

Dynamics of Higher Education in Post-Independent India

Sharmita Dhar (Research Scholar)

Bani Chatterjee (Professor)

Narayan Chandra Nayak (Associate Professor)

Dept. of Humanities and Social Science

Indian Institute of Technology

Kharagpur- 721302

Abstract

This study is an attempt towards analyzing the impact of new economic policy on the changing 'pattern of demand' for the different subjects of education system in India. Here a two way approach has been undertaken- (i) 'Epoch break analysis' which attempts to find whether the adoption of new economic policy has altered the growth rate of general education and the other –(ii) 'Differential pattern of demand in the same epoch' illustrates how the growth rate among the different streams of education varied in the post reform period in Indian economy. It further shows that the economic liberalization has resulted in creating greater inclination towards those subjects, which help to reap higher dividend in the job market. Thus education plays more a role of human capital investment, as championed by Schultz et al, rather than human consumption good, promoting greater human needs.

Key-words: Epoch break analysis; education system; human capital.

1. Introduction

As it was expected, the Indian economy and also her education system have undergone vast changes since independence. This is best reflected in the changing pattern of higher education, which includes growth rate of different subjects; changing preferences for different subjects over time, shift in market demand from one subject to another, introduction of newer subjects etc. This change in educational front is in tune with the changes in global scenario, which includes the social and cultural changes, infrastructural changes, economic changes and changes in science and technology. Again these changes are interrelated. The purpose of this study is to show how the higher education system of India is sensitive to these changes. Also special emphasis has been laid on the impact of 'economic liberalization' introduced in the early nineties, by the Indian government, on the Indian education system

Since the adoption of new economic policy, India has experienced a dramatic change in educational front. The new economic reform package i.e. inflow of foreign capital, policy of

liberalization and globalization has created more demand for professional education, particularly information technology. Human capital measured in terms of educational enrolment rate is correlated with Foreign Direct Investment (FDI) in developing countries (Noorbakhsh et al., 2001). Transnational Corporations (TNCs) are able to locate complex and skill-intensive affiliates only in countries that have a well-educated work force. In order to become more competitive in attracting FDI, it is important to provide quality education to the people, which suit the need of these firms. Good quality and appropriate, in this context means ability to absorb technical knowledge, especially in engineering (Velde, 2002). i.e., creation of a technologically equipped workforce which will be the main driving force for the rapidly changing global economy. In return globalization has increased the job opportunities for students of these technical/knowledge-based subjects. Actually, there exists a two-way nexus between globalization and technical education .In this paper, time-based and discipline-based changes after independence have been analyzed. To be specific the objectives of the paper are as follows:

2. Objectives of the Study

The objectives of the study are as follows:

1. Whether adoption of new economic policy has changed the demand of general education. To examine this, the model of 'Epoch Break Analysis' has been used.
2. To examine the changes in growth rates among different disciplines of professional and general education, in the post economic liberalization era of India by adopting the model of 'Differential Pattern of Demands in the same Epoch'.

3. Literature Review

This paper attempts to analyze the enrolment pattern in higher education after independence and also tries to find out the impact of economic reforms on the demand for different subjects and lastly analyzes the subject wise growth pattern. The literature is reviewed accordingly.

- Firstly studies based on the impact of the globalization, FDI, GATS/WTO on higher education or any specific area of higher education. In other words, whether higher growth rate of any subject can be attributed to changes made in economic reform front.

- Secondly, studies based on the analysis of asymmetric or unbalanced demand among the subjects.
- Thirdly, studies showing how to overcome the demand constraints and indicating policy measures to improve demand condition of those subjects for which growth rate is lower.

Noorbahsh et al (2001) showed that human capital measured by education enrolment rate is positively correlated with FDI in developing countries; implying countries with higher human capital are associated with more FDI.

Velde (2002) discussed the policy options available to policy makers in developing countries to attract FDI and influence the behaviour of Transnational Corporations, and he focused on the effects these corporations have on human capital formation and income inequality in the host countries. He discussed how FDI policy might have affected the interaction between FDI and human capital formation in developing countries.

Morris (1996) examined the role of technical education for the rapid development of the four 'Asian Tigers'; namely: Hong Kong, Taiwan, South Korea and Singapore. It was argued that whilst patterns of educational provision displayed some common features there were also significant differences in other areas, such as the role of the state, sources of educational funding, the role of technical education and of the school curriculum.

Lall (1996,2000) and Moran (1998) provided a general framework for understanding FDI and FDI policy. Both stressed the importance of host country policy to overcome information related market failure with regard to FDI. These included failure in development of technologies and skills, failure in the international investment process and failure to capture economy-wide benefits associated with TNCs.

Hachhethu (2002) analyzed the evolution of the social sciences (he considered four disciplines: history, political science, economics and sociology as the core of social science) in Nepal. He concluded that both the government and other institutions have constantly neglected the social sciences and offered some suggestions on the urgent changes that are required to be made.

Fredriksson (1997) analyzed the demand for university education in Sweden between 1967-1991. University enrolment rate were measured as the ratio of students enrolled at university level relative to the number of qualified leavers from upper secondary level (graduates). He

found a robust, positive and significant impact of public funding of education through grants and loans on the enrolment rate of the graduates of the upper secondary level in Sweden.

Using a time series framework for the years 1950-1982 Huijsman et al. (1986) found a significant impact of public funding of education on enrolment of males in Netherlands in higher education. They confirmed that other factors like per capita income have a much higher impact on enrolment.

The analysis of educational behaviour of young students in England and Wales by Whitfield and Wilson (1991) showed that government funding in employment and training schemes (YOP, YTS) which raises the attractiveness of alternatives to schooling reduces the enrolment in higher education.

Dynarski's analysis (1999) focused directly on the impact of eligibility for financial aid on college attainment. She found a highly significant positive impact of aid eligibility on college attendance and completion and a significant negative impact of the policy shift in 1982, on the youth, whose eligibility for financial aid was affected. Further she found evidence for financial aid having a threshold effect implying that public funds are best when they are generous for the first year of college and decreasing thereafter.

Winter-Ebmer and Wirz (2002) provided evidence for the impact of public funding on enrolment of the students in college. They used a panel data for European countries and applied instrumental variables techniques to find that public funding for schooling- regardless at what level- increased college enrolment. A second issue of concern was the impact of tuition fees, which were found to reduce college enrolment.

5. Methodology

In this study enrolment rate is taken as the realized demand for education with elements of nature of private marketed goods and public or merit good where typical market logic is not followed. In both the models 'Epoch break analyses and 'Differential pattern of demand in the same epoch' enrolment data is assumed to follow the exponential time path. i.e.,

$$y_t = b_0 e^{b_1 t}$$

y_t : Enrolment data

t : time period; 1950 is taken as the base period.

Taking log of both sides, we get

$$\log y_t = \log b_0 + b_1 t$$

or, $Y_t = B_0 + b_1 t$ Where $Y_t = \log y_t$ and $B_0 = \log b_0$

Before stating the methodology of the model, hypotheses are stated as follows:

$$H_{1,1}: b_{1i_1} \neq b_{1i_2}$$

where,

b_{1i_1} : slope value of the fitted time path of the enrolment of ith subject in the first epoch.

i_1 : arts (a_1), science (s_1) or commerce (c_1)

b_{1i_2} : slope value of the fitted time path of the enrolment of corresponding subjects (a_2, s_2, c_2) in the second epoch.

$$H_{2,1}: b_{1i} \neq b_{1j}$$

where,

b_{1i}, b_{1j} : slope value of the fitted time path of the enrolment of i and jth subject in the first epoch respectively.

i, j : arts (a_i), science (s_i) or commerce (c_i)

But $i \neq j$

$$H_{2,2}: b_{2i} \neq b_{2j}$$

where,

b_{2i}, b_{2j} : slope value of the fitted time path of the enrolment of i and jth subject in the second epoch respectively.

i, j : arts, science, commerce, engineering, medicine, veterinary science, agriculture or dentistry

But $i \neq j$

To test the hypothesis $H_{1,1}$, F statistic has been constructed where,

$$F = \frac{(b_{1i_1} - b_{1i_2})^2 / \{ \sigma_u^2 * (1/\sum T_i^2 + 1/\sum T_j^2) \}}{(RSS_1 / \sigma_u^2)},$$

$T_i = (t_i - t)$ $t_i =$ time period of the first epoch

$T_j = (t_j - t)$ $t_j =$ time period of the second epoch

To test the hypotheses $H_{2,1}$ and $H_{2,2}$, F statistic has been constructed where,

$$F = [(b_{1i} - b_{1j})^2 / \{\textcircled{u}^2 * (1/\sum T_i^2 + 1/\sum T_j^2)\}] / (RSS_i / \textcircled{u}^2)$$

For both the cases if $F > F_{\textcircled{1}, \textcircled{2}}$ alternative hypothesis is taken to be accepted.

$\textcircled{1}, \textcircled{2}$: corresponding degrees of freedom.

Model –I: Epoch Break Analysis

The model of epoch break analysis is specifically constructed for the testing of the first objective. i.e., whether the adoption of new economic policy has changed the demand of education. The second half of the twentieth century has been divided into two epochs – first one consists of the years after independence to economic reform, more specifically from 1951 to 1990 and second one incorporates years after reforms i.e., from 1991 to 1998. This model deals with enrolment data of graduate students only. On the basis of the data the following table has been constructed.

Table: 1: Enrolment of Graduates in General Education- Arts, Science and Commerce in the First Epoch

Year	t_i taken 1950 as the base	$T_i^2 = (t_i - t)^2$ $= (t_i - 23.33)^2$	artsg	scg	comg	totalgg
1951	1	498.63	269150	85440	36980	391570
1961	11	152.03	561290	217650	112970	891910
1971	21	5.43	1339400	625590	318560	2283550
1981	31	58.83	3242560	1434580	1054160	5731300
1985	35	136.19	4039840	1767880	1514700	7322420
1991	41	312.23	5501850	2430330	2468030	10400210

Source: IAMR, Estimates of Stock of Different Categories of Educated Manpower till 2001 A.D.

Courtesy: Institute of Applied Manpower Research, I.P. Estate, Mahatma Gandhi Marg, New Delhi-110002

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Table: 2

Enrolment of Graduates in General Education- Arts, Science and Commerce in the Second Epoch

Year	t_i taken 1950 as the base	$T_i^2 = (t_i-t)^2$ $= (t_i-44.5)^2$	artsg	scg	comg
1991	41	12.25	5501850	2430330	2468030
1992	42	6.25	5796420	2568290	2672620
1993	43	2.25	6101340	2712020	2888820
1994	44	0.25	6410110	2859670	3110820
1995	45	0.25	6705100	3004600	3328000
1996	46	2.25	7008600	3154900	3552800
1997	47	6.25	7322700	3311100	3786300
1998	48	12.25	7663100	3479300	4037800

Source: IAMR, Estimates of Stock of different Categories of Educated Manpower up to 2001 A.D.

Courtesy: Institute of Applied Manpower Research, I.P. Estate, Mahatma Gandhi Marg, New Delhi-110002

On the basis of the above data b_1 , RSS and corresponding F values have been computed and stated in the following tabular form.

Table: 3

The values of b_1 , RSS₁ and F in both the epochs for streams in general education

Subject	Atrs		Science		Commerce	
	1	2	1	2	1	2
b_1	.078382	.047011	.085910	.051013	.106946	.069949
RSS ₁	.0379580	.00011503	.0965496	.0000078	.027451	.000431
$(b_{11} - b_{12})^2$.000984		.0012178		.00136878	
F	.039897		.0494		.05549	

In this model $\textcircled{1}_1=1$ and $\textcircled{2}_2 = n_1-2 = 6-2=4$, where n_1 is the number of observation in the first epoch. Therefore, $H_{1,1}$ will be accepted if calculated value of $F < F_{1,4} = 7.71$ (at the 5% level of significance) and rejected otherwise.

Now,

$F_{\text{arts}} = 0.039897 < 7.71$ $H_{1,1}$ is accepted at the 5% level of significance.

$F_{\text{sc}} = 0.0494 < 7.71$ $H_{1,1}$ is accepted at the 5% level of significance.

$F_{\text{com}} = 0.05549 < 7.71$ $H_{1,1}$ is accepted at the 5% level of significance.

From the above discussion, it can be said that after adoption of new economic policy there is no change in the pattern of demand in education so far as general education is concerned whether it is arts, science or commerce.

Model-II Differential Pattern of Demands in the same Epoch

To test the second objective whether there are any changes among the professional and general education after reform, the model of differential pattern of demands in the same epoch has been taken. The chosen epoch is the years of reform and after reform starting from 1991 to 1997. The model deals with enrolment data of graduation –both general educations as well as professional education. General education consists of –Arts, Science and commerce where as professional education includes –Engineering, medicine, Veterinary Science, Agriculture and Dentistry.

Table: 4
Enrolment of Graduates in General and Professional Education in the Second Epoch

Year	t_i	$T_i^2 = (t_i - 44)^2$	artsg	scg	comg	medg	engg	deng	agrig	vetg
1991	41	9	5501850	2430330	2468030	296400	519640	13930	168360	34360
1992	42	4	5796420	2568290	2672620	304000	553000	14770	174950	35470
1993	43	1	6101340	2712020	2888820	312000	587640	15670	181630	36610
1994	44	0	6410110	2859670	3110820	320750	623370	16630	188420	37790
1995	45	1	6705100	3004600	3328000	330000	663210	17600	195200	39000
1996	46	4	7008600	3154900	3552800	339800	704540	18600	202300	40200
1997	47	9	7322700	3311100	3786300	349800	751890	19700	209400	41400

Source: IAMR, Estimates of Stock of different Categories of Educated Manpower up to 2001 A.D.
Courtesy: Institute of Applied Manpower Research, I.P. Estate, Mahatma Gandhi Marg, New Delhi-110002

On the basis of the above data b_i , RSS and corresponding F values have been computed and stated in the following tabular form.

Table: 5
Showing the Values of b_i and RSS_i for general subjects for the years 1991-1997

Subject	Arts	Science	Commerce
b_i	.047566	.051487	.071242
RSS_i	.000089	.0000595	.0002906

Table: 6
The Values of b_i and RSS_i for Professional Subjects for the years 1991-1997

Subject	Engineering	Medicine	Agriculture	Veterinary Science	Dentistry
b_i	.061204	.027704	.036321	.031170	.057750
RSS_i	.00001225	.0001647	.00001167	.00000502	.0000142

Table: 7

The F Values for pair wise comparison of the streams in general education for the first epoch

Subject	Arts	Science	Commerce
Arts	-	-	-
Science	0.868	-	-
Commerce	12.50	1.535	-

In the first epoch for one case calculated F value exceeds theoretical F value.

$$F_{\text{arts, com}} = 12.5 > 6.61 \quad H_{2,1} (b_{1\text{arts}} \neq b_{1\text{com}}) \text{ is rejected at the 5\% level of significance.}$$

- In the first epoch growth rate of Commerce is significantly different from that of Arts.
- In the first epoch growth rate of Commerce is not statistically different than that of Science.
- In the first epoch growth rate of Arts is not statistically different than that of Science.

Table: 8

The F values for pair wise comparison of the streams in general and professional for the years 1991-1997

Subject	Arts	Science	Com	Eng	Med	Ag	Vg	Dg
Arts	-	-	-	-	-	-	-	-
Science	2.41	-	-	-	-	-	-	-
Com	88.02	91.86	-	-	-	-	-	-
Eng	29.21	22.22	4.85	-	-	-	-	-
Med	61.95	133.13	91.32	1282.57	-	-	-	-
Ag	19.86	54.14	58.75	707.62	63.12	-	-	-
Vg	42.21	97.16	77.36	1030.9	10.21	31.83	-	-
Dg	16.29	9.23	8.77	13.63	767.38	550.89	140.74	-

In this model $\Theta_1=1$ and $\Theta_2 = n_1-2 = 7-2=5$, where n_1 is the number of observations. Therefore, H_2 will be accepted if calculated value of $F < F_{1,5} = 6.61$ (at the 5% level of significance) and rejected otherwise.

In the second epoch for two cases theoretical F values exceed calculated F values.

$$F_{\text{arts, sc}} = 2.41 < 6.61 \quad H_{2,2} (b_{1\text{arts}} \neq b_{1\text{sc}}) \text{ is accepted at the 5\% level of significance}$$

$$F_{\text{com, eng}} = 2.41 < 6.61 \quad H_{2,2} (b_{1\text{com}} \neq b_{1\text{eng}}) \text{ is accepted at the 5\% level of significance}$$

From the above discussion following observations can be made for the second epoch:

- Among the subjects of general education growth rate of Commerce is significantly different from other two subjects in the second epoch.
- Growth rates of Arts and Science are similar in the second epoch.
- Pair wise growth rates of any two professional subjects are statistically different.
- Among the general and professional subjects growth rate is highest in Commerce and engineering respectively.
- Growth rate in the case of commerce as well engineering is statistically similar.

Comparing the relative growth rates of Commerce and Science in both the epoch, the data reveal that in the first epoch growth rate of Commerce is not statistically different than that of Science where as in the second epoch the growth rates are significantly different and that of Commerce is higher than that of Science. The likely interpretation is that the new economic policy may shift the students from Science to professional courses specifically to Engineering rather than medicine owing to following reasons.

- Less capital investment.
- Low payback period.
- Low risk.
- Short gestation period.
- Higher present rate of earning compared to future rate of earning.

These, however, requires further investigation and research work.

5. Conclusion

The actual choice of any subject mainly depends on three factors- (i) psychological factor i.e. willingness/desire/preference to pursue (purchase) the course; (ii) availability of the preferred course and (iii) economic capacity to pursue the course. Willingness to pursue any course is again associated with the return from the course. Return may be in form of sense of inner satisfaction (utility), job opportunity associated with its long term status, social prestige, money etc. Since the advent of the globalization education has become oriented more towards income generation and it is being regarded more as investment good rather than consumption good. As the concept of investment for education purpose came into being the priority was given to return from such investment. Comparing each subject with different instruments of investment, one's tendency would invest in those subjects from which return

is high and at the same time of low risk. Among all these professional subjects engineering is the least risky since the earning opportunities are high after completion of engineering disciplines. Alternatively the gestation period in the case of engineering is small resulting in highest dividend in the least period of time (investment). As a result both demand and growth rate in the case of engineering disciplines is high. Similarly is the case of commerce related subjects where opportunities have grown by leaps and bound since the arrival of the concept globalization. In contrast in the case of 'medicine' the gestation period is very long and in most cases the return is also low compared to the scale of investment. So, investment in medical courses bears greater risk, which has resulted in low growth rate of enrollment in medical studies. Whereas for the subjects connected with general education, it can be seen that the growth rate of these disciplines as compared to engineering is low, an indication that general education is being neglected. As Waltzer (2000) comments: 'advocating on behalf of the general education / core curriculum in a large research-led university is challenging in the face of students disinterest in liberal general education.... most students think of them (general education subjects) as required courses to be got out of the way'. However, reasoning and problem solving skills through general education enhances persistence by facilitating students' successful adoption to the intellectual demands of the academic programme (Pacarella and Teenzini, 2005). Forrest (1982) also found that a positive correlation between the proportion of general education subjects in UG degree programme and students' general intellectual and analytical skills, presumed to be necessary for the individual to function and adapt to a complex society.

Since the professional courses require substantial individual investment, most of the students who come from lower /middle income group and have a tendency to avoid risks do not have an opportunity to take up this courses which in turn results in social loss. According to Kremer (1993) 'the presence of a liquidity constraint for students due to the lack of sufficient income or capital market failures when deciding on participation to higher education has three major effects: (i) a loss of talent since high ability low income students will be deter to apply for higher education generating an inefficiency and social loss, (ii) a loss of opportunity to individuals and (iii) a strengthening of the link between family back ground and life time income'.

Hence for ensuring balance growth of knowledge in a society it is necessary to harmonize the traditional knowledge (as imparted through general courses) and the technical skills acquired through the professional courses. In order to correct this lopsided growth among different disciplines of education intervention of the state is necessary. The following

initiatives on part of the government will help to change the tide towards proper growth among different disciplines- financial aid, educational loans at low interest, waiver of tuition fees, public funding of education etc.

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