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HIGHER EDUCATION AND GROSS DOMESTIC PRODUCT IN INDIA: AN EMPIRICAL INVESTIGATION

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ABSTRACT

The study attempts to assess the growth of higher education in India over the period 2001-02 to 2010-11. Further the study examines the relationship between gross enrolment ratio (GER) in higher education and gross domestic product (GDP) at constant prices. In addition, an attempt is made to know the impact of GDP on total enrolment of higher education in India over the said period. The study depicts that, Indian higher education has witnessed phenomenal expansion during the last decade. Today, it has one of the largest higher institutions in the world and second largest in terms of enrolments. In spite of this, wide variations are observed in GER among different states and union territories in India. The correlation coefficient between the GER and GDP is 0.972 which suggests that two are positively correlated and highly significant. Finally, from the regression analysis it is also revealed that the GDP has significant positive impact on the growth of total enrolment in higher education in the country. Against the findings of the study, it is suggested that public policy should be directed towards the expansion of higher education system in the country. Further, to derive utmost benefits from higher education both by the individuals and society at large, variations in the access of higher education among states and union territories in the country should be eliminated.

KEYWORDS

Higher Education, Universities, Colleges, Teachers, Enrolments, Gross Enrolment Ratio and Gross Domestic Product.

1. INTRODUCTION

In the global knowledge-based economy, education in general and higher education in particular is universally recognised as a form of investment in human capital that yields economic returns and contributes to nation's future wealth. In this knowledge intensive world driven by information technology, primary education is a must but the importance of higher education cannot be ignored because higher education, being at the apex of educational system, is an essential input for meeting the manpower requirements of the highest calibre in crucial areas of national development. It is also an important contributory factor for ensuring social justice by producing vertical mobility to deprived sections of society by making higher levels of knowledge accessible them and in the process of improving the quality of life of the nation as a whole (Azad, 2002). Thus, higher education is one of the most important inputs that influence the all round development of any nation.

The correlation between economic development and the development of higher education, and the paramount importance of higher education to economic and social development in the knowledge-based economy, are almost universally accepted (World bank, 1994). It is widely accepted that without more and better higher education, developing countries will find it difficult to benefit from the global knowledge-based economy (World Bank, 2000).

India has made considerable progress in the field of higher education, particularly, in science and technology and having third largest number of scientific and technical personnel in the world. It has also become a major player in the knowledge-based global economy. Skill based activities have made significant contribution to this growth. Such activities depend on the large pool of qualified manpower that is fed by its large higher education system. Thus, it is now widely accepted that higher education has been critical to India's emergence in the global knowledge economy (Agarwal, 2009). During the last decade, higher education in the country has witnessed phenomenal expansion. Today the country has one of the largest higher education systems in the world in terms of institutions and second largest in terms of enrolments (Ernst & Young, 2012). It is against this backdrop, a modest attempt is made in this paper to analyze the growth of higher education in India over the last one decade (2001-02 to 2010-11).

The structure of the paper is as follows: Section 2 reviews literature on the relationship between education in general and higher education in particular with economic growth. Section 3 examines the growth of higher education in India. Section 4 discusses data sources and methodological issues. Section 5 reports the empirical results and discussion. Finally, section 6 presents summary and conclusion.

1.1 OBJECTIVES OF THE STUDY

The main objectives of the study are as follows:-

1. To analyze the growth of higher education in India in terms of variables like universities, colleges, student enrolments and teachers over the period 2001-02 to 2010-11.
2. To find the relationship between GER in higher education institutions and GDP in India over the said period.
3. To examine the impact of GDP on total enrolment in higher education in the country over the period of study.

1.2 LITERATURE REVIEW

Several studies at national as well as international level have been organized to capture the effect of education on economic growth. Some of the studies are as follows: - Schultz (1961) estimated the contribution of education to economic growth with the help of the rate of return to human capital vis-a-vis the rate of return to physical capital. He arrived at the conclusion that education alone accounted for 21-40 per cent of increase in the national income growth in the U.S.A., over the period of 1929-1956 and increase in education per member of the employed labour force accounted for 17-33 per cent of income growth over the same period. Barro & Lee (1993) have studies the rate of schooling success in the adult population at various levels (primary, secondary and higher education) from 1960 to 1985 in 129 countries and concluded that levels of education have significant explanatory capacity. Education has direct positive relationship with the growth rate of GNP. Philip Steven (2003) finds the relationship between education and economic growth. The study analysis the role of education in the use of technology and suggests that education is necessary for economic growth and for learning new technology. Hanushek & Wobmann (2010) evaluated the role of education in promoting economic growth. First, education increases human capital inherent in the labour force which in turn increases labour productivity and as a result of this output increases to higher equilibrium level. Second, education increases the capacity to bring about innovation in the economy and new knowledge and new technologies, product and promotes economic growth. Third, education facilitates the dissemination of knowledge, which is necessary to

understand new information and to successfully implement new technologies developed by others, again foster economic growth. Further, they emphasised on quality education as an important determinant to economic growth rather than mere school attainment and found that cognitive skills are more positively related to economic growth. The study conducted by World Bank (1994) shows that higher education is of paramount importance for economic and social development. Institutions of higher education have the main responsibility for equipping individuals with advanced knowledge, and skills required for positions of responsibility in government, business and the profession. Estimated social rates of returns of 10 per cent or more in many developing countries also indicate the investments in higher education contribute to increase in labour productivity and to higher long-term economic growth, which are estimated for poverty alleviation. In discussing the myriad ways in which higher education contributes to economic development in India, Tilak (2007) lists the following: improving earnings, alleviating absolute and relative poverty, influencing human development indicators such as infant mortality, gender parity and life expectancy. Thus, education in general and higher education in particular has high economic value. A considerable part of the community's wealth must be invested for the same. Investment in education leads to the formation of human capital, comparable to physical capital and social capital, and that makes a significant contribution to economic growth (Dickens *et al.*, 2006; Loening, 2004).

1.3 GROWTH OF HIGHER EDUCATION IN INDIA

The system of higher education in India is one of the largest in the world. The system of education in India inherited a poor educational infrastructure from the colonial masters. The colonial policy focused neither on mass education nor on higher education. As a consequence, the country had to begin from scratch soon after its independence (Rani, 2010). Higher education in India has expanded very fast after the independence. The government of India realized that the economic and social progress would be contingent upon the spread of education across the country. Several initiatives were taken including the setting up of the University Grants Commission, an autonomous body for the development and maintenance of standards in higher education, and establishment of several other institutions of technical and scientific excellence.

There has been a spectacular growth in the higher education sector in the post-independence period in terms of the three indicators, viz., (i) number of educational institutions (universities and colleges), (ii) number of teachers and (iii) number of students. The number of universities in India has increased by almost 28 times, from 20 in 1947-48 to about 564 in 2010-11. The number of colleges has registered 67 times increased from 496 in 1948 to 33,023 in 2010-11. The number of teachers has also gone up from around 24,000 in 1950-51 to 699,000 in 2010-11 depicting 29 fold increases. Similarly, student enrolment increased by 170¹ times, from a tiny base of 100,000 to a whopping level of 1,69,74,883 over the said period.

Table 1 and Figure 1 & 2 depict the growth of higher education in India for the period 2001-02 to 2010-11. In the year 2001-02 the number of universities was 272 which went up to 564 in the year 2010-11. The increase in the universities during the period was 2 times. The number of colleges also increased from 13150 to 33023 during the above said period. The increase in the colleges for the above mentioned period was 2.5 times. Similarly, total higher education institutions increased by 2.5 times during the said period. In 2001-02, enrolment in higher education institutions was 8821095 which increased by 1.9 times to a level of 16974883 in 2010-11. Teachers in higher education institutions also increased by 1.6 times from 427 to 699 during the above said period. Thus, it shows that higher education has expanded at a very fast rate during the last decade.

TABLE 1: GROWTH OF INSTITUTIONS, ENROLMENTS AND TEACHERS AT HIGHER EDUCATION INSTITUTIONS IN INDIA (2001-02 TO 2010-11)

Year	No. of Universities	No. of Colleges	Total HEI*	Student Enrolment	No. of Teachers ('000)
2001-02	272	13150	13422	8821095	427
2002-03	300	15343	15643	9516773	436
2003-04	320	16885	17205	10116330	457
2004-05	343	17625	17968	10763775	472
2005-06	355	18064	18419	11506475	488
2006-07	369	19000	19369	11612505	488
2007-08	416	20677	21093	13321817	505
2008-09	471	22064	22535	14467493	521
2009-10	504	25951	26455	15635360	589
2010-11	564	33023	33587	16974883	699
AAGR	8.5	11.0	11.0	7.6	5.8

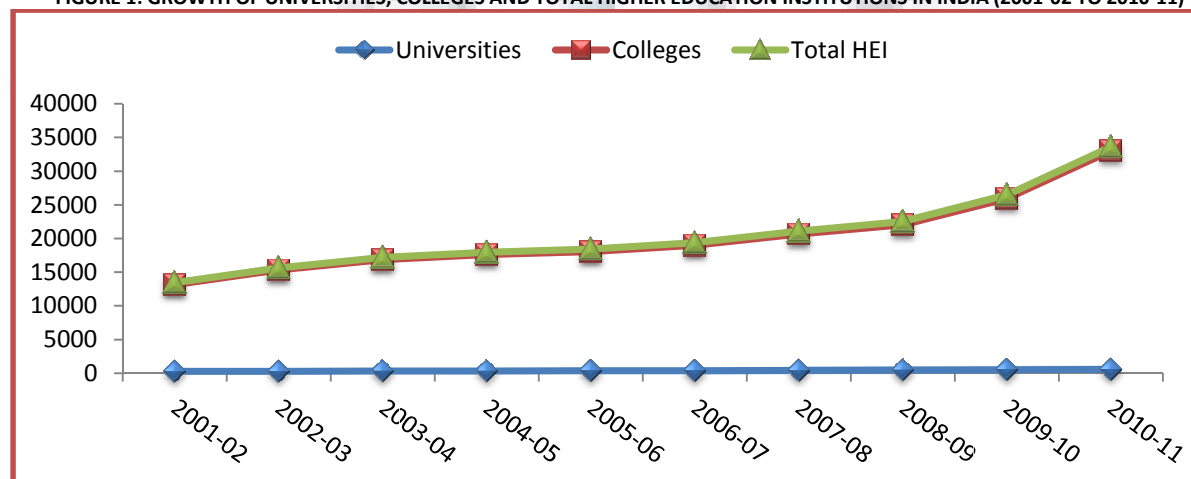
Note: (a) *Total HEI (Higher Education Institutions) = Universities + Colleges.

Sources:

- (i) UGC Annual Reports, Various Issues.
- (ii) Kolhatkar, M. R. (2012). 'Survey of Higher Education (1947-2007)'.
- (iii) Higher Education in India at a Glance (2012). UGC, New Delhi.

An analysis of growth trends in higher education during the period 2002-11 (Table 1) reveals that, it has witnessed high growth in the last decade. The number of institutions has grown at an average annual growth rate (AAGR) of 8.5 per cent while colleges and total higher education institutions has grown at an AAGR of 11 per cent. During 2002-11, enrolment in higher education has grown at 7.6 per cent while the growth rate of teachers was 5.8 per cent.

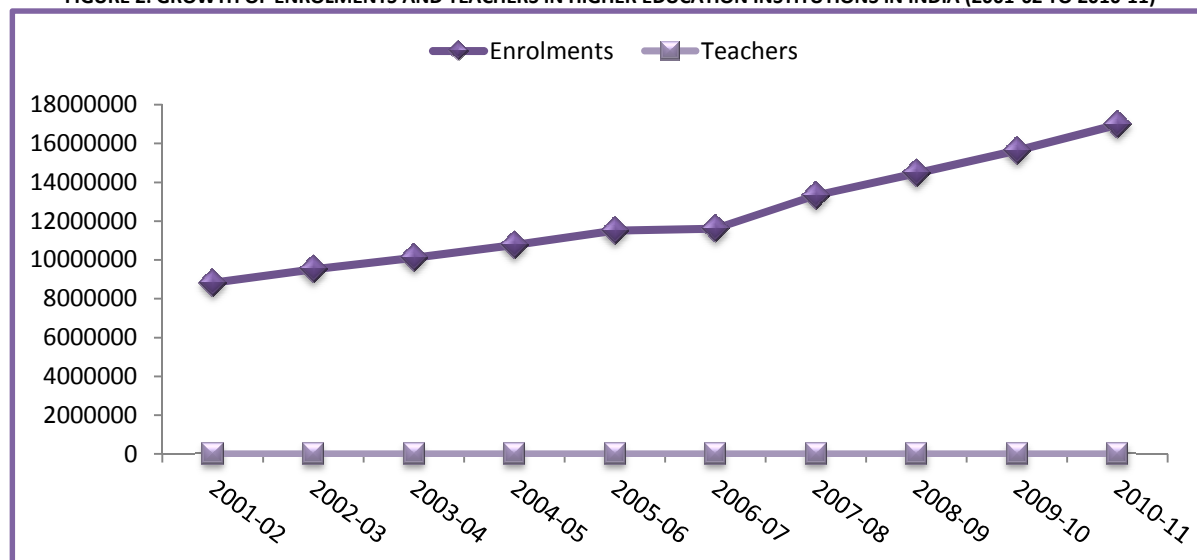
FIGURE 1: GROWTH OF UNIVERSITIES, COLLEGES AND TOTAL HIGHER EDUCATION INSTITUTIONS IN INDIA (2001-02 TO 2010-11)



Source: Table 1

¹ UGC Annual Report (various years).

FIGURE 2: GROWTH OF ENROLMENTS AND TEACHERS IN HIGHER EDUCATION INSTITUTIONS IN INDIA (2001-02 TO 2010-11)



Source: Table 1

TABLE 2: DESCRIPTIVE STATISTICS ANALYSIS, 2001-02 TO 2010-11

Variable	Mean	Std. Dev.	Min	Max
Universities	391.4	95.03	272	564
Colleges	20178.2	5755.3	13150	33023
Total HEIs	20569.6	5847.5	13422	33587
Enrolments	12273650.6	2724257.6	88210958	16974883
Teachers	508.2	81.41	427	699

The descriptive statistics of all variables used in the study are provided in Table 2. The average for universities is 391.4 with a standard deviation of 95.03. It ranges from 272 to 564. The mean value of colleges is 20178.2, varies from a minimum of 13150 to a maximum of 33023 with standard deviation of 5755.3. The mean value of enrolments in higher education institutions is 12273650.6 with a standard deviation of 2724257.6 and mean value of teachers is 508.2 with a standard deviation of 81.41, ranges from 427 to 699. Table 3 reveals the distribution of universities & university Level Institutions in India.

TABLE 3: DISTRIBUTION OF UNIVERSITIES & UNIVERSITY LEVEL INSTITUTIONS IN INDIA

Types of University	India (As on 17. 09. 2012).
State University	299
Private University	140
Institutions of National Importance	39
Deemed University	130
Central University	44
Total	652

Source- ASHE, 2012.

The higher education landscape of the country is characterised by 299 state universities, 140 private universities, 130 deemed universities. Along with these universities, the country has 39 institutes of National Importance, (that specialize in the fields of engineering & technology, management, medical sciences, language, information technology, statistical research etc). In total the country has 652 universities and university level institutes that impart higher and technical education and provide affiliation to more than 33,000 colleges and institutes in the country. India is acknowledged to have the largest higher education systems in the world in terms of number of institutions and second largest higher education system in the world in terms of enrolments, after China. The private sector has played an instrumental role in this growth, with private institutions now accounting for 64 per cent of the total number of institutions and 59 per cent enrolment in the country, as compared to 43 per cent and 33 per cent respectively a decade ago. The government has also given the required thrust to the sector in its five year plans. Growth in private institutions has been significant during the 11th Plan period, with 98 private state universities, 13 private deemed universities, 6335 private colleges and 2321 private diploma institutions being set up during this period (ASHE, 2012).

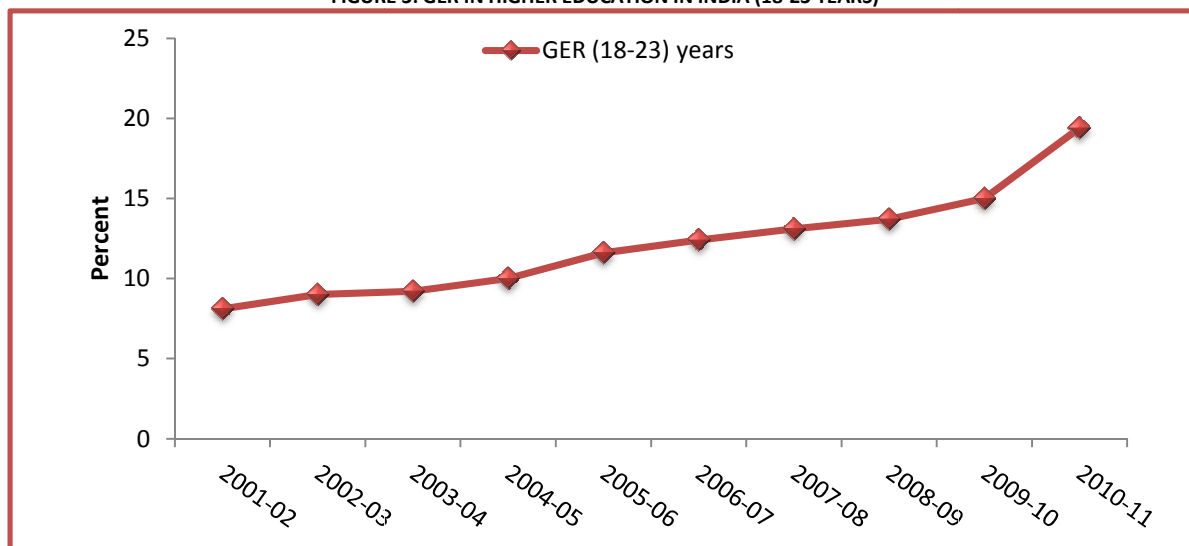
India has shown impressive growth in the number of institutes and enrolments in the country, it still faces challenges on several fronts including low and inequitable access to higher education, shortage of faculty, deficient infrastructure as well as low quality and inadequate research. Today, a key concern for India is the creation of an employable workforce to harness its demographic dividend to the maximum extent. To achieve this, the country needs an education system that can deliver quality in terms of a skilled and industry-ready workforce, without diluting focus on world-class research and innovation (Ernst & Young, 2012).

1.4 GROSS ENROLMENT RATIO IN HIGHER EDUCATION

The access to higher education is measured in term of gross enrolment ratio, (GER) which is a ratio of persons enrolled in higher education institutions to total population of the persons in age group of 18 to 23 years. Under this definition, the GER for higher education in India has increased from 8.1 per cent in 2001-02 to 19.4 per cent in 2010-11 (Figure 3). The national target was to increase the GER to 15 per cent by the end of the Eleventh Five Year period (2011-12), which has been achieved, and 30 per cent by 2020. While this goal requires higher capacity for intake, it also requires steps to improve access to higher education across gender and different social groups, and to bridge the rural-urban divide in order to ensure more equitable outcomes in educational participation (ASHE, 2012). Increased enrolments in the 11th Plan have enabled Indian higher education to cross the threshold of 15 per cent GER, moving the country from an 'elite' to a 'mass'² higher education system. Despite this growth, the unmet demand for access to higher education remains significant, indicating that a further expansion of access to higher education is required.

² Trow (1973) classified higher education systems worldwide according to their enrolments. He defined the 'elite', 'mass' and 'universal' states when the GER is 'less than 15 per cent; between 15 and 50 per cent; and more than equal to 50 per cent respectively.

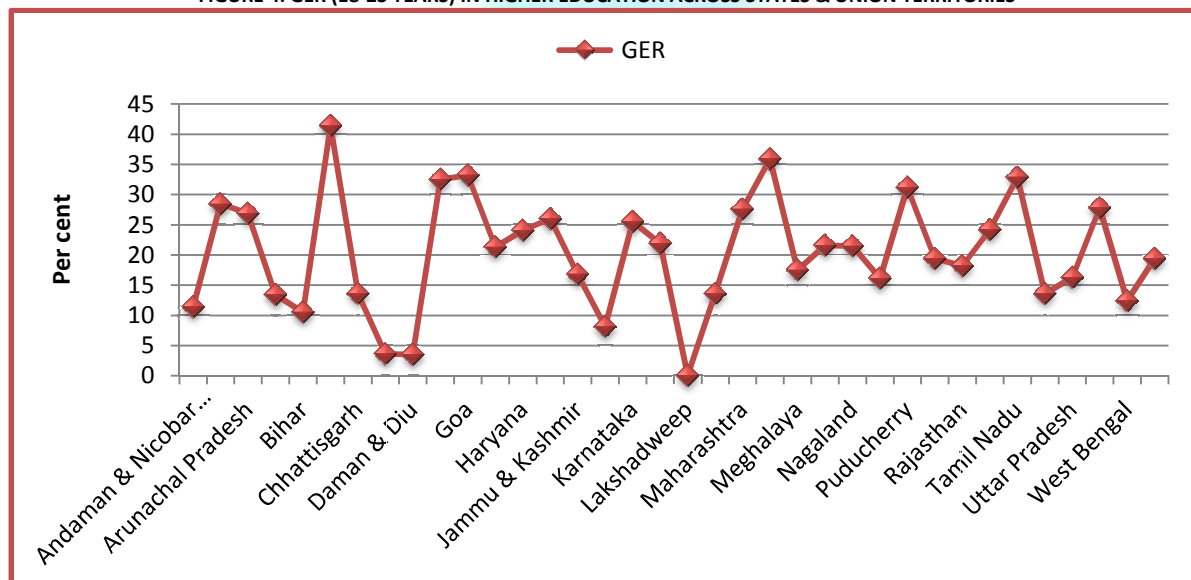
FIGURE 3: GER IN HIGHER EDUCATION IN INDIA (18-23 YEARS)



Source- Statistics of Higher and Technical Education, Various Issues.

Though the overall demand for higher education in India is increasing, there are wide variations in GER across states and union territories (see Figure 4). The GER at the higher education level ranges from as low as 3.5% in Daman & Diu to as high as 41.4% in Chandigarh. The GER is above national average of 19.4% in 19 states and UTs which includes Uttarakhand, Tamil Nadu, Puducherry, Andhra Pradesh, Arunachal Pradesh and Maharashtra etc and less than the national average of 19.4% in 16 states and UTs that include West Bengal, Tripura, Odisha, Madhya Pradesh and Jharkhand etc.

FIGURE 4: GER (18-23 YEARS) IN HIGHER EDUCATION ACROSS STATES & UNION TERRITORIES



Source- AISHE, 2010-11

1.5 DATA SOURCES AND METHODOLOGY

The study has used time-series data covering the period from 2001-02 to 2010-11. The variables used in the study have been collected from different secondary sources. These are collected from University Grants Commission (UGC) Annual Reports, Various Issues, Ministry of Human Resource Development, Higher Education in India at a Glance (2012), UGC, and Reserve Bank of India (RBI) Handbook of Statistics of Indian Economy, Government of India. Several indicators of the growth of higher education such as number of universities, colleges, teachers, enrolments and gross enrolment ratio (GER) are taken into consideration. To observe the growth of variables, we have used annual growth rate.

ANNUAL GROWTH RATE

Annual growth rate is computed by using the following formula:

$$G = \frac{Y_t - Y_{t-1}}{Y_{t-1}} * 100$$

Where,

G = Annual Growth Rate

Y = Value in period t

Y_{t-1} = Value in period t-1

Now, AAGR is calculated by adding all the annual growth rates and dividing it by the number of years. The AAGR is, therefore, the Arithmetic Mean of a series of growth rates. GDP at (2004-05) constant prices³ is used as a proxy variable for economic growth in India.

The other statistical tool used in this study is as follows:-

³ Whole sale price index (WPI) based on 2004-05 prices are used throughout this chapter to convert all the figures from current prices into constant (real) prices, based on the data drawn from Handbook of Statistics of Indian Economy: Reserve Bank of India (RBI), 2011-12. Thus, these figures in real prices are adjusted for increase in prices.

MEAN

$$\mu = \frac{\sum Xi}{N}$$

Where, $i = 1, 2, \dots, N$

The standard deviation (σ) is calculated by using

$$\sigma = \sqrt{\frac{\sum (X - \mu)^2}{N}}$$

Where, $\sum (X - \mu)^2$ is sum of squares deviation from mean

N is number of observation

Further, the study uses **correlation coefficient** to know the relationship between GDP at constant prices and GER in higher education in India.

$$r = \frac{\sum xy}{N \cdot \sigma x \cdot \sigma y}$$

Where, r = Correlation Coefficient

$x = (X - \bar{X})$ and $y = (Y - \bar{Y})$

σx = Standard deviation of series x

σy = Standard deviation of series y

N = Number of paired observations

To assess the impact of per capita gross domestic product (GDP) at constant prices on the total enrolment in higher education over the period of study, the study uses Ordinary Least Squares (OLS) methodology for the above mentioned period. All the variables have to be transformed into logarithmic form to obtain a linear model. Thus, we have the following linear model:

$$\text{LNTEH}_t = \beta_0 + \beta_1 \text{LNGDP}_t + u_t \quad (1)$$

LNTEH_t = Natural logarithm of total enrolment in higher education institutions;

LNGDP_t = Natural logarithm of Gross Domestic Product at constant prices;

β_0 & β_1 are parameters to be estimated and u_t implies the random error term.

1.5.1 LIMITATIONS

In some cases correlation coefficients were found to be statistically significant between two variables and concluded that one causes the other. Significant correlation coefficients are not necessarily a proof for cause-effect relationships and therefore they have their own limitations. However, a theoretical base or economic reasoning was supplied in such cases.

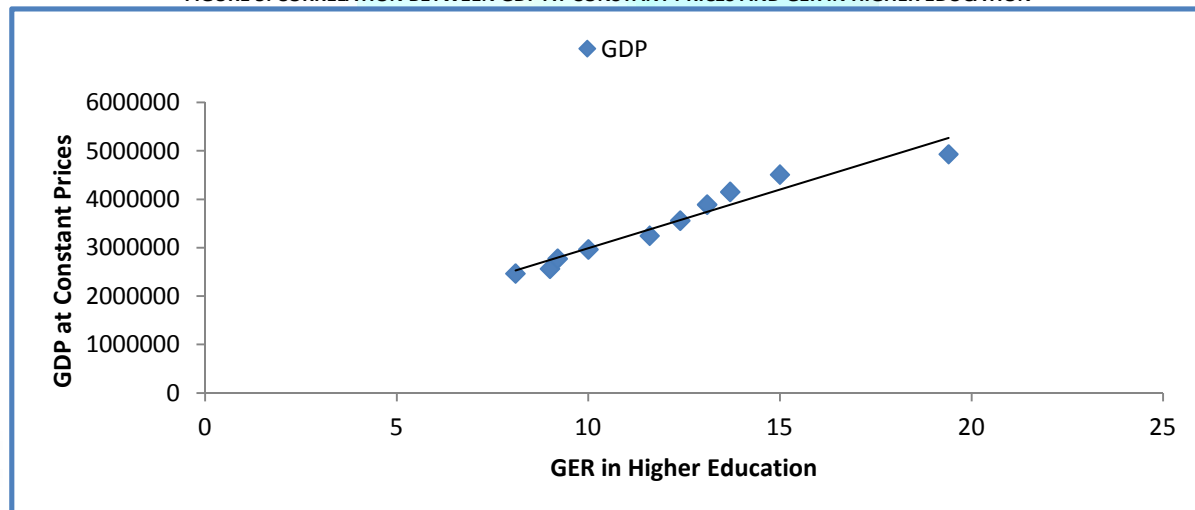
1.6 EMPIRICAL RESULTS AND DISCUSSION

The relationship between GER in higher education and GDP at constant prices over the period 2001-02 to 2010-11 is given in Table 3 and Figure 5. The coefficient of correlation between GDP and GER is 0.972, which suggest that two are highly and positively correlated and the relationship is significant at one per cent level of significance. The study corroborates the finding of (Agarwal, 2006) that there is broadly a positive correlation between GER in higher education and per capita GDP of nations.

TABLE 3- CORRELATION BETWEEN GER AND GDP IN INDIA

Variables	Observations	Pairwise Correlation
GDP & GER	11	0.972*

Note: * Significance at 1% level of significance, ** Significance at 5% level of significance, ***Significance at 10% level of significance.

FIGURE 5: CORRELATION BETWEEN GDP AT CONSTANT PRICES AND GER IN HIGHER EDUCATION

Further, the study investigates the impact of LNGDP_t on LNTEH_t . The value of coefficients measure the per cent change in dependent variable of LNTEH_t with 1 per cent change in independent variable LNGDP_t . Table 5 presents the results of the regression analysis as OLS methods was used to estimate the coefficient value of explanatory variables to determine the enrolments in higher education institutions during the period 2001-02 to 2010-11.

TABLE 5: OLS REGRESSION RESULTS

Dependent variable	Independent Variable			
LNTEH_t	Intercept	LNGDP_t	F-statistics	R^2
	2.77 (0.002)	0.89 (0.000)	472.3 (0.000)	0.98

Notes: Level of significance ***, **, * are denoted as 1 per cent, 5 per cent and 10 per cent respectively. P values under brackets denote the probability of the level of significance.

The slope coefficient is statistically significant at 1 per cent level and the relationship between the variables is positive. It implies that in India, a one per cent increase in GDP contributes 0.89 per cent increase in total enrolment in higher education institutions. Moreover, $F = 472.3$ and $P = 0.000$ imply that the regression model significantly fits the data. Finally, R^2 indicates that about 98 per cent variation of enrolment in higher education can be explained by total variations in independent variable.

1.7 CONCLUSION

Education particularly higher education is critical input in human resource development and is vital for the country's economic growth and development. The main purpose of this study to examine the growth of higher education in India during the period of 2001-02 to 2010-11. First empirical analysis reveals that, higher education in India during the last decade has witnessed massive expansion. GER in higher education in India has also increased but there are wide inter-state disparities. Further, the study found that, there is strong and positive correlation between GDP and GER in India. Finally the study found a positive and significant impact of GDP at constant prices on enrolment in higher education. The result shows that a 1 per cent increase in GDP at constant prices will increase enrolment by about 0.89 per cent. In the light of the above discussions, it is suggested that public policy should be directed towards expansion of higher education in the country. However, to ensure the benefits of higher education among all sections of the society the wide variations in the access of higher education among states & union territories in the country should be eliminated by a coordinated effort of both government and other stakeholder's commitment.

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