



HOW HUMAN RESOURCE QUALITY AND INTERNATIONAL PUBLICATIONS AFFECT REVENUE FROM RESEARCH ACTIVITIES: EVIDENCE FROM SOUTHERN VIETNAMESE UNIVERSITIES

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ARTICLE INFO	ABSTRACT
DOI: 10.52932/jfmr.v17i1enes.1325 <i>Received:</i> April 07, 2026 <i>Accepted:</i> June 26, 2026 <i>Published:</i> August 08, 2026 Keywords: International publications, Quality of human resources, Research revenue, Universities, Vietnam Article classification: Research paper JEL codes: I21, I22, A20	Purpose – This study examines the relationship between human resource quality, international publications, and research revenue in universities in Southern Vietnam, addressing the need to identify which internal capacity factors drive research income beyond tuition. Design/methodology/approach – We employ the Robust Least Squares regression method to examine an unbalanced panel comprising 39 universities in Southern Vietnam from 2017 to 2023. Findings – The results show that the proportion of faculty with PhDs has the strongest positive impact on research revenue compared to other degree groups, consistent with the Triple Helix theory on the role of high-quality human capital in the innovation ecosystem. Conversely, the proportion of faculty with Master's degrees has a negative impact, reflecting a tendency to focus on teaching rather than revenue-generating research. Finally, a non-linear, U-shaped relationship exists between international publications and research revenue, with a turning point at 145 articles, indicating that academic reputation from publications can be converted into revenue only when a threshold is reached. Originality/value – This is the first study to jointly examine human resource quality, international publications, and research revenue among Vietnamese universities.

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Practical implications – The findings also highlight the need for greater financial transparency and accountability in Vietnamese higher education, including standardized reporting, public disclosure, and independent audits. The study's results support educational managers in developing policies to sustainably increase revenue from research activities.

Social implications – By clarifying the internal capacity factors that drive research revenue, this study offers guidance for policymakers seeking to reduce universities' dependence on tuition fees, thereby supporting more equitable and sustainable access to higher education. Strengthening research income also has broader implications for the quality of teaching staff and the contribution of universities to national innovation and socio-economic development.

1. Introduction

Scientific research plays a pivotal role in enhancing the quality of universities. It provides opportunities for faculty and students to update and expand their knowledge, thereby improving the quality of teaching and learning. Moreover, scientific research fosters the creation of new inventions and innovations that help solve societal problems and promote economic development. Publishing research results in prestigious scientific journals not only enhances a university's reputation but also solidifies its standing in the international academic community. Leslie et al. (2012) emphasize that promoting scientific research at universities is essential for cultivating high-quality human resources and ensuring sustainable national development. Klineciewicz and Zaei (2025) further emphasize that universities must invest in scientific research to enhance educational quality and strengthen ties with businesses and international organizations.

This study focuses on Southern Vietnamese universities for several reasons. The southern region, home to key economic centers such as Ho Chi Minh City, is crucial to driving the nation's economic growth and innovation. This

region is home to a concentration of industries, international businesses, and a diverse population, presenting unique socio-economic dynamics that require focused research. Southern universities are well-positioned to address region-specific challenges, such as rapid urbanization, industrial development, and environmental sustainability, particularly in the Mekong Delta. By concentrating research efforts on this region, this study yields tailored solutions that institutions in other parts of Vietnam cannot easily develop. Additionally, prioritizing research in this region can help these universities close performance gaps and boost national and international competitiveness. This emphasis can foster stronger collaborations with industry leaders, attract more funding and talent, and amplify their potential for impactful research and innovation.

A notable trend is the significant investment in modern research infrastructure and equipment. Universities have equipped laboratories with advanced technology, specialized machinery, and software to support high-quality research projects. These efforts have improved research quality and enhanced Vietnam's visibility in the global scientific community. Collaborating with

international partners provides Vietnamese researchers with access to new knowledge, thereby improving the competitiveness and effectiveness of domestic research.

2. Theoretical Foundation

The Triple Helix model (Etzkowitz & Leydesdorff, 2000) posits that knowledge-based economic development emerges from the overlapping interactions among three institutional spheres: university, industry, and government, in which each actor can partially substitute for the others, generating hybrid arrangements that sustain innovation. A central implication for higher education is the Entrepreneurial University: institutions that move beyond teaching and basic research to embrace a “third mission” of direct socioeconomic contribution through research contracts, technology licensing, and consultancy (Audretsch, 2014). Research revenue is the observable financial outcome of this third mission, reflecting the degree to which a university has embedded itself within the model’s Knowledge Space (research production), Innovation Space (commercialization), and Consensus Space (inter-institutional alignment). Cai and Etzkowitz (2020) confirm that this trajectory from knowledge production to network embeddedness to revenue generation holds across emerging economies, though its pace is mediated by institutional governance and the composition of academic human capital. International publications reinforce this dynamic by serving as reputation-building signals that lower the transaction costs of forming industry-government partnerships (Leydesdorff & Smith, 2022).

Another significant trend is the sharp increase in international publications. Scopus report the number of publications by Vietnamese scientists in prestigious journals grew from 3,000 in 2010 to over 12,000 in 2020. This increase reflects

the improvement in research quality and the growing capacity of Vietnamese scientists to integrate internationally. In addition, universities are focusing on developing a team of young faculty members and researchers through doctoral programs, post-doctoral training, and short-term courses, both locally and internationally. This initiative aims to build a highly skilled research workforce capable of meeting the growing demands of society and the labor market.

Nguyen et al. (2021) argue that government incentives and support policies are crucial for promoting university research activities. Funding programs, scholarships, and scientific awards motivate lecturers, scientists, and students to actively engage in research, contributing to the broader development of science and technology in Vietnam. However, challenges remain. Research infrastructure remains weak, with insufficient investment from both the government and the private sector. Current support policies lack synchronization and effectiveness; only about 30% of universities have functioning technology transfer centers. Increased investment and support are urgently needed to fully unlock the potential of these activities and maximize their contribution to the economy and society.

The quality of human resources has a significant impact on the revenue generated from research and technology transfer activities at universities. Highly qualified and experienced faculty members tend to attract more research projects and produce higher-value results, increasing research revenue. Hoc and Trong (2019) suggest that faculty members with doctoral degrees can enhance a university’s competitiveness in securing research funding and promoting international collaboration, leading to increased revenue from technology transfer contracts. In contrast, Dang et al. (2024) argue that faculty members

with master's degrees, associate professor titles, or even full professor titles may lack the skills necessary for implementing quality projects or attracting funding, which reduces the potential for generating revenue. Inadequate commercialization skills and limited collaboration with businesses may lead to fierce competition for funding, inefficient project management, and wasted resources, all of which diminish the ability to generate revenue from research and technology transfer (Dang et al., 2024; Nguyen et al., 2021). The inconsistencies in these studies mainly stem from differences in institutional contexts between countries. Furthermore, many studies assume a linear relationship, while the actual impact may be non-linear or have threshold effects. Therefore, conflicting results do not necessarily reflect theoretical contradictions but may arise from differences in models and research contexts.

The existing literature presents several inconsistencies regarding the determinants of research performance and innovation outcomes in higher education institutions. While Nguyen et al. (2021) highlight the importance of management and infrastructure policies in enhancing research productivity, the role of human resource factors appears less pronounced, contrasting with international studies that emphasize human capital as a key driver of research performance. Similarly, studies on university-industry collaboration in Vietnam (Dang et al., 2024; Hoc & Trong, 2019) report that collaboration outcomes are concentrated more on social and institutional benefits than on economic returns, which differs from the expectations of the Triple Helix framework and evidence from developed economies where commercialization outcomes are more prominent. In addition, Klineciewicz and Zaei (2025) suggest that research success can be achieved through multiple configurations of conditions, challenging the assumption of uniform effects commonly adopted in traditional linear models.

Despite these contributions, existing studies exhibit notable limitations. Leslie et al. (2012) rely heavily on theoretical overviews and qualitative analysis, reducing the practical applicability of their conclusions. Hoc and Trong (2019) and Nguyen et al. (2021) relied primarily on faculty-based survey data collected from specific groups of universities, limiting the generalizability of their findings across the higher education sector. Dang et al. (2024) focused largely on perceived outcomes of collaboration, with less attention to measurable research-related outcomes. Meanwhile, Klineciewicz and Zaei (2025) examined research infrastructure within the contexts of Poland and the Czech Republic, which differ substantially from the institutional environment of Vietnam.

To address these gaps, this study uses data collected from the public reports of 39 universities in Southern Vietnam between 2017 and 2023. Observations with missing data were excluded, resulting in a final dataset of 163 observations. We use the Robust Least Squares regression model to analyze the relationship between human resource quality, the number of international publications, and research revenue at universities.

Based on Triple Helix Theory and the empirical findings from prior studies, the hypotheses of this study are developed as follows:

Hypothesis H1a: The proportion of faculty members holding master's degrees negatively affects university research revenue.

Hypothesis H1b: The proportion of faculty members holding doctoral degrees positively affects university research revenue.

Hypothesis H1c: The proportion of faculty members with Associate Professor titles positively affects university research revenue.

Hypothesis H1d: The proportion of faculty members with Professor titles positively affects university research revenue.

Hypothesis H2: The relationship between international publications and university research revenue follows a non-linear U-shaped pattern, whereby the initial effect is negative but becomes positive after exceeding a certain accumulation threshold.

3. Research methodology

3.1. Model construction

Previous studies highlight a positive relationship between international research publications and universities' revenue from technology transfer. Dang et al. (2024) noted that increased international publications and collaborations help elevate universities' global and domestic reputation, thereby creating favorable conditions for expanding technology transfer contracts and industry engagement. Similarly, Klineciewicz and Zaei (2025) noted that international publications elevate the global status of researchers and universities, attracting collaboration opportunities from businesses and organizations. Nguyen et al. (2021) further emphasized that institutions with robust international publishing records secure more funding as partners prioritize reputation and research achievements. Building on this evidence, Model 1 is designed to examine the impact of global publication output on technology transfer revenue:

Model 1:

$$Revenue_research_{i,t} = \beta_0 + \beta_1 international_publications_{i,t} + \sum \beta qcontrol_{i,t} + \alpha_i + \alpha_t + \mu_{it} \quad (1)$$

Previous studies underscore the critical role of human resource quality in driving universities' income from research activities and technology transfer. Rousseeuw and Croux (1993) highlighted that highly qualified and experienced lecturers enhance research stability and accuracy, attracting more projects and funding. Similarly, Ranga and Etzkowitz (2013) and Geuna and Nesta (2006) emphasized that

high-caliber faculty enhance research quality and facilitate technology transfer agreements, thereby significantly boosting university revenue. Based on this, Models 2, 3, 4, and 5 are developed to examine the impact of faculty qualifications, including Master's and doctoral degrees, Associate Professor, and Professor titles, on revenue from scientific research transfer:

$$Revenue_research_{i,t} = \beta_0 + \beta_1 MSc_{i,t} + \sum \beta qcontrol_{i,t} + \alpha_i + \alpha_t + \mu_{it} \quad (2)$$

$$Revenue_research_{i,t} = \beta_0 + \beta_1 PhD_{i,t} + \sum \beta qcontrol_{i,t} + \alpha_i + \alpha_t + \mu_{it} \quad (3)$$

$$Revenue_research_{i,t} = \beta_0 + \beta_1 Assoc.Prof_{i,t} + \sum \beta qcontrol_{i,t} + \alpha_i + \alpha_t + \mu_{it} \quad (4)$$

$$Revenue_research_{i,t} = \beta_0 + \beta_1 Prof_{i,t} + \sum \beta qcontrol_{i,t} + \alpha_i + \alpha_t + \mu_{it} \quad (5)$$

We established model number 6 to examine the simultaneous impact of the number of international publications and the quality of human resources on the revenue from scientific research transfer at universities:

$$Revenue_research_{i,t} = \beta_0 + \beta_1 Prof_{i,t} + \beta_2 Assoc.Prof_{i,t} + \beta_3 PhD_{i,t} + \beta_4 MSc_{i,t} + \beta_5 international_publications_{i,t} + \sum \beta qcontrol_{i,t} + \alpha_i + \alpha_t + \mu_{it} \quad (6)$$

In addition, we set up model 7 to examine the non-linear relationship between international publications and scientific research transfer revenue at universities:

$$Revenue_research_{i,t} = \beta_0 + \beta_1 Prof_{i,t} + \beta_2 Assoc.Prof_{i,t} + \beta_3 PhD_{i,t} + \beta_4 MSc_{i,t} + \beta_5 international_publications_{i,t} + \beta_6 international_publications_squared_{i,t} + \sum \beta qcontrol_{i,t} + \alpha_i + \alpha_t + \mu_{it} \quad (7)$$

In which revenue_research is the revenue from scientific research transfer activities, Prof variable is the number of lecturers with the Professor title, and the Assoc. Prof variable represents the number of faculty members with Associate Professor titles. The Prof variable denotes the number of faculty members with Professor titles. The PhD variable is the

number of lecturers with doctoral degrees. The MSc variable is the number of lecturers with master's degrees. International publications refer to the number of annual international publications produced by a specific university. The control variables include total revenue, total number of students, and floor area per student. First, Total Income (TINCOME) is included to control for the financial capacity and overall scale of the institution. Second, Total Students (TSTUDENT) is employed to account for the enrollment scale of the university. A larger student body may reflect a stronger institutional presence, but it could also indicate a heavier orientation toward teaching rather than research. Third, Size per Student (SPSTUDENT), calculated as the total floor area divided by the total number of students, is introduced as a proxy for the university's physical infrastructure capacity. All variable definitions are detailed in Appendix A.

3.2. Estimation methodology

We performed two tests to evaluate the method's suitability for each model: the Hausman test and the Redundant test (Le et al., 2024; Nguyen et al., 2024). Based on the results of these tests, we selected the Fixed Effects Model (FEM) for all models (Le et al., 2023) to analyze the impact of international publications and the quality of human capital on research revenue. However, as highlighted by Le et al. (2024) and Nguyen et al. (2024), the FEM may face challenges such as heteroscedasticity, non-normal distributions, and outliers, particularly when the dataset is small. To address these limitations, we employed the Robust Least Squares (RLS) method, which is advantageous over FEM when dealing with outliers or non-normal distributions. RLS employs robust loss functions to mitigate the influence of outliers, resulting in more stable and precise estimates under less-than-ideal conditions. According to Rousseeuw and Croux (1993), robust methods

such as RLS significantly enhance estimation efficiency compared to FEM, especially when the data deviates from the normal distribution and contains numerous outliers. This makes RLS an effective tool for regression analysis, particularly with irregular or heterogeneous datasets.

3.3. Data

We collected data from annual public reports of 61 universities in the South from 2017 to 2023. These reports are published on the universities' websites as required by Circular 36/2017/TT-BGDDT and Circular 09/2024/TT-BGDDT. We selected the sampling period from 2017, as universities require time to fully publish their annual reports on their websites after the enactment of Circular 36/2017/TT-BGDDT in 2017. After removing observations and universities that lacked necessary data, the final dataset consists of 163 observations from 39 universities.

4. Results and discussions

4.1. Descriptive statistics

Descriptive statistics (*see Appendix 3 online*) reveal that several variables are noticeably right-skewed, as seen in the large gap between the mean and median – for example, research revenue averages 12.573 but has a median of just 3.300, and international publications average 50.207 despite a median of 0.000. The high standard deviations for these variables further point to the presence of extreme outliers in the sample. The research staff variables follow a typical pyramid structure, declining steadily from master's degree holders (324.220) to PhDs (144.110), associate professors (31.195), and full professors (4.695). Additionally, the two scale-related variables, TINCOME and TSTUDENT, show considerable dispersion, reflecting substantial differences in size across the units in the sample.

4.2. Pearson correlation matrix

Appendix 4 (*see Appendix 4 online*) presents the correlation of all variables based on the collected sample data. The results show that the variables, including the presence of lecturers with master's degrees, PhD degrees, associate professors, and professors, as well as the size per student (SPSTUDENT), total income, and total number of students, all positively correlate with

research revenue. In contrast, international publications exhibit a negative correlation with research revenue. The correlation coefficients among the variables do not exceed 0.87, with the strongest correlation between lecturers with master's degrees and those with PhD degrees (0.867), indicating a relatively strong positive relationship.

4.3. Regression Results and Discussion

Table 1. Regression results using the Fixed Effects Model

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
MSc		-0.023 (0.163)				-0.030 (0.319)	-0.028 (0.364)
PhD			0.011 (0.760)			-0.108 (0.310)	-0.125 (0.243)
Assoc. Prof				0.123 (0.118)		0.403** (0.024)	0.432** (0.016)
Prof					0.178 (0.761)	-0.041 (0.953)	-0.113 (0.8714)
International publications	-0.140*** (0.001)					-0.105** (0.023)	-0.215
International publications square							0.0003 (0.241)
SPSTUDENT	0.262** (0.012)	0.303*** (0.006)	0.301*** (0.007)	0.294*** (0.007)	0.297*** (0.008)	0.253** (0.015)	0.233** (0.026)
TINCOME	0.175*** (<0.001)	0.165*** (<0.001)	0.165 (<0.001)	0.171*** (<0.001)	0.163*** (<0.001)	0.194*** (<0.001)	0.198*** (<0.001)
TSTUDENT	-0.001** (0.034)	-0.001** (0.027)	-0.002*** (0.007)	-0.002*** (0.002)	-0.002*** (0.005)	-0.001** (0.041)	-0.001** (0.041)
C	-20.046** (0.012)	-14.415** (0.088)	-17.202** (0.044)	-17.367** (0.037)	-16.884** (0.045)	-13.751* (0.087)	-11.801 (0.148)
R-squared	0.476	0.412	0.397	0.416	0.398	0.531	0.539
Adjusted R-squared	0.449	0.3417	0.366	0.386	0.366	0.479	0.4417
F-statistic	17.519	13.501	12.715	13.713	12.715	10.327	9.385
Prob(F-statistic)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
N	163	163	163	163	163	163	163
Wald test	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Wooldridge test	0.142	0.143	0.146	0.141	0.143	0.094	0.093
Hausman test	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Redundant test	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
University fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Turning point							358.33

Notes: Table 1 represents the estimation results from FEM. The sample comprises 163 observations from 39 universities in Southern Vietnam, spanning the years 2017 to 2023. All variable definitions are reported in Appendix A. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. The P-value is in parentheses.

Table 1 presents the estimation results for the research revenue of 39 universities in southern Vietnam. Various tests were conducted to determine the most appropriate method for the models. After applying for the Hausman test and the Redundant test, both of which yielded p-values below 5%, the fixed effects model (FEM) was chosen. The results indicate that lecturers with master's degrees, doctoral degrees, professor titles, and international publications have a negative impact on research revenue. On the other hand, lecturers with Associate Professor titles and those with a high number of international publications show a positive relationship with research revenue.

Furthermore, the variables "SPSTUDENT" and "TINCOME" exhibit a positive correlation with research revenue, while "TSTUDENT" has an adverse effect. However, the FEM does not address issues of heterogeneity, outliers, or non-normal data distributions. To mitigate these concerns, we apply the robust least squares (RLS) method, which is better suited to handling outliers, especially in small datasets. Outliers can significantly distort the estimation results, reducing the model's accuracy and stability (Le et al., 2024; Nguyen et al., 2024).

Table 2. Regression results using RLS estimations

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Msc		0.006*** (0.006)				-0.009*** (0.008)	-0.009*** (0.009)
PhD			0.018*** (<0.001)			0.052*** (<0.001)	0.050*** (<0.001)
Assoc. Prof				0.041*** (<0.001)		-0.038** (0.047)	-0.035** (0.069)
Prof					0.217*** (0.002)	0.002 (0.979)	-0.013 (0.859)
International publications	-0.012** (0.026)					-0.011** (0.023)	-0.029*** (0.009)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
International publications squared							0.0001* (0.098)
SPSTUDENT	0.044*** (0.001)	0.049*** (<0.001)	0.052*** (<0.001)	0.055*** (<0.001)	0.045*** (<0.001)	0.046*** (<0.001)	0.040*** (<0.001)
TINCOME	0.003 (0.429)	-0.005 (0.126)	-0.002 (0.503)	0.001 (0.806)	-0.005 (0.164)	0.008*** (0.006)	0.010*** (0.001)
TSTUDENT	0.001 (0.201)	0.001 (0.304)	0.001 (0.989)	0.001 (0.8417)	0.001 (0.142)	-0.001* (0.097)	-0.001** (0.074)
C	1.338 (0.188)	1.308 (0.209)	0.937 (0.301)	1.215 (0.172)	1.636* (0.093)	0.132 (0.880)	0.469 (0.593)
R-squared	0.074	0.076	0.152	0.149	0.091	0.189	0.209
Adjusted R-squared	0.026	0.028	0.108	0.105	0.044	0.100	0.111
Deviance	1770.263	1717.676	1475.206	1461.315	1639.472	1067.463	1027.158
R-squared statistic	19.755	22.519	44.505	48.309	25.974	104.4176	114.741
Prob (R-squared stat.)	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Turning Point							145

Notes: Table 2 represents the estimation results from RLS. The sample comprises 163 observations from 39 universities in Southern Vietnam, spanning the years 2017 to 2023. All variable definitions are reported in Appendix A. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. The P-value is in parentheses.

Table 2 presents the estimated coefficient of determination (R^2) for Model 7, which is 0.209. The P-value of the LR statistic is less than 1%, indicating that the model is statistically significant. This finding confirms that the regression model is statistically significant, meaning that the independent variables, including the proportions of faculty with doctoral and Master's degrees, senior academic titles, and the volume of international publications, collectively explain the variance in university research revenue. In other words, R^2 reflects the appropriate resolution level of the nature of the revenue studied, as determined by the survey data.

5. Conclusions and managerial implications

5.1. Conclusion

This study evaluates the impact of human resource quality and international publications

on university research revenue. The dataset comprises 39 universities in Southern Vietnam from 2017 to 2023, marking a pioneering effort in leveraging data from three public financial reports to analyze these relationships. By employing the Robust Least Squares method to address heteroskedasticity and outlier sensitivity (Rousseeuw & Croux, 1993), the empirical results indicate that an increase in the number of faculty members with doctoral degrees will positively affect research revenue. Specifically, model 7 shows that when the proportion of faculty with PhDs increases by 1 unit, research revenue increases by approximately 0.050 units (*ceteris paribus*). This effect is the largest compared to the other academic qualification variables in the full model, reflecting the particular importance of the PhD workforce to revenue-generating research. The results are also consistent with the Triple Helix theory, where highly qualified faculty play a crucial

role in fostering interactive relationships, technology transfer, and collaboration between universities, the government, and businesses within the innovation ecosystem (Etzkowitz & Leydesdorff, 2000). Our findings support Hypothesis 1b.

Conversely, Master 's-level lecturers (MSc) show a negative association with research revenue in model 7. When the proportion of lecturers with a master's degree increases by 1 unit, research revenue decreases by approximately 0.009 units. This result can be explained by the fact that lecturers with master's degrees tend to focus primarily on teaching rather than on in-depth research (Rahimi et al. 2021). Our findings support Hypothesis 1a. Besides, the effects of Associate Professor and Professor titles lose statistical significance in the full model, most likely due to multicollinearity with the PhD variable, since virtually all holders of these titles in Vietnam also hold doctoral degrees, and to the relatively small number of full Professors in the sample. Beyond statistical overlap, a substantive explanation is that senior titleholders in Vietnamese universities frequently bear heavy administrative and accreditation duties that crowd out time for revenue-generating research, attenuating any positive human capital effect. These findings are broadly consistent with Hattie and Marsh (1996), who caution that formal seniority does not automatically translate into research productivity when non-research obligations are large. Hypotheses 1c and 1d are not supported.

Most notably, international publications exhibit a U-shaped (non-linear) relationship with research revenue. In Model 7, both the international publications variable and the international publications squared variable are statistically significant, and the relationship between international publications and research revenue has an inflection point at 14.5 articles. When the number of publications increases and reaches 14.5 articles, research revenue reaches a minimum. However, if the

number of publications continues to increase, this relationship becomes positive. Statistically, there are 30 annual observations of the international publication's variable above 14.5, and 195 observations below this level based on data from 61 universities in the South from 2017 to 2023. This suggests that universities tend to focus on domestic publications rather than international publications. For institutions below this threshold, additional publications associated with research revenue decrease, which can be explained by the fact that faculty at early-stage research universities tend to prioritize basic, curiosity-based research rather than applied or commercially oriented projects; outputs that are academically valuable but do not generate immediate revenue. When the number of publications exceed 14.5 articles, the institution's accumulated prestige capital and density of its international network begin to attract research contracts, technology transfer agreements, and competitive funding income, reversing the initial negative trend. This finding also extends the common linear characteristics in previous literature and constitutes the most novel empirical contribution of the research. The findings provide empirical evidence supporting Hypothesis 2.

The findings contribute empirical evidence supporting sustainable growth in research revenue for higher education institutions. To enhance research capabilities, universities should prioritize investment in training and development, equipping faculty with the skills necessary to increase international publications. For instance, leading US institutions such as Harvard and MIT have heavily invested in research infrastructure, offering abundant funding and support for research projects. These efforts enable researchers to focus on producing high-impact publications while benefiting from a robust funding ecosystem, including federal, state, and private resources (National Science Foundation, 2021).

Similarly, Germany emphasizes the development of high-quality human resources through doctoral and postdoctoral training programs. Access to international collaborations and advanced facilities enables researchers to enhance the quality and quantity of their publications (El Hajj et al., 2020). Universities should also implement incentive mechanisms to motivate professors and doctoral lecturers to publish impactful research, striking a balance between incentives and manageable workloads to prevent burnout. For example, France has introduced policies that link research funding to achievements in international collaborations and large-scale projects, thereby fostering quality improvements and attracting funding (Morillo, 2019).

5.2. Recommendations

The dominance of doctoral faculty as a revenue driver indicates that universities should prioritize doctoral recruitment, retention, and in-service PhD sponsorship as a core strategic investment. Structured workload models that protect research time, particularly for mid-career faculty who face growing administrative burdens, are equally important to avoid the diminishing returns observed for Associate Professors in the full model. The non-linear publication finding calls for a threshold-aware publication strategy. Universities with fewer than 145 international articles should concentrate resources on crossing this inflection point through seed funding, writing support, and international co-authorship facilitation. Moreover, improving the transparency of financial reporting at Vietnamese higher education institutions is crucial. Policymakers should establish standardized regulations for reporting content and format, supported by an online disclosure system to enhance accessibility. Independent and periodic audits, along with strict sanctions for violations, are recommended to ensure accuracy and accountability. Training programs for financial management staff can further improve report quality.

5.3. Limitations of the study

Despite its contributions, this study faces limitations. Inconsistencies in reporting formats limit the dataset, and the Robust Least Squares method cannot fully address endogeneity. Furthermore, the study's limitations lie in its relatively small and unbalanced dataset, which limits the application of advanced econometric methods, such as the Generalized Method of Moments (GMM), to fully address endogeneity. Future work should consider System GMM (Blundell & Bond, 1998) or instrumental variable approaches. Additionally, the analysis does not distinguish between revenue types (grants, contracts, licensing) or publication quality (journal ranking, citation impact), disaggregation of which would yield sharper policy insights. Future research should expand the sample nationally, incorporate bibliometric quality indicators, and conduct comparative analyses across ASEAN higher education systems to test the cross-national validity of the publication threshold and faculty qualification findings reported here.

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Data Availability

The data analyzed in this study were compiled by the authors from publicly available annual Three Public Disclosure Reports issued by the participating universities. These reports are available on the official websites of the respective institutions.

AI Usage Statement

During manuscript preparation, the authors used Gemini and Grammarly for language editing and improving sentence clarity and readability. The authors reviewed, edited, and take full responsibility for the final content of the manuscript.

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