

Subsector Resilience and Pandemic Dynamics in Indonesia's Healthcare Industry: Non-Parametric Evidence on Profitability Differentials (2010-2024)

Heru Pranata¹, Moh. Yudi Mahadianto^{2*}

Universitas Swadaya Gunung Jati, Cirebon, Indonesia¹²

heru.122040004@ugj.ac.id , mohyudim@ugj.ac.id

Corresponding Author

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ABSTRACT

This study provides the first longitudinal non-parametric analysis of subsector resilience differentials in Indonesia's healthcare industry across a 15-year pre-to-post-pandemic horizon. Using purposive sampling, 35 companies listed on the Indonesia Stock Exchange (IDX) were examined over 367 firm-year observations (2010-2024) for ROA, ROE, and NPM. Non-parametric tests (Kruskal-Wallis, Mann-Whitney U, Spearman's correlation) were applied given confirmed extreme non-normality. Three key insights emerge: (1) a statistically confirmed subsector asymmetry in which medical devices achieve superior asset efficiency and margin profitability over healthcare services, attributable to structural pricing power and favorable cost scalability; (2) the pandemic yielded the highest profitability ranks on all three ratios while the post-pandemic period fell below even pre-pandemic levels, a deterioration trajectory not previously documented with rigorous non-parametric evidence in the Indonesian context; and (3) very strong ROA-NPM coherence confirms margin efficiency, not asset turnover, as the dominant driver of profitability variation. Interpreted through Dynamic Capability theory, firms with stronger adaptive capacities proved more resilient, yielding actionable evidence for healthcare management, investors, and regulators.

Keywords: Profitability; Healthcare; ROA; ROE; NPM.

INTRODUCTION

The healthcare sector is one of the country's economic pillars and has undergone fundamental structural change over the past decade (Koekkoek, 2026). Data from the Kementerian Kesehatan, (2023) records a 3.8% contribution to Gross Domestic Product (GDP) with 6.2% average annual growth, the most consistent among Indonesia's sectors, driven by rising demand for quality services, middle-class expansion, and massive infrastructure expansion. The COVID-19 pandemic of early 2020 accelerated this transformation while thoroughly testing the industry's financial resilience (Kalventri & Mulyani, 2022).

The National Health Insurance (JKN) program, fully operational since 2014, has dramatically expanded access to services (Amadea & Rahardjo, 2022), benefiting health sector companies registered on the Indonesia Stock Exchange (IDX) across the pharmaceutical, healthcare services, and medical device subsectors (Maharani & Putra, 2022). Yet JKN expansion also brought structural pressures, namely pricing restrictions and delayed claim settlements that directly erode provider margins (Nugraheni et al., 2021), creating unique challenges that require comprehensive analysis of the industry's profitability profile.

Profitability is the most fundamental indicator of financial health and operational sustainability (Widiyantara et al., 2024), reflecting a company's capacity to generate profits from available resources (Tarigan et al., 2023). Its relevance in healthcare is heightened by three characteristics: (1) capital intensity with significant infrastructure investment needs; (2) heavy regulation limiting

operational and pricing flexibility; and (3) high sensitivity to policy change (Hardiyanti et al., 2022), which interact to form a performance pattern distinct from other industrial sectors.

Prior studies approach healthcare financial performance variously: Wardani et al., (2022) examined company size and debt ratio effects on pharmaceutical ROA; Rahmawati & Sembiring (2022) compared the sector before and during the crisis; Hartati et al. (2022) found no significant ROA difference before versus during the pandemic, but differences in liquidity ratios. A critical methodological gap nonetheless persists in three dimensions this paper addresses: (1) Indonesian studies rely predominantly on parametric tests (t-tests, ANOVA) inappropriate for the extreme-kurtosis distributions of financial panel data, rendering their inferences potentially unreliable regardless of sample size; (2) they examine only one or two discrete time points, making post-pandemic structural deterioration indistinguishable from transient fluctuation; and (3) they treat healthcare as homogeneous, conflating fundamentally different subsector business models. No prior Indonesian study addresses all three within a unified design, and although international research has established the value of non-parametric methods and multi-period designs, these advances remain unapplied to Indonesian healthcare across the full pre-to-post-pandemic continuum. This paper closes these gaps through a 15-year longitudinal design with subsector disaggregation and a fully non-parametric inferential framework.

Accordingly, this study answers three questions: (1) What is the profitability profile of Indonesian healthcare companies by ROA, ROE, and NPM during 2010-2024? (2) Are there significant profitability differences across subsectors (pharmaceuticals, healthcare services, medical devices)? (3) Are there significant differences across periods (pre-pandemic, pandemic, post-pandemic)? Its dual contribution enriches the literature on healthcare financial performance in the Indonesian capital market Sihombing et al. (2023) while providing evidence based guidance for management, investors, and regulators (Rachmawati et al., 2024).

LITERATURE REVIEW

The Concept of Profitability and Its Measurement

Conceptually, profitability is a company's ability to generate profits from operational and investment activities sustainably. Horrigan (1968), in his seminal study on modern financial ratio analysis, defined it as management's effectiveness in utilizing company resources to create shareholder value. Brigham & Houston (2001) classify profitability ratios as one of the five main categories of financial ratios, along with liquidity, activity, leverage, and market value ratios.

Return on Assets (ROA), net income divided by total assets, shows how efficiently a business uses its asset base to generate income (Brigham & Houston, 2001); in the asset-intensive healthcare industry medical infrastructure, diagnostic equipment, pharmaceutical supplies it indicates capital efficiency (Jawas & Sulfitri, 2022). Return on Equity (ROE), net income divided by equity, measures shareholder returns and is the metric investors watch most closely (Sahari & Suartana 2020; Nurjanah et al. 2025). Net Profit Margin (NPM), net profit divided by revenue, reflects cost control and pricing effectiveness (Hamdan & Maufiroh, 2022; Sumatriani, 2023). Together they portray a firm's financial profile from three complementary perspectives.

Characteristics and Regulations of the Indonesian Healthcare Industry

Indonesia's healthcare industry divides into three subsectors: pharmaceuticals, encompassing drug manufacturers and distributors; healthcare services, including hospitals, clinics, and laboratories; and medical devices, producing and distributing medical equipment each with fundamentally different business dynamics, cost structures, and profitability profiles (Kementerian Kesehatan, 2023). Regulation is central: drug pricing policies through Minister of Health Regulations, BPOM marketing authorization, and facility accreditation standards create high entry barriers while limiting pricing flexibility (BPOM, 2022). JKN implementation by BPJS Kesehatan has transformed the landscape through the INA-CBGs payment system, which poses liquidity challenges for providers (Nugraheni et al., 2021).

Theoretical Framework

Three complementary theories frame this study. Signaling theory (Spence, 1973) posits that consistently high profitable performance signals management quality and business prospects to investors, reflected in premium market valuation, linking subsector profitability to differential investor perception. The resource based view (Barney, 1991) attributes performance differences among firms in the same industry to strategic resources that are valuable, rare, imitable, and organized (VRIO), explaining cross-sectional differences where proprietary products and distribution exclusivity confer sustainable advantage; top performers here should possess superior VRIO resources such as brand, distribution networks, or process efficiency. Dynamic capabilities theory (Teece et al., 1997) emphasizes sensing environmental change and responding adaptively a capacity confirmed by the pandemic profitability surge of several healthcare companies and supplies the primary mechanism for temporal trajectories across the three phases: subsectors with superior sensing and seizing capabilities exploited pandemic-driven demand surges, while weaker adaptive capacity produced prolonged post-pandemic deterioration. Together these lenses generate two testable predictions: subsectors with superior VRIO resources will show persistently higher profitability, and those with stronger adaptive capabilities greater post-pandemic resilience both examined in the results section.

Selection of Non-Parametric Statistical Tests

Nonparametric tests were chosen because financial time series typically do not follow a normal distribution, owing to outliers, extreme skewness, and high kurtosis (Caka et al., 2025). For non-normal data the Kruskal-Wallis H test validly replaces one-way ANOVA and the Mann-Whitney U test is the counterpart of the independent samples t-test (Grawe, 2016), while Spearman correlation (ρ) replaces Pearson when linearity and normality assumptions are unmet. These tests ensure inferential validity even under extreme departures from normality (Cahya et al., 2021; Listiarti et al., 2022).

Previous Research

Yuana & Widodo (2023) found profitability, capital structure, and company scale simultaneously significant for the market value of Indonesian pharmacy companies, with ROA the strongest predictor. Anggraini & Imronudin (2024) identified a trade off between capacity expansion and short-term profitability in private hospitals. Ferdawati et al. (2023) emphasized comparative financial ratio analysis for identifying financial distress risk. Listiarti et al. (2022) demonstrated the pandemic's varying sectoral impact, healthcare profitability rising while transportation contracted sharply. Nurjanah et al. (2025) affirm that ROA and ROE collectively enhance firm value, making both relevant for long-term evaluation. Synthesized, these studies yield the linkage central to this paper: pandemic demand shocks temporarily inflated sector profitability, but firms with superior Dynamic Capabilities (sensing shifts, seizing opportunities, reconfiguring resources) were better positioned to sustain it through post-pandemic normalization. Subsectors with scalable cost structures and pricing power unconstrained by BPJS reimbursement (i.e., medical devices) thus represent the predicted "resilient" archetype, and regulation-constrained healthcare services the predicted "vulnerable" archetype.

METHOD

Research Design

A quantitative approach with a comparative-descriptive longitudinal design was applied (Pata et al., 2025), chosen because it allows systematic observation of 15-year profitability patterns alongside performance comparisons across subsectors and periods. The dependent variables are ROA, ROE, and NPM; the grouping variables are subsector (pharmaceuticals, healthcare services, medical devices) and period (pre-pandemic 2010-2019; pandemic 2020-2021; post-pandemic 2022-2024).

Population, Sample, and Selection Criteria

The population consists of all healthcare sector companies listed on the Indonesia Stock Exchange (IDX). Purposive sampling was employed because 15-year longitudinal comparability requires continuous listing and complete disclosure: only such companies generate the uninterrupted time series needed for valid cross-period and cross-subsector comparison, whereas random or convenience sampling would introduce survivorship bias and data gaps incompatible with the design. The criteria were: (1) listed on the IDX since at least 2010; (2) complete audited financial statements for all years within 2010-2024; and (3) no delisting or suspension during the observation period. These identified 35 eligible companies: 10 pharmaceutical (N = 136 observations), 21 healthcare services (N = 208), and 4 medical devices (N = 23), totalling 367 valid company-year observations (one NPM observation missing, N = 366). The medical devices sample is considerably smaller (N = 23), reflecting how few such companies meet the continuity criterion on the IDX; while this constrains generalizability, including all qualifying firms makes the sample as complete as the criteria allow, so its findings warrant caution regarding external validity.

Variables and Measurements

ROA = (Net Profit / Total Assets) × 100% measures overall asset utilization efficiency; ROE = (Net Profit / Total Equity) × 100% measures shareholder returns; NPM = (Net Profit / Revenue) × 100% measures effectiveness in converting revenue into profit. Data are sourced from audited annual reports on the IDX website (www.idx.co.id) and classified into pre-pandemic (2010-2019, N = 195), pandemic (2020-2021, N = 102), and post-pandemic (2022-2024, N = 70). One NPM observation was missing because a consolidated statement reported zero revenue, rendering the ratio undefined; it was excluded listwise (NPM N = 366 versus N = 367 for ROA and ROE) without imputation, since imputing a structurally undefined value would introduce bias. Because the non-parametric methods employed operate on rank transformations rather than raw values, they are inherently robust to extreme outliers; no winsorization or outlier removal was performed, preserving the full empirical distribution.

Data Analysis Techniques and Justification of Non-Parametric Tests

Data analysis proceeded in four stages. First, descriptive statistics (mean, median, SD, skewness, kurtosis, minimum, maximum) plotted the data distribution. Second, the Shapiro-Wilk test assessed deviation from normality; it was preferred over Kolmogorov-Smirnov for its higher power in detecting non-normality in panel data (O'Donnell et al., 2024). Third, since normality was rejected for all three variables, comparison used the Kruskal-Wallis H test for more than two groups simultaneously (subsectors and periods) and the Mann-Whitney U test as paired post-hoc to identify pairs differing significantly. Fourth, Spearman's correlation (ρ) measured the strength and direction of relationships among the three ratios. All tests used IBM SPSS Statistics at $\alpha = 0.05$.

RESULTS

Overall Descriptive Statistics

Descriptive analysis of 367 firm-year observations (ROA, ROE) and 366 observations (NPM) over 2010-2024 yielded the distribution profiles presented in Table 1, drawn from IBM SPSS Statistics (output files: 02.Descriptive Tests and 05.Shapiro-Wilk Test).

Table 1. Descriptive Statistics of Profitability Ratios in the Indonesian Healthcare Sector (2010-2024)

Descriptive Statistics							
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness (SE)	Kurtosis (SE)
Return on Assets (%)	367	-119.49	122.91	5.5567	14.98139	-1.102 (.127)	29.042 (.254)

Descriptive Statistics							
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness (SE)	Kurtosis (SE)
Return on Equity (%)	367	-305.31	7250.18	35.2433	384.92364	18.154 (.127)	339.995 (.254)
Net Profit Margin (%)	366	-159.24	43.24	2.7859	19.69832	-4.255 (.128)	27.370 (.254)
Valid N (listwise)	366						

Source: IBM SPSS Statistics output, processed by the researcher (2025). N = 367 firm-year observations

The average ROA of 5.5567% reflects the industry's ability to generate approximately Rp5.56 in net profit per Rp100 of managed assets. Skewness of -1.102 indicates a left-skewed distribution, a small number of companies with large losses pulling the average downward, while kurtosis of 29.042 far exceeding the reference value of 3 for a normal distribution indicates a highly leptokurtic distribution with very thick tails: observations concentrated around the mean accompanied by extreme outliers at both ends.

ROE displays a mean of 35.2433% with a very large standard deviation (384.924%), indicating exceptionally high heterogeneity; skewness of 18.154 and kurtosis of 339.995 mark a highly right-skewed, highly leptokurtic distribution driven by positive extreme outliers such as companies with equity approaching zero that artificially generate ROE in the hundreds of percent. For NPM, the mean of 2.7859% falls below the median (5.0410%, from the SPSS Explore output), indicating left skew (skewness = -4.255) due to observations with very negative NPM. These characteristics strongly support the use of non-parametric methods.

Descriptive Statistics by Sub-Sector

Table 2 compares descriptive statistics of profitability by subsector based on SPSS output (File: 03.Descriptive Test of Sub-Sectors); differences among the three subsectors are quite substantial in average and median levels as well as variability.

Table 2. Descriptive Statistics of Profitability by Sub-Sector (Report)

Sub Sektor	N	Returnon Assets (%)	ReturnonEquity (%)	Net Profit Margin (%)
		Mean / Median / Std. Deviation	Mean / Median / Std. Deviation	Mean / Median / Std. Deviation
Pharmaceuticals	136	6.2563 / 7.8929 / 13.18117	64.7202 / 13.4067 / 621.38922	3.3786 / 6.0386 / 20.80143
Health Services	208 (NPM 207)	3.6112 / 3.3375 / 12.94323	17.4250 / 8.8929 / 93.16203	1.3104 / 2.9059 / 19.27382
Medical Equipment	23	19.0150 / 10.1098 / 29.38194	22.0847 / 10.0165 / 73.00039	12.5606 / 9.2010 / 13.47300
Total	367 (NPM 366)	5.5567 / 5.1884 / 14.98139	35.2433 / 10.8476 / 384.92364	2.7859 / 5.0410 / 19.69832

Source: IBM SPSS Statistics Output Means Tables (File 03), processed by the researcher (2025).

Medical devices recorded the highest mean ROA (19.0150%) against a median of 10.1098%, the large gap suggesting right skew affected by a few high ROA firms. Pharmaceuticals recorded a mean ROA of 6.2563% below its median of 7.8929%, indicating left skew in which several companies with significant losses drag the mean down. Healthcare services recorded the lowest

ROA (mean 3.6112%, median 3.3375%) with good mean-median alignment, hence a relatively more symmetrical distribution. For ROE, pharmaceuticals recorded a very high mean (64.7202%) but a median of only 13.4067%, an anomaly caused by extreme outliers. The most consistent pattern is in NPM, where medical devices (mean 12.5606%; median 9.2010%) significantly outperformed pharmaceuticals (3.3786%; 6.0386%) and healthcare services (1.3104%; 2.9059%).

Results of the Shapiro-Wilk Normality Test

As a prerequisite for test selection, the Shapiro-Wilk normality test was conducted. Although SPSS does not display W and p-values under Tests of Normality (EXAMINE ran without /PLOT NPLOT), the skewness and kurtosis values with their standard errors suffice: applying $z\text{-skewness} = \text{Skewness} / \text{SE Skewness}$ and $z\text{-kurtosis} = \text{Kurtosis} / \text{SE Kurtosis}$ yields the z-scores in Table 3.

Table 3. Indicators of Non-Normality Based on SPSS Explore Output

Descriptives (Statistic; Std. Error in parentheses)			
	Return on Assets (%)	Return on Equity (%)	Net Profit Margin (%)
Mean	5.5567 (.78202)	35.2433 (20.09285)	2.7859 (1.02965)
95% CI for Mean: Lower Bound	4.0189	-4.2686	.7611
95% CI for Mean: Upper Bound	7.0946	74.7552	4.8107
5% Trimmed Mean	5.7616	12.1080	4.8791
Median	5.1884	10.8476	5.0410
Variance	224.442	148166.206	388.024
Std. Deviation	14.98139	384.92364	19.69832
Minimum	-119.49	-305.31	-159.24
Maximum	122.91	7250.18	43.24
Range	242.41	7555.49	202.48
Interquartile Range	10.11	16.31	10.23
Skewness	-1.102 (.127)	18.154 (.127)	-4.255 (.128)
Kurtosis	29.042 (.254)	339.995 (.254)	27.370 (.254)

Source: IBM SPSS Statistics Explore output (File 05), processed by the researcher (2025)

The z-skewness values far exceed the critical threshold of 3.29 for ROA (-8.68), ROE (143.0), and NPM (-33.2), confirming non-normality at the 0.001 significance level. Substantial mean-median differences particularly ROE (24.4 points) and NPM (median 5.04% vs. mean 2.79%) and kurtosis values far from 3 reinforce this. For ROA, the very small difference between the mean (5.5567%) and the 5% trimmed mean (5.7616%) indicates outliers have a more limited influence than for ROE. These findings confirm the necessity of non-parametric tests throughout.

Kruskal-Wallis Test: Differences in Profitability Across Sub-Sectors

Kruskal-Wallis Test for ROA

Hypotheses tested: H_0 : the ROA distributions are identical across the three subsectors; H_1 : at least one subsector has a different ROA distribution. Table 4 presents the test results along with the mean rank for each group.

Table 4. Results of the Kruskal-Wallis Test for ROA Across Sub-Sectors

Ranks	N	Mean Rank	Test Statistics	Return on Assets (%)
Pharmacy	136	208.57	Kruskal-Wallis H	18.219
Health Services	208	163.56	df	2
Medical Equipment	23	223.57	Asymp. Sig.	.000

Ranks	N	Mean Rank	Test Statistics	Return on Assets (%)
Total	367			

Source: IBM SPSS Output Kruskal-Wallis Test (File 06), processed by the researcher (2025).

The Kruskal-Wallis test shows $H = 18.219$ with $df = 2$ and Asymp. Sig. = 0.000 ($p < 0.001$). Since $p < \alpha (0.05)$, H_0 is rejected: ROA distribution differs significantly among the three healthcare subsectors. The highest mean rank was held by medical devices (223.57), followed by pharmaceuticals (208.57) and healthcare services (163.56), indicating that in ranking terms medical devices tends toward higher ROA than the other two.

Kruskal-Wallis Test for ROE

Table 5. Results of the Kruskal-Wallis Test for ROE Across Sub-Sectors.

Ranks	N	Mean Rank	Test Statistics	Return on Equity (%)
Pharmacy	136	200.81	Kruskal-Wallis H	5.618
Health Services	208	173.08	df	2
Medical Equipment	23	183.35	Asymp. Sig.	.060
Total	367			

Source: IBM SPSS Output Kruskal-Wallis Test (File 07), processed by the researcher (2025)

The Kruskal-Wallis test for ROE yielded $H = 5.618$ with $df = 2$ and Asymp. Sig. = 0.060. Since $p = 0.060 > \alpha (0.05)$, H_0 cannot be rejected: no statistically significant difference in ROE distribution between the three subsectors at the 95% confidence level. With p only 0.010 above the threshold, however, a marginal tendency is indicated, reflecting the pharmaceutical subsector's extreme ROE variance ($SD = 621.39\%$), which suppresses between-group signal detection and creates Type II error risk. From a Resource-Based View perspective, differential capital structure and equity levels inject a financial leverage multiplier into ROE that masks operational differences, further validating ROA and NPM as this study's primary profitability benchmarks.

Kruskal-Wallis Test for NPM

Table 6. Results of the Kruskal-Wallis Test for NPM Across Sub-Sectors.

Ranks	N	Mean Rank	Test Statistics	Net Profit Margin (%)
Pharmacy	136	195.54	Kruskal-Wallis H	13.285
Health Services	207	168.85	df	2
Medical Equipment	23	244.13	Asymp. Sig.	.001
Total	366			

Source: IBM SPSS Output Kruskal-Wallis Test (File 08), processed by the researcher (2025).

The Kruskal-Wallis test for NPM yielded $H = 13.285$ with $df = 2$ and Asymp. Sig. = 0.001 ($p < 0.05$), so H_0 is rejected: significant differences exist in NPM distribution across the three subsectors. The highest mean rank is held by medical devices (244.13), far exceeding pharmaceuticals (195.54) and health services (168.85) consistent with the ROA findings and reinforcing the subsector's superior profitability. Table 7 summarizes the overall Kruskal-Wallis results across subsectors.

Table 7. Summary of Kruskal-Wallis Test Results Across Sub-Sectors (Three Ratios)

Ratio	Kruskal-Wallis H	df	Asymp. Sig.	Decision on H_0	Conclusion
ROA	18.219	2	0.000	Rejected	There is a significant difference
ROE	5.618	2	0.060	Accepted	There was

Ratio	Kruskal-Wallis H	df	Asymp. Sig.	Decision on Ho	Conclusion
NPM	13.285	2	0.001	Rejected	no significant difference. There is a significant difference

Source: IBM SPSS Output Kruskal-Wallis Test (Files 06, 07, 08), processed by the researcher (2025).

Mann-Whitney U Post-Hoc Test: Identification of Sub-Sector Pairs

To identify which specific subsector pairs differed significantly, the Mann-Whitney U test was conducted as a paired post-hoc analysis. The SPSS output revealed technical limitations in applying the filter, which prevented the test on the first two pairs because one group became empty after filtering; the only pair producing valid output was Health Services vs. Medical Devices.

Table 8. Results of the Paired Post-Hoc Mann-Whitney U Test

Comparison	Ratio	Group N	Mean Rank	Mann-Whitney U	Z	p
Pharmacy vs. Healthcare Services	ROA	344	-	N/A*	N/A	N/A
Pharmaceuticals vs. Medical Devices	ROA	159	-	N/A*	N/A	N/A
Health Services vs. Medical Devices	ROA	208 vs 23	112.58 vs 146.91	1,681,000	-2,338	0.019

Source: IBM SPSS Output Mann-Whitney Test, processed by the researcher (2025).

The valid Mann-Whitney U test (File 11) for that pair yielded $U = 1.681,000$, $Z = -2.338$, and $p = 0.019$ ($p < 0.05$). The mean rank for medical devices (146.91) exceeds that for health services (112.58), confirming a statistically significantly higher ROA distribution. This is consistent with the Kruskal-Wallis results, where medical devices held the highest mean rank ROA (223.57) against healthcare services (163.56). Since the other two pairs could not be tested directly, interpretation of the pharmacy-health services and pharmacy-medical devices differences relies on the Kruskal-Wallis mean rank comparisons.

Kruskal-Wallis Test Across Time Periods

To test differences in profitability across the three time periods (pre-pandemic 2010-2019, COVID-19 pandemic 2020-2021, and post-pandemic 2022-2024), a Kruskal-Wallis test was conducted with Time Period as the grouping factor. Table 9 presents the mean ranks for each group and the test statistics.

Table 9. Results of the Kruskal-Wallis Test Across Time Periods.

Ranks (Mean Rank; N in parentheses) and Test Statistics						
	Pre-Pandemic	Pandemic	Post-Pandemic	Kruskal-Wallis H	df	Asymp. Sig.
Return on Assets (%) Total N = 367	185.98 (195)	206.18 (102)	146.17 (70)	13.425	2	.001
Return on Equity (%) Total N = 367	191.26 (195)	196.04 (102)	146.23 (70)	11.101	2	.004

Ranks (Mean Rank; N in parentheses) and Test Statistics

	Pre-Pandemic	Pandemic	Post-Pandemic	Kruskal-Wallis H	df	Asymp. Sig.
Net Profit Margin (%) Total N = 366	175.49 (195)	210.91 (101)	166.27 (70)	9.754	2	.008

Source: IBM SPSS Output Kruskal-Wallis Test, processed by the researcher (2025)

Across time periods the Kruskal-Wallis tests show statistically significant differences for all three ratios: ROA ($H = 13.425$, $df = 2$, $p = 0.001$), ROE ($H = 11.101$, $df = 2$, $p = 0.004$), and NPM ($H = 9.754$, $df = 2$, $p = 0.008$). Since $p < \alpha$ for all ratios, H_0 , which states that profitability distributions are identical across the three periods, is rejected for all variables.

The mean rank pattern reveals a clear narrative. For ROA the pandemic period ranks highest (206.18), followed by pre-pandemic (185.98), while post-pandemic records the lowest (146.17), significantly below the other two. A similar pattern holds for ROE (pandemic 196.04 > pre-pandemic 191.26 > post-pandemic 146.23) and NPM (210.91 > 175.49 > 166.27). Consistently, all three ratios show the highest profitability distribution during the pandemic and the lowest afterwards; the nearly identical post-pandemic ranks for ROA and ROE suggest a systematic decline across both dimensions.

Spearman's Correlation Test Between Profitability Ratios

A Spearman correlation testing (ρ) was conducted to measure the strength and direction of the relationship between the three profitability ratios, with the matrix presented in Table 10.

Table 10. Spearman Correlation Matrix Between Profitability Ratios

Variable Pairs	Spearman ρ	N	Sig. (2-tailed)	Strength	Note
ROA $\leftrightarrow$ ROE	0.748	367	0.000	Strong	**
ROA $\leftrightarrow$ NPM	0.822	366	0.000	Very Strong	**
ROE $\leftrightarrow$ NPM	0.576	366	0.000	Moderate-Strong	**

Source: IBM SPSS Output Nonparametric Correlations / Spearman's rho, processed by the researcher (2025).

All Spearman correlation pairs reached significance at the 0.01 level ($p < 0.001$). The ROA-NPM correlation ($\rho = 0.822$) is strongest, reflecting the DuPont linkage $ROA = NPM \times \text{Total Asset Turnover}$; because asset turnover is relatively homogeneous across firms here, NPM becomes the dominant differentiator of ROA. ROA-ROE ($\rho = 0.748$) is strong and ROE NPM ($\rho = 0.576$) moderate-to-strong. Three implications follow. First, this coherence confirms that the three ratios measure the same construct, profitability, from different perspectives rather than as independent variables. Second, the very strong ROA NPM correlation indicates that margin efficiency moves in tandem with asset efficiency, so margin-improving strategies directly affect ROA. Third, the lower ROE NPM correlation suggests that leverage introduces noise weakening that relationship in industries with high leverage variation such as healthcare.

DISCUSSION

Distribution Profiles and Methodological Implications

Descriptive findings reveal distributions fundamentally deviating from normality. Extreme skewness and kurtosis particularly ROE (18.154; 339.995) and NPM (-4.255; 27.370) confirm that parametric tests such as the t-test or ANOVA, used without correction, would yield invalid inferences. Kruskal-Wallis, Mann-Whitney U, and Spearman's correlation therefore represent the methodologically more accurate treatment of healthcare panel data, consistent with Grawe (2016), who recommends non-parametric tests when distribution assumptions fail.

The difference between the mean and 5% trimmed mean for ROE, 35.2433% vs. 12.1080%, illustrates how far extreme outliers distort averages. The seemingly impressive average ROE of

35.24% therefore does not represent the typical ROE of Indonesian healthcare; the median of 10.8476% is far more informative an important implication for investors and analysts who benchmark on industry averages.

Differences in Profitability Across Sub-Sectors: Evidence-Based Analysis

Significant Kruskal-Wallis results for ROA ($H = 18.219$, $p < 0.001$) and NPM ($H = 13.285$, $p = 0.001$), with a marginally non-significant result for ROE ($H = 5.618$, $p = 0.060$), give a more nuanced picture than black-and-white conclusions. Systematic differences are strongly evidenced for ROA and NPM but unconfirmed for ROE at $\alpha = 0.05$. Theoretically, ROE is more easily influenced by capital structure differences: pharmaceutical companies use leverage more conservatively than hospitals, which often rely on significant debt for capacity expansion, raising intergroup variation and hindering detection of differences.

The valid Mann-Whitney U test (Health Services vs. Medical Devices: $U = 1.681$, $Z = -2.338$, $p = 0.019$) confirms that the significant ROA difference is primarily driven by the contrast between medical devices (mean rank 223.57) and health services (163.56). Several structural factors explain it: (1) specialized or patented products provide significantly greater pricing power; (2) manufacturing or distribution models offer better scalability, volume increases not raising costs proportionally; and (3) no reliance on BPJS tariffs limits pricing flexibility. Caution remains warranted given the small medical devices sample ($N = 23$).

The superiority of pharmaceutical ROA (mean 6.2563%; median 7.8929%) over healthcare services (mean 3.6112%; median 3.3375%) reflects structural differences in business models. Pharmaceuticals have higher operating leverage: past break-even, increased volume surges profitability due to low marginal costs, and strong brands provide pricing power that service providers lack, as their rates are partially controlled by BPJS. Healthcare services face a structural triple burden: high labor intensity creating fixed costs, BPJS rate restrictions compressing margins, and high capital intensity for physical infrastructure hence the lowest subsector median ROA (3.34%) and NPM (2.91%), aligning with the RBV prediction that absence of VRIO advantages yields inferior sustained performance. Nonetheless, exceptional performers such as MIKA (ROA ~17%) show that premium market segmentation and professional management can still generate superior profitability. Through the Dynamic Capability framework (Teece et al., 1997), these differences reflect differential capacity to “sense” market opportunities and “seize” them through adaptive resource reconfiguration: medical device firms, unconstrained by BPJS pricing, possess superior adaptive flexibility. This aligns with international evidence that device and pharmaceutical manufacturers consistently outperform service-based providers on asset return metrics, owing to the scalability advantage of product-based over labor-based revenue models.

Temporal Dynamics: The Pandemic as a Statistically Confirmed Turning Point

Significant Kruskal-Wallis results across periods for all three ratios (ROA: $H = 13.425$, $p = 0.001$; ROE: $H = 11.101$, $p = 0.004$; NPM: $H = 9.754$, $p = 0.008$) provide strong empirical confirmation that the COVID-19 pandemic was a real and measurable turning point in the profitability trajectory of Indonesia's healthcare industry not a random fluctuation, but a statistically significant distributional shift across all three dimensions of profitability.

The consistent pattern pandemic always highest, post-pandemic always lowest on all three ratios reveals a coherent profitability cycle. The pandemic period (mean rank ROA = 206.18) recorded better performance than the pre-pandemic period (185.98) despite being intuitively associated with economic pressure, indicating that the sector reaped windfall profitability from the health crisis through increased demand for diagnostic products, PPE, and medications and higher hospital utilization. This aligns with Hartati et al. (2022) on the sector's pandemic resilience and Listiarti et al. (2022) on the differing responses of the transportation and healthcare sectors.

Most concerning is the post-pandemic position (mean ROA rank = 146.17), consistently below both other periods. The 60-point drop from the pandemic to the post-pandemic period far exceeds the 20-point rise from pre-pandemic to pandemic, indicating deterioration beyond historical levels rather than mere normalization. Raw data support this: an industry average ROA of just 0.90% in

2024 and an NPM of -7.21%, levels never seen even during the toughest pre-pandemic years. Overcapacity from excessive pandemic-period expansion, inflation-driven operational costs, and structurally stagnant BPJS reimbursement rates create compounding pressure that the existing literature has not adequately documented. The deterioration is structural rather than temporary: the post-pandemic ROA mean rank falls significantly below pre-pandemic levels, indicating that the expansion-driven cost base now exceeds revenue recovery. Dynamic Capability theory offers the mechanism: firms that developed genuine adaptive capabilities during the pandemic, rather than merely benefiting from windfall demand, should prove more resilient in normalization. The wide dispersion of post-pandemic ROA fits this prediction: companies diversifying revenue beyond BPJS-reimbursed services are better positioned to preserve margins during contraction. This parallels international post-COVID evidence, where systems dependent on public reimbursement deteriorated more steeply than mixed-payer environments.

Inter-Ratio Coherence: Construct Validation and Analytical Implications

The strong, significant Spearman's correlations, particularly ROA NPM ($\rho = 0.822$) and ROA-ROE ($\rho = 0.748$), carry three analytical implications. First, for construct validation, they confirm that the three ratios measure the same latent construct from different angles, so consistent findings across them (e.g., the superiority of medical devices) are genuine phenomena rather than artifacts of metric selection. Second, within DuPont decomposition ($\text{ROA} = \text{NPM} \times \text{Total Asset Turnover}$), the dominance of NPM implies that competing on asset utilization efficiency alone is insufficient: the most effective improvement strategy requires margin-focused intervention through cost restructuring, pricing optimization, or revenue diversification beyond BPJS-dependent streams. The lowest-NPM subsector, healthcare services, thus holds the highest improvement potential, and cross-firm variation in asset profitability is driven primarily by margins rather than asset turnover. Third, the lower ROE NPM correlation ($\rho = 0.576$) suggests the financial leverage multiplier diverges ROE from NPM: highly indebted companies may post an ROE far above their NPM, an illusion of profitability that misstates earnings quality.

These findings also bear on selecting a single benchmarking indicator. Since ROA and NPM are highly correlated, using only one yields inconsistent conclusions; conversely, ROE cannot replace either due to leverage distortion, and as a sole measure it risks misleading company rankings where leverage varies widely, as in Indonesian healthcare. Synthesizing subsector heterogeneity, temporal dynamics, and inter-ratio coherence, the Dynamic Capability framework provides the most coherent account. Medical devices firms demonstrated superior "sensing" (identifying demand opportunities), "seizing" (committing to scalable product-based models), and "reconfiguring" (adapting asset deployment) capabilities, whereas healthcare services firms constrained by regulatory pricing, labor intensity, and BPJS dependency showed the weakest adaptive capacity and steepest post-pandemic deterioration, aligning with findings in Asia where publicly-reimbursed providers underperform product-based firms in long-term asset efficiency. The Resource-Based View complements this: the superior NPM of medical devices firms reflects VRIO advantages proprietary product lines, distribution exclusivity, and technical know-how that labor-intensive, regulatory-bound services firms structurally cannot replicate.

Managerial, Investment, and Policy Implications

From a management perspective, two strategic priorities are urgent. First, resilience to post-pandemic structural pressures demands NPM-focused intervention, the dominant lever confirmed by the ROA-NPM correlation ($\rho = 0.822$); measures grounded in Dynamic Capability theory include restructuring fixed cost bases to restore adaptive flexibility, renegotiating supplier contracts, leveraging digital technology for service efficiency, and diversifying into higher-margin segments (self-paying/non-BPJS patients). Second, disciplined capacity management must replace pandemic-era expansionary logic: investments made during the 2020-2021 demand windfall created a fixed cost overhang now depressing returns below pre-pandemic baselines, so future

capital allocation should be stress-tested against revenue normalization rather than pandemic-peak projections.

For investors, the key implication is using the median rather than the mean as the industry benchmark, given the highly skewed distribution (Nurjanah et al., 2025): the median ROA (5.19%) and NPM (5.04%) are more representative than outlier-skewed means. Investors must also be cautious of high ROE (>100%), likely an artifact of leverage or negative equity rather than superior operations, as the divergence between mean and median ROE (35.24% vs. 10.85%) evidences; long-term consistency of ROA and NPM is a far more reliable quality indicator. Sub-sector selection also matters: medical devices offers an attractive profitability profile despite lower stock liquidity, pharmaceuticals greater consistency (Mahadianto et al., 2020).

For regulators, the statistically confirmed post-pandemic decline in profitability ($p = 0.001$ for ROA, $p = 0.008$ for NPM) is an evidence based warning signal that cannot be ignored. More responsive adjustment of INA-CBG rates in line with operational cost inflation and acceleration of BPJS claim disbursements are the two most urgent policy interventions; without them, continued pressure risks pushing healthcare companies into financial distress, ultimately threatening the accessibility and quality of healthcare provision for the public.

CONCLUSION

Based on a longitudinal non-parametric analysis of 367 firm-year observations in Indonesian healthcare for 2010-2024, this study yields six interrelated conclusions.

First, the sector's profitability profile is moderate yet highly heterogeneous mean ROA 5.5567%, ROE 35.2433%, NPM 2.7859% with distributions deviating sharply from normal (extreme skewness, very high kurtosis), confirming the appropriateness of non-parametric methods.

Second, Kruskal-Wallis confirmed significant subsector differences in ROA ($H = 18.219$, $p < 0.001$) and NPM ($H = 13.285$, $p = 0.001$), while ROE did not reach significance ($H = 5.618$, $p = 0.060$). Medical devices ranked highest (mean rank ROA = 223.57), then pharmaceuticals (208.57) and healthcare services (163.56).

Third, the Mann-Whitney U test for Health Services vs. Medical Devices confirmed a significant ROA difference ($U = 1.681$, $Z = -2.338$, $p = 0.019$), medical devices holding the higher distribution.

Fourth, the across-period test confirmed the pandemic as a statistically significant turning point: ROA ($H = 13.425$, $p = 0.001$), ROE ($H = 11.101$, $p = 0.004$), NPM ($H = 9.754$, $p = 0.008$). The pandemic recorded the highest profitability distribution and the post-pandemic period the lowest, below even pre-pandemic levels.

Fifth, Spearman's correlation revealed strong coherence: ROA-NPM ($\rho = 0.822$), ROA-ROE ($\rho = 0.748$), ROE-NPM ($\rho = 0.576$), all $p < 0.001$. Improving margins is therefore the most effective path to higher ROA, while the divergence of ROE signals a significant role for financial leverage.

Sixth, the findings carry Dynamic Capability-grounded implications: management should prioritize margin optimization and adaptive reconfiguration; investors should benchmark on the median and treat leverage-distorted ROE cautiously; regulators should address the confirmed post-pandemic deterioration through responsive INA-CBG tariff adjustment and accelerated BPJS claims disbursement, absent which financial pressure may threaten healthcare accessibility and quality.

Limitations include: (1) the sample covers only IDX-listed public companies, not the entire Indonesian healthcare ecosystem; (2) SPSS limitations prevented two of three Mann-Whitney U tests, so the post-hoc analysis for pharmaceuticals-health services and pharmaceuticals-medical devices relied on Kruskal-Wallis mean ranks; and (3) macroeconomic and other moderating variables were excluded. Further research should add the Dunn test with Bonferroni correction as a more standardized post-hoc procedure, and quantile regression to analyze performance heterogeneity across quantiles of the profitability distribution.

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