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Higher Education and Economic Development: A State-Level Analysis of India

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Abstract*: This paper examines the relationship between higher education and economic growth at the state level in India for the period 2009–2019 across the selective states. It applies panel EGLS estimation to assess the effect of higher education institutions, population dynamics, and gross fixed capital formation on per capita GDP. The findings reveal a positive and significant relationship between the number of universities and economic growth, emphasizing the pivotal role of higher education in fostering innovation and human capital development. While gross fixed capital formation also positively influences growth, population growth exhibits a negative correlation with per capita GDP due to resource constraints and infrastructure stress. This research fills the existing gaps in studies through a nuanced state-level analysis of the interplay between university density and macroeconomic variables. The research suggests that, along with increasing the establishment of universities in the underdeveloped regions, quality education should be enhanced and made accessible through digital tools. This study emphasizes that higher education is transformative in propelling equitable economic progress in India.*

Key Words: *Higher Education, Economic Growth, Gross domestic product, Number of universities.*

1. INTRODUCTION:

Education has always been essential to economic and societal development. Its benefits include stimulating innovation, lifting the quality of life for a community, and giving individuals the information and skills needed to serve their economy well. Among those various levels of education available, higher education plays a uniquely critical role. While serving to offer specialized instruction, institutions of higher learning also represent research, critical thinking, and knowledge centres. Considering that a country as varied as India has such enormous diversity in demographic and regional factors, this relationship between higher education and economic development assumes greater significance.

Universities have a revolutionary role to play as accelerators for regional development. They generate highly qualified workers and stimulate innovation, which both contribute to local economy and stimulate economic activity. However, universities do not have an identical effect on the growth of economics, but this varies upon several criteria, such as the quality of instruction and how that aligns with regional economic needs and also how able the region is to take on recent graduates. It is in an effort to get further into these issues that this research will look into how higher education influences the economic routes taken in various geographical contexts.

This study examines the complex relationship between higher education institutions and economic growth in several Indian regions. Given the vast diversity of geography, culture, and economic systems of the nation, the study explores the impact of university density and presence on economic success. The objective is to find out whether regions with a greater concentration of universities experience faster economic growth and which variables influence this relationship.

This research aims to stress the importance of higher education in determining the economic destiny of India through examining statistics on economic success and university dispersion. It intends to focus light on how regional variations in infrastructure of higher education affect the economic outcome and underscore the need for policies that unlock the

university's ability for equitable and balanced expansion. This paper supports the belief that in India, regional variations stimulate both individual and societal growth in economics through higher education.

2.BACKGROUND OF THE STUDY:

India's higher education system, which is one of the largest in the world, is crucial for economic growth due to its role in skill development, innovation, and regional development. Huge inter-state disparities in the number of universities lead to unbalanced economic growth. Although a few states are backed up by strong educational infrastructures, others lag far behind, thereby limiting their scope of economic growth. There are few studies that focus more on the state level, with an emphasis on school or literacy-level education rather than looking into how universities contribute to state-level economic growth. The study bridges this gap and analyses the impact of universities on economic performance from 2010 to 2019, providing insights for balanced regional development and policy planning.

3.RESEARCH OBJECTIVE:

The aim of this research will be to analyse the impact of education on economic growth within the Indian states. Specific goals include investigating how university output-both governments, private, and total-contributes to the economic outcomes in that particular state, while investigating how the population dynamics and the gross fixed capital formation have influence over per capita GDP of that particular state. So, the paper tries to integrate these factors while explaining how education has resulted in the growth of economies for Indian states.

3.1. Research questions

•Is there a relationship between the number of universities and the economic growth in Indian states?

4.REVIEW OF LITERATURE:

Kotásková et al. (2018) investigated the impact of education on economic growth in India, covering the period from 1975 to 2016. Their findings highlighted tertiary education—particularly for males—as a significant driver of economic development. They emphasized that quality education amplifies this effect. Employing Granger Causality and Cointegration methods, the study also shed light on the limitations of measuring human capital stock.

Ray et al. (2011-2012) focused on education expenditure and its relationship with GDP growth in India between 1961 and 2010. They identified a long-term equilibrium between the two and advocated for improving human capital and the quality of education. However, their reliance on older data was noted as a limitation. Similarly, Kuwar (2021) emphasized education's contributions to productivity, innovation, and income growth. While the study underscored the economic significance of basic literacy, it lacked a detailed exploration of the specific impacts of different education levels.

Self and Grabowski (2004) offered insights into the causal relationship between education and economic growth in India from 1966 to 1996. They demonstrated that primary education significantly influences growth and highlighted the transformative potential of female education across all levels. Chatterji (2008) also examined the importance of primary and female education in India, emphasizing its external benefits and policy implications. However, the lack of methodological details and updated data limited the study’s scope.

Valero (2021) explored the interplay between the quantity and quality of human capital and economic growth, using Barro regression techniques to reveal the spillover effects of education. The study advocated for lifelong learning but relied heavily on older datasets. Meanwhile, Obradović (2009) investigated how education supports governance, innovation, and economic growth, with primary education yielding the highest returns in developing economies. Nevertheless, a detailed sectoral analysis was missing.

Aghion et al. (2009) provided an interesting perspective by distinguishing between the roles of basic and higher education in fostering economic growth. They argued that basic education supports imitation, while higher education drives innovation, particularly for economies near the technological frontier. However, the study faced challenges related to endogeneity and was largely based on U.S.-specific contexts.

More recently, Mussaiyib and Pradhan (2024) examined the causal relationship between higher education and GDP growth in BRICS nations. They found a positive impact of higher education, with variations in causality patterns. However, the study focused less on the role of primary and secondary education. Hanushek (2016), on the other hand, emphasized the importance of cognitive skills over mere educational attainment as a key driver of economic growth. While offering valuable cross-country insights, the study lacked depth in analysing sectoral and gender-specific dimensions.

Education has widely been known to play a fundamental role in economic growth. Tertiary education is significantly correlated with male education to produce development, while the growth and social progress associated with primary and female education are emphasized. Education expenditure in GDP growth has been established as correlated. But gaps in data and analysis make it not totally possible to understand such dynamics.

Research highlights the spill over effects of education on governance, innovation, and productivity with basic education differentiated from higher education being more related to imitation while higher education being linked to innovation. Cognitive skills are more important than educational attainment for sustained economic growth. Higher education contributes positively but significantly to GDP, with primary and secondary education studies less common. The implications of the results are as follows: overall, each level of education is positive, but data, scope, and methodology all reflect gaps

5. RESEARCH GAP:

Despite significant advancements in understanding the relationship between education and economic growth, several critical gaps remain in India. The state-wise dynamics of this relationship are generally neglected in the studies. Other important factors that the authors have overlooked are the varied roles of different institutional types like government and private universities. There also is a requirement to investigate gender-specific effects and interplay among levels of tertiary, secondary, and primary education more nuanced explorations. Other more apparent limitations are that relatively few incorporate more general macroeconomic variables such as population growth and gross fixed capital formation into their work. This means that the influence of these more general factors on their interaction with education in growing economies cannot be ascertained. Filling these gaps may provide an even richer view of mechanisms driving growth and development.

6. METHODOLOGY AND DATA SOURCE:

6.1. Data and variables

The objective of this paper is to examine the dynamic relationship between the education (number of higher educational university) and the economic growth in the selective states of India. The data used for the study is from 2009-2010 to 2018-2019 of 17 states of India. The states are selected on the bases of population.

Table 1: Top 17 states with respect to population

States	Total Population (000's)	Percentage of total population
Jammu & Kashmir (UT)	12541	1.04
Himachal Pradesh	6865	0.57
Punjab	27743	2.29
Uttarakhand	10086	0.83
Haryana	25351	2.09
NCT of Delhi	16788	1.39
Rajasthan	68548	5.66
Uttar Pradesh	199812	16.50
Bihar	104099	8.60
Assam	31206	2.58
West Bengal	91276	7.54
Jharkhand	32988	2.72
Odisha	41974	3.47

Chhattisgarh	25545	2.11
Madhya Pradesh	72627	6.00
Gujarat	60440	4.99
Maharashtra	112374	9.28
Andhra Pradesh	49577	4.09
Karnataka	61095	5.05
Kerala	33406	2.76
Tamil Nadu	72147	5.96
Telangana	35004	2.89

Source: CENSUS OF INDIA 2011

Table 2: Variables of the study

PPSGDP	Per capita state gross domestic product
TU	Total University
POP	Population
GFCF	Gross Fixed Capital Formation
LNPPDGP	Log Per capita state gross domestic product
LNTU	Log Total University
LNPOP	Log Population
LNGFCF	Log Gross Fixed Capital Formation

The above table gives the abbreviation for the variables used in the paper and the analysis.
The two main variables are number of higher educational universities and real per capita GDP ass the proxy for GDP. The population and gross fixed capital formation as a proxy of investment are taken as control variables. The number higher educational universities include "central university, central open university, Institution of National Importance, state public university, state open university, state private university, Institution Established Under State Legislature Act, Deemed University-Government, Deemed University-Government Aided, Deemed University-Private". For the purposes of this study, data for Andhra Pradesh and Telangana have been combined and treated as a single entity, as Telangana was not officially formed until 2014.All the required data for sample period are obtained from ministry of education government of India -AISHE Report, census report, nitiayog and EPWRF. All the variables are in natural logarithms to reduce, to some extent the problem of heteroscedasticity.

6.2. Econometric specification:

Hypothesis and Model Specification:

H_o - there is no relation between the number of total university and GDP

H_{a1} - there is a relation between the number of total university and GDP

Per capita GDP states wise is taken as dependent variable and total university (higher education university), population and gross fixed capital formation as independent variables.

$Ppsgdp = \beta_1 + \beta_2 . TU + \beta_3 . Population + \beta_4 . GFCF$

$LNPPSGDP = \beta_1 + \beta_2 . LNTU + \beta_3 . LNPOP + \beta_4 . LNGFCF$

This paper examines causal dynamic relationships between the count of higher education universities and economic growth in 17 Indian states over the time period of 2009–2010 to 2018–2019. Data analysis and statistical modelling are conducted using EViews. The Panel EGLS (Cross-section weights) estimation method is used.

7. ANALYSIS AND DISCUSSION:

The result shows that there is positive relationship between the number of university (higher education) and per capita Gdp in the states of India. All the variables are in the natural logarithm. However, the control variable population has the negative relationship with the per capita Gdp, whereas gross fixed capital formation and per capita Gdp has a positive relationship.

Table 3: Result of panel EGLS Technique

variable	Coefficient	t-Statistic	Prob.
C	12.85175	29.48918	0.0000
LNTU	0.419105	7.881248	0.0000
LNPOP	-0.582993	-14.52124	0.0000
LNGFCF	0.241528	12.47979	0.0000

R-squared	0.794032
Adjusted R-squared	0.790045
F-statistic	199.181
Prob(F-statistic)	0.000000

The dependent variable is log per capita Gdp and independent variable are log total university, log population and log gross fixed capital formation.

The coefficient of LNTU is positive and highly significant. This suggests a positive relationship between the number of universities and economic growth. States with more universities tend to experience higher economic growth, emphasizing the role of higher education in stimulating economic development.

The coefficient for LNPOP is negative and highly significant. This implies that higher population size may inversely correlate with economic growth per capita because it is more difficult to scale resources, services, and infrastructure with increased populations.

The coefficient for LNGFCF is positive and statistically significant at, thereby suggesting that investment in fixed capital is a key stimulus for economic growth. States having more investment in infrastructure, machinery, and real estate are likely to have better economic growth, which supports capital formation.

The R-squared value of 0.7940 implies that the model explains about 79.4% of the variance in economic growth across Indian states, which indicates a good fit. The Adjusted R-squared further confirms that the explanatory variables are meaningful.

The F-statistic is highly significant at 199.18, with a p-value of 0.0000, which indicates that the model is statistically significant and that the independent variables collectively have a strong explanatory power.

LNTU (universities) has a stronger positive impact on GDP than LNGFCF, emphasizing the pivotal role of higher education in fostering human capital and innovation for economic growth.

8. CONCLUSION AND POLICY IMPLICATION:

This study confirms the positive significant relationship that exists between higher education institutions- number of universities and the growth of economic across chosen Indian states. The findings fall in line with existing literature such as Kotásková et al. (2018), and Aghion et al. (2009), who, respectively, explained how more universities promote more innovation in developing economies. By using panel EGLS estimation, it is found that the states with a higher density of universities grow faster economically, since the coefficient for the log of total universities (LNTU) is positive and significant. This being so, population was indicated to have a negative coefficient to reflect the fact that an increase in population levels seems to pose challenges to achieving faster growth in per capita GDP-the general case in studies that emphasize stressors brought about by high population concentration. The positive relationship found between GFCF and GDP strengthens the role of infrastructural and investment factors on economic performance. This study contributes to the literature by filling up the research gaps, mainly in the state-level analysis of university density and how it interacts with macroeconomic variables such as population and capital formation. It provides empirical evidence that higher education institutions can be engines of balanced regional development.

8.1. POLICY IMPLICATION:

Establishing new universities in states with lower institutional density, such as Bihar and Odisha, can help bridge regional disparities.

Policies should focus on enhancing the quality of education through increased funding for research, better faculty training, and modernized curricula to ensure alignment with regional economic needs.
Promoting collaborations between government and private entities can expand higher education infrastructure and improve accessibility, particularly in underserved regions.
Expanding access to education through online platforms and digital tools can help reach underserved populations, particularly in remote areas like Himachal Pradesh and Jammu & Kashmir.

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