existing research examines the factors that contribute to the failure to make payment behavior. However, people need to evaluate the influence of failure to make payment for offerings on the profitability of South African municipalities. More research is needed that analyses the effects of failure to make payments for municipal services in South Africa using extensive municipal data and robust statistical models.

Municipalities give financial and nonfinancial information showing their particular success every year. Researchers seldom use this data to produce scientific proof of municipal profitability. The influence of the failure to make payments on the profitability of South African municipalities is investigated in this research. Many studies have looked at the factors that lead to failure to make payments for government services in South Africa. Those characteristics are often divided into two main types: incapacity and refusal to make payments. Hence, this research differs from others in that it accepts the many causes of failure to make payments found in the literature and then investigates how failure to make payments impacts the profitability of municipalities. Therefore, in the framework of this research, failure to make payments is represented as a factor in municipal profitability. Unpaid debts wiped down by every municipality's electrical division can substitute for failure to make payments (Klug et al., 2022).

While an average South African municipality offers a wide range of services, such as electricity, water, cleanliness, disposal of solid waste, and waste management, the electrical component was chosen for several reasons (Majadibodu, 2023). Several problems still need to be solved in power delivery in post-apartheid South Africa. These problems arise as a result of causes that involve insufficient generating ability, industrialization and economic expansion, growing populations and increased demand, global warming, and legislation regarding the distribution of electricity, which results in extremely low taxation that is not cost-sensitive (Bond, 2022). Low electricity prices and municipalities' failure to meet their fiscal obligations to Eskom have increased electricity interruptions in South Africa.

Due to budgetary and operational limitations, Eskom has needed help renovating and upholding its electricity-generating facilities. As a result, most power plants routinely encounter malfunctions. Therefore, load shedding continues to prevent the electrical system from completely failing. South Africa saw 1150 hours of power disruptions in 2021 alone (Burkhardt, 2022). These difficulties have broad implications, significantly impacting economic expansion and growth. As a result, it is necessary to comprehend the profitability of municipalities' power distribution functions along with how they are influenced by the behavior of failure to make payments for electricity.

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Literature Review. The research is based on systems and contingency theories, which examine and offer answers to the issues that organizations, including municipalities, confront when attempting to maximize profitability (Siksnelyte-Butkiene et al., 2023). According to systems theory, municipalities are viewed as units that collaborate as pieces that function, transforming resources that are accessible into outcomes while engaging with the inside as well as the outside surrounding environment (Millington et al., 2022). The notion emphasizes the need for municipal agencies to grasp their missions to provide adequate user service. As a result, it emphasizes the necessity of municipal agencies managing their partner interactions as effectively as possible (Mazele & Amoah, 2022). On the other hand, the contingency theory of management proposes that successful managers are decided by how their leadership style fits a specific scenario inside a corporation (Kalina et al., 2023). These contingencies are tied to numerous conditions, such as a shortage of materials, social and environmental issues, political issues, new technology, and an organization's structure and scope (Giddy et al., 2022).

The notion highlights the necessity for organizations such as municipalities to be more cognizant of themselves, objective, and adaptable by implementing proper contingency plans to cope with situations inside or outside the municipality's authority (Mamokhere, 2022). In addition to the systems and contingency theories, this research uses the New Public Management (NPM) paradigm. Meth et al. (2023) research laid the groundwork for NPM, drawing focus on the rise of a supervisory, as compared to a managerial, method for providing services for the public. The theory's key components are self-determination, transparency, user focus, and a market-oriented perspective. As a result, it establishes the relationship between the electricity provider and its setting, where the service has the authority to establish goals for accomplishment and ultimately be held responsible for the outcomes (Lin & Okyere, 2023). One need for the NPM theory to succeed is that the utility must have effective revenue recovery strategies.

The notion is closely related to effective management, which employs agreements and achievement measures. Ayamolowo et al. (2022) discuss this connection in detail. NPM has been both criticized and applauded in the literature throughout the years. Overall, the validity and importance of NPM have been frequently implicitly predicated on a coherent and cohesive management theory system founded on the business community knowledge on which modern public administration is based (Lukat et al., 2022). In summary, the study employs the NPM theory as a prescriptive understanding to provide services in the same way that individuals appreciate them to strengthen administrators' independence in the public sector and compensate both corporations and workers for increasing the public sector's effectiveness in production.

A further significant notion is the urban management (UM) method, which is based on reforming local governments and topographical conceptions of 'municipality managerial thinking' to regulate the supply of critical services provided by the government at the level of cities, such as housing, schooling, medical treatment, electricity, and gas (Mokhethi, 2020). To solve electricity concerns successfully and fairly, the UM strategy in this research comprises the five management tasks linked to municipality organization: organizing, preparing, directing, and regulating. This strategy requires specific institutional changes to effectively oversee new municipality development owing to the absence of continuing management. However, it has additionally generated debate over local legitimacy and independence in urban administration (Nel, 2017). According to the theory of public choice (a sort of UM tackle developed by Ayamolowo), urban managers and administrators rival for new funding and capital using the facilities contributed forth in towns to meet the requirements of companies and commercial growth.

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The UM method assists municipal supervisors and administrators in guaranteeing excellent services to residents in South Africa by enhancing the productivity and efficacy of electricity (an essential commodity) (McDaid, 2014). The power delivery business is crucial to the South African economy. Eskom, the National Energy Regulator (NERSA), cities, and power end users are essential participants in this business. Eskom is the electrical provider in charge of the bulk of energy produced, transmitted, and distributed in South Africa (Eberhard & Naude, 2016). Eskom sells most of its electricity to cities (42%), who then redistribute it to end users, which include business users (23%) and mining (14%) (Baker, 2017). Eskom has an inevitable dominance in practice. Hence, NERSA monitors Eskom's actions, particularly in delivering and pricing massive energy. NERSA was founded by the National Energy Regulator Act No. 48 of 2004, along with the Electricity Regulation Act No. 4 of 2006, the Gas Act No. 48 of 2001, and the Petroleum Pipelines Act No. 60 of 2003 (Lukamba Muhiya, 2008). It is a judicial organization that regulates the nation's electrical power, pipeline gas, and petroleum sectors.

As a whole, NERSA is in charge of these three industries, controlling pricing and eliminating dominant behaviors. South Africa has a reasonably high electricity percentage for the area, ranging from 85 to 90% (Hadebe & Geeringh, 2017). Cities in the nation generate a sizable percentage of their revenue from the sale of energy. In 2016, for instance, larger cities received a median of 29% of their revenue from providing power. In contrast, smaller communities were somewhat less reliant, with electricity accounting for a median of 27% of their revenue (Sonday, 2021).

Nonetheless, several issues have been identified in the electrical delivery system. Most of these issues come from the fact that South Africa's electricity grid is now restricted and will remain so for years unless the amount of power required to alleviate the present deficit is created (Taliotis et al., 2014). In addition, the overlapping of the power sector's long-term strategy with other national strategic initiatives and the little endogenization of the plan's long-term scope into established environmental transitional governance systems are blamed for the sector's present issues (Nkoana, 2016).

In summary, according to Swartz (2019), the electricity industry is in disaster because of legislative choices centered on pricing coal-generated power concerning present and future infrastructure demands, as well as making investments in emerging technologies that are more environmentally friendly.

As a result, Visser (2022) suggests that if South Africa wants to preserve the industry, it has to carry out an evolution that incorporates more varied origins for supplies and participants. Although the power industry faces several issues, municipalities distributing electricity must contend with failing to pay for electricity supplies. Implementing advanced payment technology has been advocated as a suitable answer to this challenge.

Hence, pressure organizations oppose this measurement method, claiming that using prepaid meters creates "spaces of estimation" in which low-income families are subjected to continual metrological monitoring (Klug et al., 2022). Despite the collapse of apartheid, South Africa has encountered widespread failure to make payment for service costs, which has been described as a 'behavior of failure to make payment' stemming from apartheid renting boycotts in the 980s (Burkhardt et al., 2022). As a result, cities have dropped billions of dollars in income and need help to meet their financial commitments with large providers. Several research investigations have sought to identify the factors contributing to South Africa's failure to make payments (Majadibodu, 2023). Although the majority believe that the behavior is the result of anti-apartheid renting boycotts, more factors are mentioned. Indifference, impoverishment, reluctance, joblessness, entitled behavior, discontent with goods or services, dishonesty of municipality personnel, growth in service

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costs, insufficient interaction, and issues with municipal procedures for making decisions are all frequently identified causes. Furthermore, Murshed and Ozturk (2023) contend that failure to make payments in South Africa is tied to individuals' perceptions of the municipality acting in their best interests.

It is thought to be related to three elements of confidence: faith in the government's ability to utilize the acquired income to deliver anticipated services, confidence in the authority to implement fair methods for obtaining revenue along with service delivery, and confidence among other citizens to pay the appropriate part (Lin & Sai, 2022). Surprisingly, the unwillingness to pay is additionally connected to the level of academic achievement and the ethnic background of the residents. The implications of failure to make payments to municipalities are extensive and well-established in the literature (Onaolapo et al., 2022). In most cases, municipalities fail to meet their financial responsibilities for large-scale purchases, endangering the viability of essential electricity services. Therefore, municipalities fail to reach their service provision targets, which leads to service delivery demonstrations, which usually cause theft and damage to municipal property (Liu et al., 2023). The income loss implies that governments need to reinvest in vital facilities that would boost the delivery of services. Furthermore, mass service suppliers can only furnish large quantities if communities make payments (Kabeyi & Olanrewaju, 2022).

It was prevalent in South Africa when Eskom could postpone or threaten to discontinue ample electricity supplies to municipalities whose payments to the electricity corporation were past due. For instance, in 2020, Eskom threatened to cut off electricity to one-third of municipalities to recoup R31 billion (Mentel et al., 2022). The literature mentions attempts to build remedies that foster payment behavior. Liu et al. (2022) provide a conceptual framework to reveal creative methods that municipalities might adopt to promote the behavior of responsibility paying. The proposed framework uses current technology and linkages with participation from municipalities, significant persons or groups, and traditional authorities to create a positive cultural backdrop (Cao et al., 2022). Furthermore, towns are advised to follow leadership and strategy guidelines to be innovative, change, focused on outcomes, revolutionary, and pragmatic in managing payments and disputes.

These suggestions are reinforced by Amusa et al. (2009). However, Adom et al. (2012) contend that a lack of competence in towns fosters a refusal to shell out for services given. The research blames challenging political and administrative interactions, a shortage of transparency, malfunctioning caucuses, inadequate employment relationships, fragile participation by the public structures, and inadequate financial management for instilling the notion that professional conduct is optional in municipal government. As a result, municipalities need to guarantee strong governance, offer evaluation and monitoring processes for managing profitability, foster a behavior of service, guarantee fiscal accountability, instill professional principles in workers, and implement various explicit and implicit programs. These initiatives may be critical in enhancing the efficiency of municipalities and, as an outcome, transforming the failure to make payment behavior into a payment.

METHODS

This research looks at the influence of bad debts on the profitability of South African municipalities in the electricity supply sector. Panel regression models are employed to accomplish this (Chamberlain, 1982). Panel models are selected in this research due to their expanded sample size and give an understanding of analytical problems that time-series or cross-sectional data cannot solve (Betti et al., 2002). Furthermore, panel data models are used because they enable variables that vary across municipalities while staying constant over time, as well as variables that alter over time

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but are the same for all municipalities throughout the entire period. Furthermore, panel models are dynamic, accommodating variables that fluctuate over time and among municipalities and variables that change in predetermined ways (McManus, 2015). The pooled ordinary least squares (pooled OLS) model, fixed effects (FE) model, and random effects (RE) model are a few of the frequently employed estimations in panel data modeling. These three make distinct presumptions, and Brüderl and Ludwig (2015) provide further information on their respective expectations and characteristics. However, the fundamental mathematical formula for panel data regression models varies as follows:

$$yit = \alpha + x'it\ \beta + vi + \mathcal{E}it$$

Where yit is the dependent variable for making choices unit i (which in turn in this research is municipality i) in period t (i.e., year t in the larger context of this research); α is the constant; x'it indicates the explanatory variables; β is the coefficient for every explanatory variable; vi is the municipal particular error term, which varies across municipalities however has a constant value for a particular municipality; along with Ɛit is the 'common' error term. Ɛit is often possible to separate Ɛit = vt + $\mathcal{W}$it, provided that $\mathcal{W}$it is a traditional error term that more accurately characterizes vt. Whatever the characteristics of vt and Ɛit, if Equation (1) holds, then the following is correct:

$$yi = \alpha + xi\ \beta + vi + \mathcal{E}i$$

where yi = ∑t yit /Ti and xi = ∑t xit / Ti; while Ɛit = ∑t Ɛit / Ti. Equation (2) must also be valid when removed from Equation (1).

$$(yit - yi) = (xit - xi)\ \beta + (\mathcal{E}it - \mathcal{E}i)$$

The foundation for determining b in panel data analysis is provided by equations (1) – (3). It equates to estimating Equation (3) using the OLS for the fixed effects (FE) model, often known as the inside predictor. Nonetheless, the RE model is the assessment of the following instead of the differences among each of the estimation methods, as it is a cumulative average of those estimations:

$$(yit - \theta yi) = (1 - \theta)\ \alpha + (xit - \theta xi)\ \beta + \{(1 - \theta)\ vi + (\mathcal{E}it - \theta\mathcal{E}i)\}$$

When θ is a function of θ2v and 02v = 0, it means vi is 0, then θ = 0, meaning that Equation (2) may be calculated immediately by employing the OLS. Hence, if 0Ɛ2 =0, it indicates that Ɛit is 0, then θ = 1, implying that the inside estimation delivers all the information accessible, so the regression has an R2 of 1. Additional talks about panel data modeling may be found in the literature. In this research, the effect of failure to make payment for electrical services on the profitability of every municipality is estimated using these panel regression estimators (Wang et al., 2019). It is accomplished by predicting the profitability of municipalities about the write-off of bad debts and a few chosen control variables that are anticipated to directly affect each municipality's profitability about its role in providing energy. The estimated model is stated in the form of:

$$PROFit = \alpha it + b1DEBTit + b2\ GRANTit + b3\ LABit + b4\ CONit + b5\ FBEit + vi + \mathcal{E}it$$

When DEBTit is the number of bad debts that the municipality i wrote down in year t; PROFit is the profitability of municipality i in year t; GRANTit is the amount municipality i obtained as a

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grant from the federal government in year t; LABit is the total number of workers employed by municipality i's electricity department in year t; CONit is the total number of users municipality i worked in year t; FBEit is the total number of users in municipality i that were provided with free essential electricity services in year t; The "normal" error phrase is Ɛit, and the municipal particular mistake term is vi. The following part provides a detailed explanation of these variables. A pooled OLS model is run to determine if identical coefficients are applied to every chosen municipality.

When distinct coefficients apply to various towns, selecting between FE and RE models would be necessary. Out of the pooled OLS, FE, and RE models, this research will select the optimal model 1. Thopil and Pouris (2015) propose obtaining the first-order serial correlation if the model has difficulty with autocorrelation (or serial correlation). Biegler (2009) suggests physically predicting the model after determining the suitable model and making initial modifications to all variables. Next, a prediction and an additional regression are made using the residuals of the previous pooled differentiation model over their initial lag. Lastly, a test determines if the lagged residual equals 0.05. The null hypothesis of a lack of serial correlation ought to be rejected at the 5% significant level if the outcome shows a significant p-value, suggesting that the model contains serial correlation. The research follows the described methodology. Additionally, the research will use the Breusch-Pegan test and Spearman's correlation matrices to conduct additional diagnostic tests to appropriately identify heteroscedasticity and multicollinearity issues.

Descriptive Statistics. Data from the 2007–22 financial and nonfinancial censuses of 28 towns and cities are utilized. As a result, the data is a panel of time series (T = 15 years) and cross-sections (N = 28 municipalities). The information from the Statistics South Africa homepage relates to every municipality's role in providing power. Eight metropolitan cities and twenty classification B1 local municipalities were chosen in the sample of 28 municipalities. In the latter case, local governments that contain a sizable town or city are referred to as "secondary cities" or "urban cores." These towns were chosen because they house a sizable portion of the nation's population, serve as manufacturing centers, and significantly contribute to its GDP. As a result, their achievement is crucial to the nation's profitability and needs to be highly valued.

Data were gathered for the six variables mentioned in the preceding part. It is important to note that this data relates to every municipality's role in providing electricity. Table 1 provides descriptive statistics for the data set, and the comprehensive variable definitions are provided below the table. The dependent variable for the model developed in this research is the profitability of every municipality annually or PROF. Profitability is inferred from every municipality's annual financial surplus or deficit for its electrical unit. The differences across municipalities (R339 156000) are more significant than those within (R305 803 000), as Table 1 illustrates. This variance might be related to South Africa's municipal classification system. The average PROF differs by 15 years (2007–22) for every municipality, ranging from R170 869 000 to R1 239 743 000. The constitution and characteristics of the chosen towns, which differ regarding size and operational contexts, may cause this diversity. It is made feasible because the sample includes classification B1 local and metropolitan municipalities selected from the various provinces nationwide.

The FE and RE models are selected using the Hausman test. This test's null hypothesis states no statistically significant difference between FE and RE coefficients. The choice might be to reject the null hypothesis if the test result is significant; in such case, the FE coefficients would be the appropriate model to select. The pooled OLS and RE models are compared using the Breusch and Pagan Lagrangian Multiplier (BPLM) test. The absence of a random effect is the test's null hypothesis. The null hypothesis is rejected if the BPLM value is negligible. As a result, the pooled OLS model would be thrown out to the RE model.

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Table 1. Descriptive Statistics

Variable	Unit of measurement	Variation	Mean	Std. Dev.	Min.	Max.
PROF	R'000		204 205	452 436	−661 483	3506 347
		Overall-Between		339 156	170 869	1 239
		Within		305 801	−1 035 539	743
						2 559
						870
DEBT	R'000		70 484	194 755	0	1 877 903
		Overall-Between		151 613	135	649 233
		Within		125 344	−578 749	1 299
						154
GRANT	R'000		33 321	84 406	0	552
		Overall-Between		54 977	0	877
		Within		64 830	−174 973	208
						294
						418
						535
LAB	Number		430	669	0	3 650
		Overall-Between		655	10	2 274
		Within		181	−1 516	2 259
CON	Number		195 059	236 083	6 173	1 106
		Overall-Between		234 368	8 763	663 869
		Within		51 405	−66 851	700
						432
						023
FBE	Number		63 146	122 085	0	793
		Overall-Between		100 664 71	2 506	225
		Within		486	−171143	428
						476
						470
						566

Note: N = 420; n = 28; T = 15

"DEBT" describes the number of bad debts every municipality's electrical unit writes off annually. It is the primary independent variable meant to represent the failure to make payments for public services. The write-off of bad debts is anticipated to have a detrimental impact on municipalities' profitability. This anticipation stems from the accounting premise that writing off bad debts is viewed as an expenditure to the company and, as such, lowers its profit (or increases its loss). With a more significant overall standard deviation and an average surplus of R70 484 000 (about US$ 4,695 803), Table 1 indicates a significant disparity between the stated mean surplus and statistics for each municipality. Throughout the era, there have been more differences among municipalities than within each.

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GRANT is the term used to describe the annual financial grant, including a proportional grant each municipality receives from the federal government. Municipalities get funding from the federal government through an unrestricted grant, which enables them to offer essential services to low-income families at no charge. Since donations are seen as revenue, a positive correlation between this control variable and profitability is anticipated. The sample's average grant, shown in Table 1, is R33 321 000, or around US$2 219 920. The total standard deviation is more significant. With GRANT, the variance is greater within municipalities than among them, in contrast to the other factors, where differences were higher among municipalities than within. It is made feasible because most national grants—like the proportionate portion of the award, for instance—rely on the annual amount gathered nationwide. This revenue may fluctuate yearly, which might account for the differences in the funds every municipality has given over time.

The total number of full- and part-time personnel that work in every municipality's electrical department annually is referred to as LAB. Using the number of workers as a control variable, we anticipate towns with a higher staff count will do better financially due to their excellent capability. There are 430 workers on average, according to Table 1, with a higher total standard deviation of 669. Over time, more variances are seen for this variable across municipalities than within every municipality. The quantity of residential and non-residential users that each municipality supplies with electricity annually is referred to as CON. It is an additional control variable that should positively correlate with profitability. It is because, considering that revenue is a consequence of quantity and unit pricing, having more user units might result in more income. With an average of 195 059 user units and a higher overall standard deviation of 236 083, Table 1 illustrates the high dispersion of individual numbers from the sample mean.

Table 2. Explanation Variable Spearman's Correlation Matrices

	DEBT	GRANT	LAB	CON	FBE
DEBT	1.000				
GRANT	0.278	1.000			
LAB	0.527	0.331	1.000		
CON	0.501	0.252	0.731	1.000	
FBE	0.448	0.202	0.534	0.654	1.000

On 15 May 2022, US$1 = R15.01.

Comparably, across the era, more variances in CON are observed among municipalities than within every municipality. FBE is the total number of user units every municipality provides with free basic electricity annually. This control variable displays the total number of low-income clients in every municipality over a specific year. Because governments receive less money from their poorer users, there should be an inverse link between profitability and these user units. With a wider total standard deviation of 122 085, Table 1 displays the average number of user units in the sample that receive free basic electricity, which is 63 146. Throughout time, FBE varies more among municipalities than within every municipality. Testing for correlation is crucial to getting a comprehensive picture of the explanatory factors and their relationships. Correlation tests are essential to determine whether problems with multicollinearity within the explanatory factors or serial correlation between residuals are present.

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Multicollinearity between explanatory variables may impact how the model is fitted and how empirical results are interpreted. In linear panel-data models, serial correlation skews the standard errors and reduces the efficiency of the outcomes. Consequently, the strength and trajectory of the relationship between the explanatory variables are determined using Spearman's correlation test. Table 2 presents the outcomes. Except for the LAB and CON matrix correlation coefficient, which is higher at 0.731, all of the correlation coefficients in Table 2 are modest. The two are control variables, not the main independent variables; therefore, even though there may be reason for concern over the serial correlation between these variables, their respective values for correlation with the primary variable of interest (DEBT) are lower. It suggests that among the primary variable of interest (DEBT) and the control variables, the issue of multicollinearity is not a significant worry. Thus, empirical estimates may go forward to comprehend the effect of written-off bad debts on the profitability of South African municipalities that supply power to cities.

RESULT AND DISCUSSION

The panel regression models used in this research are pooled ordinary least squares (OLS), fixed effects (FE), and random effects (RE). Pooled OLS overlooks the data's cross-section and time series characteristics, presuming no heterogeneity across the 28 municipalities. The variance inflating factor (VIF) test examines the challenge of multicollinearity amongst the explanatory variables in pooled OLS. This test examines how an estimator's variance may be exaggerated owing to high relationships among more than two variables. A VIF score above ten indicates that the pooled model has a multicollinearity issue. Even though Spearman's correlation test was done previously, the research also runs a VIF test to see if the multicollinearity test findings given for Spearman's test in Table 2 remained constant. The predicted VIF values of all explanatory variables vary from 1.56 to 8.14, with a mean VIF value of 4.19, indicating that multicollinearity is not a concern across the explanatory factors. It supports the findings of Spearman's test, which revealed minimal multicollinearity across the explanatory factors.

The Breush-Pagan test was also used to assess for heteroscedasticity in the pooled OLS model (Halunga et al., 2017). This test determines if the variance of the model's terms for error is affected by the results of the independent variables. The Breush-Pagan test outcome showed a significant Chi2 value of 901.16 with a p-value of 0.000, indicating that variances are not uniform and, therefore, support heteroscedasticity. As a result, robust estimates were used in the panel regression models to overcome the heteroscedasticity issue. Following that, both the FE and RE panel regression models were computed. The Hausman test is then applied to determine which of the FE and RE models is the most resilient. The Hausman test's null hypothesis implies that the RE model is suitable, but the different hypothesis indicates that the FE model is acceptable. If the Hausman test value for probability is statistically significant, the null hypothesis that RE is suitable is rejected; alternatively, the null hypothesis is accepted. The Hausman test findings revealed an insignificant p-value of 0.202, indicating that the RE model was the most effective. Considering the issue of heteroscedasticity has already been proven, a RE model with robust standard errors is calculated to solve it.

A Breush and Pagan Lagrangian Multiplier (BPLM) test is also performed to determine the best model among the pooled OLS model and the RE model. This test compares the null hypothesis of no random impact in the data set to the other possibility of a random impact. The BPLM test outcomes reveal a significant Chi2 with a p-value of 0.003, indicating that the data contains a random impact. Hence, the RE model should be selected above the pooled OLS model. The initial lag of the projected residual was substantial after screening for serial correlation in panel data utilizing the

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Thopil and Pouris (2015) technique, demonstrating the existence of serial correlation in the RE model with robust standard errors. The serial correlation issue was then addressed using a RE model with a self-regressive process. Table 3 shows the estimated findings for the pooled OLS model with robust standard errors (Model 1), the RE model including robust standard errors (Model 2), and the RE with no serial correlation (Model 3). Despite the presentation of all three models, the most effective model is the robust RE model (with no serial correlation); hence, Model 3 is used in the research, and its findings are detailed in Table 3.

Table 3. Shows the Outcomes of the Municipal Profitability Models' Estimations

	Model 1	Model 2	Model 3
DEBT	−0.235	−0.206	−0.291***
	(0.211)	(0.259)	(0.089)
GRANT	1.214***	1.063*	0.509*** (0.186)
	(0.466)	(0.573)	
LAB	94.547	90.640	52.838
	(106.016)	(105.185)	(58.832)
CON	1.020***	1.074***	1.177*** (0.186)
	(0.393)	(0.372)	
FBE	0.063	0.091	0.346** (0.170)
	(0.359)	(0.327)	
_cons	−63318.59***	−71000.21**	−73717.01**
	(24633.82)	(32825.46)	(32373.83)
N	420	420	420
Prob > Chi^2	0.000	0.000	0.000
R2	0.560		
Within		0.218 0.906	0.250
Between Overall		0.579	0.884
			0.563
Rho		0.034	0.591
Sigma_u		49210.852	0
Sigma_e		261210.79	229180.06

*Note that ***, ** with *significance at 1%, 5%, 10% level, subsequently. Standard errors in brackets ()*

Although certain may claim that the terms FBE and GRANT are often applied similarly since the number of impoverished residents in a municipality impacts the grant obtained by that municipality, it is crucial to emphasize that specific grants are not decided by the number of low-income families in a municipality. In this research, the GRANT variable includes both conditional and non-conditional grants. As a result, it reflects more than just the grant determined by the number of disadvantaged families. As a result, GRANT and FBE cannot serve as substitutes in this circumstance. Furthermore, as illustrated in Table 2, the correlation coefficient of these variables is relatively low at 0.202, showing no indication of multicollinearity. As a result, both can be used as explanation variables in the identical model.

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As previously stated, Model 3 was the most robust, and its outcomes were used in this investigation. Excluding LAB, empirical estimates in the selected model demonstrate that other factors are highly significant drivers of municipal profitability. Except for DEBT, which has a negative value of 0.206, all statistically relevant factors have positive coefficients. The negative coefficient of DEBT suggests that a unit more excellent of bad debts removed down affects every municipality's profitability by 0.291. In other words, if bad debts are paid off for a thousand Rands, municipal profitability falls by around R291, all else equal. The primary independent variable in the model is DEBT, which is used to indicate the behavior of users not paying for electrical services. A negative correlation between lousy debt write-offs and municipal financial performance was anticipated.

GRANT and CON are significantly different at the 1% significance level, whereas FBE3 is significant at the 5% significance level. Positive coefficients are found in all three variables. The sole non-statistically significant control variable is LAB, meaning that the number of workers a municipality employs in its electrical sector is not a significant predictor of the municipality's profitability in the supply of electricity supplies. In the context of GRANT, the positive coefficient indicates that municipalities that get more extensive grants from the national government (including an equal proportion of grants) are more inclined to do well financially. More precisely, the data demonstrate that a thousand Rand rise in the national government grant obtained by every municipality will boost the profitability of that municipality's power generation unit by an average of R509.

The positive coefficient of CON indicates that municipalities with more significant numbers of users accomplish more effectively in terms of finances; a unit increase in the number of users would boost a municipality's profitability by approximately 1.177, indicating that if the number of users worked by the municipality increased by a thousand, the municipality's profitability would be enhanced by approximately R1177. On the other hand, the positive coefficient of FBE indicates that a unit increase in the number of homes getting free basic electricity increases the municipality's profitability by roughly 0.346. In another way, if the number of homes getting free basic electricity grows by 1,000, the municipality's profitability would improve by around R346. This discovery was predicted since towns get government funding depending on the number of impoverished families and, consequently, the amount of fundamental services they provide for free. If the national government provides the municipality with funding, one may claim that the additional free basic electricity provided by the municipality enhances the municipality's efficiency. The outcomes of this research reveal that the behavior of failure to make payments impacts the profitability of South African municipal electricity sections.

While various research indicates that the failure to make payment behavior is the consequence of several characteristics identified in the literature by Murshed and Ozturk (2023), no proof for research assesses the influence of the failure to make payment behavior on municipal profitability. According to the present findings, bad debts wiped out, which are seen as one of the main influencing variables in this research, negatively and substantially influence municipal profitability. It demonstrates that increased bad debt paid down widens the income deficit gap, leading to negative municipal profitability. Although there has been apparent research that investigates this occurrence in the public management field, the findings of this research on the effect of bad debts correspond with Biegler (2009), who additionally defines the way bad debt costs along with bad debts written-off influence the general operating costs for company corporations. Furthermore, funding from the national government, the number of users, and the number of dwelling units getting free basic electricity favorably impact municipal profitability.

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Considering various challenges brought on by the failure to make payments, municipalities continue to be dedicated to delivering community services as prescribed by the South African Constitution. Hence, they get government funds every year that help boost the provision of services and municipal profitability. The outcomes correspond to Brüderl and Ludwig's (2015) discoveries, supporting the notion of municipalities developing a sustainable income basis to prevent relying on funds from the national government while delivering services to local populations. Furthermore, the findings correspond with information from Statistics South Africa (2022), which reveals that subsidy and grant programs were the second highest form of revenue after power revenue from sales. Grants and subsidies made up around R24.7 billion (or 25% of total income) throughout municipalities in 2022, whereas income from power sales contributed to approximately R26.5 billion (or 27% of the overall revenue). Given that municipalities in South Africa serve as intermediaries, acquiring energy straight from Eskom and distributing it to ultimate users resulted in an R6 billion cash surplus in 2022. This research proves that increasing user payments for electricity services improves municipal profitability.

CONCLUSION

This paper was established to determine the impact of failure to make payments on the profitability of South African municipal electricity suppliers. The research uses a panel dataset of 28 municipalities from 2007 to 2022. The random effects panel data regression model was applied to investigate the connection between municipal profitability and electricity failure to make payments. There are two significant findings mentioned. First, it was discovered that failure to make payments hurt municipal profitability. Bad debts that were wiped down as a representation of the failure to make payments were shown to have a significant negative coefficient in this research. It was discovered that every thousand rand rise in bad debts wiped down affects municipal profitability by around R291. Second, national government funds, the number of users, and the number of home units getting free electricity for essential use were all positive and significant predictors of profitability.

Although previous research has looked at the factors of failure to make payment behavior, this research differentiates itself by evaluating the impact of failure to make payment using an example of electrical services. The research's findings support the necessity for more creative techniques to transform failure to make a payment into a payment behavior. Given the magnitude of write-downs of bad debt and the documented impact on profitability, municipal power delivery companies must pursue alternative measures. Municipal electrical service providers must use other techniques. Although they may legitimately disconnect non-paying users from the electricity supply and retrieve the debt through legal means, this technique does not provide significant sound effects. It is because some people may continue to fail to meet their financial responsibilities despite receiving threats of a lawsuit. As frequently underlined in the literature, such opposition owing to a feeling of entitlement has established a behavior between certain citizens.

Recommendation. The research recommends that municipal electricity distribution providers utilize information from the NPM theory's theoretical mandates and adopt some small company practices that can enhance the sustainability of their finances. Poor houses must be applied for and verified yearly to be eligible for free elemental power; the other occupants should be reformed as "users," as advised (Hood, 1991). Municipalities must maintain their sovereignty but with more responsibility, a focus on users, and a market focus. To build competing municipal electricity services, effective management, agreements, and profitability indicators must be emphasized.

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Furthermore, as Van Dijk (2007) emphasized, establishing and enforcing successful financial cost recovery mechanisms must be emphasized. Overall, municipal electric power providers should learn a lot from theory and create internal processes and contingencies that will help them increase their technological productivity and cost-effectiveness. These approaches can dramatically minimize bad debt write-offs and enhance the long-term viability of municipal power supplies. Much remains to be done regarding implementing the UM strategy, given South Africa's productivity issues in delivering power.

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