Public expenditure in different education sectors and economic growth: The Indian experience

Ghosh Dastidar, Sayantan and Chatterji, Monojit

University of Huddersfield, Sidney Sussex College, University of Cambridge

24 September 2015

Public expenditure in different education sectors and economic growth: The Indian experience

Sayantan Ghosh Dastidar
Department of Strategy, Marketing and Economics
University of Huddersfield, UK
Email: s.ghosh-dastidar@hud.ac.uk

Monojit Chatterji
Sidney Sussex College
University of Cambridge, UK
Email: mc722@cam.ac.uk

Abstract: The study examines the empirical relationship between public primary, secondary and tertiary education expenditure and economic growth of India using time series econometric analysis for the time period 1951-2011. The econometric analysis indicates that all the sectoral education expenditures positively affect GDP growth from 1980 onwards when the country started to shift from a state-led growth model towards a pro-business regime. We argue that the labour market characteristics and the institutional structure were responsible for the lack of effectiveness of education spending prior to 1980s. Before the 1980s, the public sector was the principal operator in the Indian economy, private sector participation was minimal and bureaucratic jobs were the most attractive jobs which were unproductive and highly rent-seeking. Such a situation discouraged proper utilisation of the skilled work force and hence the education expenditure did not exhibit the desired growth effects. With the onset of reforms, industrial and service sectors expanded creating more job opportunities and thus there was better utilisation of the educated labour pool. As a result, the effect of education expenditure started to be felt as the human capital was put to better use.

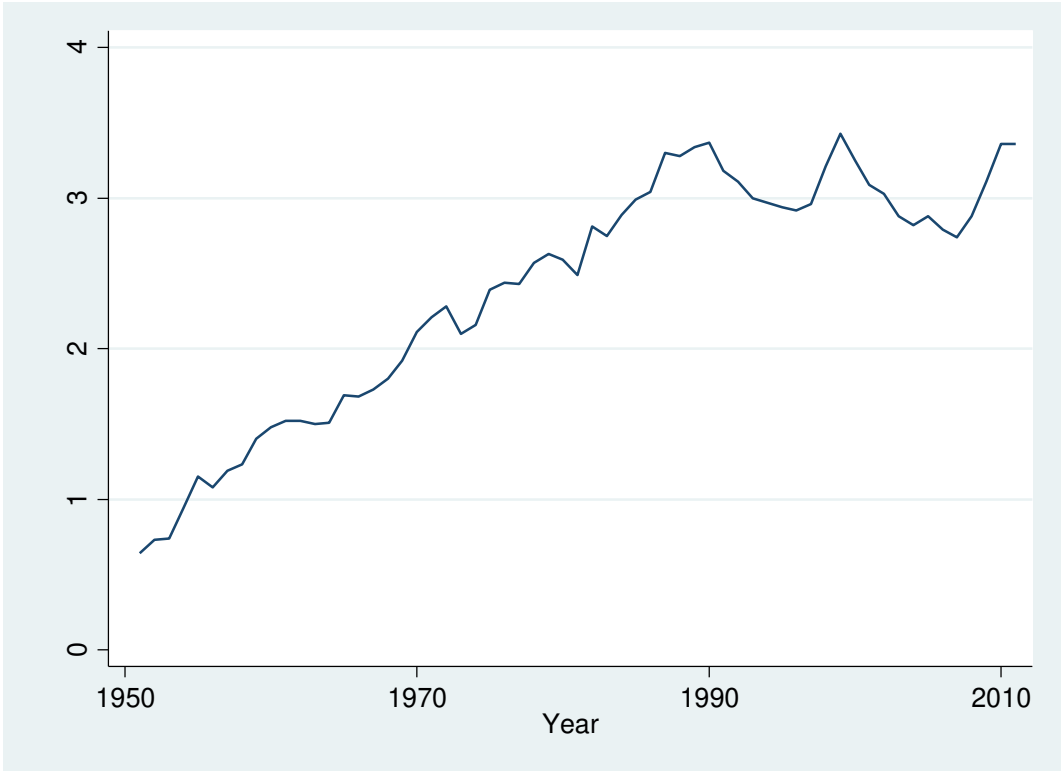
Keywords: Education Expenditure, Primary Education, Secondary Education, Tertiary Education, Economic Growth, India
JEL Classifications: H50, H52, O11, O47

1. Introduction

Education has long been regarded as one of the prime drivers of economic growth. Over time, many growth theories (see, for example, Lucas, 1988; Romer, 1990; Mankiw, et al., 1992) have developed relating human capital and economic growth, thereby underlining the importance of education in the growth process. The belief that education promotes growth has led governments of many developing countries to invest in the education sector.

The Government of India acknowledged the role of education in development immediately after independence in 1947 (Tilak, 2005). Education was made an integral part of development planning from the very first five year plan (1951-56). The quantitative expansion of the Indian education sector has been overall impressive. The expenditure share in GDP started off at 0.64% in 1951 and slowly rose to 3.36% in 2011.

Figure 1: Aggregate Public Education Expenditure as percentage of GDP



Source: Analysis of Budgeted Expenditure on Education (various years), MHRD, Govt. of India.

However, the government of India initially focused more on tertiary education and somewhat neglected school education (De and Endow, 2008). This was because the government gave relatively more emphasis to industrial sector development compared to that of agriculture from the second five year plan (starting from 1956). As seen in Table 1 below, average share of tertiary education expenditure in total education expenditure kept on increasing through the three decades, 1951-1980. At the same time, primary education expenditure share showed a downward trend.

Table 1: Sectoral Education Expenditure as share of Total Education Expenditure

Year	Primary Education Expenditure Share (%)	Secondary Education Expenditure Share (%)	Tertiary Education Expenditure Share (%)
1951-1960	4.43	6.73	20.75
1961-1970	1.7	2.73	60.54
1971-1980	0.4	6.09	71.84
1981-1990	9.56	16.49	60.01
1991-2000	29.6	24.88	33.78
2001-2011	52.89	18.38	21.4

Source: Authors' own calculations based on data from MHRD and RBI database.
Note: All expenditure presented here is by the education department of central government of India. Tertiary education expenditure includes university/higher education expenditure and technical education expenditure. Expenditure shares do not add up to 100 because other categories such as vocational and 'other' education have not been included.

The Constitution of India listed education as a state subject (Article 45) and the responsibility of financing school education rested largely on the state governments. However, without the active support of the central government, the target put down by the Indian Constitution of achieving 'Universal Elementary Education' (UEE) remained an empty rhetoric (MHRD, 1997). In 1976, education was transferred to the concurrent list (i.e. joint responsibility of the state and central government) and after the implementation of National Policy on Education (NEP) in 1986, the share of primary education gradually started to increase in the central budget. Since then, there has been significant quantitative increase in education spending especially at the primary level (from 0.4% of total education spending during 1971-1980 to about 52.89% during 2001-2011).

Budgetary allocations to secondary education by the central government do not show any systematic pattern. The relative importance of secondary education increased once the National Policy of Education (1966) laid emphasis on school education observing the growth of educated unemployment among educated youth and the mismatches in the labour market (Tilak, 2005).

Many studies have previously tried to assess the empirical relationship between aggregate public education expenditure and economic growth of India. There are quite a few studies in this field at the disaggregated level too (see the discussion in Section 2). However, most of those disaggregated level studies focus on the relationship between enrolment ratio in different education sectors or sectoral rate of return and economic growth. To the best of our knowledge, there exists virtually no major empirical study for India which tries to examine the growth effects of public spending in different education sectors (primary, secondary and tertiary sectors). This study therefore attempts to extend the literature in this direction. This analysis will enable us to understand the relative importance of spending in each education sector in the growth process. If it is found that public expenditure is not having the desired effect in a particular sector then a raise in the budget for that sector could be recommended. The reasons behind this argument are two-fold. Firstly, the level of public education expenditure in India is inadequate and the government needs to attach more importance towards education (see, for example, Forbes India, 2013; New York Times, 2013; Times of India, 2014; Hindustan Times, 2014; Ghosh, 2014 among others). Secondly, one may argue that if the public expenditure is not being effective in a particular sector then why the private sector is not being encouraged to increase participation instead of the government. In fact, the private sector has been expanding in India quite rapidly during the post-reform period with 29% of aggregate student enrolment in the 6-14 age group in 2014 (The Hindu, 2014). Out of all primary level schools, 27% are private (MOSPI, 2010). We do not disagree with the case of further privatisation of the education sector but the government has to still play an active role in India. That is because the private sector operates for profits and they are not expected to open schools or

colleges in economically backward areas. Being a developing country, India has millions of underprivileged who cannot afford the higher fees of private education (Patel, 2009). So, it has to be the responsibility of the government to ensure universal access to education. Hence, this study will also indirectly contribute to the on-going public vs. private sector investment debate in Indian education sector.[1]

The rest of the paper is structured as follows. Section 2 reviews the relevant literature, Section 3 outlines the econometric model used in the paper, Section 4 presents and interprets the results and Section 5 concludes.

2. Review of the Literature

The relationship between public education expenditure and economic growth is a frequently debated topic in both theoretical and empirical literature. Importance of education in the growth process can trace back its validation to Adam Smith and Alfred Marshall. However, the early growth models like the Harrod–Domar model and neo-classical growth models regarded capital and labour as the sole determinants of economic growth. The theoretical foundation for the impact of education on economic growth was first built by the endogenous growth theories introduced by Romer (1990) and Lucas (1988). Lucas (1988) and Mankiw et al. (1992) argue that the accumulation of human capital would lead to an increase in the productivity of other factors through innovation and technological progress and thereby raise growth. In their models, a state's rate of growth depends on the rate of accumulation of human capital. Thus, the empirical literature trying

[1] We also wanted to perform a comparative analysis of the growth-enhancing effects of public and private expenditure in education. But, this could not be done because of lack of long time series data for the private sector. However, we suspect that there is a very high chance of the presence of a reverse causality from GDP growth towards growth of private education expenditure because it could be argued that, unlike public investment, private investment in the education is an economic good and people have to pay for it. So, as the Indian economy started to experience a faster growth since the 1980s more and more people started moving up the income ladder and consequently there were more consumers in the private education market demanding enrolment of their children in private schools, mainly because of the deplorable condition of many, if not most, public schools. A 2013 article by the Economic Times says that education has witnessed one of the fastest growth rates among different expenditure heads of Indian households and the household budget share of education increased from 2% to 7% between 1993-94 and 2011-12.

to examine the growth effects of education expenditure (or, human capital accumulation in general) draws its theoretical basis from the endogenous growth theories.

The literature examining the association between aggregate public education expenditure and economic growth is considerably large and the empirical evidence is quite mixed (see Ghosh Dastidar et al., 2012 for a detailed review). Here, given the scope of the paper, we choose to focus only on those studies that examine the empirical relationship between education expenditure in different education sectors and economic growth.

Devarajan et al. (1996) examine the composition effect of public expenditure on economic growth using data on a sample of 43 developing countries and find that school and tertiary education expenditure has no effect on growth; only the category, 'other education' which includes subsidiary services to education, exert positive growth effects. They argue that such outcome can be due to distortions and misallocation of resources in the developing country markets. Aghion et al. (2009) find that the effectiveness of education investments in different sectors vary across US states according to the technology level or technological environment in each state. They observe that only in technically advanced US states, an exogenous shock to four-year college education and research education has positive growth effects. Whereas for a technologically less advanced state, four-year college education and research education have statistically insignificant and negative effects respectively. Solaki (2013) employs co-integration analysis and finds a positive effect of tertiary education expenditure on the economic growth of Greece during 1961-2006. Primary and secondary education expenditures do not seem to have any impact.

It seems that most past studies use rate of return to education or enrolment ratios as proxy for education. Boldin et al. (1996) employ Granger Causality Analysis for the time period 1960-1996 and find that higher education enrolment has a positive effect on GDP growth in Brazil whereas for Chile there was no impact. Jaoul (2004) analyses the higher education-growth link for France and Germany before the Second World War and observe that higher education (measured by total

number of students in arts, law, medical science and other sciences) positively influenced economic growth of France. However, this phenomenon was not observed in Germany. Kui (2006) does a co-integration analysis and reports that economic development is the cause of higher education and result of primary education in China during 1978-2004. Danacica et al. (2010) find that higher education enrolment ratio has no effect on economic growth of Romania.

The existing Indian studies have also evaluated the effectiveness of education using sectoral enrolment ratio or rate of return. Self and Grabowski (2004) find secondary education, measured in terms of enrolment, to be positively correlated with economic growth of India. Haldar and Mallik (2010) report that the stock of human capital, measured by primary gross enrolment rate (lagged by three years), has a significant effect on growth of per capita GNP. Mathur and Mamgain (2004) observe significantly increasing effects of education on economic growth of Indian states (NSDP per capita) by increasing levels of education. They show that the higher education has the highest growth effects followed by higher secondary education. Studies, attempting to evaluate the rate of return to education in India, also find that overall education is beneficial for growth (Harberger, 1965; Nalla-Gounden, 1967; Tilak, 1990). As mentioned previously, no major work seems to exist on the sectoral education expenditure-growth link for India. Therefore, this study aims to fill this gap in the existing literature.

3. Model Formulation and Variable Description

The Augmented Solow Model, formulated by Mankiw et al. (1992), has been employed to examine the relationship between sectoral education expenditure and growth. In this model, the output or GDP is expressed as a function of education expenditure, trade openness, physical capital accumulation and size of labour force. Primary, secondary and tertiary education expenditures enter the model separately. The model is expressed as follows.

$$GDP_t=\beta_0+ \beta_1Primary_t+ \beta_2Trade_t+ \beta_3PCapital_t+ \beta_4Labour_t +e_t \quad (1)$$

$$GDP_t=\beta_0+ \beta_1Secondary_t+ \beta_2Trade_t+ \beta_3PCapital_t+ \beta_4Labour_t +e_t \quad (2)$$

$$GDP_t=\beta_0+ \beta_1Tertiary_t+ \beta_2Trade_t+ \beta_3PCapital_t+ \beta_4Labour_t +e_t \quad (3)$$

where, at time 't', 'GDP' is GDP at factor cost (constant 2004 prices, INR billion), 'Primary', 'Secondary' and 'Tertiary' denote public primary, secondary and tertiary education expenditure respectively (all in constant 2004 prices, INR crore),[2] 'Trade' is exports and imports as percentage of GDP, 'PCapital' is a proxy for physical capital defined as gross capital formation as percentage of GDP (2004 constant prices), 'Labour' is size of labour force and 'e' is the error term. The data on GDP, trade, physical capital and labour come from the Handbook of Statistics on Indian Economy (2012) published by the Reserve Bank of India whereas that on public education expenditure have been obtained from the Union Budget publications (various issues) and Ministry of Human Resource Development (Government of India) online database. All variables are in their natural logarithms except physical capital since the variable is expressed as a percentage of GDP (value lies between 0 and 1).

4. Results and Discussion

Initially, we start our analysis with a simplified model where a bivariate analysis with GDP and education expenditure has been conducted in order to establish the direction of causality. One of the main reasons for doing this exercise before estimating the full model is that data on trade openness is available from 1960 onwards whereas we have data on education expenditure and GDP from 1951 onwards. So we did not want to lose observations. Secondly, we wanted to examine whether a long run relationship exists between only education expenditure in any sector (primary variable of interest) and GDP. However, Johansen test for co-integration indicates that there is no long run

[2] 1 crore=10 million

relationship between primary, secondary or tertiary expenditure and growth. Hence, Vector Autoregression (VAR) method has been employed to estimate the short run relationship. We initially choose VAR over OLS or GLS methods because we suspect that some of the explanatory variables might be potentially endogenous. For instance, it is quite possible that a country starts to grow first and then decides to open up its market to foreign firms. In that case there can be reverse causality from trade towards growth (Tsen, 2006). Moreover, there can be causality running from education expenditure towards trade openness and vice versa. For example, education expenditure leads to human capital accumulation which will increase the quality of labour. This, in turn, can lead to an increase in the productivity of the entire labour force and can encourage further exports (for example, see Chuang, 2000). Hence, a better way to deal with this endogeneity problem will be to apply the Vector Autoregression (VAR) approach. We treat 'Labour' as an exogenous variable because size of the labour force depends on the demographic characteristics of a country. However, to confirm whether 'LABOUR' is actually exogenous or not, we first estimated our VAR model with 'LABOUR' as an endogenous variable. But none of the other variables seem to exert statistically significant effect on 'Labour' and so we treat it as an exogenous variable.

We start by checking the order of integration of our variables using the Augmented Dickey Fuller (ADF) test. The test results are presented below.

Table 2: ADF test results with trend and intercept

Variable	Level	First Difference
GDP	0.99	0.00***
Primary	0.46	0.00***
Secondary	0.07	0.00***
Tertiary	0.54	0.00***
Trade	0.48	0.00***
PCapital	0.46	0.00***
Labour	0.41	0.00***

Note: *, ** and *** represent statistical significance at 10%, 5% and 1% respectively.

The ADF test indicates that all the variables are I(1) hence we insert them in their first difference into the model. The equations used for estimating the gross relationship between education expenditure in different sectors and growth are as follows:

$$\Delta GDP_t = \beta_0 + \beta_1 \Delta Primary_t + e_t \quad (4)$$

$$\Delta GDP_t = \beta_0 + \beta_1 \Delta Secondary_t + u_t \quad (5)$$

$$\Delta GDP_t = \beta_0 + \beta_1 \Delta Tertiary_t + \mu_t \quad (6)$$

where, e, u and μ are the error terms. The optimal number of lags has been chosen using the Akaike Information Criterion (AIC).

The findings presented in the tables (3-5) below indicate that none of sectoral education expenditure has any effect on GDP growth for the time period 1954-2011. Only, secondary education expenditure affects growth negatively with a year lag. But the overall effect of this variable is insignificant as the Granger Causality Test marginally fails to reject the null of no causality (Table 4). There is also some evidence of reverse causality from GDP growth to growth in primary education expenditure.

Table 3: VAR Results with Primary Education Expenditure, 1954-2011

Dependent Variable	Independent Variable	Coefficient
ΔGDP_t	ΔGDP_{t-1} ΔGDP_{t-2} $\Delta Primary_{t-1}$ $\Delta Primary_{t-2}$ Constant	-0.26*** -0.10 0.00 -0.00 0.03***
$\Delta Primary_t$	ΔGDP_{t-1} ΔGDP_{t-2} $\Delta Primary_{t-1}$ $\Delta Primary_{t-2}$ Constant	-13.78*** -1.2 -0.00 0.02 0.37
LM Test for Autocorrelation H_0 : No Autocorrelation at lag order 1 P-value=0.13 H_0 : No Autocorrelation at lag order 2 P-value=0.13	**Granger Causality Test** H_0: $\Delta Primary_t$ does not cause ΔGDP_t P-value=0.83 H_0: ΔGDP_t does not cause $\Delta Primary_t$ P-value=0.00	

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. The model includes a time trend.

Table 4: VAR Results with Secondary Education Expenditure, 1954-2011

Dependent Variable	Independent Variable	Coefficient
ΔGDP_t	ΔGDP_{t-1} ΔGDP_{t-2} Δ Secondary$_{t-1}$ Δ Secondary$_{t-2}$ Constant	-0.23* -0.17 -0.01** 0.00 0.03***
$\Delta Secondary_t$	ΔGDP_{t-1} ΔGDP_{t-2} $\Delta Secondary_{t-1}$ $\Delta Secondary_{t-2}$ Constant	-5.92* 1.35 -0.10 -0.11 0.28
LM Test for Autocorrelation H_0 : No Autocorrelation at lag order 1 P-value=0.29 H_0 : No Autocorrelation at lag order 2 P-value=0.97	**Granger Causality Test** H_0 : $\Delta Secondary_t$ does not cause ΔGDP_t P-value=0.11 H_0 : ΔGDP_t does not cause $\Delta Secondary_t$ P-value=0.16	

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. The model includes a time trend.

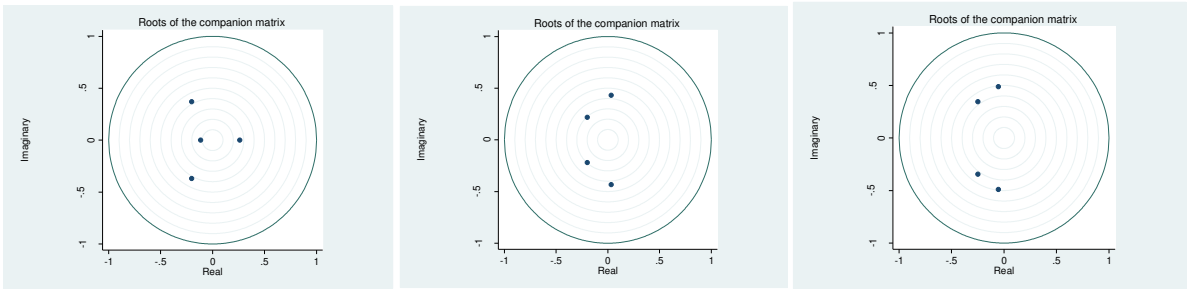
Table 5: VAR Results with Tertiary Education Expenditure, 1954-2011

Dependent Variable	Independent Variable	Coefficient
ΔGDP_t	ΔGDP_{t-1} ΔGDP_{t-2} $\Delta Tertiary_{t-1}$ $\Delta Tertiary_{t-2}$ Constant	-0.25** -0.10 -0.00 -0.02 0.03***
$\Delta Tertiary_t$	ΔGDP_{t-1} ΔGDP_{t-2} $\Delta Tertiary_{t-1}$ $\Delta Tertiary_{t-2}$ Constant	1.69 0.83 -0.35*** -0.28** 0.27***
LM Test for Autocorrelation H_0 : No Autocorrelation at lag order 1 P-value=0.11 H_0 : No Autocorrelation at lag order 2 P-value=0.72	**Granger Causality Test** H_0 : ΔTertiary does not cause ΔGDP P-value=0.34 H_0 : ΔGDP does not cause ΔTertiary P-value=0.39	

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. The model includes a time trend.

All the VAR systems satisfy stability conditions, as indicated by the Figures 2(a-c) representing unit root circles for the VAR systems for primary, secondary and tertiary expenditure respectively. As can be seen below, all the eigenvalues lie within the unit root circle indicating that the VAR system used in our analysis is stable.

Figure 2: Unit Root Circles



(a) (b) (c)

The finding, that none of the education expenditure categories have any significant effect on growth, is upheld even when we re-estimate the relationship using the fully specified model (Equations 1-3). The results are reported in the following tables 6-8.

Table 6: Fully specified VAR Model Estimation with Primary Education Expenditure, 1962-2011

Dependent Variable	Independent Variable	Coefficient
ΔGDP_t	ΔGDP_{t-1} $\Delta Primary_{t-1}$ $\Delta Trade_{t-1}$ $\Delta PCapital_{t-1}$ $\Delta Labour_t$ Constant	-0.22* 0.00 0.09** 0.04 -1.05** 0.02**
$\Delta Primary_t$	ΔGDP_{t-1} $\Delta Primary_{t-1}$ $\Delta Trade_{t-1}$ $\Delta PCapital_{t-1}$ $\Delta Labour_t$ Constant	-17.25*** 0.02 0.10 2.58 18.21 0.23**
$\Delta Trade_t$	ΔGDP_{t-1} $\Delta Primary_{t-1}$ $\Delta Trade_{t-1}$ $\Delta PCapital_{t-1}$ $\Delta Labour_t$ Constant	-0.47 0.00 -0.02 1.16** 0.00* -0.03
$\Delta PCapital_t$	ΔGDP_{t-1} $\Delta Primary_{t-1}$ $\Delta Trade_{t-1}$ $\Delta PCapital_{t-1}$ $\Delta Labour_t$ Constant	0.10 0.00 -0.02 -0.36*** 0.10 -0.01
LM Test for Autocorrelation H_0 : No Autocorrelation at lag order 1 P-value=0.99	**Granger Causality Test** H_0 : $\Delta Primary_t$ does not cause ΔGDP_t P-value=0.37 H_0 : ΔGDP_t does not cause $\Delta Primary_t$ P-value=0.00	

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. Labour enters the model as an exogenous variable. Optimal Number of Lags=1 as per AIC. The model includes a time trend.

Table 7: Fully specified VAR Model Estimation with Secondary Education Expenditure, 1962-2011

Dependent Variable	Independent Variable	Coefficient
ΔGDP_t	ΔGDP_{t-1}	-0.16
	$\Delta Secondary_{t-1}$	-0.01
	$\Delta Trade_{t-1}$	0.10**
	$\Delta PCapital_{t-1}$	-0.02
	$\Delta Labour_t$	-0.92**
	Constant	0.00
		0.04**
$\Delta Secondary_t$	ΔGDP_{t-1}	-5.88*
	$\Delta Secondary_{t-1}$	-0.17
	$\Delta Trade_{t-1}$	0.66
	$\Delta PCapital_{t-1}$	-3.43
	$\Delta Labour_t$	18.21
	Constant	16.54
		-0.06
$\Delta Trade_t$	ΔGDP_{t-1}	-0.57
	$\Delta Secondary_{t-1}$	0.02
	$\Delta Trade_{t-1}$	-0.04
	$\Delta PCapital_{t-1}$	1.27**
	$\Delta Labour_t$	2.57*
	Constant	0.00**
		-0.03
$\Delta PCapital_t$	ΔGDP_{t-1}	0.09
	$\Delta Secondary_{t-1}$	0.00
	$\Delta Trade_{t-1}$	-0.02
	$\Delta PCapital_{t-1}$	-0.36***
	$\Delta Labour_t$	0.09
	Constant	0.00
		-0.01
LM Test for Autocorrelation	**Granger Causality Test**	
H_0 : No Autocorrelation at lag order 1	H_0 : $\Delta Secondary_t$ does not cause ΔGDP_t	
P-value=0.87	P-value=0.19	
	H_0 : ΔGDP_t does not cause $\Delta Secondary_t$	
	P-value=0.10	

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. Labour enters the model as an exogenous variable. Optimal Number of Lags=1 as per AIC. The model includes a time trend.

Table 8: Fully specified VAR Model Estimation with Tertiary Education Expenditure, 1962-2011

Dependent Variable	Independent Variable	Coefficient
ΔGDP_t	ΔGDP_{t-1}	-0.21
	$\Delta Tertiary_{t-1}$	-0.00
	$\Delta Trade_{t-1}$	0.09**
	$\Delta PCapital_{t-1}$	0.02
	$\Delta Labour_t$	-1.01**
	Constant	0.04***
$\Delta Tertiary_t$	ΔGDP_{t-1}	1.93
	$\Delta Tertiary_{t-1}$	-0.25**
	$\Delta Trade_{t-1}$	0.26
	$\Delta PCapital_{t-1}$	3.43**
	$\Delta Labour_t$	-3.20
	Constant	0.30**
$\Delta Trade_t$	ΔGDP_{t-1}	-0.38
	$\Delta Tertiary_{t-1}$	-0.06
	$\Delta Trade_{t-1}$	-0.02
	$\Delta PCapital_{t-1}$	1.02*
	$\Delta Labour_t$	2.53*
	Constant	-0.05
$\Delta PCapital_t$	ΔGDP_{t-1}	0.10
	$\Delta Tertiary_{t-1}$	0.00
	$\Delta Trade_{t-1}$	-0.02
	$\Delta PCapital_{t-1}$	-0.36***
	$\Delta Labour_t$	0.12
	Constant	-0.01
LM Test for Autocorrelation H_0 : No Autocorrelation at lag order 1 P-value=0.98	**Granger Causality Test** H_0 : $\Delta Tertiary_t$ does not cause ΔGDP_t P-value=0.83 H_0 : ΔGDP_t does not cause $\Delta Tertiary_t$ P-value=0.12	

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. Labour enters the model as an exogenous variable. Optimal Number of Lags=1 as per AIC. The model includes a time trend.

There can be many reasons why education may not have the desired positive effect on growth. Blankenau et al. (2007) argue that the government can increase taxes in order to finance rising education expenditure. In that case, the negative tax effects may offset the positive education spending effect. Krueger and Lindahl (2001) say that a country which is improving its education policy is likely to change or improve other economic policies as well which will enhance its growth.

In that case, it can be very difficult to separate the effect of education policy from that of the other policies. Goel (1974) argues that most of the increase in the education expenditure in India has gone into quantitative expansion (for example, like building more schools without investing in qualitative programmes like teachers' training) rather than qualitative improvements. The paper reports that although the education expenditure as a proportion of the national income rose from 1.3% in 1951-52 to 2.9% in 1967-68, the direct per capita expenditure on either primary or middle or secondary or higher education has not increased in the same proportion as the per capita income at current prices, which increased by 110.4% during the period 1951-52 to 1967-68. The teacher-pupil ratio, which is often used as an index of efficiency of an education system, had deteriorated at all the levels of education. The expenditure incurred on training a teacher had also gone down during the aforesaid time period. There was around 33.2% reduction in the per capita investments in training college teachers. Devarajan et al. (1996) show that the supposed link between public expenditure and growth is not observed in case of developing countries. They show that capital expenditure in education do not have any effect on growth which probably is an indication of misallocation of resources in developing countries.

However, it is not that public education expenditure has played absolutely no role in the Indian growth process. It seems that the nature of the relationship between education expenditure and economic growth changed once the Indian economy started to move from a state-led growth model towards a pro-business model since the 1980s. Hence, the lack of a relation between education expenditure and growth, when examined for the entire period of 60 years after independence, can probably be attributed to the labour market characteristics and institutional structure of the Indian economy till the 1970s. During the first three decades after independence, the focus of the Indian policymakers was to achieve growth with social justice following a state-led growth model (Aggarwal and Kumar, 2012). The public sector was the key player in the economy. Till 1970s, policy regulations in the Indian economy gave ample opportunities for rent-seeking in both private

and public sector, especially for large enterprises. Moreover, because of the rigid labour laws it was not easy to fire employees, especially in the public sector. Hence there was a tendency among the companies to hire fewer employees on long term contracts. As a result, the unemployment among graduates in India was quite high. Further, there was clear evidence of rent extraction. In the OECD countries the average wage in the public sector is about 50% higher than per capita GDP whereas in India it was four times as high (Pissarides, 2000). Apart from this, there are many other benefits attached to a public sector job, such as subsidised housing. On an average, public enterprises in India pay twice the average wage of private enterprises, despite the fact that they employ on average a less qualified work force which leads to misallocation of resources. In 1994, of those who succeeded in the civil service examinations for a job in public administration, 38% were qualified engineers and 5.5% qualified doctors. So, the market structure was such that it was encouraging skilled workers to engage in unproductive activities and probably reduced the effectiveness of public education expenditure during the 1950s, 60s and 70s. For example, if the research sector is underdeveloped, as was in the case of India, then the prospective researchers will either migrate to other countries or will engage in rent-seeking activities. If property rights are not respected and innovations are not protected via patents then entrepreneurs cannot keep the profits out of the innovations done in their organisations. Consequently, entrepreneurship will be discouraged and skilled workers, in spite of having the expertise, will not engage in innovative activities. On the other hand, when the markets in a country are large and the people are encouraged to open their own businesses and are allowed to keep their profits, then many talented people get attracted towards entrepreneurship. The prime example of such behaviour is the Great Britain during the Industrial Revolution. The structure of the labour market is therefore vital for the determination of the productivity of human capital. In other words, the labour market in an economy decides the type of use its human capital is put to. It determines that what proportion of the human capital is put into growth-enhancing activities and how much into non-productive activities such as pure rent seeking. The paper, Murphy et al. (1991), is quite useful to understand this concept. The paper says that

markets demanding more civil servants and fewer engineers will not have the same outcome from investing in education as that of a market which encourages more engineering graduates. It shows that countries with more engineers grow faster whereas those with more lawyers grow comparatively at a slower rate. The paper shows, using cross-country data, that there is a positive and significant effect of engineers on growth and a negative and insignificant effect of lawyers on growth.[3]

India began to move towards an open and liberal regime since 1980-81 onwards. There was a clear shift in industrial policies in favour of a market-led growth through domestic decontrols as the country faced stagnating industrial growth towards the end of the 1970s. Some reforms were initiated in the foreign trade sector also. This process of reforms further accelerated in mid-1980s and were followed by deeper and more systematic liberalisation measures from 1991-92 onwards. Many studies confirm that the major structural break in India's growth occurred around 1980. Sinha and Tejani (2004) say that the long-term growth trend appears to break upward from 1980 onwards. The average growth rate of real GDP increased from 3.5% during 1950-1979 to around 5.5% during 1980-2000. Rodrik and Subramanian (2004) find that India's GDP per capita growth more than doubled since 1980, rising from 1.7% during 1950-80 to 3.8% during 1980-2000. They do a structural break test (Bai and Perron test) and find that the break occurs in 1979. Wallack (2003) studies GDP and its disaggregated components for structural breaks and finds the evidence of a break in 1980.

[3] In the Lucas growth model (1988), people divide their time between work and further skill accumulation (research and training). One implication of this model is that the choice, which skilled workers in an economy make between growth enhancing activities or rent-seeking activities, depends on the dynamic features of that economy to a large extent.

Table 9: Average Annual GDP Growth Rate of India

Time Period	Growth Rate (%)
1951-1960	3.67
1961-1970	3.38
1971-1980	2.97
1981-1990	4.80
1991-2000	5.56
2001-2011	7.06

Note: Author's own calculations based on GDP data from RBI database.

Once these regime changes in the Indian economy are accounted for, education expenditure shows a clear effect on GDP growth. There were two such regime changes in the Indian economy. One in 1980-when India started to undertake various industrial reforms; the other in 1991 when India embraced widespread trade reforms. Accordingly, we create period dummies for post-1980 and post-1991 time periods and first assess whether these dummies have any impact on Indian GDP growth using the following estimating equation.

$$\Delta GDP_t=\beta_0+ \beta_1\Delta Primary_t+ \beta_2\Delta Trade_t+ \beta_3\Delta PCapital_t+ \beta_4\Delta Labour_t + \beta_5 dummy80 + \beta_6 dummy91+ e_t \quad (7)$$

where, 'dummy80' is period dummy for post-1980 period which takes a value 1 since 1980 onwards and 0 otherwise and 'dummy91' denotes period dummy for post-1991period which takes a value 1 since 1991 onwards and 0 otherwise. Similarly, the equations with secondary and tertiary education will be specified. The OLS estimation results are presented in Tables 10-12. We employ OLS in this case because our model does not seem to suffer from the problem of reverse causality bias since GDP does not cause trade, physical capital, and secondary and tertiary education expenditures (as seen from the results presented in Tables 6-8). There was only some evidence of reverse causality in case of primary education. Hence, we re-estimate Equation 7 using Instrumental Variable (IV) GMM Estimation method where 'Primary' is instrumented using first and second

year lagged values. GMM results indicate that 'Primary' can actually be treated as exogenous in our model. Nonetheless, we report both the OLS and GMM findings in Table 10 to show that the findings are consistent across the estimation procedures. The Ramsey Reset Test indicates that our model is correctly specified and Portmanteau Test for white noise establishes that there is no problem of autocorrelation.

Table 10: OLS and IV GMM Estimation Results with Primary Education Expenditure, 1961-2011

Variable	OLS Estimation Results			IV GMM Results
$\Delta Primary_t$	0.00	0.00	0.00	-0.01
$\Delta Trade_t$	-0.02	-0.06	-0.04	-0.02
$\Delta PCapital_t$	0.04	0.01	0.02	-0.01
$\Delta Labour_t$	-0.61	-0.03	-0.41	-0.35
dummy80	0.03***		0.02*	0.03*
dummy91		0.03***	0.01	0.00
constant	0.04***	0.04***	0.04***	0.03***
	R^2=0.25 **Ramsey RESET test** H_0: No omitted variable P-value=0.67 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.70	R^2=0.20 **Ramsey RESET test** H_0: No omitted variable P-value=0.48 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.78	R^2=0.26 **Ramsey RESET test** H_0: No omitted variable P-value=0.94 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.72	R^2= 0.15 **Endogeneity Test** H_0:$\Delta Primary_t$ is exogenous P-value=0.47

Note: Dependent Variable=ΔGDP_t. ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. Heteroskedasticity robust standard errors have been used.

The coefficient on 'dummy80' is positive and statistically significant indicating that the growth rate of GDP accelerated after 1980. The 1991 period dummy also comes out with a coefficient of similar size and similar level of significance but it becomes insignificant once we include the 1980 period dummy which implies that incorporating the post-1980 dummy is enough to account for the regime change. The tables 11 and 12 present estimation results of Equation 7 with secondary and tertiary education expenditure respectively.

Table 11: OLS Estimation Results with Secondary Education Expenditure, 1961-2011

Variable	OLS Estimation Results		
$\Delta Secondary_t$	0.01	0.01*	0.01
$\Delta Trade_t$	-0.05	-0.07	-0.05
$\Delta PCapital_t$	0.05	0.04	0.05
$\Delta Labour_t$	-0.38	0.00	-0.40
dummy80	0.004***		0.004***
dummy91		0.003***	-0.00
constant	0.04***	0.04***	0.04***
	R^2=0.33 **Ramsey RESET test** H_0: No omitted variable P-value=0.64 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.68	R^2=0.24 **Ramsey RESET test** H_0: No omitted variable P-value=0.96 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.82	R^2=0.33 **Ramsey RESET test** H_0: No omitted variable P-value=0.95 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.68

Note: Dependent Variable=ΔGDP_t. ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. Heteroskedasticity robust standard errors have been used.

Table 12: OLS Estimation Results with Tertiary Education Expenditure, 1961-2011

Variable	OLS Estimation Results		
$\Delta Tertiary_t$	0.01	0.01	0.01
$\Delta Trade_t$	-0.05	-0.07	-0.05
$\Delta PCapital_t$	-0.01	-0.00	0.01
$\Delta Labour_t$	-0.16	0.21	-0.18
dummy80	0.004***		0.004***
dummy91		0.002***	-0.00
constant	0.03**	0.03***	0.03***
	R^2=0.30 **Ramsey RESET test** H_0: No omitted variable P-value=0.76 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.40	R^2=0.22 **Ramsey RESET test** H_0: No omitted variable P-value=0.83 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.62	R^2=0.30 **Ramsey RESET test** H_0: No omitted variable P-value=0.71 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.40

Note: Dependent Variable=ΔGDP_t. ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. Heteroskedasticity robust standard errors have been used.

There is some evidence that secondary education expenditure has a positive effect on growth but this effect is fragile and sensitive to model specifications and estimation methods. In the VAR estimation, this positive effect does not show up. Next, we interact the variables primary, secondary and tertiary education expenditure with the 1980 period dummy and re-estimate our model by incorporating these interaction variables into our model. Furthermore, a lagged dependent variable has been included in the model to eliminate any potential problem of autocorrelation. The new model looks as follows:

$$\Delta GDP_t=\beta_0+\beta_1\Delta GDP_{t-1}+\beta_2\Delta GDP_{t-2}+\beta_3\Delta Primary_t+\beta_4\Delta Trade_t+\beta_5\Delta PCapital_t+\beta_6\Delta Labour_t+ \beta_7 Primary80+ e_t \quad (8)$$

$$\Delta GDP_t=\beta_0+\beta_1\Delta GDP_{t-1}+\beta_2\Delta GDP_{t-2}+\beta_3\Delta Secondary_t+\beta_4\Delta Trade_t+\beta_5\Delta PCapital_t+\beta_6\Delta Labour_t+ \beta_7 Secondary80+ e_t \quad (9)$$

$$\Delta GDP_t=\beta_0+\beta_1\Delta GDP_{t-1}+\beta_2\Delta GDP_{t-2}+\beta_3\Delta Tertiary_t+\beta_4\Delta Trade_t+\beta_5\Delta PCapital_t+\beta_6\Delta Labour_t+ \beta_7 Tertiary80+ e_t \quad (10)$$

where, 'Primary80' is the interaction term between Primary education expenditure and dummy80, 'Secondary80' is Secondary education expenditure*dummy80 and 'Tertiary80' denotes Tertiary education expenditure*dummy80.

We estimate the final model (Equations 8-10) using both OLS and Prais-Winsten Regression methods. Our model does not suffer from autocorrelation problem (as evident from the Portmanteau Test results) so OLS should suffice. However, we still apply Generalized Least Squares (GLS) method to the model to check the robustness of our findings to different estimation procedures. Tables 13-15 below present the results obtained by estimation of equations 8-10.

Table 13: OLS and Prais-Winsten Regression Results with Primary80, 1961-2011

Variable	OLS Estimation Results	Prais-Winsten Regression Results
ΔGDP_{t-1}	-0.31*	-0.62***
ΔGDP_{t-2}	-0.22	-0.38***
$\Delta Primary_t$	-0.00	-0.00
$\Delta Trade_t$	-0.05	-0.09
$\Delta PCapital_t$	0.04	-0.01
$\Delta Labour_t$	-0.42	-0.65
Primary80	0.01***	0.01***
constant	0.06**	0.08***
	R^2=0.37 **F Test of Significance** H_0:Primary80=0 P-value=0.00 **Ramsey RESET test** H_0: No omitted variable P-value=0.14 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.79	R^2=0.46 **F Test of Significance** H_0:Primary80=0 P-value=0.00

Note: Dependent Variable=ΔGDP_t. ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. Heteroskedasticity robust standard errors have been used.

Table 14: OLS and Prais-Winsten Regression Results with Secondary80, 1961-2011

Variable	OLS Estimation Results	Prais-Winsten Regression Results
ΔGDP_{t-1}	-0.17	-0.50***
ΔGDP_{t-2}	-0.20	-0.37***
$\Delta Secondary_t$	0.01	0.00*
$\Delta Trade_t$	-0.04	-0.07**
$\Delta PCapital_t$	0.10	0.03
$\Delta Labour_t$	-0.67	-0.98
Secondary80	0.004***	0.01***
constant	0.06**	0.08**
	R^2=0.35 **F Test of Significance** H_0:Secondary80=0 P-value=0.00 **Ramsey RESET test** H_0: No omitted variable P-value=0.40 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.96	R^2=0.48 **F Test of Significance** H_0:Primary80=0 P-value=0.00

Note: Dependent Variable=ΔGDP_t. ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. Heteroskedasticity robust standard errors have been used.

Table 15: OLS and Prais-Winsten Regression Results with Tertiary80, 1961-2011

Variable	OLS Estimation Results	Prais-Winsten Regression Results
ΔGDP_{t-1}	-0.22*	-0.57***
ΔGDP_{t-2}	-0.15	-0.34***
$\Delta Tertiary_t$	0.01	0.01
$\Delta Trade_t$	-0.04	-0.08**
$\Delta PCapital_t$	0.11	0.04
$\Delta Labour_t$	-0.59	-0.80
Tertiary80	0.004***	0.01***
constant	0.05**	0.08***
	R^2=0.33 **F Test of Significance** H_0:Tertiary80=0 P-value=0.48 **Ramsey RESET test** H_0: No omitted variable P-value=0.14 **Portmanteau Test** H_0: No Autocorrelation P-value= 0.76	R^2=0.44 **F Test of Significance** H_0:Primary80=0 P-value=0.00

Note: Dependent Variable=ΔGDP_t. ***, ** and * indicate statistical significance at 1%, 5% and 10% level respectively. Heteroskedasticity robust standard errors have been used.

A 1 percentage point increase in growth rate of primary education expenditure is expected to raise GDP growth rate by 0.01 percentage points. Compared to this, the effect of secondary and tertiary expenditure is relatively smaller, as far as OLS estimation results are concerned. A similar increase in growth rate of either of secondary or tertiary expenditure raises GDP growth rate only by 0.004 percentage points. However, if we look at the Prais-Winsten estimates then the growth effect of expenditure in all sectors seem to be similar. The results give an overall impression that public education expenditure started to exert a positive impact (though the elasticities are not very large) on Indian GDP growth once the country introduced substantial industrial and trade reforms, started to encourage private sector participation and embraced globalisation since the 1980s. As a result, industrial and service sectors expanded creating more job opportunities and thus there was better utilisation of the educated labour pool. Prior to the 1980s, as discussed earlier, public sector was the predominant manipulator of the human capital in the Indian economy. Public sector jobs such as bureaucratic positions were the most attractive form of jobs which are highly unproductive and encourage rent-seeking. That is why, probably, we do not find any effect of any sectoral education

expenditure on growth when we do the econometric analysis for the entire time period 1951-2011. However, as the Indian economy started to become increasingly pro-business, the effect of education expenditure started to be felt as the human capital was put to better use. Moreover, as competition increased with increasing trade openness since 1991, companies were compelled to invest in innovation and thereby exploit the human resources more effectively. So, we see that primary, secondary and tertiary education expenditure influenced GDP growth positively since 1980. The explaining power of the model improves once lagged dependent variables are included. The growth effect of trade openness during 1961-2011 is fragile which is consistent with the findings of past Indian studies such as Chatterji et al. (2014). Maybe, there are measurement errors associated with the variable-physical capital and that is why we almost never get to observe the theoretical relationship between physical capital and growth in the empirical exercise (Krueger and Lindahl, 2001). Both physical capital and labour force size do not seem to exert any meaningful effect on growth. Even if we drop these variables from our model, the findings stay unchanged.

From a policy point of view, one area of concern is the low coefficient on the education variables. In other words, even though there is an effect of education expenditure on growth during the post-liberalisation period but it seems to be quite low. The meagre growth effects to a large extent reflect the poor quality of the Indian public education system. There is no common education system in India. At the top end, there are private English-language schools which offer high-quality curricula whereas those who cannot afford private schooling (and they are the majority) go to government managed public schools. Though basic child literacy rates have risen over the past two decades but basic skill acquisition, including reading and writing, still remain low by international standards. Lall (2005) says that, in India's 600,000 villages and multiplying urban slum habitats, 'free and compulsory education' is nothing more than basic literacy instruction dispensed by barely

qualified "para-teachers"[4]. As discussed earlier in the paper, though the budget allotted to school education, especially at the primary level, has significantly increased over the past two decades but most of those investments have gone into quantitative expansion (like building more schools in rural areas) rather than qualitative improvements.

Needless to say, there are significant qualitative differences between the private and public schools and the sorry state of the country's publicly funded education system has been well documented in several past studies (see Kingdon, 2005; Hill and Chalaux, 2011 for details). Firstly, the rate of teacher absenteeism and shirking is much higher in public schools which ultimately have a detrimental impact on school learning. In public schools, teachers are hired by the government on permanent contracts whereas those in private schools are mostly hired at school level on fixed-term contracts. Teachers in private schools face a stronger accountability mechanism. Muralidharan and Kremer (2007) discuss that in a survey of 3000 public schools only once a head teacher dismissed a teacher for repeated absence, whereas in a sample of around 600 private schools, 35 head teachers had dismissed a teacher at some point for repeated absence. Secondly, the quality of school infrastructure in public schools is abysmal. PROBE (1999) reports that 42% of sample primary schools did not have at least two classrooms, 60% had leaking roofs, 84% had no toilet, 54% had no drinking water and 26% did not have functioning blackboards in all classrooms. Education expenditure is a necessary but not sufficient condition for growth. Along with quantity, quality is equally important. The government has to devise better mechanisms to monitor the investments so that misallocation of resources could be avoided which, in turn, will raise the growth effects of these investments.

[4] Para-teachers are recruited locally to work in public schools, normally on fixed-term contracts, and generally have lower credentials, as compared to regular teachers, in terms of teacher qualifications (Hill and Chalaux, 2011).

5. Conclusion

The study tries to estimate the relationship between public primary, secondary and tertiary education expenditure and economic growth using time series econometric analysis for the time period 1951-2011. It seems that the nature of the relationship between education expenditure and growth changes following a regime change in the Indian economy since 1980. The econometric analysis indicates that expenditure in each education sector positively affects GDP growth from 1980 onwards. However, no effect is observed if the analysis is conducted for the entire time period indicating an alteration in parameters across regimes.

In other words, public education expenditure started to exert a positive impact on Indian GDP growth once the country embraced substantial industrial reforms since 1980s, started to encourage private sector participation and eventually embraced globalisation since 1991onwards. As a result, industrial and service sectors expanded creating more job opportunities and thus there was better utilisation of the educated labour pool. Till 1970s, policy regulations in the Indian economy gave ample opportunities for rent-seeking, especially for large enterprises. Moreover, because of the rigid labour laws it was not easy to fire employees, especially in the public sector. Hence there was a tendency among the companies to hire fewer employees on long term contracts. As a result, the unemployment among graduates in India was quite high, thereby underutilising the available human capital. Bureaucratic jobs in the public sector were the most attractive form of jobs which are highly unproductive and encourage rent-seeking. That is why, probably, education expenditure did not have any effect on growth during 1951-1979 and this rendered the relationship for the entire time period 1951-2011 into being non-existent.

The findings also make the case stronger for the government involvement in India for funding both school and higher education. Undoubtedly, private sector should still be encouraged to invest in education because empirical evidence suggests that private schools are more efficient than public schools in imparting learning (Desai et al, 2008; French and Kingdon, 2010; Pal and Kingdon,

2010). However, since education is a 'public good' hence it is the government's responsibility to ensure access to education for everyone, especially those from poor households, who cannot afford the high fees of private schools. Finally, education expenditure is a necessary but not sufficient condition for growth. Along with quantity, quality is equally important. Even though education expenditure starts to influence growth positively during the post-liberalisation era however the effect seems to be quite low which probably reflects the poor quality of the Indian public education system, especially at the school level. Therefore, besides increasing expenditure level the government has to undertake necessary reforms to upgrade the quality of the system. Otherwise, the effectiveness of the education spending will continue to be low.

References

AGGARWAL, A. and KUMAR, N. 2012. Structural Change, Industrialization and Poverty Reduction: The Case of India. *South and South-West Asia Development Papers*, No. 1206,(ESCAP).

AGHION P., BOUSTAN, L., HOXBY C., and VANDENBUSSCHE, J. 2009. The Causal Impact of Education on Economic Growth: Evidence from the United States. Brookings Papers on Economic Activity, Conference Draft.

BLANKENAU, W. F., SIMPSON, N. B. and TOMLJANOVICH, M. 2007. Public Education Expenditures, Taxation, and Growth: Linking Data to Theory. *American Economic Review*, 97(2), 393-397.

BOLDIN, R., MOROTE, E. S., and MCMULLEN, 1996. Higher Education and Economic Growth in Latin American Emerging Markets.
Accessed at http://www.internationalprofessor.com/documentation/onlinepublicatitons/BoldinetalPDF.pdf

CHATTERJI, M., MOHAN, S., and GHOSH DASTIDAR, S. 2014. Relationship Between Trade Openness And Economic Growth Of India: A Time Series Analysis. *Journal of Academic Research in Economics*, 6(1), 45-69.

CHUANG, Y.-C. 2000. Human Capital, Exports, and Economic Growth: A Causality Analysis for Taiwan, 1952–1995. *Review of International Economics,* 8(4), 712-720.

DANACICA, D-E, BELASCU, L. and ILIE, L. 2010. The Interactive Causality between Higher Education and Economic Growth in Romania. *International Review of Business Research Papers*, 6(4), 491-500.

DE. A., and ENDOW, T. 2008. Public Expenditure on Education in India: Recent Trends and Outcomes. *Research Consortium on Educational Outcomes and Poverty (RECOUP) Working Paper,* No. 18.

DESAI, S. A., DUBE, V.R. and R. BANERJI. R. 2008. Private Schooling in India – A New Landscape.mimeo, NCAER.

DEVARAJAN, S., SWAROOP, V. and ZOU, H.-F. 1996. The composition of public expenditure and economic growth. *Journal of Monetary Economics*, 37(2), 313-344.

FORBES INDIA, 2013. Amartya Sen: 'You need an educated, healthy workforce to sustain economic development'. 26th July, 2013. Accessed at: http://forbesindia.com/article/close-range/amartya-sen-you-need-an-educated-healthy-workforce-to-sustain-economic-development/35701/0.

FRENCH, R., and KINGDON, G. 2010. The relative effectiveness of private and government schools in Rural India: Evidence from ASER data, mimeo, Institute of Education, University of London.

GHOSH, J. 2014. Hollow Promises. *Frontline*, 31(15), 13-15.

GHOSH DASTIDAR, S., MOHAN, S. and CHATTERJI, M. 2012. The relationship between public education expenditure and economic growth: The case of India. *Dundee Discussion Papers in Economics*, 273, University of Dundee.

GOEL, S. C. 1974. Education and Economic Growth in India. *Comparative Educatio*n, 10(2), 147-158.

HALDAR, S. K., and MALLIK, G. 2010. Does Human Capital Cause Economic Growth? A Case Study of India. *International Journal of Economic Sciences and Applied Research*, 3(1), 7-25.

HARBERGER, A.C. 1965. Investment in Men versus Investment in Machines: The Case of India, in Education and Economic Development (eds.: C.A.. Anderson and M J Bowman). Chicago: Aldine, 11-50.

HILL, S., and CHALAUX, T. 2011. Improving Access and Quality in the Indian Education System, *OECD Economics Department Working Papers*, 885.

HINDUSTAN TIMES, 2014. More than a million have no school and no hope for the future, 13th July, 2014. Accessed at: http://www.hindustantimes.com/india-news/more-than-a-million-have-no-school-and-no-hope-for-the-future/article1-1239782.aspx.

JAOUL, M. 2004. Higher education, causality and growth: a comparison of France and Germany before the Second World War, *Compare: A Journal of Comparative and International Education*, 34(1), 117-133.

KINGDON, G. G. 2005. Private and public schooling: The Indian experience. *Conference Draft*, Prepared for the conference:"Mobilizing the Private Sector for Public Education", Kennedy School of Government, Harvard University.

KRUEGER, A. B., and LINDAHL, M. 2001. Education for growth: Why and for whom? *Journal of Economic Literature*, 39(4), 1101-1136.

KUI, L. 2006. The Interactive Causality between Education and Economic Growth in China. *Working Paper*, Accessed at http://papers.ssrn.com/sol3/papers.cfm?Abstractid=920624.

LALL, M .2005. The Challenges for India's Education System. *Asia Programme Briefing Paper*, 05/03.

LUCAS, R. E. 1988. On the Mechanics of Economic Development. *Journal of Monetary Economics,* 22(1), 3-42.

MANKIW, N. G., ROMER, D., and WEIL, D. N. 1992. A Contribution to the Empirics of Economic Growth. *Quarterly Journal of Economics*, 107(2), 407-437.

MATHUR, A., and MAMGAIN, R.P. 2004. Human Capital Stocks, Their Level of utilization and Economic Development in India. *Indian Journal of Labour Economics*, 47 (4), 655-75.

MINISTRY OF HUMAN RESOURCE DEVELOPMENT. 1997. 50 years of Education. Government of India.

MINISTRY OF HUMAN RESOURCE DEVELOPMENT, Analysis of Budgeted Expenditure on Education, Various Issues, Department of Education, Government of India.

MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION. 2010. Education in India: 2007-08, National Sample Survey 64th Round (2007-08), Government of India.

MURALIDHARAN, K., and KREMER, M. 2007. Public and Private Schools in Rural India. Harvard University, mimeo.

MURPHY, K. M., SHLEIFER, A. and VISHNY, R. W. 1991. The Allocation of Talent - Implications for Growth. *Quarterly Journal of Economics*, 106(2), 503-530.

NALLA-GOUNDEN, A.M. 1967. Investment in Education in India, *Journal of Human Resources*, 2 (3), 347-58.

NEW YORK TIMES, 2013. Why India Trails China. 19th June, 2013. Accessed at: http://www.nytimes.com/2013/06/20/opinion/why-india-trails-china.html?_r=0.

PAL, S., and KINGDON, G. G. 2010. Can Private School Growth Foster Universal Literacy? Panel Evidence from Indian Districts. *IZA Discussion Paper,* No. 5274.

PATEL, V. 2009. Private higher education in India – changing scenario. *International Journal of Education Economics and Development*, 1(1), 36-46.

PISSARIDES, C. A. 2000. Human Capital and Growth: A Synthesis Report. *Technical Papers,* No. 168, OECD Development Centre.

PROBE (1999), *Public Report on Basic Education in India*. Oxford University Press, New Delhi.

RESERVE BANK OF INDIA. 2012. Handbook of Statistics on Indian Economy. RBI Database.

RODRIK, D., and SUBRAMANIAN, A. 2004. From "Hindu Growth" to Productivity Surge: The Mystery of the Indian Growth Transition. *NBER Working Paper,* No. 10376, National Bureau of Economic Research.

ROMER, P. M. 1990. Human Capital and Growth: Theory and Evidence. *Carnegie – Rochester Conference Series on Public Policy,* 40, 47-57.

SELF, S., and GRABOWSKI, R. 2004. Does Education at all Levels Cause Growth: India, A Case Study. *Economics of Education Review*, 23(1), 47-55.

SINHA, A. and TEJANI, S. 2004. Trend break in India's GDP growth rate: Some comments. *Economic and Political Weekly*, 39(52), 5634-5639.

SOLAKI, M. 2013. Relationship Between Education and GDP Growth: A Bi-variate Causality Analysis for Greece. *International Journal of Economic Practices and Theories*, 3(2), 133-139.

THE ECONOMIC TIMES. 2013. Why large section of Indian households today prefer private education over government's? 3rd January, 2013.
Accessed at http://articles.economictimes.indiatimes.com/2013-01-03/news/36130452_1_nsso-consumption-expenditure-national-sample-survey-office.

THE HINDU. 2014. Over a quarter of enrolments in rural India are in private schools. 16th January, 2014. Accessed at http://www.thehindu.com/features/education/school/over-a-quarter-of-enrolments-in-rural-india-are-in-private-schools/article5580441.ece.

TILAK, J. B. G. 1990. Education and Earnings: Gender Differences in India. *International Journal of Development Planning Literature*, 5(4), 131-39.

TILAK, J.B.G. 2005. Post-Elementary Education, Poverty and Development in India. *Post-Basic Education and Training Working Paper*, No. 6, in BEYOND THE BASICS: EDUCATION AND POVERTY funded by the British Department for International Development.

TIMES OF INDIA, 2014. Budget 2014: Need of the hour in education. 7th July, 2014. Accessed at: http://timesofindia.indiatimes.com/budget-2014/student/Budget-2014-Need-of-the-hour-in-education/articleshow/37935910.cms.

TSEN, W. H. 2006. Granger Causality Tests among Openness to International Trade, Human Capital Accumulation and Economic Growth in China: 1952–1999. *International Economic Journal*, 20(3), 285–302.

WALLACK, J. 2003. Structural breaks in India's macroeconomic data. *Economic and Political Weekly*, 38(41), 4312-4315.

WORLD BANK. 2012. World Development Indicators, World Bank.