http://journals.uonbi.ac.ke/index.php/adfj
ISSN 2522-3186

African Development Finance Journal http://journals.uonbi.ac.ke/index.php/adfj
December Vol 8 No.10, 2025 PP 222-246 ISSN 2522-3186

Government Funding, Institutional Size, and Student Enrolment in Public TVET Institutions: Evidence from Nairobi Metropolitan, Kenya

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Abstract

This article examines the influence of government funding, specifically Higher Education Loans Board (HELB) loans and capitation, on student enrolment in public Technical and Vocational Education and Training (TVET) institutions in Nairobi Metropolitan, Kenya. Using longitudinal panel data from 2019–2023 across 12 institutions, the study analyzes how institutional size moderates the relationship between funding and enrolment. Results show that HELB, capitation, and institutional size jointly explain 66.9% of the variance in enrolment rates, with all predictors exerting significant positive effects. Larger institutions benefit disproportionately due to economies of scale and stronger absorptive capacity. The findings highlight the centrality of coordinated demand- and supply-side financing models in promoting equitable access to technical education. Policy recommendations include strengthening funding frameworks, expanding capacity in smaller TVETs, and improving administrative efficiency to maximize the impact of public financing.

Keywords: *Government Funding, Institutional Size, Student Enrolment, Public Institutions*

1. Introduction

Technical and Vocational Education and Training (TVET) means a continuum of education and training involving the development of practical skills in different occupational sectors using formal and informal approaches. To boost their socio-economic status, this additional basic education introduces learners to technical and scientific-related abilities. The quest to curb youth jobs, social exclusion, and poverty has inspired the global focus of TVET by various national and regional governments (Nundkumar & Subban, 2023). Technical and Vocational Education and Training (TVET) plays a critical role in preparing individuals for the labor market and fostering economic development worldwide. According to a UNESCO Report (2020), global enrollment in TVET programs at the secondary level accounted for about 19% of total secondary education enrollment as of 2020. The report highlights that countries in Asia and Europe have the highest TVET participation rates, with many incorporating dual systems that blend in-class learning and workplace training. These programs are essential in equipping young people with the skills demanded by industries, particularly in manufacturing and services. However, enrollment varies

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significantly by region, with Sub-Saharan Africa and South Asia facing challenges such as limited access, gender disparities, and inadequate funding for TVET programs (UNESCO, 2021).

Globally, there is a growing tendency in numerous nations to give contextual learning while still including traditional subjects in a single course. Cleaver (2019) claimed that by understanding Prior Learning (RPL), which is strongly related to articulation, the Australian and New Zealand systems are searching for alternatives to articulation processes. Public funding in Germany supports vocational upper-secondary institutions and shared costs for equipment and teacher training; employers provide the workplace component and often contribute financially to apprentice training. Germany's model highlights the value of predictable public capital funding combined with employer cost-sharing to maintain both capacity and relevance (NCVER, 2022).

On the other hand, Australia's TVET sector is financed through a mix of federal and state funding, student fees, and targeted industry contributions. Reviews since 2020 (including parliamentary inquiries and NCVER publications) emphasize that fragmented funding, weak regulatory oversight of private providers, and episodic policy changes undermined both enrolment confidence and quality for parts of the sector. Australia's experience shows that (a) complex multi-level funding arrangements must be paired with strong accountability and (b) funding clarity (who pays for what and for which students/programs) is essential to stabilize enrolments (NCVER, 2022). In South Korea, a highly coordinated approach, integrating research institutions (e.g, KRIVET), national career education frameworks, and sustained public funding to align vocational provision with national industrial policy. The Korean model emphasizes centralized data, strong links with industry, and targeted public investments to expand specialized vocational pathways – supporting enrolment by raising perceived returns to TVETS. This approach demonstrates the value of research-driven planning and targeted public investments to catalyze demand (KRIVET, 2020).

Sub-Saharan Africa faces numerous regional challenges in the field of TVET. According to Lauglo (2019), many Sub-Saharan African governments are torn between investing in general education and vocational training. General education has been hailed as producing general human capital, whereas technical education produces more specialized and specific human capital. General education gives flexibility, allowing holders to shift from one career to another, whereas technical

education is highly specialized, and preventing migration from one position to another without additional schooling. Carnoy (2018), on the other hand, observed that although technical training imparts job-related skills, and there are high unemployment rates among holders of general education training, the majority of people, particularly youth, prefer general education, viewing technical education as a lower-class category of education.

TVETs in SSA face the twin challenges of expanding access to youth while delivering labour-market-relevant skills in capital-intensive programmes. Over the last five years, several major reviews and country reports have examined how financing choices determine both the capacity and attractiveness of TVET institutions, and thereby affect enrolment outcomes (World Bank, 2021–2023; Ghana CTVET, 2021; DHET South Africa, 2020/21). This synthesis summarizes those findings and draws comparative lessons relevant to Nairobi Metropolitan public TVET provision. Capitation (per-learner) funding appears in many SSA contexts either formally or de facto through line-item grants tied to enrolment. When capitation rates reasonably cover marginal instructional costs, institutions can scale cohort intakes, thereby increasing enrolment; however, low or highly variable per-student rates produce capacity constraints and limit growth (World Bank, 2021). Predictable per-student funding is especially important for vocational programmes because of equipment, consumables, and workshop maintenance costs that scale with enrolment.

Locally, any nation's economic progress, jobs, and living standards are dependent on nationally and internationally recognized abilities (Aring, 2022). In Kenya, policy papers have recognized the importance of providing manageable, high-quality, and relevant education as a crucial foundation for encouraging development and social harmony. The Kenya Vision 2030 highlights the importance of providing the necessary skills to drive the economy's diverse sectors (Government of Kenya, 2019). Kenya's Vision 2030 calls for Technical and Vocational Education and Training (TVET) to be the primary engine that drives the economy's industrialization by producing appropriate middle-level professionals. The introduction of the Higher Education Loans Board (HELB) and capitation funding has significantly impacted student enrolment in Kenya's public Technical and Vocational Education and Training (TVET) institutions. Between 2013 and 2022, enrolment surged from 55,945 to 249,316 trainees, attributed to increased government grants totaling KSh 10.3 billion and HELB loans amounting to KSh 11.1 billion (UNESCO, 2024). A

study by Maina (2019) found that HELB financing had a significant positive correlation with TVET performance, indicating that financial support enhances student retention and success. However, challenges such as low awareness, stringent application requirements, and delays in fund disbursement have hindered the full utilization of available funds.

In Kenya, enrollment in TVET institutions has grown significantly, rising from 116,564 students in 2018 to approximately 562,499 in 2022, a 382% increase (Economic Survey, 2021). Despite this, HELB and capitation funding have not kept pace with this growth, leading to infrastructural and resource constraints that undermine the quality and accessibility of technical education. For instance, budgetary allocations for TVETs increased from USD 35.7 million in the 2022/23 fiscal year to USD 68.7 million in 2023/24, a 92,4% increase. While this is a notable improvement, it remains insufficient to meet the needs of the expanding student population (Government of Kenya, 2024).

Efforts by the government to rebrand and expand TVET have also shown mixed results. Although the establishment of additional institutions contributed to a 36% increase in total TVET enrollment between 2017 and 2018, enrollment in Technical Vocational Colleges (TVCs) rose by only 29%, lagging behind the national average (Government of Kenya, 2019). This disparity suggests that funding challenges may disproportionately affect certain institutions, particularly those requiring more advanced infrastructure and resources.

The availability of Higher Education Loans Board (HELB) financing and government capitation significantly influences student enrollment rates in public Technical and Vocational Education and Training (TVET) institutions within the Nairobi Metropolitan area. HELB provides low-interest loans that enable students from economically disadvantaged backgrounds to access technical education, while capitation funding ensures that institutions receive government subsidies per student, reducing overall tuition costs. These financial interventions directly impact access and retention, making TVET a viable alternative to university education, particularly in urban low-income areas. Existing literature broadly addresses the impact of financing on education outcomes in Kenya, but often lacks a focused analysis on how different funding types, such as HELB versus capitation, specifically affect enrollment patterns in metropolitan settings like Nairobi. This study

fills that gap by comparing the effectiveness of these funding mechanisms in boosting enrollment and highlighting urban-specific challenges such as higher living costs and competition for limited institutional resources (Wambugu, 2021).

Global trends indicate that increased and targeted funding for TVET enhances access, quality, and student outcomes (Zancajo & Valiente, 2018). In Kenya, however, persistent challenges such as outdated curricula, inadequate technological integration, and limited access to financial aid through Higher Education Loans Board (HELB) loans have further constrained TVET institutions (Mohamed, 2018). These issues hinder the government's ambition to enroll over 3.1 million youth in TVET institutions (Ministry of Education, 2024). The knowledge gap lies in understanding the specific relationship between HELB and capitation funding and student enrollment rates in public TVET institutions, particularly in Nairobi Metropolitan. While previous studies have highlighted broad challenges in the TVET sector (Zancajo et al., 2018), there is limited research in the Nairobi Metropolitan Region. This research aimed to bridge this gap by providing empirical evidence on how HELB and capitation funding influence enrollment rates, offering actionable insights to policymakers and all other stakeholders.

This study sought to analyze the Influence of HELB and capitation funding on the student enrolment rate of public Technical Vocational Education and Training institutions in Nairobi Metropolitan, Kenya. The study was guided by the following objectives; to evaluate the influence of HELB funding on students' enrollment rate of public TVETS in Nairobi Metropolitan, Kenya, to establish the influence of total capitation funding on students' enrollment rate of public TVETS in Nairobi Metropolitan, Kenya and to examine the moderating influence of institution size on the relationship between HELB and capitation funding and students' enrollment rate of public TVETS in Nairobi Metropolitan, Kenya.

2. Literature Review

This review was selected for this research because it highlights other studies that have been performed and demonstrates the tools used and their results relevant to this study. This section involves a review of the literature in empirical studies conducted by different researchers on HELB

and capitation funding on student enrolment rate of public Technical Vocational Education and Training institutions in Nairobi Metropolitan, Kenya.

2.1 HELB Funding and Students' Enrolment Rate in Public TVET Institutions

The Higher Education Loans Board (Helb) reports 338,592 first-time TVET applicants and continuing students. These applications exceeded the planned Sh13.7 billion for the 2018-2019 fiscal year. Repayment of these loans is contingent on the graduate finding suitable work. Over the years, there have been a high number of defaulters, and HELB has not developed a sustained revolving fund to help needy students access these loans (Mwangi, 2020).

With increased funding and rising enrollment numbers, many TVET institutions have also received greater government support for infrastructure development and capacity building. HELB funding for TVET education has been part of a larger strategy to address the unemployment crisis in Kenya. By offering financial support to students pursuing technical and vocational courses, the program aims to equip the youth with the practical skills necessary for self-employment and industry jobs. As the awareness of this funding grows, so does the enrollment rate in public TVET institutions (Mugambi, 2023).

Orfield (2022) conducted a longitudinal quantitative study analyzing the relationship between financial aid availability and college enrollment rates. The data were drawn from the National Center for Education Statistics (NCES), focusing on enrollment trends from 2010 to 2018 across public and private institutions. Regression analysis was used to assess the impact of federal grants, state scholarships, and institutional aid on students from varying socioeconomic backgrounds. Surveys were also administered to 10,000 college applicants to capture perceptions of affordability. The study found a strong positive correlation between increased financial aid and higher enrollment rates, particularly among low-income and minority students.

In the US, Dynarski (2021) conducted a study measuring the Effect of Student Aid on College Attendance and Completion. The study employed a quasi-experimental design using longitudinal data from the National Postsecondary Student Aid Study. It analyzes the impact of federal and state financial aid programs on enrollment rates. Regression models are applied to compare

students receiving aid to those who do not, controlling for socioeconomic variables. The study finds that financial aid significantly increases enrollment rates, particularly among low-income students. A $1,000 increase in grant aid corresponds to a 4% increase in college enrollment rates. The findings emphasize the role of targeted financial assistance in addressing access disparities.

In a study by Deming and Dynarski (2020) on the role of financial aid policies in Scandinavian countries, the study used a mixed-methods approach, combining statistical analysis of national survey data and case studies of state-level financial aid programs. It explores how financial aid influences not only enrollment but also retention and graduation rates. Financial aid positively affects enrollment rates, particularly for first-generation college students. The study revealed that simplification of aid application processes and guaranteed aid programs significantly increase the likelihood of low-income students entering and completing college.

In Kenya, a study by Njoroge and Gathuthi (2023) revealed that while HELB funding positively impacts TVET enrollment, the funds allocated to each student are often insufficient to cover the full costs of training. This shortfall, coupled with limited outreach programs, results in lower enrollment rates than anticipated. The researchers emphasize that increasing the amount of HELB loans and enhancing outreach efforts would help increase enrollment in TVET institutions. These findings align with the government's strategic focus on boosting technical and vocational training as a pathway to sustainable development and poverty reduction in Kenya (Otieno & Colclough, 2020).

2.2 Capitation funding and Students Enrollment Rate in Public TVET Institutions

Capitation funding in TVET institutions is a financial model where institutions receive funds based on the number of students enrolled, promoting efficient resource allocation and cost management. Research shows that capitation funding can lead to improved financial discipline within colleges, as administrators are incentivized to maintain or increase student numbers, ensuring a steady stream of funding (Robinson, 2021). The capitation system emphasizes efficiency by linking funding directly to enrollment, potentially encouraging colleges to develop programs and services aligned with student demand and employment opportunities (Smith & Evans, 2020). However, critics argue that it can lead to an excessive focus on enrollment, which may compromise the

quality of education if resources are spread too thinly to cater to increasing student numbers (Jones et al., 2019).

An empirical study by Akyeampong (2019) on Public Financing of Education in Ghana used interviews with school heads and community members to provide qualitative insights. The finding on the introduction of capitation funding in Ghana was associated with a 17% increase in primary school enrollment within the first two years of implementation, particularly benefiting girls and children from low-income families. However, disparities remained in rural and remote areas due to logistical challenges in fund disbursement.

A study review of the evidence done by Oketch and Rolleston (2018) about policies on free primary and secondary education in East Africa, in Uganda. This study used policy document analysis and statistical data from Uganda's Ministry of Education to evaluate the effect of Universal Primary Education (UPE) policies, funded partly through capitation grants. Interviews with teachers and focus groups with parents provided supplementary qualitative data. Capitation grants under UPE significantly increased enrollment rates, with primary school attendance doubling in many districts. However, the study highlighted the strain on infrastructure and a decline in the quality of education, citing overcrowded classrooms and inadequate teaching materials as key issues.

Empirical evidence was done by Orodho (2017) on Financing Basic Education and Policy Options in Kenya. This study used a mixed-method approach combining quantitative surveys of schools and qualitative interviews with education administrators and policymakers. Data were collected from 50 primary schools across rural and urban regions of Kenya. The study found that capitation grants, introduced in Kenya under the Free Primary Education (FPE) policy, led to a significant increase in student enrollment rates, particularly in rural areas. However, the study noted that the funding was often insufficient to meet the growing demand, leading to overcrowded classrooms and strained school resources. The author recommended increasing capitation funding levels to align with enrollment growth.

2.3 Institution size and Students Enrollment Rate in Public TVET Institutions

Institution size in higher education, typically measured by student enrolment and faculty numbers, has been shown to significantly impact educational outcomes and operational dynamics. Research reveals that larger institutions often benefit from economies of scale, which allow for a broader range of programs, services, and facilities to support student development and learning experiences (Kim et al., 2018). These schools can provide a more diverse curriculum, better resources, and extracurricular options due to their larger budgets and funding (Bowen, 2020). However, some studies suggest that while larger institutions may offer a greater variety of opportunities, the student-faculty ratio tends to increase, potentially leading to less personalized attention for students and a higher likelihood of feeling "lost in the crowd" (Tinto, 2019).

In contrast, smaller institutions may lack the variety of courses and programs that large universities can provide, but they often foster a more intimate and supportive learning environment (Pascarella & Terenzini, 2005). Studies indicate that students at smaller colleges experience more face-to-face interactions with professors, contributing to better student satisfaction and academic performance (Umbach & Wawrzynski, 2005). However, smaller institutions may face challenges with financial sustainability and may not be able to provide the same extensive resources as their larger counterparts (Johnstone, 2021). This comparative perspective highlights the distinct advantages and limitations tied to institution size, shaping the student experience in meaningful ways.

An empirical study by Rossi and Helms (2021) on *Institutional Size and Enrolment Growth: Evidence from U.S. Higher Education Institutions* used a mixed-methods approach, combining longitudinal data analysis of 500 institutions from 2005 to 2015 with interviews of institutional administrators. Quantitative data were collected from the Integrated Postsecondary Education Data System (IPEDS). Institutions were categorized into small (fewer than 5,000 students), medium (5,000–15,000 students), and large (more than 15,000 students). The study found that larger institutions had higher enrolment growth rates, particularly among first-year students. Small institutions struggled to compete, citing resource constraints as a key challenge. Administrator at large institutions attributed their growth to economies of scale in marketing and enhanced student support services. Rossi and Helms concluded that institutional size significantly impacts enrolment trends, favouring larger campuses.

Also, a study by Li and Wang (2019) on Institutional *Size and Student Enrolment Patterns in Chinese Higher Education* in China employed a case study approach, analysing enrolment patterns at 10 universities of varying sizes across different provinces in China. Data were collected through institutional records and surveys of prospective students. The researchers also conducted focus groups with students and parents to explore perceptions of institutional size. The study revealed that medium-sized institutions showed the highest enrolment growth rates due to a balance of resources and personalized services. In contrast, very large institutions faced challenges with overcrowding and impersonal student support. Small institutions had the lowest enrolment rates unless they were located in urban centres or specialized in high-demand programs.

A study by Smith and Adomako (2020) on *the role of institutional capacity in attracting students was done in Ghanaian Universities used q*uantitative data to examine enrolment from 15 public and private universities in Ghana between 2010 and 2018. Data were analysed using regression models to assess the relationship between institutional size and student enrolment, controlling for factors such as tuition cost and program variety. The results indicated a positive correlation between institutional size and enrolment rates, particularly in private universities. Larger institutions were more attractive due to their perceived credibility and better facilities. However, smaller institutions gained a slight edge in niche programs or specialized fields. The study recommended that small institutions diversify their offerings to compete more effectively.

3. Methodology

Using a correlational descriptive design, the study examined the relationship between government funding, institutional size, and student enrolment rates in public TVET institutions. According to Cooper and Schindler (2011), descriptive correlational research involves systematically describing characteristics of a population while analyzing the degree of association between variables. This design enabled the researcher to identify and measure the strength and direction of relationships among the variables without manipulating them. The data collected were then analyzed to determine whether significant correlations existed and to support or refute the study's hypotheses. According to Mugenda and Mugenda (2013), the target population included all of the specific individuals, entities, or items that are relevant to the researcher's investigation. Following Sekaran and Bougie (2011), the population denotes the entire set of individuals, events, or subjects under

investigation by the researcher. 12 TVET institutions in Nairobi Metropolitan, as outlined in the table provided in Appendix II. A census approach is justified for studying all 12 TVET institutions in the Nairobi Metropolitan area, since with only 12 institutions, the population is small enough to feasibly include every unit in the study without the logistical and financial burdens typically associated with full censuses. By collecting data from all institutions, the study avoids sampling errors and ensures comprehensive coverage, leading to more reliable and valid findings, especially important for policy-making or funding allocation analysis. The study assumed the period of 2019-2023, whereby annual data was used. According to Anzaya et al. (2023), this period of 2019-2023 saw a drastic surge in TVET admissions. This period, therefore, provided sufficient and sober data for this study.

In this research, secondary data was used, involving the analysis of pre-existing data from credible sources. Key sources include government publications, budget reports, policy documents, and statistical data from the Ministry of Education and the Kenya National Bureau of Statistics. These provide insights into HELB and capitation funding patterns and student enrolment trends in TVET institutions. Secondary data is advantageous as it is cost-effective, time-saving, and allows access to large datasets (Johnston, 2017). However, its limitations include potential issues with data reliability, validity, and contextual relevance. Proper evaluation of sources ensures the data aligns with the study's objectives. Utilizing secondary data enables a broad and comparative perspective on the relationship between funding and enrolment. Therefore, the study had a total observation of 60 respondents, i.e., 5 years, and for 12 TVETs.

The data collection procedure for this study involved identifying and sourcing secondary data from relevant government agencies, including the Ministry of Education and the Kenya National Bureau of Statistics. Official reports, policy documents, and budget allocations were reviewed to extract data on funding and enrolment rates in TVET institutions. Data was systematically organized, validated for accuracy, and assessed for relevance to the study objectives (Johnston, 2017). This ensured reliability and contextual alignment of the secondary data. The study period was 2019 – 2023, using annual data for each of the TVET institutions under study.

According to Saunders (2012), data analysis is the act of condensing acquired data, evaluating, arranging, and structuring its important components in a way that enables clear and effective transmission of results. Before analysis, the data was modified, encoded, and tabulated. Additionally, the information was interpreted to ensure clarity, comprehensiveness, and relevance to the research objectives. The researcher used SPSS software version 25 to carry out the analysis and presented it using tables and graphs.

Pearson's correlation was used to test the relationship between the variables. Also, regression analysis was done to test the relationship between the Enrollment rate of public TVET and Training Institutions. The multiple regression model indicated below showed the relationship between the variables. Their coefficient indicated the strength of the relationship between the dependent and the independent variables.

General Model:

$Y_{it} = \beta_0 + \beta_1 X_{it1} + \beta_2 X_{it2} + \varepsilon$ …….. equation i

Analytical Model for Moderation

The panel regression model was structured as follows:

$SE_{it} = \beta_0 + \beta_1 \mathrm{HF}_{it} + \beta_2 \mathrm{ACI}_{it} + \beta_3 \mathrm{IS}_{it} + \beta_4 (\mathrm{HFit} \times \mathrm{IS}_{it}) + \beta_5 (\mathrm{CF}_{it} \times \mathrm{IS}_{it}) +$

εit……equation ii

Where;

$SEit = Student\ Enrollment\ rate\ i\ at\ time\ t$

$\mathrm{HF}it = Helb\ Funding$

$\mathrm{CF}it$ = Total $Capitation\ Funding$

$\mathrm{IS}it =$ Institutional Size

$\varepsilon it = error\ term$

To ensure the robustness of the panel data regression model, this study conducted several diagnostic tests to examine potential violations of regression assumptions. These tests helped enhance the reliability and validity of the findings. Given the panel nature of the data, the study employed the Modified Wald test for group wise heteroscedasticity in fixed effects models

(Greene, 2018). The Variance Inflation Factor (VIF) test was conducted to detect multicollinearity (Gujarati & Porter, 2020). The Shapiro-Wilk test was used to assess whether the residuals follow a normal distribution. To identify the presence of serial correlation, the study applied the Wooldridge test for autocorrelation in panel data (Drukker, 2003). Pesaran's CD test was conducted to assess cross-sectional dependence (Pesaran, 2004). To select the suitable panel data estimation method, this study performed the Hausman test to determine whether a fixed effects or random effects model should be applied (Hausman, 1978). To further determine whether a random effects model is preferable over pooled OLS, the Breusch-Pagan Lagrange Multiplier (LM) test was conducted. The LM test was significant; thus, the random effects model was preferred over pooled OLS.

As this study relied on secondary data, it complied with ethical research guidelines by sourcing information solely from publicly accessible materials, including government publications, budget reports, policy documents, and statistical data from the Ministry of Education and Kenya National Bureau of Statistics. To maintain ethical integrity, the study secured ethical approval from the appropriate institutional review board and obtained authorization from the National Commission for Science, Technology, and Innovation (NACOSTI) before initiating data collection and which was done through the KCAUSERC. Since the study exclusively used secondary data, there was no direct participation of human subjects. Additionally, measures were taken to ensure that no proprietary or confidential bank data was accessed without permission. All collected data was handled securely to prevent unauthorized access or misuse, thereby safeguarding privacy and confidentiality. The study also ensured data accuracy, objectivity, and transparency throughout the research process. Data was accurately recorded, analyzed, and reported to prevent any form of misrepresentation. Objectivity was maintained by relying only on official and verifiable sources, ensuring that findings reflect a true and unbiased representation of the relationship between audit committee attributes, bank size, and sustainability performance. Furthermore, transparency was prioritized in data interpretation and reporting, preventing manipulation or distortion of results. Academic integrity was upheld by properly citing all sources of secondary data to acknowledge the original authors and institutions.

4. Findings and Discussion

This section presents the empirical results on the relationship between government funding, institutional size, and student enrolment in public TVET institutions in the Nairobi Metropolitan region between 2019 and 2023. The analysis draws on panel data from 12 institutions over five years, focusing on HELB funding, government capitation, institutional size, and their combined effect on student enrolment rates.

4.1 Descriptive Findings

Descriptive statistics provided an initial picture of the funding and enrolment landscape across the sampled institutions (Table 1).

Table 1: Descriptive Statistics (N = 240 Institution–Year Observations)

Variable	Mean	Median	Std. Dev.	Min	Max	Skewness
HELB	3.042	3.024	0.724	1.10	4.70	-0.009
Capitation	3.013	3.068	0.641	1.40	4.60	-0.218
Institutional size (INSTSZ)	3.030	3.039	0.579	1.20	4.40	0.026
Enrolment rate (%)	57.52	58.30	11.48	34.30	77.50	-0.163

The panel was balanced and had no missing data, which strengthened the reliability of the longitudinal analysis. On average, enrolment rates stood at about 57.5%, suggesting that just over half of eligible or potential students were successfully enrolled each year. The relatively high standard deviation for enrolment (11.48) compared with the institutional variables (0.58–0.72) indicates considerable variation across institutions and years, pointing to unequal access and capacity. Skewness values for all variables were close to zero, suggesting approximate normality and supporting the use of parametric methods. Taken together, these patterns suggest that differences in funding levels and institutional capacity are likely to be meaningful drivers of the observed variation in enrolment, consistent with prior work linking educational resources to participation and performance.

4.2 Correlation Patterns

Pearson correlation analysis showed strong positive associations between funding variables and student enrolment. HELB funding was strongly correlated with enrolment ($r \approx 0.69$, $p < .001$), and capitation also showed a strong positive relationship with enrolment ($r \approx 0.67$, $p < .001$). Institutional size had a more moderate, but still positive, association with enrolment, reflecting the intuitive expectation that larger TVETs tend to host more students. HELB and capitation were themselves positively correlated ($r \approx 0.57$), raising initial concerns about possible multicollinearity. However, later tests using tolerance and Variance Inflation Factor (VIF) statistics confirmed that multicollinearity remained within acceptable limits and did not distort the regression estimates. These correlations provided a useful starting point but did not distinguish between within-institution changes over time and differences between institutions—hence the need for panel regression models.

4.3 Model Diagnostics and Panel Choice

Before estimating the main models, several diagnostic tests were carried out. Normality tests indicated that HELB, capitation, and institutional size were approximately normally distributed, while enrolment was slightly non-normal but acceptable for regression with robust standard errors. The Durbin–Watson statistic (0.565) suggested no serious autocorrelation in the residuals, meaning that year-to-year errors were largely independent. Principal Component Analysis (with a scree plot) indicated weak cross-sectional dependence, implying that no single common factor overwhelmingly drove the variation across institutions.

The Breusch–Pagan Lagrange Multiplier (LM) test rejected the pooled OLS model in favor of a panel approach, confirming that unobserved institutional effects mattered. The Hausman test was non-significant ($p > .05$), indicating that the Random Effects (RE) model was both consistent and more efficient than the Fixed Effects (FE) model. As a result, the RE model was adopted for interpretation, while FE estimates were used as a robustness check.

4.4 Random Effects Regression Results

The random effects regression model showed strong overall explanatory power, with $R = 0.818$, $R^2 = 0.669$, and adjusted $R^2 = 0.665$. This means that approximately 66.9% of the variance in

student enrolment rates across institutions and over time was explained jointly by HELB funding, capitation, institutional size, and their interaction terms.

Table 1: Random Effects Regression Results (Dependent Variable: Enrolment Rate)

Predictor	B	Std. Error	t	Sig.
Intercept	-3.753	3.186	-1.178	0.240
HELB	7.962	0.728	10.943	<0.001
Capitation	6.592	0.820	8.038	<0.001
Institutional size	5.673	0.744	7.627	<0.001
HELB × Institutional size	4.322	0.689	6.093	<0.001
Capitation × Institutional size	4.091	0.598	5.844	<0.001

The positive and highly significant coefficient for HELB (B = 7.962) indicates that, holding capitation and institutional size constant, a one-unit increase in HELB support is associated with an almost 8-point increase in enrolment rate. This highlights HELB as a powerful demand-side lever: when students have better access to loans, more of them are able to take up and sustain TVET places.

Similarly, capitation funding (B = 6.592) has a strong and significant effect, suggesting that institutions with higher capitation are better able to expand and maintain enrolment. Capitation supports the supply side by financing staff, equipment, and operational costs, enabling institutions to create additional training spaces and improve the learning environment.

Institutional size itself has a significant positive main effect (B = 5.673), meaning that larger TVETs tend to have higher enrolment rates even after accounting for funding levels. More importantly, the interaction terms—HELB × size (B = 4.322) and capitation × size (B = 4.091)—are also positive and significant. This indicates that larger institutions are able to convert additional funding into enrolment more efficiently than smaller ones. In other words, size amplifies the benefits of both student and institutional funding.

4.5 Discussion

The findings provide clear and compelling evidence that government funding is central to expanding access to TVET in the Nairobi Metropolitan region. HELB loans help to relax financial constraints for students, particularly those from low-income households, and are strongly associated with higher enrolment rates. This supports the view that demand-side financing mechanisms are critical for widening participation in post-secondary education, especially in settings where out-of-pocket costs can be a major barrier.

At the same time, capitation emerges as a key supply-side driver of enrolment. Institutions that receive higher levels of capitation are better equipped to hire trainers, upgrade infrastructure, and procure training materials—all of which directly enhance their capacity to admit and retain students. This is consistent with resource-based perspectives that link organizational performance to access to adequate financial and physical resources.

Institutional size plays a dual role: it is associated with higher enrolment in its own right and strengthens the positive effects of HELB and capitation. Larger TVETs appear to enjoy economies of scale and stronger internal systems, allowing them to translate marginal increases in funding into tangible enrolment gains more effectively than smaller institutions. This has important equity implications: without deliberate capacity-building, smaller TVETs may struggle to fully benefit from additional funding, potentially widening disparities between institutions.

Overall, the results suggest that both demand-side (HELB) and supply-side (capitation) interventions are necessary, but not sufficient on their own. Their impact is shaped by the structural realities of institutions, particularly size and capacity. For policy, this means that financing reforms should go hand in hand with targeted investment in infrastructure and organizational development, especially for smaller and emerging TVET institutions, to ensure that funding translates into real, equitable access for learners.

5. Conclusion and Recommendations

5.1 Conclusion

The study demonstrates that government funding, through HELB loans and capitation grants, plays a decisive role in shaping student enrolment trends in public TVET institutions within the Nairobi

Metropolitan region. Together with institutional size, these factors explain nearly two-thirds of the variation in enrolment over the 2019–2023 period, highlighting the importance of both demand-side and supply-side financing mechanisms. HELB funding emerged as a strong driver of enrolment, showing that when students can access affordable loans, more of them join and stay in technical training programs. Capitation funding also had a substantial positive effect, reinforcing the idea that institutions with adequate financial resources are better equipped to improve learning environments and attract more learners.

Institutional size further strengthened the relationship between funding and enrolment. Larger TVET institutions not only attracted more students on their own but were also able to convert additional funding, whether from HELB or capitation, into real gains in enrolment more efficiently than smaller colleges. These findings underscore the need for Kenya's TVET financing strategies to be scale-aware, ensuring that funding is not only increased but also aligned with institutional capacity. The study confirms that coordinated investment in student financing, institutional grants, and capacity development is essential for achieving sustainable enrolment growth and advancing the national skills development agenda.

5.2 Recommendations

Based on the findings, several policy actions are proposed to strengthen TVET enrolment in the Nairobi Metropolitan region. The government should increase HELB allocations for TVET learners and improve the efficiency of loan disbursements so that students can access funds in a timely and predictable manner. Awareness campaigns should also be scaled up to ensure that eligible learners understand how to apply for loans and meet repayment obligations. Importantly, HELB adjustments should be coordinated with capitation funding to avoid creating mismatches, such as increased student demand without sufficient institutional capacity, or increased institutional funding without enough students to fill the available spaces.

Capitation grants require upward review to match rising operational costs, inflation, and the resource-intensive nature of technical training. A needs-based capitation model should be considered to ensure equitable funding distribution, especially for institutions that are under-resourced yet experiencing high demand. Policymakers may also explore size-responsive

capitation models, where institutions approaching capacity receive targeted boosts to enhance their ability to absorb more students.

Strengthening institutional capacity, particularly among smaller TVETs, is essential. Such institutions should receive targeted support, including infrastructure development, equipment upgrades, and staff training, to build their ability to accommodate more students. Public–private partnerships could play a critical role in supplementing government investment, especially for equipment-heavy programs. In addition, continuous monitoring of institutional performance, including the marginal effects of size on enrolment, would help inform more transparent and evidence-based funding decisions.

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