

Chapter 6

Research Findings **Mobility Intentions of Prospective Indian** **Students**

6.1 Introduction

The student mobility from the institutions of India in STEM subjects is often studied in terms of their contributions towards their homeland. Remittances, research contributions, back migration etc. are often researched. It is not easy to find out the exact impact of the so called brain drain or brain gain owing to a plethora of subjective issues involved. The present research has emphasis on the research intentions of the students studying in the higher educational institutes of United States. Hence, the behavioural economics among the prospective STEM students in India as well as the current students pursuing studies in the American institutions have been taken into account. It was found that the decisions of scholars have been guided by a variety of factors such as family, career prospects, income, government policies etc. The migration and mobility decisions change with changing economic as well as social conditions in a country. Compared to previous years, many students nowadays are in favour of returning back to their homeland. Globalised economy has resulted in changing reforms in higher education. The higher institutions have been busy in adopting new pedagogy, technologies, policy goal, and collaborations with foreign institutions in developed countries. Newer approaches adopted by the governments in sending and receiving countries directly and indirectly influence the mobility decisions. The growth oriented capitalist economy in line with the globalised world has resulted in the birth of new occupations based on specialized knowledge and expertise. The science and technology sector is sensitive in their response to the newly emerging areas. Hence, the STEM students need to keep themselves updated, which is best possible in the best educational facilities of the United States. Many Indian students leave India due to bureaucracy, poor research environment, difficult admission procedures and lack of OPT like hands on training facilities in India.

The great foreign constituent of the U.S. human scholarly capital is connected to the aptitude of U.S. higher education system to draw, support, and care for overseas S&E graduate students. Foreign students, mostly those belonging to Asia, stand for a great portion of enrolment and degrees in S&E area in U.S. institutions of graduate level teaching and learning (Johnson et al. 1998). The pull factor for education in the U.S. keeps on growing although the spirit of mobility and its variety is altering. All through the early sixties, the U.S. universities were destinations of postgraduate scholars from India (called graduate students in the American jargon), mostly in quarters of natural sciences of Physics, Chemistry, and Biology along with Mathematics. These academic visits were largely for obtaining a PhD.

degree of an eminence not simply attained in India. The U.S. education arrangement could effortlessly attract this class of students, ever since the U.S. scholarly society was reliant on graduate students, desired for research projects backed by funding agencies. The U.S. universities then were not seeking students as a basis of revenue creation as the propensity has been in vogue nowadays, with spotlight now on undergraduate employment. The Indian students pursuing in the U.S. in the past completed their post-doctorate as part of his —training skill, allowed by the immigration regulations. But now the Indian students plan to go to the U.S. with a durable plan. The students' families are habitually enthusiastic that their stay in the U.S. is protracted so that their professional careers are improved and also build substantial wealth through rewarding job offers made by industry. The industry would rationalize the continuous stay of the student in the U.S. by supporting their probable worker for a U.S. visa a must under the immigration rules. This led to more and more seekers of green card holders in the United States and possibly leading to a permanent U.S. residency. Students arranging to move to the United States are at present alert of a range of choices accessible to them in the U.S. education structure. The United States Education Foundation in India (USEFI), with its branches in major cities is offering reliable information along with supervision for pursuing studies in the U.S.

With this backdrop, the present research is written with the intent of mapping out some of these alterations in the mobility of students and other professionals between India and the United States. The charisma of education service in the U.S. continues to grow up but the character of mobility and its variety is undergoing change. Throughout the early sixties, the U.S. universities were centres of attraction for postgraduate Indian students (known as graduates in the American phraseology), largely in natural sciences of Physics, Chemistry, Biology and Mathematics. These instances of student mobility were chiefly for receiving a PhD. degree of a value recognised everywhere. The American education structure could simply attract this class of students, as the U.S. educational society depended on graduate students for research projects supported by money-granting agencies. The U.S. universities were not in search of students as a foundation of income creation as the propensity seems to be these days, with attention nowadays on undergraduate recruitment.

The institutions under study include the IITs in Kharagpur, New Delhi and Kanpur; IIM Kolkata, IIM New Delhi, IIM Bengaluru; IISc Bengaluru, medical institutions like AIIMS, New Delhi; erstwhile Bengal Engineering College, Tata Institute of Fundamental Research, Jawaharlal Nehru Centre for Advanced Scientific Research, Indian Agricultural

Research Institute New Delhi, National Physical Laboratory, Institute of Physics, Inter-University Centre for Astronomy and Astrophysics, Institute of Mathematical Sciences, Mehta Research Institute and Mathematical Physics Allahabad, S.N.Bose National Centre for Basic Sciences, Indian Institute of Astrophysics, Harish Chandra Research Institute, Christian Medical College at Vellore, certain departments of sample Indian Universities like Life Science Department and Computer Science Department of Jawaharlal Nehru Univeristy, University of Hyderabad, Saha Institute of Nuclear Physics, Computer Engineering Department of Jadavpur University, Jamia Millia Islamia, Council of Scientific and Industrial Research, Indian Institute of Science Education and Research, from where the Indian students generally out migrate.

The non-participatory surveys were done by sending emails to the student union bodies of the selected institutions of the United States; such as, Massachusetts Institute of Technology, Cornell University, United States Naval Academy, Rice University, California Institute of Technology, Carnegie Mellon University, Stanford University, Princeton University, Georgia Institute of Technology, Yale University, Duke University, University of Pennsylvania, University of Ann Arbor, University of Notre Dame, Columbia University, University of Southern California, University of California – Barkeley, University of Illinois at Urbana – Champaign, University of Texas – Austin, Purdue University, Washington University in St. Louis, Virginia Tech, Brown University, Johns Hopkins University, Tufts University, Georgia Institute of Technology, Purdue University – West Lafayette, University of Illinois – Urbana Champaign, Texas A&M University, University of Wisconsin – Madison, University of Maryland – College Park, University of Minnesota, Rice University, University of Pittsburgh, Iowa State University, University of Rochester, University of Delaware, Case Western Reserve University, University of Dayton, Michigan State University, Colorado School of Mines, University of Utah, Lehigh University (Rossin), University of Connecticut, Stony Brook University, University of Houston, Syracuse University, University of North Carolina, Michigan Technological University, New Jersey Institute of Technology, University of Cincinnati, George Washington University, University of Alabama, University of South Florida, Texas Tech University, University of Kansas, University of Kentucky, Missouri Institute of Science and Technology. In applied mathematics, applied mathematics, discrete mathematics and combinatorics, financial math, number theory, representation theory, symplectic geometry, topology, algebraic geometry, complex analysis, logic and probability are popular courses in the U.S. universities. The

popular earth science courses taught in the U.S, institutions include geology, climate studies, marine estuarine studies, earth remote sensing, geochemical science, natural resource, fishery science, geo science policy etc. The popular institutes include Montana Tech, Case Western, University of Minnesota Duluth, George Mason University, Dartmouth College, The City University of New York, Howard University, Montclair State University etc.

The environmental science is a very popular course in the U.S. The most popular universities are West Texas A&M University, Western Kentucky, Southern Illinois University Edwardsville, Marshall University, Clemson University, Western Washington University, and University of Denver etc. The forte of the American Universities is environmental management, public health, policy issues, conservation, toxicology etc.

6.2 Research findings

6.2.1 How do the forces of globalisation affect the institutions?

It seems that for improving competitiveness of the affiliated colleges the fiscal autonomy will be the important and also academic autonomy is the major guiding strength. In the case of the renowned institutions in India, strengthening the industry interface, application of technical expertise, faculty and research as well as case technique have become priority. Increasingly more open markets and decreasing governmental power are allowing companies to shatter geographical limitations. With the downfall of socialist economies, the 21st century global order is promising owing to accommodating capitalism and controlled socialism. Countries contend with each other for fiscal gain, as protectionism disappears. The lifting of governmental control might have supported the release of supremacy of an all-inclusive economic order, but the secret of affluence is fuelled by the most momentous human resources. After discovering the necessity for a greatly skilled and bright labour force, India like other countries worldwide have placed emphasis on greater investment in education and skill improvement. The surveyed Institutions have in recent decades greatly encouraged skill augmentation. The study of Indian institutions imparting science and technology education has demonstrated such characteristic trends. Several such joint projects and R&D are carried out in these institutions. The present trend of globalisation of education in India is a challenge for such parallel mediocrity of educational institutions in the country.

Now let us discover opportunities to students of the institutions surveyed in the background of altering higher education as well as job profile. The existing literatures are weighed against in the findings produced during the survey among sample student

population. The top ranked institutions in India have a discrete edge in job market, while the current employment market has a propensity to favour the potential employees from reputed institutes. Conventional and time-tested paths of service are losing relevance with the emergence of newer openings and careers, as is relevant from the courses chosen by students of these Institutions. As is revealed by interviews; presently, most students have a baffling range of options – of colleges, areas of study, areas of specialisation and methods and so on. Students are faced with difficult tasks of making alternatives derived from popular trends. In an economy open to globalisation, talent hunters from different corners of the world captures people with special aptitude from across the globe. In truly globalised economy, there exists a definitive measure, providing an archetypal method to recognize the brilliance of the human resource. There must be indistinguishable level playing field, providing likelihood to all, founded on true merit. In the case of the Indian Institutes, the job market has become enormously significant in the selection of courses. Interaction with students divulges that the students are conscious of fast changing job profile due to shifting nature of India's opening economy. The speedy diversification of courses in response to technological improvement has led to their irresistible preference for technical courses over social science disciplines. The student mobility likings have been influenced by such courses of science and technology.

The companies in India are in scurry to meet the new global principle to benchmark workforce of different countries including the developing countries – thus they are endorsing the selection systems of workers based on merit. In case of the IIT, the computer engineering courses are in the route of modernizing their proficient human resources by frequently arranging international workshops, conferences, international publications in addition to creating international tie ups with the foreign Institutions plus transnational companies like Dell, Microsoft, HP, Infosys, TCS, Wipro and so on.

Knowledge is the motivating force in the quickly changing globalised financial system as well as society. Quantity and quality of dedicated workforce determine their skill in the world market. Emergence of knowledge results in both challenges as well as opportunities. Undeniably the growth of the international economy has increased chances for those countries with high levels and quality of education. Globalisation has a multi-dimensional influence on education. It encourages new techniques in new areas like E-learning, Flexible learning, Distance Education, Overseas training etc. Globalisation means many diverse things for education. Our Institutes like IISc and IITs regularly produce top-

notch professionals. These institutes impart quality training as per industry opportunity and give due weight to institute-industry interface.

In computer science and electrical engineering, the meritorious students staying in India are chosen by multinational companies. They also become mobile labour force moving all over the world. A section of employees also prefer to pursue foreign degrees in USA as some of them are sponsored by the firms they work for. A very small number of them ultimately join management schools. A lion's share of IIT students are engaged by the IT sector with corporations like Infosys, TCS, Cognizant, HP, Dell and Wipro as they also provide services in the U.S. as well as in India. The out sourcing of jobs in Hyderabad, Bangalore, Pune and Sector V of Kolkata has made skilled migration to some extent irrelevant as the wage is increasing in Indian companies. However, the traditional information technology degrees and certificates are being replaced by newer courses like cyber security, business intelligence, health information management, computational finance, project management and leadership, human computer interaction, health informatics, web technology; cloud computing, video games and multimedia. Courses like data science and Big data are gradually occupying places among the most sought after subjects due to their steep demands. The students from India nowadays prefer to study IT courses in these fields. The modern globalised economy relies on imparting training to skilled manpower in different countries of the world – in different set up and ambience followed by employment in a country. Thus the technical manpower produced generally gets exposure after getting training in different countries. The engineering courses are also getting diversified such as, Aerospace engineering, architecture and design; civil engineering with focus on developing communities; water engineering and management; courses on electrical engineering in embedded systems; power electronics, photonics, engineering management, materials science, biomedical or automotive engineering, nuclear engineering, systems engineering, environmental health engineering, communications engineering, chemical engineering, robotics, sustainable energy, mechatronics etc. Besides, natural sciences are also popular choices, such as, atmospheric and oceanic sciences, marine science, environmental resource engineering, evolutionary biology, agricultural science, green chemistry, biochemistry, biomedical science, clinical laboratory science, ecological conservation, cosmetic science, geology-geophysics-geoengineering, condensed matter science, astronomy and astrophysics, nanoscience to nanotechnology, petroleum geology, photonics, digital signal and image processing, predictive analytics,

The Institutional response to the forces of globalisation as revealed by this study finds a brief mention below. Globalisation has definitely influenced the institutions of higher learning in India. The surveyed Universities are regularly implementing reforms in syllabus like introducing ‘_integrated course’ as per the recommendation of Human Resource Ministry of Government of India as well as the University Grants Commission. Upgrading the quality of teaching and research in higher education is necessary in modern educational system, as even the premier surveyed institutions; considered as the finest in the country lag behind many other countries as revealed by contemporary world university rankings. India immediately should have research of global standard and subsequently publication of noteworthy number of papers of lofty quality in international journals. Getting teachers of good quality in different subjects is a major problem as was revealed by the surveyed institutions because of a plethora of factors. Skilled migration of highly qualified teachers to foreign universities is one major cause. Lack of improved teaching-learning facilities even in the renowned Indian institutions in contrast to the top ranked institutes of different countries of the world is a reason behind flight of merit from such institutions. Survey has revealed that the Indian Universities, for example are introducing ‘_integrated course’ in engineering disciplines. But interaction with students has proved that only a few students of engineering truly find teaching as a profession as an interesting option. The gradual shift of the institutions of higher learning as regards weight on teaching and learning of applied disciplines, campus interview based placement openings, attractiveness of job-oriented courses, stress on responsibility of teachers and other staff indicate gradual move of our university system towards production as well as distribution of knowledge systems. Labour markets for students passing out are undergoing hurried transformation in response to impromptu technical revolution and globalisation in an amplified dimension.

As part of the surveys, the questionnaires were distributed among faculty in different Indian institutions. Overall responses were 57 percent from faculty. The questionnaire was intended to seek responses from the faculty regarding the globalised higher education in their campuses. The questions and the responses are listed below:

- a. *Do you think the current trend of globalisation of higher education is inevitable?* About 96 percent teachers agreed that the present trend of higher education is following the trends set by the forces of globalisation.

- b. *What measures are being taken by your Institution for higher academic collaborations like twinning programme, joint degree, dual degree, choice based credit system, branch campus etc. and if any problems are faced due to such structural reforms?*

All the institutions surveyed were found to be adopting with the ongoing measures mentioned above. The apex body University Grants Commission also regularly sets certain rules as mentioned, regarding the policy measures for uplifting the quality of higher education. These measures also follow the developed countries' policies. However, such sweeping changes also demand very high investment in education – from government as well as private sources. There are some issues, such as, shortage of staff, lack of research culture, low level of research, lack of innovation, absence of willingness to change the system etc. The teaching faculty finds themselves at a loss in such contradictory system.

- c. *Is there any teacher or student exchange programmes in your Institution?*

Only 34 percent had such programmes, suggest that the Indian institutions need to develop.

- d. *Is your Institution connected by online libraries like Inflibnet, Delnet, national and foreign libraries etc. in digital format?*

Although inflibnet has been introduced in all institutions, pan India or international linkage e.g. library exchanges were not commonly found.

- e. *What are the career oriented courses involving science and technology being taught in your Institution?*

There are vast choices regarding career oriented courses. Most of the technical and science courses have high demand in job market. Due to rapid changes in the production system in the Indian as well as global economy, emphasis has been placed more on super specialisation. The institutions were found to be equipped with many updated courses in collaboration with foreign establishments. The teachers however admitted that the students would always prefer to study many such latest advanced fields in the west rather than in India.

f. *Is there any foreign student in your Institution?*

Only the top bracket institutes had some representation from abroad, even from developed countries. But overall representation by the scholars from developed education system is low. It suggests urgent need to boost the system, improve international ranking, greater exchange of faculty, more stress on research and development etc.

g. *Is English medium instruction followed in your Institution? All had such facility.*

h. *What the new learning technologies are followed in your Institution like smart class, video conferencing, online teaching, virtual class etc.?*

These facilities were found to be accessible in all the institutes. Keeping pace with rapidly changing teaching learning systems, the teaching methods have been undergoing transformations.

i. *If you have international peer reviewed publication published from abroad having impact factor?*

Almost 78 percent faculty had publication from abroad.

9a. *if any of your paper is cited?*

All the respondents had citations.

9b. *if YES, how many papers are cited?*

No such specific data could be obtained.

j. *If the Institution has any link with industries for course development, and/or placement etc.?*

The departments teaching science subjects in the institutions have been developing alliances with industries. Most (83 percent) departments had placements and industry interface. The curricula are designed to cater to the demands of industry, at least to some extent. The industries further train the students after their appointment during probationary period.

k. *Whether your Institution has NAAC accreditation?*

All the institutions were NAAC accredited. Most of them had several cycles of NAAC.

l. Have you provided consultation to industries or any other organisation?

Faculty in engineering, bio science, and chemistry specialized departments regularly provide consultations.

m. Is your Institution involved in R&D?

R&D or research and development have become part and parcel of the educational institutions. The production systems in the present globalized world have been undergoing rapid transformation. Thus, constant upgradation of the products needs developed R&D in order to stay competitive in market.

n. Are the students keen to enroll in foreign countries for higher education?

The faculty members were asked about their students. Although the students were given separate questionnaires, the similar questions were asked to their teachers too. According to the teachers, the students in IT, biotechnology, theoretical physics felt interested to pursue career in developed western countries, and not necessarily in the United States. The students pursue not only higher studies abroad, but also they get engaged in several fellowship programmes in foreign universities and institutions.

o. Are you conducting / or have you conducted any international project (s)?

Only 16 percent teachers were found who have had conducted international projects. The internationalisation of the Indian institutions has ensured greater access to global education for teachers as well as students. The international research collaborations are more available for teaching faculties in premier institutions of India.

p. Do you teach in any foreign Institution?

During the survey, only 5 percent teachers could be found who visiting faculty in foreign institutions. In IITs and IISc like institutions, a great number of faculties have international involvements.

q. Is there any faculty from abroad in your department/Institution?

No such teacher was found belonging to foreign origin, although the institutions surveyed had visiting professors from foreign institutions having higher rankings.

Research collaborations with teaching faculties from higher ranker institutions are common in India's premier institutions.

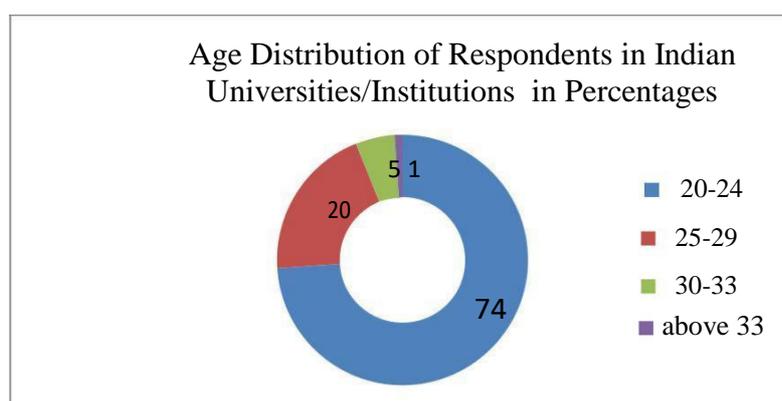
6.2.2 Factors influencing student mobility

The survey in the Indian institutions was carried out among the student population of different age groups based on stratified random sampling technique. The stratified random sampling is used in the case of the selection of students from science and technology subjects as maximum cases of student mobility abroad take place in this category. Most of the surveyed students belong to 20-25 age group in all the institutions. The case studies are discussed in two parts, such as, the case study of the Indian institutions based on participatory surveys and the non-participatory surveys conducted in the higher educational institutions in United States.

Table: 6.1 Age Distribution of Respondents in Indian Universities/ Institutions

Age Group	Percentage
20-24	74
25-29	20
30-33	5
above 33	1

Figure: 6.1

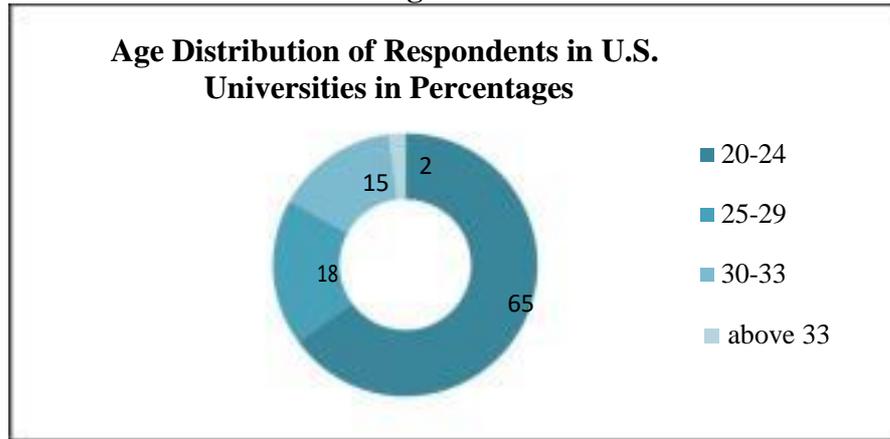


Source: Field survey, 2016

Table: 6.2 Age Distribution of Respondents in U.S. Universities

Age Group	Percentage
20-24	65
25-29	18
30-33	15
above 33	2

Figure: 6.2



Source: Field survey

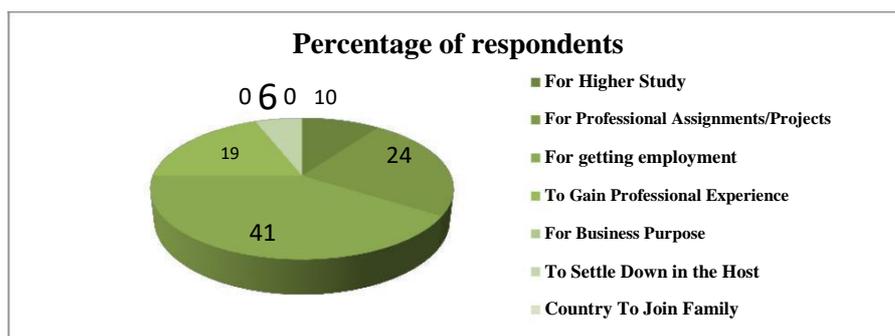
When data were collected in the Universities in India, roughly 85 percent respondents were in the age-group of 20-25, in comparison to about 11 percent in 25-30 age-groups. A small section of respondents even belonged to upper age group. Being research oriented institutions of higher education such as JNU and IISc, most of students were found to be enrolled in PhD or post doctorate. In engineering category, practically 95 percent students were in below 25 age group. In IIT's case study also a more or less matching state of affairs was revealed. As a result, the majority of students of IIT enrolled in technical fields were in 20-25 age groups. Throughout the survey in IITs, the study was persistently restricted to students of science and technology subjects only. The propensity of student mobility to overseas destinations in IIT is generally more frequent among technical professionals. The physics research institutions have restricted access. So, only 31 students could be surveyed. The agricultural institutions were surveyed, where 77 students in post graduation and Doctorate levels could be surveyed.

Table: 6.3 The push factors and pull factors of outward student mobility in Indian Institutions

Purposes	Percentage of respondents
For Higher Study	10
For Professional Assignments/Projects	24
For getting employment	41
To Gain Professional Experience	19
For Business Purpose	0
To Settle Down in the Host Country	6
To Join Family	0

Source: Field survey

Figure: 6.3 The push factors and pull factors of outward student mobility in Indian Institutions



Source: Field Survey 2016

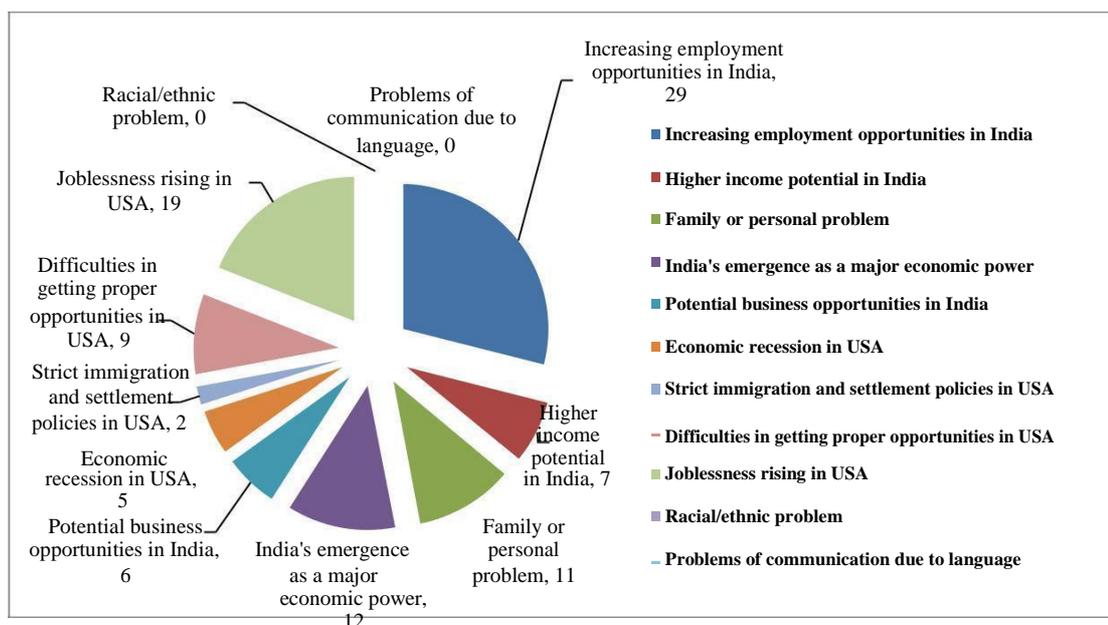
The student mobility pattern cannot be explained without looking into the encouraging factors among students acting behind going overseas. It is notable that even during past years of 90's decade, the IIT students had a distinctive trend of going abroad, either for work or for higher education. Many engineers, who left India during the 60's and 70's from India to the U.S., ultimately settled there and became green card holders. But as India emerged as an economic giant, the job openings are shifting, so are the income opportunities. The scientists find it favourable to stay back in the U.S. due to better research funding and opportunities. Whereas most of the students are concerned about service opportunities or obtaining higher education for upcoming prospects, a considerable section of students are fascinated about professional assignments or projects for lead in their career. To expand professional skill is the major inspiring factor for those studying in science research institutes, followed by higher education as well as employment in the U.S. With the growing emphasis on technology in this globalised world, the career profile of the scientists has become competitive globally. Salary wise, the employment of the IT engineers in India and the U.S. barely makes any differentiation at least in the high expertise level. For the University students, higher education out of the country is the principal motivating factor. The engineering students have an urgent priority to secure service, while the scholars in physical science plus natural science disciplines are more disposed to pursue higher studies in the U.S. It should be noted that settling down in the United States is no longer a main concern for students in all the Institutions surveyed. The attractiveness of the U.S. seems to be on the wane particularly after the recession and emergence of other destination countries. The destinations as well as the source countries are gradually becoming competitive, as their job markets are getting diversified, the quality of higher education is improving, and the governments are busy in offering incentives to the potential migrants.

Table: 6.4 Motivating Factors behind those Preferring Return Migration

Motivating Factors for Return Migration	Percentage of respondents
Increasing employment opportunities in India	29
Higher income potential in India	7
Family or personal problem	11
India's emergence as a major economic power	12
Potential business opportunities in India	6
Economic recession in USA	5
Strict immigration and settlement policies in USA	2
Difficulties in getting proper opportunities in USA	9
Joblessness rising in USA	19
Racial/ethnic problem	0
Problems of communication due to language	0

Source: Field survey

Figure: 6.4 Motivating factors behind return migration (percentage)



Source: Field survey

The students doing PhD in natural sciences, information technology and engineering said that they were not averse to come back to India after their higher studies / service is finished in the United States, were further assessed about the encouraging factors liable for their homecoming to India. Strangely optimism and despondency both seem to coexist together at the rear the choice of their mobility. The key rousing factor of return of expatriate Indians was the growing job outlook in India. India's success as a leading IT power is implied by the growth of Indian outsourcing companies such as Infosys and Wipro. The ability of employment generation by the Indian business houses in India's IT sector is colossal. The job

attrition rate is rather high attended by severe need of skilled labour force in this industry. The panic of economic downturn led to harsh joblessness crisis in the U.S.; has sent its waves across the world as well. This might have provoked the surveyed people to respond pessimistically with reference to the employment creation in the American financial system. For the students of physics, mathematics, geology and bioscience; India still does not offer good opportunities. They keep their minds open regarding working in other countries such as, Canada, Germany, UK, China, France, and so on. Despite governmental efforts, the Indian research organisations do not provide the favourable research environment like the developed countries where work ethics and professionalism are considered important. As a result, the promising researchers in science and technologies prefer to gain experience in the research laboratories in the U.S. and in the process, India is deprived.

India's surfacing as an economic power and originator of employment as well as depressing push factor of mobility like America's job loss have played as key rousing factors behind return skilled migration. Encouraging factors of student mobility and major obstacles to studying abroad have been discussed in the following section. Among the 'other' positive factors of migration the principal factors cited by the probable migrants are specialised training not easily accessible in India, making quick progress in career, superior quality of education in the host country and so on. Respondents were asked to point out the factors they felt as the main barriers to studying abroad were: finding precise information; gaining recognition to the institute of your preference; getting a visa, charge of the visa and application procedure; charge of studying abroad; language obstacles; cultural differentiation; distance from residence or family and other. Respondents were permitted to check as many reasons as applied, so percentages do not total one hundred. Women were more prone than men to mention distance from home as well as family as a main impediment and men were more liable than women to mention no impediments. An obvious networking develops among students – the senior as well as fellow students in many Institutions abroad. The technical particulars of immigration into the United States is certainly related to visa application, selection of Universities, in detail techniques of preparation for admission tests such as GRE etc. All these information are eagerly shared by the student community abroad. The literature survey done for this report has revealed wide-ranging networking which plays an imperative role in the scenario of outward mobility of Indian students.

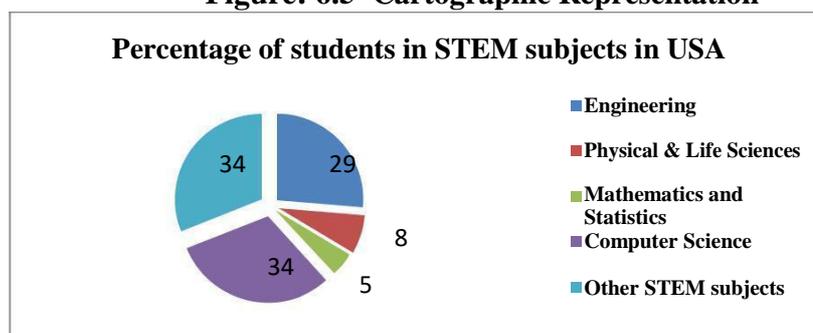
6.2.3 Intended fields of study

The S&E students were asked about their planned areas of study if they get chance in the U.S. Institutions in future. For the good number of students, the preference was engineering. The students were selected based on stratified random sampling. A variety of STEM courses were selected. For engineers, degrees in management appear to be adding credentials in their bio-data. Globalisation has caused diversification followed by further specialisation of courses with job profile also. The desire among engineers for obtaining degrees in management corroborates this fact. Physical and natural sciences have become top priority areas among the student community in general. The present day knowledge economy has become specialised, and as a result, interdisciplinary courses are in high demand. The American universities teach interdisciplinary courses – better than other countries.

Table: 6.5 Intended Field of Study (Percentage of students of science research institutions)

Intended field of study	Percentage of students
Engineering	29
Physical & Life Sciences	8
Mathematics and Statistics	5
Computer Science	34
Other STEM subjects	34

Figure: 6.5 Cartographic Representation



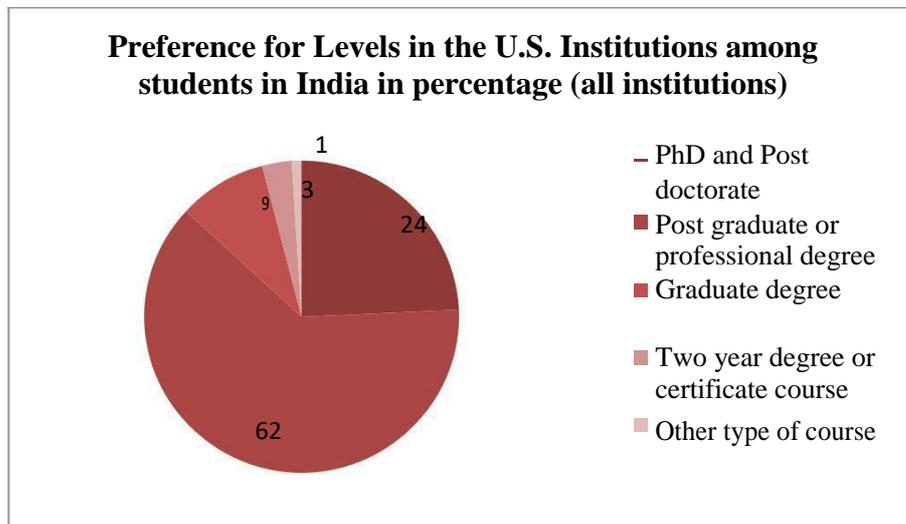
Source: Field Survey

Table: 6.6 Preference for Levels in the U.S. Institutions among students in India (all institutions)

Types of study abroad	Percent of respondents
PhD and Post doctorate	24
Post graduate or professional degree	62
Graduate degree	9
Two year degree or certificate course	3
Other type of course	1

Source: Field survey

Figure: 6.6



Source: Field survey

6.2.4 Impressions about the United States as a study destination

Impressions regarding the United States as a study destination may be analyzed from the on hand data. High value of higher education, broad choice of curricula and hospitable nature of the U.S. towards students from across the world are highly treasured by the students of IIT. Nevertheless soaring tuition fees as well as expensive school application procedure is a dispiriting attribute of the American higher education system. High distinction of tertiary education, extensive range of programs of study and friendly nature of the U.S. towards foreign students are viewed by the students as optimistic feature of the U.S. higher education system. Intricate visa application method is regarded as to be a gloomy problem. High-quality student support services, excellent standard of living are imperative concerns for students, though high quality of tertiary education along with extensive range of curricula taught by the U.S. Institutions are also believed to be indispensable like the students. Expensive school

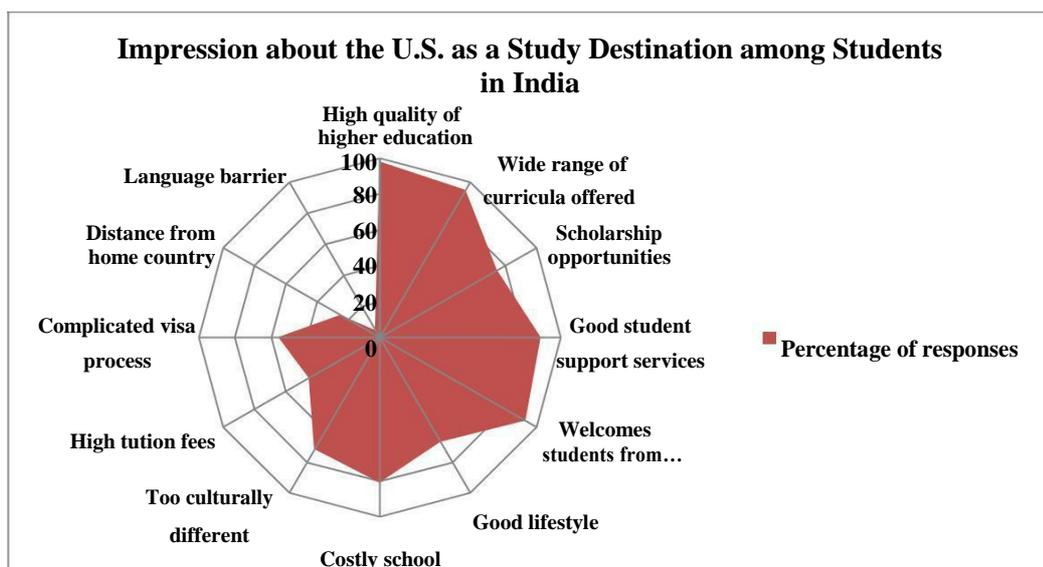
application procedure and costly tuition fees are off-putting factors. The Institutions hit by recession in the United States have hiked their fees, even exceeding the U.K. in numerous cases. During 2009-10 rise in graduate enrollment in U.K. surpassing the U.S. confirms that tuition bill in the U.S. have become inconsistent.

Table: 6.7
Impressions about the United States as a Study Destination among Students in India

Impressions about the U.S. as a Study Destination	Percentage of responses
High quality of higher education	98
Wide range of curricula offered	95
Scholarship opportunities	75
Good student support services	89
Welcomes students from overseas	93
Good lifestyle	67
Costly school application process	81
Too culturally different	72
High tuition fees	94
Complicated visa process	56
Distance from home country	25
Language barrier	5

Note: The respondents were asked to put tick mark in their choices. Hence, one person preferred more than one option regarding his/her impression of the U.S. as a study destination.

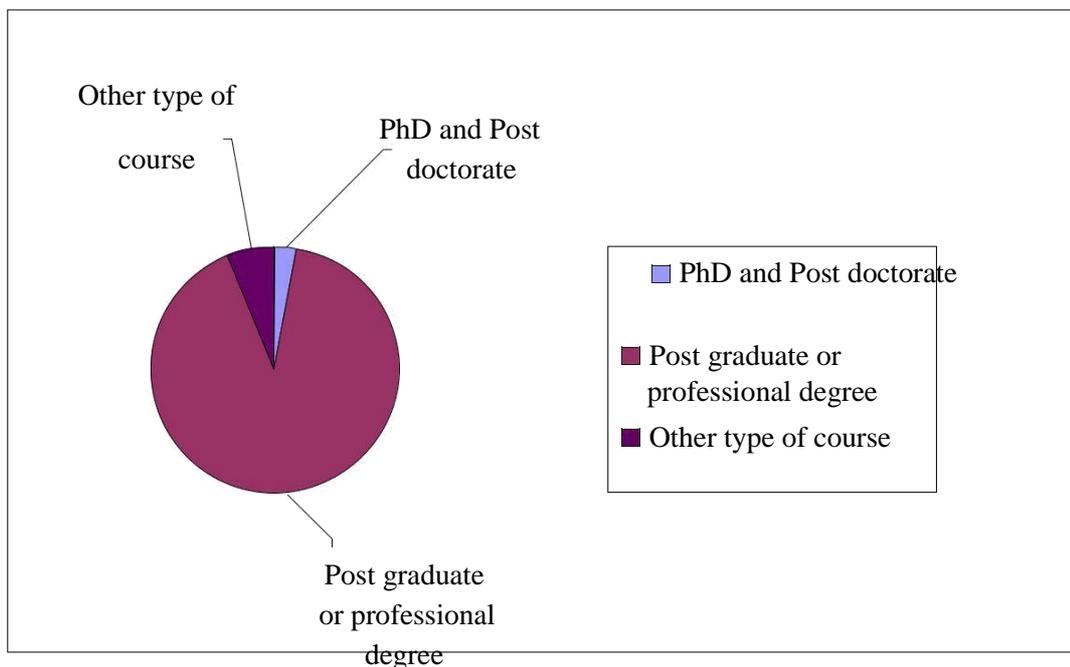
Figure: 6.7



Source: Field survey

The general idea about the major study destinations among the engineers implies a remarkable keenness for the United Kingdom and not the United States. This hints the increase of the production and distribution system of higher education in countries offering stiff competition to USA. Australia performs poorly in the in general liking as a study destination basically due to ‘curry bashing’ like physical attacks on Indian students in Australia. Pursuing a PhD or post doctorate in the U.S. visibly occupy a second rank in the list of precedence of students who are currently more in favour of bagging an early as well as high salary job.

Figure : 6.8 Preference for PhD and Other Courses in USA



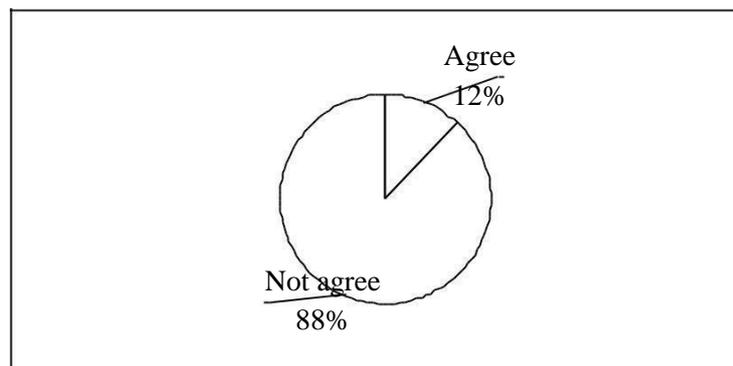
Source: Field survey

In IIT, Kharagpur it is evident that more students are in concerned about pursuing PhD or higher qualification perhaps because IIT, Kharagpur has a discrete convention of research. Many IITians from Kharagpur has previously done well in research activities contrary to IIT- Kanpur, Delhi and Mumbai for instance. In the case of the surveyed students of Indian Institutions, the United States Educational Foundation (USIEF) is a vital service provider. The USIEF provides wide-ranging information for would-be applicants for entrance in the U.S. higher educational Institutions. It is of note that notwithstanding great diffusion of internet technology in urban as well as rural areas; acquaintances and relatives still appear to be one of the chief sources of information in relation to the higher studies in USA among the

STEM students of India. Though USIEF is the chief supplier of information besides friends and families, education fairs often held in the major metropolises of India every year and in addition internet is a major source of information. Likewise, for students other than IITs, the source of information conspicuously matches the IIT students. Students were asked about their favoured study abroad destinations, their motives for studying overseas, the major impediments they faced and their major sources of information on overseas study in addition to their views of the U.S. as a probable study abroad destination in comparison to five other important host destinations. The foreign universities in near future may set up their campuses in India for drawing local students. However, the students are not keen to pursue study in the branch campuses of foreign Institutions in India as the present study suggests. The obvious bias for the United States as well as UK among the students most likely is caused by bright future scope of research in science and technology with teaching scope.

Figure: 6.9

Students in India about their Intention to Study in Branch Campuses in India



Source: Field survey

On the whole, the survey outcome points toward that the state of the United States as a likely study destination for Indians. The survey results also depicted a number of heartening issues and blemishes for the United States as a learning destination for Indian students. The majority of respondents cited the worth or type of academic course as their main reason for studying abroad. In contrast the Continental Europe, Australia, Southeast or East Asia, the Middle East; the United Kingdom and the United States was rated well for outstanding tertiary education system and extensive range of schools and programs, besides for being welcoming toward global students, presenting a unmatched level of affluence and for being a safe place to study. Yet, the U.S. received the most awful ratings for the inflated fee of tuition and high-priced school application procedure. The National Science Board, (2008)

views that the U.S. higher education is now threatened by many competitive countries of the world quickly catches up with the competitiveness of USA. Europe's reorganisation of its graduate education core curriculum has ensured more PhDs in science and engineering stream in comparison to the U.S. The findings of the present study also match with the study of the National Science Board. The past authority of the U.S. in science and technology is fast becoming thing of the past. The students find other different alternatives in European and Asian Universities as market-friendly, worldwide acceptance and also less costly. Thus it may be recommended that upgrading of the visa process is indispensable to make it easier for global students and scholars in general and Indian students in particular. As part of any possible immigration reformation, a novel visa type may be structured for international students who attain a PhD in a STEM field from U.S. Institutions. The brain circulation of skilled migrants at least in disciplines like computer sciences is expected to make certain gain for the growth of human resource in addition to the development of R&D in India also.

Once, the worldwide mobility of scholastic aptitude was restricted and universities across the world enrolled only local students, solely hired citizens as faculty, and offered hardly any prospects for non-nationals to attain citizenship status. The U.S. was the exceptional case and vigorously employed faculty and graduate students belonging to Europe and beyond starting in the 1930s. The early approach towards liberal immigration policies at foremost U.S. universities positively helped maintain a leadership position that sustained well into the 1980s. But at present, both developed and developing countries are modernising their higher education arrangements, looking for raising the global profile and magnetism of their universities, and incorporating higher education into their home and foreign strategy schemes. Thus, new contenders for international students are emerging outside the US soil.

India is rising as a large-scale R&D destination for quite a lot of MNCs. General Electric, Lucent, Suzuki, Phillips, Siemens, IBM, Microsoft, Oracle, Dell, Hindustan Levers and many more such R&D centres are contending for employing Indian skilled workers in their centers in India. Indian group leaders having working experience in their R&D centres abroad for a number of years are being moved to India - a win-win situation for both the parties. Several Indian companies have also started establishing R&D centres, predominantly in the medical and the healthcare businesses, act as pull factor for global researchers for frontier areas of science. The academic sector has regrettably not been capable to be a focus for Indian talent abroad; to the same degree as the corporate sector has been doing. The

research facilities and the work environment are though not yet attractive but this is gradually changing with the surfacing of the globalised higher education sector in India.

It may be argued that the active involvement of the government in higher education, increasing competition in higher education due to competition among service ought to benefit the higher education scenario in the country in the long run. The changing prospect for education and service influences the students in positive as well as negative manner. An Indian student from a middle class prosperous family, starts exploring the likelihood of studying overseas, from the college days. Such ambitions get aggravated once the relatives and acquaintances of that student study in foreign Institutions. Earlier parents were reluctant to send their children abroad. Now many urban affluent families encourage their children to travel overseas by giving them support during the decisive years of their studies, with the expectation of their increased chances of earning abroad in near future. In the past, a Master's or a PhD in the U.S. was the only aim of an Indian student moving to USA. But as the survey responses suggest, now it forms not the only option among the Indian students. In the post recession period, the United States temporarily lost much of its attractiveness among international students including the students from India also, despite renewed interest in the U.S. as a higher education destination. Other countries are rapidly catching up with the U.S. by offering various incentives to students. Skilled workers experienced in western markets and management systems are in much demand in the growing economy in India. The recent experience of the previous students of the surveyed institutions now working in the U.S. is not very happy either. With the loss of H1B visa enabled workers' jobs, visa status is also lost, resulting in compulsory exit from the U.S. The present decision of the prospective Indian workers to study in the U.S. followed by few years' job experience and eventually return to India is also guided by overall recessionary trends in many developed OECD nations of the world. The trend of reverse brain drain from USA is observable across many disciplines of science, technology and engineering fields. The crisis in USA presents a healthy opportunity for India to stay powerful in the 21st century knowledge economy, with the gain of skilled persons in vital science, technology and engineering fields. The slowdown in the U.S. has resulted in many populist measures like putting cap on issuing H1B visa to foreign nationals, which might cause local unemployment among the American citizens. The scholars studying science and technology prefer to respond to the changing market demands.

6.3 Findings

This part of the findings will look into the behavioural approach among the students studying in the U.S. Institutions. Thus the mobility intentions of Indian students are discussed in this section. The push and pull factors are constructed as dummy variables from value —one|| once they scored high on a 5-point Likert scale and value of —zero|| if they were relatively less important in determining the return intentions.

Table 6.8 has provided descriptions, summary statistics plus estimation results for variables applied in the ordered probit model of return intentions. Estimates of the marginal effect of few selected variables from the final estimation model are shown in Table 6.9. The marginal effects have been calculated as the changes in the probability of choosing a particular category of return intention for the explanatory variables selected. All empirical work has been done by using standard errors of the change in probabilities and are given in parentheses below the marginal effects. The categories of return intentions (y) are labeled from 1 to 6, with one which corresponds to the highest return intention category and six corresponding to lowest return intentions category. Negative value for the marginal effects tends to indicate that the probability of choosing a specific return intention category goes down whereas positive values indicate that this probability rises. The human capital theory views that the difference in the anticipated foreign and domestic income is the principal determinant of skilled migration. The migration decisions are guided by the lack of satisfactory income in the native country has been included as a push factor and competitive income prospects in the present country of domicile has been included as a pull factor. The technique of applying these two subjective measures for testing the effect of income differences are justified by the possibility of each migrant having dissimilar perceptions of the income differentials based on inadequate information regarding all alternative employment avenues available to the migrants. Not everyone may place equal weightage to the same payment. Academic opportunities in USA and upward job mobility are also strong incentives for people. Many students do not leave study even though they secure jobs. Those academic assignments are often sponsored by the firms where they work or self financed. Additional qualifications enhance prospects in the job market. The students compare the academic environments in India to that in USA. Some sectors like the IT field need constant updating of knowledge. So, they need to study often beyond their eligibility qualification in order to stay competitive. The probability of coming back increases when the psychic costs, like adjustment costs, associated with being in the U.S. is high. An ordered probit model of

return intentions is estimated of students where the dependent variable means the return intentions discussed in the previous section with the six categories ranging from values 1 through 6. Human capital theory stresses on the role of income disparity in migration decisions (Sjaastad, 1962). Wage differences between the country of destination and the country of origin are viewed as the key determinant of migration flow. To explain the return intentions of the STEM students, a set of variables are used as suggested by human capital theory apart from variables that are considered to be fit in the present research case in the empirical estimation. Various —subjective variables are used to determine the importance of a range of monetary, social, political as well as human capital factors. Some have basis on the respondents' rankings of several push and pull factors regarding their importance in their willingness to return or stay. The final empirical model is selected based on goodness-of-fit statistics; e.g. mainly the AIC plus McFadden's adjusted R^2 . More details about the model selection process are mentioned later. In the next section, the rationale for consideration of each of the variables and also their empirical importance in determination of the return intentions of Indian STEM students are discussed.

Below the variables are discussed; considered in determining the return intentions of engineers.

Gender Effects: The dummy variable takes on the value 1 for —female and 0 for —male. The positive coefficient estimate for gender means that females are less likely to indicate that they will be returning to India compared to males. Anyway, gender is not statistically significant in the final model presented in the following Tables.

Age Effects: —Age and —Age squared are part of the explanatory variables in order to control for cohort effects in addition to possible nonlinearities. Older employees and hence sponsored students generally exhibit stronger return intentions than younger generation who have a longer time frame for working and earning a better salary level in the west. In the final model, age has a positive coefficient and the square of age has a negative coefficient, which indicates that the probability of weak return intentions increases with the age of the scientific brain at a decreasing rate. These two variables, however, are not statistically significant in explaining differences in return intentions for the students.

Stay Duration: Stay duration means the number of years spent in the host country. When duration increases, the incentive to return is to diminish, as individuals get more accustomed to living in their workplaces. The duration of stay variable is positive and

statistically significant at the 1 percent level of significance – indicating the length of stay in the host country increases, and the tendency to stay outside India also increases. Stay duration may also lead to a weakening of ties to India, and a strengthening of ties to the cities of USA where they work and study. It seems that re-adapting to India can be difficult when stay duration increases. It may also increase the psychological distance with the social as well as work environment of the India even if India is the birth place.

Initial Return Intentions: the author has decided to formally test the significance of prior return intentions of the STEM students. Respondents were asked regarding their initial return intentions when they decided to study and work in USA. The possible responses were —return, —undecided and —stay. About 26 percent students intended to return prior to leaving India, whereas about 67 percent engineers decided not to return and the rest was undecided about returning. Two dummy variables are included in the model e.g. X4 for —unsure and X5 for —return, for determining whether differences in the primary intention of the engineers prior to their venture abroad is important in determining their present intentions about returning to India. The coefficients of the variables of initial return intentions are positive and significant at the 1 percent level of significance. The probability of not coming back ($y = 5, 6$) decreases as initial intention shifts from —stay to —unsure and the initial intention shifts from —stay to —return (calculated from second Table in this section).

Family Support: Family attitudes and support about migration decision are to have a significant impact on the decision to return of the students. Greater family encouragement to get job and settle in USA results in a greater non-return intentions. Thus in comparison to respondents whose families are least supportive, the probability of not returning ($y = 5$ or 6) increases whose families are supportive.

Academic opportunities: Majority (about 98 percent) of students mentioned that academic conditions were —better or —much better. This included better infrastructure in academic institutions, highly qualified faculty of international reputation, better research environment, good placement opportunities, scholarships from various sources, facility to work alongside studies, opportunity to work in industries as intern, interdisciplinary courses etc. A dummy variable constructed for each assessment category revealed that the —much worse category was statistically significant at the 5 percent level with reference to other categories in the earlier simpler models. So, the academic assessment variables have little explanatory power on return intentions, hence are excluded from the final preferred model.

Social Life: The social life is expected to be important in the differences in return intentions. About 43 percent respondents indicated that their social environment was neutral compared to India, and 10 percent indicated as —worse or —much worse. The above categories were merged to three (skipping the —don't know category) by amalgamating the —worse and —much worse categories, and also —better and —much better categories. With —much worse as the reference, both the —neither better nor worse plus —better categories are positive and statistically significant at the 1 percent level. If the reference category is —much better, both the —neither better nor worse in addition to —worse dummy variables are negative as well as statistically significant, at the 5 percent and 1 percent levels of significance respectively. These results prove the importance of social environment in determination of the current return intentions. Those who are not satisfied with social conditions in cities are more likely to return.

Standard of Living Assessment: The students were also asked to assess the standard of living applying similar scale for the social life abroad. The distribution of responses is shifted towards —much better end of the scale. As the coefficients of —much better plus —better dummy variables are statistically indifferent from each other, they are merged. In the similar fashion, the first four categories are combined into one category since they are statistically not significant with respect to each other. So, this latter variable is applied as the reference. The coefficient of the variable named —standard of living is better is positive and statistically significant at 5 percent significance level who assess their standard of living as being better than India have greater intention to stay.

Fields of specialisation: Fields of specialisation: It is a common perception that advanced education accompanied by on-the-job trainings in USA are complementary and cause higher productivity and wages. The capital-dependent disciplines are believed to be suffering more from brain drain compared to the non-capital dependent disciplines. So, dummy variable for capital-dependent disciplines was made in the analysis to check whether the similar result would be true for the sample of science and technology students migrating from India and currently working and studying in USA. This dummy variable was statistically insignificant. Therefore, discipline is not a significant determinant of return intentions. The sample in U.S. universities is mainly tilted toward engineering, earth science, natural sciences, as the majority of students study in engineering and technical fields.

Initial Reasons for Going to India: A dummy variable for each specialisation like software, Chip design, Bio-informatics, IT consulting, Physics, engineering, agriculture, and

mathematics was applied in the model in order to determine whether certain fields are more prone to brain drain compared to others. All were found to be statistically significant at the 5 percent level of significance in the initial, simpler models. While the probability of return increases when respondents left due to a job requirement, and many do not have return plans in immediate future. The stay duration affects the probability of coming back to India negatively, many do not expect to return, particularly if they are able find good jobs or start up opportunities in south. When engineers go out to avoid the political ambience, or owing to lifestyle preferences or they discover the facilities plus equipment (knowledge base) for research not sufficient in India, they are not likely to move out. The probability of never coming back ($y = 5$ or 6) increases for those who left India as a result of political reasons, for those who moved due to lifestyle preferences, and for those who migrated as a result of inadequate facilities for research. If the students choose their institution of study keeping in mind the job opportunities, this increases probability of not returning ($y = 5$ or 6). As students they hope to be employed upon completing their studies and thus they hardly face the uncertainty as well as psychic costs associated with looking for a job after their studies are finished. Generally, many students migrate to USA from India for studying engineering courses in computer science in the Institutions of USA every year.

Difficulties Faced in India and Adjustment Factors: Students were asked whether they faced any difficulties in India and how they could adjust. Prior experience (work, study or travel) before moving to the south may make it easy adjusting to or be comfortable with the present city of stay and is expected to delay or postpone returning back to India. Besides previous experience, several other adjustment factors were in the questionnaire, including having pan Indian friends and colleagues in the institution of study, and also difficulties like unfavourable employment opportunities in India. These adjustment factors and difficulties experienced while in India are included in the model as dummy variables. Each has negative coefficient, indicates increasing probability of return intentions.

Income Effects: As we expected, the prospects of better level of income outside of India has positive coefficient estimate, meaning a lower probability of return intentions. About 89 percent of those surveyed indicated income as an important pull factor while deciding about returning to India. The probability of indicating that return is unlikely is higher for those who indicated that higher income levels abroad is important compared to those who indicated that it is not so central. One issue obvious in this observation is that some settle for jobs in south that may be well below their capacity and levels of education.

Effects of Additional Push and Pull Factors: The *expected* income is a relevant variable. The employment opportunities and labour market conditions at India may play a crucial role in the perceptions of opportunity held by skilled migrants. General monetary conditions and fiscal stability determines relative employment scopes and may decrease or increase an engineer's expected income accordingly. Even if economic instability is selected as a 'very important' reason by half and an 'important' reason for a vast number of respondents, it is not statistically significant in determination of return intentions. Therefore it is excluded in the final preferred model. Two push factors are included in the final version of the ordered probit model of return intentions; i.e. being away from research centers / recent advances and finding the cultural or social life to be less than satisfying in India. Locating away from research centers and also recent advancements is positive and significant at the five percent level of significance. For the engineers who mentioned that this was a vital push factor, the probability of unlikely return ($y = 5$) increases. The pull factors affecting the return intentions according to importance are, a higher income level in the host country, a more ordered and organized life, and spouse's preference or job.

Effect of Last Impressions: The last impression of India has a very high impact on return intentions. The probability of returning ($y = 1$ or 2) is decreased for workers who were negatively affected by their last impression regarding India, and increases for engineers who were left with more positive impressions.

The third Table in this section has summarized the impacts of various factors considered here in determining return and non-return intentions. Two extreme categories at both ends of the scale marked for return intentions variable are merged together to form categories like —definitely return and —definitely not return. The highest positive marginal effect on the probability of —definitely returning for the engineers surveyed happens when the respondent has a compulsory service requirement: the probability of returning increases. This indicates that the compulsory and professional requirement is an important means of motivating return. Other factors having great impact on a respondent's probability of definitely returning include family support and an initial intention to return to India, both of which increase the probability of definitely returning. Experiencing a positive impression from the last visit to India has a favorable impact on —definitely returning but to a lesser degree; positive impression increases the probability of definitely returning. The inability to get accustomed to the social ambience in Hyderabad and Bangalore does increase the probability of definitely returning. The most crucial factors impacting the probability of

definitely not returning are mentioned in Table 3; which include a judicious combination of financial, political, social as well as family considerations. Marriage to a spouse belonging to the host city has the highest marginal impact (0.14) on the probability of non-return. Many respondents have indicated that they left India owing to political reasons, which boosts their probability of not returning. Family support for the decision to settle in the U.S. has considerable influence on non-return. The probability of non-return intentions increases. The marginal impact of the income differential is lower: it increases the probability of non-return. Lifestyle factors also have marginal effects. The research has studied the determination and evaluation of several factors affecting the return intentions of students abroad using the results of survey works conducted by the authors. While the decision to migrate is a planned decision, return intentions are closely linked to the realization of these intentions. The return intentions give insights about what is of importance for individuals while deciding on whether to return or stay. The empirical study of return intentions of the IT engineers in south involved the ordered probit model rooted in the human capital theory of migration that predicts that individuals decides to migrate when the net present value of benefits generated from migration is positive. Various socio-economic and political factors are important in discerning between engineers with strong return intentions and those with non-return intentions of strong nature. The push factors like political instability and pull factors like higher income and a more ordered plus organized life in the host cities. Among the pull factors, family considerations, followed by high income in the south and a more ordered lifestyle, in order of importance, all seems to weaken return intentions. A majority of the surveyed engineers have indicated that higher income levels influence their decision to return or stay.

When asked, how many cities you have travelled in India for employment: The IT engineers and scientists were found to enjoy high mobility. The MNCs have branches in different cities of India. The cities like Pune, Chennai, Hyderabad and Bangalore are pull factors, due to which the inter firm and intra firm job mobility in the form of horizontal as well as vertical mobility is seen. The junior level professionals typically spend less than 5 years in any city of India or USA. As the software and hardware technologies are constantly in the process of upgradation, the firms also need to train their human resources stay competitive in the competitive market. Different cities normally enjoy skill base in different sectors despite human mobility.

6.4 Discussion

The study suggests comprehensive relations among various socio-economic factors related to job mobility and migration. Higher income prospects are alluring to the engineers as they move from India. For the students in natural science, research opportunities, scholarship, future prospects are important. Family considerations are also significant factors affecting mobility decisions often resulting into brain gain or counter migration. Specialisation is also a very important factor in mobility. International projects are available in plenty in the U.S. for the engineers working in India. The experiences of students during study in the U.S. Universities are valuable in the Indian job market; many of them are engaged in research funded by their own organisations. The globalised phase of the Indian economy is gradually becoming technology dependent, resulting in the shift of GDP from primary sector to tertiary and quaternary as well as quinary sector. So, the STEM qualifications obtained in the U.S. will always be valuable in near future in India.