CHAPTER - II

2. Review of studies, concepts and methodology

2.1 The need for review

In order to have a better understanding of individual demand for education, it is essential to gloss over the various studies by economists over a period of time. Such a review of studies both at international and national level would provide a comprehensive view as to what has been done in the area of demand for education and what could be the areas for further research. Empirical studies, provide a direct motivation to carry out further research in this area.

2.2 Research trend in the area of demand for education

2.2.1 Consumption approach

During the pre 1960s period, the demand for education was considered in a traditional way like the demand for any other good. The Hypothesis was that the demand for education is a function of cost, alternatively called price, and family income. Some economists attempted to estimate demand for education in USA by regressing household income and direct cost of education. This kind of approach was called as "Consumption model". During the 1960s and 70s economists analyzed the effect of family background variables and ability of the individual expressed in terms of scores obtained in the qualifying exam in addition to direct cost and family income, on
demand for education. This kind of approach could not fully explain the changes in pattern of enrollment in higher education and was lacking in many respects in particular on labour market perceptions of the individual. Therefore, inclusion of family background factors and individual factors could only improve the consumption version of demand.

2.2.2 Investment approach

The aspects like foregone earnings as imputed private cost and the expected lifetime earnings prospects were not taken for consideration by consumption models on the assumption that students might not be aware of these aspects due to non availability of information, known as "information bottleneck". Therefore, economists formulated alternative explanations on the demand behavior of individuals. Certain Economists like Schulty, Becker, Blaug and a host of others formulated human capital approach incorporating the investment aspects. This approach treats abilities, taste and preferences are given and hence the student's investment decision on education rests on the direct cost of education including foregone earnings and the expected lifetime earning prospects. This approach hypothesizes that people spend on themselves in diverse ways not only for the sake of present enjoyment but for the sake of future pecuniary and non-pecuniary returns. Since individuals behave rationally,
they would invest on education up to a level where the expected returns are maximized. Based on this, the human capital approach postulates that (a) it is possible to predict total enrollment at various stages of educational process vertically, in higher education in particular and (b) it is also possible to predict enrollments in specific fields of study and in different types of institutions, in higher education.

Therefore human capital approach significantly explains the individual’s demand behavior and quantitatively establishes the positive relationship between investment on education and expected lifetime earnings. The approach could not explain fully the changes in enrollment patterns especially in various subjects of study in higher education. This was not due to any defect in the approach or methodology but due to certain assumptions about the economy which could not hold good under certain circumstances. The assumptions of pure market economy, smooth interplay of supply and demand for labour and absence of unemployment could not hold in particular in developing countries. Market distortions could not restore automatic adjustments in supply of and demand for places in education as well as in the supply and demand for labor in the labor market. The peculiar behavior of students to enroll in higher education, and in certain subjects, in spite of low rate of return could not be
explained by the human capital approach. Studies by Blaug 1969, McMahon and Wagner 1981, Psacharopoulos and Sanyal 1981 reveal that job opportunity or lack of it influence the choice of courses at higher education. Since there is a close relationship between particular educational choice and the type of occupation a person can go into, the human capital approach also got modified. Occupations that offer high wages, other things being equal, will encourage students to prefer programs associated with them. Choosing a type of education to be undertaken, therefore involves simultaneously making an occupational choice also.

2.2.3 Research studies on demand for education

After having known the types of approaches for analysis of demand for higher education, a perusal of various research studies on the subject would provide an idea on the directions of research.

Research studies on the demand for education can be grouped into two branches. The first group is about the analysis, estimation and projection of enrollments at institutional or state or national level, generally called as macro or aggregate level studies. The second one consists of models explaining the enrollment or application decision of an individual with
reference to an institution or subject of study, called as micro or individual demand studies. The following chart explains in detail.

**Chart 2.1**

Demand studies on Higher Education

- Macro/Aggregate demand
  - Estimation and projection of demand
- Micro/individual demand
  - Macro determinants of demand
  - Horizontal demand decisions
  - Vertical demand decisions
  - Type of college and determinants
  - Type of subject and determinants

**2.2.4 Aggregate Demand Studies**


To estimate and project enrollment in higher education Robins 1963, Psacharopoulos 1987 and Teish and Samyal 1982 used retention ratio, extrapolation of historical trends and constant further enrollment ratio respectively. However it is realized that enrollments are poor indicators of actual demand. Studies by OECD 1983, Sethi 1983 and by a host of others brought forth the effect of demographic factors like population growth, family size,
disposable income etc., As enrollments are poor indicators, efforts by economics to link the aggregate demand with the education system and labour requirements, could not yield desired results. Hence economists turned their attention to study the behavior pattern of individuals.

2.2.5 Studies on individual demand for Higher education

Macro perceptions differ from micro perceptions. Macro perceptions are averages. Several behavioral characteristics of specific individual units tend to be averaged out. Therefore it is very essential to understand how at individual level demand for higher education takes shape and what are its influencing factors. This would help the planner to carry out enrollment forecasting.

The cost and benefit as perceived by the individual influence the decision making. Benefits are not known exactly whereas costs are known to the individual. Studies on individual demand for higher education can be grouped on the basis of type of decision that an individual would be taking viz.

a) Whether to enroll in higher education or not?
b) If yes, what type of college (private or public, selective and non-selective) to enroll?
c) If yes, to the above what kind of course to select?

Individual's decision may be simultaneous as to whether to go to college, if so which college and in what subject to enroll. Sometime the decision may not be simultaneous rather sequential.
The methodology used for the analysis of enrollment decision may be grouped into two (1) certain economists like Campbell and Siegel 1967, Hoenack 1967 and Spies 1973 presumed that students decision rules are fixed and measured the demand or enrollment variable in numbers or as percentage of students enrolled in a college or course to total enrollment in various colleges or courses. This way of quantifying the dependent variable namely demand for education could not explain the behavioral pattern of individuals. (2) Therefore some economists Viz., Rander and Miller 1971, Fuller et al 1982 and William Weiler 1989 are of the view that student's decision rules are not fixed but rather change with the options that are available. The relative attractiveness of a course or college depends on cost, income and a host of factors. Such studies are called choice theory studies. The choice theory describes a process in which an individual evaluates the options available and selects one with some probability. Options are assumed to have utility to an individual. The utility depends on variety of factors both exogenous and endogenous. The researcher must specify how this utility relates to the probability that a given option will be selected by a given student. Once specified, the influence of particular factor on utility and thereby on the probability of enrollment can be estimated. In these studies the dependent
variable i.e. demand for education or choice of a course/college is measured either 1 or 0. Thus the concept of probability is introduced in the choice decision. Further, to analyze the individual demand behavior studies used time series or cross-section or longitudinal data and utilized different mathematical forms to describe the student's decision behavior.

Given the option set to an individual say for example the option to choose a course out of the two available courses, then it is possible to estimate the probability of choice with the given set of characteristics of the individual. The choice theory application in education decision making has gained wide acceptance. Before perusing studies on the choice of course, it would be essential to gloss over important studies on the demand for type of college.

2.2.6 Demand for college of choice studies

Out of the horizontal choice studies, choice of college by a student gained much prominence in the developed countries, the USA in particular. A review of such studies, may help this study to adopt certain research methods, models and data analysis as the college choice and subject choice behavior of students are common in certain aspects.

Rander and Miller 1971 study on the decision of the high school seniors in USA to join private or community or government
college related the relative frequency of choices to the characteristics of the individual and his alternatives. Family income, cost of alternative options, ability of the student and quality of the college were found to be the significant factors. The study used logit model to analyze the exact application decision of the individual. Alternative specifications on income and cost were tried by the study. Instead of using tuition cost and income as separate independent variables, a ratio of cost to income was used to indicate the capacity to pay. The coefficient of cost to income ratio was negative and significant.

Using the cross section data of high school students in the initial year and then follow up survey data after one and half years, Fuller et al 1982 analyzed application decision with conditional logit model. The study concluded that financial aid and individual's ability relative to academic standard of a college as significant factors This study in addition to tuition cost, took foregone earnings also for consideration.

A study by Mohab Ghali et al 1977, used cross section data of high school students of the state of Hawaii who actually selected a post secondary option. This study used logit model and choice of the college was concluded as a function of cost of option, family income, ability, sex, type of college. The study brought out that choice of a college is quite inelastic with respect to both tuition
and total cost of education. This implies that changes in tuition will not affect enrollment appreciably. This study does not consider the labour market factor.

Parker and Summer 1993 used 3 years cross section data on the students who were admitted in selective liberal Arts colleges and related the choice of college to the cost and institutional quality. The study found out that an increase in the level of tuition fee changed by a college cause significant reduction in the share of admitted applicants.

A longitudinal study by Jackson 1988 on choice of college by high school seniors in USA who have selected and joined various colleges between 1972 and 1980, using multiple regression analysis, and measuring dependent variable as 1 or 0, reveals that college admission decisions play insignificant role in college choice except for a small group of talented, affluent students. Most students seriously consider only colleges relatively nearer to their homes.

The above cited studies treated the application decision as exogenous, which may understate the true effect of price. There is little empirical research on the application process. Spies 1973 after examining the application choice of high school seniors with high academic ability, found out that high cost selective colleges
and universities can expect to receive a smaller share of the applicant pool, than lower priced institutions. Manski and Wise 1983 estimated a model of probability of application as a function of the characteristics of the potential applicant and found out that income of the parents and quality of the college play a significant role in the choice of the college.

2.2.7 Individual subject choice studies

A Researcher who is interested to study the choice behavior have to recognize that educational investments vary not only in college standards or quality but also in the substance of their programs of study. Studies on subject choice are limited compared to college choice. This is probably because of availability of reasonable range of choice of subjects, in developed countries. Yet another reason may be the existence of wage parity in developed countries between occupations, which may not induce the student to give importance in the choice of subjects.

However, in developing countries due to rapid growth of demand for college education with a slow growth of places has forced the students to face stiff competition. In addition to this, choice range is also limited due to rigid curriculum. In such an educational environment, subject choice has gained prominence, rather than type of college.
Subject choice studies also used time series or cross section or longitudinal data, and analyzed choice behavior and estimated the individual demand for subjects by using either regression model or probit or logit models.

It is necessary to bring out here the nature of research studies carried out on the individual demand for courses. Broadly studies on this can be grouped as pre-selection and post-selection analysis i.e on application decision and enrollment decision respectively. Pre-selection analysis is about the potential demand for a course (probability of applying for a course) from high school students prior to completion of their high school studies. Post selection analysis is about enrollment choice of a high school completed student, who reveals his preference for a course. These studies analyze the students choice behavior based on the ex-ante expected rate of return. On the other hand another set of studies have analyzed how far the actual rate of return varies between occupations of individuals with the related educational qualifications, treating earnings differentials as a function of subject choice, and therefore called ex-post rate of return studies.

This study concentrates on the post selection i.e. enrollment decision of the individuals. The following chart will indicate the types of studies on the demand for courses.
Studies conducted on course choice during 1960s focused on aggregate student enrollment as opposed to individual students choice and generally used least squares linear regression analysis. The introduction of maximum likelihood estimation techniques like logit and probit models in 1970s enabled the researcher to estimate the probability that a high school student will apply to certain courses and choose a course to attend out of the selected courses. The individual's demand for a particular course would then be obtained from these probabilities. Aggregate
and individual choice models have defined a number of variables that influence college course choice viz. tuition fees, financial aid, family income, social economic status, individuals ability in terms of marks scored and labour market factors like expected earnings and job opportunity.

2.2.8 Course wise ex-post returns studies


A notable study by Kilnove and Maloul 1971, on earnings differentials between engineering fields reveals that differences were not substantial and hence postulated that in case of high degree of uniformity of salaries between various jobs, the student would be indifferent to subject choice. This study links the labour market conditions and individual demand for courses.

The inference of choice from the ex-post rate of return studies may be too a generalization of the choice behavior of students. Inference from general to a specific unit of the group
may be only an average behavior of students, which may not reflect vital traits of behavior of individual units. Further the relationship between college major and earnings differentials may not always significant as earnings differentials are also due to labour market factors and the type of educational system. Ex-post rate of return is a post analysis as to whether earnings received by graduates in various jobs differ according to subject of study. From such analysis it is difficult to conclude that students demand particular course based on earnings differentials alone. Therefore it is necessary to study whether students are influenced by expected earnings differentials while selecting a course of study at graduate level by analyzing the choice behavior of students. Such a study would help to compare the expected earnings and the actually earned and to find out whether student expectations are based on market conditions.

2.2.9 Studies on pre selection - individual demand for courses

The earliest study on the application decision by students in USA to enter medicine course, by Sloan 1971, reveals that the application decision of students to apply for medical course was much influenced by expected earnings. The study considered that the demand for medical school admission was mainly influenced by prospective economic benefit, than other factors like price or
tuition cost, income of the family, alternative Ph.D stipend and number of applicants in the previous year.

A survey of studies on individual demand for higher education during 1970's, by Soumelis 1981, indicates that by and large student's educational plans for post secondary education were greatly influenced by scholastic achievement, sex and socioeconomic status of students. It was also found that economic factors which clearly enter into students decision function, is initial salary differentials. However, due to lack of information students could not be explicitly guided by this factor. This survey of the studies also brings out that it is possible to estimate the demand for post secondary education subject wise on the basis of scholastic achievement at secondary school, sex and socioeconomic status.

Harnquist 1978, and the OECD study in Sweden reveals that the students choosing science or technical studies more frequently had higher scores in mathematics and science subjects. Sex differences also prevail in choices between fields of study. The influence of sex seem to be fairly consistent in all OECD countries and had followed predictable patterns in the past.

The results of OECD study on individual demand, are consistent with the results of other studies like Adkins 1974 which showed that "for boys this stereo typing tends to push them
towards educational choices which open a maximum of socially and economically rewarding professional choices and involves them in the formation of educational - occupational strategies from a relatively early age”.

Whereas a study by Marceau 1979 states that "Sex, role expectations, weigh heavily on girls and tend to push them towards making educational satisfaction a priority over career considerations". Thus girls seemed to enroll in health specialties, particularly in "nursing and care" options, (rather than in medicine and dentistry which are professionally more rewarding) education, home economics, languages and humanities in general. This study bring out the strong influence of socioeconomic status (SES). Students with high SES can take the risk and overcome the admission obstacles and opt for high rewarding courses. Whereas less privileged students even with high scores might be hesitant to choose potentially rewarding fields because of fear of failure. OECD case studies 1979 on individual demand for education, including demand for subjects though considered expected economic benefits, could not establish that students choice of course is influenced by expected benefits, rather revealed that sex, high school performance and socioeconomic status are the main determining factors.
A widely known study by Psacharopoulos and Soumelis 1979 on demand for higher education, using a sample of 7425 secondary school children in Greece who were in the last two years of secondary school of 1974, analyzed the factors underlying the formation of the individual demand for education. The students were asked to state their decision both vertical as well as horizontal as to (a) whether a student plans to pursue his studies even at tertiary level (vertical decision) (b) If yes, whether to seek a place in university or non-university and (c) whether to seek entry in prestigious faculties such as medicine or engineering or other general faculties like economics or political science (b and c are horizontal decisions). These three decisions were taken as dependent variable i.e. demand for higher education is assumed to take a value of 1 or 0. The independent variables were grouped in major categories as (a) geographic location of the secondary school, family background like income, education and occupation of parents, the student's scholastic achievement, economic factors like expected earnings and perceptions and attitudes. In order to avoid the problem of considering cost of higher education and expected earnings separately, the authors used a proxy for the expected private rate of return to post secondary education i.e.
\[ R = \frac{YGRAD - YSEC}{4YSEC} \]

YGRAD = expected post secondary graduate earnings.
YSEC = expected earnings had the student not continued the studies.
R = expected rate of return.

The expected rate of return is positively related to the decision to study at the post-secondary level. The study employed logit analysis rather than OLS method to avoid certain statistical problems. The study reveals that urban residence scores in secondary school and family income are positively related to choice of subjects i.e. selective subjects like medicine and engineering, implying that students with urban residence, high family income were able to get in to professional courses. This study is on the pre-selection or application decision of the students.

All the studies cited above especially studies in OECD countries highlight scholastic achievement and socioeconomic status of the student as determinants of subject choice at college. Independent variables are mostly endogenous. Exogenous factor like initial salary differentials though taken into account by students, due to lack of information on the labour market trends, the influence is insignificant. Economic factors could not be projected properly because students at secondary level could have formulated a broad outline as what area of study should select while joining the college. Students could
not go into detail calculations on the salary differentials between subjects of choice at college. This difference is similar to the difference between wish and demand in consumption demand analysis. That is why the studies cited, emphasize on the non-economic factors to influence the choice of the course.

Even assuming that students are aware of the labour market conditions, their motives especially economic motives do not take concrete shape during studying at higher secondary level. Another constraint is that the student can know his final score only after completing the higher secondary study. Till such time, his intention or preference expressed can only be a wish and can not take in the shape of demand. Unless the student knows his scores, how can he workout his possibility of getting the subject of his choice and how can he compare the relative advantage?. A student, soon after completing the duration of higher secondary, if decides to opt for higher education then he could apply to number of courses, instead of applying to only a few courses, in order to avoid the risk of non selection. Further application decision of a student is not the final stage in the choice analysis. It is only an intermediary stage. The student though aware of condition of institutional supply of places, he may not aware of his relative position, unless he knows about his higher secondary marks and other quota restrictions like allotment of
places for students from backward sections of the society. The analysis of choice behavior or potential demand for courses from prospective students of higher secondary may be of less use for policy decisions on the demand management. That is why this study emphasis the need for post selection analysis.

2.2.10 Studies on post selection - individual demand for courses

Given a sample of students whose college going decision have been observed, we may generate sets of feasible alternatives. We can construct the student behavior model following the usual economic practice of interpreting actual choice as revealing the preferences of the decision maker. Therefore it would be better to analyze the revealed subject choice behavior in addition to application decision of the students. Realizing the necessity of analyzing ex-post and ex-ante choice decision i.e. both application and enrollment decisions, Papas and Psacharopoulos 1987, analyzed the transition from school to the university under restricted entry in Greece. This study used a sample of 500 high school seniors who were to complete the schooling and data from same students were also collected after one year i.e. after completion of high school senior course. The purpose was to determine the extent of entry of students in to restricted field of study and the determining factors.
The study collected data on personal, family related and labour market expectation factors. Students were asked to state on the expected initial salary for graduates with different degrees both in base line and follow up survey. The study used logit model with maximum likelihood method and estimates were worked for two sets of data. Sex, father's education and occupation, senior high school grade and expected earnings alternatively expressed as rate of return were taken as influencing factors in both sets of analysis. Eight out of ten students in the base line questionnaire declared that they would like to continue their studies at university but as per follow up survey only three out of ten succeeded in doing so. Aspirations and outcomes differ sharply according to the student's background and the type of school attended. The study further reveals that females go in higher proportions to the technological institutes. It is also interesting to note that the highest success rate in the technological institutes is among the sons and daughters of manual workers. Not a single secondary school student of managerial/executive father enrolled in a technological institute. Further the choice of course of study was influenced by school grade and type of school studied. However, there were no regressive statistical analysis on the influence of expected earnings and expected job opportunity measured in-terms of months, on the choice of the course.
A similar study by Kassotakis 1981, on the attitudes of Greek students on technical and vocational education, also reveals that there is an aversion especially from males for technical and vocational courses in Greece, as these subjects are considered to be inferior.

From the above cited studies, it can be noted that family background factors and school grade play vital role in the choice of courses. Studies conducted by International Institute of Educational Planning found that" desire for professional qualifications" was by far the most common reason that students gave for choosing higher education in Philippines, Sudan, Tanzania and Zambia (Psacharopoulos and Sanyal 1981). It is stated here that studies on post selection are very much limited at international level, probably as pointed out by Kilnove and Maloul 1971 that little wage differentials in the labour market between various jobs with related subject of study, the effect of economic factors would not be highlighted. Whereas in developing countries India in particular the labour market conditions are quite different and hence it is expected that economic factors have a major influence on the choice of subjects at college.

2.2.11 Studies in India on Demand for Higher Education

Studies in India on the demand for Higher Education both aggregate and individual levels are very few, compared to studies in
developed countries, USA in particular. Research on Economics of Education for a period of more than 8 years were perused to locate studies on demand for education available with National Social Science Documentation Center, New Delhi, India. A list of research papers appeared in Economics of Education Review and Journal of Educational Planning Administration (India) for a period of 8 years were also perused. The following studies only have been noticed.

It was Blaugh and Woodhall 1969 who conducted a significant study on the subject wise enrollments and corresponding levels of employment in India for graduates. The study reveals that though rate of return or employment prospects were dim for graduates of arts and science, there was still pressure on enrollment in these fields of study. This kind of behavior of students still might be considered to be rational as holding university degree had better chances than to be without degree. The study estimated the waiting period for the university graduates as 6 months in 1967 in contract to 4 to 5 weeks in UK and USA, on the same period. The study had pointed out that since the Government of India had subsidized the higher education, enrollment continued to increase, despite whispered unemployment of graduates. Further, the Government had kept the professional fields like medicine and engineering under its control with severe restriction.
Bhagawathi Committee report (Page 15) states that as per 1971 census data, the waiting period for male as 12.7 months and 14.2 months for females and more so for the graduates of liberal arts and science.

A World Bank report on investment in Indian Education 1979 reveals that investment in higher education is profitable to individuals, in spite of initial waiting period for job. Rate of return studies on higher education by Pandit 1972, Goel 1975, Tilak 1987, Devi 1988 and a host of others cited by Tilak 1991 reveal that private rate of return for college graduates is still on the higher side compared to alternative rate of return. This is because of Government subsidization, particularly in professional and technical courses. Therefore it is natural to experience excess demand for higher education particularly in professional courses.

A study by Nair 1990 calculated rate of return for college graduates subject wise and found out that the rates of return were more for science subjects than for arts. The study also observed that internal rate of return is influenced by choice of a profession rather than level of education.

Biswal 1991, while examining the higher education enrollment pattern in India over the years, has found out that the proportion of enrollment in arts and science was too high and the trend continued for a long period. It also observed that
unemployment of graduates was more in arts and science subjects, in particular, in organized sector, than in unorganized sector. In public sector undertakings most of the graduates were professionally qualified and only 10% of graduates belonged to arts and science. Therefore, public sector job opportunities and wages have influenced the private demand for professional courses and students expectations. Analyzing the periodical situation of simultaneous devaluation and accumulation of degrees in Indian economy which reflects narrowing job opportunities and severe competition, the paper observes that there is a close connection between the socioeconomic background and the post secondary stream chosen.

The above mentioned studies are general in nature, but related to demand for higher education in India. There is hardly any study on private demand for education except one by Shri Prakash and Radhakrishnan 1973 and Shri Prakash and Sumitra Chowdhury 1992. The first study gathered data on the students admitted into various courses in university for three years viz., 1969, 1970 and 1971. The data gathered classified the students based on socioeconomic background, type and level of education, intellectual ability, vocational objectives and motivations of students, income, occupational, educational and cultural levels of parents were taken as influencing factors.
The results of the study do not lend support to the hypothesis that the demand for various subjects in university education is confined to students coming from families at high income and occupational levels. The results of the study lend support to the view that (a) higher the level and type of education greater is the influence of parental income and occupation and (b) scientific, technical and professional education as compared to education in arts and humanities appears to be influenced to a greater degree by the level of income and occupation of the parents and students own ability. Though this study did not analyze the choice behavior of students and used only simple statistical tools, still it is a notable research work in the area of private demand for education.

Shri Prakash and Sumitra Chowdhury 1992 analyzed the private demand for education in India by adopting a probabilistic approach. Educational demand is referred to the "demand of an individual to attend an educational institution to acquire at a given level of specified stream provided that one satisfies eligibility, affordability and accessibility conditions". The individual is assumed to involve in a series of choice making decisions. General behavioral propensities represent binary choices. Outcome of a choice manifests the presence or absence of an attribute of individual behavior. The choices relate to (i) whether to enroll or not (ii) if yes in which institution and (iii)
what type of education. This study analyzes the first choice
decision.

The choice to enroll or not to enroll once is exercised, it reveals
the private demand. Such a decision depends on price of
education and disposable income of the family. This study
measured price as tuition fee and other private costs of the
student i.e. expenditure on books, dress, transport and foregone
earnings.

Since the individual choice decision is attributional, model
specification should be stochastic and not deterministic. The
above cited study therefore used the following formula to calculate
the probability of an individual being enrolled. $p = \frac{QD}{NA} = \left( \frac{CPU}{NA}, \frac{Yd}{NA} \right)$
where $P = \text{Probability, } QD = \text{educational demand, } CPU = \text{total private expenditure on education, } Yd = \text{total private disposable income, } NA = \text{total age specific population.}$

Data on sample households were categorized into various
groups according to the level of household income. It is assumed
that an individual will enroll in education if the family income is
more than the threshold income level leading to affordability of the
given price level of education. The enrollment decision variable
takes a binary value of 1 or 0. This study uses Linear Probability, Logit and Linear Exponential models for the analysis of the data.

The study found out that price i.e. cost of education and family income influence the enrollment in a stage or institution or subjects. Since price has been found to have significant influence on demand, suitable policy should be adopted by government to accommodate poorer sections of the society. However, this study is more of a consumption model of educational demand. Further individual household data had been aggregated and no analysis has been done on the individuals choice behavior and the influence of economic factors like future expected earnings and job opportunity.

From the studies mentioned for the purpose of review both at international and national level, it appears that private demand studies are more on college choice than on the choice of subject of study. Perhaps this could be due to the education system with a wide choice range of subjects of study available to a student. Therefore, the necessity did not arise to induce the economists to carry out the research on choice of subject. Another aspect is that the wage differentials in the labour market in developed countries are not that wide as we observe in India between various occupations like Doctor, Engineer, Economists, Scientists, etc. Whereas in India the higher secondary
students while deciding to go for graduation, first decide on what course to study and then at what college. Therefore it is very essential to study the subject choice behavior of students in India. This study makes an earnest attempt to fill up the gap in the field of study in India.

2.2.12 How far this study is different from others?

As stated in the earlier part of this chapter, studies on individual choice decision of subjects may be grouped into (1) *ex-ante* i.e. pre-selection analysis, that may be called as application decision analysis (2) *ex-post* i.e. post selection analysis that may be called as enrollment decision. In *ex-ante* subject choice analysis, economists attempted to analyze the anticipated decision of the student who is yet to complete the high school studies. The students are asked to state what type of course he would join after completion of the higher secondary course. This kind of analysis about expectation behavior is based only on notional choice or potential choice options and therefore estimation of private demand based on the potential choice decision can be only a potential demand and not actual demand. Since the choice situation is not clear, concrete decisions can not be made by students. The student can only form a rough opinion as to which course to choose. In the absence of higher secondary examination marks, the expected choice behavior
would weigh marks as the important influencing factor. The economic motive like expected earnings differential and job opportunities may not take a concrete shape in the minds of the students. Therefore, the choice decision is based on only general expectation. While the students take a decision at enrollment stage, the economic motives are expressed and compared explicitly with various subjects. That is why this study opts for ex-post analysis.

Studies on the individual demand for courses like Psacharopoulos and Soumalis 1979 and Papas and Psacharopoulos 1987 have emphasized the importance of students ability and socioeconomic status of the students which are endogenous factors. Exogenous factors like expected earnings and job opportunity have not been fully analyzed. Hence this study proposes to analyze the influence of exogenous factors in addition to endogenous. Also goes one step further and tries to establish how far economic motives are shaped by family related factors.

Another observation is that so far studies have taken expected earnings as influencing factor in the econometric models, whereas this study includes job opportunity also as a variable in the model. This study differs from another angle also. In India, places in higher education are allotted according to the social status expressed in terms of caste. Therefore, the effect of
caste on the choice of the course is also to be analyzed in a rigid educational system.

This study analyzes the enrollment decision. It is not what students would do that concerns us most but what they actually do. It is always preferable to check assumptions about the motives by looking at the behavior that is predicted by the assumptions. The actual choice among the available alternatives reveals the preference of the students. The student knows his marks, relative position with others, admission conditions, and parents intentions and hence the choice situation is real and concrete. Therefore attempts to estimate the individual demand for courses would be more realistic. A study by Hartoz Joop et al 1989 reveals that ex-post decision of the students are consistent. This study analyses the ex-post choice decision of the students in a rigid and government controlled higher education.

2.3 Concepts

2.3.1 Individual demand

Traditionally, in consumer economics, demand is expressed as a quantity purchased with reference to certain level of price and income level of the consumer. This kind of demand is called consumption demand. Whereas individual educational demand consists of consumption as well as investment components and hence in addition to price and income, other
factor like expected future earnings, and job opportunity etc determine the individual demand. Consumption component renders immediate consumer service and investment component enhances the capability of a person. The task of identifying each component is formidable. However, it can be stated that as the student moves from lower levels to higher levels of education, the demand is dominated by investment component.

The demand for education is a derived demand. A derived demand is the demand for a producer good namely for a resource employed in production. The individual demand from stage to other stage of education is measured in-terms of years of schooling. This kind of demand is called vertical demand. Whereas horizontal demand i.e. demand for type of college/institution or type of course to be studied is measured as a qualitative variable taking the value of 1 or 0. If a student decides to join a course, he is said to demand that course. The decision translates into demand. Horizontal demand is about the choice consisting of smaller number of discrete alternatives rather than different quantities of a divisible good. In this study the term course is used, instead of terms like subject, program, major etc. to denote individual demand. It is only for a matter of convenience.
2.3.2 Potential and Actual Demand

The concept of demand requires clarification, it is as used now with ambiguity. So called a need or wish is not demand because the concept implies price and quantity. As stated in general economics, individual demand for a course is stated to be potential, if the student expresses his wish or likely to demand. For instance if a higher secondary student expresses his wish to join medicine, it can be called potential demand for medicine. Whereas in case of actual demand the student not only reveals his preference to a particular course but also decides to enroll in that course. In this study a student's decision to enroll in a course is taken as demand for that course. Individual demand, alternatively called private demand for courses may refer to demand for places in higher education.

2.3.3 Social Demand

As interpreted by Harqvist and Psachropoulos, social demand refers to the demand for education emerging from the needs and aspirations of individual persons as contrasted to educational demand based on the personnel requirements of society. Social demand is a concept at the collective level where the decisions of individual persons are aggregated.

When individuals demand for various courses are aggregated, it is called as aggregate demand or social demand. The aggregate
demand would be the horizontal summation of individual demand. There appears to be a conflict between social demand and individual demand, since social demand is more guided by the expected pecuniary and non-pecuniary benefits to the society as a whole, private demand is guided by expected rate of returns. In the short run such a divergence of objectives may exists but in the long run both will be in tandem as observed by Schultz 1988 that the public expenditure is expected to be guided by private educational demand. This research study does not concentrate on the subtle difference between individual demand and social demand.

2.3.4 Determinants of Individual Demand for Courses

To forecast enrollments/demand for various courses, three factors need consideration (i) demographic trend (ii) determinants of private demand for courses and (iii) repetition and dropout. Out of these, it is very essential to analyze the determinants of individual demand so as to make the demand projections more reliable and also to understand the directions of change in demand for courses.

A perusal of the research studies in various countries on the individual demand/enrollment for various courses and its determinants reveals that during 1960's and 70's, the studies (except a few) highlighted tuition cost as the determining factor in
the choice of courses. Subsequent studies identified the importance of family income which indicates the capacity to pay the tuition cost, in addition to tuition cost. Extensive studies in OECD countries and by International Institute of Educational Planning (IIEP) during late 70's and thereafter, found out that in addition to tuition cost and family income, other factors like extent of financial aid, individual's ability tastes and preference and family background factors like education and occupation of parents, influence the course choice.

Studies during 1980's applied more regressive statistical tools and established that in addition to the above mentioned factors, exogenous factor like expected earnings, and job opportunity have substantial influence in the choice of courses. The concept of probability was introduced in the choice decision. This study takes all the variables cited above in the analysis.

As stated by Harnqvist 1978, these factors can be classified like exogenous vs endogenous, institutional vs individual, family vs school and economic vs non-economic. This study adopts classification followed by Harnqvist 1978. The determinants of individual demand for college courses may be grouped in the following way.

1 Student related factors  > Ability measured in-terms of
Factors mentioned at sl.no. 1 and 2, are endogenous and predetermined. Whereas economic factors are exogenous and random which are not under the control of a student. However students are near future oriented more than distant future and assumed to have fair information of the salary one can expect soon after completion of the course and also on job opportunities that courses could assure. As already pointed
students expectations are based on the labour market information of the recent past and the present.

The economic factors which are distant can not be predicted even approximately due to long time horizon and lack of information to judge as what would a student earn ten years after graduation. Therefore it is expected that student and parents pay more emphasis on immediate economic factors than on distant factors. This does not mean that distant factors are not taken into account by a student. This kind of classification is only for analytical convenience. The factors mentioned at serial number 1, 2 and 3 are not watertight. They are inter related and hence difficult to judge the direction and extent of influence on the choice of the course. Of these variables student factors are considered as necessary factors, for example performance of the student at higher secondary level. Family background factors are considered as facilitating factors to take a decision on the choice of the course. Therefore, it would be necessary to design a model which could identify the intervening variables and independent variables and estimate the extent of influence on the demand for courses by an individual.

Since the variables mentioned at serial number 4 and 5 are exogenous and beyond the control of the individuals and also assumed to have uniform influence on all individuals, they are
not analyzed in this study. To construct a model to analyze the effect of various factors, they are to be defined and measured numerically.

2.3.5 Individual related factors

Out of three student related factors mentioned, most of the studies have taken student's ability and sex for analysis, as it is difficult to quantify aptitude or taste. Student's ability is expressed in-terms of level of performance and measured in terms of scores obtained at the qualifying exam at higher secondary level or scores/marks obtained in entrance exam or both. Performance is considered as the basic necessary deciding factor in the choice of a course. Studies by Psachacropoulos 1979 and 1987 and OECD studies on individual demand have confirmed that high school grade/mark as the single most determining factor in horizontal choice decisions. In this study both total higher secondary marks and marks in mathematics, physics, chemistry and biology are also taken for analysis as marks in mathematics, physics and chemistry are taken for admission in engineering and marks in physics, chemistry and biology/zoology and botany for admission to non-engineering courses.

2.3.6 Sex

The influence of sex on the choice of course is assumed to be significant and it is not neutral to choice. OECD studies in five
countries on individual demand indicate that males prefer professional courses like medicine and engineering and females prefer traditional courses. A study by Pillai 1990, on Indian Higher Education reveals that out of 100 women students enrolled, 56 arts, 21 Science, 13 Commerce, 7 Engineering and 3 Medicine.

A study by Subarao et al 1994 reveals that invariably in all countries women are over represented in humanities courses. There exists sex bias in the choice of the course. Further women students may choose that kind of course which may enhance their marriage prospects subject wise. Sex differences is also seem to sharpen when there is a correspondence between educational options and occupational fields. One of the major responsibility of the parents in India is to educate their daughter so as to have an advantage in the marriage market as the degree holders are preferred. Parents may decide to send the daughter to college only to be on the study till such time an alliance materializes. Marriage, particular in India is the determinant of a woman's social position. Therefore to get married that too to a man with high paying jobs, woman has to acquire a degree preferably professional. This may reduce the dowry level also. This attitude may be true in respect of students taking up arts and science courses. Whereas in the choice of professional courses, it is the job opportunity that would enhance the economic independence
of females, influences substantially. However, the trend is changing in India, females equally prefer professional course. A study by Brahman and Schneider 1991 reveals that gender gap which was wider during 1960s got reduced during 1980s. Another question is whether perceptions on expected earnings differ according to sex.

2.3.7 Family Background Factors

Numerous studies on college and course choice have established that family background factors exert decisive influence on private demand. Parents education, occupation and income, cultural values and family size may be some of the factors to mention. Instead of using these variables individually, as they are interrelated, they can be used as a composite variable measured as an index reflecting various attributes of the family. The composite variable is called as socioeconomic index by economists. OECD studies and studies by Costes Soumelis 1981 used this index. This study takes family income, parents education and occupation as the family background factors. Income of the family is classified into 7 categories i.e. Rs.25000 and less between Rs.26000 to 50000 etc. Education of the father is categorized into 4 i.e. 8 years and less, 9 to 12 years, 13 to 15 years and 16 and above years. Occupation is categorized into 7 types like worker, farmer, business, middle class, officer and managerial, professional and others.
Numerical weights are given for each variable. The maximum total weight is 18 (family income 7, education 4 and occupation 7). Suppose a student's family earns 10 out of 18, then the index is .555. If the index is more, a family is considered to be having better socioeconomic status.

This composite index however cannot exhibit the relative importance of family variables in terms of their influence on the choice of the course. Therefore, this study uses both Social Economic Status (SES) as well as individual family variables. The influence of these variables on the choice of the course is substantial, as per studies carried out in developed countries. The effect of SES may be indirect, if not direct, through determining students' high school performance. However, its effect is more pronounced when the selection process is severe. Further stratifying the students on the basis of SES may reveal the distributions' aspects also.

2.3.8 (a) Education of Parents

Students of more educated parents are better informed about various courses offered, admission conditions and relative advantages of various courses. Further, more educated parents may motivate their wards and influence the choice of the course directly. There is an indirect relationship as level of
intellectual ability of the student is influenced by the level of parents education.

(b) Occupation of the parents

In all probability students are likely to enter in the occupation of their parents than any other occupation. Therefore parents will prevail upon their wards to choose a course that would reinforce their own occupational standings. This kind of presumption may hold good in the cases of parents holding high level occupations. A worker would expect his son to enroll in medicine to become a doctor and so might be the case of office clerk. In fact inter-generations effect of education can be noticed, especially among middle class parents to invest more on their children to acquire professional skills, in order to get high level jobs. Therefore it is presumed that parents occupation has positive and significant influence on the choice of the course. In this study occupation of the parents are grouped into seven categories. Occupation includes self-employed also.

© Family Income

Family income exhibits the capacity to bear the cost of education. It is postulated that students from wealthier families are likely to choose professional courses because they have the capacity to pay the tuition fees. The influence of family income may be significant in the choice of the course in a open education system. However it is doubtful about its influence
in a government dominated system. A study by Psacharopoulos and Somelis 1979 reveals that family income does not have significant influence on the decision of the student to choose between selective and non-selective courses.

[d) Social Origin/Caste

The educational system and choice mechanism can not be neutral to social background of the students. The social purpose of higher education in a democratic country must be to provide equal access. In a market type of educational system, the choice mechanism is likely to favor the meritorious and privileged classes. Therefore some mechanism to provide equal access is a must. To achieve this, governments reserve certain number of places in various courses for certain depressed sections of the society. This is called as non-price rationing of places. The negative discrimination in terms of color, creed, race and religion can be nullified to some extent by adopting certain policies of positive discrimination. One such measure is fixing quota for a section of students in higher education. In India social background or social status is understood and expressed in terms of caste. Therefore type of caste plays significant role in the decision making of the student, as the student would have a wider range of choice.
2.3.9 Economic Factors

Though individual demand studies for five countries (OECD 1975 and 1979 studies) and such other studies by Psachacropoulos and Somelis 1979 and Psachacropoulos and Papas 1987 bring out that family background factor like education, occupation and income of the parents and individual performance at higher secondary level have stable and substantial relationship with the choice of a course, these factor do not seem to be efficient predictors of change in the demand for individual courses. These factors can be used for analytical purposes only and are predetermined and endogenous. The above said studies seem to highlight the consumption demand aspect rather than investment aspect. According to human capital theory, a rational decision of the individual to choose a course, should be based on (a) the direct cost of educational option (b) opportunity cost of option chosen (c) prospects of employment upon graduation and (d) the expected earnings differentials. Considerable number of studies like that of the study of supply elasticity of educated labour by Freeman show decisions of the young people to enroll in the college and to choose various fields of study are quite responsive to economic benefits.
(a) Tuition cost of the course

A survey on the price sensitivity for the demand for higher education and subjects in particular by Jackson and Weathersby by 1975 and another survey by McPherson 1976 reveal that cost is inversely related to demand for colleges and courses, but the magnitude is small. The estimated elasticity of enrollment demand averages to about -0.03. Price sensitivity analysis with time series and cross section data at state, national and institutional levels reveal that price sensitivity is significant in an open education system and insignificant in an education system controlled by Government where cost of education is subsidized. If tuition fees between courses do not differ substantially, then students even from low income groups would seek enrollment in professional courses. If it is so, then cost must be neutral to the choice of the course in a subsidized system.

The students' direct private costs of higher education include tuition fee, examination fee, expenses on books and instruments and on transportation. For students who stay in hostels, hostel expenses are also included. This study takes these costs as private direct cost, as done by other studies. The
cost is expressed in absolute Indian rupee, expressed by students at the time of survey.

The analysis of cost on the demand for courses may not reflect the real effect of cost. That is why studies like Rander and Miller 1975 and Elizabeth and Savoca 1990; took the capacity to pay i.e. cost and income ratio rather than the tuition fees, while analyzing the choice of the college. Shri Prakash and Chowdhury 1992 also advocate to use cost-income ratio. The capacity to pay is expressed as the ratio of cost to family income. Studies have shown that the impact of cost on probability of enrollment would decline with parents income

(b) The Concept of Foregone Earnings

The concept represents the true opportunity cost and is more relevant in horizontal choice decisions. The opportunity cost means the earnings foregone by a student by attending the college instead of joining the labour market. In other words it represents the wages lost due to taking up college study. Economists do not have common agreement whether to include opportunity cost in the analysis of choice of college/course. Fuller et al 1982 used the concept to analyze demand for college. Whereas Wimgroot and Oosterbeek 1992, introduced the concept of human capital investment under uncertainty and observed that when unemployment rate is very
high for a graduate with a course of study, expected foregone earnings may decrease and become insignificant and vice versa. However, it is generally postulated that the demand for courses is inversely related to opportunity cost as it is real at college. Foregone earnings though real in Indian conditions, it is not known whether the students take into serious considerations.

This study takes into account opportunity cost also i.e. the earnings lost due to joining a course at college. The foregone earnings are the earnings of a higher secondary qualified person in the labour market. The sample students were asked to state that if they had not chosen the course and gone for a job, how much they would expect to earn in the labour market. This study measures cost of a course in three ways (a) in absolute monetary terms (b) cost and income ratio and (c) cost plus foregone earnings.

© Expected Earnings

Considerable number of studies, Freeman 1971 and Mchmahaon 1984 in particular have substantiated that students expected earnings have a decisive influence on the choice of courses. The question is which type of expected earnings student take into consideration - is it expected starting/initial earnings or the expected life time earnings? As per human capital
model expected life time earnings influence the educational investment decisions. Wills and Rosen 1979 study reveals that students at the time of post secondary decision making were based on life time expected earnings. But many economists like Schultz and Freeman expressed doubts on two counts (1) in view of long horizon and uncertainty in the labour market, it is difficult to predict the entire life time earnings and (2) students are present oriented i.e. investment horizons are short. Ackley 1978 also had observed that due to uncertainty about future gives current circumstances greater weight-age not only in consumption but also in investment decisions. As it is difficult for the students to estimate right now the future expected earnings, say after 20 years, they form adaptive rather than rational expectations.

A path breaking study by Freeman revolutionized the concept of expected earnings. In his study, he has established that individuals choose their field of study 2 to 3 years prior to graduation based on wages at the time of choosing courses. Starting salary or initial salary, immediately after graduation is taken as a proxy for expected life time earnings. The logic of using starting salary is that students have fair knowledge about the existing salary for various jobs and the required qualification, through their teachers, parents, friends and newspapers and television. To cross check whether student's calculations are in
tune with the labour market the actual starting salary for various jobs and the expected starting salary expressed by students may be compared. Further he states that individuals cannot and therefore do not estimate lifetime expected earnings.

Another aspect is that the students while deciding will examine the initial salary differentials also between various jobs. Initial salary differentials between professional courses are expected to be significant.

In this study expected initial earnings, and at 5th, 10th and 20th year of service, are collected as stated by students. In addition to this the expected salary for higher secondary and other graduate courses are also stated by the students, to find out the expected salary differentials. For choice analysis, this study uses the initial expected salary as stated by students.

[d] Rate of Return

Individuals may take into account the relative expected earnings in selecting a course. But as observed by Mark Blaug 1976 (Page 189), the cost of acquiring a professional degree may vary independently of changes in earnings, there by altering the relative attractiveness of one occupation to another. This suggests that comparisons among rate of return would provide better criteria of shortages or surpluses than comparisons among
The demand for years of schooling may be a positive function of expected earnings and a negative function of costs, but from this it does not follow that choice of subject is likewise a matter of rate of return. Such more detailed work on particular professions and occupations is needed."

Expected rate of return is a cost benefit calculation relating to cost and the earnings that the students expected to receive. It is expressed in percentage that discounts the streams of earnings expected by the student over his life, back to the present value with reference to total costs. Costs of various courses are known to a student at the time of decision making whereas the expected earnings are only a rough calculation on the basis of preconceived ideas. Analysis of cost and expected earnings as separate independent variables may not reveal the relationship between these and the demand for a course. Although a student may not exactly calculate the expected rate of return, it would be better for the researcher to analyze the student's choice decision with reference to the expected rate of return. It is assumed that the private rate of return for a course would reflect the potential demand for that course. Rate of return is of two types (1) ex-post returns - which is calculated on actual observed earnings of individuals who are in the labour market and (2) ex-
ante returns - which is calculated on the expected salary expressed by student, when he enters the labour market.

Studies like Tan Lee and Mignet 1984 William and Gorden 1981 on England's Higher Education reveal that expected rate of return calculated on the basis of students earnings expectations are fairly close to private rate of return calculated for actual earnings data.

This study assumes that students are guided by expected starting salary levels while choosing a course. Students have been asked to state their expected initial salary for the courses chosen and for the other degree course and also for the higher secondary qualification. On the lines suggested by George Papas & George Psacharopoulos, 1987 this study calculates two types of return (1) \( r_c = \frac{E_{Sc} - E_{HSC}}{N(E_{HSC}) + C_c} \) (2) \( r_{c1} = \frac{E_{Sc}}{N(E_{HSC}) + C_c} \). The formulae are explained as under:

\[
rc_2 = \frac{(E_{Sc} - E_{HSC})}{N(E_{HSC}) + C_c}
\]

Where \( rc_2 \) = rate of return for the course selected

\( Esc \) = expected initial salary for the course selected.
ESHsc = expected initial salary for the higher secondary qualification
N = number of years for the completion of the course
Cc = direct private cost to be incurred - assumed to remain same for all the years

As the choice decision is based on the cost and expected earnings differentials between courses, another proxy measure of expected returns is also worked in this study.

\[ rc_1 = \frac{(ESc1 - ESc2)}{N(ESc2) + Cc} \]

Where:
- \( rc_1 \) = rate of return for the course selected \( C1 \)
- \( ESc1 \) = expected initial salary for the course selected \( C1 \)
- \( ESc2 \) = expected initial salary for the alternative course not preferred.
- \( N \) = number of years for the completion of the course \( c1 \)
- \( Cc1 \) = direct private cost to be incurred - assumed to remain the same for all years.

These two types of rate of returns which are proxies, are expected to be positively related to the choice of the course.

(e) Expected Job Opportunity

Only few studies like by Mark Blaug 1969, Freeman 1971 and 1975 and MeMachern and Wagner 1981 analyzed the job opportunity that a course could provide to student and its influence on the choice of a course. Students have expectations about the employment opportunity in different fields, the likely duration of their job search, and their initial
salary. These expectations are formed on the basis of the existing and recent labour market conditions. Studies both in developed and under developed countries reveal that these expectations tend to be reasonably accurate and hence the demand for a course would much depend on job opportunity. In countries like India, where graduate employment is high, choice of the course on the basis of job opportunity still considered be a rational behavior. Such a behavior had been observed by Mark Balug 1969 and by Amirk Singh 1993 citing Ashok Mitra Commission report on the education in West Bengal, a state in India. IAMR 1992 study on educated employment in India reveals a negative relationship between level of education and youth unemployment rate. The study observes that the expectations of the individuals that more education would assure better employment opportunity with a comfortable salary had motivated the individuals to enroll in colleges. But the question is Does the job opportunity of course induce the choice? Studies in OECD 1979 countries and by Nicolas Glytos 1990 and Psachropoulos and Samyal 1981 on the vertical choice i.e. to go to college or not, establish that job opportunity exert substantial influence. But then the question is Does it happen in choice of a course, that too in a limited choice situation and dull labour market?. 
Another question is why do students attach importance to job opportunity? Erichkirchler (page 12) observes that unemployment affect inter family resource contributions, marital power structure and material happiness. Therefore, it is needless to emphasize the importance of job. Students course choice decision are expected to be influenced substantially by job opportunity. A student may wish to select a course that would provide him certain specific skills which are required for certain jobs called occupation specific skills. Hence it is natural that students are expected to prefer courses like medicine and engineering and such other occupation specific courses. Mark Balugh 1976 page 187 also observed that job opportunity is ranked above all other motives. Since there exists a close relationship between particular course and type of occupation, students would prefer to invest in such courses which offer job with high wages. On the existing or recent past labour market conditions student may compare job opportunity for various courses. Some students may take job opportunity as the base category motive, due to insecurity and form of risk. They may ready to accept a job which is offered initially irrespective of level of salary. Thereafter he can move up in the ladder by observing labour market conditions. On the other hand some students may prefer a course that would get a initial job with reasonable high salary. They may prefer to wait.
Therefore it is not clear whether starting salary or job opportunity will weigh more in the choice of the course. It is postulated in this study that in the choice of a professional course both may be weighed by the students equally since better job may assure better salary also. Cream 1971 study cited at page of Handa's paper had argued that students are more likely to be influence by marginal changes in employment than in salary. This study intends to analyze the importance attached to job opportunity by students who choose the field of study in engineering course like Civil, Mechanical, Computer Sciences etc. It is expected that students will be neutral to job and salary factor in the choice of fields in engineering.

Generally employment opportunity is measured in weeks or month within which a students expects to get a job. Such a measurement has been used by George Papas and Psacharopoulos 1987. Alternatively, the job opportunity is expressed as job search time, or job waiting time. In this study job opportunity is measured in terms of number of months a student estimates to wait to get the first/initial job. It is postulated that there would be an inverse relationship between the waiting period and the probability of choosing a course.

2.4 METHODOLOGY

This section deals about the sample selected for the study, source of data and tools and models used for analyzing data.
2.4.1 Selection of Pondicherry Colleges as area and population for the study.

The higher secondary students who completed their study in the academic year 1994-95 and joined various colleges in Pondicherry form the population of the study. Union Territory of Pondicherry consists of Pondicherry, Mahe, Karaikal and Yanam as enclaves of Pondicherry. Since most of the colleges especially professional colleges are located in Pondicherry, Pondicherry has been chosen as area of study. The enclaves do not have any professional college. Pondicherry colleges have been taken for study because of the following reasons (1) it is city with people with a variety of culture, race and language - may be taken as mini national or international community (2) all the colleges are government funded and controlled (3) it has both arts and science and professional colleges (4) the admission norms i.e. marks obtained at higher secondary examination and reservation of places are to be followed by colleges as per the government directions (5) the choice range is not that wide and (6) the courses are compartmentalized in colleges. The higher educational system in Pondicherry is fully government controlled and hence it would be helpful to test the proposition that the student's course choice behavior is influenced by personal, family background and labour market factors as is observed in an open and market oriented higher education system.
2.4.2 Period of Study

The academic year 1994-95 has been selected for the study, since many of the professional colleges came into existence like Dental, Veterinary and Agriculture either one or two years prior to this academic year and have grown reasonably well with facilities. Students and parents of U.T. of Pondicherry also had the information of these colleges on various aspects like, admission procedure, conditions and tuition fees etc. In this year the Pondicherry city had two Arts & Science Colleges (One meant for girls exclusively and the other for boys and girls) offering the science and arts courses, Engineering College, Dental College and college of Nursery and Physiotherapy - one each in number. The Agricultural College is not located in Pondicherry, rather at Karaikal which is an enclave of U.T. of Pondicherry. However selection of this college as a sample is with a purpose to give proper representation for professional colleges.

2.4.3 Sample Selection

Out of the students who have been admitted in various colleges in Pondicherry in the academic year 1994-95, a sample of students have been selected to study the choice behavior. The 1st year students of medicine had been omitted as they were admitted on basis of entrance exam marks, whereas admission for all other courses, HSC marks were the basis. Further out of the 20 students got admitted for medicine under Pondicherry quota, only
10 formed the sample. The sample is not sufficient, and hence did not considered for study. The students are assumed to make a series of choices shown in the following decision tree. Two options at each decision level are assumed to be the minimum.

Chart 2.3
Decision tree

![Decision Tree Diagram]

2.4.4 Type of sampling method used.

The population i.e. 1st years of students in various colleges admitted in to various courses were divided into students admitted to (1) professional courses (2) sciences courses and (3) arts and humanities courses i.e. students were stratified into 3 sub groups based on the broad area of study (chart 2.4). Students were listed out in the alphabetical order of names. In each sub group, in the order of their names, samples were drawn
by simple random method. The sample in a subgroup to be representative, care has been taken that the sample drawn in each group is equiproportional as far as possible. This kind of method is called stratified random sampling method. The students are stratified according to their choice of courses. Out of the total students 1645, 670 have been taken as samples, which form 40% of the population.

**Chart 2.4**

**sample size**

<table>
<thead>
<tr>
<th>Total number of students enrolled in the 1st year (1994-95)</th>
<th>1,645</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of students enrolled in arts and humanities</td>
<td>953</td>
</tr>
<tr>
<td>No of students selected as sample</td>
<td>403</td>
</tr>
<tr>
<td>No of students responded and provided information</td>
<td>271</td>
</tr>
<tr>
<td>No of students enrolled in science courses</td>
<td>392</td>
</tr>
<tr>
<td>No of students selected as sample</td>
<td>206</td>
</tr>
<tr>
<td>No of students responded and provided information</td>
<td>177</td>
</tr>
<tr>
<td>No of students enrolled in professional courses</td>
<td>300</td>
</tr>
<tr>
<td>No of students selected as sample</td>
<td>230</td>
</tr>
<tr>
<td>No of students responded and provided information</td>
<td>222</td>
</tr>
</tbody>
</table>

Such a choice based sampling method had been advocated by Rander and Miller 1975 and Madella 1986, (page 75) and William Weiler 1989 (Page 280). The choice of a course is an endogenous variable. Choice set faced by a student is partly endogenous and hence choice based sampling is most appropriate. Study by
Fuller et al 1982 on the choice of the college had justified the relevance of choice based sampling in such situations. In case the sample is stratified or classified according to exogenous variables like sex, caste, institution, it is called exogenous sampling.

2.4.5 Unit of observation - individual student

Educational analysis while using data referring to groups of people, students or classroom or institutions etc. have to been in mind that such data mask a lot of variation. Therefore in data design for educational research, the individual student should be the unit of observation. Further this study's objective is to examine the individual demand behavior. This study takes an individual student as a unit of study. Apart from primary data, secondary data on number of places, number of applicants for each course etc. were collected.

2.4.6 Nature of data collected

The cross section data is helpful to understand existing relationships. Since this study wishes to estimate the relationship between demand for a course and its determining factors, cross section data is more relevant. Though it is desirable to go in for time series data to examine the change of relationship between individual demand and determinants over a period of time, due to various types of constraints it is not possible in this study.
2.4.7 Data collection method

The data on individual student were collected through a questionnaire. A pilot survey consisting of 45 samples were undertaken, with a view to improve the structure of questionnaire. After certain modifications by adding new questions and deleting certain questions which are not required, a improved questionnaire was developed. The pre-tested questionnaire was given to each student with a note requesting him/her to provide answer to the questions. Some of the questionnaire are open ended and some are structured depending up on the various objectives of the study. The sample students were given sufficient time to go through and provide their views within a day or two. In order to avoid duplication of answer/information, students were asked to carry home the questionnaire and fill it up without consulting their fellow students. In addition to the primary data from students, information has been collected from colleges.

2.4.8 Analysis of data

Apart from simple statistical tools like average, standard deviation, correlation, sophisticated logit model is used for the analysis of data with the help of computer.
2.4.9 Model Formulation

The data collected are to be analyzed and the conclusions thus arrived have to be tested statistically so as to formulate educational policies. The following issues are to be decided in the formulation of econometric model especially for a univariate dichotomous dependent variable (1) how to specify a model which is consistent with economic theory and at the same time statistically manageable (2) how to estimate the model and test the hypothesis on the parameter of a model and (3) what criteria to use to choose among competing models?.

2.4.10 Criteria for building a model

The individual's choice behavior is assumed to be rational on the lines of human capital theory. Rational economic behavior is evaluated with an objective. Maximization of utility is generally said to be the objective of an individual. However in certain choice situations reference to utility need not be explicit and the criteria may not be maximization of utility, rather it can be an index of the propensity to favor a particular choice. In such choice situations, the individual is assumed to evaluate the relative advantages of the options. As observed by Takeshi Amemiya 1981 in some instances the researcher may specify more directly how the independent variables affect the probability of a given option to be chosen, without referring to the utility
maximization or propensity index. This is more opt in the choice of the course. The individual weighs the comparative advantage between options and reveals his preference to a course.

In this study it is assumed that each high school student who had applied for admission to various courses, faces a set consisting of at least two mutually exclusive and discrete choice options for enrollment. As per human capital model, an individual "i" would choose a course say "j" to enroll, out of the two alternatives if expected initial salary $E_{ij}$ is higher than the expected initial salary for the other course i.e. $E_{ik}$, cost of the respective courses being $C_j$ and $C_k$. Choice is revealed when $E_{ij} > E_{ik}$ with $C_j < C_k$.

An alternative decision criteria, in a dull labour market, could be that the individual “i” would choose a course “j” if its expected job waiting time $ET_j$ is lesser than the other course $k$, assuming that the expected earnings being same or higher for the course and cost being lesser or equal for $j$ compared to $k$.

Then, course $j$ will be chosen to enroll if

$$E_{ij} > E_{ik}, \text{ with } C_j < C_k \quad (1)$$

or

$$ET_j < ET_{ik}, \text{ with } C_j < C_k \quad (2)$$

$$E_j > E_k$$
In addition to factors viz expected earnings cost and job opportunity, individual and family background factors also influence the enrollment choice of the individual. It can be generalized that the individual would attach some utility to each of the choices available to him. The individual would choose a course if only if the utility of j exceeds the utility k, the other alternative. Thus, the probability of drawing an individual who would choose j from the population of students admitted in various courses, is the probability of the utility of j exceeds the utility of other alternative. This study aims to find out the probability of enrolling in a course, in a given set of attributes of the individual. One of the objectives of the study is to predict the likelihood that an individual with a given higher initial salary, selecting a course than the other.

The probability thus calculated represents the utility attached to that option which is called as utility function and stated as

$$U_j = a x_j + e_j$$

$U_j$: utility index of $i^{th}$ individual

$X_j$: variables describing the option and

$a_i$: vector of unknown parameters

Thus the probability of $i^{th}$ individual choosing the $j^{th}$ option i.e., $p_{ij}$ depends on the structure of distribution of stochastic terms.

Let 'y' represent the probability $p_{ij}$ then

$$p_{ij} = y = \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + e_i$$
2.4.11 Quantification and Classification of Independent Variables

The independent variables in this study are grouped into categorical variables and non-categorical variables for the estimation purpose. By categorical variable it is meant that the variable's values are categorized into a new set of variables that correspond to the original categories. Caste of the student and occupation of the father are the two categorical variables in this study. The caste variable $X_2$ takes a value of 1, 2, and 3 to represent forward caste, backward caste, and scheduled caste/scheduled tribe and thus new set of variables are created as $X_2(1)$, $X_2(2)$, and $X_2(3)$. Each new variable is treated again as qualitative taking the value of 1 or 0. If a sample belongs to forward caste then $X_2(1)$ takes a value of 1 and otherwise 0. Of these three new variables one is to be treated as base category as per the statistical procedure that the number of new variables required to represent a categorical variable in the equation is less than the number of categories. This procedure is mainly to avoid multicollinearity (Damodar Gujarati 1988 Page 436).

The following are the independent variables used in the model.

$X_1 = \text{sex}$ i.e. if male then $X_1$ takes the value 1 and otherwise 0

$X_2 = \text{Caste - categorized into 3 groups i.e. } 1=\text{OC(Forward Caste)}, \quad 2=\text{BC (Backward Caste)} \text{ and } 3=\text{SC/ST(Scheduled Caste/Scheduled Tribe)}$ and these categorized variables are
taken as $X_2(1)$, $X_2(2)$, $X_2(3)$ and take a parameter coding of 1 if the sample belongs to say $X_2(1)$ otherwise 0. $X_2(3)$ is treated as base category.

$X_3 = \text{Father's education - measured in years}$
$X_4 = \text{Mother's education measured in years}$
$X_5 = \text{Father's occupation - categorized in to 7 groups i.e.}$
1 = worker consisting of labours, petty business, industrial unskilled workers.
2 = White collar middle class consisting of clerical and middle level cadres.
3 = Agriculture
4 = Business
5 = Executive/managerial consisting of officer level postings like Asst.Engineer, Executive Engineer, Lecturer, Office Manager, Marketing Manager.
6 = Professional - Judge, Doctor, Lawyer and Chartered Accountants etc.
7 = Others - retired, unemployed etc.

These categorized variables are taken as $X_5(1)$, $X_5(2)$, $X_5(3)$, $X_5(4)$, $X_5(5)$, $X_5(6)$ and $X_5(7)$ and each variable takes a parameter coding of 1 if the sample belongs it, otherwise 0. $X_5(7)$ is treated as base category.

$X_6 = \text{Annual income of the family measured in monetary terms, at current prices.}$
$X_7 = \text{Socioeconomic index - worked out by taking Father's education, occupation and family yearly income.}$
$X_8 = \text{Aggregate percentage of marks obtained in maths, physics and chemistry at higher secondary exam.}$
$X_9 = \text{Aggregate percentage of marks obtained in physics, chemistry and biology at higher secondary exams.}$
X10= Overall percentage at higher secondary exam.
X11. Yearly expected initial salary for the course enrolled
X13. Yearly expected initial salary for the other degree course
X14. Rate of return I with reference to initial expected salary for the course selected and the expected salary for the other degree.
X15. Expected job time (waiting period) measured in terms of months.
X16. Yearly private cost of the course enrolled expressed in monetary terms.
X17. yearly private cost
   Cost ratio = --------------
          annual family income
X18. Private cost of the course enrolled plus foregone earnings i.e. expected earnings for higher secondary qualification.
X19. Rate of return II with reference to expected salary for the course enrolled and the initial salary expected for higher secondary qualification.

2.4.12 Estimation:

Estimating the student's behavioral model follows the usual economic practice of interpreting actual choice as revealed preference. There are three functional forms of estimation. They are

1. Linear probability model (LPM) : \( Y_i = a + bX_i + e_i \)
2. Logit model
3. Probit model
The LPM expresses the dichotomous dependent variable as a linear function of the explanatory variables and estimated by OLS method. However LPM is plagued by following problems:

a) Non-normality of ui (b) heteroscedasticity of ui (c) possibility of Yi i.e estimated probability lying outside the 0-1 range and (d) the R2 values will generally be lower (e) it assumes the marginal effect or incremental effect of independent variable remains constant throughout.

A probability model is required to be used since the estimated probability lies between 0 and 1 and the relationship between probability and independent variables is non-linear. Out of the two models viz logit and probit, the former is preferred by economists like Takeshi Amemiya 1981, page 23 & 24 and Damodaran Gujarati 1988 and Fuller etal 1982 (page 492) in-terms of mathematical convenience and availability of computer program. Logit and probit formulations are quite comparable, the chief differences being that the logistic has slightly flatter tails i.e the normal curve approaches to axes more quickly than the logistic curve and logit uses cumulative logistic function and probit uses cumulative distribution function. Further logit is more suitable for choice based samples. Individuals enrollment decision is based on the comparison of utility between alternatives and not on the maximization of utility and hence
logit is more appropriate than probit. When the observation is about individuals and not groups the logit is more suitable. Therefore this study preferred logit model to probit and LPM.

2.4.13 Logit Model:

The logit model uses maximum likelihood method to estimate the parameters. If $P_i$ is the probability of enrolling in a course, then $1 - P_i$ is the probability of not enrolling. Then the odds ratio in favor of enrolling in the course is

$$\frac{P_i}{1 - P_i}$$

If natural log is taken we obtain

$$L_i = \ln \left( \frac{P_i}{1 - P_i} \right) = \beta_0 + \beta_1 x_i + \epsilon_i$$

Where $L_i : \text{Logit}$

$\beta_1, \beta_2$ etc : are parameter estimates of independent variables.

The dependent variable ie individual demand expressed as choice of a course is linearly related to independent variables and it takes value 1 or 0. Profitability of $p(d) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + \epsilon$, where $p(d) = L_i : \text{Profitability of enrollment in a course.}$

Therefore probability of choosing a course

$$\text{Probability of demand, } p_i(d) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_1)}}$$

$$p_i(d) = \frac{1}{1 + e^{-z}}$$

Where $z :$ is the linear combination i.e. $Z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n$

Taking the antilog of log odds ie $L_i = \text{antilog} \left[ \frac{P_i}{1 - P_i} \right]$, we can estimate
the probability. The independent variable in this equation is
the logarithm of the odds that a particular choice will be made.
One important feature of logit model is that it transforms the
problems of predicting probabilities with in a (0,1) interval to the
problem of predicting the odds of an event's occurring with in
the range of the real line. The slope of the cumulative logistic
distribution is greatest at $P = 1/2$. This implies that changes in
independent variables will have their greatest effect on the
probability of choosing a given option at the mid point of
distribution.

2.4.14 Selection of independent variables

Various sets of independent variables have been taken based
on the theoretical perception of the study. For instance cost has
been measured in 3 ways and three sets of equations have been
worked out. In logistic regression as in other multivariate
statistical technique, one can identify subgroups of independent
variables that are good predictors of the dependent variable. One
can use forward stepwise selection or backward stepwise
selection. In this study backward stepwise selection method is
followed.

Backward elimination starts with all of the variables in the
model. Then at each step, variables are evaluated for entry and
removed. Wald statistic is used to select variables for removal.
Such an automatic model building is available in the computer program.

All variables that are used to represent the same categorical variable are entered or removed from the model together. This study apart from working out the logit model with various sets of combination of independent variables, it attempts to find out best prediction variables.

2.4.15 Interpretation of logit results:

a) Logit coefficients:

Coefficients refer to the marginal effect of each independent variable on the dependent variable estimated at the mean value of the predicted probability. Coefficients refer to change of log odds associated with one unit change of independent variable. If coefficients have negative signs, then log odds decrease with increase in one unit of the independent variable.

As regards categorical variable like caste categorized into 3 types: X2(1) Forward, X2(2) Backward clear and X2(3) Scheduled caste we can make statements about the effect of a particular category in comparison with base category. In this study X2(3) is treated as base category and omitted in the equation as per statistical procedure as referred in the preceding part of this chapter. The coefficients of variables represent the effect of each
category compared to reference category. If the coefficients of
the categorical variables taken in the model are negative it
means that compared to base category value, the values of
categorical variables are associated with decreased log odds.

b) Partial correlation:
A statistic that is used to look at partial correlation between
dependent and each of the independent variables is called as "R"
statistic. R ranges in value from -1 to +1. Positive value of R
indicates that as the value of the independent variable
increases, so does the likelihood of the event occurring i.e. choice of
the course. If the R is negative, the opposite is true. If the Wald
statistic is less than 2, R is set to 0.

c) Co-efficients as odds:
Instead of writing the logistic model in terms of the log of the odds,
which is called a logit, for better understanding, it may be
expressed as odds i.e.:

Probability (event i.e. choice of a course)
------------------------------------------
Probability (no event i.e. non choice of a course)

The odds of an event occurring are defined as the ratio of the
probability that it will occur to the probability that it will not.
The "e" is raised to the power of Bi, is the factor by which the
odds change when the ith independent variable increased by one
unit i.e. Exp "B". If B is positive this factor will be greater than 1, which means that the odds are increased and if negative, the factor will be less than 1 which means that the odds are decreased.

2.4.16 Testing Hypotheses about the coefficients:

To test the significance of the coefficients individually, it is postulated that null hypothesis $H_0 = B_1 = 0$ i.e. the value of the coefficient is not significantly different from 0. In the logit model, out of the available statistic, this study uses wald statistic to find out whether individual $B$ are significantly different from 0. The Wald statistic is just the square of the ratio of the coefficient to its standard error. The significance level of the Wald statistic is worked out using a significance level of .05. If the significance level is .05 and less $B$ is said to be significantly different from 0.

To test the significance of all the coefficients it is postulated that $H_0 = B_1 = B_2 = B_3 = B_n = 0$, i.e. all the coefficients values are not significantly different from 0. To test this null hypothesis, model chi-squire is used. The model chi-square is the differences between the -2 log likelihood of the model with only a constant and -2 log likelihood of the model with the constant and independent variables. The significance of the model chi-square is worked out with reference to differences in the degrees of freedom between these models. Thus model chi-square tests the null hypothesis
that the coefficients for all of the terms in the current model except the constant, are 0. This is comparable to the overall F test of regression.

2.4.17 Assessing goodness of fit of the model:

a) There are various ways to assess whether or not the model fits the data. One way is to compare the predictions to the observed outcomes of the dependent variable. Suppose out of a sample of 75 students 25 choose engineering course and the rest 50 non engineering professional course like dental, veterinary etc., the dependent variable's value being 1 if engineering is chosen and otherwise 0, it is possible to classify through the model how many students have been classified correctly both in engineering and non-engineering.

The predicted outcomes can be put in a tabular form. From the tables it is seen that out of 25 students who have chosen engineering i.e. 1, the model predicts or classifies only 20 students correctly and misclassify 5 students as if they have chosen non-engineering courses.
The off diagonal entries of the table tells us how many students incorrectly classified. However the classification table does not reveal the distribution of estimated probabilities in these two groups.

(b) -2 log likelihood value:

Another way of assessing the goodness of fit of the model is to actually examine how likely the sample results are given the parameter estimates. The probability of the observed results given the parameter estimates is known as the likelihood expressed as -2 log likelihood. A good model is one that results in a high likelihood of the observed results. To test the null hypothesis that the observed likelihood does not differ from the value of the likelihood, of a model that fits perfectly, we can use the -2 log likelihood value, which follows a chi-square distribution, with N-p degrees of freedom where N is the number
of cases and P is the number of parameters estimated. If the observed -2 log likelihood value is more than the critical value at 5% level of significance, then we can reject the null hypothesis.

© Goodness of fit statistic:

Yet another statistic that can be used to test how well the model fits is the goodness of fit statistic. It compares the observed probabilities to those predicted by the model. It is the difference of observed value Yi and the predicted value Pi. This statistic also has a Chi-square distribution. This study uses all the three ways to assess goodness of fit.