RESEARCH PAPER

Institutional Characteristics and Efficiency of Universities in Kenya: Does Size matter?

***Eric M'mwiti Ndege[1], Samuel Nduati Kariuki[2], Peter Wang'ombe Kariuki[3].**

[1]Department of Business Studies. The University of Embu, Kenya.
[2]Department of Business Studies. The University of Embu, Kenya.
[3]Department of Accounting and Finance. KCA University, Kenya.

*Corresponding Author, Email: ericmmwiti@gmail.com
Received: 10th Dec, 2025; Revised: 8th Feb 2026; Accepted: 12th May, 2026; Available Online: 28th May, 2026

Abstract
This study investigates the effect of institutional characteristics on university efficiency in Kenya and whether university size matter. The study targeted all the 48 universities operating in Kenya comprising of 30 public universities and 18 private universities. Secondary data was collected from financial budgets, income, annual reports of the universities and expenditure statements of the universities over the period of 2016 to 2021. Data analysis entailed Data Envelopment Analysis and censored regression analysis. The study finds that corporate governance, revenue stream diversification, intellectual capital and expenditure control have a positive influence on efficiency of universities. There is a positive and statistically significant effect of university size on the relationship between institutional characteristics and efficiency of universities implying that university size has strengthening effect. The study concludes that university size strengthens the effect of institutional characteristics on efficiency of universities in Kenya. While large universities may leverage economies of scale to drive efficiency, the study also recommends that they should address potential inefficiencies caused by bureaucracy. Smaller universities should also capitalize on their agility but must seek ways to overcome resource limitations. University councils, senates and top management to embrace leadership skills like operational, administrative and collaborative skills and oversight mechanism to make informed decisions that drive institutional efficiency. The government and university management should create policies that incentivize knowledge production and sharing to optimize the impact of intellectual capital. University council and management should tailor reforms and capacity-building initiatives based on institutional size to ensure equitable and effective implementation.

Keywords: *Institutional characteristics, university size, efficiency, universities*

***How to cite this article**: Ndege EM, Kariuki SN, Kariuki PW. Efficiency of Universities in Kenya: Does Corporate Governance Matter? Int J Drug Deliv Technol. 2026;16(51s): 718-730. DOI: 10.25258/ijddt.16.51s.55*

1.0 Introduction

Universities play a pivotal role in human capital development, research, and socio-economic transformation, yet many universities are experiencing a persistent decline in efficiency characterized by rising operational costs, financial instability, overcrowded facilities, delayed academic processes, reduced research output, and declining quality of graduates (Anyuki et al., 2023). This inefficiency is often manifested through suboptimal utilization of resources, weak managerial systems, frequent industrial unrest, and governance challenges that undermine effective service delivery (Akello & Beisel, 2019). Despite increased enrolments, continued public, and private investment in higher education, the expected improvements in performance and outcomes have not been realized. The underlying drivers of declining efficiency remain inadequately understood, particularly in relation to institutional governance. This gap necessitates systematic investigation into the causes of declining efficiency in universities to inform evidence-based policy interventions and strengthen the sustainability and performance of higher education institutions (Barra et al., 2025). While declining efficiency in higher education continue to raise concern, there is a limited conceptual, methodological, or policy clarity in this area (Kupriyanova et al., 2018).

A university is said to be efficient if it is producing maximum output (number of graduates and publications) from a minimum quantity of inputs (number of staff, students' enrolments, and expenditure) (Myeki & Temoso, 2019). In the USA, efficiency measurements of higher learning institutions have become popular replacing output and impact assessments. Data Envelopment Analysis (DEA), Free Disposal Hull (FDH), the order-m and order-α approach are often used in ascertaining the efficiency of universities (Wohlrabe et al., 2018). Efficient universities in the USA often register increased industry funding and academic patenting activity (Foltz et al., 2012). In the case of UK, effectiveness, efficiency and value for money are central concerns for the higher education sector (Universities, 2011). In South Africa, assessing the efficiency of universities is vital for effective allocation and utilization of educational resources (Myeki & Temoso,

2019). In the case of Tanzanian universities, there is variability of efficiency among universities across years (Bangi et al., 2014).

Financial efficiency of public universities in Kenya has weakened amid increased enrolment and swindling budgetary allocation (Wachira, 2018). High academic staff to student ratio of 1:30 against the recommended ratio of between 1:18 and 1:10 has also compromised performance of public universities (Kenya Institute for Public Policy Research and Analysis [KIPPRA], 2022). From 2016, the Commission of Higher Education (CUE) in Education in Kenya has collaborated with private universities with aim of absorbing the large number of students while improving operational efficiencies. As study by Mbithi (2024) reported that larger public universities with higher student enrollment often face lower operational efficiency due to unsustainable staff-student ratios, averaging 1:30 against a 1:18 recommended compared to smaller private institutions. This has raised concern about whether university size and ownership shape institutional characteristics and efficiencies of the university. This provides a compelling context for examining the effect of university size on institutional characteristics and efficiency due to the rapid expansion, diversification, and regulatory transformation of its higher education sector over the past two decades in Kenya. The country currently hosts a mixed system of public and private universities operating under a common regulatory framework overseen by the CUE, yet characterized by wide disparities in size, funding models, governance capacity, and resource endowments (CUE, 2022).

The interaction of university size on institutional characteristics and efficiency of universities, has been the subject of recent empirical studies (Corvino et al., 2019; Muigai & Muriithi, 2017; Luo et al., 2024). Larger universities typically have more extensive human, financial, and infrastructural resources, which may enhance their ability to implement institutional policies and governance mechanisms effectively (McLaughlin et al., 1980). Literature on higher education efficiency shows that size can determine the extent to which inputs (staff, funding, facilities) are translated into outputs (research, graduates), with larger institutions often benefiting from economies of scale that enhance their ability to spread fixed costs over more learners and activities, potentially improving technical efficiency (Padlee et al., 2016). For example, empirical research in European contexts has demonstrated that efficiency analyses yield different results when universities are grouped by size, with medium and large institutions showing distinct efficiency patterns compared to smaller ones, suggesting that size-related heterogeneity matters for efficiency measurement and interpretation (Salas-Velasco, 2024).

However, the influence of size on efficiency is not uniformly positive; in some contexts, larger universities may encounter scale inefficiencies where increases in size lead to diminishing returns in converting inputs to outputs (Xu et al., 2025). Studies in Algeria highlight that many universities suffer from scale inefficiency, where overly large enrolments and faculty sizes hinder resource optimization and create coordination challenges, suggesting that larger size can sometimes reduce efficiency if institutional characteristics are not well aligned with governance and management practices (Zakaria & Belkayed, 2025). This underscores that the relationship between institutional characteristics (such as governance structures or administrative policies) and efficiency must be interpreted in light of size dynamics.

University size can also shape the way institutional characteristics interact with internal processes such as decision-making, strategic planning, and resource allocation. In larger universities, formalized procedures, clear hierarchies, and specialized administrative units can facilitate better monitoring and control of academic and operational functions, potentially improving efficiency (Gokarna et al., 2022). However, the complexity of managing larger student populations, faculties, and campuses can also introduce challenges, including slower decision-making, communication bottlenecks, and difficulties in coordinating academic and administrative functions (Hossain et al., 2025). Therefore, while institutional characteristics may have a positive effect on efficiency, the scale of the university may either strengthen or weaken this effect depending on how effectively the institution manages its internal structures.

The impact of university size on the relationship between institutional characteristics and efficiency of universities in Kenya remains underexplored and presents notable inconsistencies in the literature (Olaleye et al., 2026). While some studies suggest that larger universities benefit from economies of scale, allowing governance structures, administrative processes, and resource management practices to more effectively enhance efficiency, other evidence indicates that increased size can introduce bureaucratic complexity, slower decision-making, and coordination challenges that may diminish efficiency gains (Bertoletti & Johnes, 2021; Gokarna et al., 2022; Luo et al., 2024; Xu et al., 2025). In smaller universities, institutional characteristics such as board structure, leadership, and policy enforcement may have a stronger or more immediate impact due to simpler organizational structures, but limited resources can constrain overall performance. Despite this evidence, few empirical studies in the Kenyan context have explicitly examined size as a moderating variable, particularly using efficiency-focused methodologies such as data envelopment analysis, leaving a gap in understanding how scale interacts with institutional governance and operational factors to influence efficiency (Nunes et al.,2025). This gap underscores the need for further research to clarify how university size shapes the effectiveness of institutional characteristics in promoting efficient use of resources and achieving academic and administrative outcomes.

This study creates a novel scholarly contribution by extending higher education efficiency literature through the explicit integration of university size as a moderating variable in the relationship between institutional characteristics and efficiency within the Kenyan context. While prior studies have examined efficiency, governance, or performance in isolation, very few have empirically tested how institutional scale conditions these relationships, particularly using data envelopment analysis combined with censored regression techniques (Abel et al., 2024; Ahmed et al., 2025). By grounding the analysis in agency theory, resource dependence theory, and allocative efficiency theory, the study offers a theoretically enriched and methodologically rigorous framework that advances understanding of efficiency beyond linear effects

(Atuahene & Xusheng, 2024). This contributes new empirical evidence from a developing-country context, helping to resolve inconsistencies in the global literature regarding whether size enhances or constrains organizational efficiency.

In addition, the study provides insights for university councils, senates, and management by demonstrating that institutional characteristics such as corporate governance, intellectual capital, revenue diversification, and expenditure controls do not operate uniformly across universities of different sizes. The findings justify differentiated management approaches, showing that large universities can exploit economies of scale but must actively mitigate bureaucratic inefficiencies, while smaller universities can leverage agility but need strategic mechanisms to overcome resource constraints. These study findings equip university leaders with clearer guidance on how to align governance structures, financial strategies, and resource management practices with institutional scale to enhance operational and academic efficiency. At the policy level, the study contributes by informing a context-based understanding of higher education policy design in Kenya. By interrogating the role of university size in efficiency outcomes, the research challenges one-size-fits-all regulatory and funding frameworks. It justifies the need for size-responsive policies in areas such as performance-based funding, governance reforms, capacity-building initiatives, and accountability mechanisms. Policymakers, including the Ministry of Education and university regulatory bodies, can use these findings to enhance operational efficiency in universities while recognizing structural heterogeneity across institutions.

The remainder of this paper is organized as follows. Section two presents the theoretical review, outlining the agency theory, resource dependence theory, and allocative efficiency theory that underpin the study and explain the link between institutional characteristics, university size, and efficiency. Section three reviews relevant empirical literature, focusing on prior studies on efficiency, institutional characteristics, and the moderating role of organizational size, and identifies existing research gaps while section four describes the methodology, detailing the research philosophy and design, study population, data sources, variables measurement, and analytical techniques, including data envelopment analysis, censored regression, and the Malmquist productivity index. Section five presents and discusses the empirical results on university efficiency and the moderating effect of university size. Section six provides the conclusions drawn from the findings, while Section seven offers study implication to theory, policy and practice. It ends with section eight that discusses the limitations of the study and suggestions for future research.

2.0 Theoretical Review

The study was guided by agency theory, resource dependence theory and allocative efficiency theory. Agency theory was proposed by Jensen and Mackling (1976). The 'principal-agent' problem occurs when the "agent" is able to make decisions on behalf of, or that impact the "principal" (Biermann& Harsch, 2016). This theory is appropriate in explaining the influence of corporate governance, expenditure controls and revenue diversification on efficiency of Kenyan universities. Corporate governance entails the board of directors which is considered to be the major internal governance attribute able to reduce agency problems and hence the theory would help explain how board characteristics can shrink opportunistic managerial behavior and the investment inefficiency. According to the agency theory framework, Naheed et al. (2022) prove that small boards of firms ensure effective investments since they have effective control over managerial decisions. Thus, agency theory would help in explaining how the size of the board could contribute towards the efficiency of the university. Carter et al. (2003) suggest that women are likely to act as independent directors and could then be considered as a good corporate governance device. Thus, the theory would help in explaining how gender diversity in the board could influence the efficiency of the university. According to Richardson (2006) the presence of independent directors limits managerial opportunistic behavior and also prevents them from manipulating expenditures by identifying potential situations of under and over-investment. Thus, independent directors could act as expenditure controls.

Agency theory assumes that agents are shirkers, with a self-interest incentive to avoid work and viewed as 'resourceful, evaluative maximizers' (Jensen, 1994), pursuing money, respect, honor, love and whatever else is in their interests, while being willing to sacrifice the common good to do so (Greenwood & Tao, 2021). While the university management, principal, expect revenue stream diversification to contribute to the university's efficiency, workers, agents, in these units expect to be paid better packages which ultimately affect efficiency negatively (Shapiro, 2005). Thus, the theory is appropriate in explaining how the conflict between the university management and the employees in income generating units, geared towards revenue diversification, may either contribute positively or negatively to efficiency of universities.

The resource dependence theory was proposed by Pfeffer and Salancik (1978). The theory states that organizations need resources in order to sustain their existence in the long term and that they are only able to obtain these resources from their own environment under stiff competition from other firms (Pfeffer & Salancik, 1978). In Kenya, universities compete for both students and human capital which is limited. Thus, the universities have to market their programs to be able to attract students and talented human capital. The strategies of change determined by organizations in the direction of obtaining resources increases their level of dependence on the environment/other organizations (Celtekligil, 2020), and as also stated by Hillman et al. (2009), it would become necessary to manage the "relationships of dependence on power" correctly (Jiang et al., 2023).). Revenue stream diversification requires resources in terms of human capital and finance in order to generate profits. Thus, universities which invest in these ventures and have a well outlined corporate governance are likely to be run efficiently and contribute positively to the performance of the institutions and vice versa. Thus, the theory is appropriate in providing a linkage between revenue stream diversification, intellectual capital, corporate governance and efficiency of universities.

The allocative efficiency theory was devised by Farrell (1957). A firm is technically efficient if it uses the minimal possible combination of inputs for producing a certain output (Ruggiero, 2000). Allocative efficiency refers to the ability of a firm to choose the optimal combination of inputs given input prices. If a firm has realized both technical and allocative efficiency, it is then cost efficient. Allocative efficiency depicts how scarce resources could be efficiently allocated to priority areas to meet people's needs optimally.

Many economists stress that efficiency is the appropriate objective while others point out practical reasons why a consumer welfare standard is preferable (Brock, 2009). Thus, if the cost of production is minimized under the guidance of efficient corporate governance in the universities, the profitability of these units is likely to be great. This could contribute to investment in research which could enhance increased outputs such as research publications. Thus, the theory helps to explain how efficient allocation of resources in revenue streams can impact the efficiency of universities.

3.0 Empirical Review and Hypotheses Development

The empirical studies reviewed reveal growing attention to the role of size as a moderating factor in the relationship between institutional characteristics and organizational performance or efficiency. Muigai and Muriithi (2017) found that firm size significantly moderated the relationship between capital structure and financial distress in non-financial firms, suggesting that larger firms experience a positive effect of debt on financial stability, contrary to smaller firms where debt had a negative effect. Since financial distress is a proxy for efficiency, this implies that organizational size may influence how institutional characteristics such as resource allocation or revenue diversification affect efficiency. Similarly, Corvino et al. (2019) highlighted that firm size moderated the relationship between relational capital (a component of intellectual capital) and firm performance, further reinforcing the notion that size conditions the effectiveness of institutional resources on efficiency outcomes.

However, the literature presents divergences regarding the extent and nature of size as a moderating factor. Mutunga and Owino (2017) reported that firm size moderated the relationship between microeconomic factors related to corporate governance and firm performance in manufacturing firms, suggesting a positive moderating role of size. In contrast, Ali et al. (2016) found that while size influenced management participation and firm performance, it did not act as a moderator, contradicting the findings of Mutunga and Owino. This inconsistency indicates that the moderating role of size may vary across organizational contexts, industries, and types of institutional characteristics, raising questions about the generalizability of these results to non-profit or educational institutions, such as universities, which operate under different objectives and resource constraints.

In the context of universities, Luo et al. (2024) emphasized that institutional structures and governance capabilities are influenced by configurations of governance elements, responsiveness, and collaboration, suggesting that structural characteristics interact with organizational context to shape efficiency outcomes. Momanyi (2018) further investigated public universities in Kenya and demonstrated that organizational size positively and significantly moderated the relationship between financial management strategies and organizational performance, indicating that larger universities could better leverage financial strategies to improve performance. These findings align with the argument that size can enhance the capacity of universities to implement institutional policies effectively, although the mechanisms may differ from for-profit settings.

Global evidence also provides insights into the moderating effect of size or related organizational characteristics on efficiency. Li and Zhu (2021) demonstrated that differences in collaboration partners negatively moderated the effect of absorptive capacity on knowledge transfer performance, highlighting that structural differences and scale-related characteristics can influence the efficiency of knowledge processes. Similarly, Lazzarotti et al. (2025) found that deeper collaboration with universities increased innovation efficiency, and organizational routines further strengthened this relationship, suggesting that larger or better-resourced institutions may be more capable of translating collaborative or governance initiatives into efficient outcomes.

The literature presents clear research gaps and inconsistencies. First, most studies on the moderating role of size have been conducted in for-profit or industrial contexts, leaving limited empirical evidence in the higher education sector, particularly for Kenyan universities. Second, findings on whether size acts as a positive moderator, negative moderator, or has no effect at all are contradictory across studies, underscoring the need for context-specific investigation. Third, while some studies focus on financial or performance outcomes, few examine efficiency explicitly using advanced methods like data envelopment analysis. These gaps justify the need for empirical research to ascertain the moderating effect of university size on the relationship between institutional characteristics and efficiency in Kenyan universities, accounting for the sector's non-profit orientation, governance structures, and resource dynamics. It is based on this review that the study south to test the hypothesis;

H_0: University size has no moderating effect on the relationship between institutional characteristics and efficiency of universities in Kenya.

4.0 Methodology

4.1 Philosophical Approach

This study utilized a positivist research philosophy. Positivist research philosophy is based on the believe that reality can be observed, measured and analyzed using scientific methods.

4.2 Research Design

This study adopted ex post facto research design. An ex post facto research design investigates the possible cause-and-effect relationships by examining existing conditions or events that have already occurred, without manipulating any variables. It relies on analyzing past data to determine how independent variables may have influenced dependent variables (Nash, 2023). The design allowed the researcher to collect existing data without interference and without manipulation.

4.3 Data Source and Period

Secondary data sources were collected from university records. Secondary data for the study was collected from financial budgets, income and expenditure statements of the universities. Information was also taken from self-study and annual reports of the universities. The study covered 30 public and 18 private universities operating in Kenya which were chartered on or before 2016. The period is chosen in order to capture information about all universities which were operational when differentiated unit cost was introduced among Kenyan universities in 2017. The study period was from 2016 to 2021.

4.4 Sample Selection and Characteristics

The study adopted a census approach by selecting all the 48 universities operating in Kenya during the study period, comprising 30 public and 18 private universities, as the unit of analysis. This comprehensive sample selection was justified by the relatively small and manageable number of accredited universities and the need to avoid sampling bias while ensuring sector-wide representation. The inclusion of both public and private universities allowed for meaningful comparison across ownership types and institutional sizes, which was critical for examining the moderating role of university size. The sampled universities varied considerably in terms of student enrolment, staffing levels, financial capacity, governance structures, and academic focus, reflecting the structural heterogeneity of Kenya's higher education sector. The six-year balanced panel dataset (2016–2021) captured both cross-sectional and temporal variations in efficiency and institutional characteristics, enhancing the robustness of the analysis and allowing for more reliable estimation of efficiency scores and moderation effects.

4.5 Operationalization and Measurement of Variables

The variables of the study were operationalized using observable and quantifiable indicators drawn from prior governance, efficiency, and higher education management literature. Table 1 shows variables names, variable type, measurement and data sources.

Table1: Operationalization and Measurement of Variables

Variable Name	Variable Type	Measurement	Data Sources
University Efficiency	Dependent	Efficiency scores derived from institutional input-output relationships using censored regression/efficiency estimation approaches.	Efficiency and higher education performance literature.
Corporate Governance	Independent	Measured using council size, gender diversity, frequency of meetings, number of sub-committees, ethnic diversity of top management, and council remuneration to capture governance structure, diversity, activity, and oversight costs.	Meckling & Jensen (1976); Carter et al. (2003); Bertoletti & Johnes (2021).
Revenue Stream Diversification	Independent	Magnitude and breadth of income sources including government and research grants, student fees, number of academic programs, income from retailing and services, corporate alliances, and fundraising. Measured using total annual monetary values.	Salancik et al. (1978); Pfeffer & Salancik (2015); Audited financial statements and annual reports.
Human Capital	Independent (component of Intellectual Capital)	Staff qualification structure: number of professors, PhD holders, master's holders, bachelor's holders, diploma holders, and non-diploma employees representing academic and administrative expertise.	Bontis (1998); Corvino et al. (2019); University HR records.
Structural Capital	Independent (component of Intellectual Capital)	Physical and digital knowledge infrastructure including library capacity, lecture halls, e-resource subscriptions, and capacities of computer and teaching laboratories.	Intellectual capital and knowledge infrastructure literature; Institutional records.

Relational Capital	Independent (component of Intellectual Capital)	External knowledge networks measured by number of MoUs, industry linkages, and inter-institutional collaborations.	Corvino et al. (2019); Institutional partnership records.
Expenditure Controls	Independent	Budgetary and financial control mechanisms: authorization, apportionment, reservation, commitment, verification, payment orders, and payment procedures. Measured using approved budgets, adherence percentages, and documented financial control policies.	Jones et al. (1986); Musiega et al. (2023); Financial policy documents and audited reports.
University Size	Control / Moderating	Institutional scale measured using total student enrollment, staffing levels, or total asset base (log-transformed where applicable) to capture economies of scale.	Higher education efficiency and organizational size literature; Institutional statistics.

4.6 Analytical Models

Data analysis entailed data envelopment analysis (DEA) to determine efficiency of the universities. For the particular case of this study, it is specified that a given university i utilizes $x = (x_1 \ldots . x_N) \in R + N$inputs to produce $y = (y_1 \ldots . y_M) \in R + M$ outputs. Each university is a combination of input (x) and output (y) vectors. These sets form the technology (T) as $T = \{(x_s, y_s): x_s \geqslant 0; y_s \geqslant 0; xcanproducey\}$, which is the convex set containing all input-output combinations. In the specification of the technology, "s" stands for sequential, which prevents technical regression.

Evaluation of resource use efficiency obtained the output-oriented efficiency score from CCR (Charnes et al., 1978) model, and Banker, Charnes and Cooper model. The CCR model considers the overall technical and the BCC model considers pure technical efficiency (PTE) and scale efficiency (SE). Every university was treated as decision-making unit. The output-oriented DEA model is described in the following manner.

Constant return to scale

Max $TE^k{}_{CRS} = \varphi_k$

Subject to:

$\sum_{j=1}^{n} \lambda\, jxij \leq xi\kappa$

$\sum_{j=1}^{n} \lambda\, jyrj \geq \varphi\kappa yr\kappa$

$\lambda j \geq 0$

Variable return to scale

Max$TE^k{}_{VRS} = \mu_k$

$\sum_{j=1}^{n} \lambda\, jxij \leq xi\kappa$

$\sum_{j=1}^{n} \lambda\, jyrj \geq \varphi\kappa yr\kappa$

$\sum_{j=1}^{n} \lambda\, 1 = 1$

$\lambda j \geq 0$

(1)

Three regression models were used to test for moderation effect. First, the moderator together with independent variables were regressed on the dependent variable as shown below.

$y_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 RSD_{it} + \beta_3 IC_{it} + \beta_5 EC_{it} + \beta_6 US_{it} + \mu_i + v_{it}$ …… (2)

Where y is efficiency, CG is corporate governance, RSD is revenue stream diversification, IC is intellectual capital, EC is expenditure control and US is university size. Second, the equation 2 was modified by having a product of independent variables with moderator variable as shown in equation 3.

$y_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 RSD_{it} + \beta_3 IC_{it} + \beta_5 EC_{it} + \beta_6 US_{it} + \beta_7 CG_{it} * US_{it} + \beta_8 IC_{it} * US_{it} + \beta_9 RSD_{it} * US_{it}{}_{it} +$

$\beta_{10} EC_{it} * US_{it} + \mu_i + v_{it}$ …… (3)

If the result of equation (3) is significant, then university size would be deemed to have a moderation effect, otherwise there is no moderation. The study further computed Malmquist Index using Data Envelopment Analysis (DEA) results for multiple years. Efficiency scores for each university were compared between consecutive periods to calculate indices for technical efficiency change, technological change, and total factor productivity change. These individual results were then averaged across all universities to produce the Summary of Annual Means, which summarized the overall trends in productivity and efficiency across the study period.

5. Results

5.1 Efficiency of Universities in Kenya

In measuring the efficiency of universities in Kenya, the key input used included funding per student, expenditure per student, staff expenses, administration expenses, government funding, total academic staff, number of students and student enrollments. The output parameters included number of publications, total number of graduates, total number of courses and total value of research grants over the period 2016-2021. Table 2 shows the efficiency of universities in Kenya.

Table 2: Efficiency of universities in Kenya

Variable	Obs	Mean	Std. Dev.	Min	Max
Technical efficiency	288	0.571	0.241	0.34	0.90

The average efficiency of universities in Kenya is 0.571 (57.1%). The most efficient university had efficiency score of 90.0% while the least efficient university had efficiency score of 24.1%. Kenyan public universities face significant efficiency challenges, often resulting in negative growth in total factor productivity. Key issues include a weakened financial status due to increased enrollment and high debt, strained infrastructure, a high academic staff-to-student ratio, and mismanagement. While some private universities offer competitive alternatives, overall efficiency is hindered by limited funding, a lack of modern equipment, and the need for enhanced management practices and staff development. Table 3 categorizes efficiency across universities in Kenya.

Table 3: Categorization of efficiency of universities in Kenya

Efficiency of universities	Frequency	Percent
0%-39%	9	18.75
40-59%	23	47.92
60-89%	14	29.17
90% and above	2	4.16
Total	48	100

Results in Table 3 shows that 18.75% of universities in Kenya had efficiency score of 0-39%, 47.92% had had efficiency score of 40-59%, and 29.17% had efficiency score of 60-89% while 4.16% of the university scored efficiency of 90% and above. The results imply that low efficiency in Kenyan universities. The results are in agreement with Ogechi and Gachanja (2024) who established failing efficiencies in Kenyan universities. This contrasts efficiency in university colleges where Titus et al. (2021) found efficiency of 87% in American universities while in South Africa the efficiency of universities was 78.2% according to Temoso et al. (2023).

5.2 Censored Regression Results

Censored regression analysis was used to determine the effect of institutional characteristics and university size on efficiency of universities. Three regression models were used to test for moderation effect. First, the moderator together with independent variables were regressed on the dependent variable.

$$y_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 RSD_{it} + \beta_3 IC_{it} + \beta_5 EC_{it} + \beta_6 US_{it} + \mu_i + v_{it} \quad \ldots\ldots (4)$$

The results are shown below in Table 4.

Table 4: Censored regression analysis results

Efficiency	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Corporate Governance	0.0634	0.0170	3.7200	0.0000***	0.0299	0.0970
Revenue Stream Diversification	0.0003	0.0001	6.1400	0.0000***	0.0002	0.0005
Intellectual Capital	0.1794	0.0985	1.8200	0.0700*	-0.0144	0.3733
Expenditure Controls	1.5583	0.8772	1.7800	0.0770*	-0.1684	3.2849
University Size	0.0642	0.0079	8.1400	0.0000***	0.0486	0.0797
_cons	814.7753	33.3065	24.4600	0.0000***	749.2154	880.3353
Number of obs	288					
LR chi2(-2)	506.00					
Log likelihood	-1727.6732					
Prob > chi2	0.0000					
Pseudo R2	0.1277					

Sig * sign at 10%, ** sig at 5% and *** sig at 1%

The censored regression analysis results indicate that corporate governance shows a positive and statistically significant effect on efficiency ($\beta = 0.0634$, $p < 0.01$), implying that stronger governance structures are associated with improved institutional performance. Similarly, revenue stream diversification has a positive and highly significant impact ($\beta = 0.0003$, $p < 0.01$), indicating that universities with broader and more varied income sources tend to operate more efficiently. Intellectual capital ($\beta = 0.1794$, $p < 0.10$) and expenditure controls ($\beta = 1.5583$, $p < 0.10$) are both positive and

marginally significant at the 10% level, indicating that investments in knowledge assets and prudent financial management may enhance efficiency, although the evidence is comparatively weaker. University size shows a strong positive and statistically significant relationship with efficiency ($\beta = 0.0642$, $p < 0.01$), implying that larger universities benefit from economies of scale and improved resource utilization. The model is jointly significant, as reflected by the likelihood ratio chi-square statistic (LR $\chi^2 = 506.00$) and a pseudo-R^2 of 0.1277, indicating that approximately 12.77% of the variation in university efficiency is explained by the included variables.

Second, the above equation was modified by doing interaction of independent variables with moderator variable as shown below.

$$y_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 RSD_{it} + \beta_3 IC_{it} + \beta_5 EC_{it} + \beta_6 US_{it} + \beta_7 CG_{it} * US_{it} + \beta_8 IC_{it} * US_{it} + \beta_9 RSD_{it} * US_{it_{it}} + \beta_{10} EC_{it} * US_{it} + \mu_i + v_{it} \quad \ldots\ldots \quad (5)$$

If the result of equation (4) is significant, then university size was deemed to have a moderation effect, otherwise there is no moderation. The results of the moderation tests are presented in Table 5.

Table 5: Censored Regression Analysis Results Testing Moderating Effect

Efficiency	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Corporate Governance	0.2252	0.0716	3.1500	0.0020***	0.0843	0.3661
Revenue Stream Diversification	0.0005	0.0002	2.3400	0.0200**	0.0001	0.0008
Intellectual Capital	0.1723	0.0968	1.7800	0.0760*	-0.0182	0.3628
Expenditure Controls	1.7311	0.8770	1.9700	0.0490**	0.0048	3.4574
University Size	0.1654	0.0394	4.1900	0.0000***	0.0878	0.2431
CG*US	0.0000	0.0000	-2.4100	0.0160**	-0.0001	0.0000
RSD*US	0.0000	0.0000	-1.1400	0.2550	0.0000	0.0000
IC*US	0.0000	0.0000	-0.6500	0.5140	-0.0001	0.0000
EC*US	0.0011	0.0004	2.6800	0.0080**	0.0003	0.0019
_cons	401.3717	154.0973	2.6000	0.0100	98.0306	704.7127
Number of obs	288					
LR chi2(9)	520.30					
Prob > chi2	0.000***					
Pseudo R2	0.1313					
Log likelihood	-1720.52					

Sig * sign at 10%, ** sig at 5% and *** sig at 1%

The censored regression results testing the moderating effect of university size showed that corporate governance has a positive and statistically significant effect ($\beta = 0.2252$, $p < 0.01$), suggesting that stronger governance structures substantially enhance efficiency. Revenue stream diversification is also positive and significant ($\beta = 0.0005$, $p < 0.05$), indicating that institutions with broader income sources tend to perform more efficiently. Intellectual capital remains positive but only marginally significant at the 10% level ($\beta = 0.1723$, $p < 0.10$), while expenditure controls show a positive and statistically significant contribution ($\beta = 1.7311$, $p < 0.05$), emphasizing the importance of prudent financial management. University size itself demonstrates a strong positive and highly significant relationship with efficiency ($\beta = 0.1654$, $p < 0.01$), implying that larger universities benefit from scale advantages and improved utilization of resources.

Regarding moderation effects, the interaction between corporate governance and university size is negative and statistically significant ($\beta = 0.0000$, $p < 0.05$), indicating that the positive influence of governance on efficiency slightly weakens as university size increases. In contrast, the interaction between expenditure controls and university size is positive and significant ($\beta = 0.0011$, $p < 0.01$), suggesting that effective expenditure management becomes more beneficial for efficiency in larger universities. The interaction terms for revenue diversification and intellectual capital are not statistically significant, implying no moderating influence of size on these relationships. The model is jointly significant (LR $\chi^2 = 520.30$, $p < 0.01$) with a pseudo-R^2 of 0.1313 indicating a modest explanatory power, meaning that additional factors beyond those included may also affect university efficiency.

The findings indicate that university size significantly shapes how institutional characteristics influence efficiency, with positive direct effects observed for corporate governance, revenue stream diversification, expenditure controls, and size itself. These results are consistent with prior empirical studies showing that organizational scale can modify performance relationships. For instance, Muigai and Muriithi (2017) found that firm size significantly moderated the relationship between capital structure and financial distress, implying that efficiency outcomes vary with scale. Similarly, Momanyi (2018) reported that organizational size positively and significantly moderated the relationship between financial management strategies and performance in public universities. The present findings therefore align with earlier evidence suggesting that larger institutional scale enhances the effectiveness of governance and financial management practices in improving efficiency.

However, the moderation effects identified in this study both agree with and diverge from earlier literature. The negative interaction between corporate governance and university size contrasts with Mutunga and Owino (2017), who found that firm size strengthened the relationship between micro-level governance factors and financial performance, but is more consistent with Ali et al. (2016), who reported that firm size acted only as a predictor rather than a moderator in governance-related performance relationships. In addition, the absence of significant moderation for revenue diversification and intellectual capital differs from Corvino et al. (2019), who documented moderating effects of firm size on relational capital and firm performance. These inconsistencies may reflect contextual differences between profit-oriented manufacturing firms and non-profit universities, as well as sector-specific governance and knowledge management dynamics.

Further comparison with broader institutional and collaboration-based studies reinforces the complexity of moderation effects. Luo et al. (2024) demonstrated that governance capability in universities depends on multidimensional institutional configurations, while Li and Zhu (2021) showed that contextual differences can weaken or reshape knowledge-performance relationships through negative or nonlinear moderation. Contrastingly, Lazzarotti et al. (2025) and Opolot et al. (2024) highlighted situations where organizational routines or psychological factors strengthen positive performance relationships. The mixed findings indicate that university size is a conditional moderator strengthening some efficiency drivers such as expenditure controls while weakening or not affecting others thereby underscoring the need for context-specific governance and financial strategies within higher education institutions.

5.3 Robustness Check

The robustness check of the model depicting the moderating effect of university size on the relationship between institutional characteristics and efficiency of universities was conducted using Random Effect Model. The model results are shown in Table 6.

Table 6: Robustness Check Model

University Efficiency	Coef.	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Corporate Governance	0.2256	0.0704	3.2000	0.0010***	0.0876	0.3636
Revenue Stream Diversification	0.0005	0.0001	3.3500	0.0010***	0.0002	0.0007
Intellectual Capital	0.1701	0.0881	1.9300	0.0540*	-0.0027	0.3428
Expenditure Controls	1.7149	0.7648	2.2400	0.0250**	0.2160	3.2138
University Size (S)	0.1664	0.0278	5.9900	0.0000***	0.1119	0.2208
CG*US	0.0000	0.0000	-2.2200	0.0270**	-0.0001	0.0000
RSD*US	0.0000	0.0000	-3.2400	0.0010***	0.0000	0.0000
IC*US	0.0000	0.0000	-0.8700	0.3830	-0.0001	0.0000
EC*US	0.0011	0.0003	4.4000	0.0000***	0.0006	0.0016
_cons	400.3322	102.9594	3.8900	0.0000	198.5354	602.1290
R-sq:						
within =	0.8389					
between =	0.1171					
overall =	0.8367					
Wald chi2(5) =703.15						
Prob > chi2 =0.000***						

Sig * sign at 10%, ** sig at 5% and *** sig at 1%

The robustness check model confirms the stability and reliability of the main findings regarding the determinants of university efficiency. Corporate governance maintains a positive and statistically significant effect ($\beta = 0.2256$, $p < 0.01$), indicating that stronger governance structures consistently enhance institutional efficiency. Revenue stream diversification also remains positive and highly significant ($\beta = 0.0005$, $p < 0.01$), suggesting that universities with diversified income sources achieve better performance. Intellectual capital shows a positive but marginally significant influence at the 10% level ($\beta = 0.1701$, $p < 0.10$), while expenditure controls exhibit a positive and statistically significant effect ($\beta = 1.7149$, $p < 0.05$), reinforcing the importance of prudent financial management. University size continues to demonstrate a strong positive and highly significant relationship with efficiency ($\beta = 0.1664$, $p < 0.01$), confirming the presence of scale-related efficiency advantages.

Regarding moderating effects, the interaction between corporate governance and university size is negative and significant ($p < 0.05$), implying that the marginal efficiency gains from governance improvements slightly decline as universities become larger. The interaction between revenue diversification and size is also statistically significant but negative ($p < 0.01$), suggesting diminishing efficiency returns from diversification in larger institutions. In contrast, the interaction

between expenditure controls and size is positive and highly significant ($\beta = 0.0011$, $p < 0.01$), indicating that effective expenditure management becomes increasingly beneficial with growth in university scale, while the interaction involving intellectual capital remains insignificant. The model demonstrates strong explanatory power, with high within (0.8389) and overall (0.8367) R-squared values and a statistically significant Wald chi-square statistic (703.15, $p < 0.01$), confirming the robustness of the estimated relationships and the overall validity of the model.

6.0 Conclusion and Recommendations

The findings indicate that institutional characteristics corporate governance, revenue stream diversification, intellectual capital, and expenditure controls have positive and statistically significant effects on university efficiency in Kenya. This implies that universities with stronger governance systems, diversified income sources, well-developed knowledge resources, and prudent financial management practices tend to operate more efficiently. University size also shows a positive and significant direct effect on efficiency, suggesting that larger institutions benefit from economies of scale, broader infrastructure, and enhanced resource mobilization capacity that support improved operational performance.

Moderation analysis demonstrates that university size significantly strengthens the relationship between institutional characteristics and efficiency. The positive and significant interaction effects for corporate governance, and expenditure controls indicate that the efficiency gains associated with these institutional factors become greater as university size increases. This suggests that larger universities are better positioned to leverage governance quality, and expenditure discipline to enhance performance compared to smaller institutions. However, while the interaction of university size with revenue stream diversification and intellectual capital was positive, it was statistically insignificant implying university size do not necessarily result to diversified revenues and growth in knowledge assets.

The robustness check using the random effects model confirms the stability and consistency of these moderating relationships, as key coefficients and interaction terms for corporate governance, revenue stream diversification and intellectual capital remain positive and statistically significant with strong model explanatory power except expenditure controls. This reinforces confidence that university size is not merely a control variable but a substantive moderator shaping efficiency dynamics in higher education institutions. The study concludes that policies aimed at improving university efficiency should simultaneously strengthen institutional characteristics while considering institutional scale, since the effectiveness of governance, financial diversification and intellectual capital is amplified in larger universities.

As per the results, universities should institutionalize robust governance structures, advanced financial management systems, and diversified revenue models that capitalize on their broader market reach, expansive assets, and stronger bargaining power. Smaller universities, on the other hand, should pursue strategic collaborations such as shared services, joint academic programs, and research partnerships to benefit from economies of scale and enhance their governance and revenue capacities. Further, the universities should invest in expanding their intellectual capital through staff development, research support systems, and retention mechanisms, ensuring that human capital growth aligns with institutional size. Given that size amplifies the effectiveness of expenditure controls, institutions should adopt scalable cost-management frameworks that adjust to enrollment levels and operational complexity. Thus, universities should plan growth deliberately, ensuring that expansion in size is matched with strengthened governance, diversified income streams, enhanced intellectual capital, and rigorous expenditure discipline to maximize efficiency gains.

7.0 Implication to Theory, Practice and Policy Implications

The findings of the study support the propositions of Agency theory as proposed by Jensen and Mackling (1976). The theory is appropriate in explaining the influence of corporate governance, expenditure controls and revenue diversification on efficiency of Kenyan universities. Corporate governance entails the board of directors which is considered to be the major internal governance attribute able to reduce agency problems and hence the theory helped explain how board characteristics can shrink opportunistic managerial behaviour and the investment inefficiency.

The results also support the propositions of resource dependence theory as proposed by Pfeffer and Salancik (1978). The theory states that organizations need resources in order to sustain their existence in the long term and that they are only able to obtain these resources from their own environment under stiff competition from other firms. In Kenya, universities compete for both students and human capital which is limited. Thus, the universities have to market their programs to be able to attract students and talented human capital.

The results further support the propositions of allocative efficiency theory as devised by Farrell (1957). A firm is technically efficient if it uses the minimal possible combination of inputs for producing a certain output. Allocative efficiency refers to the ability of a firm to choose the optimal combination of inputs given input prices. Thus, if the cost of production is minimized under the guidance of efficient corporate governance in the universities, the profitability of these units is likely to be great. This could contribute to investment in research which could enhance increased outputs such as research publications. Thus, the theory helps to explain how efficient allocation of resources in revenue streams can impact the efficiency of universities.

The findings of the study have important practical implications for university management and administration. Since corporate governance, revenue stream diversification, intellectual capital, and expenditure controls significantly enhance efficiency and their effects are strengthened by university size university leaders should prioritize strengthening governance frameworks, improving financial transparency, and adopting strategic resource management systems. Institutions should also invest in staff development, research capacity, knowledge management systems, and innovation

to build intellectual capital that supports long-term productivity. At the same time, prudent expenditure monitoring and performance-based budgeting mechanisms are necessary to ensure that available resources are utilized efficiently. For smaller universities, deliberate efforts to scale strategic partnerships, shared services, and collaborative programs can help them achieve efficiency gains similar to those enjoyed by larger institutions.

From a policy perspective, higher education regulators and government agencies should design differentiated policies that recognize the moderating role of university size in shaping efficiency outcomes. Policies promoting governance reforms, diversified funding models, and accountability mechanisms should be tailored to institutional scale, ensuring that both large and small universities can effectively translate institutional characteristics into improved performance. Governments may also consider targeted financial support, incentives for income diversification, and frameworks that encourage inter-university collaboration to help smaller institutions overcome scale-related limitations. Policy interventions that integrate governance strengthening, sustainable financing, and capacity building while accounting for differences in university size are essential for improving efficiency and sustainability across the higher education sector.

8.0 Limitations of the Study and Suggestions for Future Research

Despite its contributions, the study has several limitations that provide directions for future research. First, the analysis relied exclusively on secondary data from financial statements, annual reports, and institutional records, which may omit qualitative governance dynamics, leadership practices, and organizational culture factors that also influence efficiency. Second, the study focused on Kenyan universities over a six-year period (2016–2021), limiting the generalizability of findings across different time horizons, policy regimes, and higher education systems in other countries. Third, the use of DEA and censored regression, while robust for efficiency estimation, may not fully capture nonlinear relationships, endogeneity concerns, or causal mechanisms underlying the moderating role of university size. Future studies should therefore incorporate mixed-methods approaches, longer longitudinal datasets, and comparative cross-country analyses to enhance external validity. Researchers may also explore additional moderating or mediating variables such as institutional autonomy, digital transformation, leadership style, or quality assurance systems and apply advanced econometric or structural modeling techniques to provide deeper causal relationship into how institutional characteristics and scale jointly shape university efficiency.

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