An Empirical Analysis of Higher Education and Economic Growth in India

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Abstract
This paper analyses the relationship between education and economic growth in India. It makes a contribution to the literature by analyzing the existence of nonlinearities in this relationship. The direction of the causality that we account for is from education to economic growth. In some cases, an increase in education might have a positive (or large) effect on GDP growth and, in other cases, the effect might be negative (or small). Because the effect of education might differ in different stages, nonlinearities gain importance in the analysis of the relationship between education and economic growth. Specifically, we hypothesise that a country's economic growth performance differs depending on the evolution of its human capital and hence, on its educational achievement. Additional we have made an attempt to relate the population data with the economic growth, the results reveals that the influence of population growth has less relation with respect to economic growth. The results proved that the education and per capital income have direct positive relationship with the economic growth.

Keywords: GDP, per capital income, economic growth

1. Introduction

Growth of an economy as indicated by a rise in the level of real per capital national income, is used as an important indicator of economic advancement and its analysis assumes much significance in analysing the socio-economic development of an economy. Every economy tries to achieve a higher rate of growth of national income or sustain their growth level. An important component of national income is the gross domestic product (GDP) which is originated within the territory of the country. Growth of GDP promotes production, economic activities and employment in the economy and generates revenues for the government. Revenue resources in turn can be used to promote both economic and social sector investments and finance re-distributive welfare schemes. Thus, through the trickle down mechanism, growth generates into social sector developments. Historically nothing has worked better than economic growth in enabling societies to improve the chances of their members, including those at the very bottom (Rodrik, 2008). Economic growth affects the welfare of each individual as it brings about changes in the level of income.

Growth helps in generating revenues to meet the social needs of health, education, proper drinking water and sanitation (Bhagwati and Panagariya, 2013). It therefore ensures, sustainability by providing resources for improving human development (Ranis et. al., 2000). Thus, understanding the pattern and determinates of economic growth will help economies to identify the key factors and appropriate strategies for rising their growth rate and pulling nations out of mass unemployment and poverty and competing with the world economies.

The level and spread of education infrastructure has become the essential requirement for the development of any economy India in general in particular. Education infrastructure includes suitable spaces to learn or all resources necessary to develop and deliver quality education. This is one of the most basic components necessary to ensure access to education at all levels of education (primary, secondary and higher). Poor and insufficient education infrastructure negatively impact student learning and institution outcomes. Due to which, many countries have made huge investment in improving their education infrastructure. Education infrastructure is a facilitative set up, needed to provide quality education in any region or it refers to the spectrum of services or facilities which are essential for an educational institute for providing quality education. The Sustainable Development Goals have refocused attention on ways of providing external finance to support development. Because they have different motivations and work through different modalities, remittances, foreign direct investment (FDI), and official development assistance may be expected to have different consequences for economic growth (Bird et al., 2020).

In other words, the term 'higher education infrastructure' refers to set of components or facilities which includes physical, non-physical and human resources needed to support students/scholars of higher education which are engaged in learning and research. In any economy, education infrastructure, responsible for shaping and raising knowledge as well as abilities, is an important element of the intellectual country capital and appropriate its use can be a source of current and future welfare. It may also be a crucial element for the economy shape and factor enabling developing competitive edge of enterprises. India including Haryana has witnessed a massive expansion of its education infrastructure over the period of time. To accommodate the growing demand of young population, strong education infrastructure is needed in order to keep pace with the developing economy and provide it with quality manpower.

Sustained high rate of economic growth is by now widely recognized as a necessary condition for poverty reduction. However, it is possible to demonstrate empirically that there is no invariant relationship between the rate of economic growth and the rate of poverty reduction. The poverty reducing impact of growth depends on a variety of factors that characterise the pattern of growth. As mentioned in section 3 of the present paper, an important factor is the degree of employment intensity of the growth process, while the other is the ability of the poor to benefit from the employment opportunities that are created (Osmani et al., 2003). Relevance of these two broad sets of factors for poverty reduction have already been demonstrated in the previous section. Given the importance of such factors in poverty reduction, it is quite possible to see in reality different experiences of growth and poverty reduction. While on the one hand high rates of growth can be accompanied by moderate or slow rates of poverty reduction, it is also possible to have rapid rates of poverty reduction with moderate rates of growth – if the pattern of growth is sufficiently employment-intensive and the poor can readily integrate into the growth process and benefit from the incomeearning opportunities that open up (Islam et al., 2014). Modern growth theory suggests that human capital has a positive impact on economic growth. Although there are exceptions, empirical evidence generally shows that human capital has a positive and statistically significant impact on the growth rate of per capita income.1 For example, Artadi and Sala-i-Martin (2003) argue that if primary school enrolment rates at independence in African countries had been as high as those in OECD countries, the average annual growth rate of per capita income in Africa would have been 2.37 per cent instead of the 0.9 per cent recorded in the last four decades; a growth rate that would have more than doubled per capita GDP over the 40-year period. On the other hand, if African countries had had the same rate of investment in physical capital as OECD countries during the same period, GDP per capita would have grown by 0.44 per cent higher. This additional contribution to the growth rate of per capita income is only 30 per cent of the additional contribution that education would have made to economic growth in Africa. This suggests that education has a much larger impact on economic growth in African countries than physical capital.

This paper have made an attempt to relate the education, per capital income and population data with the economic growth, the results reveals that the influence of population growth has less relation with respect to economic growth. The results proved that the education and per capital income have direct positive relationship with the economic growth.

2. Literature review

'Economics of Education' (Heggade 1992) covers almost all aspects of the Indian education system. It is an in-depth study and analysis and deals with inter-relations between education and economic development; different approaches to educational planning like social demand, rate of return and manpower balancing; and brings out its relevance to India. The study also attempts an international comparison about planning and financing of education and examines the trend and pattern of growth of Indian education during 1951-1990. Further, it also gives a detailed account of the weaknesses of Indian education system and examines the objectives and features of New Education Policy 1986.

The significance of human capital for economic growth was recognized in earlier times. The major contribution to the subject on the relationship between education and economic growth was first made by Adam Smith followed by Marshall, Schultz, Bowman and others. Adam smith in his Wealth of Nations emphasized on state investment in education and other social areas. He felt that private entrepreneurs provoked by profit maximization may not make adequate investment in these sectors. Investment in education leads to the formation of human capital, comparable to physical capital & social capital, and that makes a significant contribution to economic growth (Dickens et al., 2006; Loening, 2004; Gylfason and Zoega, 2003; Barro, 2001).

A great deal of literature on growth stemming from the work of Barro (1991, 2001) has paid attention on some measure of human capital as a determinant of economic growth. Barro (1991) verified that in the period 1960– 1985 the growth rate in a sample of 98 countries depends positively on the initial level of human capital measured by schooling rates and negatively on the initial level of per capita GNP. Mankiw et al (1992) extended Solow"s model by introducing the accumulation of human capital measured by education levels and found that contribution of human capital is significant.

Tilak (2001) has attempted to find out the relationship between higher education and development in India using three variables viz; (a) percentage of population with higher education;
(b) poverty; and (c) SDPIP for different years, and concludes that higher education is positively correlated to economic growth and inversely to poverty. Based on the data supplied by Employment Exchanges the study argues that educated unemployment is a serious problem in India and higher education is viewed as the main source. The study also observed that, "over supply of arts and science graduates, heavy subsidization of education, preference for white-collar jobs, preference for public sector jobs, etc. are the most important factors for growth in educated unemployment".

Most of the studies were carried out to see the impact of basic education as a human capital in economic growth. McMahon (1987), Horii et al (2007) Voon (2002) investigated the relationship between higher education and economic growth. McMahan (1987) found that higher education has a positive effect on income growth, but with a long lag – about seven and half years. Voon (2002) argued that the higher the level of education due to high investment, the stronger the growth impact of education. While Horii et al (2007) showed that higher education raises individual earnings, but its contribution to economic growth in the long run is less clear.

The literature on the Indian economy has had a mixed response. Bosworth, Collins and Virmani (2007) concluded that education's contribution to India's economic growth has been negligible. In another study Chandra (2010) tested the causality between investment in education and economic growth in India and concluded a bi-directional causality between them. Pradhan (2009) took a data set from 1951-2001 and confirmed that there exists a long and short term relationship between education and economic growth in the Indian economy and the direction of causality is from economic growth to education but there is absence of reverse causality.

3. Gross Enrolment Ratio In Higher Education (18-23 Years)

Total Student enrolment has been classified in 8 levels viz – Ph.D., M.Phil., Post Graduate, Under Graduate, PG Diploma, Diploma, Certificate and Integrated. Percentage share of student enrolment in these levels are shown in Figure 6. State-wise and level-wise estimated student enrolment is given in Table 6. State-wise student enrolment through regular mode at various level is given in figure (a).

Figure (a): Student wise enrolment

The highest number of students are enrolled at Under Graduate level across India. Similar situation could be observed in States/UTs. Out of the total enrolment of 3,66,42,378 students, a vast majority of 2,90,16,350 students are enrolled in Under Graduate that is a sweeping 79.19%. On the other hand, second to Under Graduate, 11.23% students are enrolled in Post-Graduation which is approximately 41.14 lakh students. There are 3,110 students enrolled in Integrated Ph.D. in addition to 1,61,412 students enrolled at Ph.D. Level. There is a small share of 7.39% students enrolled at Diploma level in India that amounts to around 27.0 lakh students and out of this majority of students are enrolled in Teacher Training, Nursing and Technical streams. However, a small share of 1.77 lakh and 2.35 lakh students are enrolled each at Certificate and PG Diploma levels, respectively, constituting approx. 0.48% and 0.53% of the total share at each level. In terms of state-share of enrolment, Maharashtra tops in the enrolment of students in Universities (including constituent units) with 9,51,642. This is followed by Tamil Nadu with 8,00,516 students and Delhi with 7,53,585 students. State wise enrolment in responding University Teaching Departments along with its constituent Units and off campus Centers are given in figure

(b). State-wise enrolment in responding Colleges and Stand Alone institutions are given figure (c) and figure (d), respectively. Nandan et. al, 2020 addresses two key research issues: (i) whether gender equality promotes economic growth across Indian states and (ii) whether interstate differences in gender equality can explain per capita income disparities among the Indian states.
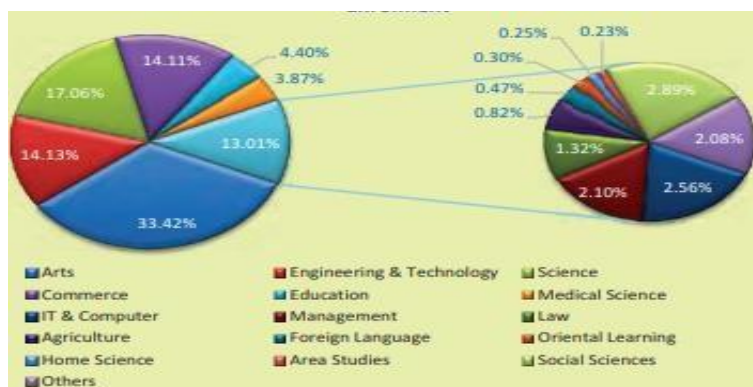

Figure (b): University Teaching Departments along with its constituent Units
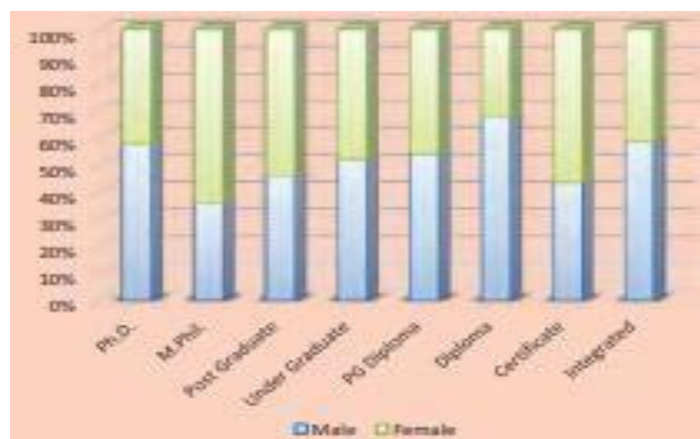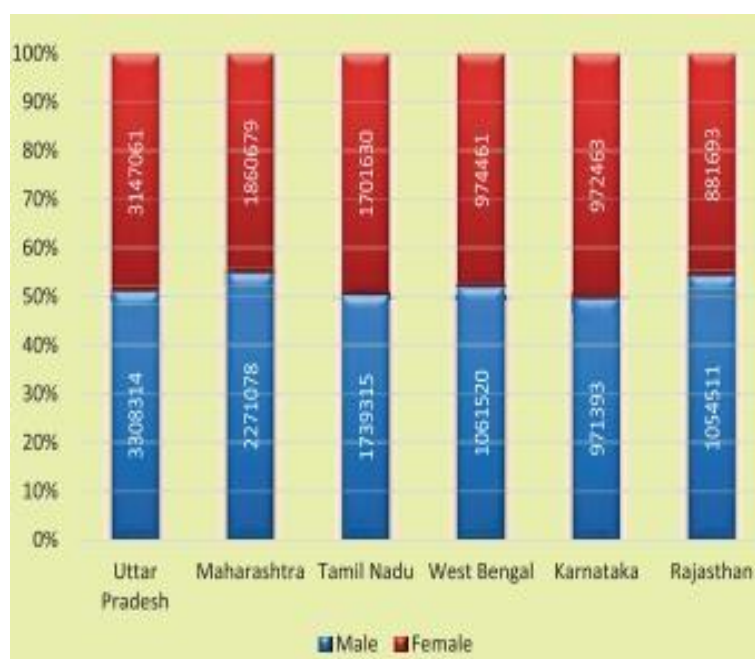
Figure (c): Gender wise distribution

Figure (d): Major states distribution

Uttar Pradesh, with its highest student enrolment in India, has 51.2% male and 48.8% female students. Maharashtra has the second highest student enrolment with approx. 55% male and approx 45% females. Thereafter, Tamil Nadu has 50.5% male and 49.5% female, West Bengal with 52.1% male and 47.9% female students. In Karnataka, percentage of females enrolled is 50% whereas in Rajasthan more male students are enrolled as compared to female students.

4. Methodology

A model with a system of simultaneous equations is used for analysis. Change in per capita income, change in higher education and change in population density are the interdependent variables. A simultaneous equations approach accounts for interactions among the interdependent variables and gives a comprehensive estimation. Also, simultaneity helps in overcoming inconsistency and bias and leads to efficient estimation. As the intention of this analysis is to examine the impact analysis, average values of income, employment, education and all other variables are applied at the county level.
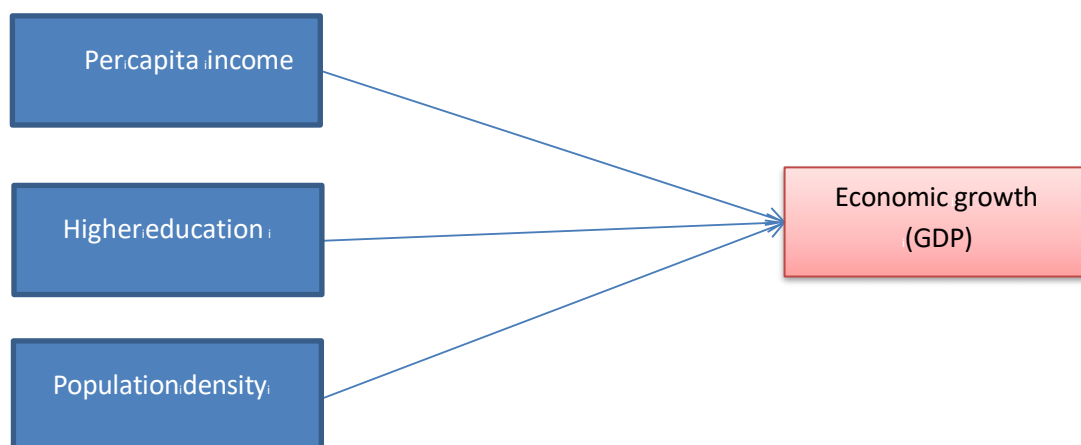
Figure: Research Model

Empirical Model

As indicated above, the focus of this study is to analyze the relationship between higher education and economic growth represented by change in population density, change in per capita income and change in higher education. Higher education is represented by percentage of population with bachelor degree or higher. This study uses three- simultaneous equation model. The general form of the three simultaneous equations model is specified as:

$$(1a) \quad INC = f(EDU, POP / X^{INC})$$
$$(1b) \quad EDU = f(INC, POP / X^{EDU})$$
$$(1c) \quad POP = f(INC, EDU / X^{POP})$$

Where INC, EDU, and POP represent per capita income, higher education, and population density, respectively in the *ith* county; X^{INC}, X^{EDU} and X^{POP} are a set of exogenous variables
that have either direct or indirect effects on per capita income, higher education, and population density. The empirical model for estimation is as follows;

$$(2a) \quad INCC = \alpha_{0INC} + \beta_{1INC}CHEDU + \beta_{2INC}CHPOP + \beta_{3INC}INCBASE +$$
$$\beta_{4INC}EDUBASE + \beta_{5INC}POPBASE + \sum \delta_{1INC}X^{INC} + \varepsilon_1$$
$$(2b) \quad EDUC = \alpha_{0EDU} + \beta_{1EDU}CHINC + \beta_{2EDU}CHPOP + \beta_{3EDU}INCBASE +$$
$$\beta_{4EDU}EDUBASE + \beta_{5EDU}POPBASE + \sum \delta_{1EDU}X^{EDU} + \varepsilon_2$$
$$(2c) \quad POPC = \alpha_{0POP} + \beta_{1POP}CHINC + \beta_{2POP}CHEDU + \beta_{3POP}INCBASE +$$
$$\beta_{4POP}EDUBASE + \beta_{5POP}POPBASE + \sum \delta_{1POP}X^{POP} + \varepsilon_3$$

The endogenous variables INCC, EDUC, and POPC indicate a change in county''s per capita income, higher education, and population density, respectively.

5. Hypothesis for the study

H1: There is a significant relationship between changes in per capital income with the economic growth of the nation.
H2: There is a significant relationship between changes in higher education with the economic growth of the nation.
H2: There is a significant relationship between populations with the economic growth of the nation.
Our data is limited to the share of government consumption of GDP. This variable nets out government investment and transfers. Since these are among the obvious government activities that may enhance growth, we expect the consumption variable to have a negative coefficient. We use the growth rate of this government share as our variable representing the effect of government size on economic growth. Using the growth rate rather than the level of government reflects our

belief that increased government activity will temporarily affect growth as production patterns or transaction requirements or investment procedures are altered. Using the level of government activity implies that a one-time change in government intervention will permanently change economic growth and create, ceteris paribus, increasing wealth differences across countries.'[8]

6. Results and discussion

Per Capital Income VS Economic growth (GDP)

The below tables shows the model summary and ANOVA results obtained under liner regression analysis carried out in SPSS 24.0. GDP data is selected as the dependent variable and per capital income data is select as the independent variable. The regression analysis were carried out under 95% of confidence level (a=0.05). This result helps in validating the hypothesis H1.

Table: Regression analysis (H1)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.276ᵃ	.076	.070	1.595

a. Predictors: (Constant), Per Capital Income

ANOVAᵃ

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	59.523	2	29.761	11.701	.012ᵇ
	Residual	719.809	283	2.543		
	Total	779.332	285			

a. Dependent Variable: Economic growth GDP

b. Predictors: (Constant), Per Capital Income

From the above table, its clear that the sigma value (p=0.012) is less than 0.05 (p<0.05) and obtained f value is 11.701, thus we accept the hypothesis. Thus, there is a positive significant relationship between changes in per capital income with the economic growth of the nation.

Education VS Economic growth (GDP)

The below tables shows the model summary and ANOVA results obtained under liner regression analysis carried out in SPSS 24.0. GDP data is selected as the dependent variable and higher education data is select as the independent variable. The regression analysis were carried out under 95% of confidence level (a=0.05). This result helps in validating the hypothesis H2.

Table: Regression analysis (H2)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.255ᵃ	.065	.059	1.605

a. Predictors: (Constant), Education

ANOVAᵃ

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50.766	2	25.383	9.860	.000ᵇ
	Residual	728.566	283	2.574		
	Total	779.332	285			

a. Dependent Variable: Economic growth GDP

b. Predictors: (Constant), Education

From the above table, its clear that the sigma value (p=0.000) is less than 0.05 (p<0.05) and obtained f value is 9.86, thus we accept the hypothesis. Thus, there is a positive significant relationship between changes in education with the economic growth of the nation.

Population VS Economic Growth (GDP)
The below tables shows the model summary and ANOVA results obtained under liner regression analysis carried out in SPSS 24.0. GDP data is selected as the dependent variable and population growth data is select as the independent variable. The regression analysis were carried out under 95% of confidence level (a=0.05). This result helps in validating the hypothesis H3.

Table: Regression analysis (H3)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.203[a]	.041	.034	1.625

a. Predictors: (Constant), Population

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.982	2	15.991	6.055	.053[b]
	Residual	747.350	283	2.641		
	Total	779.332	285			

a. Dependent Variable: Economic growth GDP

b. Predictors: (Constant), Population

From the above table, its clear that the sigma value (p=0.053) is more than 0.05 (p<0.05) and obtained f value is 6.055, thus we reject the hypothesis. Thus, there is a no significant relationship between changes in population with the economic growth of the nation. The obtained sigma value is too close to 0.05 thus it can be said that the influence of growth in population data have least effect on the economic growth data (GDP).

7. Conclusion

Education frequently takes center stage in discussions about economic development. Indeed, at the micro level, the positive effects of education for human and social development, including effects on health and wages, have been widely documented. However, at the macro level, the empirical evidence on the relation between education growth and economic growth is mixed. This paper investigates this puzzle, which so far has mainly been investigated using linear regressions. One contribution of this paper is therefore to employ instead within-country variation to investigate how educational expansion, increase in per capital income and population could have promote economic growth in an economy, India, with a substantial wage premium for education. Our key contribution is to suggest and test a hypothesis that may reconcile the findings at the micro and the macro levels. We hypothesize that in India part of the explanation of the micro–macro puzzle can be found in the relationship between the education and per capital income to the India's economy.

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