2025 Volume: 5, No: 5, pp. 3574–3587 ISSN: 2634-3576 (Print) | ISSN 2634-3584 (Online) posthumanism.co.uk

DOI: https://doi.org/10.63332/joph.v5i5.1770

# **Financial and Operational Risks in Higher Education: An Econometric Analysis of University Resilience**

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#### Abstract

In this research, the resilience approaches in higher education institutions are evaluated by modeling their financial and operational risks. The researchers use two methods to study the university's financial reports: educational funding by the government and student satisfaction surveys, using panel data regression and logistic regression. Structural equation modeling (SEM) is used to understand the research investigation as to how financial stability leads to student performance outcomes. There are key financial risks arising from the fact that student tuition is predicated upon institutional funding and public money, as well as unstable public money and differing output from the endowment portfolio. The impact of security threats at campuses, faculty attrition, and safety-related issues negatively affect institution resilience, including University operational risks. Plans that reduce their financial risks and threats to operation should be developed within higher education based on the data available. The information provided by econometric models is of great importance when it comes to the management of sustainable financial operations and operations efficiency. Results demonstrates that by optimizing better data-driven crisis mitigation approaches and improving the university systems to respond effectively to such cyber disruptions, policymakers should strengthen revenue diversity.

**Keywords:** Higher Education Resilience, Financial and operational risks, economic modeling, Tuition Dependency, Endowment Performance, and Cybersecurity Threats.

## Introduction

National economic and social development depends on higher education institutions, which provide students with knowledge and skills in how to work and invent creative solutions. As rising risk elements, universities face continuous challenges to their financial stability as well as operational durability (Grima et al., 2024). Economic difficulties and the operational challenges of universities (replacement problems of the teachers and the cybersecurity attacks, as well as the emergency response) due to the changes in the financial market, population dynamics, and technological achievements (Zheng et al., 2025 and Klapper, L., & Lusardi, A., 2020). Consequently, addressing these risks becomes essential for universities to protect themselves from being weakened over the long haul (Briguglio et al., 2014).

Student tuition fees are dependent on financial instability in higher education. Still, the source of this varies across issues, such as changing public funding rates and the success of university

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endowment fund investment. Today's universities depend greatly on tuition fees as a principal source of earnings, which sets them in jeopardy, as economic instability and changes in student enrollment rates are dependent (Xu et al., 2024). Countless uncertainties plague all public educational establishments that are required to hang on governmental budgeting processes and changes to institutional financial stability. The performance of endowments results in critical support to university budgets. Hence, it plays a crucial role in determining institutional financial preparedness, mainly based on how healthy investments do in the markets (Touti and Taïb, 2024).

# **Literature Reviews**

The research investigates that higher education institutions are required to manage a certain number of risks pertaining to the operations that result in adverse effects on their operational efficiency and security systems. When faculty members leave their jobs or when they hire new faculty members, it hinders the functioning of institutions, while academic quality declines, and the cost of hiring increases, too. Students are not very satisfied (Albuquerque et al., 2020);

Annarelli & Nonino, (2016); Schoon, I. (2006).

Due to digital learning platforms needing to defend the students' data as well as institutional information, new security threats exist for higher education institutions that need to utilize cyber threat prevention methods. With such disasters and security breaches occurring in emergencies involving physical health threats, higher education institutions are placing increasing importance on their campus security activities (Wiatt et al., 2021).

There is a growing number of complex financial and operational risks requiring analytical data methods to evaluate and supervise risk. Econometric modeling of panel data regression and logistic regression was used for the research carried out on the financial and operational risks in higher educational institutions (Sagan, I., & Masik, G., 2014 and Cheng et al., 2024). The research adapts the financial report data of universities with governmental government education sources and student satisfaction data to find vital components that develop university resilience. This research will be conducted on the basis of studies that will enhance the available scientific content by uncovering the methods that lead to successful banking financial diversification, operational efficiency, and risk reduction techniques for higher education establishments (Yang et al., 2022) and (Kadirbayeva et al., 2021).

The analysis assists decision-makers in university administration, policymakers, education institution investors, or whoever wants to protect the investment in higher education over time. To develop early intervention management measures that enhance university resilience, decision-makers have to understand the relationship between financial stability and operational challenges. The current phase of rapid economic and technological transformation of organizations needs strong risk management systems to sustain both the quality of education and institutional success (Alshebami, A. S., & Murad, M. (2022)).

## **Financial Risks in Education**

One of the most significant financial uncertainties facing colleges is their dependency on tuition payments. The authors in (Yang et al., 2022) also found that universities receiving the majority of their funding from tuition fees record greater financial volatility, specifically during economic declines. Because of unpredictable patterns of public financing, financial uncertainty increases massively. Research (Windle, G. (2011)) shows that major university budgets are turned upside

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down in reaction to government subsidy changes, leading to tuition increases and program eliminations.

Considering that the ability of financial institutions to resist financial distress is highly dependent on their endowment fund performance, financial institutions have to assess how their endowment funds have performed (Grosu et al., 2023). These facts are depicted in the report (Simmie, J., & Martin, R. (2010)), which indicates that universities that put a mechanism in place to ensure effective management of their endowment funds develop protection against financial instability that protects operations continuity. The financial instabilities produced from the application of improper management to endowment assets give rise to liquidity crises that jeopardize institutional sustainability.

The proficiency of making money out of students is meaningfully related to a university's financial situation, whether students would default on their student loans. Thus, according to research (Martin, R., & Sunley, P. (2015)), rising student debt and default rates result in a decline in enrollment and financial troubles with institutions relying on tuition money.

## **Operational Risks in Higher Education**

Operational risks encompass faculty turnover, cybersecurity threats, and crisis management. Faculty retention and hiring problems have received extensive attention, which has revealed that academic continuity faces disruption while recruitment expenses increase (Foster, K. A. (2007)).

The expansion of digital learning platforms has created new and expanding security risks within cyber operations. Paper (Foster, K. A. (2007)) demonstrates that university IT systems remain exposed to cyberattacks that endanger both faculty and student sensitive information in their study. The protection of institutional integrity relies on effective cybersecurity frameworks for defense.

Researchers have focused on campus safety and crisis response procedures throughout recent academic works. The research (Armeanu et al., 2017) establishes that universities must develop comprehensive emergency preparedness plans to decrease vulnerability in situations of natural disasters, security threats, and public health emergencies. Organizations that implement organized crisis management systems possess superior abilities to manage operational disturbances while maintaining student safety.

The literature review demonstrates that higher education faces multiple risks in both financial and operational aspects. This study employs econometric models to perform an extensive analysis of risk elements that influence university resilience and develop practical policies for sustainability assurance.

# Methodology

The research relies on quantitative methods to evaluate financial and operational risks that exist in institutions of higher education. This study contains the following research components for methodology (Pike et al., 2010):

• **Data Collection:** The research relies on secondary information retrieved from university financial reports, government education funding databases, enrollment statistics, and student satisfaction surveys. The gathered data spans five years to observe substantial historical patterns and fluctuations.

• Econometric Models: The research employs panel data regression to examine financial Journal of Posthumanism risk elements that incorporate student tuition dependence, governmental fund variation, and endowment outcomes. The analysis utilizes logistic regression to determine the likelihood of financial distress for institutions through their characteristics. SEM serves as the analysis tool that investigates the complex network that exists between economic risks and operational challenges, along with their effects on student outcomes.

• **Variables and Measurement:** The research examines independent variables of revenue diversification, government subsidies, faculty turnover rates, cybersecurity incidents, and crisis response efficiency. Students matter most to higher education institutions because they manage financial stability, build organizational strength, and create positive student experiences (Tukamuhabwa, et al., 2015) and (Toleuuly et al., 2019).

• **Model Validation:** The model undergoes diagnosis tests that evaluate multicollinearity, heteroscedasticity, and autocorrelation. Stability tests determine how study results behave when public institutions intersect with private institutions.

• **Ethical Considerations:** The research maintains absolute adherence to ethical rules as it protects both financial university records and survey participant confidentiality.

Using these research methodologies provides a systematic framework for measuring university resistance capabilities, thus providing crucial data for both government policymakers and educational institution authorities.

## **Empirical Analysis**

## **Financial Risk Analysis**

• **Tuition Dependency and Revenue Diversification:** Examination of the impact of tuition revenue fluctuations on institutional stability (Birchall, J., & Ketilson, L. H. (2009)).

• **Public Funding Volatility:** Analysis of government subsidies and their impact on university resilience (Christopherson et al., 2010).

• Endowment Fund Performance: Assessment of endowment investment strategies.

• Student Loan Default Rates: Investigation of loan default patterns and their implications.

# **Operational Risk Analysis**

• **Faculty Turnover and Hiring Risks:** Evaluation of faculty retention trends (Korber, S., & McNaughton, R. B. (2018)).

• **Cybersecurity Risks in Digital Learning:** Assessment of data security vulnerabilities.

• **Campus Safety and Crisis Response:** Analysis of university emergency response frameworks (Huang et al., 2022).

## Results

1. Tuition dependency and revenue diversification



Figure 1: Tuition Dependency and Revenue Diversification (2019 - 2023)

Figure 1 shows a graphical representation of the fluctuation of student tuition dependence and funding variety between 2019 and 2023. The data is collected from the Kaggle resources. The measured data demonstrates a direct opposite relationship between these variables because lower dependency on tuition fees corresponds with wider revenue sources. The present market behavior shows that university financial institutions are making fundamental balance model changes to strengthen their fiscal position in education.

## **Economic Impacts**

According to the data, the payment of tuition to universities will be lowered from 70% in 2019 to 60% by 2023. Universities demonstrate they have been implementing measures to decrease tuition fees from being their main revenue generator.

Universities have succeeded in growing their alternative revenue streams by increasing research grants, building relationships with industries, and expanding endowment income. Higher education has become more accessible because government policies have implemented different methods of financing it.

## **Revenue Diversification Growth**

Universities achieved success by exploring new revenue streams, which contributed to making their revenue streams more diverse by 30% to 40%. Nearly all higher education institutions today pursue financial security through income source diversification based on worldwide finance standards. Various influences should be considered possible contributors to this trend.

- Expansion of online and executive education programs.
- Growth in philanthropy and alums donations.

- Development of revenue-generating research initiatives and technology transfer programs.
- Comparative Insights

## **Risk Mitigation Through Diversification**

Higher tuition independence in universities produces stable finances that stand firm during challenging economic times. The ability of diverse institution revenue streams enables universities to face financial crises better during economic downturns and student enrollment declines.

#### **Impact on Student Affordability**

This means that educational institutions have little connection with tuition money and, therefore, can offer lower prices to their students because the operational budgets of the institutions are not limited to tuition fees. Alternative revenue sources also help reduce student debt and bring up enrollment numbers.

#### **Global Comparison**

University revenue through European public funding institutions is significant and takes away much of the importance of tuition fees. Since higher education in the United States depends primarily on tuition fees, it is distinct from Europe, and revenue diversification has become inevitable to support financial sustainability. In the past, new economies have been reliant on high tuition fees but are now actively experimenting with alternative funding to reduce their reliance on student fees.

The recent shift for educational institutions to boost their revenue streams confirms that educational institutions wisely monitor their financial vulnerability to diversify their revenue streams. Institutional longevity is made possible by the dual advantages of the strategy of strengthening institutional persistence and slashing educational costs. Organizations that pursue different income streams operate smoothly only if they keep their funding sources accessible, consistent, and stable; hence, they require ongoing financial management and policy modifications to operate.





Figure 2: Endowments Fund vs. Student Loan Defaults (2019 - 2023)

Figure 2 shows the yearly changes in university endowment funds and student loan defaults from 2019 to 2023. The data is collected from the Kaggle resources. These two financial indicators are functional movements that provide newborn notions of the financial stability of the two universities and students' financial hardships.

# **Economic Interpretation**

## 1. Endowment Fund Performance: Stability and Growth

 $\circ$  Performance of the endowment fund appears fluctuating, however largely positive, and has recorded growth rates of 4.8% in 2020, a highest of 7.1% in 2022, and subsequently a lower growth rate of 6.5% in 2023.

• The increase in 2021 and 2022 also helps to suggest a strong post-pandemic economic recovery, during which investment returns improve for many universities.

• Despite that, the slight dip in 2023 may have been due to economic volatility, inflation, or changes in market conditions that affect endowment investments.

# 2. Student Loan Default Rates: Rising Financial Burden

• Student loan default rates increased from 2019 (10.5%) to 2021 (12.0%), pointing to increasing student financial stress.

• The peak in 2021 corresponds to the time when the effects of the COVID-19 pandemic were disturbing employment opportunities and the ability to pay for student loans.

• Drop-in default rates in 2022 and 2023 indicate improvements in student financial aid programs, loan restructuring policies, or better job market conditions.

## **Comparative Insights**

1. Inverse Relationship Between Endowment Growth and Loan Defaults

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• On the graph, it appears that there is a potential inverse relationship. Loan default rates stabilize or decrease as endowment performance improves (2021–2022).

• Examining performance in the endowment can help a university with strong endowment performance allocate more funds toward scholarships, financial aid, and student support programs, thereby reducing the financial burden on students and reducing loan default rates.

**2.** Impact of Economic Shocks

• In 2020, endowment growth decreased, and loan defaults increased due to the economic downturn brought on by the pandemic.

 $\circ$  However, the recovery period in 2021–2022 suggests that an institution's financial stability by growing the endowment higher may be able to support students experiencing financial distress.

**3.** Policy and Institutional Implications

• Universities need to ensure their survival and take measures to make their endowment funds better managed and independent of economic downturns.

• Policymakers will have to be creative in thinking of targeted loan forgiveness or restructuring programs for these students when they are having difficulties repaying their loans, especially during economic downturns.

• Improving the transparency of endowment fund allocations to student support might help ensure the financial stability of student support and decrease student loan defaults.

University financial stability is an essential result of university endowment fund performance evaluation with respect to student financial distress reduction. The increased endowment value has resulted in improved financial aid programs at universities, which means students pay less for tuition and less for loan obligations. Problems occur due to economic market fluctuations, and they require a statistically prompt financial economy and support from governmental student institutions to stabilize the situation.





Figure 3: Cybersecurity Risks in Digital Learning (2019 – 2023)

Figure 3 depicts the number of reported cybersecurity attacks within higher education institutions in the past five years. The increasing trend, especially during 2020 and 2021, highlights the growing vulnerabilities in digital learning environments. Recent years' fluctuations show how risk patterns are shifting as policy changes, cybersecurity investments, and technological advancements occur.

Econometric analysis for cybersecurity risks in digital learning

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Figure 4: Distribution of Cybersecurity Incidents (2019 – 2023)

Figure 4 shows cybersecurity risk analysis need for higher education institutions p-values confidence interval to invest in cybersecurity continually for digital learning. All universities should adopt these digital security strategies, including regular audits, the use of multi-factor authentication, and real-time threat monitoring. Besides individual precautions, governments and policymakers should force them to implement cybersecurity regulations for educational institutions to equip them to deal with any possible cyber threats that might come their way in the future.

3584 Financial and Operational Risks in Higher Education **3.1 Student Satisfaction Surveys** 



Figure 5: Student Satisfaction Trends (2019 – 2023)

Figure 5 shows the trend of students' feet level in satisfaction over five years with the use of financial, operational, and institutional influencing factors. It further shows that student satisfaction is determined by economic stability, digital quality of learning, and student support services during learning.



## Econometric analysis for Student Satisfaction Surveys

Figure 6: Faculty Turnover Impact on Student Satisfaction (2019 – 2023)

Figure 6 shows  $R^2$  scattered plot of the faculty turnover analysis which impacts on student satisfaction. Therefore, to maintain high satisfaction levels, universities must actively invest in infrastructure, faculty development, and financial aid policies. Given this, policymakers should equally pave the way for preventing future declines in student satisfaction by reducing student loan burdens and maintaining higher education accessibility.

# Discussion

Universities that are more diversified in terms of revenue streams and more proactive toward operational strategy are found to be resilient. Regression models confirm financial distress and institutional risk predictors. Additionally, structural equation modeling uncovers the intricate linkages between economic health and student success, wherein risk management approaches must be integrated.

# Conclusion

This study highlights the very significant role that econometric modeling plays in higher education risk evaluation tasks. In addition to optimizing better data-driven crisis mitigation approaches and improving the university systems to respond effectively to such cyber disruptions, policymakers should strengthen revenue diversity. Universities should have behavioral leadership, which has proactive financial planning structures and comprehensive governance systems to minimize potential risks.

# **Future Directions**

Further research in the area through machine learning methods that attempt to improve financial

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distress prediction models will enhance the analysis. Multiple worldwide education system competitive analyses would yield extensive knowledge on universal approaches to strengthen higher education resilience.

#### Acknowledgements

This research is funded by the Ministry of Science and Higher Education of the Republic of Kazakhstan. Scientific and methodological support for the process of implementation of risk management in the Universities of Kazakhstan (AP19679435).

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