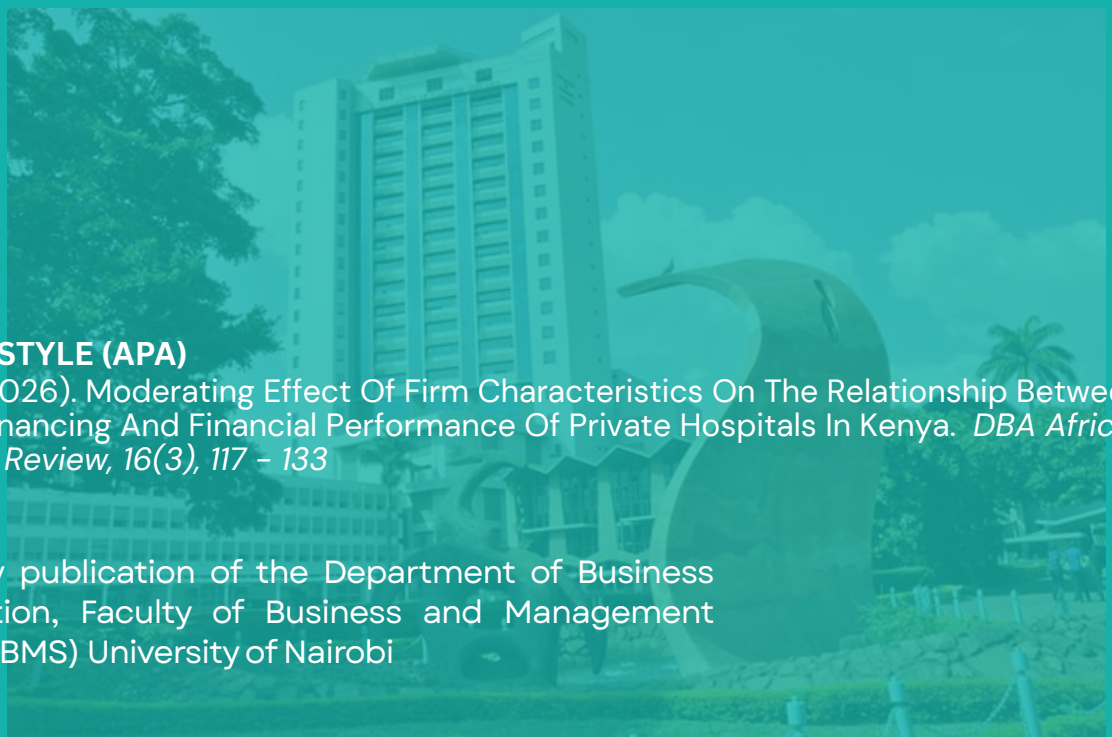
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MODERATING EFFECT OF FIRM CHARACTERISTICS ON THE RELATIONSHIP BETWEEN HEALTHCARE FINANCING AND FINANCIAL PERFORMANCE OF PRIVATE HOSPITALS IN KENYA

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Abstract

This study examined the moderating effect of firm characteristics, namely hospital size and hospital age, on the relationship between healthcare financing and the financial performance of private hospitals in Kenya. The study tested the null hypothesis that firm characteristics have no significant moderating effect on the relationship between healthcare financing and the financial performance of private hospitals in Kenya, with two sub-hypotheses relating to hospital size and hospital age. The research was anchored on the agency theory and the resource-based view, which together suggest that the scale and maturity of a hospital condition the extent to which loan facilities, out-of-pocket payments and insurance receipts are converted into profitability. Adopting a positivist philosophy and a longitudinal panel design, the study conducted a census of all the licensed medium-sized and large private hospitals in Kenya, whose audited annual reports were studied over a five-year period. For each moderator, a hierarchical fixed-effects panel regression was estimated in three steps: a base model, a model introducing the moderator, and a model introducing the interaction terms between the moderator and the financing sources. The results showed that hospital size significantly strengthened the effects of loan facilities and insurance receipts on financial performance, and that including size and its interactions raised the explanatory power of the model markedly. Hospital age likewise significantly moderated the relationship, strengthening the contribution of loan facilities while weakening that of out-of-pocket payments. The null hypothesis was therefore rejected for both characteristics: the returns to healthcare financing proved contingent on the scale and maturity of the hospital. The study recommends that financing strategies be tailored to hospital size and age, and that policymakers and financiers direct capacity-building support to smaller and younger hospitals so that they too can convert financing into performance.

Keywords: firm characteristics, hospital size, hospital age, healthcare financing, financial performance, Kenya

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Introduction

Background

Firm characteristics are traits specific to a firm that lie largely within its control, arising from managerial decisions and the resources the firm has accumulated (Almajali, Alamro & Al-Soub, 2012). Among the most studied of these are firm size and firm age (Kusa & Ongore, 2013). Firm size denotes the scale of operation of a business entity and is commonly measured by the book value of total assets, with larger firms holding more assets and generating greater earnings (Liargovas & Skandalis, 2008; Amato & Burson, 2017). Firm age is the number of years a firm has been in operation, and it proxies accumulated experience, reputation and institutional relationships (Liargovas & Skandalis, 2008). Both attributes are hypothesized to condition how effectively a firm converts its resources, including its financing, into performance (Almajali et al., 2012; Kusa & Ongore, 2013).

Healthcare financing encompasses the mobilization, allocation and management of financial resources for the delivery of health services, through mechanisms that include loan facilities, health insurance reimbursements and out-of-pocket payments (Al Mustanyir, 2023; Zhou et al., 2022). For private hospitals, these financing sources fund investment in quality care, infrastructure and technology, and thereby shape financial outcomes (Powell, 2024). Yet the same shilling of financing need not yield the same return in every hospital. The agency theory of Jensen and Meckling (1976) suggests that larger and older institutions possess more elaborate governance and monitoring structures that reduce agency costs in the deployment of finance. The resource-based view of Barney (1991) similarly holds that such institutions command complementary resources, including reputation, systems and managerial capability. These complementary resources enable larger and older institutions to exploit financing more effectively than their smaller and younger counterparts (Helfat et al., 2023). Whether the returns to healthcare financing are indeed contingent on hospital characteristics is thus a question with both theoretical and practical stakes (Matemilola, Kijkasiwat & Liew, 2024; Zhang & Chen, 2025).

The private hospital sector in Kenya offers an apt setting for this question. As at 2023, the Kenya Medical Practitioners and Dentists Council had licensed 153 medium-sized and large private hospitals, classified as level 4B, level 5 and level 6 facilities (KMPDC, 2023). This population spans small facilities and very large tertiary institutions, and hospitals aged from a single year to more than a century. The sector faces high operating costs, rising demand for quality care and constrained access to financial resources (Nyawira et al., 2022), with delayed insurance settlements a persistent source of strain (Nguru & Ireri, 2022). This pronounced heterogeneity in scale and maturity provides precisely the variation needed to test whether firm characteristics moderate the financing–performance relationship.

Problem Statement

A growing body of research establishes that firm characteristics moderate financial relationships, but almost entirely outside the healthcare sector. Zhang and Chen (2025) found that firm age and firm size significantly moderated relationships between predictor and outcome variables in a study of corporate innovation, while

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Chakkravarthy, Irudayasamy, Elangovan, Rengaraju and Parayitam (2024) established that firm size moderated the relationship between return on assets and firm value. Pratiwi and Lukiastuti (2025) reported that firm size buffered the negative effect of capital structure on the return on assets among Indonesian listed firms, Matemilola, Kijkasiwat and Liew (2024) demonstrated that firm age significantly moderated capital structure choices in emerging markets, and Mutumanikam and Adelin (2024) found that leverage and firm characteristics jointly shaped performance across emerging markets. None of these studies, however, examined healthcare financing or the hospital context.

Studies conducted within the healthcare sector, on the other hand, have examined financing and firm attributes as separate determinants of performance and have not tested whether firm characteristics condition the effect of financing. "Yadav, Singh and Prusty (2024) reviewed the influence of financing and firm-level attributes on hospital outcomes in emerging and developed economies without modelling interactive effects. Indrawati and Hanif (2023) related governance and capital structure to financial performance in the health industry, but treated profit management as a mediator and did not consider firm characteristics as moderators. In Kenya, Kamau and Kimutai (2022) associated healthcare financing schemes with the financial performance of public hospitals in Nairobi but did not consider firm characteristics as moderating variables. Consequently, to the best of the authors' knowledge, there is little empirical evidence on whether hospital size and hospital age condition the effect of healthcare financing on the financial performance of private hospitals in Kenya.

These conceptual and contextual gaps motivated the present study, which sought to determine the moderating effect of firm characteristics on the relationship between healthcare financing and the financial performance of private hospitals in Kenya. The study tested the following null hypotheses:

$H0_1$: Firm characteristics have no significant moderating effect on the relationship between healthcare financing and the financial performance of private hospitals in Kenya.

$H0_{1a}$: Hospital size has no significant moderating effect on the relationship between healthcare financing and the financial performance of private hospitals in Kenya.

$H0_{1b}$: Hospital age has no significant moderating effect on the relationship between healthcare financing and the financial performance of private hospitals in Kenya.

Literature Review

Theoretical Review

The agency theory, advanced by Jensen and Meckling (1976), anchors the moderation analysis. The theory conceptualises the firm as a nexus of contracts in which principals delegate decision-making authority to agents whose interests are imperfectly aligned with their own, giving rise to agency costs of monitoring, bonding and residual loss. In private hospitals, agency relationships are evident in the manner in which management sources and deploys financing on behalf of the owners, and debt financing in particular is theorised to discipline managers by

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committing free cash flows to fixed repayment obligations. Larger and older hospitals typically possess more elaborate governance and monitoring structures that mitigate these agency costs, which is why the theory predicts that the returns to financing rise with scale and maturity. Recent evidence affirms the theory's relevance: Pratiwi and Lukiastuti (2025) attributed the performance effects of ownership structure to alignment and monitoring mechanisms, and Matemilola, Kijkasiwat and Liew (2024) showed that firm-specific attributes shape the financing decisions through which performance is realised. Critics counter that the theory's assumption of opportunistic managers is overly pessimistic and understates stewardship and trust (Donaldson & Davis, 1991), a caution that argues for testing its predictions empirically rather than assuming them.

The resource-based view, proposed by Barney (1991), complements the agency perspective. The theory holds that firms achieve superior performance by strategically deploying valuable, rare, inimitable and non-substitutable resources (Cooper, Pereira, Vrontis & Liu, 2023; Helfat et al., 2023). Larger and older hospitals command such resources in greater measure, including established reputations, managerial capabilities, infrastructure and relationships with financiers and insurers. These complementary assets should enable them to convert a given volume of financing into performance more effectively than smaller and younger rivals. The theory thus supplies the resource logic behind the hypothesized positive moderation of hospital size and age.

The pecking order and trade-off theories complete the framework by explaining the financing behaviour being moderated. The pecking order theory of Myers and Majluf (1984) holds that firms exhaust internal funds before turning to debt, while the trade-off theory (Myers, 1984) postulates that firms balance the benefits and costs of debt in pursuit of an optimal capital structure. Both theories acknowledge that the terms on which a firm accesses and deploys financing depend on its characteristics: age brings reputation and creditworthiness that lower the cost of debt, and scale brings the collateral and systems that widen access to it, so that the performance consequences of financing should vary systematically with both.

Empirical Review

Zhang and Chen (2025) examined a contingency model of chief executive gender and corporate innovation, with firm age and firm size as moderating variables. The study was conducted among publicly listed firms and employed moderated regression analysis on panel data. It established that both firm age and firm size significantly moderated the relationships between the predictor and outcome variables, with larger and older firms exhibiting stronger effects. The identified research gap is that the study was situated outside the healthcare sector and did not examine healthcare financing or financial performance as the outcome, leaving open whether the moderating effect of size and age extends to the financing–performance relationship in hospitals.

Chakkravarthy, Irudayasamy, Elangovan, Rengaraju and Parayitam (2024) analysed the relationship between return on assets and firm

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value among publicly listed firms in an emerging market, with institutional holdings and firm size as moderators. Methodologically, the study employed a moderated-mediation framework estimated on panel data. Its key finding was that firm size significantly moderated the relationship between financial performance and firm value. The research gap is that the study concerned the performance–value link of listed companies rather than the financing–performance link of hospitals, and it did not consider healthcare financing sources.

Pratiwi and Lukiastuti (2025) examined the effect of ownership structure and capital structure on the financial performance of firms listed on the Indonesia Stock Exchange over the period 2020 to 2024, with firm size as a moderating variable. Using moderated regression analysis, the study found that capital structure negatively and significantly affected the return on assets and that firm size significantly moderated the relationship, buffering the adverse effect of leverage in larger firms. Matemilola, Kijkasiwat and Liew (2024) examined the moderating effect of firm age on the capital structure choices of firms across emerging markets, applying dynamic panel analysis with the generalised method of moments, and found that firm age significantly conditioned the influence of firm fundamentals on leverage. Mutumanikam and Adelin (2024) examined the impact of financial leverage on firm performance in emerging markets and documented that leverage and firm characteristics jointly shaped performance. Across all three studies, the identified gap is the absence of the healthcare context and of healthcare-specific financing sources, and none extended the moderation analysis to hospital financial performance.

Within the healthcare sector, Yadav, Singh and Prusty (2024) undertook a systematic review of business models in healthcare spanning emerging and developed economies, synthesising evidence on how financing sources and firm-level attributes influence profitability, liquidity and efficiency. The review's scope was broad but it did not model interactive effects, so the moderating effect of firm characteristics remained untested. Indrawati and Hanif (2023) studied firms in the health industry and related corporate governance and capital structure to financial performance with profit management as a mediating variable; the study's gap is that firm characteristics were not modelled as moderators. In Kenya, Kamau and Kimutai (2022) examined healthcare financing schemes and the financial performance of public hospitals in Nairobi City County using panel data, finding a significant association; the study, however, covered public rather than private hospitals and did not test moderation. The absence of moderation evidence from private hospitals in Kenya constitutes the gap the present study fills.

Conceptual Framework

Figure 1 presents the conceptual framework of the study. The independent variable is healthcare financing, operationalised through three observable sources: loan facilities, out-of-pocket payments and insurance receipts, each measured as the natural logarithm of its total annual value. The dependent variable is financial performance, measured by the return on assets. The moderating variable is firm characteristics, comprising hospital size, measured as the natural logarithm of total assets, and hospital age, measured in years since establishment.

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The framework posits, first, a direct relationship between healthcare financing and financial performance, corresponding to the base model. Second, and centrally for this study, it posits that firm characteristics condition the strength and direction of that relationship, corresponding to hypotheses $H0_{1a}$ and $H0_{1b}$: the effect of each financing source on performance is expected to differ across hospitals of different sizes and ages. Analytically, the framework translates into a moderated regression in which financial performance is modelled as a function of the financing sources, the moderator, and the products of the two, with a significant interaction term evidencing moderation.

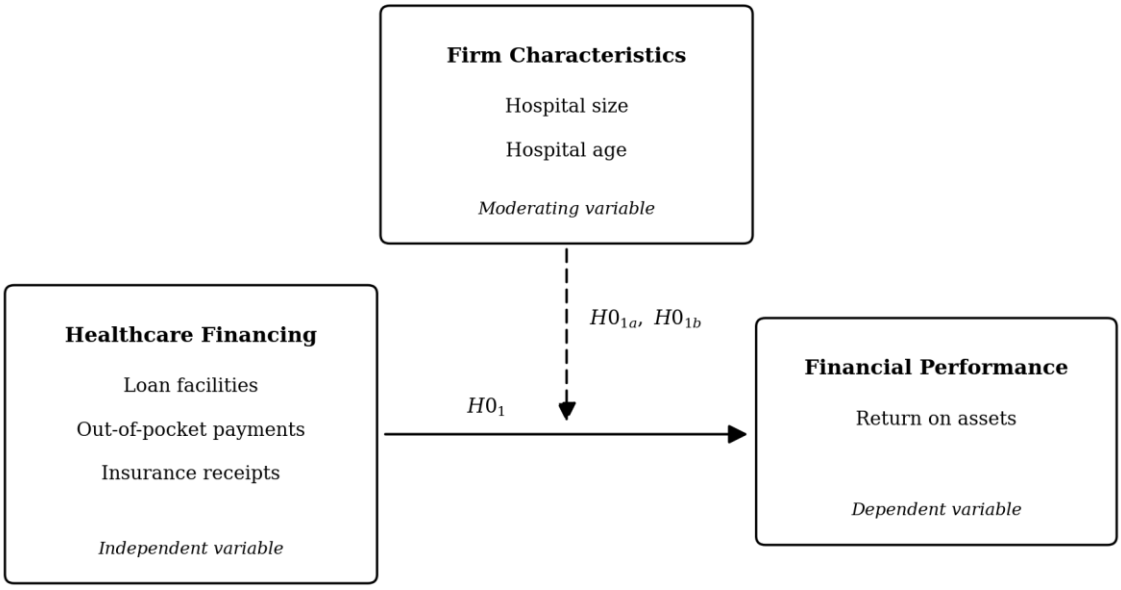


Figure 1: Conceptual Model of the Study

Note. Authors' conceptualisation. Solid arrow = direct effect of healthcare financing on financial performance; dashed arrow = moderating effect of firm characteristics on that relationship.

Methodology

The study adopted a positivist research philosophy, which ensures objectivity by relying on quantifiable data and the empirical testing of hypotheses (Ryan, 2018), and a longitudinal panel research design, which permits the analysis of relationships over time and the control of unobserved firm-specific heterogeneity (Cooper & Schindler, 2018). The target population comprised all 153 private hospitals in Kenya licensed at level 4B and above, made up of 54 level 4B, 90 level 5 and nine level 6 hospitals (KMPDC, 2023). Because the population was relatively small, a census was adopted, which eliminated sampling error and captured the full diversity of the sector (Sekaran, 2016).

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Secondary data were collected from the audited annual reports and financial statements of the hospitals for the five-year period from 2019 to 2023, yielding a balanced panel of 765 hospital-year observations. This period was chosen because it was the most recent five-year window for which complete audited financial statements were available for all the hospitals at the time of data collection, and because it spans the years immediately before, during and after the coronavirus disease 2019 (COVID-19) pandemic, thereby capturing the full range of operating conditions under which the hypothesized relationships could be observed. Because the annual reports and financial statements of private hospitals are not publicly available, access was obtained by writing formally to the management of each hospital, supported by an introduction letter from the University of Nairobi and a research permit from the National Commission for Science, Technology and Innovation. The hospitals were assured that the data would be treated in confidence, used solely for academic purposes and reported only in aggregate form, and the data were then extracted from the audited financial statements provided by the hospitals' finance departments using a structured data collection sheet.

Healthcare financing was decomposed into loan facilities, out-of-pocket payments and insurance receipts, each measured as the natural logarithm of its total annual value, in line with prior operationalisations of healthcare financing volumes (Zhou et al., 2022; Bose, 2022). Hospital size was measured as the natural logarithm of total assets (Amato & Burson, 2017), hospital age as the number of years each hospital had been in existence (Liargovas & Skandalis, 2008), and financial performance as the return on assets, the ratio of net income to total assets (Mwangudza, Jagongo & Ndede, 2020). Following the moderator framework of Baron and Kenny (1986), a hierarchical fixed-effects regression was estimated in three steps for each moderator: Model 1 regressed financial performance on the three financing components; Model 2 introduced the moderator as a direct predictor; and Model 3 introduced the interaction terms between each financing component and the moderator. Moderation exists where the interaction coefficients are statistically significant.

Prior to estimation, diagnostic tests for multicollinearity, normality, linearity, heteroscedasticity, autocorrelation and stationarity were performed and confirmed the suitability of the data for panel regression: variance inflation factors ranged from 1.33 to 2.36, the Shapiro-Wilk statistics were consistent with normality, the modified Wald and Wooldridge tests found no heteroscedasticity or serial correlation, and all variables were stationary in levels. The Hausman specification test ($\chi 2$ = 469.55, $p < .001$) led to the selection of the fixed-effects model over the random-effects alternative. An alpha level of .05 was used for all statistical tests.

Results And Discussion

Descriptive Results

Table 1 summarizes the descriptive statistics of the study variables across the 765 hospital-year observations (N = 765), which arise from the 153 hospitals observed annually over the five years from 2019 to 2023. The financing components and hospital size are expressed as natural

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logarithms, hospital age in years and financial performance as the return on assets.

Hospital size had a mean of 8.51 (*SD* = 0.41), ranging from 7.82 to 10.49; the spread of more than 2.6 log points corresponds to a more than fourteen-fold difference in asset base between the smallest and largest hospitals, and the pronounced positive skewness confirms that the sample contained a few very large tertiary hospitals alongside a majority of small and medium-sized facilities. Hospital age had a mean of 24.73 years (*SD* = 25.34) and a range from one year to 115 years; the median of 15 years, set against the much larger mean, reveals a right-skewed distribution dominated by relatively young hospitals alongside a smaller number of century-old institutions. This wide heterogeneity in scale and maturity provides the variation required for the moderation analysis. The financing variables displayed comparable log-scale dispersion with positive skewness, while financial performance was compact and near-symmetric, with a mean return on assets of 0.0706 (*SD* = 0.0071), equivalent to an average return of about 7.1% on assets.

Table 1: *Summary of Descriptive Statistics of the Study Variables*

Statistic	Ln(loan facilities)	Ln(out-of-pocket payments)	Ln(insurance receipts)	Hospital size	Hospital age (years)	Financial performance (ROA)
N	765	765	765	765	765	765
Minimum	6.240	6.644	7.227	7.816	1.00	0.0525
Maximum	8.767	9.294	9.910	10.489	115.00	0.0890
M	7.052	7.395	7.983	8.514	24.73	0.0706
Mdn	6.955	7.312	7.893	8.412	15.00	0.0693
SD	0.413	0.413	0.420	0.412	25.34	0.0071
SE	0.015	0.015	0.015	0.015	0.92	0.0003
CV	0.059	0.056	0.053	0.048	1.02	0.101
Skewness	1.308	1.284	1.349	1.540	1.958	-0.146
Excess kurtosis	2.118	2.404	2.493	3.224	2.814	-0.780

Note. N = number of hospital-year observations (153 hospitals observed annually from 2019 to 2023); *M* = mean; *Mdn* = median; *SD* = standard deviation; *SE* = standard error of the mean; CV = coefficient of

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variation; Ln = natural logarithm; ROA = return on assets. The financing variables are natural logarithms of total annual values in millions of Kenya shillings; hospital size is the natural logarithm of total assets.

Hypothesis Testing

The null hypothesis that firm characteristics have no significant moderating effect on the relationship between healthcare financing and the financial performance of private hospitals in Kenya ($H0_1$) was tested through two hierarchical fixed-effects regressions, one for each moderator, with the results presented in Tables 2 to 7. Table 2 presents the base model for the analysis of hospital size, in which financial performance is regressed on the three financing components alone. Loan facilities ($\beta = 0.773$, $p < .001$) and out-of-pocket payments ($\beta = 0.013$, $p = .003$) were significant predictors while insurance receipts were not, and the model explained 71% of the within-hospital variation in performance. This base model serves as the benchmark against which the effect of introducing hospital size is assessed.

Table 2: *Model 1 – Base Model for the Hospital Size Analysis*

Variable	β	*SE*	*t*	*p*	95% CI
Ln(loan facilities)	0.7734	0.0225	34.33	< .001	[0.7291, 0.8176]
Ln(out-of-pocket payments)	0.0135	0.0046	2.95	.003	[0.0045, 0.0224]
Ln(insurance receipts)	0.0075	0.0047	1.59	.113	[-0.0018, 0.0169]
Constant	10.4714	0.0897	116.74	< .001	[10.2952, 10.6475]

Note. $N = 765$ hospital-year observations; number of hospitals = 153. Fixed-effects (within) panel regression. β = regression coefficient; *SE* = standard error; CI = confidence interval. R^2 (within) = .71; $F(3, 609) = 498.60$, $p < .001$.

Table 3 introduces hospital size as a direct predictor. Hospital size had a positive and highly significant effect on financial performance ($\beta = 0.358$, $p < .001$), and its inclusion raised the within-hospital explanatory power of the model substantially, from 71% to 86%. The coefficient of loan facilities fell from 0.773 to 0.504, indicating that part of what had previously been attributed to loan facilities was in fact associated with the scale of the hospital, with which financing is correlated. This confirms that hospital size is an important determinant of performance in its own right, setting the stage for the test of its moderating role.

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Table 3: *Model 2 – Introducing Hospital Size*

Variable	β	*SE*	*t*	*p*	95% CI
Ln(loan facilities)	0.5038	0.0186	27.13	< .001	[0.4673, 0.5403]
Ln(out-of-pocket payments)	0.0086	0.0031	2.74	.006	[0.0024, 0.0148]
Ln(insurance receipts)	0.0043	0.0033	1.33	.185	[-0.0021, 0.0107]
Hospital size	0.3579	0.0137	26.18	< .001	[0.3310, 0.3847]
Constant	8.7793	0.0892	98.38	< .001	[8.6040, 8.9545]

Note. N = 765 hospital-year observations; number of hospitals = 153. Fixed-effects (within) panel regression. β = regression coefficient; *SE* = standard error; CI = confidence interval. R^2 (within) = .86; $F(4, 608) = 965.72$, $p < .001$.

Table 4 introduces the interaction terms between the financing components and hospital size. The interaction between loan facilities and hospital size was positive and highly significant (β = 0.226, $p < .001$), and the interaction between insurance receipts and hospital size was also positive and significant (β = 0.023, $p = .001$), while the interaction with out-of-pocket payments was insignificant (β = -0.001, $p = .854$); the within-model explanatory power rose further to 90%. Since two of the three interaction terms were statistically significant, hospital size significantly moderated the relationship between healthcare financing and financial performance, and the null sub-hypothesis that hospital size has no significant moderating effect on the relationship between healthcare financing and the financial performance of private hospitals in Kenya ($H0_{1a}$) was rejected. The positive interaction coefficients indicate that the beneficial effects of loan facilities and insurance receipts on performance were stronger in larger hospitals.

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Table 4: *Model 3 – Hospital Size Interaction Effects*

Variable	β	*SE*	*t*	*p*	95% CI
Ln(loan facilities)	0.4445	0.0167	26.65	< .001	[0.4117, 0.4772]
Ln(out-of-pocket payments)	0.0046	0.0036	1.29	.198	[-0.0024, 0.0116]
Ln(insurance receipts)	0.0031	0.0028	1.08	.279	[-0.0025, 0.0086]
Hospital size	0.4495	0.0139	32.41	< .001	[0.4223, 0.4768]
Loan facilities × Hospital size	0.2262	0.0205	11.01	< .001	[0.1858, 0.2665]
Out-of-pocket payments × Hospital size	-0.0006	0.0033	-0.18	.854	[-0.0071, 0.0058]
Insurance receipts × Hospital size	0.0226	0.0070	3.21	.001	[0.0088, 0.0364]
Constant	8.5626	0.0020	4180.94	< .001	[8.5585, 8.5666]

Note. N = 765 hospital-year observations; number of hospitals = 153. Fixed-effects (within) panel regression. β = regression coefficient; *SE* = standard error; CI = confidence interval. R^2 (within) = .90; $F(7, 605) = 760.92$, $p < .001$.

Table 5 reproduces the base model for the analysis of hospital age, regressing financial performance on the three financing components alone; the results are identical to those of Table 2 and provide the benchmark against which the introduction of hospital age and its interactions is evaluated.

Table 5: *Model 1 – Base Model for the Hospital Age Analysis*

Variable	β	*SE*	*t*	*p*	95% CI
Ln(loan facilities)	0.7734	0.0225	34.33	< .001	[0.7291, 0.8176]
Ln(out-of-pocket payments)	0.0135	0.0046	2.95	.003	[0.0045, 0.0224]
Ln(insurance receipts)	0.0075	0.0047	1.59	.113	[-0.0018, 0.0169]
Constant	10.4714	0.0897	116.74	< .001	[10.2952, 10.6475]

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Note. N = 765 hospital-year observations; number of hospitals = 153. Fixed-effects (within) panel regression. β = regression coefficient; *SE* = standard error; CI = confidence interval. R^2 (within) = .71; $F(3, 609) = 498.60$, $p < .001$.

Table 6 introduces hospital age as a direct predictor. Hospital age had a positive but marginally insignificant direct effect on financial performance (β = 0.009, p = .061), and its inclusion left the explanatory power of the model almost unchanged at 71%. This indicates that, unlike hospital size, the age of a hospital did not have a strong independent effect on performance; its importance, if any, was likely to lie in how it conditioned the effect of financing, which is tested in the next model.

Table 6: *Model 2 – Introducing Hospital Age*

Variable	β	*SE*	*t*	*p*	95% CI
Ln(loan facilities)	0.7615	0.0234	32.61	< .001	[0.7156, 0.8074]
Ln(out-of-pocket payments)	0.0134	0.0046	2.94	.003	[0.0045, 0.0224]
Ln(insurance receipts)	0.0075	0.0047	1.58	.114	[-0.0018, 0.0168]
Hospital age	0.0085	0.0045	1.88	.061	[-0.0004, 0.0174]
Constant	10.3719	0.1040	99.72	< .001	[10.1676, 10.5762]

Note. N = 765 hospital-year observations; number of hospitals = 153. Fixed-effects (within) panel regression. β = regression coefficient; *SE* = standard error; CI = confidence interval. R^2 (within) = .71; $F(4, 608) = 376.38$, $p < .001$.

Table 7 introduces the interaction terms between the financing components and hospital age. The interaction between loan facilities and hospital age was positive and significant (β = 0.279, p < .001), and the interaction between out-of-pocket payments and hospital age was negative and significant (β = -0.049, p < .001), while the interaction with insurance receipts was insignificant (β = 0.051, p = .223); the explanatory power of the model rose to 74%. Because the interaction terms for loan facilities and out-of-pocket payments were significant, hospital age significantly moderated the relationship between healthcare financing and financial performance, and the null sub-hypothesis that hospital age has no significant moderating effect on the relationship between healthcare financing and the financial performance of private hospitals in Kenya ($H0_{1b}$) was rejected. Since both hospital size and hospital age exhibited significant moderating effects, the overall null hypothesis ($H0_1$) was rejected.

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Table 7: *Model 3 – Hospital Age Interaction Effects*

Variable	β	*SE*	*t*	*p*	95% CI
Ln(loan facilities)	-1.8494	0.3738	-4.95	< .001	[-2.5834, -1.1153]
Ln(out-of-pocket payments)	0.4253	0.0731	5.82	< .001	[0.2817, 0.5690]
Ln(insurance receipts)	0.1417	0.1109	1.28	.202	[-0.0760, 0.3594]
Hospital age	1.0921	0.1972	5.54	< .001	[0.7049, 1.4793]
Loan facilities × Hospital age	0.2787	0.0564	4.94	< .001	[0.1679, 0.3894]
Out-of-pocket payments × Hospital age	-0.0490	0.0086	-5.68	< .001	[-0.0659, -0.0320]
Insurance receipts × Hospital age	0.0509	0.0417	1.22	.223	[-0.0311, 0.1329]
Constant	0.5606	1.3803	0.41	.685	[-2.1502, 3.2714]

Note. N = 765 hospital-year observations; number of hospitals = 153. Fixed-effects (within) panel regression. β = regression coefficient; *SE* = standard error; CI = confidence interval. R^2 (within) = .74; $F(7, 605) = 239.99$, $p < .001$."

Discussion of Findings

The finding that the returns to healthcare financing rise with hospital size admits a coherent explanation rooted in the study's theoretical framework. In the authors' assessment, three mechanisms are at work. First, scale confers bargaining power: large hospitals negotiate better lending terms with banks and faster, more favourable reimbursement arrangements with insurers, so each unit of financing arrives cheaper and converts to revenue sooner. Second, scale spreads the fixed costs of financial management: the treasury functions, claims-management units and internal audit systems that deploying large facilities productively requires exist only above a certain size, which is the governance mechanism agency theory predicts (Jensen & Meckling, 1976). Third, under the resource-based view (Barney, 1991), the complementary assets of large hospitals, from specialised equipment to consultant networks, give borrowed capital productive outlets that smaller facilities lack. The insignificant size interaction for out-of-pocket payments is itself informative: cash collected at the point of service requires little institutional machinery to convert into revenue, so scale adds little to its contribution.

The moderating effect of hospital age was more nuanced, and the contrast between its two significant interactions is revealing. Older

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hospitals derived greater benefit from loan facilities, which is consistent with age conferring the reputation, credit history and lender relationships that reduce the cost of debt and relax collateral constraints. At the same time, the contribution of out-of-pocket payments weakened with age. The authors' interpretation is that as hospitals mature they deepen their integration with insurers and corporate schemes, so direct patient payments become a shrinking and less strategically managed share of their revenue mix; younger hospitals, by contrast, depend on out-of-pocket collections for survival and manage them aggressively. Age, in other words, changes not merely how much a hospital earns from each financing source but which sources it is organised to exploit.

These results align with, and extend, the prior evidence. They are consistent with Matemilola, Kijkasiwat and Liew (2024), Zhang and Chen (2025) and Chakkravarthy et al. (2024), who found firm characteristics to be significant moderators of financing and performance relationships in non-healthcare settings, and with Pratiwi and Lukiastuti (2025), who reported that firm size buffered the effect of capital structure on the return on assets. The contribution of the present study to this state of knowledge is threefold. First, it supplies the first moderation evidence from private hospitals in a frontier African market, showing that the contingency findings of listed-firm studies carry over to healthcare. Second, by decomposing healthcare financing into three sources, it shows that moderation is source-specific: scale amplifies debt and insurance income, age amplifies debt but attenuates out-of-pocket income, a granularity absent from prior studies that treated financing as a single construct. Third, it offers a reconciliation of the mixed findings in the financing–performance literature: studies that pool hospitals of very different sizes and ages will estimate an average effect that describes none of them, which may explain why that literature has been inconclusive.

Conclusion

This study set out to resolve a practical dilemma posed at the outset: private hospitals in Kenya draw on the same three financing sources, yet their financial fortunes diverge widely, and it was unclear whether the explanation lay in the financing itself or in the institutions deploying it. The evidence provides a clear answer. The same shilling of financing does not yield the same return in every hospital: its yield depends on the scale and maturity of the institution that deploys it. Larger hospitals extract systematically greater performance from debt and insurance income, and older hospitals from debt, while the value of direct patient payments is greatest for younger institutions.

The conclusion, therefore, is that hospital financial performance in this sector is not determined by access to financing alone but by the fit between financing sources and institutional capacity. Debates on hospital financing policy that focus exclusively on expanding the volume of credit or reimbursement flowing to the sector miss the complementary question of absorptive capacity, that is, whether the receiving hospital has the scale, governance and maturity to convert those funds into returns. For theory, the findings affirm the contingency logic of the agency and resource-based perspectives in a healthcare setting; for practice, they imply that a uniform

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financing strategy across a heterogeneous hospital sector will systematically favour its largest and oldest members. A financing policy that matches instruments to institutional capacity, rather than one applied uniformly, is the path this evidence commends.

Recommendations

Given the significant moderating effect of firm characteristics, the study recommends that financing strategies be tailored to the size and age of the hospital. Larger and more established hospitals should leverage their scale and reputation to access and deploy debt financing and insurance arrangements aggressively, since the returns to these financing sources rise with scale and maturity. Smaller and younger hospitals should first invest in governance, systems and capacity so as to improve their ability to convert financing into performance before taking on substantial leverage, while managing their out-of-pocket collections, the source from which they benefit most, with particular discipline.

Policymakers and financial institutions can complement these efforts by providing capacity-building support targeted at smaller and younger private hospitals, including technical assistance in financial management and governance, and by designing credit products whose terms reflect the differing risk profiles that scale and maturity imply. Future research should examine additional firm characteristics, such as ownership structure and governance quality, as potential moderators, test for non-linear moderation across the size and age distributions, and integrate the moderating effect of firm characteristics with the intervening role of working capital in a unified model of hospital financial performance.

Ethical Approval

Appropriate research approvals and license were obtained via NACOSTI/P/25/4182783

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Conflicts of Interest

None

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