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AN INTERNAL OPTIMIZATION MODEL FOR TEACHING BUDGET ALLOCATION TO TEACHING COLLEGES OF LOCAL REGULAR UNDERGRADUATE UNIVERSITIES

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Abstract

This study aims to develop an internal optimization model for the allocation of teaching budgets to local regular undergraduate universities, focusing on identifying internal indicators that influence budget allocation and their interrelationships. Utilizing a mixed-methods approach, the research surveyed 511 participants from 16 public undergraduate universities in Sichuan Province, incorporating both quantitative and qualitative analyses through SPSS and interviews. The findings revealed five key internal indicators: the Scale of the Faculties (SF), Special Projects (SP), Discipline and Professional Construction (DPC), Collaborative Education (CE), and Teaching Reform and Research (TRR), all positively associated with teaching budget allocation. Notably, SF was found to mediate the relationship between the other variables and budget allocation. The constructed optimization model demonstrated robustness through various fit indices, indicating a substantively meaningful and parsimonious model. The study holds significant policy implications, offering a strategic guide for budget allocation that could enhance educational outcomes, transparency, and accountability in fund management. Academically, it provides a theoretical framework for educational economics, potentially impacting related fields such as public administration and organizational theory. Practically, it offers valuable insights for university administrators, facilitating informed decision-making to maximize educational quality and performance. This research contributes to the broader discourse on financial management within educational institutions, providing a benchmarking tool for optimal resource allocation and encouraging the adoption of best practices in financial decision-making.

Keywords: Local Regular Undergraduate Universities; Teaching Colleges; Teaching Budget Allocation; Optimization Model.

1. INTRODUCTION

1.1 Research Background

Effective budget management is crucial for universities to efficiently utilize resources and achieve strategic goals, especially in China where higher education institutions face the dual challenges of improving quality and ensuring financial sustainability. Well-managed budgets enable universities to enhance educational outcomes, recruit qualified faculty, and bolster research (Guderian et al., 2020). Innovative budgeting is essential for adopting new technologies and teaching methods, supporting research and development efforts (Dodgson, 2017; Humeniuk et al., 2022). This is particularly vital for local regular undergraduate universities in economically less developed areas like Sichuan's Tibetan regions, which must

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balance affordable education with high teaching and research standards. Given their role in serving diverse communities, these institutions require strategic budget allocation to meet educational challenges including faculty development, infrastructure enhancement, and student services. Traditional budgetary practices fall short of meeting contemporary needs, pointing to the necessity for an optimized internal budget model to ensure comprehensive funding of educational priorities.

1.2 Problem Statement

Existing research has shed light on inefficiencies in university budgeting, including a lack of financial management awareness, poor performance assessment, and misalignment between departmental budgets and institutional goals, especially within China's local undergraduate universities. Challenges encompass outdated budgeting methods, insufficient internal assessments, and issues with budget transparency and performance evaluation, leading to poor resource allocation. This study narrows its focus to these universities, proposing an internal optimization model for teaching budget allocation that considers key variables such as the Scale of the Faculties (SF), Special Projects, and Discipline and Professional Construction. By highlighting SF's mediating role, the model underscores faculty size and development as crucial for efficient budget use. The proposed model aims to enhance budget efficiency and effectiveness, allowing universities to allocate funds in line with institutional objectives and external standards. This approach is vital for improving financial management and ensuring better educational quality, transparency, and accountability. Thus, this study addresses the gap by presenting a structured framework to remedy current budgeting practice inefficiencies, significantly benefiting local undergraduate universities in Sichuan Province and beyond.

1.3 Research Objectives

This paper aims to address the issues related to the teaching budget of local regular undergraduate universities. It seeks to explore the following:

1. The key internal indicators that influence teaching budget allocation in these universities.
2. The correlations between these indicators.
3. The impact of these indicators on teaching budget allocation.

2. LITERATURE REVIEW

2.1 Education Finance Theory (EFT)

The discussion on Education Finance Theory (EFT) underscores the pivotal role of financial management in educational settings, notably in higher education, by examining the allocation, distribution, and utilization of financial resources to achieve educational aims. This analysis spans a broad spectrum of research areas, including policy analysis, budgeting practices, funding source evaluations, and the development of financial strategies to promote equitable education access. The multifaceted research covers how policy changes (Johnes & Johnes, 1994) and curricular reforms (Li, 2018) impact resource allocation and outcomes, the formation of financial management strategies for institutional sustainability (Muhavani, 2019), the

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exploration of government and alternative funding models (Mabeya & Elly, 2020), and the scrutiny of student fee structures for transparency and equity (Ridpath et al., 2023). Additionally, it delves into the assessment of regional disparities in funding (Zhao, 2023) and the innovative potential of crowdsourcing for educational financing (Agarwal et al., 2021). These studies comprehensively illustrate EFT's application in addressing the financial challenges and solutions within higher education settings.

2.2 Innovation Management Theory (IMT)

Innovation Management Theory (IMT) outlines the processes organizations use to foster new ideas, services, or products, encompassing the stages of ideation, development, and implementation. Tidd & Bessant (2018) provide a detailed analysis of managing changes across technology, market, and organizations under this theory, highlighting innovation as essential for growth and adaptability. In higher education, IMT plays a critical role in curriculum development, teaching methodologies, and administrative processes, supporting sustainable educational growth (He, Xin, & Hu, 2019). The digital transformation introduces new IMT applications, such as collaborative psychology management innovations by Bao and Xu (2022), and the utilization of MOOCs for improved teaching infrastructures as explored by Zhao and Liu (2018).

Furthermore, the theory supports innovative teaching and management models in universities, with examples of innovation and entrepreneurship ecosystems (Zhao & Huang, 2022). Big data technology, as discussed by Yu (2021), and the formation of high-level teaching teams (Kan, 2021) demonstrate IMT's contribution to revealing educational insights and fostering collaborative innovation. Larger educational strategies, like constructivism and transformational leadership (Jiang, Jiang, & Ye, 2023; Meng, 2022), also align with IMT's principles, aiming at optimizing educational management and improving teaching quality.

IMT guides the strategic allocation of teaching budgets in higher education by promoting investments in technologies and pedagogies that enhance educational outcomes and operational efficiency. This approach ensures that budgeting decisions align with the institution's strategic goals and the evolving educational landscape, maximizing the impact of resources on student engagement and learning success

2.3 Resource Dependence Theory (RDT)

Resource Dependence Theory (RDT) is a framework that explains how organizations are influenced by their external environment and the need to secure essential resources. It suggests that organizations must develop strategies to manage their dependencies on external resources and adapt to changing circumstances.

In the context of higher education, RDT can be applied to understand how universities are influenced by external factors and how they allocate resources to meet their goals. Researchers have used RDT to analyze various aspects of higher education finance, including:

- Resource allocation: Examining how universities allocate resources to meet their strategic goals (Kohtamäki, 2023).

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- External dependencies: Analyzing the impact of external factors on institutional efficiency and resource management (Chan, 2006).
- Budget optimization: Developing strategies for optimizing budget allocation based on external resource dependencies (Zhao, 2023).

By applying RDT to the construction of an internal optimization model for teaching budget allocation, you can frame the discussion on how universities can strategically manage their dependencies on external resources. This will provide a robust theoretical foundation for your model and emphasize the importance of aligning internal budget allocation strategies with external factors.

2.4 Teaching Budget Allocation in Chinese higher education

As of late 2023, among China's universities, 1,125 are local undergraduate institutions, representing 90.7% of the nation's total. These public universities adhere to the "Financial Rules for Public Institutions," highlighting budgeting and performance management's significance. Emphasizing efficient fund utilization and performance, the Chinese higher education financial system mandates institutions to enhance financial systems and economic accounting (Ministry of Finance & Ministry of Education, 2022). Within this framework, budgeting emerges as a pivotal financial management aspect, emphasizing balanced income and expenditure to ensure key areas remain funded while practicing thriftiness. Chen (2007) conceptualizes university budget management as a strategic process aligning with institutional goals, advocating for innovative budget concepts like "comprehensive," "financing," and "cost" budgets, along with methods such as "zero-based" and "human-based" budgeting for effective financial operations. This perspective is supported by Wang (2016), who discusses the incentives driving Chinese higher education funding, including bureaucratic aspirations and government fund acquisition.

Despite these insights, a comprehensive empirical analysis of performance funding models, particularly in provincial contexts like Sichuan's reform, remains a gap. Further explorations could investigate budgeting's impact on various outcomes such as academic performance, equity, and access to higher education.

3. RESEARCH HYPOTHESES

3.1 The Scale of Faculties (SF) and teaching budget allocation (TBA)

In higher education, the allocation of teaching budgets is directly influenced by student enrollment numbers, leading to increased budgets for faculty salaries and educational resources, which reduces costs per student, possibly improves educational quality, and boosts tuition revenue (Amin, 2015; Hanushek & Rivkin, 2010; Higher Education Funding Council for England, 2020). Additionally, universities with a diverse range of majors attract more funding due to market demand and the attractiveness of varied academic offerings, contributing to higher enrollment and financial gains. STEM disciplines typically receive more funding than the humanities and social sciences, reflecting their more intensive resource needs (Duncan &

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Singer, 2018; Perna et al., 2010; Ehrenberg & Zhang, 2005; Olitsky & Milakofsky, 2013; Burke & Minassians, 2013). Moreover, the size of the faculty correlates with budget allocations, with larger faculties supporting a wider curriculum and better educational outcomes, thus attracting more students and increasing revenue. Thus, teaching budget distribution within universities is closely linked to student numbers, the diversity of academic programs, and faculty size, indicating the strategic priorities of each institution.

H1: There is a positive correlation between SF and teaching budget allocation.

3.2 Special Projects (SP) and teaching budget allocation (TBA)

The creation of ideological and political theory courses significantly impacts budget planning in higher education, underscoring the necessity for advanced pedagogic approaches and protection measures. Such courses' funding can often be skewed by government policies favoring certain institutions (Gilroy, 2015), a practice with historical roots in budget documentation (Erozan & Turan, 2004). Chinese Ministry of Education mandates call for substantial funding for Marxist colleges to improve infrastructure and academic resources (Ministry of Education of the People's Republic of China, 2003). Similarly, the need for quality sports facilities has led to an increase in budgetary allocations to support physical education, with potential benefits on healthcare costs (Wang, 2018; Osipov et al., 2016; Li, 2015; Ridpath et al., 2015). National policies now push for enhanced physical education infrastructure and fiscal backing (Office of the Central Committee of the Communist Party of China and the General Office of the State Council, 2020). Additionally, the growing concern for student mental health is reshaping financial priorities, advocating for increased investment in mental wellness services and the integration of mental health education into curricula, to improve student well-being and academic outcomes while potentially reducing long-term costs (McCloud & Bann, 2019; Leshner et al., 2021; Aharoni Zorach & Lipka, 2022; Li, Bao, & Liu, 2022; Zając et al., 2023; Zapata-Garibay et al., 2021).

H2: The presence and scale of SP within teaching colleges are positively associated with teaching budget allocation.

3.3 Discipline and Professional Construction (DPC) and teaching budget allocation (TBA)

In higher education, the development of professional construction projects aimed at improving academic and vocational disciplines requires dedicated teaching budget allocations (TBA) to provide quality, market-relevant education. This strategic allocation is essential for blending professionalism with innovation in education (Yang, 2024; Li, 2023). Curriculum development is critical in this effort, laying the groundwork for educational quality and efficient use of teaching resources, a point stressed by Tractenberg et al. (2020). There is a push for curricula that are more global and interconnected, which necessitates a budgetary shift toward embracing modern educational methods (Posillico et al., 2021). The need for budget adjustments to support innovative materials and courses is also highlighted (Chen & Yang, 2021; Bao & Chen, 2022), along with the importance of using TBA to deliver curricula that advance student literacy and ethics (Wang, 2023; Li, 2023). The maintenance of experimental and training labs presents a complex challenge, illustrating the intricate relationship between TBA and the

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provision of hands-on laboratory experiences crucial for high-quality education in fields like science and engineering. This challenge is reflected in various institutional strategies and their impacts (Martin & Brown, 1997; Petrova and Hadjianastasis, 2015; Arvidsson et al., 2016).

H3: Discipline and Professional Construction (DPC) programs by local regular undergraduate universities is positively associated with increased teaching budget allocation.

3.4 Teaching Reform and Research (TRR) and teaching budget allocation (TBA)

The importance of teaching reform and research (TRR) in higher education is crucial for improving educational competitiveness and adapting to new challenges. Kniest (2017) stresses the need for better funding and accountability to support these reforms, while Krylova, Simakina, and Frygin (2016) point out the inefficiencies in Russian education reform funding. Domínguez Menéndez et al. (2018) suggests modern management techniques to overcome financial hurdles, advocating for strategic teaching budget allocations (TBA) to bolster educational reforms and interdisciplinary research projects, recognized for their innovative potential (Ehrenberg, 2003; Dorff & Narayan, 2013). Additionally, teaching achievement awards play a vital role in encouraging excellence and faculty development (Supriyoko, 2010; Holden, 2007; Totochenko, 2022; Feixas and Zellweger, 2020), highlighting the importance of financial incentives in maintaining high-quality education (Carvalho, 2013). Moreover, the interdisciplinary approach is commended for its ability to enhance institutional sustainability and academic quality, necessitating adaptable funding models for support (Domínguez Menéndez et al., 2018; Khadri, 2014; König & Gorman, 2016). These insights collectively emphasize the need for efficient TBA to foster teaching reforms, research, and interdisciplinary collaboration within higher education.

H4: Investments in Teaching Reform and Research (TRR) activities have a positive influence on teaching budget allocations.

3.5 Collaborative Education and teaching budget allocation (TBA)

The integration of part-time external teachers into higher education is crucial for enhancing delivery and quality, requiring strategic teaching budget allocation (TBA) to address budget constraints and professional development needs (Husbands, 1998; Sclafani, 2010; Roshchina & Filippova, 2014; Beaton, 2017; Crawfurd & Pugatch, 2020). Dual tutoring, leveraging both internal and external faculty, presents a novel approach to supplementing financial support and improving educational outcomes but necessitates careful budgeting (González, 2000; Appell, 2023; Synchak & Hrekhova, 2020; Kisbiyanto, 2015; Zinth & Barnett, 2018). On-the-job practice is identified as essential for pedagogical enhancement and professional development, advocating for TBA supporting continuous learning (Ball & Forzani, 2009; Dziaczkowska, 2016; Aglazor, 2017; Oleynikova et al., 2019). Internships are pivotal for bridging theory with practice, emphasizing the necessity of strategic budgeting for program support (Lynch et al., 1999; Hergert, 2009; Hodo, 2013; Tavener et al., 2021). Finally, the integration of industry and education is crucial for fostering innovation and economic development, requiring financial investment and strategic financial management for effective partnerships (Zhou, 2020; Zhu et al., 2021; Lu, 2022; Oleynikova et al., 2019; Newman, 2013). This collective research

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underscores the multifaceted nature of TBA, emphasizing strategic investment in part-time faculty, dual tutoring, on-the-job practice, internships, and industry-education collaboration to enhance higher education outcomes.

H5: Collaborative education initiatives have a positively significant influence on teaching budget allocations by local regular undergraduate universities.

H6: The scale of the faculties (SF) mediates the relationships between other independent variables (DPC: Discipline and Professional Construction, CE: Collaborative Education, TRR: Teaching Reform and Research, SP: Special Projects) and teaching budget allocation in local regular undergraduate universities.

Based on the above discussion and literature we have proposed the following conceptual framework as shown In Figure 1.

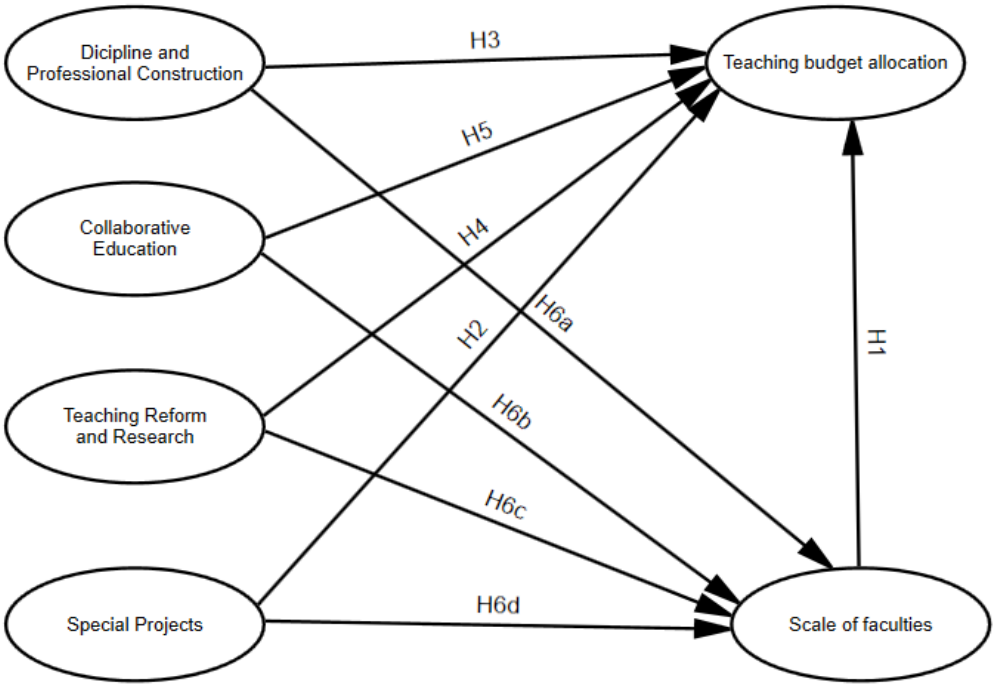

Figure 1: Conceptual framework

4. RESEARCH METHODOLOGY

4.1 The Scale of Measurement

In this study, six variables and their related observation dimensions were formed by reviewing and analyzing the relevant documents of national standards. The first category are documents

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related to financial management and performance appraisal of higher education institutions: Financial System of Higher Education Institutions (Ministry of Finance & Ministry of Education, 2022); Financial Rules for Public Institutions (Ministry of Finance, 2022); Notice of Sichuan Province on Further Improving the Budget Allocation System for Provincial Undergraduate Colleges and Universities (Sichuan Provincial Department of Finance and Sichuan Provincial Department of Education, 2022); Detailed Rules for Scoring Performance Indicators of Provincial Ordinary Undergraduate Colleges and Universities in Sichuan Province (Sichuan Provincial Department of Finance, Sichuan Provincial Department of Education, 2022)

The second category are documents on Conformity Assessment and Audit Assessment: Undergraduate Education Teaching Audit and Evaluation Index System for Ordinary Colleges and Universities (2021-2025)(Ministry of Education, 2021); Sichuan Provincial Undergraduate Education Teaching Audit and Evaluation Index System (Category II)(Office of the Education Supervision Committee of the People's Government of Sichuan Province, 2022); Qualification Evaluation Index System for Undergraduate Teaching in Ordinary Colleges and Universities(Ministry of Education, 2011). Table 1 shows the variables and their observation dimensions.

Variables	Observed Dimensions	Label Name	References	Websites
TBA: Teaching budget allocation	The scale of the faculties	TBA1	(Ministry of Finance, Ministry of Education, 2022)	http://jkw.mof.gov.cn/zhengcefabu/202207/t20220729_3830852.htm
	Collaborative education	TBA2		
	Teaching reform and research	TBA3		
SF: The scale of the faculties	New majors	SF1	(Sichuan Provincial Department of Finance and Sichuan Provincial Department of Education, 2022)	https://pgc.sasu.edu.cn/info/1018/2295.htm
	STEM majors	SF2		
	New teachers	SF3		
	Double qualified teachers	SF4		
DPC: Discipline and Profession Construction	Curriculum construction Projects	DPC1	(Ministry of Education, 2011)	https://www.swpu.edu.cn/jxpgc/info/1208/5187.htm
	Construction of experimental and training laboratories	DPC2		
	Construction of off-campus practical education bases	DPC3		
CE: Collaborative Education	Employ part-time external teachers	CE1	(Ministry of Education, 2021)	http://www.moe.gov.cn/srcsite/A11/s7057/202102/t20210205_512709.html
	On-the-job practice of teachers	CE2		
	Students' internship	CE3		
	Integration of industry and education projects	CE4		

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Variables	Observed Dimensions	Label Name	References	Websites
TRR: Teaching Reform and Research	Teaching reform and research project	TRR1	(Office of the Education Supervision Committee of the People's Government of Sichuan Province, 2022)	https://www.swpu.edu.cn/jxpgc/info/1208/5187.htm
	Teaching Achievement Award	TRR2		
	"Four New" construction projects	TRR3		
SP: Special Projects	Construction of ideological and political theory courses	SP1	(The General Office of the Central Committee of the Communist Party of China and the General Office of the State Council, 2019)	http://www.moe.gov.cn/jyb_xxgk/moe_1777/moe_1778/201908/t20190815_394663.html http://www.moe.gov.cn/srcsite/A12/moe_1407/s3020/201102/t20110223_115721.html https://www.gov.cn/zhengce/2020-10/16/content_5551794.htm
	College Student Mental Health Education	SP2	(The General Office of the Ministry of Education, 2011)	
	Aesthetic Education Immersion Programs	SP3	(General Office of the Central Committee of the Communist Party of China and General Office of the State Council, 2020)	

Notes: New Majors: A new major has been enrolled, but has not yet graduated from a class of graduates. STEM majors: Science, technology, engineering, and mathematics majors.

4.2 Sample and data collection

The study focused on 16 public undergraduate universities in Sichuan Province. Both quantitative and qualitative research methods were employed. Utilizing a literature review and national teaching quality standards, six variables were defined and a Likert Five Scale was developed for the survey. A total of 511 valid responses were gathered from 598 individuals, including teachers, administrators, project leaders, and various department heads, through stratified random sampling.

4.3 Data analysis

Data analysis and model construction were conducted using SPSS-Statistics 26.0 and SPSS Amos 26.0, where analyses of reliability, validity, and path effects of structural and measurement models were performed. Furthermore, qualitative insights were obtained from interviews with 10 representatives from nine universities, including teachers and leaders from academic and financial departments. The interview data underwent comprehensive analysis using SPSSAU for word cloud, word frequency, cluster, social network relationship, and LDA topic analyses, offering a detailed understanding of the factors influencing teaching quality in these institutions.

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5. RESULTS

5.1 Respondent profile

Table 2: Profile

Data Demographic	Options	Frequency	Percentage (%)
Gender	Male	287	56.20%
	Female	224	43.80%
Total		511	100%
Age	25-35 years old	98	19.20%
	35-45 years old	200	39.10%
	45-55 years old	171	33.50%
	above 55 years old	42	8.20%
Total		511	100%
Academic Qualifications	Undergraduate (Bachelor's)	112	21.90%
	Graduate (Master's Degree)	294	57.50%
	Graduate (Ph.D.)	102	20%
	Others	3	0.60%
Total		511	100%
Worked hours on teaching budget	less than 1 year	78	15.30%
	1-3 years	104	20.40%
	4-6 years	91	17.80%
	7-9 years	42	8.20%
	More than 10 years	196	38.40%
Total		511	100%

Table 2 is based on a survey conducted among 511 individuals, focusing on gender, age, academic qualifications, and working hours dedicated to teaching budgets in higher education settings. The gender distribution shows a higher proportion of males (56.20%) compared to females (43.80%). Regarding age, the largest group falls within the 35-45 years bracket (39.10%), followed by the 45-55 years age group (33.50%), with fewer respondents aged 25-35 years (19.20%) and above 55 years (8.20%). Most respondents hold graduate degrees, with 57.50% possessing a Master's degree and 20% having earned a Ph.D., whereas 21.90% have an undergraduate degree, and a minimal percentage (0.60%) selected 'Others'. Regarding tenure working on teaching budgets, most respondents (38.40%) have more than ten years of experience. This is followed by those with 1-3 years (20.40%) and 4-6 years (17.80%) of experience, with fewer respondents working in this capacity for 7-9 years (8.20%) or less than a year (15.30%). This profile provides insight into the demographic and professional background of individuals involved in managing teaching budgets in higher education.

5.2 Reliability and Validity Tests

The KMO measure evaluates the adequacy of the sampling by comparing the magnitude of observed correlation coefficients to the magnitude of partial correlation coefficients; values closer to 1 suggest that factor analysis is appropriate. If KMO is above 0.80: This is considered meritorious and indicates that the data is very suitable for factor analysis.

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Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.908
Bartlett's Test of Sphericity	χ^2	5141.593
	df	190
	p -value	0

According to Table 3, the KMO value was calculated as 0.908, the Bartlett test result as χ^2=5141.593, df=190, and p<0.001, indicating that is very suitable for factor analysis.

Table 4: Rotated Component Matrix

Items	The loadings of factors						
	1	2	3	4	5	6	Commonality
TBA1						0.773	0.729
TBA2						0.786	0.751
TBA3						0.785	0.749
SF1	0.776						0.708
SF2	0.790						0.701
SF3	0.788						0.710
SF4	0.795						0.710
DPC1					0.786		0.723
DPC2					0.807		0.763
DPC3					0.793		0.762
TRR1			0.842				0.793
TRR2			0.802				0.754
TRR3			0.812				0.784
CE1		0.778					0.727
CE2		0.786					0.703
CE3		0.772					0.717
CE4		0.787					0.714
SP1				0.825			0.766
SP2				0.810			0.761
SP3				0.777			0.724

Table 4 reveals six distinct factors based on items' loadings and commonalities, showing how each variable shares variance with others, ranging from 0.701 to 0.793. Factor 1 (Scale of the Faculties), with loadings between 0.776 and 0.795 and commonalities from 0.701 to 0.710, reflects the universities' faculty scale. Factor 2 (Collaborative Education) showcases a tight link to collaborative initiatives, evident from loadings of 0.772 to 0.787 and commonalities between 0.703 to 0.727. Factor 3 (Teaching Reform and Research) is strongly aligned with reform and research activities, highlighted by loadings over 0.802 and commonalities from 0.754 to 0.793. Factor 4 (Special Projects) emphasizes the impact of special projects, with loadings from 0.777 to 0.825 and commonalities between 0.724 to 0.766. The Teaching Budget Allocation (TBA) factor, with items TBA1 to TBA3 loading above 0.773, underscores their crucial relation to TBA, supported by commonalities from 0.729 to 0.751. Lastly, the Discipline and Professional Construction (DPC) factor, through items DPC1 to DPC3 with loadings from

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0.786 to 0.807, shows its core relevance to discipline and professional efforts, as indicated by commonalities between 0.723 to 0.763. In conclusion, the analysis underscores the significant interrelation among the identified factors, highlighting their collective impact on higher education's structural and operational dynamics, especially in terms of collaborative education, teaching reform, special projects, and budget allocations.

Average Variance Extracted (AVE) and Composite Reliability (CR) are crucial for evaluating construct validity and reliability in structural equation modeling. Acceptable thresholds are an AVE above 0.50, showing the construct explains over half the variance of its indicators, and a CR value above 0.7, indicating strong indicator consistency (Agus St Mt et al., 2019). Table 5 shows the confirmatory factor analysis (CFA) for six factors and 20 items revealed AVEs all surpassing the 0.5 threshold and CRs exceeding 0.7, demonstrating solid aggregation validity within the model.

Table 5: The Results of AVE and CR

Factors	AVE	CR
TBA	0.613	0.826
SF	0.607	0.861
DPC	0.613	0.826
CE	0.661	0.854
TRR	0.616	0.865
SP	0.623	0.832

5.3 The Goodness of Fit

The model fit indices value, the χ^2 value is 181.684 with 155 degrees of freedom (df) and a p-value of 0.070, the χ^2/df ratio 1.172, the RMSEA value of 0.018, RMR (0.033), and with GFI (0.966), CFI (0.995), NFI (0.965), NNFI (0.965)/TLI (0.994), and AGFI (0.954). The high GFI, CFI, NFI, NNFI/TLI, and AGFI, combined with a low RMSEA, RMR, and SRMR, all indicate that the model is both substantively meaningful and parsimonious. Figure 2 shows the standardized model estimates.

Table 6: Model fit indices

Common-used	χ2	df	p	χ2/df	GFI	RMSEA	RMR	CFI	NFI	NNFI
Threshold Value	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9
Default Model	181.684	155	0.07	1.172	0.966	0.018	0.033	0.995	0.965	0.994
Others	TLI	AGFI	IFI	PGFI	PNFI	PCFI	SRMR	RMSEA 90% CI		
Threshold Value	>0.9	>0.9	>0.9	>0.5	>0.5	>0.5	<0.1	-		
Default Model	0.994	0.954	0.995	0.713	0.787	0.811	0.024	0.002 ~ 0.029		

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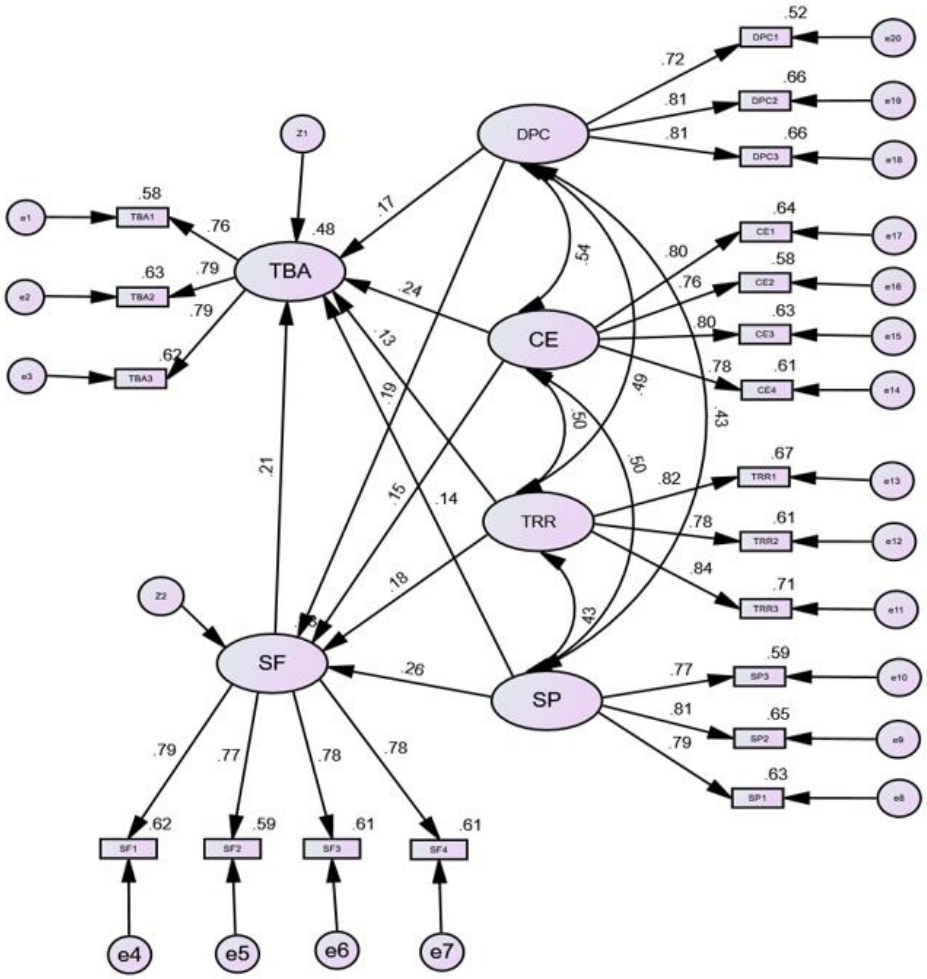

Figure 2: Standardized TBA Model Estimates

5.5 Hypotheses Testing

The research hypotheses validation confirmed that all hypotheses (H1 through H5) regarding Teaching Budget Allocation (TBA) were accepted, based on path estimates, standard errors, critical ratios, and p-values. H1, demonstrating a positive correlation between the Scale of Faculties (SF) and TBA, was strongly significant (path estimate: 0.202, C.R.: 3.614). H2 supported a link between Special Projects (SP) and TBA (path estimate: 0.137, C.R.: 2.537, p-value: 0.011*). H3, connecting Discipline and Professional Construction (DPC) to TBA, was confirmed (path estimate: 0.189, C.R.: 2.946, p-value: 0.003**). H4, relating Teaching Reform and Research (TRR) to TBA, showed significance (path estimate: 0.120, C.R.: 2.379, p-value: 0.017*). Lastly, H5 established the strongest correlation between Collaborative Education (CE) and TBA (path estimate: 0.222, C.R.: 3.997). Comprehensive analysis indicates these educational factors significantly affect TBA, substantiating a well-validated structural model within the study's context.

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Table 7: The Regression Weights of Structural Equation Modeling

Hypotheses	Path	Estimate	S.E.	C.R.	P	Decision
H1	TBA<---SF	0.202	0.056	3.614	***	Accepted
H2	TBA<---SP	0.137	0.054	2.537	0.011*	Accepted
H3	TBA<---DPC	0.189	0.064	2.946	0.003**	Accepted
H4	TBA<---TRR	0.120	0.05	2.379	0.017*	Accepted
H5	TBA<---CE	0.222	0.056	3.997	***	Accepted

Notes: *** = $p < 0.001$, ** = $p < 0.01$, * = $p < 0.05$

This research examines the mediating effect of the Scale of Faculties (SF) on the relationship between various factors—Collaborative Education (CE), Teaching Reform and Research (TRR), Discipline and Professional Construction (DPC), Special Projects (SP)—and Teaching Budget Allocation (TBA) using Bootstrapping with 2000 samples and 95% confidence intervals.

Table 8: The regression Weights of SF's mediating effects

Hyp.	Path	Effects	Bootstrapping		PC 95% CI		P-value
			Estimates	Std. Error	Lower	Upper	
H6b	CE → SF → TBA	Total	0.273	0.063	0.145	0.389	0.001
		Direct	0.241	0.062	0.113	0.359	0.001
		Indirect	0.032	0.016	0.005	0.068	0.019
H6c	TRR → SF → TBA	Total	0.169	0.060	0.054	0.288	0.008
		Direct	0.132	0.060	0.014	0.250	0.003
		Indirect	0.037	0.017	0.009	0.074	0.005
H6a	DPC → SF → TBA	Total	0.213	0.062	0.090	0.333	0.002
		Direct	0.175	0.062	0.052	0.293	0.006
		Indirect	0.038	0.017	0.010	0.076	0.006
H6d	SP → SF → TBA	Total	0.198	0.053	0.097	0.303	0.001
		Direct	0.144	0.055	0.038	0.255	0.010
		Indirect	0.054	0.021	0.020	0.101	0.003

From Table 8, significant direct and total effects were observed across all paths, with CE, TRR, DPC, and SP all directly influencing TBA. Indirect effects through SF were also significant, suggesting SF's key role in mediating these relationships. Specifically, the indirect effect was strongest for SP (0.054, $p = 0.003$), indicating that SF is a significant mediator, especially in the relationship between SP and TBA. In conclusion, while direct paths from predictors to TBA remain significant, illustrating direct influences on TBA, the presence of significant indirect effects underscores SF's crucial mediating function. This indicates that strategies involving SF not only directly affect TBA but also play a crucial role in mediating the impact of various educational factors on budget allocation, with the strongest mediation observed for SP.

6. CONCLUSION

There are five internal indicators: the Scale of the Faculties (SF), Special Projects (SP), Discipline and Professional Construction (DPC), CE (Collaborative Education), and Teaching Reform and Research (TRR). That's to say, the five factors influence the allocation of the

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teaching budget. The parameters, such as path coefficients, S.E., C.R., and P-Value ($p < 0.001$), are measured and analyzed. The analysis of the measurement model within SEM validating the observed variables (indicators) can well represent these latent variables (constructs). The six variables are well-defined and measured within the SEM framework, with all observed variables significantly contributing to and reliably measuring the latent construct SF. According to the qualitative research results, 6 research hypotheses were confirmed separately. Five internal indicators: Scale of the Faculties (SF), Special Projects (SP), Discipline and Professional Construction (DPC), Collaborative Education (CE), and Teaching Reform and Research (TRR) have a positive influence on Teaching budget allocation (TBA) and Scale of Faculties (SF) mediates the relationship between other independent variables (DPC: Discipline and Professional Construction, CE: Collaborative Education, TRR: Teaching Reform and Research, SP: Special Projects) and teaching budget allocation in local regular undergraduate universities.

7. SUGGESTION

This research marks an important step toward better understanding and optimizing teaching budget allocation within universities. To build on these findings, future studies could adopt several approaches to increase the scope and impact of the research. First, conducting a comparative analysis of teaching budget allocation between different regions or countries could uncover diverse practices and models, offering insights for potential adoption or adaptation in varying educational and regulatory environments. Secondly, incorporating external indicators, such as government policies, economic trends, and societal demands, could provide a more comprehensive understanding of the influences on budget allocation, leading to the development of models that are responsive and adaptable to these external factors. Lastly, integrating advanced technologies like artificial intelligence (AI) and machine learning (ML) could revolutionize the budget allocation process. These technologies have the potential to improve data-driven decision-making, accurately predict future funding requirements, and automate the allocation process based on evolving criteria, ultimately enhancing the efficiency and effectiveness of budget distribution.

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