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Research Article

Financing of Higher Education in India and Saudi Arabia: A Comparative Empirical Analysis of Budgetary Allocations, Growth Trends, and Developmental Outcomes

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ABSTRACT

Financing of higher education is a critical determinant of educational quality and a driving force behind national development. India and Saudi Arabia, with their distinct economic systems and policy frameworks, have developed distinct strategies for funding higher education, each influenced by their unique social, economic, and developmental priorities. This study offers a comparative empirical analysis of financing higher education in India and Saudi Arabia, focusing on key financial indicators such as public expenditure on higher education as a percentage of GDP, total budgetary allocations for education, and gross expenditure on research and development (GERD). It also compares and analyses trends in Gross Enrolment Ratio (GER) and Pupil-Teacher Ratio (PTR) across both countries. Based on secondary time series data from 2000–01 to 2021–22, the study adopts a mixed-methods approach, combining qualitative and quantitative analyses to explore the landscape of higher education financing in both countries. Additionally, this study employs statistical tools like parametric and non-parametric tests, Compound Annual Growth Rate (CAGR), and regression modeling to analyze trends and patterns in these indicators. The findings of this study provide significant insights into the dynamics of higher education financing and its impact on developmental outcomes. The study concludes with important recommendations for policymakers and stakeholders seeking to strengthen higher education funding strategies to foster national growth and development.

Keywords: Financing Higher Education, Public Expenditure, GDP, GERD, GER, PTR, CAGR, Regression Modeling, India, Saudi Arabia.

JEL Classification Number: I2, I21, I22, I23

1. INTRODUCTION

Financing higher education plays a critical role in determining the quality of education, shaping human capital development, and driving socio-economic progress. Adequate and strategic investment in higher education ensures broader access, fosters research and innovation, strengthens infrastructure, and supports the recruitment and retention of qualified faculty members (Bloom et al., 2006). Moreover, robust higher education systems contribute significantly to building skilled workforces, enhancing

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national competitiveness in the global economy, and promoting inclusive socio-economic advancement (OECD, 2013; World Bank, 2010).

In this context, India and Saudi Arabia present compelling cases for comparative analysis. Both countries have made substantial investments in their higher education sectors, albeit within distinct socio-economic, political, and cultural frameworks. India, characterized by rapid economic growth, demographic diversity, and complex social structures, faces persistent challenges in education funding (Tilak, 1993). Conversely, Saudi Arabia, endowed with abundant oil revenues, has strategically invested in education as part of its broader vision to diversify its economy and reduce dependency on hydrocarbons (Ryan, 2023). The significance of this comparative study lies in several dimensions. Firstly, higher education is a fundamental human right and a critical driver of economic development, innovation, and quality of life (UNESCO, 2015). Understanding the financing mechanisms employed by India and Saudi Arabia offers valuable insights for policymakers, educators, and researchers striving to enhance educational quality, equity, and accessibility. Secondly, higher education financing profoundly impacts a nation's global competitiveness. Countries with robust higher education systems are better positioned to attract investment, foster innovation, and sustain high-tech industries vital for long-term economic growth (OECD, 2013; Smith & Abouammoh, 2013). Cultural and social factors also significantly influence education funding approaches. Saudi Arabia's education reforms are shaped by its socio-religious context and economic transformation agendas, whereas India's policies are influenced by its democratic governance structures and socio-economic diversity (Jha & Desai, 2019). Comparative analysis thus provides a deeper understanding of how cultural, economic, and political dynamics affect financing strategies and outcomes in different national contexts.

Furthermore, the globalization of higher education, marked by increasing cross-border mobility of students and researchers, presents new challenges and opportunities for national education systems (Varghese, 2008). Comparing the higher education financing models of India and Saudi Arabia sheds light on how these countries adapt to globalization trends and foster international collaboration. Ensuring equity and access remains a core priority of higher education financing. Evaluating the mechanisms in both countries can inform strategies to promote affordability, reduce student debt burdens, and enhance opportunities for marginalized populations (Marginson, 2011). The rapid integration of technological innovations, such as online and blended learning platforms, adds another dimension to financing challenges. Analyzing how India and Saudi Arabia fund technological advancements in education offers valuable lessons for leveraging technology to expand access and improve quality (Serrano et al., 2019). Additionally, higher education is integral to achieving the Sustainable Development Goals (SDGs), particularly those related to quality education, economic growth, and reduced inequalities (Yuan & Zuo, 2013; Leal Filho et al., 2021). This comparative study examines how both nations align their higher education investments with sustainable development objectives.By critically comparing government, private, and international funding mechanisms in India and Saudi Arabia, this study seeks to identify effective and sustainable models of higher education financing. It also explores strategies to enhance affordability, ensure quality assurance, and optimize educational outcomes, thereby contributing to broader efforts to strengthen higher education systems globally (Khayati & Selim, 2019; Hénard & Roseveare, 2012).

In sum, this study aims to provide empirical insights into the budgetary allocations, growth trends, and developmental outcomes associated with the financing of higher education in India and Saudi Arabia, offering policy recommendations for enhancing education funding strategies and promoting sustainable national development.

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For a more detailed survey on this study, readers may refer to the work of (Moeed & Afjal, 2024), (Moeed, A., 2023). (Abdullateef et. al., 2023), (Mohiuddin et al., 2023), (Abdullateef et. al., 2023), (Ryan, M., 2023), (Shaturaev, J., 2021), (Varghese, N. V., 2021), (Hamdan, A., & Hamdan, R., 2020), (Mishra, 2020), (Panigrahi, J., 2018), (Panigrahi, J., 2023). (Sharanabasappa & Kadamudimatha, 2017),(Rani, 2016), (Alharbi, E. A. R. 2016), (Pavan, A. 2016), (Goksu, A., &Goksu, G. G. 2015), (Hamdan, A. K. 2015), (El-Araby, A. 2011), (Alamri, M., 2011), (Smith & Abouammoh, 2013),(Tilak, J. B. 2012), (Bhatia & Dash, 2011), Puttaswamaiah, S., & Endowment, C. B. 2010), and among others.

2. OBJECTIVES OF THE STUDY

The objectives of this study are as follows:

1. To conduct a comparative analysis of financing higher education in India and Saudi Arabia, focusing on key financial indicators such as public expenditure on education as a percentage of GDP, percentage of total budgetary allocations on education, and GERD.
2. To compare and analyze the trends in GER and PTR between India and Saudi Arabia.
3. To identify the similarities, differences, and policy implications of higher education funding approaches in India and Saudi Arabia.

3. DATA SOURCES AND METHODOLOGY

This study utilizes secondary time-series data covering the period from 2000-01 to 2021-22. The data was sourced from various reports produced by institutions such as SAMA, MEES, UGC, AISHE, as well as from international organizations including the World Bank, UNESCO, OECD, and the World Economic Forum. The study employs a mixed-methods approach that combines both qualitative and quantitative techniques to analyze and compare financing higher education in India and Saudi Arabia. Comparative methods and data visualization techniques are used to examine key indicators, including GDP, education budget allocations, Gross Expenditure on Research and Development (GERD), Gross Enrolment Ratio (GER), and Pupil-Teacher Ratio (PTR). Additionally, this study employs statistical tools like parametric and non-parametric tests, Compound Annual Growth Rate (CAGR), and regression modeling to analyze trends and patterns in these indicators. This comprehensive methodology facilitates a deeper understanding of the financing dynamics in higher education across both nations.

Table 1: Variable Names and Description

Sign	Variables	Measurement	Sources
GDP	Gross Domestic Product on Higher Education	As a % of GDP	WDI, UNESCO, Analysis of Budgeted Expenditure on Education of Various Years, SAMA Reports of Various Years.
BE	Budgetary Expenditure on Higher Education	As a % of Total Budgetary Expenditure on Education	WDI, UNESCO, Analysis of Budgeted Expenditure on Education of Various Years, SAMA Reports of Various Years.
GERD	Gross Expenditure on Research and Development	(As a % of GDP)	WDI, OECD, World Economic Forum, and UNESCO Institute for Statistics.
GER	Gross Enrolment Ratio	Percentage of Students Enrolled in Higher Education	World Bank, UNESCO Institute for Statistics, GCC Education Industry Report of Various Years, and AISHE Reports of Various Years
PTR	Pupil-Teacher Ratio	Average Number of Students Per Teacher in a University or College	World Bank, UNESCO Institute for Statistics, GCC Education Industry Report of Various Years, and AISHE Reports of Various Years

Sources: Various Public Resources

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3.1 Model Specification and Functional Form

3.1.1 Compound Annual Growth Rate (CAGR) Analysis

Compound Annual Growth Rate (CAGR) is a method used to calculate the average annual growth rate of an investment or economic indicator over a specified period.. Its primary purpose is to assess the overall growth trend by providing a consistent rate of growth, assuming that the investment or indicator grows at a constant rate each year over the specified period.

The formula of CAGR is as follows:

$$CAGR = \left(\frac{FV}{IV}\right)^{1/n} - 1 \times 100$$

Where:

- FV = Final Value
- IV = Initial Value
- n = Number of Years

3.1.2 Regression Modelling

We apply simple linear regression to analyze the trend in public expenditure on higher education in India and Saudi Arabia over time. This model helps us understand how expenditure has changed annually and to what extent it has increased or decreased. This model enables a comparative and contrastive analysis of how government spending on higher education has evolved in both countries and provides valuable insights into the effects of policy decisions and investment trends. The regression model is specified as:

$$Y = a + b.t + \epsilon$$

Where:

- **y**= is the Public Expenditure on Higher Education (Response Variable)
- **a**= is the intercept (Expenditure at the Initial Period)
- **b**= is the slope (Average Annual Rate of Change in Expenditure)
- **t**= is the time index (Year)
- ϵ= is the error term

4. ANALYSIS OF THE TRENDS IN GOVERNMENT SPENDING ON HIGHER EDUCATION IN INDIA AND SAUDI ARABIA

The analysis of government spending trends on higher education in India and Saudi Arabia reveals distinct patterns and priorities in each country's approach. Both nations share the goal of enhancing their higher education systems, yet their strategies and outcomes differ. India faces the challenge of scaling its education system to meet growing demand while maintaining quality, while Saudi Arabia focuses on rapidly advancing its higher education sector to support economic diversification. Despite these differences, both countries aim to ensure that higher education contributes to sustainable economic development and social well-being. A comparative analysis of budget allocation trends from 2010 to 2018 shows a commitment in both countries to increasing funding for higher education, focusing on infrastructure, faculty recruitment, research, and student support. These trends reflect policy reforms aimed at modernizing the sector. However, challenges such as equitable access, quality improvement, and infrastructure gaps persist in both countries. Overall, the increase in investment highlights the recognition of higher education's critical role in driving socioeconomic progress and

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innovation, demonstrating a shared commitment to its development as a catalyst for national growth and prosperity.

Table 2: Comparing the Government Spending on Higher Education in India and Saudi Arabia

Year	Country	Government Spending on Higher Education (In billions of USD)	Higher Education Spending (As % of GDP)
2010	India	4.9	0.41%
2010	Saudi Arabia	8.0	3.9%
2011	India	5.2	0.44%
2011	Saudi Arabia	8.8	4.3%
2012	India	7.1	0.49%
2012	Saudi Arabia	8.5	4.2%
2013	India	6.9	0.54%
2013	Saudi Arabia	9.1	4.5%
2014	India	7.3	0.59%
2014	Saudi Arabia	9.8	4.9%
2015	India	10.8	0.69%
2015	Saudi Arabia	10.0	5.17%
2016	India	12.5	0.78%
2016	Saudi Arabia	10.3	4.71%
2017	India	13.5	0.81%
2017	Saudi Arabia	11.1	4.42%
2018	India	14.5	0.83%
2018	Saudi Arabia	12.2	4.76%

Table 2 reveals that India steadily increased its higher education spending from $4.9 billion in 2010 to $14.5 billion in 2018, with its share of GDP rising from 0.41% to 0.83%. In contrast, Saudi Arabia consistently allocated a much higher proportion of GDP to higher education, ranging from 3.9% to 5.17%, though its absolute spending grew moderately from $8.0 billion to $12.2 billion. Notably, India's absolute spending surpassed Saudi Arabia's from 2017 onward, despite maintaining a lower GDP share. While Saudi Arabia's spending as a percentage of GDP peaked in 2015, it declined slightly thereafter, whereas India's share continued to grow steadily. Overall, Saudi Arabia emphasized higher education through a greater GDP commitment, while India pursued gradual expansion to meet rising educational demands.

5. COMPARING PUBLIC EXPENDITURES ON EDUCATION AS A PERCENTAGE OF GDP- INDIA VS SAUDI ARABIA

Table 3 compares public expenditure on education as a percentage of GDP in India and Saudi Arabia from 2000-01 to 2021-22. In India, education spending ranged from 3.2% to 4.6%, showing a steady increase over time, reflecting a growing commitment to improving educational access and quality. In contrast, Saudi Arabia's expenditure was consistently higher, ranging from 5.1% to 8.5%, peaking at 8.5% in 2016-17 before dropping to 7.1% in 2021-22. This fluctuation suggests a more variable investment approach, with periods of both growth and reduction. While both countries have made

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efforts to increase education spending, their differing trends highlight distinct national priorities. India has shown consistent growth, while Saudi Arabia's expenditure has been more volatile, possibly due to shifting economic conditions or policy changes. This comparison emphasizes the need for continued investment and reform in both countries to ensure adaptable and equitable education systems.

Table 3: Comparing Public Expenditures on Education as a % of GDP in India and Saudi Arabia: 2000-01 to 2021-22

Year	India's Expenditure on Education (As % of G.D.P.)	Saudi Arabia's Expenditure on Education (As % of G.D.P.)
2000-01	4.1	5.9
2001-02	3.6	7.7
2002-03	3.6	7.6
2003-04	3.4	7.1
2004-05	3.2	6.2
2005-06	3.3	5.4
2006-07	3.4	5.8
2007-08	3.4	6.7
2008-09	3.6	5.1
2009-10	3.9	6.4
2010-11	4.0	6.5
2011-12	3.8	6.5
2012-13	3.7	5.6
2013-14	3.8	6.4
2014-15	4.0	6.7
2015-16	4.2	7.8
2016-17	4.2	8.5
2017-18	3.8	8.1
2018-19	3.9	7.9
2019-20	4.1	7.7
2020-21	4.3	7.8
2021-22	4.6	7.1

Source: *World Development Indicators (WDI), UNESCO Institute for Statistics, Analysis of Budgeted Expenditure on Education of Various Years, and SAMA Reports of Various Years.*

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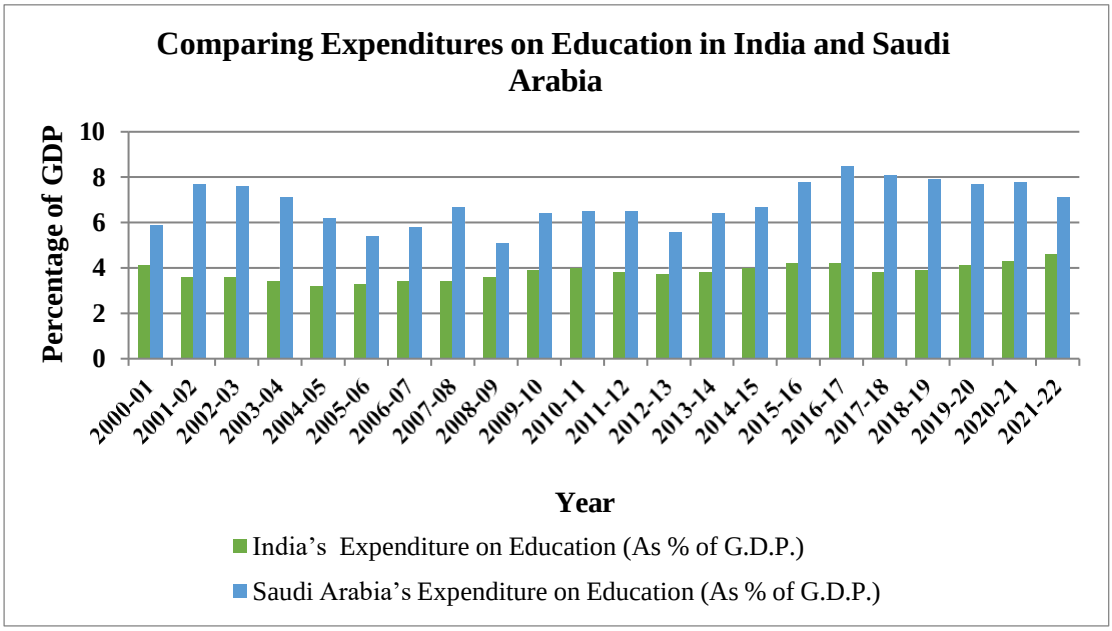
Figure 1: Comparing Public Expenditures on Education as a % of GDP in India and Saudi Arabia: 2000-01 to 2021-22



5.1 Comparative Analysis of Public Expenditure on Higher Education (% of GDP) Between India and Saudi Arabia Using Independent Samples t-Test

H_0: There is no significant difference between public expenditures on higher education in India and Saudi Arabia regarding the percentage of GDP.

H_1: There is a significant difference between public expenditure on higher education in India and Saudi Arabia regarding the percentage of GDP.

Table 4: (a) Group Statistics

	Country	N	Mean	Std. Deviation	Std. Error Mean
Expenditure on Higher Education (As % of GDP)	India	22	3.8136	.35896	.07653
	Saudi Arabia	22	6.8409	.95551	.20372

Table 4: (b) Independent Samples t-Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper

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Expenditure on Higher Education (As % of GDP)	22.023	.108	-13.911	42	.000	-3.02727	.21762	-3.46644	-2.58810
			-13.911	26	.000	-3.02727	.21762	-3.47393	-2.58061

In accordance with our hypothesis, we conducted a t-test to compare the expenditure on higher education as a percentage of GDP between India and Saudi Arabia. The analysis presented in Table 4(b) indicates a p-value of 0.000, which is significantly lower than the conventional significance level of 0.05. As a result, we reject the null hypothesis. These findings indicate that there is a statistically significant difference in the public expenditure on higher education between India and Saudi Arabia in terms of the percentage of GDP allocated to this sector.

5.2 Compound Annual Growth Rate (CAGR) Analysis for % of GDP

India	Saudi Arabia
Initial GDP (2000–01): 4.1% Final GDP (2021–22): 4.6% Period: 21 years $CAGR_{India} = \left(\frac{4.6}{4.1}\right)^{1/21} - 1$ ≈ 0.00535 or 0.54%	Initial GDP (2000–01): 5.9% Final GDP (2021–22): 7.1% Period: 21 years $CAGR_{Saudi\ Arabia} = \left(\frac{7.1}{5.9}\right)^{1/21} - 1$ ≈ 0.00902 or 0.90%

The above analysis reveals that India's public expenditure on education as a percentage of GDP has increased at a slow and steady rate, with a compound annual growth rate (CAGR) of just 0.54%. This indicates a gradual but limited advancement in funding for education. In contrast, Saudi Arabia has experienced a higher CAGR of 0.90%, demonstrating a more robust and dedicated approach to investing in education. This suggests that Saudi Arabia has placed a greater emphasis on education within its national development priorities compared to India.

5.3 Regression Modelling

The regression model for expenditure on higher education, as a percentage of GDP, for India and Saudi Arabia is presented in the following manner:

$$GDP_{India} = 48.5 + 0.026t$$

$$GDP_{Saudi\ Arabia} = 95.7 + 0.051t$$

The above analysis indicates that India's public expenditure on higher education has been increasing at an average rate of 0.026 percentage points per year, signifying a slow but consistent upward trend over the years. In contrast, Saudi Arabia has demonstrated a more significant and consistent rise, with an average annual increase of 0.051 percentage points per year, suggesting a more proactive and robust approach to enhancing public investment in higher education.

6. COMPARING PUBLIC EXPENDITURES ON EDUCATION AS A PERCENTAGE OF TOTAL BUDGETARY EXPENDITURE ON EDUCATION- INDIA VS SAUDI ARABIA

Table 5 compares public expenditure on education as a percentage of total budgetary expenditure in India and Saudi Arabia from 2000-01 to 2021-22. Saudi Arabia consistently allocated a higher percentage of its total budget to education, with values ranging from 17.84% in 2000-01 to 25.70% in 2009-10, before stabilizing around 18-19% in recent years. In contrast, India's allocation fluctuated

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between 10.04% in 2017-18 and 14.60% in 2000-01, reflecting varying priorities and economic conditions. These trends show that Saudi Arabia maintained a stronger and more consistent focus on education in terms of total budgetary allocation, while India's commitment exhibited more variability over time. Despite these differences, both countries have consistently prioritized education as a key area for investment, highlighting its importance for long-term development.

Table 5: Comparing Public Expenditures on Education as a % of Total Budgetary Expenditure on Education in India and Saudi Arabia: 2000-01 to 2021-22

Year	India's Expenditure on Education (As % of Total Budgetary Expenditure on Education)	Saudi Arabia's Expenditure on Education (As % of Total Budgetary Expenditure on Education)
2000-01	14.60	17.84
2001-02	12.89	20.90
2002-03	12.60	21.29
2003-04	11.98	21.46
2004-05	12.13	20.19
2005-06	12.73	19.29
2006-07	13.29	21.60
2007-08	13.32	25.40
2008-09	13.63	19.26
2009-10	11.96	25.70
2010-11	12.79	25.50
2011-12	12.91	25.60
2012-13	12.59	24.30
2013-14	13.87	24.80
2014-15	12.74	24.50
2015-16	12.85	25.10
2016-17	12.74	24.95
2017-18	10.04	22.26
2018-19	12.07	21.60
2019-20	12.47	17.50
2020-21	11.86	18.90
2021-22	11.97	18.79

Source: *World Development Indicators (WDI), UNESCO Institute for Statistics and Analysis of Budgeted Expenditure on Education of Various Years, and SAMA Reports of Various Years.*

Figure 2: Comparing Public Expenditures on Education as a % of Total Budgetary Expenditure on Education in India and Saudi Arabia: 2000-01 to 2021-22

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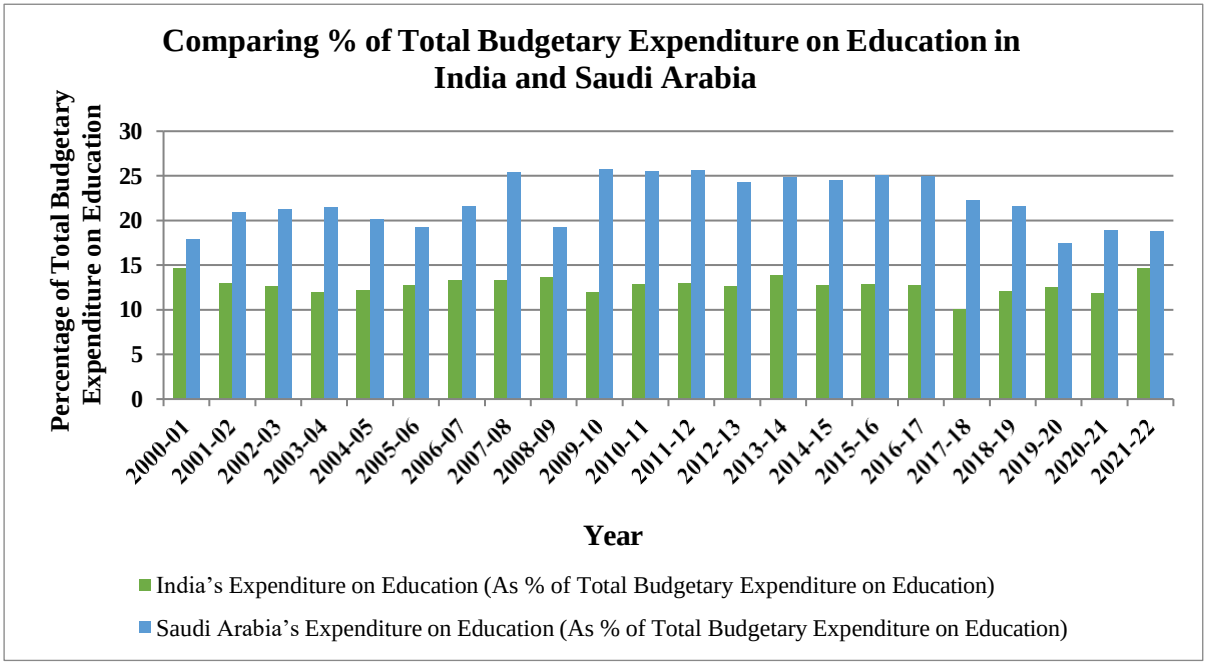

6.1 Comparative Analysis of Public Expenditure on Higher Education (% of Total Budgetary Expenditure on Education) Between India and Saudi Arabia Using the Mann-Whitney U Test

H_0: There is no significant difference between public expenditures on higher education in India and Saudi Arabia regarding the percentage of total budgetary expenditure on education.

H_1: There is a significant difference between public expenditures on higher education in India and Saudi Arabia regarding the percentage of total budgetary expenditure on education.

It is clear that the data on public expenditure on higher education, as a percentage of total budgetary expenditure on education for India and Saudi Arabia, does not fulfill the normality assumption. Therefore, the Mann-Whitney U test has been employed for the analysis.

Table 6(a): Mann-Whitney Test

Ranks				
	Country	N	Mean Rank	Sum of Ranks
Expenditure on Higher Education (As % of Total Budgetary Expenditure on Education)	India	22	11.50	253.00
	Saudi Arabia	22	33.50	737.00
	Total	44		

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Table 6(b): Test Statistics[a]

	Expenditure on Higher Education (As % of Total Budgetary Expenditure on Education)
Mann-Whitney U	.000
Z	-5.682
Asymp. Sig. (2-tailed)	.000

Based on the data presented in Table 6(b), we observed that the p-value is below 0.05, leading us to reject the null hypothesis. This finding allows us to conclude that there is a significant difference in public expenditures on higher education between India and Saudi Arabia in terms of the percentage of total budgetary allocations for education.

6.2 Compound Annual Growth Rate (CAGR) Analysis for % of Total Budgetary Expenditure on Education

India	Saudi Arabia
Initial Value (2000–01): 14.60%	Initial Value (2000–01): 17.84%
Final Value (2021–22): 11.97%	Final Value (2021–22): 18.79%
Period: 21 years	Period: 21 years
$CAGR_{India} = \left(\frac{11.97}{11.60}\right)^{1/21} - 1$ ≈ -0.0091 or -0.91%	$CAGR_{Saudi\ Arabia} = \left(\frac{18.79}{17.84}\right)^{1/21} - 1$ ≈ 0.0024 or 0.24%

Based on the above analysis, it is evident that India has experienced a gradual decline in the proportion of public expenditure directed toward education, with an average annual decrease of nearly 1%. This trend indicates a diminishing emphasis on education within the broader fiscal priorities of the country. In contrast, Saudi Arabia has demonstrated a slight but consistent increase in its budgetary allocation to education over the past two decades. Although the growth is modest, it reflects a steady and ongoing commitment to supporting education through public financing.

6.3 Regression Modelling

The regression model for expenditure on higher education as a percentage of the total budgetary allocation for education, in both India and Saudi Arabia, will be presented as follows:

$$Y_{India} = 13.22 - 0.067t$$

$$Y_{Saudi\ Arabia} = 20.23 + 0.127t$$

The above analysis highlights distinct trends in the budgetary allocation to education in India and Saudi Arabia over the study period. For India, the intercept value of 13.22 indicates that around 2000–01, the country allocated approximately 13.22% of its total budget to education. However, the negative slope of -0.067 reflects a slow but consistent decline of about 0.067% per year. This points to a gradual shift away from prioritizing education in the national budget over the past 22 years. In contrast, Saudi Arabia began with a higher initial share of education spending, as shown by the intercept of 20.23. The positive slope of 0.127 suggests that education spending as a share of the total budget increased slightly during the early years, likely up until 2015. However, this upward trend did not continue consistently; a subsequent decline indicates a non-linear pattern, which means the trend fluctuated and could not be

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fully captured by a simple linear model. This suggests that Saudi Arabia's education spending was influenced by varying national priorities or economic conditions over time.

7. COMPARING GROSS EXPENDITURE ON RESEARCH AND DEVELOPMENT (GERD) AS A PERCENTAGE OF GDP- INDIA VS SAUDI ARABIA

Table 7 compares Gross Expenditure on Research and Development (GERD) as a percentage of GDP between India and Saudi Arabia from 2000-01 to 2021-22. India's GERD has consistently been higher than Saudi Arabia's, ranging from 0.64% to 0.86% over the years, reflecting a relatively stronger emphasis on R&D investment. In contrast, Saudi Arabia's GERD started at 0.01% in 2000-01, gradually increasing, peaking at 0.89% in 2011-12, before declining to 0.46% by 2021-22. While both countries made efforts to invest in research and development, Saudi Arabia's investments have been more volatile, with notable peaks and subsequent declines, while India's investment showed a steady but moderate commitment to R&D. These trends highlight the differences in their approaches to fostering innovation and technological advancement, emphasizing the need for both nations to continue investing in R&D for future growth and competitiveness.

Table 7: Comparing Gross Expenditure on Research and Development (GERD) as a % of GDP in India and Saudi Arabia: 2000-01 to 2021-22

Year	India's Gross Expenditure on R and D (As % of GDP)	Saudi Arabia's Gross Expenditure on R and D (As % of GDP)
2000-01	0.76	0.01
2001-02	0.74	0.01
2002-03	0.73	0.02
2003-04	0.72	0.06
2004-05	0.76	0.05
2005-06	0.82	0.04
2006-07	0.80	0.04
2007-08	0.81	0.05
2008-09	0.86	0.05
2009-10	0.83	0.07
2010-11	0.79	0.88
2011-12	0.76	0.89
2012-13	0.74	0.87
2013-14	0.71	0.81
2014-15	0.70	0.80
2015-16	0.69	0.78
2016-17	0.67	0.76
2017-18	0.67	0.75
2018-19	0.66	0.81

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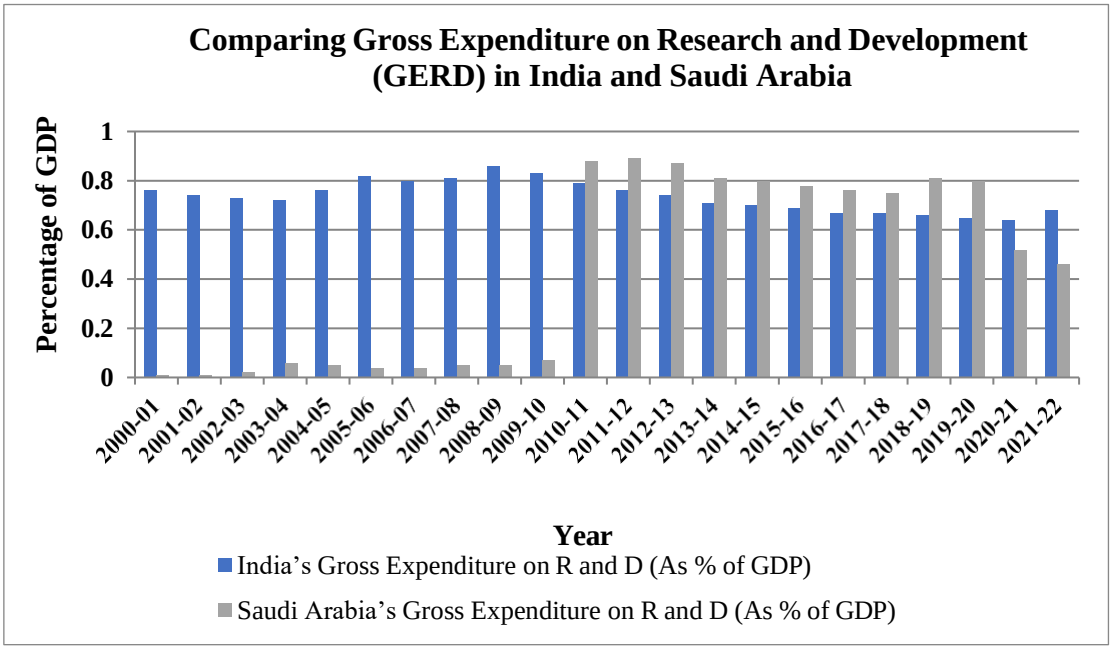
2019-20	0.65	0.80
2020-21	0.64	0.52
2021-22	0.68	0.46

Source: *World Bank, UNESCO Institute for Statistics, OECD, and World Economic Forum.*

Figure 3: Comparing Gross Expenditure on Research and Development (GERD) as a % of GDP in India and Saudi Arabia: 2000-01 to 2021-22



7.1 Comparative Analysis of Gross Expenditure on Research and Development (% of GDP) Between India and Saudi Arabia Using the Mann-Whitney U Test

H_0: There is no significant difference between India and Saudi Arabia regarding the Gross Expenditure on Research and Development as a percentage of GDP.

H_1: There is a significant difference between India and Saudi Arabia regarding the Gross Expenditure on Research and Development as a percentage of GDP.

It is evident that the data on Gross Expenditure on R&D (as a percentage of GDP) for India and Saudi Arabia do not satisfy the normality assumption. Therefore, the Mann-Whitney U test has been applied for the analysis.

Table 8(a): Mann-Whitney Test

Ranks				
	Country	N	Mean Rank	Sum of Ranks
Gross Expenditure on R and D (As % of GDP)	India	22	25.25	555.50
	Saudi Arabia	22	19.75	434.50
	Total	44		

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Table 8(b): Test Statistics[a]

	Gross Expenditure on R and D (As % of GDP)
Mann-Whitney U	181.500
Wilcoxon W	434.500
Z	-1.421
Asymp. Sig. (2-tailed)	.155

From Table 8(b), we found that the p-value is greater than .05, so we accept our null hypothesis. Thus, we can say that there is no significant difference between India and Saudi Arabia regarding the gross expenditure on research and development as a percentage of GDP.

7.2 Compound Annual Growth Rate (CAGR) Analysis for % of GERD

India	Saudi Arabia
Initial GERD (2000–01): 0.76 % Final GERD (2021–22): 0.68 % Period: 21 years $CAGR_{India} = \left(\frac{0.68}{0.76}\right)^{1/21} - 1$ ≈ -0.0053 or -0.53% per year	Initial GERD (2000–01): 0.01% Final GERD (2021–22): 0.46% Period: 21 years $CAGR_{Saudi\ Arabia} = \left(\frac{0.46}{0.01}\right)^{1/21} - 1$ ≈ 0.1875 or 18.75% per year

The above analysis indicates that India's Gross Expenditure on Research and Development (GERD) has experienced a slight decline over the years, with a negative Compound Annual Growth Rate (CAGR) of -0.53%. This suggests either stagnation or a marginal downward trend in R&D investment. In contrast, Saudi Arabia has demonstrated a robust increase in GERD, recording a high CAGR of 18.75%. However, this growth peaked around 2011-12, followed by a noticeable decrease in recent years, indicating some fluctuation in its R&D spending trajectory.

7.3 Regression Modelling

The regression model for Gross Expenditure on Research and Development (GERD) as a percentage of GDP, comparing India and Saudi Arabia, will be formulated as follows:

$$GERD_{India} = 0.789 - 0.0056t$$

$$GERD_{Saudi\ Arabia} = 0.112 + 0.033t$$

The above analysis shows that India's intercept value of 0.789 reflects its Gross Expenditure on Research and Development (GERD) as a percentage of GDP around the year 2000–01. The negative slope of -0.0056 indicates that India's GERD has been declining steadily by approximately 0.0056% each year. This points to a gradual decrease in the country's commitment to R&D investment over the past 22 years, highlighting the need for renewed focus and policy support to enhance research funding. On the other hand, Saudi Arabia's intercept of 0.112 reveals that its R&D spending was very low at the beginning of the observed period (2000–01). However, the positive slope of 0.033 reflects a strong and consistent upward trend, with GERD increasing by about 0.033% annually. This indicates that Saudi Arabia made significant progress in boosting its R&D investment, particularly up to 2015, marking a period of active development in research infrastructure and funding. Nonetheless, a noticeable decline

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in GERD is observed post-2020, possibly due to global economic challenges or shifts in national priorities.

8. COMPARATIVE ANALYSIS OF GROSS ENROLMENT RATIO (GER) IN HIGHER EDUCATION BETWEEN INDIA AND SAUDI ARABIA (2000–01 TO 2021–22)

Table 9 presents a comparative analysis of the Gross Enrolment Ratio (GER) in higher education between India and Saudi Arabia from 2000–01 to 2021–22. Throughout the period, both countries showed steady growth in GER, but Saudi Arabia consistently maintained a significantly higher enrolment rate. India's GER increased gradually from 9.5% to 28.4%, reflecting steady progress in expanding access. In contrast, Saudi Arabia's GER rose sharply from 22.3% to 71.4%, particularly after 2010–11, indicating more aggressive policies and higher investment in higher education. Overall, while both countries advanced, Saudi Arabia's growth rate and enrolment levels significantly outpaced those of India.

Table 9: Comparing Gross Enrolment Ratio (%) in Higher Education between India and Saudi Arabia (2000–01 to 2021–22)

Year	India's GER in Higher Education (%)	Saudi Arabia's GER in Higher Education (%)
2000-01	9.5	22.3
2001-02	9.6	23.8
2002-03	10.1	23.4
2003-04	10.6	26.9
2004-05	10.9	28.7
2005-06	10.7	29.5
2006-07	12.4	30.0
2007-08	13.1	30.0
2008-09	13.7	30.0
2009-10	15.0	31.0
2010-11	17.9	37.0
2011-12	20.8	43.0
2012-13	21.5	51.0
2013-14	23.0	58.0
2014-15	23.6	58.3
2015-16	24.5	61.0
2016-17	25.2	67.3
2017-18	25.8	69.7
2018-19	26.3	68.0
2019-20	27.1	70.9
2020-21	27.3	70.6

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Year	India's GER in Higher Education (%)	Saudi Arabia's GER in Higher Education (%)
2021-22	28.4	71.4

Source: *World Bank, UNESCO Institute for Statistics, GCC Education Industry Report of Various Years, and AISHE Reports of Various Years.*

8.1 Descriptive Statistics

Metric	India GER (%)	Saudi Arabia GER (%)
Min	9.5	22.3
Max	28.4	71.4
Mean	19.26	45.54
Median	20.8	43
Standard Deviation	6.43	17.06
CAGR (2000–2021)	5.71%	4.95%

From the above table, we conclude that India started from a low base (9.5%) but shows a consistent upward trend, while Saudi Arabia started much higher and peaked quickly, sustaining above 70% in recent years.

8.2. Compound Annual Growth Rate (CAGR) Analysis for GER

India	Saudi Arabia
Initial GER (2000–01): 9.5 Final GER (2021–22): 28.4 Period: 21 years $CAGR_{India} = (\frac{28.4}{9.5})^{1/21} - 1 \approx 5.54\%$	Initial GER (2000–01): 22.3 Final GER (2021–22): 71.4 Period: 21 years $CAGR_{Saudi\ Arabia} = (\frac{71.4}{22.3})^{1/21} - 1 \approx 5.83\%$

The above analysis reveals that, despite Saudi Arabia's initial advantage, both countries have maintained consistent policy efforts, with similar compound annual growth rates in Gross Enrolment Ratio (GER), ranging from approximately 5.6% to 5.9%. However, Saudi Arabia has experienced a slightly higher average annual increase in GER compared to India.

8.3. Regression Modelling

The regression model for the gross enrollment ratio (GER) in higher education in both India and Saudi Arabia will be outlined as follows:

$$GER_{India} = 0.94 + 0.89t$$

$$GER_{Saudi\ Arabia} = 22.2 + 2.42t$$

The above analysis indicates that Saudi Arabia's GER grew at a faster pace in absolute terms, averaging around 2.42% per year, compared to India's 0.89% per year. However, both trends show strong positive growth, suggesting sustained long-term improvement in both countries' higher education enrollment.

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9. COMPARATIVE ANALYSIS OF PUPIL-TEACHER RATIO (PTR) IN HIGHER EDUCATION BETWEEN INDIA AND SAUDI ARABIA

Table 10 presents a comparative analysis of the Pupil-Teacher Ratio (PTR) for regular enrolment in higher education between India and Saudi Arabia from 2000–01 to 2021–22. India's PTR ranged from 20 to 30, peaking at 30 in 2017–18, reflecting a higher student-to-teacher ratio. In contrast, Saudi Arabia maintained a consistently lower PTR, ranging from 15 to 22.9, with a notable decrease to 15 in 2020–21. This consistently lower PTR in Saudi Arabia indicates a more favorable student-teacher ratio compared to India throughout the period.

Table 10: Comparing Pupil-Teacher Ratio (PTR) in Higher Education between India and Saudi Arabia (2000–01 to 2021–22)

Year	India's PTR for Regular Enrolment (University and Colleges)	Saudi Arabia's PTR for Regular Enrolment (University and Colleges)
2000-01	24	20.0
2001-02	24	21.0
2002-03	25	20.0
2003-04	26	22.0
2004-05	22	22.9
2005-06	26	22.4
2006-07	21	22.7
2007-08	20	20.7
2008-09	21	19.9
2009-10	24	19.2
2010-11	26	18.2
2011-12	24	18.9
2012-13	24	20.3
2013-14	21	21.0
2014-15	22	20.3
2015-16	21	19.8
2016-17	25	20.3
2017-18	30	20.0
2018-19	29	19.0
2019-20	28	19.6
2020-21	24	15.0
2021-22	24	19.3

Source: *World Bank, UNESCO Institute for Statistics, GCC Education Industry Report of Various Years, and AISHE Reports of Various Years*

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9.1 Descriptive Statistics

Statistic	India PTR	Saudi Arabia PTR
Count (Years)	22	22
Mean	23.73	20.19
Median	24	20.15
Minimum	20	15
Maximum	30	22.9
Range	10	7.9
Standard Deviation (σ)	2.67	1.76

The above data indicate that from 2000–01 to 2021–22, Saudi Arabia maintained a lower and more stable average PTR (mean = 20.19, SD = 1.76), reflecting relatively consistent teacher-student ratios. In contrast, India had a higher and more fluctuating average PTR (mean = 23.73, SD = 2.67), pointing to greater variability in resource allocation. Additionally, Saudi Arabia's lower minimum PTR of 15.0 further suggests a more effective and sustained effort in managing educational resources, particularly in higher education.

9.2 Compound Annual Growth Rate (CAGR) Analysis for PTR

India	Saudi Arabia
Initial PTR (2000–01): 24 Final PTR (2021–22): 24 Period: 21 years $CAGR_{India} = (\frac{24}{24})^{1/21} - 1 = 0\%$	Initial PTR (2000–01): 20.0 Final PTR (2021–22): 19.3 Period: 21 years $CAGR_{Saudi\ Arabia} = (\frac{19.3}{20})^{1/21} - 1 \approx -0.17\%$

The data shows that India's Pupil-Teacher Ratio (PTR) remained constant at 24 from 2000–01 to 2021–22, with a CAGR of 0%, indicating no overall improvement in teacher availability. In contrast, Saudi Arabia's PTR declined slightly from 20.0 to 19.3 over the same period, with a CAGR of -0.17%, suggesting a slow but steady improvement in teacher availability.

9.3 Regression Modelling

The regression model for the pupil-teacher ratio (PTR) in higher education for both India and Saudi Arabia will be structured as follows:

$$PTR_{India} = 23.38 + 0.038t$$

$$PTR_{Saudi\ Arabia} = 21.35 - 0.096t$$

The above equations indicate that India's PTR has slightly increased by around 0.038 per year, suggesting a growing student-teacher load, while Saudi Arabia's PTR has declined by about 0.096 annually, reflecting continuous efforts to reduce class sizes and enhance faculty ratios.

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10. COMPARATIVE ANALYSIS OF GER AND PTR IN HIGHER EDUCATION BETWEEN INDIA AND SAUDI ARABIA

Indicator	India	Saudi Arabia
Initial GER (2000–01)	9.50%	22.30%
Final GER (2021–22)	28.40%	71.40%
GER CAGR	5.60%	5.90%
Avg PTR (2000–2022)	~24.1	~20.3
PTR Trend	Fluctuating, peak 30	Stable, low

The comparative analysis shows that from 2000–01 to 2021–22, Saudi Arabia consistently recorded a higher Gross Enrollment Ratio (GER) than India, rising from 22.3% to 71.4%, while India's GER increased from 9.5% to 28.4%. Although both countries had similar Compound Annual Growth Rates (CAGR) in GER, 5.6% for India and 5.9% for Saudi Arabia. However, Saudi Arabia achieved a much greater overall expansion in higher education access. In terms of the Pupil-Teacher Ratio (PTR), India had a higher and more variable average (~24.1), peaking at 30, suggesting challenges in maintaining optimal teacher availability. In contrast, Saudi Arabia maintained a lower and more stable PTR (~20.3), reflecting better student-teacher ratios and potentially more effective educational delivery.

11. ANALYSIS OF SIMILARITIES, DIFFERENCES, AND POLICY IMPLICATIONS OF HIGHER EDUCATION FUNDING APPROACHES IN INDIA AND SAUDI ARABIA

There are some similarities, differences, and policy implications of higher education funding approaches in India and Saudi Arabia.

11.1 SIMILARITIES

Government Funding: Both India and Saudi Arabia rely heavily on government funding to support higher education. In both countries, the government plays a major role in providing financial support to higher education institutions.

Scholarships: Both countries offer scholarships to students to help them finance their education. Scholarships are typically awarded based on merit or financial need.

Focus on Access and Expansion: Both countries prioritize increasing enrollment and improving educational infrastructure to broaden access to higher education.

11.2 DIFFERENCES

Loans: While education loans are becoming an increasingly popular source of funding for higher education in India, they are not as common in Saudi Arabia. This may be due to cultural or economic factors.

Private Funding: Private funding for higher education is more prevalent in India than in Saudi Arabia. This may be due to differences in the economic structure of the two countries or the fact that India has a larger private sector.

Foreign Investment: Saudi Arabia has attracted significant foreign investment in the education sector, while India has not. This may be due to differences in the regulatory environment or the overall attractiveness of the two countries as investment destinations.

11.3 POLICY IMPLICATIONS

The study highlights several important policy implications, which are as follows:

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1. **Boost Budgetary Allocations for Higher Education:** Both India and Saudi Arabia should prioritize increasing public higher education spending as a percentage of GDP. A consistent rise in funding is required to fulfill rising educational demand, improve quality, and improve development outcomes.
2. **Increase Investment in Research and Development:** There is a need for higher investment in research and development (R&D). Both countries need to spend greater percentages of their educational funds on R&D to encourage innovation, global competitiveness, and knowledge-based economies.
3. **Enhance Pupil-Teacher Ratio (PTR):** Both countries need to make investments in hiring new faculty members and their professional growth to address the PTR. To raise the standard of education, policies should ensure a sufficient number of trained teachers, especially in under-represented areas.
4. **Promote Equitable Access to Higher Education**: Both India and Saudi Arabia should strengthen targeted financial aid programs to promote equitable access to higher education, with a focus on increasing GER among marginalized, disadvantaged, and rural populations.
5. **Adjust Funding to Economic and Demographic Changes:** Both India and Saudi Arabia strive to ensure that the allocation of educational funds remains responsive to their shifting national priorities. To support this goal, policymakers should design dynamic financial models that can adapt to ongoing economic changes and population growth.
6. **Conduct Continuous Monitoring and Evaluation:** Both countries should conduct regular assessments of the effects of higher education funding on significant indicators such as GER and PTR. Feedback systems will guarantee that policies are modified in light of new information and changing demands in education.
7. **Adopt Data-Driven Decision-Making:** Policymakers in both countries should use data-driven methodologies to evaluate the impact of budgetary allocations on educational achievement and optimize policies to better coordinate with national development objectives.
8. **Improve Governance and Accountability:** Transparent financial management and strong accountability structures should be implemented to guarantee that educational expenditures are allocated appropriately and that outcomes are periodically evaluated.
9. **Promote Long-Term Financial Sustainability:** Both countries must develop sustainable and long-term funding approaches to higher education that balance present needs and demands with future challenges, assuring ongoing investment in education for future generations.
10. **Encourage International Collaboration:** Both countries should look to foster international collaboration in funding for higher education, particularly in research, to improve global competitiveness and attract a variety of viewpoints and experiences.

12. CONCLUSION

This study provides a comprehensive comparative and empirical analysis of the financing of higher education in India and Saudi Arabia, highlighting key similarities and differences in their approaches. Both nations rely substantially on government funding to support higher education, with Saudi Arabia consistently allocating a higher percentage of its GDP towards this sector compared to India, indicating a stronger policy commitment. In contrast, India's higher education financing has shown gradual growth in absolute terms, albeit with periodic fluctuations in budgetary allocations relative to GDP, reflecting shifts in governmental priorities and economic conditions. Scholarship programs and financial aid initiatives in both countries have played a pivotal role in enhancing access to higher education, though debates continue regarding their long-term effectiveness in promoting equitable outcomes. Investment in research and development (R&D) further highlights the two nations' commitment to innovation: India has maintained a stable R&D-to-GDP ratio, while Saudi Arabia has

significantly increased its R&D investments, underscoring its broader economic diversification agenda. In terms of developmental outcomes, the trends in Gross Enrolment Ratio (GER) and Pupil-Teacher Ratio (PTR) provide important insights. India has demonstrated a steady increase in GER, reflecting expanding access to higher education, although maintaining an optimal PTR remains a challenge due to growing student populations. Saudi Arabia, meanwhile, has achieved relatively higher improvements in PTR, indicating better resource allocation per student, which contributes positively to educational quality. Overall, the findings emphasize the need for sustained and strategic investment in higher education financing, research, and human capital development. Policymakers in both countries must continue to explore innovative funding models, ensure efficient resource utilization, and focus on improving GER and PTR outcomes to foster inclusive, high-quality, and future-ready higher education systems. Strengthening these areas will be crucial for enhancing national competitiveness and achieving broader developmental goals in an increasingly knowledge-driven global economy.

CONFLICT OF INTEREST

There is no conflict of interest among authors regarding the present study.

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