Landscaping Higher and Technical Education through Investment in INDIA

Gunjan Bhatnagar¹, Dr. Shalini Sharma²
¹Assistant Professor, HITM, Agra, Uttar Pradesh, INDIA
²Professor, Galgotias University, Greater Noida, Uttar Pradesh, INDIA

ABSTRACT

Education has played a pivotal role in the development of Indian economy. Demand for higher and technical education has been increasing phenomenally but growth of investment in education has lagged behind the growth of demand for and enrolments in higher, technical and professional education resulting in vicious cycle of low quantity of quality inputs and lower quantity of lower quality output of manpower. Incidentally there is severe scarcity of high quality of faculty. This paper focuses on investment in higher education and seeks to determine trend growth. Decomposition model (Shri Prakah, 1994) is used to determine the contribution of growth of enrolments and unit cost separately and jointly. Quality is assumed to be associated with the inter-temporal rise in unit cost.

Keywords-- Higher Education, Investment, Decomposition Model

I. INTRODUCTION

Services have emerged as pivots of development of Indian economy. Education and health are among important tertiary sectors not only as instrument of growth but also as means to nurture and sustain the development of human resources and transform them into human capital. It is worth noting that India has acquired the potential demographic dividend in the form of huge population size and dominance of its structure by the lower age population. However, the potential demographic dividend cannot be actualized without heavy investment in health, nutrition, sanitation and hygiene on the one hand, and requisite amount of investment in education in general and higher technical and professional education in particular on the other. Past researches have established that access to high income and prestigious jobs in high level technical occupations and professions are directly related to the possession of higher technical and professional education qualifications. Besides, productivity and its growth directly depend on completed education years in general and higher professional and technical education in particular (Shri Prakash, 1977, 1994, Amit Sharma, 2012a, 2012b, Shalini Sharma, Amit Sharma and Gunjan Bhatnagar, 2012). Besides, growth of Indian economy is productivity driven (Amit Sharma, 2012a, Shri Prakash and Balakrishnan, 2008). For raising productivity it is, therefore, imperative that education and skill endowment of workforce is raised continuously Demand for higher and technical education has been increasing phenomenally but growth of investment, especially public investment in education has lagged behind the growth of demand for and enrolments in higher, technical and professional education; it has resulted in vicious cycle of low quantity of quality inputs and lower quantity of lower quality output of manpower. Incidentally, there is severe scarcity of high quality of faculty also. This chapter focuses on investment in higher education and seeks to determine trend growth. Decomposition model (Shri Prakah, 1994) is used to determine the contribution of growth of enrolments and unit cost separately and jointly. India and China have emerged as the major destination of FDI, MNCs and their Indian affiliate’s and partners. Deepening and widening of the global competitive edge for the Indian business not only in Indian but in international markets also necessitates reduction in cost of production and improvement in the product quality and launching of new lines of production. Reduction of cost is directly related to the improvement in productivity. Innovations and technological up-gradations, the twin pillars of cost reduction and improvement in quality, crucially depend on higher technical and professional education, which is more capital and knowledge intensive than school or general education. It is, therefore, imperative that both public and private investment in higher technical and professional education is taken proper care in coming years. But current and future investment in education is add ons on past investment in higher and technical education made so far in Indian economy. This
has to take care of replacement investment in order to substitute obsolete machines and equipment as well as for repairs and maintenance of operational machinery. Besides, new investment has to cope with expansion of enrollments, addition of institutions and quality.

Education has transformed agriculture based Indian economy and diverted into a tertiary and manufacturing dominated economy, which is now mainly a knowledge intensive economy. Elementary education has already been universalized, whereas universalisation of education up to class 12 is the important target of twelfth five year plan. Realization of this target even partly will put great pressure on higher education in general and technical and professional education in particular. Policy initiatives to provide right direction with right kind of knowledge and skills mix for the futuristic economy requires huge investment in education and also preparation of right kind of manpower to take up teaching and research as profession in future in addition to the changing economic and occupational structure.

Progress of education stands for more enrollments and more graduates flowing from increased number of institutions or expanding the intake capacity of existing institutes. With the increase in demand for education, demand for technical and higher education has also increased more than proportional. Government has given approval for opening of new IITs and IIMs because of the market demand. Number of institutes has increased many folds in higher general as well as technical education. This has ultimately led to increase in the number of enrollments in higher as well as technical education year on year basis. With the growth of enrollment’s expenditure on education has to be increased. As the number of enrollments increases, per unit cost may also increase, and expenditure increases more than proportionately. Its quality is also raised. The growth of expenditure involves both government and private investment. No doubt with the growth in enrollments, quantitative expansion has taken place which is to the advantage of Indian economy but qualitative facet is still questionable. Quantitative expansion should keep pace with qualitative expansion. For qualitative improvement it is necessary that expenditure on education is increased more than proportionately and efforts should be made for improvement by government as well as private investors. Tented schools have been replaced by buildings and good infrastructure. Use of modern equipment and technology has increased. More qualified faculty are selected and even trained to meet the situation with a view to keep quality intact.

Total Educational expenditure at any point of time is equal to the product of unit cost and total enrollments. Growth of expenditure is consequence of growth of both quality and quantity. During last decade, there has been significant rise in enrollments at all levels. As per 2012 summary report on higher education in India released by UGC, number of universities rose to 634 and affiliated colleges to over 33000 by 2010. The gross enrollments in universities reached about 17 million. However, engineering enrollments were only 2.8 million. Thus enrollments in engineering were only:

\[ \frac{2.7}{17} \times 100 = \frac{270}{17} \times 100 = 15.88\% \ (16\% \ approximately) \]

Number of technical graduates coming out of colleges increased to over 700,000 in 2011 from 550,000 in 2010. This represents a growth of 550,000/700,000 *100 = 78.5%

As per report of the higher education in India, access to higher education, measured in terms of Gross Enrollment ratio, has increased from 0.7% in 1950-51 to 1.4%, in 1960-61. By 2002-03 the GER has increased to about 11% and by 2012 it has increased to 20% these figures show significant rise in number of enrollments. Thus target to achieve 30% gross enrollment in higher education by 2020 seems to be achievable. Incidentally enrollments in higher education in developed countries ranged from 20% to 40% in mid nineties (S. Prakash, 1995).

Education in present scenario is given foremost importance both by the government and people. Education in India is provided by public as well as private sector. India has made progress in terms of primary education and successively secondary education also, but we are still much behind the world in higher and technical education. In the developed countries of the world 40 to 55% of eligible age group population is enrolled in higher education, including professional and technical education. According to 10th Five Year Plan (2002-07), the expenditure of central government on education was 65.6% of total education budget was allocated to elementary education, 9.9% to secondary education. Share of higher and technical education accounted for only 9.5% and 10.7% respectively. According to United Nations Educational Scientific and Cultural Organization (UNESCO), India has the lowest public expenditure on higher education per student though demand for higher and technical education has been increasing phenomenally but investment in education has lagged behind growth of enrolments, resulting in vicious circle of low quantity of quality inputs and lower quantity of lower quality output of manpower.

II. OBJECTIVE

This paper focuses on investment in higher education and seeks to determine trend growth. Decomposition model (Shri Prakash, 1994) is used to determine the growth of expenditure due to increase in enrolments and due to improvement in quality. Quality is assumed to be associated with the inter-temporal rise in unit cost of education. Unit cost is average cost that is cost per student.
III. METHODS AND MODELS

Comparative method is used for inter-temporal comparison. As time series constitutes the data base, Dickey-Fuller unit root test and Engel-Granger test of unit root of residuals of regression model are used. Annual compound rates of growth are estimated from exponential growth curves; these estimates are substituted in decomposition model with a view to determine the components of growth of investment due to increase in enrolments and increase due to unit cost.

IV. DECOMPOSITION MODEL

Total educational expenditure/investment equals the product of unit cost and enrolments:

\[\text{TEE} = \text{EN} \times \text{UC}\]  \hspace{1cm} (1)

Differencing relation 1 partially yields the following relation:

\[\Delta \text{(TEE)} = \Delta \text{(EN)} \times \text{UC} + \text{EN} \times \Delta \text{(UC)}\]  \hspace{1cm} (2)

\[\Delta = \text{change, TEE=total expenditure in higher education, EN=total enrolments in all streams of higher education, and UC=unit or per enrollee cost of higher education.}\]

Division of both sides of 2 by TEE=EN*UC furnishes the following relation:

\[G_{te} = Gen + Guc + Gen \times Guc\]  \hspace{1cm} (3)

\[G\] denotes annual rate of growth, subscripts te, en and uc show the total expenditure, enrolments and unit cost.

The above model will further be extended by decomposing enrolments into population and institutions; Unit cost will be decomposed into faculty and staff cost and other costs. Growth rates of relation 3 are estimated from the following growth curve:

\[\ln Y_i = \beta_0 + \beta_1 \times X\]

Y is the variable growth of which is estimated and \(i=1,2,3\) each of which refers to total expenditure, enrolments and unit cost, and \(X\) is time measured in years. \(\beta\)s are the parameters which are estimated by classical OLS. \(\beta_1\) measures the annual compound rate of growth of the given variable. As against the usual formulae of calculating compound growth rate, CGR:

\[P_t = (1 + \text{CGR})^t \times P_0\] which takes only base year and terminal year values into account, regression growth rate is based on entire set of values, \(P_t\) is terminal year value and \(P_0\) is base year value.

V. SOURCES OF DATA

Data used in the study are secondary and taken from publications of Government of India. Secondary data have been taken from various sources such as

1. Policy documents and reports of various Commissions and Committees on education;
2. Annual Reports of MHRD of Government of India;
3. AICTE (All India Council of Technical Education) Annual Reports;
4. Research Journals, Magazines and Newspapers; and

The secondary data from the sources mentioned above have been pooled up and analyzed by making use of various statistical, tools and models etc.

VI. DATA ANALYSIS

<table>
<thead>
<tr>
<th></th>
<th>Expenditure</th>
<th>Enrollment</th>
<th>Unit cost</th>
<th>GDP at factor cost</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth rates</td>
<td>0.0618</td>
<td>0.0436</td>
<td>0.0179</td>
<td>0.0643</td>
<td>0.006</td>
</tr>
<tr>
<td>t-values</td>
<td>4.136085</td>
<td>52.87277</td>
<td>1.201812</td>
<td>100.4197</td>
<td>36.74235</td>
</tr>
<tr>
<td>Coefficient of determination</td>
<td>0.8508</td>
<td>0.998928</td>
<td>0.324986</td>
<td>0.999703</td>
<td>0.997783</td>
</tr>
</tbody>
</table>

Expenditure on education has grown at an annual compound rate of 6.18%, which is statistically significant. Enrollments have also grown at a statistically significant rate of 4.36%. These results suggest that expenditure has grown ahead of enrollments. Consequently, unit cost of education is expected to grow. This is directly evident
from the growth rate of unit cost. Unit cost has grown at a rate of 1.79%. This indicates that if the economy is growing, capacity to incur more expenditure also increases. But the growth of unit cost is accounted by the fact that expenditure on education has grown ahead of enrolments. Interestingly, expenditure has grown at a rate which almost equals the rate of growth of GDP. Thus, the educational expenditure has kept pace with the rise in affordability. Besides, both economy and education have grown more rapidly than population. Incidentally, part of growth of expenditure is accounted by inflation and implementation of sixth pay commission.

The decomposition model is almost precisely satisfied if OLS estimates of regression growth rates are substituted in equation 3, the following results are obtained by this substitution:

\[ 0.0618 = 0.0436 + 0.0179 + 0.0001 \]

where 0.0001 is Interaction Effect of Gen*Guc.

LHS - RHS = 0.052

Thus the error is only 0.05% which is nominal and statistically acceptable.

To find the share of enrollment, unit cost and interaction effect, their respective growth rate have been divided by growth rate of expenditure (0.0618).

<table>
<thead>
<tr>
<th>Share in expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment</td>
</tr>
<tr>
<td>0.0436/ 0.0618*100</td>
</tr>
<tr>
<td>70.55%</td>
</tr>
<tr>
<td>Unit cost</td>
</tr>
<tr>
<td>0.0179/ 0.0618*100</td>
</tr>
<tr>
<td>28.96%</td>
</tr>
<tr>
<td>Interaction effect</td>
</tr>
<tr>
<td>0.0001/ 0.0618*100</td>
</tr>
<tr>
<td>0.16%</td>
</tr>
</tbody>
</table>

From the above figures, it is evident that 70.55% of total growth of expenditure is being accounted by growth of enrolments; this part of expenditure is dictated by the need to maintain the current status of education, leaving only 29.12% (approx) for improvement in quality. Even out of 29.12%, 28.96% is contributed by unit cost which is devoted for improvement.

On regressing GDP at factor cost on time, it emerges that GDP has grown at the rate of 6.43% which is marginally greater than the growth rate of expenditure i.e. 6.18%. On the whole growth rate of expenditure is at the pace of GDP. This defines the affordability of expenditure on education. As affordability rose, expenditure on education grew commensurately.

Expenditure was also regressed against the enrolments and against the GDP which gave the following results:

<table>
<thead>
<tr>
<th>Slope</th>
<th>Expenditure on Enrollment</th>
<th>Expenditure on GDP</th>
<th>Slope coefficients Expenditure on Enrollment and GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.41</td>
<td>0.96</td>
<td>2.142</td>
<td></td>
</tr>
<tr>
<td>4.13</td>
<td>4.23</td>
<td>0.371</td>
<td></td>
</tr>
<tr>
<td>0.8501</td>
<td>0.856</td>
<td>0.859</td>
<td></td>
</tr>
</tbody>
</table>

1) Corresponding to unit increase in enrollments, expenditure increases by Rs 1.41. Increase in expenditure exceeds the enrollment by Rs 0.41.

2) Correspondingly, unit increase in GDP, 0.96 increases in expenditure occurs, which means expenditure on education trails behind the rise in GDP.

Addition of one explanatory variable to the equation raises explanatory power by 0.9 and 0.3 percentage points. :.; both GDP and enrollment are important.

Coefficient of determination (R square) in case of enrollment is 85.01% and in case of GDP it is 85.68%. However in case of both enrollment and GDP taken together as determinants of expenditure, coefficient of determination increases to 85.98% which is an increase of almost 1%. This shows that contribution of both GDP and enrollment is important to growth of GDP expenditure.

On regressing absolute values of expenditure, on enrollments and GDP, it is found that corresponding to an increase of one unit in enrollments, expenditure increases
by Rs. 0.69. In total the t-values are not significant, which is due to multi-collinearity.

The analysis of growth rate shows that the growth rate of enrollments and GDP are very closely related with expenditure. This inference needs direct testing which leads to multiple regressions. Since there is a chance of multi-collinearity, so stepwise regression is followed.

<table>
<thead>
<tr>
<th></th>
<th>unit cost per capita GDP</th>
<th>unit cost with enrollment /GDP per cost</th>
<th>unit cost on per capita GDP and enrollment / population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth rates</td>
<td>0.004</td>
<td>0.716</td>
<td>0.919</td>
</tr>
<tr>
<td>t-values</td>
<td>1.01</td>
<td>1.72</td>
<td>1.04</td>
</tr>
<tr>
<td>Coefficient of</td>
<td>0.253</td>
<td>0.499</td>
<td>0.518</td>
</tr>
<tr>
<td>determination</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

on regressing unit cost on per capita GDP, t-value is found to be non significant and coefficient of determination is 25% whereas on regressing unit cost on enrollment /GDP the coefficient of determination (R square) value is 49.9% and t-value is significant at 0.1 probability level i.e. 1.72. Since the contribution of both per capita GDP and enrollment /population are significant we have done multiple regressions. On multiple regressions the t-value was again insignificant.

VII. CONCLUSION

In developing countries everything is underdeveloped and grows at slow pace with economic growth. Growing economy needs growth of every sector such as health, education, manpower etc. This study highlights the need for greater effort for improvement in education through investment. Education expenditure, is governed partly by policies and spending capacity of public as well as private sector. Cost of education is increased greatly due to quality improvement of physical and intellectual infrastructure of learning, teaching and also due to periodic pay revisions. The study considers that increase in share of total expenditure on education is accounted by the following factors:

- Partly due to inflationary pressure
- Partly due to expansion in enrollments
- Partly it is affected by decline in teacher / student ratio
- Partly it is affected by improvement in working capacity
- Partly because of improvement in infrastructure

If larger proportion of population goes for education and quality is to be improved, expenditure on it needs to be raised more rapidly than the GDP.

REFERENCES

APPENDIX

Financial requirement based on SES enrollment without private education and norm based recurring cost (Rs crore).

<table>
<thead>
<tr>
<th></th>
<th>Expenditure (crore)</th>
<th>Enrollment</th>
<th>Unit cost</th>
<th>GDP at factor cost</th>
<th>Per capita GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>726</td>
<td>15034</td>
<td>482</td>
<td>3363505</td>
<td>27123</td>
</tr>
<tr>
<td>2008</td>
<td>891</td>
<td>16460</td>
<td>541</td>
<td>3919007</td>
<td>31198</td>
</tr>
<tr>
<td>2009</td>
<td>1104</td>
<td>18222</td>
<td>605</td>
<td>4560910</td>
<td>35820</td>
</tr>
<tr>
<td>2010</td>
<td>1322</td>
<td>20341</td>
<td>649</td>
<td>5249163</td>
<td>40605</td>
</tr>
<tr>
<td>2011</td>
<td>1213</td>
<td>22365</td>
<td>542</td>
<td>6095230</td>
<td>46492</td>
</tr>
</tbody>
</table>

Source: Draft Report of Working Group on HE 11th FYP