

Financial Sustainability in Mission-Differentiated Regional Universities: Exploratory Evidence from Thailand's Rajabhat System

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Abstract

Mission-differentiated universities—institutions legally mandated to prioritize regional development over research commercialization, distinct from conventional autonomous research universities—face significant financial sustainability challenges that warrant context-specific analysis. This exploratory study investigates the patterns associated with financial sustainability in Thailand's 32 Rajabhat Universities (2021–2023, N = 96 institution-years), a network operating under centralized civil service frameworks. Integrating resource dependency theory with mission-sustainability balance constructs, this research employs dynamic random effects models on a short post-pandemic panel to examine how internal efficiency and external resources relate to multi-dimensional sustainability outcomes. The analysis identifies three exploratory patterns. First, administrative intensity shows the most consistent negative association across sustainability dimensions (elasticities range from -1.20 to -1.81), suggesting that mission proliferation and civil service rigidities may contribute to resource misallocation. Second, revenue diversification and government support exhibit non-significant effects, indicating that strategies typically effective in urban research universities may not transfer directly to regional mission-differentiated contexts characterized by geographic remoteness and high government dependency (67%). Third, sustainability exhibits strong path dependence, with lagged coefficients (0.52–0.97) suggesting that historical financial positions substantially influence current outcomes. The findings suggest two actionable pathways for mission-differentiated institutions: (1) establishing inter-university consortia for shared administrative services to address cost pressures from civil service rigidity, and (2) transitioning toward outcome-based funding formulas with base viability guarantees. Given the short observation window, these patterns warrant corroboration through extended longitudinal studies. This exploratory research provides context-specific insights that complement rather than replace existing best-practice frameworks, supporting Sustainable Development Goals (SDGs) 4, 10, and 17 while addressing gaps in the literature on higher education finance in developing nations.

Keywords: Financial sustainability, Higher education, Mission-differentiated institutions

1. Introduction

Financial sustainability in higher education institutions is a crucial issue worldwide, as universities face demographic shifts, declining government funding, and increased competition for students and resources (McLaren & Struwig, 2019; Webb, 2015). In developing nations, higher education institutions play a central role in achieving the Sustainable Development Goals (SDGs)

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while facing significant pressures from severe resource constraints and economic volatility (Scott & Guan, 2023). Fiscal austerity and demographic decline can contribute to sustainability crises that compromise institutional viability and mission fulfillment, leading to reduced program funding, decreased enrollment, and difficulties maintaining faculty and staff levels.

Thailand's higher education system exemplifies these issues in acute form, with enrollment declining amid Southeast Asia's lowest fertility rates (Jitruksa et al., 2024) and continuing government funding cuts initiated during the 1997 Asian Financial Crisis (Joungtrakul et al., 2021). With 38 institutions committed to supporting educational equity and local development, Rajabhat Universities constitute the largest higher education network in Thailand. Established under the Rajabhat University Act of 2004 (Chinnawog, 2018), these institutions pursue four concurrent missions: local human capital development, community-focused research, regional cultural heritage preservation, and geographic educational equity (Issaro, 2021; Jantanukul, 2024). Despite this strategic mandate, Rajabhat Universities face disproportionate financial sustainability challenges: a 60% per capita funding gap relative to research-intensive universities (Kiattiwattanawisarn, 2022); high government revenue reliance averaging 67%, creating vulnerability to appropriation fluctuations (Girdwichai, 2024; Sairotrung & Jariyajamsit, 2019); demographic decline disproportionately affecting regional institutions as student migration to urban centers intensifies (Jitruksa et al., 2024); and growing technological infrastructure demands amid diminishing enrollment bases (Lekhakula, 2021).

Although this situation resembles challenges faced by community colleges in the United States and regional universities in Australia serving comparable local development missions under resource constraints (Tran et al., 2025), important institutional distinctions warrant emphasis. Unlike Australian regional universities that operate under enterprise bargaining agreements allowing workforce adjustments responsive to enrollment fluctuations (Tran et al., 2025), Thai Rajabhat Universities are constrained by a centralized civil service framework governing personnel structures, tenure protections, and salary scales across the entire public higher education sector (Joungtrakul et al., 2021). This governance architecture—which also differentiates Rajabhat Universities from Thailand's autonomous research universities, such as Mahidol (Kiattiwattanawisarn, 2022)—fundamentally limits workforce adjustments responsive to revenue shocks, creating structural conditions not captured by international comparisons alone. This contextual divergence motivates the need for context-specific empirical analysis rather than direct application of findings from different institutional environments.

A systematic review of the literature identifies three crucial gaps. First, a geographical and institutional context gap exists because most research concentrates on developed country contexts (Cernostana, 2018; Webb, 2015), with limited examination of institutions in developing economies with explicit local development missions. Second, measurement gaps persist, as prior research has confined financial sustainability assessment to specific dimensions. While Alonso-Cañadas et al. (2017) examine debt and payment capacity, Kathomi (2022) focuses on asset investment without a comprehensive analysis. Third, factor integration gaps remain, as compartmentalized analysis has not systematically integrated internal institutional factors and external environmental conditions (Tran et al., 2025), limiting understanding of how these factors interact to influence sustainability outcomes.

This study addresses these gaps through two interconnected objectives: (1) assessing the financial sustainability status of Rajabhat Universities using integrated measurement frameworks

combining Cernostana's (2018) composite scoring methodology with McLaren and Struwig's (2019) five-dimensional approach; and (2) identifying factors associated with financial sustainability through theory-driven analysis grounded in resource dependency theory and mission-sustainability balance constructs, using dynamic panel data methods applied to a short post-pandemic window. The study provides context-specific evidence that complements rather than replaces existing best-practice frameworks, supporting SDGs 4, 10, and 17 while addressing literature gaps regarding higher education finance in developing nations.

2. Objective

This exploratory study addresses identified gaps in financial sustainability research for mission-differentiated institutions in developing economies through two interconnected objectives.

Objective 1: To assess the financial sustainability status of Rajabhat Universities using integrated measurement frameworks combining Cernostana's (2018) composite scoring methodology with McLaren and Struwig's (2019) five-dimensional approach, examining liquidity, solvency, profitability, efficiency, and asset management.

Objective 2: To identify factors associated with financial sustainability through theory-driven analysis grounded in resource dependency theory and mission-sustainability balance constructs. Using dynamic panel data methods applied to a short post-pandemic window, the study systematically explores internal institutional factors (enrollment dynamics, revenue diversification, and operational efficiency) and external environmental factors (government appropriations, regional economics, competitive intensity, and demographics).

These objectives contribute evidence to support strategic decision-making that balances financial sustainability with educational equity and local development missions, while acknowledging that findings should be interpreted as exploratory insights warranting further longitudinal investigation.

3. Literature Review

Integration of Resource Dependency and Mission Sustainability

This research develops an integrated theoretical framework that merges resource dependency theory (RDT) with mission-sustainability balance constructs. RDT posits that the survival of organizations depends on the procurement of critical resources from external environments, while diversification strategies reduce dependence on singular sources (Jaafar et al., 2023; Webb, 2015). However, traditional RDT applications that focus on diversifying revenue may be insufficient for institutions with distinct missions that operate within structural limits, as these often face unique challenges that require tailored strategies to align financial practices with their specific educational and community objectives, such as adapting funding models that reflect the local context and stakeholder needs. Rajabhat Universities must simultaneously pursue financial stability and fulfill local development goals, necessitating the integration of mission-sustainability balance frameworks (Cernostana, 2018; McLaren & Struwig, 2019), which acknowledge that financial stability must be congruent with institutional missions.

The integrated framework proposes that sustainability factors function via resource management efficiency (internal factors: administrative intensity, productivity, and financial

management) and resource acquisition capacity (external factors: diversification, government support, economic conditions, and institutional scale). Importantly, the effectiveness of these factors differs across institutional contexts; strategies that work well in urban research universities may prove less effective in institutions that focus on regional communities, such as community colleges or local universities that prioritize local engagement and service.

Financial Sustainability Measurement

Financial sustainability encompasses an organization's ability to use its resources effectively, carry out its mission, and remain in operation for a long time (Cernostana, 2018; McLaren & Struwig, 2019). This study combines two complementary measurement approaches. McLaren and Struwig (2019) propose five dimensions: financial performance, liquidity, asset management, debt management, and reserves. Cernostana (2018) develops a unified scoring methodology based on Balanced Scorecard principles across four domains, yielding detailed 100-point assessments with classification thresholds: excellent (80–100), satisfactory (60–79), and problematic (< 60). This integration addresses measurement limitations in previous research that confined analysis to limited focal points, as using several indicators across five dimensions captures the multifaceted nature of sustainability and allows for robustness testing.

Thai Higher Education Context: Comparative Perspective

Thailand's higher education system comprises four institutionally distinct categories, each operating under separate governance frameworks that create substantial heterogeneity in financial sustainability dynamics. Understanding this institutional diversity is essential for contextualizing the specific challenges facing Rajabhat Universities. Autonomous universities, including Mahidol University, Chulalongkorn University, and King Mongkut's University of Technology Thonburi, operate under separate legislation granting fiscal and personnel autonomy, including authority to set salary scales, hire contract faculty, and manage investment portfolios independently (Kiattiwattanawisarn, 2022), enjoying higher per capita appropriations and greater flexibility to pursue revenue diversification strategies.

Traditional government universities remain under direct ministerial oversight and full civil service regulations, constraining personnel flexibility but receiving stable baseline appropriations. Rajabhat Universities, the focus of this study, were established under the Rajabhat University Act, B.E. 2547 (2004), with four concurrent missions emphasizing local human capital development, community-focused research, cultural heritage preservation, and geographic educational equity (Chinnawog, 2018; Issaro, 2021; Jantanukul, 2024), operating under centralized civil service frameworks with significant per capita funding gaps compared to autonomous institutions (Kiattiwattanawisarn, 2022). Rajamangala Universities of Technology serve applied technical and vocational missions with similar civil service constraints but different disciplinary orientations, focusing on practical skills and workforce readiness in fields such as engineering, agriculture, and business.

Prior Thai HEI research predominantly examines either autonomous institutions or aggregated analyses treating Thai HEIs as a single category (Joungtrakul et al., 2021; Lekhakula, 2021; Scott & Guan, 2023), obscuring important governance and mission differences that likely moderate sustainability dynamics. While existing Rajabhat-specific studies examine specific operational issues such as revenue management (Sairotrung & Jariyajamsit, 2019), risk

management (Girdwichai, 2024), and crisis response (Jitruksa et al., 2024), comprehensive econometric analysis of financial sustainability factors across the full Rajabhat network remains underexplored.

Determinants of Financial Sustainability

Prior research identifies both the internal and external factors associated with financial sustainability, with effects varying substantially by institutional context and governance framework. Table 1 summarizes key empirical studies that inform this analysis.

Table 1 Summary of prior studies on financial sustainability factors in higher education

Author	Context	Methodology	Key Finding
Webb (2015)	4-year US colleges/universities	Descriptive panel analysis	Revenue diversification associated with greater crisis resilience
Alonso-Cañadas et al. (2017)	Spanish public universities	Panel regression on debt ratios	Debt structure and productivity linked to financial sustainability
Cernostana (2018)	Private HEIs (Latvia)	Balanced Scorecard composite scoring	Proposed 100-point integrated measurement framework
Almagtome et al. (2019)	Iraqi HEIs	Exploratory case study	Administrative intensity is positively associated at moderate levels
McLaren & Struwig (2019)	South African university	Ratio analysis	Proposed five-dimensional framework
Minyoso & Musiega (2020)	Kenyan public universities	Regression analysis	Aggressive working capital management improves efficiency but reduces liquidity buffers
Le et al. (2021)	Vietnamese public universities	Herfindahl-Hirschman Index	Government support shows significant positive effects at ~50% baseline dependency
Kathomi (2022)	Kenyan universities	Panel data analysis	Debt financing and asset investment linked to sustainability
Jaafar et al. (2023)	Malaysian public universities	Panel regression (HHI)	Revenue diversification significantly associated with sustainability
Tran et al. (2025)	Australian public universities	Panel regression	Administrative intensity shows a U-shaped relationship

Internal Institutional Factors. Empirical evidence on administrative intensity reveals context-dependent patterns. Tran et al. (2025) document U-shaped patterns in Australian universities, suggesting optimal thresholds, while Almagtome et al. (2019) observe positive

associations at moderate levels. For institutions governed by civil service frameworks that restrict staffing flexibility, administrative intensity may predominantly yield adverse effects if structural limitations prevent enrollment-responsive modifications, particularly in terms of reduced adaptability to changing student demands and market conditions. University productivity exhibits positive links to financial indicators through cost control and revenue generation (Alonso-Cañadas et al., 2017), though effects likely vary across dimensions of sustainability. Financial management strategies show trade-offs: aggressive working capital management may enhance operational efficiency while lowering liquidity buffers, which can lead to increased financial risk if unexpected expenses arise (Kathomi, 2022; Minyoso & Musiega, 2020).

External Environmental Factors. In developed countries, revenue diversification is often associated with sustainability. Webb (2015) documents greater crisis resilience among diversified US institutions, while Jaafar et al. (2023) report significant positive Herfindahl-Hirschman Index effects in Malaysian universities, consistent with the predictions of RDT. However, the viability of diversification depends extensively on opportunity structures, as urban universities can commercialize research and recruit international students—options often unavailable to remote regional institutions. Government financial support demonstrates complex relationships; Le et al. (2021) report significant positive effects in Vietnamese universities, though these effects likely depend on baseline dependency levels. Economic conditions affect sustainability by influencing household income, enrollment demand, and public-sector fiscal capacity (Webb, 2015), while institutional size generates economies of scale (Kathomi, 2022).

Research Gaps and Hypotheses Development

The literature review reveals three notable gaps. First, geographical and institutional context gaps make it challenging to generalize findings across settings, since most research focuses on developed countries and conventional autonomous universities. Second, gaps in measurement limit evaluation to singular dimensions, such as assessing academic performance in isolation from other variables like student engagement or institutional support. Third, gaps in factor integration remain, as compartmentalized analysis does not systematically examine internal-external interactions and contextual contingencies within mission-differentiated settings, which hinders a holistic understanding of the factors influencing outcomes in these environments.

Guided by these gaps, this study develops eight exploratory hypotheses for the Rajabhat University context, grounded in theoretical frameworks and literature synthesis. Given the short observation window, these hypotheses are framed as directional expectations to be explored rather than confirmed, indicating that the study aims to identify potential trends and relationships rather than establish definitive conclusions at this stage.

H1: Administrative intensity is expected to show negative associations with multiple dimensions of financial sustainability, reflecting mission proliferation and civil service rigidities that constrain efficient resource allocation.

H2: University productivity is expected to show positive associations with asset management efficiency and reserve accumulation, while potentially straining short-term liquidity through aggressive working capital management.

H3: A financial management orientation toward short-term liabilities is expected to be associated with lower liquidity ratios, reflecting trade-offs between buffer maintenance and operational flexibility.

H4: Revenue diversification is expected to show limited or non-significant effects, reflecting geographic remoteness and mission specifications that constrain alternative revenue opportunities.

H5: Economic factors are expected to show modest positive associations, primarily with reserves and long-term sustainability indicators, while short-term effects are expected to be attenuated by government stabilization mechanisms.

H6: Government financial support is expected to show diminished marginal effects, reflecting high baseline dependency levels (67% on average) consistent with saturation thresholds observed in prior cross-national research.

H7: Institutional size is expected to show mixed effects across dimensions, with economies of scale potentially offset by coordination challenges and geographic dispersion.

H8: Historical financial sustainability is expected to show positive persistence across structural dimensions, with stronger effects in structural indicators (debt management, reserves), moderate effects in liquidity ratios, and potentially weaker or mean-reverting persistence in operational profitability.

4. Methodology

Study Design and Scope

This study is designed as exploratory empirical research rather than definitive causal inference. Given the three-year observation window (2021–2023, $N = 96$ institution-years, reducing to $N = 64$ after first-differencing for lagged dependent variables), it is explicitly acknowledged that the short panel dimension ($T = 3$, effectively $T = 2$ for dynamic specifications) limits formal dynamic panel econometric techniques. Robust System GMM estimation typically requires $T \geq 4$ for reliable instrument-based identification (Roodman, 2009), and dynamic random effects specifications on short panels are known to generate Nickell bias that downward-biases lagged coefficients (Baltagi, 2021).

Accordingly, the dynamic random effects models employed here should be interpreted as pattern-identification tools that generate directional evidence and hypotheses for future longitudinal investigation, rather than definitive tests of causal relationships. The findings complement rather than replace long-panel studies from developed economies, contributing context-specific insights regarding mission-differentiated regional universities operating under civil service governance frameworks.

Three features of the research design mitigate (though do not eliminate) the limitations of the short panel: (1) high cross-sectional coverage (84.2% of Thailand's 38 Rajabhat Universities), reducing selection bias concerns; (2) multi-dimensional outcome measurement using six financial sustainability indicators, enabling cross-indicator robustness assessment; and (3) multiple estimation approaches (dynamic random effects, static random effects, dynamic fixed effects, and Pooled OLS), enabling specification robustness testing.

Data Sources and Sample Construction

This research utilized panel data from 32 Rajabhat Universities, collected between 2021 and 2023, yielding 96 institution-year observations representing 84.2% of Thailand's 38 Rajabhat

Universities. The six excluded universities lacked complete financial disclosure and were removed to maintain balanced panel properties.

Three primary data sources were triangulated to construct the panel dataset. First, financial data were extracted from audited financial statements published by Thailand's State Audit Office. Second, enrollment and personnel data were drawn from performance reports issued by the Office of the Permanent Secretary, Ministry of Higher Education, Science, Research, and Innovation. Third, macroeconomic indicators were obtained from the National Economic and Social Development Council, capturing regional economic conditions and GDP growth rates.

Justification of the 2021–2023 Observation Window. The three-year window was selected intentionally to capture a critical structural discontinuity characterized by three converging pressures: (1) post-pandemic recovery dynamics that created unprecedented operational conditions, with COVID-19 fundamentally disrupting enrollment patterns, tuition collection cycles, and administrative operations throughout 2020–2021 (Joungtrakul et al., 2021; Scott & Guan, 2023); (2) acute demographic pressures, with Thailand's below-replacement fertility rates translating into sharp university-age cohort contractions, producing a 21.4% enrollment decline across the sample (2021: 10,825 mean students; 2023: 8,512 mean students) (Jitruksa et al., 2024); and (3) policy and funding framework transitions, as the Higher Education, Science, Research, and Innovation reform (enacted 2019) achieved full operational implementation during this window. These concurrent pressures make 2021–2023 analytically valuable for exploring sustainability patterns under stress conditions, though they constrain formal long-run dynamic analysis.

Sample Representativeness. Analysis of the six excluded universities confirms no systematic exclusion bias, with comparable mean enrollment (9,247 excluded vs. 9,400 included) and government dependency (68.3% vs. 66.9%), supporting generalizability to the full Rajabhat population.

Variable Operationalization and Measurement

Dependent Variables: Financial Sustainability Indicators

Rationale for Multi-dimensional Measurement. Unlike Cernostana (2018), who aggregates all sustainability dimensions into a single composite score, this study examines six separate dependent variables to reveal trade-offs that single-indicator analyses obscure. For example, institutional interventions enhancing productivity may simultaneously strengthen capital intensity (AMR) while straining short-term liquidity (LR)—a pattern invisible to composite score analysis. Following McLaren and Struwig's (2019) five-dimensional framework, sustainability is disaggregated into distinct dimensions, retaining Cernostana's (2018) Integrated Score (IS) as a sixth dependent variable to provide aggregate-level robustness alongside dimension-specific insights.

The six financial sustainability indicators are operationalized as follows. The Financial Performance Ratio (FPR), computed as total revenue minus total expenses divided by total revenue, measures operating margin. The Liquidity Ratio (LR), computed as current assets divided by current liabilities, captures short-term debt-servicing capacity. The Asset Management Ratio (AMR), computed as fixed assets divided by total assets, captures capital intensity as a dimension of sustainability. In mission-differentiated regional institutions, AMR reflects institutional commitment to physical infrastructure supporting mission fulfillment (classrooms, laboratories,

and community engagement facilities), serving as a proxy for infrastructure-mission alignment. While some studies treat AMR as a purely accounting-based measure (Alonso-Cañadas et al., 2017), this research follows McLaren and Struwig's (2019) five-dimensional framework in which asset management represents the institution's capacity to deploy fixed resources productively over time. The Debt Management Ratio (DMR), computed as total assets divided by total liabilities, captures long-term solvency. The Reserve Ratio (RR) is the natural logarithm of total reserves divided by total revenue. The Integrated Score (IS) applies Cernostana's (2018) composite methodology, combining liquidity (30 points), operational management (20 points), long-term solvency (20 points), and profitability (30 points) into a 100-point score.

Independent Variables: Sustainability Factors

Seven theoretically grounded factors formed the independent variable set. Revenue Diversification (RD) is measured using the Herfindahl-Hirschman Index transformation: $HHI = 1 - \sum(S_i^2)$, where S_i represents the revenue share from five categories: government appropriations, tuition, research grants, auxiliary enterprises, and other revenues. Financial Management (FM) is operationalized as short-term liabilities divided by total liabilities, capturing the maturity structure of institutional debt.

Administrative Intensity (AI) is operationalized as Total Administrative Expenses divided by Net Revenue. Administrative expenses encompass three categories: (a) non-academic personnel costs (administrative, clerical, and support staff salaries and benefits); (b) administrative overhead (facilities, utilities, procurement, and IT infrastructure); and (c) central administration expenses (president's office, registrar, finance, human resources, and institutional advancement). Academic instructional expenses and direct research costs are excluded. This operationalization follows Tran et al. (2025).

University Productivity (UP) is measured as FTE students divided by FTE personnel, capturing the student-to-staff ratio as a proxy for operational efficiency. Economic Factors (EF) are operationalized as annual real GDP growth rates. Government Financial Support (GFS) is measured as government appropriations divided by total revenue. University Size (US) is measured as the natural logarithm of total FTE enrollment.

Variable Transformations. Log-transformed dependent variables (LR, AMR, DMR, RR) yield elasticity coefficients, while level-form dependent variables (FPR, IS) yield semi-elasticity coefficients. All independent variables are expressed in natural logarithms except where noted.

Econometric Specifications

The empirical strategy employed dynamic panel data models to control for institution-specific heterogeneity and temporal dynamics. The baseline dynamic specification is as follows:

$$\ln(FS_{i,t}) = \alpha + \beta_1 \ln(FS_{i,t-1}) + \beta_2 \ln(RD_{i,t}) + \beta_3 \ln(FM_{i,t}) + \beta_4 \ln(AI_{i,t}) + \beta_5 \ln(UP_{i,t}) \\ + \beta_6 \ln(EF_{i,t}) + \beta_7 \ln(GFS_{i,t}) + \beta_8 \ln(US_{i,t}) + \mu_i + \varepsilon_{i,t}$$

where i indexes universities ($i = 1, \dots, 32$), t indexes time periods ($t = 2021, \dots, 2023$), $\ln(FS_{i,t})$ represents the natural logarithm of financial sustainability indicators, $\ln(FS_{i,t-1})$ captures lagged sustainability reflecting path dependence, μ_i denotes university-specific time-invariant effects

capturing unobserved institutional characteristics (founding history, precise geographic location, and governance culture), and ε_{it} represents idiosyncratic error terms.

Static models excluding autoregressive components provide robustness checks:

$$\ln(\text{FS}_{i,t}) = \alpha + \beta_1 \ln(\text{RD}_{i,t}) + \beta_2 \ln(\text{FM}_{i,t}) + \beta_3 \ln(\text{AI}_{i,t}) + \beta_4 \ln(\text{UP}_{i,t}) + \beta_5 \ln(\text{EF}_{i,t}) + \beta_6 \ln(\text{GFS}_{i,t}) + \beta_7 \ln(\text{US}_{i,t}) + \mu_i + \varepsilon_{i,t}$$

Three estimation methods accommodate the panel structure: Fixed Effects Models (FEM) eliminate time-invariant heterogeneity by using within-transformation techniques. Random Effects Models (REM) assume uncorrelated university-specific effects with regressors, estimating through Generalized Least Squares with greater efficiency under exogeneity assumptions. Pooled OLS disregards panel structure, providing benchmark comparisons.

Model Selection and Diagnostic Testing

Model selection is guided by formal statistical tests. Hausman specification tests examine whether fixed effects or random effects estimators are more appropriate (Hausman, 1978). Given data constraints ($N = 32$, $T = 3$), Arellano-Bond and System GMM are infeasible because $T = 2$ after lagging generates instrument proliferation that undermines Hansen J-test reliability (Roodman, 2008, 2009). Diagnostic testing confirms that random effects models satisfy efficiency requirements under the exogeneity assumption, making REM the preferred baseline specification. Multicollinearity is assessed via Pearson correlation coefficients, with values below 0.80 indicating acceptable levels (Hair et al., 2010). White period-robust standard errors address heteroskedasticity concerns (Stock & Watson, 2008).

Econometric Limitations Requiring Acknowledgment

Several econometric limitations arising from the short panel dimension warrant explicit acknowledgment:

(a) Nickell Bias. Dynamic random effects specifications on short panels generate downward bias in lagged dependent variable coefficients, typically underestimating true persistence by approximately 30–40% (Nickell, 1981, as cited in Baltagi, 2021). Reported lagged coefficients should be interpreted as lower-bound estimates of true sustainability persistence.

(b) GMM Infeasibility. The Arellano-Bond difference GMM and System GMM require $T \geq 4$ for reliable Hansen J-test power and to prevent instrument proliferation (Roodman, 2008, 2009). With $T = 2$ after lagging, over-identification tests would produce unreliable results, rendering GMM inappropriate for this panel structure.

(c) Unit Root Testing Constraints. Panel unit root tests (Levin-Lin-Chu and Im-Pesaran-Shin) require $T \geq 20$ for reliable inference (Baltagi, 2021) and are therefore not performed here. Dynamic specifications, including lagged dependent variables, partially address non-stationarity concerns through first-differencing effects (Roodman, 2009).

(d) Endogeneity Concerns. Three sources of potential endogeneity remain: (i) simultaneity between administrative intensity and sustainability outcomes; (ii) omitted time-varying factors such as leadership quality and governance effectiveness; and (iii) measurement error in revenue classification and expense categorization across institutions despite standardized reporting requirements.

Robustness Check Framework

A comprehensive robustness assessment operates along three dimensions. First, model specification robustness compares dynamic and static specifications across estimation methods (FEM, REM, and Pooled OLS) to distinguish genuine factor associations from specification artifacts. Second, measurement robustness examines the consistency of findings across six financial sustainability indicators. Factors demonstrating consistent effects across multiple indicators warrant stronger interpretive confidence. Third, temporal robustness examines coefficient stability over time, though the limited time dimension ($T = 3$) constrains formal stability testing. This multi-dimensional framework strengthens confidence that identified patterns reflect genuine sustainability factors rather than statistical anomalies, measurement peculiarities, or specification sensitivities.

5. Results

Descriptive Statistics

A central descriptive finding motivates the following analysis: Thailand's Rajabhat Universities experienced a dramatic 21.4% enrollment contraction during the 2021–2023 observation window, with mean enrollment declining from 10,825 students in 2021 to 8,512 students in 2023 (see Appendix B). This demographic collapse represents the single most significant driver of cost pressures in the sample, as per-student administrative overhead rose mechanically while absolute administrative headcounts remained constrained by civil service frameworks (Joungtrakul et al., 2021). The proximate consequence is visible in the 21.8% productivity decline (UP: 25.162 $\rightarrow$ 19.683 students per FTE personnel), reflecting enrollment contraction outpacing workforce adjustment. These demographic and workforce dynamics contextualize the financial sustainability patterns examined below.

Financial sustainability indicators across 32 Rajabhat Universities (2021–2023) reveal concerning patterns (see Appendix A). Operating margins (FPR) remained marginally positive (1.2–1.9%) with significant 2022 volatility. Liquidity ratios (LR) fluctuated substantially, peaking at 37.487 in 2022 before normalizing to 22.838 in 2023. Capital intensity (AMR) declined from 0.115 to 0.061, indicating reduced fixed-asset investment. Debt management ratios (DMR) consistently exceeded critical thresholds (6.401–8.362), maintaining solvency. Reserve ratios (RR) showed slight fluctuation (2.839–2.968), indicating modest buffer capacity. Integrated scores (IS) maintained acceptable levels (74.030–76.500), though minimum scores (51–59) approached problematic zones, identifying vulnerable institutions warranting intervention, which may include targeted financial support or regulatory oversight to ensure stability.

Sustainability factor patterns reveal structural challenges (see Appendix B). Administrative intensity (AI) remained exceptionally high (0.980–0.988), with the 2022 peak of 1.823 suggesting severe resource misallocation. Revenue diversification (RD) fluctuated moderately (0.467–0.535) with limited variation. Government dependency (GFS) remained high (65.4–69.5%), consistent with constrained fiscal autonomy and indicating that these universities rely heavily on government funding to maintain their operations and services. Economic conditions (EF) varied from 1.4% to 1.9% annual GDP growth.

Multicollinearity Assessment

Correlation diagnostics (see Appendix C) confirm no severe multicollinearity, with all pairwise correlations below the 0.80 threshold (Hair et al., 2010). The highest correlation (0.712, $p < 0.01$) between university productivity (UP) and size (US) reflects scale economies while remaining acceptable. RD and government dependence (GFS) show an expected strong negative correlation (-0.515, $p < 0.01$), consistent with diversification-dependence trade-offs. AI exhibits a weak positive correlation with GFS (0.241, $p < 0.05$), suggesting an association between higher government reliance and civil service rigidities, which may hinder the ability of institutions to adapt to changing financial conditions, potentially leading to inefficiencies in resource allocation and responsiveness to market demands. University size demonstrates a significant negative correlation with GFS (-0.598, $p < 0.01$), suggesting larger institutions achieve greater fiscal autonomy.

Factors Associated with Financial Sustainability

Table 2 presents the dynamic random effects estimation results, revealing how internal efficiency factors and external resource conditions relate to multi-dimensional sustainability outcomes. The model controls for institution-specific heterogeneity and temporal dynamics through lagged dependent variables, with white period-robust standard errors ensuring consistent inference. Figure 1 provides a coefficient plot summarizing the magnitudes and statistical significance of each factor across the six sustainability dimensions for quick visual comparison.

Table 2 Dynamic random effects estimation results—financial sustainability determinants

Variable	FPR	LR	AMR	DMR	RR	IS
Lagged DV	-0.037** (0.041)	0.520*** (0.000)	0.605*** (0.000)	0.968*** (0.000)	0.736*** (0.000)	0.087 (0.351)
AI	-1.204*** (0.000)	-1.296** (0.011)	0.416 (0.761)	-1.808*** (0.000)	-1.077*** (0.000)	-64.562*** (0.000)
UP	-0.008 (0.552)	-0.597* (0.081)	1.713* (0.059)	0.131 (0.631)	0.301*** (0.000)	-0.811 (0.867)
FM	0.001 (0.711)	-0.527*** (0.000)	0.127 (0.335)	0.035 (0.371)	0.000 (0.965)	-0.519 (0.466)
RD	-0.020 (0.326)	0.490 (0.279)	0.083 (0.948)	-0.718* (0.079)	-0.046 (0.588)	-0.141 (0.984)
GFS	0.012 (0.615)	0.960* (0.096)	1.643 (0.261)	-0.576 (0.232)	0.117 (0.220)	-0.806 (0.919)
US	0.009 (0.392)	0.428 (0.142)	-0.105 (0.743)	-0.238 (0.328)	-0.193*** (0.000)	0.954 (0.794)
EF	0.019 (0.315)	-0.545* (0.096)	1.676 (0.245)	-1.024* (0.057)	0.306*** (0.000)	-7.049 (0.340)
Constant	0.002 (0.988)	-3.997 (0.302)	2.688 (0.750)	-3.263 (0.263)	2.386*** (0.003)	31.526 (0.445)
Effects Specification						
Cross-section (Rho)	0.163	0.396	0.202	0.129	0.133	0.000
Idiosyncratic	0.836	0.603	0.797	0.870	0.866	1.000

Table 2 Dynamic random effects estimation results—financial sustainability determinants (Count)

Variable	FPR	LR	AMR	DMR	RR	IS
Model Fit Statistics						
R-squared	0.977	0.830	0.601	0.795	0.889	0.605
Adjusted R-squared	0.974	0.706	0.444	0.723	0.854	0.547
S.E. of regression	0.018	0.594	1.266	0.449	0.115	6.285
F-statistic	293.486	33.653	10.337	26.726	55.306	10.525
Prob (F-statistic)	0.000	0.000	0.000	0.000	0.000	0.000
Durbin-Watson statistic	2.193	2.193	2.258	2.645	2.316	2.448
Observations	64	64	64	64	64	64
Cross-sections	32	32	32	32	32	32
Time periods	2	2	2	2	2	2
Sample period	2022- 2023	2022- 2023	2022- 2023	2022- 2023	2022- 2023	2022- 2023

Note: p-value in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Sample: 2022–2023 (N = 64) after first-differencing for lagged dependent variables from the original 2021–2023 period (N = 96)

Dynamic specification requires a one-period lag, eliminating 2021 observations for estimation.

Method: Panel EGLS (cross-section random effects) with white period-robust standard errors.

Dependent variables in natural logarithms: LR, AMR, DMR, RR

Dependent variables in level form: FPR (due to negative values), IS (0–100 scale)

Independent variables: All in natural logarithms

Log-log specifications (LR, AMR, DMR, RR) yield elasticity coefficients.

Level-log specifications (FPR, IS) yield semi-elasticity coefficients (absolute changes per 1% increase in determinants).

Rho represents the proportion of total variance attributable to cross-sectional (between-university) differences. Low rho values (0.00–0.40) indicate that lagged dependent variables absorb substantial between-variation, leaving within-variation for contemporaneous determinant estimation, a characteristic pattern in dynamic panel specifications. (Bell & Jones, 2015)

Path Dependence and Sustainability Persistence

Lagged sustainability coefficients show strong positive persistence across structural indicators: LR (0.520, $p < 0.01$), AMR (0.605, $p < 0.01$), DMR (0.968, $p < 0.01$), and RR (0.736, $p < 0.01$), consistent with Hypothesis 8. Near-unit-root behavior in debt management (0.968) suggests balance sheet structures evolve slowly through multi-year commitments. FPR shows weak negative persistence (-0.037, $p < 0.05$), consistent with mean-reverting operational dynamics. Notably, Nickell bias in dynamic random effects specifications on short panels likely underestimates true persistence by approximately 30–40% (Baltagi, 2021); reported lagged coefficients should therefore be interpreted as lower-bound estimates.

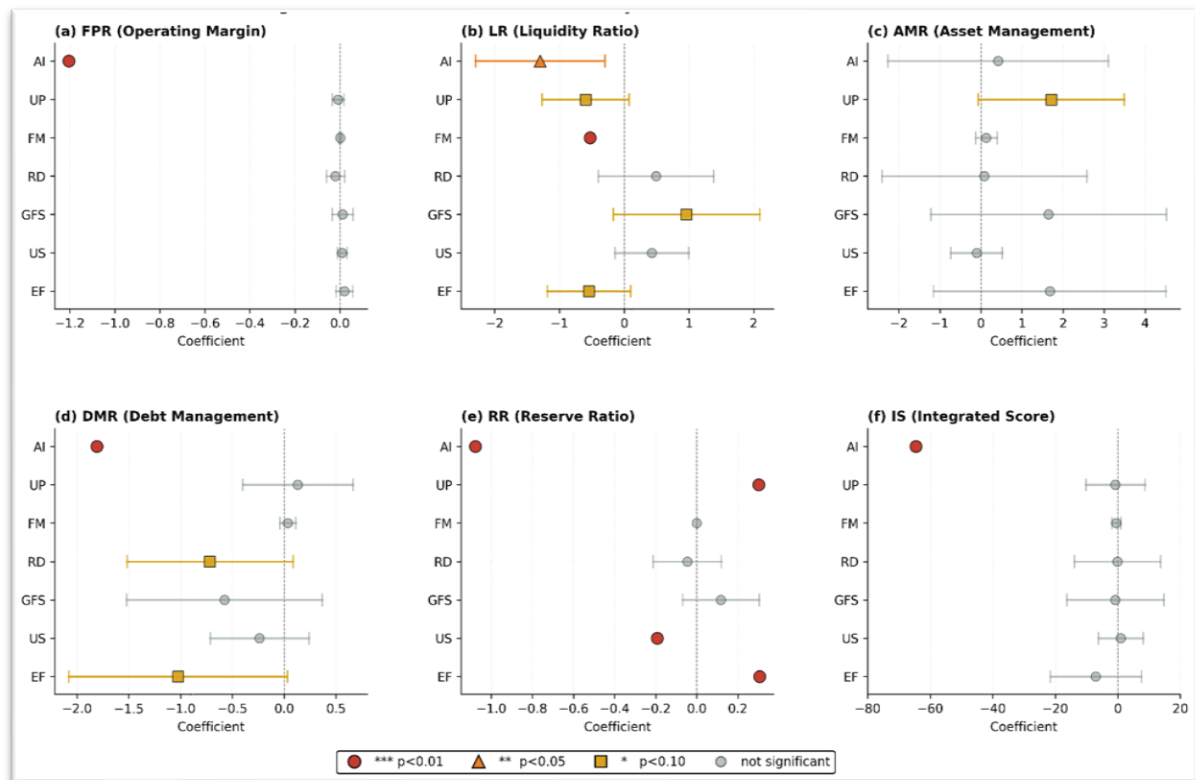


Figure 1. Coefficient plot of sustainability factors across six dimensions

Note: Point estimates (dots) with 95% confidence intervals (horizontal bars) from dynamic random effects estimation with white period-robust standard errors. Confidence intervals derived from reported p-values using the inverse normal distribution. Log-log specifications for LR, AMR, DMR, and RR yield elasticity coefficients; level-log specifications for FPR and IS yield semi-elasticity coefficients. Lagged DV captures sustainability persistence. Panel (f) has a compressed x-axis to accommodate AI's large semi-elasticity on the 100-point IS scale (coef = -64.56, $p < 0.01$).

Administrative Intensity: The Most Consistent Actionable Factor

Administrative intensity shows the most consistent negative association, with significant negative coefficients across five dimensions: FPR (-1.204, $p < 0.01$), LR (-1.296, $p < 0.05$), DMR (-1.808, $p < 0.01$), RR (-1.077, $p < 0.01$), and IS (-64.562, $p < 0.01$), consistent with Hypothesis 1. These elasticities suggest 1% increases in administrative resource consumption are associated with 1.20–1.81% decreases in sustainability, magnitudes exceeding optimal thresholds identified in prior research (Tran et al., 2025). This consistency across multiple specifications and sustainability dimensions suggests administrative rationalization as a promising pathway for sustainability enhancement in mission-differentiated regional institutions.

University productivity shows selective positive associations with AMR (1.713, $p < 0.10$) and RR (0.301, $p < 0.01$), partially consistent with Hypothesis 2. However, negative LR associations (-0.597, $p < 0.10$) reveal trade-offs whereby productivity pressures may strain short-term liquidity through aggressive working capital management. Financial management shows a predicted negative LR association (-0.527, $p < 0.01$), consistent with Hypothesis 3, reflecting trade-offs between operational flexibility and buffer maintenance.

Revenue diversification shows non-significant effects across all dimensions consistently (p-values: 0.079–0.948), aligning with Hypothesis 4, suggesting context dependency whereby geographic remoteness, mission specifications, and civil service constraints may render diversification strategies less effective in regional mission-differentiated contexts. Government financial support shows predominantly non-significant effects, with only a marginal positive LR coefficient (0.960, $p < 0.10$), largely consistent with Hypothesis 6 and aligning with diminishing marginal returns at high dependency levels (67%). University size shows a significant negative RR coefficient (-0.193, $p < 0.01$), partially consistent with Hypothesis 7. Economic factors show selective significance: negative LR (-0.545, $p < 0.10$) and DMR (-1.024, $p < 0.10$) suggest pro-cyclical vulnerability patterns, while positive RR (0.306, $p < 0.01$) is consistent with macroeconomic growth facilitating reserve accumulation, partially aligning with Hypothesis 5.

Robustness Analysis

Robustness checks across alternative specifications support the main findings (see Appendix D). Administrative intensity demonstrates strong consistency, remaining significantly negative for FPR (coefficient range: -1.023 to -1.207, all $p < 0.01$), LR, DMR, RR, and IS across dynamic random effects, static random effects, dynamic fixed effects, and Pooled OLS specifications. Financial management shows consistent negative LR effects across all specifications (range: -0.366 to -0.848, all $p < 0.01$). External factors yield predominantly non-significant or inconsistent patterns, supporting the interpretation that external resource mobilization shows limited association with sustainability enhancement in this institutional context. Dynamic RE achieves adjusted $R^2 = 0.723$ –0.974 for structural indicators, substantially exceeding Static RE fit (0.025–0.453), indicating that lagged dependent variables capture important persistence dynamics.

6. Discussion

This exploratory research examines factors associated with financial sustainability in Thailand's mission-differentiated Rajabhat Universities, offering context-specific insights that complement established best-practice frameworks in higher education finance literature. Utilizing dynamic panel econometric methods on a short post-pandemic panel, alongside a multi-dimensional sustainability measurement approach, the study reveals four patterns that warrant consideration of boundary conditions within resource dependency theory as applied to higher education financing.

Administrative Intensity as the Most Consistent Factor Associated with Sustainability

A central finding is that administrative intensity shows consistent negative associations across multiple sustainability dimensions (elasticities: -1.20 to -1.81), with magnitudes larger than those reported in comparable international studies. Tran et al. (2025) report U-shaped relationships between administrative intensity and sustainability in Australian universities, suggesting optimal thresholds. In contrast, Rajabhat Universities operate well above these efficiency-maximizing thresholds (mean AI: 0.98–0.99) in conditions where administrative expenditure may be substituted for mission-critical investment, potentially leading to reduced effectiveness in achieving their educational and research goals.

Three potential mechanisms may explain this elevated administrative burden. First, civil service employment frameworks create structural rigidities preventing flexible workforce adjustments responsive to enrollment fluctuations (Joungtrakul et al., 2021), as Rajabhat Universities must maintain administrative staff despite the 21.4% enrollment decline documented in the study sample. Second, mission proliferation may escalate administrative demands beyond sustainable levels, as the Rajabhat University Act B.E. 2547 (2004) mandated four concurrent missions requiring dedicated infrastructure, substantially increasing coordination complexity (Chinnawog, 2018; Issaro, 2021; Jantanukul, 2024). Third, performance-based funding combined with high government dependence (67%) creates compliance burdens, potentially diverting resources from internal efficiency optimization.

Productivity-Sustainability Relationships: Selective Benefits and Trade-offs

University productivity shows dimension-specific effects with positive associations for AMR (1.713, $p < 0.10$) and RR (0.301, $p < 0.01$) but negative LR effects (-0.597, $p < 0.10$), revealing trade-offs whereby efficiency gains may enable strategic capital investment and reserve accumulation while straining short-term liquidity buffers. The 21.8% productivity decline from 2021 to 2023 illustrates the inverse dynamic: enrollment contraction outpacing staff adjustment systematically depletes reserves and constrains capital investment capacity.

Three Mechanisms for the Productivity-Liquidity Trade-off. The counterintuitive negative association between productivity gains and short-term liquidity (LR: -0.597) warrants a deeper mechanistic explanation. Three interconnected processes likely contribute to this pattern:

(1) Working Capital Tightens During Enrollment Recovery. As student-to-staff ratios rise, tuition receipts are redeployed into variable instructional costs before settling into cash reserves. The lag between revenue collection timing and expenditure commitment cycles compresses liquidity buffers, creating temporary cash flow strain even as underlying efficiency improves.

(2) Capital Expenditure Reprioritization. Productivity gains generate institutional confidence to invest in deferred maintenance, equipment upgrades, and strategic facility improvements, drawing down short-term cash positions in favor of longer-term capital assets. This redeployment is visible in the positive AMR association (1.713, $p < 0.10$), showing efficiency gains channeling resources toward fixed-asset investment—a pattern consistent with forward-looking capacity development but at the cost of immediate liquidity.

(3) Civil Service Payroll Rigidity. Unlike autonomous universities, where labor costs can adjust to enrollment and revenue fluctuations, Rajabhat institutions must maintain fixed payroll obligations regardless of revenue timing. When productivity improves through enrollment recovery, the incremental revenue cannot be redirected to liquidity buffers because baseline personnel costs remain obligatory, converting productivity pressures directly into liquidity strain. This mechanism is consistent with the ‘efficiency-buffer trade-off’ documented by Minyoso and Musiega (2020) in Kenyan public universities, suggesting a broader phenomenon in state-dependent HEI contexts.

Government Assistance and Revenue Diversification: Context-Contingent Null Effects

These findings, which may be the most theoretically consequential, suggest boundary conditions for applying traditional resource dependency theory, rather than invalidating RDT

itself. While Webb (2015) and Jaafar et al. (2023) report significant positive associations between diversification and sustainability at US and Malaysian universities, Rajabhat Universities' combination of geographic remoteness, legally prescribed community missions, and civil service constraints may moderate the viability of diversification strategies. The viability of diversification may be limited by five interrelated institutional constraints: fiscal regulatory architecture imposing budget rigidity; civil service frameworks prohibiting revenue-responsive staffing adjustments (Joungtrakul et al., 2021); legal mission specifications prioritizing community service and restricting commercial operations (Issaro, 2021); demand-side constraints arising from geographic remoteness; and location-based opportunity structures that are influenced more by geographic factors than by differences in managerial capacity.

Regarding government financial support, the non-significance despite 65–70% baseline reliance is consistent with diminishing marginal returns at high dependency levels. In their study on Vietnamese universities with lower baseline dependency (~50%), Le et al. (2021) report significant positive effects, suggesting that appropriation impacts may diminish beyond certain thresholds at high reliance levels. This cross-national pattern indicates that RDT's predictions regarding external resource mobilization may operate conditionally; strong at moderate dependency levels but attenuated near saturation thresholds.

Sustainability, Persistence, and Path Dependence

Significant lagged dependent variable coefficients for structural indicators, LR (0.520), AMR (0.605), DMR (0.968), and RR (0.736) are consistent with substantial sustainability persistence. Near-unit-root DMR behavior (0.968) suggests balance sheet structures evolve slowly through long-term debt obligations and capital commitments, creating path-dependent trajectories where current positions substantially influence future outcomes. However, it should be noted that Nickell bias in dynamic random effects specifications on short panels likely underestimates true persistence by approximately 30–40% (Baltagi, 2021); the genuine path-dependence effects may therefore be even stronger than the reported coefficients suggest in this study.

Theoretical Contributions

Boundary Conditions for Context-Contingent Factors

A central contribution of this study is the identification of institutional context as a substantial moderator of factor effectiveness, suggesting boundary conditions for universal best-practice frameworks. Traditional resource dependency theory posits that revenue diversification and external resource mobilization represent central sustainability pathways (Webb, 2015; Jaafar et al., 2023). However, the non-significant results for these external factors in this study suggest that RDT's predictions operate conditionally, not universally, wherein geographic remoteness, mission specifications, and civil service constraints may render strategies less effective in regional mission-differentiated contexts, particularly in areas where local conditions and community needs differ significantly from those assumed by traditional RDT frameworks.

Three Moderators of RDT Predictions in Mission-Differentiated Contexts. Building on these cross-national patterns, we propose that three institutional moderators may condition the applicability of RDT to higher education finance:

(1) Governance Flexibility Moderator. RDT implicitly assumes that organizations can act on resource dependence signals by reallocating internal resources and adjusting staffing levels. In

civil service-bound institutions, this assumption weakens significantly; personnel structures cannot adapt to revenue shocks, legal constraints limit commercial operations, and diversification incentives diminish. The consistent negative AI effects at Rajabhat Universities (elasticities: -1.20 to -1.81), contrasted with U-shaped relationships in autonomous Australian universities (Tran et al., 2025), illustrate how governance rigidity amplifies administrative intensity's adverse consequences while simultaneously neutralizing diversification's benefits.

(2) Mission Rigidity Moderator. RDT typically treats organizational objectives as flexible, allowing strategic pivots in response to resource pressures. Rajabhat Universities, however, operate under the legally prescribed four-pillar missions established by the Rajabhat University Act B.E. 2547 (2004): local human capital development, community-focused research, cultural heritage preservation, and geographic educational equity (Issaro, 2021; Jantanukul, 2024). These mission specifications limit the strategic repositioning that diversification would otherwise enable, as they create a framework that prioritizes specific local and community needs over broader educational initiatives, potentially hindering the universities' ability to adapt to changing educational demands and global trends.

(3) Baseline Dependency Threshold Moderator. The non-significance of government financial support at 67% dependency—contrasted with the positive effects reported in Vietnamese universities at approximately 50% dependency (Le et al., 2021)—suggests a saturation threshold beyond which additional state resources cannot compensate for internal inefficiency.

These three moderators collectively suggest that RDT's application in higher education finance may benefit from context-conditional refinement rather than universal invocation. The theoretical implication is not the invalidity of RDT but rather that its predictions require specification of institutional boundary conditions—a refinement that enhances RDT's explanatory power in heterogeneous public-sector HEI contexts.

Integrated Theoretical Framework and Multi-dimensional Measurement

By integrating resource dependency theory with mission-sustainability balance constructs, this study contributes to theoretical synthesis relevant to institutions with distinct missions. The study methodologically uncovers significant trade-offs that single-indicator analyses often obscure, thereby supporting comprehensive multi-dimensional sustainability measurement frameworks. These trade-offs are illustrated by university productivity: negative liquidity effects (LR: -0.597) suggest productivity pressures may strain short-term buffers through the three mechanisms elaborated above, while positive associations with capital intensity (AMR: 1.713) and reserves (RR: 0.301) are consistent with efficiency gains facilitating long-term strategic investment.

Managerial and Policy Implications

This study generates directional evidence, offering exploratory hypotheses for policy experimentation. Given the short observation window and resulting limitations on causal inference, these recommendations should be interpreted as candidate pathways for further investigation rather than prescriptive mandates.

The findings are consistent with patterns that may reflect policy-induced institutional constraints, as centralized regulatory frameworks and uniform mandates appear to complicate the financial sustainability of regional universities, which struggle to adapt to these challenges while maintaining their educational missions and serving diverse student populations. Sustainable

models for mission-differentiated institutions may benefit from focusing on improving internal efficiency and optimizing existing resources, in addition to pursuing diversified funding sources, such as grants, partnerships with local businesses, and innovative tuition models that align with their unique missions.

For College Administrators

Administrative intensity emerges as the most consistent actionable factor in the study analysis, with the data suggesting that a 1% reduction in administrative intensity is associated with a 1.20–1.81% improvement in sustainability dimensions. Three potentially productive strategies may warrant exploration: (1) developing inter-university shared services for finance, HR, procurement, and IT functions across regional clusters, with potential administrative cost reductions of 15–20%; (2) digitizing administrative processes to reduce workload for student registration and financial aid processing by an estimated 25–30%; and (3) systematically prioritizing missions to focus resources on high-impact core functions while deprioritizing activities with low impact-to-cost ratios.

University productivity shows dimension-specific effects. Improving productivity through enrollment management and selective program rationalization can yield long-term benefits for capital investment and reserves, but may also create liquidity risks through the three mechanisms elaborated in the Discussion. Administrators may consider developing targeted enrollment strategies, combining programs strategically, and establishing monitoring protocols for liquidity ratios (candidate target range: 2.0–3.0), balancing buffer maintenance with short-term efficiency optimization given enrollment volatility (Kathomi, 2022; Minyoso & Musiega, 2020).

While revenue diversification shows non-significant effects in this institutional context, administrators may still benefit from pursuing achievable opportunities: expanding continuing education programs serving local communities, developing research partnerships with provincial government agencies, and optimizing auxiliary enterprise operations. However, the study findings suggest that diversification expectations should be calibrated realistically—likely generating supplementary revenues (5–10%) rather than transformative funding streams in the Rajabhat context.

For Government Policymakers

The findings suggest that policy architecture reform warrants consideration, with attention to institutional context heterogeneity and implementation autonomy. Civil service employment frameworks create structural rigidities, thereby preventing flexible workforce adjustments (Joungrakul et al., 2021), which can hinder the ability of universities to adapt to changing demands and improve efficiency in their operations. Policymakers may wish to explore differentiated employment frameworks offering increased staffing flexibility through options such as (1) performance-based personnel systems granting autonomy to universities meeting efficiency targets, (2) gradual administrative position transitions to contract status, and (3) regional personnel pools enabling position transfers across geographically proximate universities.

A potential policy direction involves transitioning toward outcome-based funding formulas incorporating components such as (1) base funding ensuring viability (illustratively 40%); (2) enrollment-weighted funding with productivity adjustments (illustratively 30%); (3) graduate employment outcomes (illustratively 20%); and (4) community impact indicators (illustratively

10%). The specific weighting scheme would require policy-level deliberation. Additionally, a comprehensive feasibility analysis of the Rajabhat University Act B.E. 2547 (2004) mandated missions could consider mission sequencing, prioritizing educational access during financial constraints, and partnership models leveraging other government agencies for cultural preservation and community research functions.

For the Higher Education System

At the system level, establishing formal consortia among geographically proximate universities within Thailand's six regions may enable: (1) shared administrative services combining finance, HR, procurement, and IT functions, with potential cost reductions of 20–30%; (2) cooperative academic programs offering specialized degrees jointly; (3) coordinated enrollment territories reducing intra-system competition; and (4) joint faculty appointments sustaining specialized programs. The Office of the Permanent Secretary, Ministry of Higher Education, Science, Research, and Innovation, could consider establishing peer learning networks, enabling high-performing institutions to share best practices through administrative efficiency task forces, annual sustainability conferences, and online practice repositories documenting successful projects.

7. Conclusion

This exploratory study uses dynamic panel data techniques to investigate factors associated with financial sustainability at 32 Rajabhat Universities in Thailand (2021–2023, $N = 96$ institution-years). By combining resource dependency theory with mission-sustainability balance frameworks, the study provides context-specific insights for mission-differentiated institutions and offers directional evidence that supports rather than contradicts established higher education finance frameworks, particularly in understanding how these institutions can align their missions with financial practices to enhance sustainability.

Three emergent patterns warrant attention. First, administrative intensity represents the most consistent actionable factor in the study analysis, with elasticities (-1.20 to -1.81) suggesting that resource consumption substantially exceeds efficiency-maximizing thresholds, consistent with mission proliferation and civil service rigidities documented in the sample. Second, internal efficiency factors show stronger associations with sustainability than external resource factors in this institutional context. Government support and revenue diversification exhibit non-significant effects, whereas university productivity and financial management demonstrate dimension-specific associations that are crucial for enhancing sustainability in this institutional context. Strategies effective in urban research universities appear less transferable to regional contexts, potentially due to geographic remoteness, mission specifications, and high baseline dependency (67%), which may hinder the adaptation of successful urban strategies to meet the unique challenges faced by regional institutions. Third, path dependence is a key feature of sustainability dynamics, with lagged coefficients (0.52 – 0.97) suggesting that institutional financial positions tend to persist over time, indicating that improving sustainability likely requires long-term commitment rather than episodic interventions. Notably, Nickell bias likely underestimates true persistence by approximately 30–40% (Baltagi, 2021); actual path dependence may therefore be even stronger than the reported coefficients suggest.

These results are consistent with patterns suggesting policy-induced institutional constraints, whereby budgetary restrictions, civil service rigidities, and centralized frameworks may complicate sustainability outcomes. The evidence suggests that sustainable futures for mission-differentiated institutions may benefit from dual attention to operational improvements—administrative rationalization, productivity enhancement, and mission prioritization—alongside policy reform that recognizes institutional heterogeneity while preserving implementation autonomy.

The context-adaptive approach supports Sustainable Development Goals 4, 10, and 17, with relevance extending beyond Thailand to mission-differentiated institutions in developing countries facing similar challenges of balancing fiscal sustainability, educational equity, and mission fulfillment. Theoretically, this study identifies three institutional moderators — governance flexibility, mission rigidity, and baseline dependency threshold — that may condition resource dependency theory’s applicability to public-sector HEI contexts, refining rather than rejecting RDT’s explanatory value. Methodologically, it supports multi-dimensional sustainability measurement frameworks integrating Cernostana’s (2018) composite scoring with McLaren and Struwig’s (2019) five-dimensional approach, revealing trade-offs across sustainability dimensions that single-indicator analyses obscure.

8. Limitations and Future Research Directions

This exploratory study has limitations that warrant explicit acknowledgment and shape prospects for future research. Given the consistent framing of this work as exploratory pattern identification rather than definitive causal inference, these limitations are substantive rather than incidental.

Methodological Limitations

Short Panel Dimension. The most consequential limitation is the three-year observation window ($T = 3$, effectively $T = 2$ after first-differencing for lagged dependent variables). Although this window was selected intentionally to capture the post-pandemic structural discontinuity, it constrains examination of dynamic effects across economic cycles. Sustainability is inherently a long-term concept, and short panels cannot fully capture multi-year adjustment trajectories (Baltagi, 2021). Extended longitudinal studies ($T \geq 10$) would enable robust dynamic panel estimation using System GMM and permit examination of factor stability across business cycles.

Econometric Constraints. Four econometric constraints arising from the short panel dimension merit explicit acknowledgment: (1) Nickell Bias—dynamic random effects specifications generate downward bias in lagged coefficients, typically underestimating true persistence by approximately 30–40% (Nickell, 1981, as cited in Baltagi, 2021), such that the reported lagged coefficients (0.52–0.97) in this study should be interpreted as lower-bound estimates; (2) GMM Infeasibility—the Arellano-Bond difference GMM and System GMM require $T \geq 4$ for reliable Hansen J-test power (Roodman, 2008, 2009), rendering GMM inappropriate for this panel structure; (3) Unit Root Testing Constraints—unit root tests for panels require $T \geq 20$ for reliable inference (Baltagi, 2021) and are therefore infeasible here; and (4) Endogeneity Concerns—three potential sources cannot be fully ruled out, specifically simultaneity between administrative intensity and sustainability outcomes, omitted time-varying factors such as

leadership quality and governance effectiveness, and measurement error in revenue classification across institutions.

Scope and Generalizability Limitations

Narrow Focus on Financial Sustainability. This study examines financial sustainability as a bounded dimension of institutional health, excluding complementary domains such as educational quality, research productivity, and community impact. A comprehensive institutional sustainability evaluation would benefit from integrating financial metrics with mission performance indicators and graduate outcomes.

Omitted Variables. The factor set excludes potentially consequential variables, such as leadership quality, governance structures, and organizational culture, which may moderate factor effectiveness. Mixed-methods research incorporating qualitative case studies could illuminate these unmeasured dimensions, such as how leadership quality influences decision-making processes and how governance structures affect organizational outcomes.

Contextual Generalizability. The findings pertain specifically to Thailand's 32 Rajabhat Universities during 2021–2023 and should not be directly extrapolated to (a) other Thai HEI categories operating under different governance frameworks (autonomous, traditional government, Rajamangala); (b) mission-differentiated institutions in other developing-country contexts without empirical replication; or (c) times characterized by different structural conditions. Cross-national comparative research with similar mission-differentiated institutions in the Philippines, Vietnam, or Indonesia would strengthen the generalizability of identified patterns.

Primary Policy Source Limitations. This study relies on peer-reviewed academic literature in English and Thai. It is acknowledged that direct engagement with primary policy documents, including the Rajabhat University Act B.E. 2547 (2004), Higher Education Act B.E. 2562 (2019), and archival institutional records, would further strengthen contextual grounding. Future research incorporating systematic primary policy analysis is recommended.

Future Research Directions

Five priority directions emerge from this exploratory analysis: (1) **Extended Longitudinal Studies**—expanding the panel to $T \geq 10$ would enable robust System GMM estimation and permit examination of factor stability across economic cycles; (2) **Quasi-Experimental Designs**—exploiting policy discontinuities such as the 2019 Higher Education reform through difference-in-differences approaches could provide stronger causal identification; (3) **Instrumental Variable Approaches**—identifying plausibly exogenous instruments for administrative intensity could address endogeneity concerns; (4) **Mixed-Methods Integration**—combining quantitative panel analysis with qualitative case studies of resilient versus struggling Rajabhat universities could illuminate success factors invisible to panel regression; and (5) **Cross-National Comparative Research**—extending the analytical framework to similar mission-differentiated institutions in Southeast Asia would test the generalizability of the three-moderator framework proposed in this study.

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Appendix

Appendix A: Financial Sustainability Indicators

Variable	Year	Mean	S.D.	Min.	Max.
FPR	2021	0.012	0.083	-0.178	0.223
	2022	0.013	0.166	-0.823	0.172
	2023	0.019	0.068	-0.107	0.137
LR	2021	15.946	25.271	0.396	140.371
	2022	37.487	80.872	0.928	422.498
	2023	22.838	32.705	0.778	140.117
AMR	2021	0.115	0.140	0.000	0.519
	2022	0.071	0.086	0.000	0.306
	2023	0.061	0.089	0.000	0.357
DMR	2021	6.401	6.407	0.396	35.945
	2022	8.362	9.501	0.928	50.317
	2023	7.957	6.891	0.778	26.779
RR	2021	2.965	0.914	1.321	5.135
	2022	2.839	0.953	1.448	5.564
	2023	2.968	0.915	1.355	5.232
IS	2021	74.030	9.320	51.000	92.000
	2022	76.500	10.083	56.000	94.000
	2023	74.875	8.620	59.000	91.000

Appendix B: Determinants

Variables	Year	Mean	S.D.	Min.	Max.
RD	2021	0.512	0.080	0.313	0.687
	2022	0.535	0.066	0.403	0.693
	2023	0.467	0.068	0.305	0.589
FM	2021	0.702	0.341	0.035	1.000
	2022	0.693	0.352	0.005	1.000
	2023	0.676	0.351	0.021	1.000
AI	2021	0.988	0.083	0.777	1.178
	2022	0.987	0.166	0.828	1.823
	2023	0.980	0.068	0.863	1.107
UP	2021	25.162	7.492	7.758	44.155
	2022	19.681	5.526	10.850	31.398
	2023	19.683	5.679	8.598	29.079
EF	2021	0.019	0.000	0.019	0.019
	2022	0.014	0.000	0.014	0.014
	2023	0.018	0.000	0.018	0.018
GFS	2021	0.695	0.101	0.333	0.849
	2022	0.654	0.100	0.352	0.816
	2023	0.658	0.089	0.392	0.819
US	2021	10,824.84	5,293.84	4,639.00	31,224.00
	2022	8,864.12	5,040.11	3,472.00	28,371.00
	2023	8,511.53	4,355.15	3,472.00	24,450.00

Appendix C: Correlation Matrix

	RD	FM	AI	UP	EF	GFS	US
RD	1.000						
FM	0.026	1.000					
AI	-0.192*	0.049	1.000				
UP	0.269***	-0.002	-0.161	1.000			
EF	-0.218**	0.001	-0.008	0.252**	1.000		
GFS	-	0.029	0.241**	-	0.141	1.000	
	0.515***			0.290***			
US	0.298***	0.210**	-0.106	0.712***	0.111	-	1.000
						0.598***	

Note: $p < 0.01$ (***), $p < 0.05$ (**), $p < 0.10$ (*)

Appendix D: Robustness Checks

Determinant DV	Dyn RE	Static RE	Fixed Effect	Pooled OLS	Robust Check
Panel A:					
FPR-level form					
Lagged DV	-0.037**	-	-0.176***	-0.029	Yes
AI	-1.204***	-1.142***	-1.023***	-1.207***	Yes
UP	-0.008	-0.013	0.084	-0.009	n.s.
FM	0.001	0.002	-0.018	0.001	n.s.
RD	-0.020	-0.009	-0.012	-0.024	n.s.
GFS	0.012	0.012	0.002	0.013	n.s.
US	0.009	0.009	-0.072	0.009	n.s.
EF	0.019	0.023	0.024	0.017	n.s.
Adj. R2	0.974	0.971	0.985	0.975	
Panel B: LR					
Lagged DV	0.520***	-	-0.063	0.700***	mixed
AI	-1.296*	-1.356**	-0.539	-1.296	Yes
UP	-0.597	1.033**	0.110	-0.754	No
FM	-0.527***	-0.848***	-0.845***	-0.366***	Yes
RD	0.490	0.119	0.042	0.302	n.s.
GFS	0.960	-0.279	-0.648	0.754	n.s.
US	0.428	0.270	0.268	0.387	n.s.
EF	-0.545	-0.410	0.093	-0.916	n.s.
Adj. R2	0.706	0.558	0.948	0.806	
Panel C:					
AMR					
Lagged DV	0.605***	-	-0.242	0.663***	Mixed
AI	0.416	1.671	-1.999	0.555	No
UP	1.713	1.048	3.671	1.694	Mod
FM	0.127	0.063	0.338	0.131	n.s.
RD	0.083	-0.657	1.027	0.026	n.s.
GFS	1.643	0.574	-4.045	1.500	n.s.
US	-0.105	0.373	-3.360	-0.100	n.s.
EF	1.676	0.449	0.976	1.796	n.s.
Adj. R2	0.444	0.025	0.746	0.543	

Appendix D: Robustness Checks (Cont)

Determinant DV	Dyn RE	Static RE	Fixed Effect	Pooled OLS	Robust Check
Panel D:					
DMR					
Lagged DV	0.968***	-	-0.155	0.997***	Mixed
AI	-1.808***	-1.353**	-0.380	-1.832**	Yes
UP	0.131	1.033**	-0.169	0.081	No
FM	0.035	0.153	0.104	0.030	Weak
RD	-0.718	0.118	0.128	-0.759	n.s.
GFS	-0.576	-0.280	-0.435	-0.590	n.s.
US	-0.238	0.527	0.532	-0.234	n.s.
EF	-1.024	-0.406	0.176	-1.062	n.s.
Adj. R2	0.723	0.110	0.893	0.766	
Panel E: RR					
Lagged DV	0.736***	-	-0.125	0.762***	mixed
AI	-1.077***	-0.955***	-0.800***	-1.007***	Yes
UP	0.301***	0.220*	0.119	0.274**	Yes
FM	0.000	0.006	0.000	0.002	n.s.
RD	-0.046	-0.205*	-0.220	-0.030	Mod
GFS	0.117	0.041	-0.371	0.117	n.s.
US	-0.193***	-0.183	-0.121	-0.180*	Mod
EF	0.306***	0.098	0.077	0.320*	Mod
Adj. R2	0.854	0.453	0.958	0.873	
Panel F: IS-Level Form					
Lagged DV	0.087	-	-0.377*	0.087	No
AI	-64.562***	-69.704***	-49.924**	-64.562***	Yes
UP	-0.811	0.558	23.441	-0.811	No
FM	-0.519	-0.506	5.610	-0.519	n.s.
RD	-0.141	1.626	4.129	-0.141	n.s.
GFS	-0.806	-3.909	10.314	-0.806	n.s.
US	0.954	0.097	-26.483	0.954	n.s.
EF	-7.049	-5.488	-3.847	-7.049	n.s.
Adj. R2	0.547	0.572	0.569	0.547	

Note: Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Dyn RE = Dynamic Random Effects (baseline); Static RE = Static Random Effects; Fixed Eff. = Dynamic Fixed Effects; Pooled OLS = Dynamic Pooled OLS

Robustness assessment: ✓ Yes = consistent sign and significance across 3+ specifications; ~ Mod/Weak = significant in 2 specifications or mixed patterns; ✗ No = inconsistent, n.s. = consistently non-significant across all specifications

Variables in natural logarithms: LR, AMR, DMR, RR, and all independent variables. Variables in level form: FPR (negative values), IS (0–100 scale)

Log-log coefficients = elasticities; level-log coefficients = semi-elasticities (absolute changes)

For FPR: Coefficients represent percentage point changes in operating margins per 1% increase in determinants.

For IS: Coefficients represent score point changes (0–100 scale) per 1% increase in determinants.

For LR, AMR, DMR, and RR, coefficients represent percentage changes (elasticities).